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Title 15 —Commerce and Foreign Trade
Subtitle B —Regulations Relating to Commerce and Foreign Trade
Chapter VII —Bureau of Industry and Security, Department of Commerce
Subchapter C —Export Administration Regulations

Part 774 The Commerce Control List

§ 774.1 Introduction.

§ 774.2 [Reserved]

Supplement No. 1 to Part 774
The Commerce Control List

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PART 774—THE COMMERCE CONTROL LIST

Authority: 50 U.S.C. 4801-4852; 50 U.S.C. 4601 *et seq.;* 50 U.S.C. 1701 *et seq.;* 10 U.S.C. 8720; 10 U.S.C. 8730(e); 22 U.S.C. 287c, 22 U.S.C. 3201 *et seq.;* 22 U.S.C. 6004; 42 U.S.C. 2139a; 15 U.S.C. 1824; 50 U.S.C. 4305; 22 U.S.C. 7201 *et seq.;* 22 U.S.C. 7210; E.O. 13026, 61 FR 58767, 3 CFR, 1996 Comp., p. 228.

Source: 61 FR 12937, Mar. 25, 1996, unless otherwise noted.

§ 774.1 Introduction.

(a) ***Scope of the control list.*** In this part, references to the EAR are references to 15 CFR chapter VII, subchapter C. The Bureau of Industry and Security (BIS) maintains the Commerce Control List (CCL) that includes "items"—i.e., "commodities," "software," and "technology"—subject to the authority of BIS. The CCL does not include items exclusively controlled for export by another department or agency of the U.S. Government, though in instances where other agencies administer controls over related items, entries in the CCL may contain a reference to such controls. In addition, those items "subject to the EAR" but not identified on the CCL are identified by the designator "EAR99." See § 734.2(a) of the EAR for items that are "subject to the EAR." EAR Part 738 contains an explanation of the organization of the CCL and its relationship to the Country Chart.

(b) ***ECCN cross-references for items subject to exclusive jurisdiction of another agency.***

(1) Prior to October 15, 2013, the CCL contained certain ECCNs that were only included as cross references to items subject to the export control regulations administered by the Nuclear Regulatory Commission.

(2) ECCNs formerly listed on the CCL that, as of October 15, 2013 were subject to the export licensing authority of the Nuclear Regulatory Commission at 10 CFR part 110 are: 0A001, 0B001, 0B002, 0B003, 0B004, 0B005, 0B006, 0C001, 0C002, 0C004, 0C005, 0C006, 0C201 and 1C012.

(3) The following multilateral export control regime reference is provided, as an additional point of historical reference: 0C201—INFCIRC 254 Part 1, 5.3.1(b).

Note to paragraph (b): ECCNs 0D001 and 0E001 are "subject to the ITAR" (see 22 CFR parts 120 through 130). These ECCNs are retained on the CCL as cross references to the ITAR, although the former cross references to export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110) for ECCN 0D001, and to the Department of Energy (see 10 CFR part 810) for 0E001 were removed from the Control(s) paragraph in the License Requirements section of these two ECCNs and added as a more general jurisdictional cross reference in a heading note added to these two ECCNs as of June 5, 2014.

(c) ***Where to find the CCL?*** The CCL is contained in supplement no. 1 to this part, and supplement no. 2 to this part contains the General Technology and Software Notes relevant to entries contained in the CCL.

(d) ***Conventions related to the use of quotation marks on the CCL.*** The use of double quotation marks on the CCL is intended to be an aid to alert you to terms used on the CCL that are defined in part 772 (Definitions of Terms), or for purposes of ECCNs, where a definition is provided in the "related definitions" paragraph in the License Requirements section of ECCNs or sometimes in Notes and Technical Notes for particular ECCNs and that definition is specific to that particular ECCN. In this sense the quotes are helpful both in the use of single and double quotes, but a good compliance practice is to familiarize yourself with the defined terms in part 772, and when reviewing a control parameter on the CCL that uses a term that is not in quotes to be aware it may be defined in part 772. It is also a useful compliance practice to review the "Related Definitions" paragraph and Notes and Technical Notes to determine if the term is defined for purposes of a particular ECCN.

(1) ***Use of double quotes.*** If a term on the CCL uses double quotes it means there is a defined term in part 772. However, the absence of double quotes does not mean that a term used on the CCL is not defined in part 772. Because the CCL includes many terms that are defined in part 772, BIS's practice is to use double quotes for certain key terms and to use double quotes when needed for consistency with multilateral export control regime based entries, such as many derived from control lists, in particular for the Wassenaar Arrangement that also uses the double quotes convention. However, because of the large number of defined terms used on the CCL and a desire to avoid hindering readability by placing quotes around too many words used in particular ECCNs, BIS's practice is to not add double quotes around certain terms, such as items and commodities. This convention also applies to the use of double quotes within the Definition of Terms section under part 772.

(2) ***Use of single quotes.*** The CCL also includes a convention regarding the use of single quotes. Single quotes on the CCL identify a term as a defined term in the context of a particular ECCN. This convention also applies to the use of single quotes within the Definition of Terms section under part 772.

(e) ***Chemicals identified by Chemical Abstracts Service (CAS) number.*** In some instances chemicals are listed by name and CAS number. The list applies to chemicals of the same structural formula (including hydrates) regardless of name or CAS number. CAS numbers are shown to assist in identifying a particular chemical or mixture, irrespective of nomenclature. CAS numbers cannot be used as unique identifiers because some forms of the listed chemical have different CAS numbers, and mixtures containing a listed chemical may also have different CAS numbers.

[78 FR 61903, Oct. 4, 2013, as amended at 79 FR 32627, June 5, 2014; 81 FR 64679, Sept. 20, 2016]

§ 774.2 [Reserved]

Supplement No. 1 to Part 774—The Commerce Control List

Category 0—Nuclear Materials, Facilities, and Equipment, Firearms, Ammunition [and Miscellaneous Items]

A. "End Items," "Equipment," "Accessories," "Attachments," "Parts," "Components," and "Systems"

0A002 Power generating or propulsion equipment "specially designed" for use with space, marine or mobile "nuclear reactors". (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

0A501 Firearms (except 0A502 shotguns, 0A506 semi-automatic rifles, 0A507 semi-automatic pistols, and 0A508 semi-automatic shotguns) and related commodities (except semi-automatic related commodities enumerated or otherwise described in Eccn 0A509 for Eccns 0A506, 0A507, or 0A508) as follows (see List of Items controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, FC, UN, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 0A501.y	NS Column 1.
RS applies to entire entry except 0A501.y	RS Column 1.
FC applies to entire entry except 0A501.y	FC Column 1.
UN applies to entire entry	See § 746.1 of the EAR for UN controls.
AT applies to entire entry	AT Column 1.

License Requirement Note: In addition to using the Commerce Country Chart to determine license requirements, a license is required for exports and reexports of ECCN 0A501.y.7 firearms to the People's Republic of China.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $500 for 0A501.c, .d, and .x.

$500 for 0A501.c, .d, .e, and .x if the ultimate destination is Canada.

GBS: N/A

Special Conditions for STA

License Exception STA may not be used for ECCN 0A501.a, .b, .c, .d, or .e, to any of the destinations listed in Country Group A:5 or A:6 (See supplement no.1 to part 740 of the EAR). License Exception STA may not be used for any item in this entry to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

List of Items Controlled

Related Controls: (1) See USML Category I for firearms that are fully automatic, and certain related parts, components, accessories, and attachments (including magazines with a capacity of greater than 50 rounds). (2) See ECCN 0A506 for semi-automatic rifles. (3) See ECCN 0A507 for semi-automatic pistols. (4) See ECCN 0A508 for semi-automatic shotguns and ECCN 0A502 for certain “parts” and “components” for semi-automatic shotguns that are not controlled by 0A509.a or .c. (5) See ECCN 0A509 for enumerated or otherwise described “parts,” “components,” devices, “accessories,” and “attachments” for ECCNs 0A506, 0A507, and 0A508. (6) See .d, .x, and .y of this entry for other “parts,” “components,” “accessories,” and “attachments” “specially designed” for 0A506 and 0A507, or 0A508. (7) See ECCN 0A502 for non-automatic shotguns and their “parts” and “components” that are subject to the EAR and for certain “parts” and “components” for semi-automatic shotguns that are not controlled by 0A509.a or .c. (8) See ECCN 0A504 and USML Category XII for controls on optical sighting devices.

Related Definitions: N/A.

Items:

a. Non-automatic and non-semi-automatic firearms equal to .50 caliber (12.7 mm) or less.

> *Note 1 to paragraph 0A501.a: 'Combination pistols' are controlled under ECCN 0A501.a. A 'combination pistol' (a.k.a., a combination gun) has at least one rifled barrel and at least one smoothbore barrel (generally a shotgun style barrel).*

> *Note 2 to paragraph 0A501.a: Semi-automatic firearms* equal to .50 caliber (12.7 mm) or less *are controlled under ECCNs 0A506 and 0A507.*

> *Technical Note to 0A501.a: Firearms described in 0A501.a include those chambered for the .50 BMG cartridge.*

b. Non-automatic and non-semi-automatic rifles, carbines, revolvers or pistols with a caliber greater than .50 inches (12.7 mm) but less than or equal to .72 inches (18.0 mm).

c. The following types of “parts” and “components” if “specially designed” for a commodity controlled by paragraph .a or .b of this entry or ECCNs 0A506 or 0A507, or USML Category I (unless otherwise enumerated or elsewhere specified on the USML or controlled under ECCN 0A509): Barrels, cylinders, barrel extensions, mounting blocks (trunnions), bolts, bolt carriers, operating rods, gas pistons, trigger housings, triggers, hammers/striker, sears, disconnectors, pistol grips that contain fire control “parts” or “components” (*e.g.,* triggers, hammers/striker, sears, disconnectors) and buttstocks that contain fire control “parts” or “components.”

> *Technical Note to 0A501.c: Barrel blanks that have reached a stage in manufacturing in which they are either chambered or rifled are controlled by 0A501.c.*

d. Detachable magazines with a capacity of 17 to 50 rounds “specially designed” for a commodity controlled by paragraph .a or .b of this entry or controlled by ECCNs 0A506 or 0A507.

> *Note 3 to paragraph 0A501.d Magazines with a capacity of 16 rounds or less are controlled under 0A501.x; for magazines with a capacity greater than 50 rounds, see USML Category I. Magazines that hold only blank ammunition controlled under 0A505.d are controlled under 0A501.d or 0A501.x, depending on the magazine's capacity.*

e. Receivers (frames) and “complete breech mechanisms,” including castings, forgings, stampings, or machined items thereof, “specially designed” for a commodity controlled by paragraph .a or .b of this entry.

Note 4 to 0A501.e: Frames (receivers) under 0A501.e refers to any "part" or "component" of the firearm that has or is customarily marked with a serial number when required by law. This paragraph 0A501.e is synonymous with a "part" or "component" that is regulated by the Bureau of Alcohol, Tobacco, Firearms and Explosives (see 18 U.S.C. 921(a)(3); 27 CFR parts 447, 478, and 479,) as a firearm.

Note 5 to 0A501.e: Frames (receivers) "specially designed" for semi-automatic firearms are controlled under ECCN 0A509.b or .c.

f. through w. [Reserved]

x. "Parts" and "components" that are "specially designed" for a commodity classified under paragraphs .a through .c of this entry, a commodity classified under ECCNs 0A506 or 0A507, or the USML and not elsewhere specified on the USML or CCL or controlled under ECCN 0A509.

y. Specific "parts," "components," "accessories" and "attachments" "specially designed" for a commodity subject to control in this ECCN, ECCNs 0A506, 0A507, or common to a defense article in USML Category I and not elsewhere specified in the USML or CCL as follows, and "parts," "components," "accessories," and "attachments" "specially designed" therefor.

y.1. Stocks (including adjustable, collapsible, blades and braces), grips, handguards, or forends, that do not contain any fire control "parts" or "components" (*e.g.,* triggers, hammers/striker, sears, disconnectors);

y.2 through y.5. [Reserved]

y.6. Bayonets; and

y.7. Firearms manufactured from 1890 to 1898 and reproductions thereof.

Technical Note 1 to 0A501: ECCN 0A501 includes "parts" and "components" that are not "subject to the ITAR" even though they are common to firearms described in ECCN 0A501 and to those firearms "subject to the ITAR."

Technical Note 2 to 0A501: A receiver with any other controlled "part" or "component" (e.g., a barrel (0A501.c), or trigger guard (0A501.x), or stock (0A501.y.1)) is still controlled under 0A501.e.

Technical Note 3 to 0A501: Blank firing adapters, which are attachments to semi-automatic and automatic firearms used in conjunction with blank cartridges for safety and functional reasons and used for firearm training purposes by police, military, sporting shooters, as well as in the movie industry, are designated as EAR99.

Note 6 to 0A501: Antique firearms (i.e., those manufactured before 1890) and reproductions thereof, muzzle loading and black powder firearms except those designs based on centerfire weapons of a post 1937 design, BB guns, pellet rifles, paint ball, and all other air rifles are EAR99 commodities.

Note 7 to 0A501: Muzzle loading and black powder firearms with a caliber less than 20 mm that were manufactured post 1937 that are used for hunting or sporting purposes that were not "specially designed" for military use and are not described on the USML nor controlled as shotguns under ECCN 0A502 are EAR99 commodities.

Note 8 to 0A501: Scope mounts or accessory rails, iron sights, sling swivels, and butt plates or recoil pads that are subject to the EAR are designated as EAR99. These commodities have been determined to no longer warrant being "specially designed" for purposes of ECCN 0A501.

Note 9 to 0A501: A kit, including a replacement or repair kit, of firearms "parts" or "components" customarily sold and exported together takes on the classification of the most restrictive "part" or "component" that is included in the kit. For example, a kit containing 0A501.y and .x "parts," is controlled as a 0A501.x kit because the .x "part" is the most restrictive "part" included in the kit. A complete 0A501 firearm disassembled in a kit form is controlled as a firearm under 0A501.a, .b, or .y.7.

0A502 Shotguns; shotguns "parts" and "components," consisting of complete trigger mechanisms; magazines and magazine extension tubes; "complete breech mechanisms;" except: semi-automatic shotguns controlled under Eccn 0A508; certain "parts," components," devices, "accessories," and "attachments" for semi-automatic shotguns controlled under Eccn 0A509; equipment used to slaughter domestic animals or used exclusively to treat or tranquilize animals; and arms designed solely for signal, flare, or saluting use.

LICENSE REQUIREMENTS

Reason for Control: RS, FC, CC, UN, AT, NS

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to shotguns with a barrel length less than 18 inches (45.72 cm)	NS Column 1.
RS applies to shotguns with a barrel length less than 18 inches (45.72 cm)	RS Column 1.
FC applies to entire entry	FC Column 1.
CC applies to shotguns with a barrel length less than 24 in. (60.96 cm) and shotgun "components" controlled by this entry regardless of end user	CC Column 1.

Control(s)	Country chart (see Supp. No. 1 to part 738)
CC applies to shotguns with a barrel length greater than or equal to 24 in. (60.96 cm), regardless of end user	CC Column 2.
CC applies to shotguns with a barrel length greater than or equal to 24 in. (60.96 cm) if for sale or resale to police or law enforcement	CC Column 3.
UN applies to entire entry	See § 746.1(b) of the EAR for UN controls.
AT applies to shotguns with a barrel length less than 18 inches (45.72 cm)	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $500 for 0A502 shotgun “parts” and “components,” consisting of complete trigger mechanisms; magazines and magazine extension tubes. $500 for 0A502 shotgun “parts” and “components,” consisting of complete trigger mechanisms; magazines and magazine extension tubes, “complete breech mechanisms” if the ultimate destination is Canada.

GBS: N/A

Special Conditions for STA

License Exception STA may not be used for any shotguns with barrel length less than 18 inches controlled in 0A502, to any of the destinations listed in Country Group A:5 or A:6 (See supplement no.1 to part 740 of the EAR).

List of Items Controlled

Related Controls: (1) See USML Category I for shotguns that are fully automatic. (2) See ECCN 0A508 for semi-automatic shotguns. (3) See ECCN 0A509 for enumerated or otherwise described “parts,” “components,” devices, “accessories,” and “attachments” for ECCN 0A508. (4) See 0A501.d, .x, and .y for other “parts,” “components,” “accessories,” and “attachments” “specially designed” for 0A508. (5) See ECCNs 0A501 for non-semi-automatic firearms, 0A506 for semi-automatic rifles, and 0A507 for semi-automatic pistols.

Related Definitions: N/A.

Items: The list of items controlled is contained in the ECCN heading.

Note 1 to 0A502: Shotguns made in or before 1898 are considered antique shotguns and designated as EAR99.

Technical Note: Non-automatic and non-semi-automatic shot pistols or shotguns that have had the

shoulder stock removed and a pistol grip attached are controlled by ECCN 0A502. Non-automatic and non-semi-automatic slug guns are also controlled under ECCN 0A502.

0A503 Discharge type arms; non-lethal or less-lethal grenades and projectiles, and "specially designed" "parts" and "components" of those projectiles; and devices to administer electric shock, for example, stun guns, shock batons, shock shields, electric cattle prods, immobilization guns and projectiles; except equipment used to slaughter domestic animals or used exclusively to treat or tranquilize animals, and except arms designed solely for signal, flare, or saluting use; and "specially designed" "parts" and "components," n.e.s.

LICENSE REQUIREMENTS

Reason for Control: CC, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CC applies to entire entry	A license is required for ALL destinations, except Canada, regardless of end use. Accordingly, a column specific to this control does not appear on the Commerce Country Chart. (See part 742 of the EAR for additional information)
UN applies to entire entry	See § 746.1(b) of the EAR for UN controls

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: Law enforcement restraint devices that administer an electric shock are controlled under ECCN 0A982. Electronic devices that monitor and report a person's location to enforce restrictions on movement for law enforcement or penal reasons are controlled under ECCN 3A981.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

0A504 Optical sighting devices for firearms (including shotguns controlled by 0A502); and "components" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: FC, RS, CC, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
RS applies to paragraph .i	RS Column 1.
FC applies to paragraphs .a, .b, .c, .d, .e, .g, and .i of this entry	FC Column 1.
CC applies to entire entry	CC Column 1.
UN applies to entire entry	See § 746.1(b) of the EAR for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $500 for 0A504.g.

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See USML Category XII(c) for sighting devices using second generation image intensifier tubes having luminous sensitivity greater than 350 μA/lm, or third generation or higher image intensifier tubes, that are "subject to the ITAR." (2) See USML Category XII(b) for laser aiming or laser illumination systems "subject to the ITAR." (3) Section 744.9 of the EAR imposes a license requirement on certain commodities described in 0A504 if being exported, reexported, or transferred (in-country) for use by a military end user or for incorporation into an item controlled by ECCN 0A919.

Related Definitions: N/A

Items:

a. Telescopic sights.

b. Holographic sights.

c. Reflex or "red dot" sights.

d. Reticle sights.

e. Other sighting devices that contain optical elements.

f. Laser aiming devices or laser illuminators “specially designed” for use on firearms, and having an operational wavelength exceeding 400 nm but not exceeding 710 nm.

> *Note 1 to 0A504.f: 0A504.f does not control laser boresighting devices that must be placed in the bore or chamber to provide a reference for aligning the firearms sights.*

g. Lenses, other optical elements and adjustment mechanisms for articles in paragraphs .a, .b, .c, .d, .e, or .i.

h. [Reserved]

i. Riflescopes that were not “subject to the EAR” as of March 8, 2020 and are “specially designed” for use in firearms that are “subject to the ITAR.”

> *Note 2 to paragraph i: For purpose of the application of “specially designed” for the riflescopes controlled under 0A504.i, paragraph (a)(1) of the definition of “specially designed” in § 772.1 of the EAR is what is used to determine whether the riflescope is “specially designed.”*

0A505 Ammunition as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, FC, CC, UN, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to 0A505.a and .x	NS Column 1.
RS applies to 0A505.a and .x	RS Column 1.
FC applies to entire entry except 0A505.d	FC Column 1.
CC applies to 0A505.b	CC Column 1.
UN applies to entire entry	See § 746.1 of the EAR for UN controls.
AT applies to 0A505.a,	AT Column 1.

Control(s)	Country chart (see Supp. No. 1 to part 738)
.d, and .x	
AT applies to 0A505.c	A license is required for items controlled by paragraph .c of this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT licensing requirements for this entry. See § 742.19 of the EAR for additional information.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $500 for items in 0A505.x, except $3,000 for items in 0A505.x that, immediately prior to March 9, 2020, were classified under 0A018.b. (*i.e.,* "Specially designed" components and parts for ammunition, except cartridge cases, powder bags, bullets, jackets, cores, shells, projectiles, boosters, fuses and components, primers, and other detonating devices and ammunition belting and linking machines (all of which are "subject to the ITAR"). (See 22 CFR parts 120 through 130)).

GBS: N/A

Special Conditions for STA

License Exception STA may not be used for ECCN 0A505, to any of the destinations listed in Country Group A:6 (See supplement no.1 to part 740 of the EAR).

List of Items Controlled

Related Controls: (1) See USML Category III for ammunition for modern heavy weapons such as howitzers, artillery, cannon, mortars and recoilless rifles as well as inherently military ammunition types such as ammunition preassembled into links or belts, caseless ammunition, tracer ammunition, ammunition with a depleted uranium projectile or a projectile with a hardened tip or core and ammunition with an explosive projectile. (2) Percussion caps, and lead balls and bullets, for use with muzzle-loading firearms are EAR99 items. (3) See USML Category III for shotgun projectiles that are flechettes, incendiary, tracer, or explosive.

Related Definitions: 'Marking rounds' are non-lethal, typically used for training purposes, and contain a dye or paint in a capsule that is not a chemical irritant.

Items:

a. Ammunition for firearms controlled by ECCNs 0A501, 0A506, or 0A507 or USML Category I and not enumerated in paragraph .b, .c, or .d of this entry or described in USML Category III.

b. Buckshot (No. 4 .24" diameter and larger, any material) shotgun shells and shotgun shells that contain only buckshot, or are for the dispersion of chemical irritants.

c. Shotgun shells (including less than lethal rounds) that do not contain buckshot; and “specially designed” “parts” and “components” of shotgun shells.

d. Blank ammunition for firearms controlled by ECCNs 0A501, 0A502, 0A506, 0A507, or 0A508 and not described in USML Category III.

Technical Note to 0A505.d: Includes 'marking rounds' that have paint/dye as the projectile.

e. through w. [Reserved]

x. “Parts” and “components” that are “specially designed” for a commodity subject to control in this ECCN or a defense article in USML Category III and not elsewhere specified on the USML or the CCL.

Note 1 to 0A505.x: The controls on “parts” and “components” in this entry include Berdan and boxer primers, metallic cartridge cases, and standard metallic projectiles such as full metal jacket, lead core, copper projectiles, and frangible projectiles.

Note 2 to 0A505: Metal shot smaller than No. 4 Buckshot, empty and unprimed shotgun shells, shotgun wads, smokeless gunpowder, 'dummy rounds' and 'drill rounds' (unless linked or belted), not incorporating a lethal or non-lethal projectile(s) are designated EAR99. A 'dummy round' or 'drill round' is a round that is completely inert, (i.e., contains no primer, propellant, or explosive charge). It is typically used to check weapon function and for crew training.

Note 3 to 0A505: Shotgun shells that contain two or more balls/shot larger than .24-inch are controlled under 0A505.b.

0A506 Semi-Automatic Rifles as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, FC, UN, AT

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
RS applies to entire entry	RS Column 1.
FC applies to entire entry	FC Column 1.
UN applies to entire entry	See § 746.1 of the EAR for UN controls.

Control(s)	Country chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

Special Conditions for STA

License Exception STA may not be used for ECCN 0A506, to any of the destinations listed in Country Group A:5 or A:6 (See supplement no.1 to part 740 of the EAR).

List of Items Controlled

Related Controls: (1) See USML Category I for firearms that are fully automatic, and magazines with a capacity of greater than 50 rounds. (2) See ECCN 0A507 for semi-automatic pistols, excluding pistols built with, *e.g.,* AR- or AK-style receivers (frames), which are controlled under ECCN 0A506. (3) See ECCN 0A508 for semi-automatic shotguns and ECCN 0A502 for certain “parts” and “components” for semi-automatic shotguns that are not controlled by 0A509.a or .c. (4) See ECCN 0A509 for enumerated or otherwise described “parts,” “components,” devices, “accessories,” and “attachments” for ECCNs 0A506, 0A507, and 0A508. (5) See 0A501.c, .d, .x, and .y for other “parts,” “components,” “accessories,” and “attachments” “specially designed” for 0A506 and 0A507, or 0A508. (6) See ECCN 0A501 for non-semi-automatic firearms (except 0A502 shotguns) and related commodities that are subject to the EAR. (7) See ECCN 0A502 for non-automatic shotguns and their “parts” and “components” that are subject to the EAR and certain “parts” and “components” for semi-automatic shotguns that are not controlled by 0A509.a or .c. (8) See ECCN 0A504 and USML Category XII for controls on optical sighting devices.

Related Definitions: N/A

Items:

a. Semi-automatic centerfire (non-rimfire) rifles equal to .50 caliber (12.7 mm) or less.

b. Semi-automatic rimfire rifles equal to .50 caliber (12.7 mm) or less.

> *Note 1 to 0A506.a and .b: “Parts” and “components” that are “specially designed” for a commodity classified under .a or .b of this entry, except those controlled under ECCN 0A509, are controlled under ECCN 0A501.c, .d, .x, or .y.*

Technical Note 1 to 0A506: Firearms described in 0A506 include those chambered for the .50 BMG cartridge.

Technical Note 2 to 0A506: Firearms described in 0A506 include pistols built with, e.g., AR- or AK-style receivers (frames).

0A507 Semi-Automatic Pistols as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, FC, UN, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
RS applies to entire entry	RS Column 1.
FC applies to entire entry	FC Column 1.
UN applies to entire entry	See § 746.1 of the EAR for UN controls.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

SPECIAL CONDITIONS FOR STA

License Exception STA may not be used for ECCN 0A507, to any of the destinations listed in Country Group A:5 or A:6 (See supplement no.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) See USML Category I for firearms that are fully automatic, and magazines with a capacity of greater than 50 rounds. (2) See ECCN 0A506 for semi-automatic rifles. (3) See ECCN 0A508 for semi-automatic shotguns and ECCN 0A502 for certain “parts” and “components” for semi-automatic shotguns that are not controlled by 0A509.a or .c. (4) See ECCN 0A509 for enumerated or otherwise described “parts,” “components,” devices, “accessories,” and “attachments” for ECCNs 0A506, 0A507, and 0A508. (5) See ECCN 0A501.c, .d, .x, and .y for other “parts,” “components,” “accessories,” and “attachments” “specially designed” for 0A506 and 0A507, or 0A508. (6) See ECCN 0A501 for non-semi-automatic firearms (except 0A502 shotguns) and related commodities

that are subject to the EAR. (7) See ECCN 0A502 for non-automatic shotguns and their "parts" and "components" that are subject to the EAR and certain "parts" and "components" for semi-automatic shotguns that are not controlled by 0A509.a or .c. (8) See ECCN 0A504 and USML Category XII for controls on optical sighting devices.

Related Definitions: N/A

Items:

a. Semi-automatic centerfire (non-rimfire) pistols equal to .50 caliber (12.7 mm) or less.

b. Semi-automatic rimfire pistols equal to .50 caliber (12.7 mm) or less.

> *Note 1 to 0A507.a and .b: "Parts" and "components" that are "specially designed" for a commodity classified under .a or .b of this entry, except those controlled under ECCN 0A509, are controlled under ECCN 0A501.c, .d, .x, or .y.*

> *Note 2 to 0A507: Firearms, including pistols, built with, e.g., AR- or AK-style receivers (frames) are controlled under ECCN 0A506.*

> *Technical Note to 0A507: Firearms described in 0A507 includes those chambered for the .50 BMG cartridge, including revolvers, or that may be developed to fire .50 BMG cartridges.*

0A508 Semi-Automatic Shotguns as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, FC, CC, UN, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to semi-automatic shotguns with a barrel length less than 18 inches (45.72 cm)	NS Column 1.
RS applies to semi-automatic shotguns with a barrel length less than 18 inches (45.72 cm)	RS Column 1.
FC applies to entire entry	FC Column 1.
CC applies to shotguns with a barrel length less than 24 in. (60.96 cm) and shotgun "components" controlled by this entry regardless of end user	CC Column 1.
CC applies to shotguns with a barrel length greater than or equal to 24 in. (60.96 cm), regardless of end user	CC Column 2.

Control(s)	Country chart (see Supp. No. 1 to part 738)
CC applies to shotguns with a barrel length greater than or equal to 24 in. (60.96 cm) if for sale or resale to police or law enforcement	CC Column 3.
UN applies to entire entry	See § 746.1 of the EAR for UN controls.
AT applies to semi-automatic shotguns with a barrel length less than 18 inches (45.72 cm)	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

Special Conditions for STA

License Exception STA may not be used for any shotguns with barrel length less than 18 inches controlled in 0A508, to any of the destinations listed in Country Group A:5 or A:6 (See supplement no.1 to part 740 of the EAR).

List of Items Controlled

Related Controls: (1) See USML Category I for shotguns that are fully automatic. (2) See ECCN 0A502 for non-semi-automatic shotguns. (3) See ECCN 0A509 for enumerated or otherwise described “parts,” “components,” devices, “accessories,” and “attachments” for ECCN 0A508. (4) See 0A501.d, .x, and .y for other “parts,” “components,” “accessories,” and “attachments” “specially designed” for 0A508. (5) See ECCNs 0A501 for non-semi-automatic firearms, 0A506 for semi-automatic rifles, and 0A507 for semi-automatic pistols.

Related Definitions: N/A

Items:

a. Semi-automatic centerfire (non-rimfire) shotguns.

b. Semi-automatic rimfire shotguns.

0A509 Certain “parts,” “components,” devices, “accessories,” and “attachments” for items controlled under ECCNs 0A506, 0A507, and 0A508 as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, FC, CC, UN, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 0A509.a for items for ECCN 0A502 or ECCN 0A508, and 0A509.d	NS Column 1.
RS applies to entire entry except 0A509.a for items for ECCN 0A502 or ECCN 0A508, and 0A509.d	RS Column 1.
FC applies to entire entry	FC Column 1.
CC applies to 0A509.a for items for ECCN 0A502 or ECCN 0A508, and 0A509.d	CC Column 1.
UN applies to entire entry	See § 746.1 of the EAR for UN controls.
AT applies to entire entry except 0A509.a for items for ECCN 0A502 or ECCN 0A508, and 0A509.d	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $500 for 0A509.a, $500 for 0A509.b, .c, and .d if the ultimate destination is Canada

GBS: N/A

SPECIAL CONDITIONS FOR STA

License Exception STA may not be used for ECCN 0A509, except for 0A509.a for items for ECCN 0A502 or ECCN 0A508, and 0A509.d, to any of the destinations listed in Country Group A:5 or A:6 (See supplement no.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) See USML Category I for firearms that are fully automatic, and magazines with a capacity of greater than 50 rounds. (2) See ECCN 0A506 for semi-automatic rifles. (3) See ECCN 0A507 for semi-automatic pistols. (4) See ECCN 0A508 for semi-automatic shotguns and ECCN 0A502 for certain “parts” and “components” for semi-automatic shotguns that are not controlled by .a or .c of this entry. (5) See ECCN 0A501.c, .d, .x, and .y for other “parts,” “components,” “accessories,” and “attachments” “specially designed” for 0A506 and 0A507, or 0A508. (6) See ECCN 0A501 for non-semi-automatic firearms (except 0A502 shotguns) and related commodities that are subject to the EAR. (7) See ECCN 0A502 for non-automatic shotguns and their “parts” and “components” that are subject to the EAR and certain “parts” and “components” for semi-automatic shotguns that are not controlled by .a or .d of this entry. (8) See ECCN 0A504 and USML Category XII for controls on optical sighting devices. (9) See USML Category I for similar items.

Related Definitions: N/A

Items:

a. Any "part," "component," device, "attachment," or "accessory" not elsewhere specified on the USML that is designed or functions to convert a non-semi-automatic firearm controlled by 0A501 or 0A502 to semi-automatic or to accelerate the rate of fire of a semi-automatic firearm controlled by 0A506, 0A507, or 0A508.

b. Receivers (frames), including castings, forgings, stampings, or machined items thereof, "specially designed" for an item controlled by ECCN 0A506.

c. Receivers (frames), including castings, forgings, stampings, or machined items thereof, "specially designed" for an item controlled by ECCN 0A507.

d. Receivers (frames) and "specially designed" "complete breech mechanisms" for a commodity controlled by ECCN 0A508.

> *Note 1 to 0A509.b and .c: Receivers (frames) under 0A509.b and .c refers to any "part" or "component" of the firearm that has or is customarily marked with a serial number when required by law. Paragraph 0A509.b and .c are synonymous with a "part" or "component" that is regulated by the Bureau of Alcohol, Tobacco, Firearms and Explosives (see 18 U.S.C. 921(a)(3); 27 CFR parts 447, 478, and 479,) as a firearm. For 0A509.c, receivers (frames) includes chassis "components" that serve as the legal firearm (i.e., with modern pistols, the chassis itself is the serialized firearm).*

0A521 Any commodity subject to the EAR that is not listed elsewhere in the CCL, but which is controlled for export because it provides at least a significant military or intelligence advantage to the United States or for foreign policy reasons.

0A521 commodities are subject to RS1 controls with no license exception eligibility other than License Exception GOV for U.S. Government personnel and agencies under § 740.11(b)(2)(ii) of the EAR, or an item-specific license exception identified in Supplement No. 5 to part 774 particular to an item covered under ECCN 0A521. The list of commodities determined to be classified under ECCN 0A521 controls is published in Supplement No. 5 to part 774. The license requirements and licensing policy relating to ECCN 0A521 are set forth in § 742.6(a)(8) of the EAR.

0A602 Guns and Armament as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, UN, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1

Control(s)	Country chart (see Supp. No. 1 to part 738)
UN applies to entire entry	See § 746.1 of the EAR for UN controls
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $500

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 0A602.

List of Items Controlled

Related Controls: (1) Modern heavy weapons such as howitzers, artillery, cannon, mortars, and recoilless rifles are "subject to the ITAR." (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" items. (3) See ECCN 0A606 for engines that are "specially designed" for a self-propelled gun or howitzer subject to control under paragraph .a of this ECCN or USML Category VII.

Related Definitions: N/A

Items:

a. Guns and armament manufactured between 1890 and 1919.

b. Military flame throwers with an effective range less than 20 meters.

c. through w. [Reserved]

x. "Parts" and "components" that are "specially designed" for a commodity subject to control in paragraphs .a or .b of this ECCN or a defense article in USML Category II and not elsewhere specified on the USML or the CCL.

Note 1 to 0A602.x: Engines that are "specially designed" for a self-propelled gun or howitzer subject to control under paragraph .a of this ECCN or a defense article in USML Category VII are controlled under ECCN 0A606.x.

Note 2 to 0A602: "Parts," "components," "accessories," and "attachments" specified in USML subcategory II(j) are subject to the controls of that paragraph.

Note 3 to 0A602: Black powder guns and armament manufactured in or prior to 1890 and replicas thereof designed for use with black powder propellants are designated EAR99.

0A604 Commodities related to military explosive devices and charges (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in this ECCN 0A604.

LIST OF ITEMS CONTROLLED

Related Controls: (1) Torpedoes, bombs, and mines are "subject to the ITAR" (see 22 CFR § 121.1, USML Category IV). (2) Smoke bombs, non-irritant smoke flares, canisters, grenades and charges, and other pyrotechnical articles having both military and commercial applications are controlled by ECCN 1A984. (3) Certain explosive detonator firing sets, electrically driven explosive detonators, and detonators and multipoint initiation systems are controlled by ECCN 1A007 or ECCN 3A232. (4) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. Demolition blocks, and detonators designed, modified, or adapted therefor.

b. Military explosive excavating devices.

Note to 0A604.a and .b: *This entry does not control the detonators and other items described in ECCN 1A007 or ECCN 3A232.*

c. Smoke hand grenades and stun hand grenades (e.g., "flashbangs") not controlled by ECCN 1A984.

d. through w. [Reserved]

x. "Parts," "components," "accessories," and "attachments" that are "specially designed" for a commodity subject to control in paragraphs .a through .c of this ECCN, or for a defense article controlled under USML Category IV, and not specified elsewhere on the USML.

Note to 0A604.x: *"Parts," "components," "accessories," and "attachments" specified in USML Category IV(h) are subject to the controls of that paragraph*

0A606 Ground vehicles and related commodities, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry, except 0A606.b and .y	NS Column 1
NS applies to 0A606.b	NS Column 2
RS applies to entire entry, except 0A606.b and .y	RS Column 1
RS applies to 0A606.b	RS Column 2
RS applies to 0A606.y	China, Russia, or Venezuela (see § 742.6(a)(7))
AT applies to entire entry	AT Column 1
UN applies to entire entry, except 0A606.y	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: (1) Paragraph (c)(1) of License Exception STA (§ 740.20(c)(1) of the EAR) may not be used for any item in 0A606.a, unless determined by BIS to be eligible for License Exception STA in accordance with § 740.20(g) (License Exception STA eligibility requests for 9x515 and "600 series" items). (2) Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 0A606.

LIST OF ITEMS CONTROLLED

Related Controls: (1) The ground vehicles, other articles, technical data (including software) and services described in 22 CFR part 121, Category VII are subject to the jurisdiction of the International Traffic in Arms Regulations. (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" controlled content.

Related Definitions: N/A

Items:

a. Ground vehicles, whether manned or unmanned, "specially designed" for a military use and not enumerated or otherwise described in USML Category VII.

Note 1 to paragraph a: For purposes of paragraph a, "ground vehicles" include (i) tanks and armored vehicles manufactured prior to 1956 that have not been modified since 1955 and that do not contain a functional weapon or a weapon capable of becoming functional through repair; (ii) military railway trains except those that are armed or are "specially designed" to launch missiles; (iii) unarmored military recovery and other support vehicles; (iv) unarmored, unarmed vehicles with mounts or hard points for firearms of .50 caliber or less; and (v) trailers "specially designed" for use with other ground vehicles enumerated in USML Category VII or ECCN 0A606.a, and not separately enumerated or otherwise described in USML Category VII. For purposes of this note, the term "modified" does not include incorporation of safety features required by law, cosmetic changes (e.g., different paint or repositioning of bolt holes) or addition of "parts" or "components" available prior to 1956.

Note 2 to paragraph a: A ground vehicle's being "specially designed" for military use for purposes of determining controls under paragraph .a. entails a structural, electrical or mechanical feature involving one or more "components" that are "specially designed" for military use. Such "components" include:
a. Pneumatic tire casings of a kind "specially designed" to be bullet-proof;

b. Armored protection of vital "parts" (e.g., fuel tanks or vehicle cabs);

c. Special reinforcements or mountings for weapons;

d. Black-out lighting.

b. Other ground vehicles, “parts” and “components,” as follows:

b.1. Unarmed vehicles that are derived from civilian vehicles and that have all of the following:

b.1.a. Manufactured or fitted with materials or “components” other than reactive or electromagnetic armor to provide ballistic protection equal to or better than level III (National Institute of Justice standard 0108.01, September 1985) or “equivalent standards”;

b.1.b. A transmission to provide drive to both front and rear wheels simultaneously, including those for vehicles having additional wheels for load bearing purposes whether driven or not;

b.1.c. Gross vehicle weight rating (GVWR) greater than 4,500 kg; *and*

b.1.d. Designed or modified for off-road use.

b.2. “Parts” and “components” having all of the following:

b.2.a. “Specially designed” for vehicles specified in paragraph .b.1 of this entry; *and*

b.2.b. Providing ballistic protection equal to or better than level III (National Institute of Justice standard 0108.01, September 1985) or “equivalent standards”.

> *Note 1 to paragraph b: Ground vehicles otherwise controlled by 0A606.b.1 that contain reactive or electromagnetic armor are subject to the controls of USML Category VII.*

> *Note 2 to paragraph b: ECCN 0A606.b.1 does not control civilian vehicles “specially designed” for transporting money or valuables.*

> *Note 3 to paragraph b: “Unarmed” means not having installed weapons, installed mountings for weapons, or special reinforcements for mounts for weapons.*

c. Air-cooled diesel engines and engine blocks for armored vehicles that weigh more than 40 tons.

d. Fully automatic continuously variable transmissions for tracked combat vehicles.

e. Deep water fording kits “specially designed” for ground vehicles controlled by ECCN 0A606.a or USML Category VII.

f. Self-launching bridge “components” not enumerated in USML Category VII(g) “specially designed” for deployment by ground vehicles enumerated in USML Category VII or this ECCN.

g. through w. [Reserved]

x. "Parts," "components," "accessories," and "attachments" that are "specially designed" for a commodity enumerated or otherwise described in ECCN 0A606 (other than 0A606.b or 0A606.y) or a defense article enumerated in USML Category VII and not elsewhere specified on the USML or in 0A606.y.

Note 1: Forgings, castings, and other unfinished products, such as extrusions and machined bodies, that have reached a stage in manufacture where they are clearly identifiable by mechanical properties, material composition, geometry, or function as commodities controlled by ECCN 0A606.x are controlled by ECCN 0A606.x.

Note 2: "Parts," "components," "accessories" and "attachments" enumerated in USML paragraph VII(g) are subject to the controls of that paragraph. "Parts," "components," "accessories" and "attachments" described in ECCN 0A606.y are subject to the controls of that paragraph.

y. Specific "parts," "components," "accessories," and "attachments" "specially designed" for a commodity enumerated or otherwise described in this ECCN (other than ECCN 0A606.b) or for a defense article in USML Category VII and not elsewhere specified on the USML or the CCL, as follows, and "parts," "components," "accessories," and "attachments" "specially designed" therefor:

y.1. Brake discs, rotors, drums, calipers, cylinders, pads, shoes, lines, hoses, vacuum boosters, and parts therefor;

y.2. Alternators and generators;

y.3. Axles;

y.4. Batteries;

y.5. Bearings (*e.g.,* ball, roller, wheel);

y.6. Cables, cable assembles, and connectors;

y.7. Cooling system hoses;

y.8. Hydraulic, fuel, oil, and air filters, not controlled by ECCN 1A004;

y.9. Gaskets and o-rings;

y.10. Hydraulic system hoses, fittings, couplings, adapters, and valves;

y.11. Latches and hinges;

y.12. Lighting systems, fuses, and "components;"

y.13. Pneumatic hoses, fittings, adapters, couplings, and valves;

y.14. Seats, seat assemblies, seat supports, and harnesses;

y.15 Tires, except run flat; and

y.16 Windows, except those for armored vehicles.

0A614 Military training "equipment," as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2)) of the EAR may not be used for any item in 0A614.

LIST OF ITEMS CONTROLLED

Related Controls: (1) Defense articles that are enumerated or otherwise described in USML Category IX and "technical data" (including "software") directly related thereto are "subject to the ITAR". (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* of US-origin "600 series" items. (3) "Parts," "components," "accessories" and "attachments" that are common to a simulator controlled by ECCN 0A614.a and to a simulated system or an end item that is controlled on the USML or elsewhere on the CCL are controlled under the same USML Category or ECCN as the "parts," "components," "accessories" and "attachments" of the simulated system or end item.

Related Definitions: N/A

Items: a. "Equipment" "specially designed" for military training that is not enumerated or otherwise described in USML Category IX.

Note 1 to 0A614: This entry includes operational flight trainers, radar target trainers, flight simulators for aircraft classified under ECCN 9A610.a, human-rated centrifuges, radar trainers for radars classified under ECCN 3A611, instrument flight trainers for military aircraft, navigation trainers for military items, target equipment, armament trainers, military pilotless aircraft trainers, mobile training units and training "equipment" for ground military operations.

Note 2 to 0A614: This entry does not apply to "equipment" "specially designed" for training in the use of hunting or sporting weapons.

b. through w. [Reserved]

x. "Parts," "components," "accessories" "attachments" that are "specially designed" for a commodity controlled by this entry or an article enumerated or otherwise described in USML Category IX, and not specified elsewhere on the USML.

0A617 Miscellaneous "Equipment," Materials, and Related Commodities (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry, except 0A617.y	NS Column 1
RS applies to entire entry, except 0A617.y	RS Column 1
RS applies to 0A617.y	China, Russia, or Venezuela (see § 742.6(a)(7))
AT applies to entire entry	AT Column 1
UN applies to entire entry, except 0A617.y.	See § 764.1(b) for UN controls

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 0A617.

LIST OF ITEMS CONTROLLED

Related Controls: (1) Defense articles, such as materials made from classified information, that are controlled by USML Category XIII, and technical data (including software) directly related thereto, are subject to the ITAR. (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" controlled content. (3) For controls on self-contained diving and underwater swimming apparatus and related commodities, see ECCN 8A620.f. (4) For controls on robots, robot controllers, and robot end-effectors, see USML Category VII and ECCNs 0A606 and 2B007. (5) "Libraries," *i.e.,* parametric technical databases, "specially designed" for military use with equipment controlled by the USML or a "600 series" ECCN are controlled by the technical data and technology controls pertaining to such items. (6) For controls on nuclear power generating equipment or propulsion equipment, including "nuclear reactors," "specially designed" for military use, and "parts" and "components" "specially designed" therefor, see USML Categories VI, XIII, XV, and XX. (7) Simulators "specially designed" for military "nuclear reactors" are controlled by USML Category IX(b). (8) See USML Categories X, XI and XII for "laser" protection equipment (*e.g.,* eye and sensor protection) "specially designed" for military use. (9) "Fuel cells" "specially designed" for a defense article on the USML or a commodity controlled by a "600 series" ECCN are controlled according to the corresponding "600 series" ECCN for such end items. (10) See USML Category XV for controls on fuel cells "specially designed" for satellite or spacecraft.

Related Definitions: N/A

Items:

a. [Reserved]

b. Concealment and deception equipment "specially designed" for military application, including special paints, decoys, smoke or obscuration equipment and simulators, and "parts," "components," "accessories," and "attachments" "specially designed" therefor, not controlled by USML Category XIII.

c. Ferries, bridges not described in ECCN 0A606 or USML Category VII, and pontoons, "specially designed" for military use.

d. Test models "specially designed" for the "development" of defense articles controlled by USML Categories IV, VI, VII and VIII.

e. [Reserved]

f. "Metal embrittlement agents."

g. through x. [Reserved]

y. Other commodities as follows, and "parts," "components," "accessories," and "attachments" "specially designed" therefore:

y.1. Construction equipment "specially designed" for military use, including such equipment "specially designed" for transport in aircraft controlled by USML VIII(a) or ECCN 9A610.a.

y.2. “Parts,” “components,” “accessories,” and “attachments” “specially designed” for commodities in paragraph .y.1 of this entry, including crew protection kits used as protective cabs.

y.3. ISO intermodal containers or demountable vehicle bodies (*i.e.,* swap bodies), n.e.s., “specially designed” or 'modified' for shipping or packing defense articles or items controlled by a “600 series” ECCN.

> *Technical Note: For the purpose of 0A617.y.3, 'modified' means any structural, electrical, mechanical, or other change that provides a non-military item with military capabilities equivalent to an item which is “specially designed” for military use.*

y.4. Field generators “specially designed” for military use.

y.5. Power controlled searchlights and control units therefor, “specially designed” for military use, and “equipment” mounting such units.

0A919 “Military commodities” located and produced outside the United States as follows (see list of items controlled)

License Requirements

Reasons for Control: RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies to entire entry	RS Column 1, See § 742.6(a)(3) for license requirements.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) “Military commodities” are subject to the export licensing jurisdiction of the Department of State if they incorporate items that are subject to the International Traffic in Arms Regulations (ITAR) (22 CFR parts 120-130). (2) “Military commodities” described in this paragraph are subject to the export licensing jurisdiction of the Department of State if such commodities are described on the U.S. Munitions List (22 CFR part 121) and are in the United States. (3) The furnishing of assistance (including training) to foreign persons, whether in the United States or abroad, in the design, development, engineering, manufacture, production, assembly, testing, repair,

maintenance, modification, operation, demilitarization, destruction, processing, or use of defense articles that are subject to the ITAR; or the furnishing to foreign persons of any technical data controlled under 22 CFR 121.1 whether in the United States or abroad are under the licensing jurisdiction of the Department of State. (4) Brokering activities (as defined in 22 CFR 129) of "military commodities" that are subject to the ITAR are under the licensing jurisdiction of the Department of State.

Related Definitions: "Military commodity" or "military commodities" means an article, material or supply that is described on the U.S. Munitions List (22 CFR part 121) or on the Munitions List that is published by the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies (*i.e.,* the Wassenaar Arrangement Munitions List (WAML)), but does not include software, technology, any item listed in any ECCN for which the last three numerals are 018, or any item in the "600 series."

Items:

a. "Military commodities" produced and located outside the United States that are not subject to the International Traffic in Arms Regulations (22 CFR parts 120-130) and having any of the following characteristics:

a.1. Incorporate more than a *de minimis* amount of U.S.-origin controlled content classified under ECCNs 6A002, 6A003, or 6A993.a (having a maximum frame rate equal to or less than 9 Hz and thus meeting the criterion of Note 3.a to 6A003.b.4);

a.2. Incorporate more than a *de minimis* amount of U.S.-origin "600 series" controlled content (see § 734.4 of the EAR); *or*

a.3. Are direct products of U.S.-origin "600 series" technology or software (see § 734.9(d) of the EAR).

b. [Reserved]

0A977 Water cannon systems for riot or crowd control, and "parts" and "components" "specially designed" therefor.

LICENSE REQUIREMENTS

Reason for Control: CC 1

Control(s)	Country chart (see Supp. No. 1 to part 738)
CC applies to entire entry	CC Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used for 0A977.

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

> *Note: 0A977 water cannon systems include, for example: vehicles or fixed stations equipped with remotely operated water cannon that are designed to protect the operator from an outside riot with features such as armor, shatter resistant windows, metal screens, bull-bars, or run-flat tires. Components "specially designed" for water cannons may include, for example: deck gun water nozzles, pumps, reservoirs, cameras, and lights that are hardened or shielded against projectiles, elevating masts for those items, and teleoperation systems for those items.*

0A978 Law enforcement striking weapons, including saps, police batons, side handle batons, tonfas, sjamboks, and whips.

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CC applies to entire entry	CC Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

0A979 Police helmets and shields; and "specially designed" "components," n.e.s.

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CC applies to entire entry	CC Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

0A980 Horses by sea.

LICENSE REQUIREMENTS

Reason for Control: SS

Control(s): SS applies to entire entry. For licensing requirements (and possible License Exceptions) proceed directly to part 754 of the EAR. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for SS reasons

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

0A981 Equipment designed for the execution of human beings as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s): CC applies to entire entry. A license is required for ALL destinations regardless of end-use. Accordingly, a column specific to this control does not appear on the Commerce Country Chart. (See § 742.7 of the EAR for additional information.)

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Gallows and guillotines.

b. Electric chairs for the purpose of executing human beings.

c. Air tight vaults designed for the execution of human beings by the administration of a lethal gas or substance.

d. Automatic drug injection systems designed for the execution of human beings by administration of a lethal substance.

0A982 Law enforcement restraint devices, including leg irons, shackles, and handcuffs; straight jackets; stun cuffs; shock belts; shock sleeves; multipoint restraint devices such as restraint chairs; and "specially designed" "parts," "components" and "accessories," n.e.s.

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s): CC applies to entire entry. A license is required for ALL destinations, except Canada, regardless of end-use. Accordingly, a column specific to this control does not appear on the Commerce Country Chart. (See part 742 of the EAR for additional information.)

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

*Related Controls:*Thumbcuffs and fingercuffs are classified under ECCN 0A983, "specially designed" implements of torture. Restraint devices that electronically monitor or report the location of confined persons for law enforcement or penal reasons are controlled under ECCN 3A981.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

> *Note to ECCN 0A982. This ECCN applies to restraint devices used in law enforcement activities. It does not apply to medical devices that are equipped to restrain patient movement during medical procedures. It does not apply to devices that confine memory impaired patients to appropriate medical facilities. It does not apply to safety equipment such as safety belts or child automobile safety seats.*

0A983 "Specially designed" implements of torture, including thumbscrews, thumbcuffs, fingercuffs, spiked batons, and "specially designed" "parts," "components" and "accessories," n.e.s.

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s): CC applies to entire entry. A license is required for ALL destinations, regardless of end-use. Accordingly, a column specific to this control does not appear on the Commerce Country Chart. (See part 742 of the EAR for additional information.)

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

> *Note to ECCN 0A983. In this ECCN, "torture" has the meaning set forth in Section 2340(1) of Title 18,*

United States Code.

0A998 Oil and gas exploration equipment, software, and data, as follows (see List of Items Controlled).

License Requirements

Reason for Control: Foreign policy

Control(s)	Country chart
Russian industry sector sanction applies to entire entry	See § 746.8 for specific license requirements and license review policy.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items:

a. Oil and gas exploration data, *e.g.,* seismic analysis data.

b. Hydraulic fracturing items, as follows:

b.1. Hydraulic fracturing design and analysis software and data.

b.2. Hydraulic fracturing 'proppant,' 'fracking fluid,' and chemical additives therefor.

Technical Note: A 'proppant' is a solid material, typically treated sand or man-made ceramic materials, designed to keep an induced hydraulic fracture open, during or following a fracturing treatment. It is added to a 'fracking fluid' which may vary in composition depending on the type of fracturing used, and can be gel, foam or slickwater-based.

b.3. High pressure pumps.

0A999 Specific Processing Equipment, as Follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s):

Country Chart. AT applies to entire entry. A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT licensing requirements for this entry. See § 742.19 of the EAR for additional information.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Ring Magnets;

b. Reserved.

B. "Test", "Inspection" and "Production Equipment"

0B501 Test, inspection, and production "equipment" and related commodities for the "development" or "production" of commodities enumerated or otherwise described in ECCNs 0A501, 0A506, 0A507, or 0A509 or USML Category I as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, UN, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except equipment for ECCN 0A501.y	NS Column 1
RS applies to entire entry except equipment for ECCN	RS Column 1

Control(s)	Country chart (see Supp. No. 1 to part 738)
0A501.y	
UN applies to entire entry	See § 746.1 of the EAR for UN controls
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of all License Exceptions)

LVS: $3000

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used to ship any item in this entry.

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items:

a. Small arms chambering machines.

b. Small arms deep hole drilling machines and drills therefor.

c. Small arms rifling machines.

d. Small arms boring/reaming machines.

e. Production equipment (including dies, fixtures, and other tooling) “specially designed” for the “production” of the items controlled in 0A501.a through .x., 0A506, 0A507, 0A509, or USML Category I.

0B505 Test, inspection, and production “equipment” and related commodities “specially designed” for the “development” or “production” of commodities enumerated or otherwise described in ECCN 0A505 or USML Category III, except equipment for the hand loading of cartridges and shotgun shells, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, UN, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to paragraphs .a and .x	NS Column 1
RS applies to paragraphs .a and .x	RS Column 1
UN applies to entire entry	See § 746.1 of the EAR for UN controls
AT applies to paragraphs .a, .d, and .x	AT Column 1
AT applies to paragraph .c	A license is required for export or reexport of these items to North Korea for anti-terrorism reasons

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3000

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 0B505.

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

a. Production equipment (including tooling, templates, jigs, mandrels, molds, dies, fixtures, alignment mechanisms, and test equipment), not enumerated in USML Category III that are “specially designed” for the “production” of commodities controlled by ECCN 0A505.a or .x or USML Category III.

b. Equipment “specially designed” for the “production” of commodities in ECCN 0A505.b.

c. Equipment “specially designed” for the “production” of commodities in ECCN 0A505.c.

d. Equipment “specially designed” for the “production” of commodities in ECCN 0A505.d.

e. through .w [Reserved]

x. “Parts” and “components” “specially designed” for a commodity subject to control in paragraph .a of this entry.

0B521 Any commodity subject to the EAR that is not listed elsewhere in the CCL, but which is controlled for export because it provides at least a significant military or intelligence advantage to the United States or for foreign policy reasons.

0B521 commodities are subject to RS1 controls with no license exception eligibility other than License Exception GOV for U.S. Government personnel and agencies under § 740.11(b)(2)(ii) of the EAR, or an item-specific license exception identified in Supplement No. 5 to part 774 particular to an item covered under ECCN 0B521. The list of commodities determined to be classified under ECCN 0B521 controls is published in Supplement No. 5 to part 774. The license requirements and licensing policy relating to ECCN 0B521 are set forth in § 742.6(a)(8) of the EAR.

0B602 Test, inspection, and production “equipment” and related commodities “specially designed” for the “development” or “production” of commodities enumerated or otherwise described in ECCN 0A602 or USML Category II as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, UN, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
UN applies to entire entry	See § 746.1 of the EAR for UN controls
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3000

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 0B602.

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

a. The following commodities if "specially designed" for the "development" or "production" of commodities enumerated in ECCN 0A602.a or USML Category II:

a.1. Gun barrel rifling and broaching machines and tools therefor;

a.2. Gun barrel rifling machines;

a.3. Gun barrel trepanning machines;

a.4. Gun boring and turning machines;

a.5. Gun honing machines of 6 feet (183 cm) stroke or more;

a.6. Gun jump screw lathes;

a.7. Gun rifling machines; and

a.8. Barrel straightening presses.

b. Jigs and fixtures and other metal-working implements or accessories of the kinds exclusively designed for use in the manufacture of items in ECCN 0A602 or USML Category II.

c. Other tooling and equipment, "specially designed" for the "production" of items in ECCN 0A602 or USML Category II.

d. Test and evaluation equipment and test models, including diagnostic instrumentation and physical test models, "specially designed" for items in ECCN 0A602 or USML Category II.

0B604 Test, inspection, and production "equipment" and related commodities "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities in ECCN 0A604 or related defense articles in USML Category IV (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1500

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in this ECCN 0B604.

List of Items Controlled

Related Controls: (1) See ECCN 9B604, which controls test, inspection, and production "equipment" and related commodities "specially designed" for the "development" or "production" of commodities in ECCN 9A604 or related defense articles in USML Category IV. (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of US-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. Test, inspection, and other production "equipment" that are "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities controlled by ECCN 0A604 or for bombs, torpedoes, depth charges, mines and hand grenades, and parts, components, accessories and attachments therefor, controlled under USML Category IV.

b. through w. [Reserved]

x. "Parts," "components," "accessories," and "attachments" that are "specially designed" for a commodity subject to control in paragraph .a of this ECCN.

0B606 Test, inspection, and production "equipment" and related commodities, not enumerated on the USML, "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities enumerated or otherwise described in ECCN 0A606 or USML Category VII (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $1500

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 0B606.

List of Items Controlled

Related Controls: (1) Ground vehicles, other articles, technical data (including software) and services described in 22 CFR part 121, Category VII are subject to the jurisdiction of the International Traffic in Arms Regulations. (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. Test, inspection, and production "equipment" "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities enumerated or otherwise described in ECCN 0A606 (except for 0A606.b or 0A606.y) or in USML Category VII, and "parts," "components," "accessories," and "attachments" "specially designed" therefor.

> *Note 1: ECCN 0B606 includes (i) armor plate drilling machines, other than radial drilling machines, (ii) armor plate planing machines, (iii) armor plate quenching presses; and (iv) tank turret bearing grinding machines.*

b. Environmental test facilities "specially designed" for the certification, qualification, or testing of commodities enumerated or otherwise described in ECCN 0A606 (except for 0A606.b or 0A606.y) or in USML Category VII, and "equipment" "specially designed" therefor.

0B614 Test, inspection, and production "equipment" for military training "equipment" and "specially designed" "parts," "components," "accessories" and "attachments" therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 0B614.

LIST OF ITEMS CONTROLLED

Related Controls: See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of US-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. Test, inspection, and other production "equipment" "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities controlled by ECCN 0A614 or articles enumerated or otherwise described in USML Category IX.

b. through .w [Reserved]

x. "Parts," "components," "accessories" and "attachments" that are "specially designed" for a commodity controlled by ECCN 0B614.

0B617 Test, inspection, and production "equipment" and related commodities "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities enumerated or otherwise described in ECCN 0A617 or USML Category XIII, and "parts," "components," "accessories," and "attachments" "specially designed" therefor (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $1500

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 0B617.

List of Items Controlled

Related Controls: See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. Test, inspection, and production "equipment" not controlled by USML Category XIII(k) "specially designed" for the "production," "development," repair, overhaul, or refurbishing of commodities enumerated or otherwise described in ECCN 0A617, (except for 0A617.y) or USML Category XIII, and "parts," "components," "accessories," and "attachments" "specially designed" therefor.

b. [Reserved]

> *Note: Field engineer equipment "specially designed" for use in a combat zone, identified in the Wassenaar Arrangement Munitions List 17.d, and mobile repair shops "specially designed" or modified to service military equipment, identified in Wassenaar Arrangement Munitions List 17.j, are controlled by 0B617 to the extent that the items are not included in USML Category XIII(k).*

0B999 Specific Processing Equipment, as Follows (See List of Items Controlled).

License Requirements

Reason for Control: AT, RS

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry.	A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT license requirements for this entry. See § 742.19 of the EAR for additional information.
RS applies to entire entry.	A license is required for items controlled by this entry for export or reexport to Iraq or transfer within Iraq for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§ 742.6 and 746.3 of the EAR for additional information.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items: a. Hot cells;

b. Glove boxes suitable for use with radioactive materials.

C. “Materials”

0C521 Any material subject to the EAR that is not listed elsewhere in the CCL, but which is controlled for export because it provides at least a significant military or intelligence advantage to the United States or for foreign policy reasons.

0C521 materials are subject to RS1 controls with no license exception eligibility other than License Exception GOV for U.S. Government personnel and agencies under § 740.11(b)(2)(ii) of the EAR, or an item-specific license exception identified in Supplement No. 5 to part 774 particular to an item covered under ECCN 0C521. The list of materials determined to be classified under ECCN 0C521 controls is published in Supplement No. 5 to part 774. The license requirements and licensing policy relating to ECCN 0C521 are set forth in § 742.6(a)(8) of the EAR.

0C606 Materials “specially designed” for commodities controlled by ECCN 0A606 not elsewhere specified in the USML (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $1500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 0C606.

LIST OF ITEMS CONTROLLED

Related Controls: (1) Materials that are subject to the jurisdiction of the ITAR are described in USML Category XIII. (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" controlled content.

Related Definitions: N/A

Items: Materials "specially designed" for commodities enumerated or otherwise described in ECCN 0A606 (other than 0A606.b or 0A606.y) or USML Category VII, not elsewhere specified in the USML or the CCL.

> *Note: Materials "specially designed" for both ground vehicles enumerated or otherwise described in USML Category VII and ground vehicles enumerated or otherwise described in ECCN 0A606 are subject to the controls of this ECCN unless identified in USML Category VII(g) as being subject to the controls of that paragraph.*

0C617 Miscellaneous Materials "Specially Designed" for Military Use (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $1500

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 0C617.

List of Items Controlled

Related Controls: (1) For controls on other signature suppression materials, see USML Category XIII and ECCNs 1C001 and 1C101. (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. Materials, coatings and treatments for signature suppression, "specially designed" for military use to reduce detectability or observability and that are not controlled by USML Category XIII or ECCNs 1C001 or 1C101.

b. [Reserved]

D. "Software"

0D001 "Software" "specially designed" or modified for the "development," "production," or "use" of commodities described in 0A002. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

> *Heading Note: Certain "software" for the "development," "production," or "use" of nuclear related commodities is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).*

License Requirements

Control(s): "Software" for items described in 0A002 is "subject to the ITAR" (see 22 CFR parts 120 through 130).

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The List of Items Controlled is contained in the ECCN heading.

0D501 "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by 0A501, 0A506, 0A507, 0A509 or 0B501.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, UN, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except "software" for commodities in ECCN 0A501.y or equipment in ECCN 0B501 for commodities in ECCN 0A501.y	NS Column 1.
RS applies to entire entry except "software" for commodities in ECCN 0A501.y or equipment in ECCN 0B501 for commodities in ECCN 0A501.y	RS Column 1.
UN applies to entire entry	See § 746.1 of the EAR for UN controls.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

License Exception STA may not be used for any "software" in ECCN 0D501, to any of the destinations listed in Country Group A:6 (See supplement no.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: See USML Category I for "software" directly related to articles described in USML Category I.

Related Definitions: N/A

Items: The list of items controlled is contained in this ECCN heading.

0D505 "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by 0A505 or 0B505.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, UN, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to "software" for commodities in ECCN 0A505.a and .x and equipment in ECCN 0B505.a .and .x	NS Column 1.
RS applies to "software" for commodities in ECCN 0A505.a and .x and equipment in ECCN 0B505.a and .x	RS Column 1.
UN applies to entire entry	See § 746.1 of the EAR for UN controls.
AT applies to "software" for commodities in ECCN 0A505.a, .d, or .x and equipment in ECCN 0B505.a, .d, or .x	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

License Exception STA may not be used for any "software" in ECCN 0D505, to any of the destinations listed in Country Group A:6 (See supplement no.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: See USML Category III for "software" directly related to articles described in USML Category III.

Related Definitions: N/A

Items: The list of items controlled is contained in this ECCN heading.

0D521 Any software subject to the EAR that is not listed elsewhere in the CCL, but which is controlled for export because it provides at least a significant military or intelligence advantage to the United States or for foreign policy reasons.

0D521 software is subject to RS1 controls with no license exception eligibility other than License Exception GOV for U.S. Government personnel and agencies under § 740.11(b)(2)(ii) of the EAR, or an item-specific license exception identified in Supplement No. 5 to part 774 particular to an item covered under ECCN 0D521. The list of software determined to be classified under ECCN 0D521 controls is published in Supplement No. 5 to part 774. The license requirements and licensing policy relating to ECCN 0D521 are set forth in § 742.6(a)(8) of the EAR.

0D602 "Software" "specially designed" for the "development," "production," operation or maintenance of commodities controlled by 0A602 or 0B602 as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, UN, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
UN applies to entire entry	See § 746.1 of the EAR for UN controls
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 0D602.

LIST OF ITEMS CONTROLLED

Related Controls: (1) "Software" required for and directly related to articles enumerated in USML Category II is "subject to the ITAR". (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" items.

Related Definitions: N/A

Items: "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCN 0A602 and ECCN 0B602.

0D604 "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCN 0A604 or 0B604 (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in this ECCN 0D604.

List of Items Controlled

Related Controls: (1) "Software" directly related to articles enumerated in USML Category IV is controlled under USML Category IV(i). (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCN 0A604 or 0B604.

b. [Reserved]

0D606 "Software" "specially designed" for the "development," "production," operation, or maintenance of ground vehicles and related commodities controlled by 0A606, 0B606, or 0C606 (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry, except 0D606.y	NS Column 1.
RS applies to entire entry, except 0D606.y	RS Column 1.
RS applies to 0D606.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry, except 0D606.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any software in 0D606.

List of Items Controlled

Related Controls: (1) Software directly related to articles enumerated or otherwise described in USML Category VII are subject to the controls of USML paragraph VII(h). (2) See ECCN 0A919 for foreign made "military commodities" that incorporate more than a de minimis amount of U.S.-origin "600 series" controlled content.

Related Definitions: N/A

Items:

a. "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCNs 0A606 (except for ECCNs 0A606.b or 0A606.y), 0B606, or 0C606.

b. through x. [Reserved]

y. "Specific software" "specially designed" for the "production," "development," operation, or maintenance of commodities described in ECCN 0A606.y.

0D614 "Software" related to military training "equipment," as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any "software" in 0D614.

List of Items Controlled

Related Controls: (1) "Software" directly related to articles enumerated in USML Category IX is subject to the control of USML paragraph IX(e). (2) See ECCN 0A919 for foreign made "military commodities" that incorporate more than a *de minimis* amount of US-origin "600 series" items.

Related Definitions: N/A

Items: a. "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCNs 0A614 or 0B614.

b. [Reserved]

0D617 "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by 0A617, "equipment" controlled by 0B617, or materials controlled by 0C617 (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry, except 0D617.y	NS Column 1.
RS applies to entire entry, except 0D617.y	RS Column 1.
RS applies to 0D617.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry, except 0D617.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any "software" in 0D617.

List of Items Controlled

Related Controls: (1) "Software" directly related to articles controlled by USML Category XIII is subject to the control of USML paragraph XIII(l). (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" controlled content.

Related Definitions: N/A

Items:

a. "Software" (other than "software" controlled in paragraph .y of this entry) "specially designed" for the "development," "production," operation or maintenance of commodities controlled by ECCNs 0A617 (except 0A617.y), 0B617, or 0C617.

b. to x. [Reserved].

y. Specific "software" "specially designed" for the "production," "development," operation or maintenance of commodities controlled by ECCN 0A617.y.

0D977 "Software" "specially designed" for the "development," "production" or "use" of commodities controlled by 0A977.

License Requirements

Reason for Control: CC1

Control(s)	Country chart (see Supp. No. 1 to part 738)
CC applies to entire entry	CC Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

Special Conditions for STA

STA: License Exception STA may not be used for 0D977.

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

0D999 Specific Software, as Follows (See List of Items Controlled).

License Requirements

Reason for Control: AT, RS

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT license requirements for this entry. See § 742.19 of the EAR for additional information.
RS applies to entire entry.	A license is required for items controlled by this entry for export or reexport to Iraq or transfer within Iraq for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§ 742.6 and 746.3 of the EAR for additional information.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Software for neutronic calculations/modeling;

b. Software for radiation transport calculations/modeling;

c. Software for hydrodynamic calculations/modeling.

E. "Technology"

0E001 "Technology," according to the Nuclear Technology Note, for the "development," "production," or "use" of items described in 0A002, or 0D001.

> *Heading Note: "Technology" for certain items subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110) is subject to the export licensing authority of the Department of Energy (see 10 CFR part 810).*

LICENSE REQUIREMENTS

Reason for Control:

Control(s): "Technology" for items described in 0A002 and 0D001 (applies to "software" in 0D001 for items described in 0A002 only) is subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121).

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items: The List of Items Controlled is contained in the ECCN heading.

0E501 "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, or overhaul of commodities controlled by 0A501, 0A506, 0A507, 0A509, or 0B501 as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, UN, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
RS applies to entire entry	RS Column 1.
UN applies to entire entry	See § 746.1 of the EAR for UN controls.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

License Exception STA may not be used for any "technology" in ECCN 0E501, to any of the destinations listed in Country Group A:6 (See supplement no.1 to part 740 of the EAR).

List of Items Controlled

Related Controls: See USML Category I for technical data directly related to articles described in USML Category I.

Related Definitions: N/A

Items:

a. "Technology" "required" for the "development" or "production" of commodities controlled by ECCN 0A501 (other than 0A501.y), 0A506, 0A507, 0A509, or 0B501.

b. "Technology" "required" for the operation, installation, maintenance, repair, or overhaul of commodities controlled by ECCN 0A501 (other than 0A501.y), 0A506, 0A507, 0A509, or 0B501.

0E502 "Technology" "required" for the "development" or "production" of commodities controlled by 0A502, 0A508, or 0A509.a or .d.

License Requirements

Reason for Control: CC, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
CC applies to entire entry	CC Column 1.
UN applies to entire entry	See § 746.1 of the EAR for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See USML Category I for technical data directly related to articles described in USML Category I.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

0E504 "Technology" "required" for the "development" or "production" of commodities controlled by 0A504 that incorporate a focal plane array or image intensifier tube.

LICENSE REQUIREMENTS

Reason for Control: RS, UN, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
RS applies to entire entry	RS Column 1.
UN applies to entire entry	See § 746.1(b) of the EAR for UN controls.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

License Exception STA may not be used for "technology" in ECCN 0E504, to any of the destinations listed in Country Group A:5 or A:6 (See supplement no.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

0E505 "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities controlled by 0A505.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, UN, CC, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to "technology" for "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing commodities in 0A505.a and .x; for "equipment" for those commodities in 0B505; and for "software" for that "equipment" and those commodities in 0D505	NS Column 1.
RS applies to "technology" for "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing commodities in 0A505.a and .x; for "equipment" for those commodities in 0B505 and for "software" for those commodities and that equipment in 0D505	RS Column 1.
UN applies to entire entry	See § 746.1 of the EAR for UN controls.
CC applies to "technology" for the "development" or "production" of commodities in 0A505.b	CC Column 1.
AT applies to "technology" for "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing commodities in 0A505.a, .d, and .x	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

License Exception STA may not be used for any "technology" in ECCN 0E505, to any of the destinations listed in Country Group A:6 (See supplement no.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: See USML Category III for technical data directly related to articles described in USML Category III.

Related Definitions: N/A

Items: The list of items controlled is contained in this ECCN heading.

0E521 Any technology subject to the EAR that is not listed elsewhere in the CCL, but which is controlled for export because it provides at least a significant military or intelligence advantage to the United States or for foreign policy reasons.

0E521 technology is subject to RS1 controls with no license exception eligibility other than License Exception GOV for U.S. Government personnel and agencies under § 740.11(b)(2)(ii) of the EAR, or an item-specific license exception identified in Supplement No. 5 to part 774 particular to an item covered under ECCN 0E521. The list of technologies determined to be classified under ECCN 0E521 controls is published in Supplement No. 5 to part 774. The license requirements and licensing policy relating to ECCN 0E521 are set forth in § 742.6(a)(8) of the EAR.

0E602 "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities controlled by 0A602 or 0B602, or "software" controlled by 0D602 as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, UN, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
UN applies to entire entry	See § 746.1 of the EAR for UN controls
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 0E602.

LIST OF ITEMS CONTROLLED

Related Controls: Technical data directly related to articles enumerated in USML Category II are "subject to the ITAR."

Related Definitions: N/A

Items: "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, or overhaul of commodities controlled by ECCN 0A602 or 0B602, or "software" controlled by ECCN 0D602.

0E604 "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities controlled by ECCN 0A604 or 0B604, or "software" controlled by ECCN 0D604 (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in this ECCN 0E604.

LIST OF ITEMS CONTROLLED

Related Controls: Technical data directly related to articles enumerated in USML Category IV are controlled under USML Category IV(i).

Related Definitions: N/A

Items: a. "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities controlled by ECCN 0A604 or 0B604, or "software" controlled by ECCN 0D604.

b. [Reserved]

0E606 "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbushing of ground vehicles and related commodities in 0A606, 0B606, 0C606, or software in 0D606 (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry, except 0E606.y	NS Column 1.
RS applies to entire entry, except 0E606.y	RS Column 1.
RS applies to 0E606.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry, except 0E606.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any technology in 0D606.

List of Items Controlled

Related Controls: Technical data directly related to articles enumerated in USML Category VII are subject to the controls of USML paragraph VII(h).

Related Definitions: N/A

Items:

a. "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities enumerated or otherwise described in ECCN 0A606 (except for ECCNs 0A606.b or 0A606.y), 0B606, or 0C606.

b. through x. [Reserved]

y. Specific "technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul or refurbishing of commodities or software in ECCN 0A606.y or 0D606.y.

0E614 "Technology," as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any technology in 0E614.

List of Items Controlled

Related Controls: "Technical data" directly related to articles enumerated in USML Category IX is subject to the control of USML paragraph IX(e).

Related Definitions: N/A

Items: a. "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities or "software" controlled by ECCNs 0A614, 0B614, or 0D614.

b. [Reserved]

0E617 "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities controlled by ECCN 0A617, "equipment" controlled by 0B617, or materials controlled by 0C617, or "software" controlled by ECCN 0D617 (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry, except 0E617.y	NS Column 1.
RS applies to entire entry, except 0E617.y	RS Column 1.
RS applies to 0E617.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry, except 0E617.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any technology in 0E617.

LIST OF ITEMS CONTROLLED

Related Controls: Technical data directly related to articles controlled by USML Category XIII are subject to the control of USML paragraph XIII(l).

Related Definitions: N/A

Items:

a. "Technology" (other than "technology" controlled by paragraph .y of this entry) "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities or "software" controlled by ECCN 0A617 (except 0A617.y), 0B617, 0C617, or 0D617 (except 0D617.y).

b. through x. [Reserved].

y. Specific "technology" "required" for the "production," "development," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities controlled by ECCN 0A617.y or "software" controlled by 0D617.y.

0E977 "Technology" "required" for the "development" or "production" of commodities controlled by 0A977.

LICENSE REQUIREMENTS

Reason for Control: CC1

Control(s)	Country chart (see Supp. No. 1 to part 738)
CC applies to entire entry	CC Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used for 0E977.

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

0E982 "Technology" exclusively for the "development" or "production" of equipment controlled by 0A982 or 0A503.

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s)
CC applies to "technology" for items controlled by 0A982 or 0A503. A license is required for ALL destinations, except Canada, regardless of end use. Accordingly, a column specific to this control does not appear on the Commerce Country Chart. (See part 742 of the EAR for additional information.)

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

EAR99 Items subject to the EAR that are not elsewhere specified in this CCL Category or in any other category in the CCL are designated by the number EAR99.

Category 1—Special Materials and Related Equipment, Chemicals, "Microorganisms," and "Toxins"

Note: The Food and Drug Administration (FDA) and the Drug Enforcement Administration (DEA) may control exports of items subject to the EAR and on the Commerce Control List. BIS provides cross references to these other agency controls for convenience only. Therefore, please consult relevant FDA and DEA regulations for guidance related to the item you wish to export and do not rely solely on the EAR for information about other agency export control requirements. See Supplement No. 3 to part 730 (Other U.S. Government Departments and Agencies with Export Control Responsibilities) for more information.

A. "End Items", "Equipment", "Accessories", "Attachments", "Parts", "Components"and "Systems"

1A001 "Parts" and "components" made from fluorinated compounds, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $5000

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) Items "specially designed" or modified for missiles or for items on the U.S. Munitions List are "subject to the ITAR" (see 22 CFR parts 120 through 130, including USML Category XXI).

Related Definitions: N/A

Items: a. Seals, gaskets, sealants or fuel bladders, "specially designed" for "aircraft" or aerospace use, made from more than 50% by weight of any of the materials controlled by 1C009.b or 1C009.c;

b. [Reserved]

1A002 "Composite" structures or laminates, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
NP applies to 1A002.b.1 in the form of tubes with an inside diameter between 75 mm and 400 mm	NP Column 1
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1,500; N/A for NP; N/A for "composite" structures or laminates controlled by 1A002.a, having an organic "matrix" and made from materials controlled by 1C010.c or 1C010.d.

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in this entry to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 1E001 ("development" and "production") and 1E201 ("use") for technology for items controlled by this entry. (2) Also see ECCNs 1A202, 1C010, 1C210, 9A010, and 9A110. (3) "Composite" structures "specially designed" for missile applications (including "specially designed" subsystems, "parts," and "components") are controlled by ECCN 9A110. (4) "Composite" structures or laminates "specially designed" or prepared for use in separating uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items:

a. Made from any of the following:

a.1. An organic "matrix" and "fibrous or filamentary materials" specified by 1C010.c or 1C010.d; *or*

a.2. Prepregs or preforms specified by 1C010.e;

b. Made from a metal or carbon "matrix", and any of the following:

b.1. Carbon "fibrous or filamentary materials" having all of the following:

b.1.a. A "specific modulus" exceeding 10.15×10^6 m; *and*

b.1.b. A "specific tensile strength" exceeding 17.7×10^4 m; *or*

b.2. Materials controlled by 1C010.c.

Note 1: 1A002 does not control "composite" structures or laminates made from epoxy resin impregnated carbon "fibrous or filamentary materials", for the repair of "civil aircraft" structures or laminates, having all of the following:
a. An area not exceeding 1 m^2;

b. A length not exceeding 2.5 m; and

c. A width exceeding 15 mm.

Note 2: 1A002 does not control semi-finished items, "specially designed" for civilian applications as follows:
a. Sporting goods;

b. Automotive industry;

c. Machine tool industry;

d. Medical applications.

Note 3: 1A002.b.1 does not apply to semi-finished items containing a maximum of two dimensions of interwoven filaments and "specially designed" for applications as follows:
a. Metal heat-treatment furnaces for tempering metals;

b. Silicon boule production equipment.

Note 4: 1A002 does not apply to finished items "specially designed" for a specific application.

Note 5: 1A002.b.1 does not apply to mechanically chopped, milled, or cut carbon "fibrous or filamentary materials" 25.0 mm or less in length.

1A003 Manufactures of non-"fusible" aromatic polyimides in film, sheet, tape or ribbon form having any of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $200

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: This entry does not control manufactures when coated or laminated with copper and designed for the production of electronic printed circuit boards. For “fusible” aromatic polyimides in any form, see 1C008.a.3.

Related Definitions: N/A

Items: a. A thickness exceeding 0.254 mm; or

b. Coated or laminated with carbon, graphite, metals or magnetic substances.

1A004 Protective and detection equipment and “components”, not “specially designed” for military use, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, CB, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
CB applies to chemical detection systems and dedicated detectors therefor, in 1A004.c, that also have the technical characteristic	CB Column 2
RS apply to 1A004.d	RS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: Yes for 1A004.a, .b, and .c.2.

List of Items Controlled

Related Controls: (1) See ECCNs 1A995, 2B351, and 2B352. (2) See ECCN 1D003 for “software” “specially designed” or modified to enable equipment to perform the functions of equipment controlled under section 1A004.c (Nuclear, biological, and chemical (NBC) detection systems). (3) See ECCN 1E002.g for control libraries (parametric technical databases) “specially designed” or modified to enable equipment to perform the functions of equipment controlled under 1A004.c (Nuclear, biological, and chemical (NBC) detection systems). (4) Chemical and biological protective

and detection equipment specifically designed, developed, modified, configured, or adapted for military applications is “subject to the ITAR” (see 22 CFR parts 120 through 130, including USML Category XIV(f)), as is commercial equipment that incorporates “parts” or “components” controlled under that category except for domestic preparedness devices for individual protection that integrate “components” and “parts” identified in USML Category XIV(f)(4) when such “parts” or “components” are: Integral to the device; inseparable from the device; and incapable of replacement without compromising the effectiveness of the device, in which case the equipment is subject to the export licensing jurisdiction of the Department of Commerce under ECCN 1A004. (5) This entry does not control radionuclides incorporated in equipment listed in this entry—such materials are subject to the licensing jurisdiction of the Nuclear Regulatory Commission (See 10 CFR part 110).

Related Definitions: (1) 'Biological agents' means: pathogens or toxins, selected or modified (such as altering purity, shelf life, virulence, dissemination characteristics, or resistance to UV radiation) to produce casualties in humans or animals, degrade equipment or damage crops or the environment. (2) 'Riot control agents' are substances which, under the expected conditions of use for riot control purposes, produce rapidly in humans sensory irritation or disabling physical effects which disappear within a short time following termination of exposure. (Tear gases are a subset of 'riot control agents.')

Items:

a. Full face masks, filter canisters and decontamination equipment therefor, designed or modified for defense against any of the following, and “specially designed” “components” therefor:

> *Note: 1A004.a includes Powered Air Purifying Respirators (PAPR) that are designed or modified for defense against agents or materials, listed in 1A004.a.*

> *Technical Notes: For the purposes of 1A004.a:*
> *1. Full face masks are also known as gas masks.*
>
> *2. Filter canisters include filter cartridges.*

a.1. 'Biological agents';

a.2. 'Radioactive materials';

a.3. Chemical warfare (CW) agents; *or*

a.4. 'Riot control agents', as follows:

a.4.a. α-Bromobenzeneacetonitrile, (Bromobenzyl cyanide) (CA) (CAS 5798-79-8);

a.4.b. [(2-chlorophenyl) methylene] propanedinitrile, (o-Chlorobenzylidenemalononitrile) (CS) (CAS 2698-41-1);

a.4.c. 2-Chloro-1-phenylethanone, Phenylacyl chloride (ω-chloroacetophenone) (CN) (CAS 532-27-4);

a.4.d. Dibenz-(b,f)-1,4-oxazephine, (CR) (CAS 257-07-8);

a.4.e. 10-Chloro-5, 10-dihydrophenarsazine, (Phenarsazine chloride), (Adamsite), (DM) (CAS 578-94-9);

a.4.f. N-Nonanoylmorpholine, (MPA) (CAS 5299-64-9);

b. Protective suits, gloves and shoes, “specially designed” or modified for defense against any of the following:

b.1. 'Biological agents';

b.2. 'Radioactive materials'; *or*

b.3. Chemical warfare (CW) agents;

c. Detection systems, “specially designed” or modified for detection or identification of any of the following, and “specially designed” “components” therefor:

c.1. 'Biological agents';

c.2. 'Radioactive materials'; *or*

c.3. Chemical warfare (CW) agents;

d. Electronic equipment designed for automatically detecting or identifying the presence of “explosives” (as listed in the annex at the end of Category 1) residues and utilizing 'trace detection' techniques (*e.g.,* surface acoustic wave, ion mobility spectrometry, differential mobility spectrometry, mass spectrometry).

Technical Note: For the purposes of 1A004.d, 'trace detection' is defined as the capability to detect less than 1 ppm vapor, or 1 mg solid or liquid.

Note 1: 1A004.d does not apply to equipment “specially designed” for laboratory use.
Note 2: *1A004.d does not apply to non-contact walk-through security portals.*

Note: *1A004 does not control: a. Personal radiation monitoring dosimeters;*
b. Occupational health or safety equipment limited by design or function to protect against hazards specific to residential safety or civil industries, including:

1. Mining;

2. Quarrying;

3. Agriculture;

4. Pharmaceutical;

5. Medical;

6. Veterinary;

7. Environmental;

8. Waste management;

9. Food industry.

Technical Notes: 1. 1A004 includes equipment, "components" that have been 'identified,' successfully tested to national standards or otherwise proven effective, for the detection of or defense against 'radioactive materials' 'biological agents,' chemical warfare agents, 'simulants' or "riot control agents," even if such equipment or "components" are used in civil industries such as mining, quarrying, agriculture, pharmaceuticals, medical, veterinary, environmental, waste management, or the food industry.
2. 'Simulant': A substance or material that is used in place of toxic agent (chemical or biological) in training, research, testing or evaluation.

3. For the purposes of 1A004, 'radioactive materials' are those selected or modified to increase their effectiveness in producing casualties in humans or animals, degrading equipment or damaging crops or the environment.

1A005 Body armor and "specially designed" "components" therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, UN, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
UN applies to entire entry	See § 746.1(b) for UN controls

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

License Requirements Notes: 1. Soft body armor not manufactured to military standards or specifications must provide ballistic protection equal to or less than NIJ level III (NIJ 0101.06, July 2008) to be controlled under 1A005.a. 2. For purposes of 1A005.a, military standards and specifications include, at a minimum, specifications for fragmentation protection.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: Yes, except UN

List of Items Controlled

Related Controls: (1) Bulletproof and bullet resistant vests (body armor) providing NIJ Type IV protection or greater are "subject to the ITAR" (see 22 CFR 121.1 Category X(a)). (2) Soft body armor and protective garments manufactured to military standards or specifications that provide protection equal to or less than NIJ level III or "equivalent standards" are classified under ECCN 1A613.d.1. (3) Hard armor plates providing NIJ level III or "equivalent standard" ballistic protection are classified under ECCN 1A613.d.2. (4) Police helmets and shields are classified under ECCN 0A979. (5) Other personal protective "equipment" "specially designed" for military applications not controlled by the USML or elsewhere in the CCL is classified under ECCN 1A613.e. (6) For "fibrous or filamentary materials" used in the manufacture of body armor, see ECCN 1C010.

Related Definitions: N/A

Items:

a. Soft body armor not manufactured to military standards or specifications, or to their equivalents, and "specially designed" "components" therefor;

b. Hard body armor plates that provide ballistic protection less than NIJ level III (NIJ 0101.06, July 2008) or "equivalent standards".

Notes to ECCN 1A005: 1. This entry does not control body armor when accompanying its user for the user's own personal protection.

2. This entry does not control body armor designed to provide frontal protection only from both fragment and blast from non-military explosive devices.

3. This entry does not apply to body armor designed to provide protection only from knife, spike, needle or blunt trauma.

1A006 Equipment, "specially designed" or modified for the disposal of Improvised Explosive Devices (IEDs), as follows (see List of Items Controlled), and "specially designed" "components" and "accessories" therefor.

License Requirements

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

License Requirement Note: 1A006 does not apply to equipment when accompanying its operator.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: Equipment "specially designed" for military use for the disposal of IEDs is "subject to the ITAR" (see 22 CFR parts 120 through 130, including USML Category IV).

Related Definitions: N/A

Items:

a. Remotely operated vehicles;

b. 'Disruptors'.

Technical Note: For the purposes of 1A006.b 'disruptors' are devices "specially designed" for the

purpose of preventing the operation of an explosive device by projecting a liquid, solid or frangible projectile.

Note: 1A006 does not apply to equipment when accompanying its operator.

1A007 Equipment and devices, "specially designed" to initiate charges and devices containing "energetic materials," by electrical means, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, NP, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
NP applies to 1A007.b, as well as 1A007.a when the detonator firing set meets or exceeds the parameters of 3A229	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: High explosives and related equipment "specially designed" for military use are "subject to the ITAR" (see 22 CFR parts 120 through 130). This entry does not control detonators using only primary explosives, such as lead azide. See also ECCNs 0A604, 3A229, and 3A232. See 1E001 for "development" and "production" technology controls, and 1E201 for "use" technology controls.

Related Definitions: N/A

Items:

a. Explosive detonator firing sets designed to drive explosive detonators specified by 1A007.b;

b. Electrically driven explosive detonators as follows:

b.1. Exploding bridge (EB);

b.2. Exploding bridge wire (EBW);

b.3. Slapper;

b.4. Exploding foil initiators (EFI).

Technical Notes: 1. The word initiator or igniter is sometimes used in place of the word detonator. 2. For the purposes of 1A007.b, the detonators of concern all utilize a small electrical conductor (bridge, bridge wire, or foil) that explosively vaporizes when a fast, high-current electrical pulse is passed through it. In non slapper types, the exploding conductor starts a chemical detonation in a contacting high explosive material such as PETN (pentaerythritoltetranitrate). In slapper detonators, the explosive vaporization of the electrical conductor drives a flyer or slapper across a gap, and the impact of the slapper on an explosive starts a chemical detonation. The slapper in some designs is driven by magnetic force. The term exploding foil detonator may refer to either an EB or a slapper-type detonator.

1A008 Charges, devices and "components", as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, UN, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3,000 for .a through .c; $6,000 for .d.

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) All of the following are "subject to the ITAR" (see 22 CFR parts 120 through 130):

a. High explosives and related equipment "specially designed" for military use;

b. Explosive devices or charges in this entry that utilize USML controlled energetic materials (See 22 CFR 121.1 Category V), if they have been specifically designed, developed, configured, adapted, or modified for a military application;

c. Shaped charges that have all of the following a uniform shaped conical liner with an included angle of 90 degrees or less, more than 2.0 kg of controlled materials, and a diameter exceeding 4.5 inches;

d. Detonating cord containing greater than 0.1 kg per meter (470 grains per foot) of controlled materials;

e. Cutters and severing tools containing greater than 10 kg of controlled materials;

f. With the exception of cutters and severing tools, devices or charges controlled by this entry where the USML controlled materials can be easily extracted without destroying the device or charge; *and*

g. Individual USML controlled energetic materials in this entry, even when compounded with other materials, when not incorporated into explosive devices or charges controlled by this entry or 1C992.

(2) See also ECCNs 1C011, 1C018, 1C111, 1C239, *and* 1C608 for additional controlled energetic materials. See ECCN *1E001* for the “development” or “production” “technology” for the commodities controlled by ECCN 1A008, but not for explosives or commodities that are “subject to the ITAR” (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items:

a. 'Shaped charges' having all of the following:

a.1. Net Explosive Quantity (NEQ) greater than 90 g; *and*

a.2. Outer casing diameter equal to or greater than 75 mm;

b. Linear shaped cutting charges having all of the following, and “specially designed” “components” therefor:

b.1. An explosive load greater than 40 g/m; *and*

b.2. A width of 10 mm or more;

c. Detonating cord with explosive core load greater than 64 g/m;

d. Cutters, not specified by 1A008.b, and severing tools, having a NEQ greater than 3.5 kg.

> *Technical Note: For the purposes of 1A008.a, 'shaped charges' are explosive charges shaped to focus the effects of the explosive blast.*

Note: The only charges and devices specified in 1A008 are those containing "explosives" (see list of explosives in the Annex at the end of Category 1) and mixtures thereof.

1A101 Devices for reduced observables such as radar reflectivity, ultraviolet/infrared signatures and acoustic signatures, for applications usable in rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km or their complete subsystems.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See also *1C101.* (2) For commodities that meet the definition of defense articles under 22 CFR 120.3 of the International Traffic in Arms Regulations (ITAR), describes similar commodities "subject to the ITAR" (See 22 CFR parts 120 through 130, including USML Category XIII).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1A102 Resaturated pyrolized carbon-carbon "parts" and "components" designed for rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

1A202 Composite structures, other than those controlled by 1A002, in the form of tubes and having both of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCNs 1E201 (“use”) and 1E202 (“development” and “production”) for technology for items controlled by this entry. (2) Also see ECCNs 1A002, 1C010, 1C210, 9A010, and 9A110. (3) “Composite” structures “specially designed” or prepared for use in separating uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: a. An inside diameter of between 75 mm and 400 mm; *and*

b. Made with any of the “fibrous or filamentary materials” specified in 1C010.a or .b or 1C210.a or with carbon prepreg materials specified in 1C210.c.

1A225 Platinized catalysts “specially designed” or prepared for promoting the hydrogen isotope exchange reaction between hydrogen and water for the recovery of tritium from heavy water or for the production of heavy water.

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 1E201 ("use") and 1E202 ("development" and "production") for technology for items controlled by this entry. (2) Equipment "specially designed" or prepared for the production of heavy water is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1A226 Specialized packings, which may be used in separating heavy water from ordinary water, having both of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 1E201 ("use") and 1E202 ("development" and "production") for technology for items controlled by this entry. (2) Equipment "specially designed" or prepared for the production of heavy water is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: a. Made of phosphor bronze mesh chemically treated to improve wettability; *and*

b. Designed to be used in vacuum distillation towers.

1A227 High-density (lead glass or other) radiation shielding windows, having all of the following characteristics (see List of Items Controlled), and "specially designed" frames therefor.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 1E201 ("use") and 1E202 ("development" and "production") for technology for items controlled by this entry. (2) Equipment "specially designed" or prepared for nuclear reactors and reprocessing facilities is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: In 1A227.a, the term "cold area" means the viewing area of the window exposed to the lowest level of radiation in the design application.

Items: a. A "cold area" greater than 0.09 m^2;

b. A density greater than 3 g/cm^3; and

c. A thickness of 100 mm or greater.

1A231 Target assemblies and components for the production of tritium as follows (See List of Items Controlled):

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart (see supplement No. 1 to part 738)
NP applies to entire entry	NP Column 1

Control(s)	Country chart (see supplement No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 1E001 (“production”) and 1E201 (“use”) for technology for items controlled by this entry.

Related Definitions: N/A

Items: a. Target assemblies made of or containing lithium enriched in the lithium-6 isotope “specially designed” for the “production” of tritium through irradiation, including insertion in a nuclear reactor;

b. Components “specially designed” for the target assemblies specified in item a.

Technical Note to ECCN 1A231.b.: Components “specially designed” for target assemblies for the “production” of tritium may include lithium pellets, tritium getters, and specially-coated cladding.

1A290 Depleted uranium (any uranium containing less than 0.711% of the isotope U-235) in shipments of more than 1,000 kilograms in the form of shielding contained in X-ray units, radiographic exposure or teletherapy devices, radioactive thermoelectric generators, or packaging for the transportation of radioactive materials.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) This entry does not control depleted uranium in fabricated forms for use in munitions. See 22 CFR part 121 for depleted uranium "subject to the ITAR. (2) Depleted uranium that is not fabricated for use in munitions or fabricated into commodities solely to take advantage of its high density (e.g., aircraft, ship, or other counterweights) or in the forms listed in this entry are subject to the export licensing authority of the Nuclear Regulatory Commission. (See 10 CFR part 110.) (3) "Natural uranium" or "depleted uranium" or thorium in the form of metal, alloy, chemical compound or concentrate and any other material containing one or more of the foregoing are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1A607 Military dissemination "equipment" for riot control agents, military detection and protection "equipment" for toxicological agents (including chemical, biological, and riot control agents), and related commodities (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to Part 738)
NS applies to entire entry	NS Column 1.
RS applies to entire entry	RS Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 1A607.

LIST OF ITEMS CONTROLLED

Related Controls: (1) Vaccines identified in ECCN 1C991 are not controlled by this ECCN. (2) See 22 CFR 121.1 (USML), Category XIV(h), for vaccines that are subject to the ITAR. (3) Protection and detection equipment and related items identified in ECCN 1A004, 1A995, or 2B351 are not controlled by this ECCN. (4) See 22 CFR 121.1 (USML), Category XIV(f), for dissemination, detection and protection equipment that is subject to the ITAR. (5) See ECCN 0A919 for "military commodities" located and produced outside the United States that incorporate more than a *de minimis* amount of US-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. through d. [Reserved]

e. "Equipment" "specially designed" for military use and for the dissemination of any of the riot control agents controlled in ECCN 1C607.a.

f. Protection "equipment" (including air conditioning units, protective coatings, and protective clothing):

f.1. Not controlled by USML Category XIV(f); *and*

f.2. "Specially designed" for military use and for defense against:

f.2.1. Materials specified by USML Category XIV (a) or (b); *or*

f.2.2. Riot control agents controlled in 1C607.a.

g. Decontamination "equipment":

g.1. Not controlled by USML Category XIV(f); *and*

g.2. "Specially designed" for military use and for decontamination of objects contaminated with materials controlled by USML Category XIV(a) or (b).

h. "Equipment":

h.1. Not controlled by USML Category XIV(f); *and*

h.2. "Specially designed" for military use and for the detection or identification of:

h.2.1. Materials specified by USML Category XIV(a) or (b); *or*

h.2.2. Riot control agents controlled by ECCN 1C607.a.

i. [Reserved]

j. "Equipment" "specially designed" to:

j.1. Interface with a detector, shelter, vehicle, vessel, or aircraft controlled by the USML or a "600 series" ECCN; *and*

j.2. Collect and process samples of articles controlled in USML Category XIV(a) or (b).

k. Medical countermeasures that are "specially designed" for military use (including pre- and post-treatments, antidotes, and medical diagnostics) and "specially designed" to counter chemical agents controlled by the USML Category XIV(a).

Note: Examples of "equipment" controlled by this entry are barrier and non-barrier creams and filled autoinjectors (e.g., combopens where one injector contains 2-PAM and the other atropine) if "specially designed" to counter such agents.

l. through w. [Reserved]

x. "Parts," "components," "accessories," and "attachments" that are "specially designed" for a commodity controlled by ECCN 1A607.e, .f, .g, .h, or .j or for a defense article controlled by USML Category XIV(f) and that are not enumerated or otherwise described elsewhere in the USML.

1A613 Armored and protective "equipment" and related commodities, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 1A613.y	NS Column 1.
RS applies to entire entry except 1A613.y	RS Column 1.
RS applies 1A613.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry, except 1A613.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 1A613.

LIST OF ITEMS CONTROLLED

Related Controls: (1) Defense articles, such as materials made from classified information, that are controlled by USML Category X or XIII of the ITAR, and technical data (including software) directly related thereto, are "subject to the ITAR." (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a de minimis amount of US-origin "600 series" controlled content. (3) See ECCN 9A610.g for anti-gravity suits ("G-suits") and pressure suits capable of operating at altitudes higher than 55,000 feet above sea level. (4) For other military helmet "components" or "accessories" not specified in 1A613.c, see the relevant ECCN in the CCL or USML Entry.

Related Definitions: References to "NIJ Type" protection are to the National Institute of Justice Classification guide at NIJ Standard 0101.06, Ballistic Resistance of Body Armor, and NIJ Standard 0108.01, Ballistic Resistant Protective Materials.

Items:

a. Metallic or non-metallic armored plate "specially designed" for military use and not controlled by the USML.

> *Note to paragraph a: For controls on body armor plates, see ECCN 1A613.d.2 and USML Category X(a)(1).*

b. Shelters "specially designed" to:

b.1. Provide ballistic protection for military systems; *or*

b.2. Protect against nuclear, biological, or chemical contamination.

c. Military helmets (other than helmets controlled under 1A613.y.1) providing less than NIJ Type IV or "equivalent standards" protection.

> *Note 1: See ECCN 0A979 for controls on police helmets.*
> *Note 2: See USML Category X(a)(5) and (a)(6) for controls on other military helmets.*
>
> *Note 3: 1A613.c does not apply to helmets that meet all the following:*
>
> *a. Were first manufactured before 1970; and*
>
> *b. Are neither designed or modified to accept, nor equipped with items specified by the U.S. Munitions List (22 CFR 121) or another "600 series" ECCN.*

d. Body armor and protective garments, as follows:

d.1. Soft body armor and protective garments manufactured to military standards or specifications, or to their equivalents, that provide ballistic protection equal to or less than NIJ level III (NIJ 0101.06, July 2008) or "equivalent standards"; *or*

Note: For 1A613.d.1, military standards or specifications include, at a minimum, specifications for fragmentation protection.

d.2. Hard body armor plates that provide ballistic protection equal to NIJ level III (NIJ 0101.06, July 2008) or "equivalent standards".

Note: See ECCN 1A005 for controls on soft body armor not manufactured to military standards or specifications and hard body armor plates providing less than NIJ level III or "equivalent standards" protection. For body armor providing NIJ Type IV protection or greater, see USML Category X(a)(1).

e. Atmospheric diving suits "specially designed" for rescue operations for submarines controlled by the USML or the CCL.

f. Other personal protective "equipment" "specially designed" for military applications not controlled by the USML, not elsewhere controlled on the CCL.

g. to w. [Reserved]

x. "Parts," "components," "accessories," and "attachments" that are "specially designed" for a commodity controlled by ECCN 1A613 (except for 1A613.y) or an article enumerated in USML Category X, and not controlled elsewhere in the USML.

Note: 1A613.x includes forgings, castings, and other unfinished products, such as extrusions and machined bodies, that have reached a stage in manufacturing where they are clearly identifiable by mechanical properties, material composition, geometry, or function as commodities specified in ECCN 1A613.x.

y. Other commodities as follows:

y.1 Conventional military steel helmets.

Note: 1A613.y.1 does not apply to helmets that meet all the following:

a. Were first manufactured before 1970; and

b. Are neither designed or modified to accept, nor equipped with items specified by the U.S. Munitions List (22 CFR 121) or another "600 series" ECCN.

N.B. to paragraph y.1: For other military helmet "components" or "accessories," see the relevant ECCN in the CCL or USML Entry.

y.2 [Reserved]

1A984 Chemical agents, including tear gas formulation containing 1 percent or less of orthochlorobenzalmalononitrile (CS), or 1 percent or less of chloroacetophenone (CN), except in individual containers with a net weight of 20 grams or less; liquid pepper except when packaged in individual containers with a net weight of 3 ounces (85.05 grams) or less; smoke bombs; non-irritant smoke flares, canisters, grenades and charges; and other pyrotechnic articles having dual military and commercial use, and "parts" and "components" "specially designed" therefor, n.e.s.

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s)	Country chart (see supp. No. 1 to part 738)
CC applies to entire entry	CC Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

1A985 Fingerprinting powders, dyes, and inks.

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CC applies to entire entry	CC Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See 3A981.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1A995 Protective and detection equipment not "specially designed" for military use and not controlled by ECCN 1A004 or ECCN 2B351, as follows (see List of Items Controlled), and "parts" and "components" not "specially designed" for military use and not controlled by ECCN 1A004 or ECCN 2B351 therefor.

License Requirements

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related controls: See ECCNs 1A004, 2B351, and 2B352.

Related Definitions: N/A

Items: a. Personal radiation monitoring dosimeters;

b. Equipment limited by design or function to protect against hazards specific to civil industries, such as mining, quarrying, agriculture, pharmaceuticals, medical, veterinary, environmental, waste management, or to the food industry.

> *Note: This entry (1A995) does not control items for protection against chemical or biological agents that are consumer goods, packaged for retail sale or personal use, or medical products, such as latex exam gloves, latex surgical gloves, liquid disinfectant soap, disposable surgical drapes, surgical gowns, surgical foot covers, and surgical masks. Such items are classified as EAR99.*

1A999 Specific Processing Equipment, n.e.s., as Follows (See List of Items Controlled).

License Requirements

Reason for Control: AT

Control(s):

Country Chart. AT applies to entire entry. A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT licensing requirements for this entry. See § 742.19 of the EAR for additional information.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items: a. Radiation detection, monitoring and measurement equipment, n.e.s.;

b. Radiographic detection equipment such as x-ray converters, and storage phosphor image plates.

B. “Test”, “Inspection” and “Production Equipment”

1B001 Equipment for the production or inspection of “composite” structures or laminates controlled by 1A002 or “fibrous or filamentary materials” controlled by 1C010, as follows (see List of Items Controlled), and “specially designed” “components” and “accessories” therefor.

License Requirements

Reason for Control: NS, MT, NP, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
MT applies to entire entry, except 1B001.d.4, e and f. Note: *MT applies to equipment in 1B001.d that meet or exceed the parameters of 1B101*	MT Column 1
NP applies to filament winding machines described in 1B001.a that are capable of winding cylindrical rotors having a diameter between 75 mm (3 in) and 400 mm (16 in) and lengths of 600 mm (24 in) or greater; AND coordinating and programming controls and precision mandrels for these filament winding machines	NP Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A for MT and for 1B001.a; $5000 for all other items

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCN 1D001 for software for items controlled by this entry and see ECCNs 1E001 (“development” and “production”) and 1E101 (“use”) for technology for items controlled by this entry. (2) Also see ECCNs 1B101 and 1B201.

Related Definitions: N/A

Items:

a. Filament winding machines, of which the motions for positioning, wrapping and winding fibers are coordinated and programmed in three or more 'primary servo positioning' axes, “specially designed” for the manufacture of “composite” structures or laminates, from “fibrous or filamentary materials”;

b. 'Tape laying machines', of which the motions for positioning and laying tape are coordinated and programmed in five or more 'primary servo positioning' axes, “specially designed” for the manufacture of “composite” airframe or missile structures;

> *Technical Note: For the purposes of 1B001.b, 'tape-laying machines' have the ability to lay one or more 'filament bands' limited to widths greater than 25.4 mm and less than or equal to 304.8 mm, and to cut and restart individual 'filament band' courses during the laying process.*

c. Multidirectional, multidimensional weaving machines or interlacing machines, including adapters and modification kits, “specially designed” or modified for weaving, interlacing or braiding fibers for “composite” structures;

> *Technical Note: For the purposes of 1B001.c the technique of interlacing includes knitting.*

d. Equipment “specially designed” or adapted for the production of reinforcement fibers, as follows:

d.1. Equipment for converting polymeric fibers (such as polyacrylonitrile, rayon, pitch or polycarbosilane) into carbon fibers or silicon carbide fibers, including special equipment to strain the fiber during heating;

d.2. Equipment for the chemical vapor deposition of elements or compounds, on heated filamentary substrates, to manufacture silicon carbide fibers;

d.3. Equipment for the wet-spinning of refractory ceramics (such as aluminum oxide);

d.4. Equipment for converting aluminum containing precursor fibers into alumina fibers by heat treatment;

e. Equipment for producing prepregs controlled by 1C010.e by the hot melt method;

f. Non-destructive inspection equipment “specially designed” for “composite” materials, as follows:

f.1. X-ray tomography systems for three dimensional defect inspection;

f.2. Numerically controlled ultrasonic testing machines of which the motions for positioning transmitters or receivers are simultaneously coordinated and programmed in four or more axes to follow the three dimensional contours of the “part” or “component” under inspection;

g. Tow-placement machines, of which the motions for positioning and laying tows are coordinated and programmed in two or more 'primary servo positioning' axes, “specially designed” for the manufacture of “composite” airframe or missile structures.

Technical Note to 1B001.g: For the purposes of 1B001.g, 'tow-placement machines' have the ability to place one or more 'filament bands' having widths less than or equal to 25.4 mm, and to cut and restart individual 'filament band' courses during the placement process.

Technical Notes for 1B001: 1. For the purposes of 1B001, 'primary servo positioning' axes control, under computer "program" direction, the position of the end effector (i.e., head) in space relative to the work piece at the correct orientation and direction to achieve the desired process.
2. For the purposes of 1B001, a 'filament band' is a single continuous width of fully or partially resin-impregnated tape, tow or fiber. Fully or partially resin-impregnated 'filament bands' include those coated with dry powder that tacks upon heating.

1B002 Equipment designed to produce metal alloy powder or particulate materials and having any of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $5000

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

a. "Specially designed" to avoid contamination; *and*

b. "Specially designed" for use in one of the processes specified by 1C002.c.2.

1B003 Tools, dies, molds or fixtures, for "superplastic forming" or "diffusion bonding" titanium, aluminum or their alloys, "specially designed" for the manufacture of any of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $5000

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: For "specially designed""production equipment"of systems, sub-systems, and "parts" and "components" controlled by 9A005 to 9A009, 9A011, 9A101, 9A105 to 9A109, 9A111, and 9A116 to 9A120 usable in "missiles," see 9B115.

Related Definitions: N/A

Items: a. Airframe or aerospace structures;

b. "Aircraft" or aerospace engines; *or*

c. "Specially designed" "parts" and "components" for structures specified by 1B003.a or for engines specified by 1B003.b.

1B018 Items on the Wassenaar Arrangement Munitions List (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
MT applies to equipment for the "production" of rocket propellants	MT Column 1.
RS applies to 1B018.a	RS Column 2.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $3000 for 1B018.a for countries WITHOUT an "X" in RS Column 2 on the Country Chart contained in Supplement No. 1 to part 738 of the EAR;

$5000 for 1B018.b.

GBS: N/A

List of Items Controlled

Related Controls: See ECCN 1B608.a, .b, and .x for items that, immediately prior to July 1, 2014, were classified under 1B018.a.

Related Definitions: N/A

Items: a. [Reserved]

b. [Reserved]

1B101 Equipment, other than that controlled by 1B001, for the "production" of structural composites, fibers, prepregs or preforms, usable for rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km and their subsystems, as follows (see List of Items Controlled); and "specially designed" "parts," "components" and "accessories" therefor.

License Requirements

*Reason for Control:*MT, NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.
NP applies to filament winding machines described in 1B101.a that are capable of winding cylindrical rotors having a diameter between 75 mm (3 in.) and 400 mm (16 in.) and lengths of 600 mm (24 in.) or greater AND to coordinating and programming controls and precision mandrels for these filament winding machines	NP Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See ECCN 1D101 for software for items controlled by this entry and see ECCNs 1E001 (“development” and “production”) and 1E101 (“use”) for technology for items controlled by this entry. Also see 1B201.

Related Definitions: Examples of “parts,” “components” and accessories for the machines controlled by this entry are molds, mandrels, dies, fixtures and tooling for the preform pressing, curing, casting, sintering or bonding of composite structures, laminates and manufactures thereof.

Items: a. Filament winding machines or 'fiber/tow-placement machines,' of which the motions for positioning, wrapping and winding fibers can be coordinated and programmed in three or more axes, designed to fabricate composite structures or laminates from fibrous or filamentary materials, and coordinating and programming controls;

b. 'Tape-laying machines' of which the motions for positioning and laying tape can be coordinated and programmed in two or more axes, designed for the manufacture of composite airframe and missile structures;

Technical Notes for paragraphs a and b: For the purposes of 1B101.a. and 1B101.b., the following definitions apply:

1. 'Fiber/tow-placement machines' and 'tape-laying machines' are machines that perform similar processes that use computer-guided heads to lay one or several 'filament bands' onto a mold to create a part or a structure. These machines have the ability to cut and restart individual 'filament band' courses during the laying process.

2. A 'filament band' is a single continuous width of fully or partially resin-impregnated tape, tow, or fiber. Fully or partially resin-impregnated 'filament bands' include those coated with dry powder that tacks upon heating.

3. 'Fiber/tow-placement machines' have the ability to place one or more 'filament bands' having widths less than or equal to 25.4 mm. This refers to the minimum width of material the machine can place, regardless of the upper capability of the machine.

4. 'Tape-laying machines' have the ability to place one or more 'filament bands' having widths less than or equal to 304.8 mm, but cannot place 'filament bands' with a width equal to or less than 25.4 mm. This refers to the minimum width of material the machine can place, regardless of the upper capability of the machine.

c. Equipment designed or modified for the “production” of “fibrous or filamentary materials” as follows:

c.1. Equipment for converting polymeric fibers (such as polyacrylonitrile, rayon or polycarbosilane) including special provision to strain the fiber during heating;

c.2. Equipment for the vapor deposition of elements or compounds on heated filament substrates; and

c.3. Equipment for the wet-spinning of refractory ceramics (such as aluminum oxide);

d. Equipment designed or modified for special fiber surface treatment or for producing prepregs and preforms controlled by 9A110.

Note: Equipment covered in 1B101.d includes but is not limited to, rollers, tension stretchers, coating equipment, cutting equipment and clicker dies.

1B102 Metal powder “production equipment,” other than that specified in 1B002, and “parts” and “components” as follows (see List of Items Controlled).

License Requirements

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: 1. See also 1B115.b.

Related Definitions: N/A

Items: a. Metal powder "production equipment" usable for the "production", in a controlled environment, of spherical, spheroidal or atomized materials specified in 1C011.a., 1C011.b., 1C111.a.1., 1C111.a.2., or controlled for MT reasons in Category V of the USML.

b. "Specially designed" "parts" and "components" for "production equipment" specified in 1B002 or 1B102.a.

Note: 1B102 includes:
a. Plasma generators (high frequency arc-jet) usable for obtaining sputtered or spherical metallic powders with organization of the process in an argon-water environment;

b. Electroburst equipment usable for obtaining sputtered or spherical metallic powders with organization of the process in an argon-water environment;

c. Equipment usable for the "production" of spherical aluminum powders by powdering a melt in an inert medium (e.g., nitrogen).

1B115 "Equipment, other than that controlled in 1B002 or 1B102, for the "production" of propellant or propellant constituents (see List of Items Controlled), and "specially designed" "parts" and "components" therefor.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: For the control of batch mixers, continuous mixers and fluid energy mills, see 1B117, 1B118 and 1B119.

Related Definitions: N/A

Items: a. "Production equipment" for the "production", handling or acceptance testing of liquid propellants or propellant constituents controlled by 1C011.a, 1C011.b, 1C111 or on the U.S. Munitions List;

b. "Production equipment," for the production, handling, mixing, curing, casting, pressing, machining, extruding or acceptance testing of solid propellants or propellant constituents described in 1C011.a, 1C011.b or 1C111, or on the U.S. Munitions List.

Note: 1B115.b does not control batch mixers, continuous mixers or fluid energy mills. For the control of batch mixers, continuous mixers and fluid energy mills see 1B117, 1B118, and 1B119.

Note 1: [Reserved]

Note 2: 1B115 does not control equipment for the "production," handling and acceptance testing of boron carbide.

1B116 "Specially Designed" nozzles for producing pyrolitically derived materials formed on a mold, mandrel or other substrate from precursor gases which decompose in the 1,573 K (1,300 °C) to 3,173 K (2,900 °C) temperature range at pressures of 130 Pa to 20 kPa.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1B117 Batch mixers having all of the following (see List of Items Controlled), and "specially designed" "parts" and "components" therefor.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See 1B115, 1B118, and 1B119.

Related Definitions: N/A

Items: a. Capable of mixing under vacuum in the range from zero to 13.326 kPa;

b. Capable of controlling the temperature of the mixing chamber;

c. A total volumetric capacity of 110 liters (30 gallons) or more; *and*

d. At least one 'mixing/kneading shaft' mounted off center.

> *Note to paragraph d: In 1B117.d. the term 'mixing/kneading shaft' does not refer to deagglomerators or knife-spindles.*

1B118 Continuous mixers having all of the following (see List of Items Controlled), and "specially designed" "parts" and "components" therefor.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See 1B115, 1B117, and 1B119.

Related Definitions: N/A

Items: a. Capable of mixing under vacuum in the range from zero to 13.326 kPa;

b. Capable of controlling the temperature of the mixing chamber; *and*

c. Either of the following:

c.1. Two or more mixing/kneading shafts; *or*

c.2. A single rotating and oscillating shaft with kneading teeth/pins as well as kneading teeth/pins inside the casing of the mixing chamber.

1B119 Fluid energy mills usable for grinding or milling propellant or propellant constituents specified in 1C011.a, 1C011.b or 1C111, or on the U.S. Munitions List, and "specially designed" "parts" and "components" therefor.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See 1B115, 1B117 and 1B118.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1B201 Filament winding machines (other than those controlled by ECCN 1B001 or 1B101) and related equipment, as described in this ECCN (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See ECCN 1D201 for software for items controlled by this entry and see ECCNs 1E001 ("development" and "production") and 1E201 ("use") for technology for items controlled by this entry. Also see ECCN 1E203 for technology for the "development" of software controlled by ECCN 1D201.

Related Definitions: N/A

Items: a. Filament winding machines having all of the following characteristics:

a.1. Having motions for positioning, wrapping, and winding fibers coordinated and programmed in two or more axes;

a.2. "Specially Designed" to fabricate composite structures or laminates from "fibrous or filamentary materials"; *and*

a.3. Capable of winding cylindrical tubes with an internal diameter between 75 mm and 650 mm and lengths of 300 mm or greater;

b. Coordinating and programming controls for filament winding machines controlled by 1B201.a;

c. Precision mandrels for filament winding machines controlled by 1B201.a.

1B225 Electrolytic cells for fluorine production with a production capacity greater than 250 g of fluorine per hour.

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCNs *1E001* ("development" and "production") and *1E201* ("use") for technology for items controlled by this entry. (2) See ECCN 1B999 for specific processing equipment, n.e.s.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1B226 Electromagnetic isotope separators designed for, or equipped with, single or multiple ion sources capable of providing a total ion beam current of 50 mA or greater.

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) Electromagnetic isotope separators "specially designed" or prepared for use in separating uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (2) See ECCNs 1E001 ("development" and "production") and 1E201 ("use") for technology for items controlled by this entry.

Related Definitions: N/A

ECCN Controls: This entry includes separators capable of enriching stable isotopes and separators with the ion sources and collectors both in the magnetic field and those configurations in which they are external to the field.

Items: The list of items controlled is contained in the ECCN heading.

1B228 Hydrogen cryogenic distillation columns having all of the characteristics described in this ECCN (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) Equipment "specially designed" or prepared for the production of heavy water is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (2) See ECCNs 1E001 ("development" and "production") and 1E201 ("use") for technology for items controlled by this entry.

Related Definitions: (1) The term "fine grain stainless steels," for purposes of this ECCN, means fine grain austenitic stainless steels with an ASTM (or equivalent standard) grain size number of 5 or greater. (2) The term "effective length," for purposes of this ECCN, means the active height of packing material in a packed-type column, or the active height of internal contactor plates in a plate-type column.

Items: a. Designed to operate with internal temperatures of 35 K (−238 °C) or less;

b. Designed to operate at an internal pressure of 0.5 to 5 MPa (5 to 50 atmospheres);

c. Constructed of “fine-grain stainless steels” of the 300 series with low sulphur content or equivalent cryogenic and H_2-compatible materials; *and*

d. With internal diameters of 30 cm or greater and “effective lengths” of 4 m or greater.

1B230 Pumps capable of circulating solutions of concentrated or dilute potassium amide catalyst in liquid ammonia (KNH_2/NH_3), having all of the following characteristics (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) Equipment “specially designed” or prepared for the production of heavy water is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (2) See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry.

Related Definitions: N/A

Items: a. Airtight (i.e., hermetically sealed);

b. A capacity greater than 8.5 m^3/h; *and*

c. Either of the following characteristics:

c.1. For concentrated potassium amide solutions (1% or greater), an operating pressure of 1.5 to 60 MPa (15-600 atmospheres); *or*

c.2. For dilute potassium amide solutions (less than 1%), an operating pressure of 20 to 60 MPa (200-600 atmospheres).

1B231 Tritium facilities or plants, and equipment therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) Tritium, tritium compounds, and mixtures containing tritium are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (2) See ECCNs 1E001 ("development" and "production") and 1E201 ("use") for technology for items controlled by this entry.

Related Definitions: N/A

Items:

a. Facilities or plant for the production, recovery, extraction, concentration, or handling of tritium;

b. Equipment for tritium facilities or plant, as follows:

b.1. Hydrogen or helium refrigeration units capable of cooling to 23 K (−250 °C) or less, with heat removal capacity greater than 150 watts; *or*

b.2. Hydrogen isotope storage or hydrogen isotope purification systems using metal hydrides as the storage, or purification medium.

1B232 Turboexpanders or turboexpander-compressor sets having both of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) Equipment "specially designed" or prepared for the production of heavy water is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (2) See ECCNs 1E001 ("development" and "production") and 1E201 ("use") for technology for items controlled by this entry.

Related Definitions: N/A

Items: a. Designed for operation with an outlet temperature of 35 K (−238 °C) or less; *and*

b. Designed for a throughput of hydrogen gas of 1,000 kg/h or greater.

1B233 Lithium isotope separation facilities or plants, and systems and equipment therefor (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to 1B233.b	NP Column 1
AT applies to 1B233.b	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCN 1E001 ("development" and "production") and ECCN 1E201 ("use") for technology for items described in this entry. (2) Facilities and plants described in 1B233.a are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (3) Certain lithium isotope separation equipment and components for the plasma separation process (PSP) that are described in 1B233.b through .d are also directly applicable to uranium isotope separation and are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: a. Facilities or plants for the separation of lithium isotopes;

b. Equipment for the separation of lithium isotopes based on the lithium-mercury amalgam process, as follows:

b.1. Packed liquid-liquid exchange columns "specially designed" for lithium amalgams;

b.2. Mercury and/or lithium amalgam pumps;

b.3. Lithium amalgam electrolysis cells;

b.4. Evaporators for concentrated lithium hydroxide solution.

c. Ion exchange systems "specially designed" for lithium isotope separation, and "specially designed" component parts therefor;

d. Chemical exchange systems (employing crown ethers, cryptands, or lariat ethers) "specially designed" for lithium isotope separation, and "specially designed" component parts therefor.

1B234 High explosive containment vessels, chambers, containers, and other similar containment devices, not enumerated in ECCN 1B608 or in USML Category IV or V of the ITAR, designed for the testing of high explosives or explosive devices and having both of the characteristics described in this ECCN (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) Devices "specially designed" for the handling, control, activation, monitoring, detection, protection, discharge, or detonation of the articles enumerated in USML Category IV(a) and (b) are controlled by USML Category IV(c) of the ITAR (see 22 CFR parts 120 through 130). (2) See USML Category V of the ITAR (22 CFR parts 120 through 130) for devices identified therein that are "specially designed" to fully contain explosives enumerated in USML Category V. (3) Also see ECCN 1B608 for "equipment" "specially designed" for the "development," "production," repair, overhaul, or refurbishing of items controlled by ECCN 1C608 or USML Category V and not elsewhere specified on the USML.

Related Definitions: N/A

Items: a. Designed to fully contain an explosion equivalent to 2 kg of TNT or greater; *and*

b. Having design elements or features enabling real time or delayed transfer of diagnostic or measurement information.

1B607 Military test, inspection, and production "equipment" and related commodities "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities identified in ECCN 1A607 or 1C607, or defense articles enumerated or otherwise described in USML Category XIV (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to Part 738)
NS applies to entire entry	NS Column 1.
RS applies to entire entry	RS Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $1500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 1B607.

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCN 2B350 for controls on certain incinerators. (2) See ECCN 0A919 for "military commodities" located and produced outside the United States that incorporate more than a *de minimis* amount of US-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. "Equipment" "specially designed" for the destruction of the chemical agents controlled by USML Category XIV(a).

> *Note to 1B607.a: ECCN 1B607.a includes controls over facilities "specially designed" for destruction operations. This paragraph .a does not control incinerators and "specially designed" handling facilities or "specially designed" waste supply systems therefor.*

b. Test facilities and "equipment" "specially designed" for military certification, qualification, or testing of commodities controlled by ECCN 1A607.e, .f, .g, .h, or .j or by USML Category XIV(f), except for XIV(f)(1).

c. Tooling and "equipment" "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities controlled by ECCN 1A607.e, .f .g, .h, or .j or USML Category XIV(f).

d. through w. [Reserved]

x. "Parts," "components," "accessories," and "attachments" that are "specially designed" for a commodity controlled by ECCN 1B607.b or .c, or for a defense article controlled by USML Category XIV(f), and that are not enumerated or otherwise described elsewhere in the USML.

1B608 Test, inspection, and production "equipment" and related commodities "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities enumerated in ECCN 1C608 or USML Category V (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, MT, AT, UN

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1

Control(s)	Country chart (See Supp. No. 1 to part 738)
MT applies to equipment "specially designed" for MT-controlled commodities in ECCN 1C608 or MT articles in USML Category V	MT Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $1500

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 1B608.

List of Items Controlled

Related Controls: (1) Defense articles that are enumerated in USML Category V, and technical data (including software) directly related thereto, are "subject to the ITAR". (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of US-origin "600 series" controlled content. (3) See ECCN 1B115 for controls on "production equipment," not controlled by this ECCN 1B608, for propellants or propellant constituents described in ECCN 1C011.a, 1C011.b, or 1C111 or in USML Category V.

Related Definitions: N/A

Items: a. "Equipment" "specially designed" for the "development," "production," repair, overhaul, or refurbishing of items controlled by ECCN 1C608 or USML Category V and not elsewhere specified on the USML.

> Note to paragraph a: ECCN 1B608.a. includes: (1) Continuous nitrators; (2) dehydration presses; (3) cutting machines for the sizing of extruded propellants; (4) sweetie barrels (tumblers) 6 feet or more in diameter and having over 500 pounds product capacity; (5) convection current converters for the conversion of materials listed in USML Category V(c)(2); and (6) extrusion presses for the extrusion of small arms, cannon and rocket propellants.

b. Complete installations "specially designed" for the "development," "production," repair, overhaul, or refurbishing of items controlled by ECCN 1C608 or USML Category V and not elsewhere specified on the USML.

c. Environmental test facilities "specially designed" for the certification, qualification, or testing of items controlled by ECCN 1C608 or USML Category V.

d. through w. [Reserved]

x. "Parts," "components," "accessories" and "attachments" that are "specially designed" for a commodity subject to control in this ECCN or a defense article in USML Category V and not elsewhere specified on the USML.

1B613 Test, inspection, and "production" "equipment" and related commodities "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities controlled by ECCN 1A613 or USML Category X, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $1500

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 1B613.

List of Items Controlled

Related Controls: See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of US-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. Test, inspection, and "production" "equipment," not controlled by USML Category X(c), that is "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities controlled by ECCN 1A613 or USML Category X.

b. Plasma pressure compaction (P2C) "equipment" "specially designed" for the "production" of ceramic or composite body armor plates controlled by ECCN 1A613 or USML Category X.

1B999 Specific processing equipment, n.e.s., as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country chart (see supp. no. 1 to part 738)
RS applies to entire entry	A license is required for items controlled by this entry for export or reexport to Iraq or Pakistan or transfer within Iraq or Pakistan for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§ 742.6 and 746.3 of the EAR for additional information.
AT applies to entire entry	A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT license requirements for this entry. See § 742.19 of the EAR for additional information.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 1B001, 1B101, 1B201, 1B225, and 1D999

Related Definitions: N/A

Items:

a. Electrolytic cells for fluorine production, n.e.s.

b. Particle accelerators.

c. Industrial process control hardware/systems designed for power industries, n.e.s.

d. Freon and chilled water cooling systems capable of continuous cooling duties of 100,000 BTU/hr (29.3 kW) or greater.

e. Equipment for the production of structural composites, fibers, prepregs and preforms, n.e.s.

C. "Materials"

Technical Note: Metals and alloys: Unless provision to the contrary is made, the words "metals" and "alloys" in 1C001 to 1C011 cover crude and semi-fabricated forms, as follows:
Crude forms: Anodes, balls, bars (including notched bars and wire bars), billets, blocks, blooms, brickets, cakes, cathodes, crystals, cubes, dice, grains, granules, ingots, lumps, pellets, pigs, powder, rondelles, shot, slabs, slugs, sponge, sticks;

Semi-fabricated forms (whether or not coated, plated, drilled or punched):

a. Wrought or worked materials fabricated by rolling, drawing, extruding, forging, impact extruding, pressing, graining, atomizing, and grinding, i.e.: angles, channels, circles, discs, dust, flakes, foils and leaf, forging, plate, powder, pressings and stampings, ribbons, rings, rods (including bare welding rods, wire rods, and rolled wire), sections, shapes, sheets, strip, pipe and tubes (including tube rounds, squares, and hollows), drawn or extruded wire;

b. Cast material produced by casting in sand, die, metal, plaster or other types of molds, including high pressure castings, sintered forms, and forms made by powder metallurgy.

The object of the control should not be defeated by the export of non-listed forms alleged to be finished products but representing in reality crude forms or semi-fabricated forms.

1C001 Materials "specially designed" for absorbing electromagnetic radiation, or intrinsically conductive polymers, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, MT, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to items that meet or exceed the parameters of ECCN 1C101	MT Column 1

Control(s)	Country chart (see supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in this entry to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: See also 1C101.

Related Definitions: N/A

Items:

a. Materials for absorbing frequencies exceeding 2×10^8 Hz but less than 3×10^{12} Hz.

Note 1: 1C001.a does not control:
a. Hair type absorbers, constructed of natural or synthetic fibers, with non-magnetic loading to provide absorption;

b. Absorbers having no magnetic loss and whose incident surface is non-planar in shape, including pyramids, cones, wedges and convoluted surfaces;

c. Planar absorbers, having all of the following:

1. Made from any of the following:

a. Plastic foam materials (flexible or non-flexible) with carbon-loading, or organic materials, including binders, providing more than 5% echo compared with metal over a bandwidth exceeding ±15% of the center frequency of the incident energy, and not capable of withstanding temperatures exceeding 450 K (177 °C); or

b. Ceramic materials providing more than 20% echo compared with metal over a bandwidth exceeding ±15% of the center frequency of the incident energy, and not capable of withstanding temperatures exceeding 800 K (527 °C);

Technical Note: For the purposes of 1C001.a Note 1.c.1, absorption test samples should be a square at least 5 wavelengths of the center frequency on a side and positioned in the far field of the radiating element.
2. Tensile strength less than 7×10^6 N/m^2; and

3. Compressive strength less than 14×10^6 N/m^2;

d. Planar absorbers made of sintered ferrite, having all of the following:

1. A specific gravity exceeding 4.4; and

2. A maximum operating temperature of 548 K (275 °C) or less;

e. Planar absorbers having no magnetic loss and fabricated from 'open-cell foams' plastic material with a density of 0.15 grams/cm^3 or less.

Technical Note: For the purposes of 1C001.a Note e., 'open-cell foams' are flexible and porous materials, having an inner structure open to the atmosphere. 'Open-cell foams' are also known as reticulated foams.

Note 2: Nothing in Note 1 releases magnetic materials to provide absorption when contained in paint.
b. Materials not transparent to visible light and “specially designed” for absorbing near-infrared radiation having a wavelength exceeding 810 nm but less than 2,000 nm (frequencies exceeding 150 THz but less than 370 THz);

Note: 1C001.b does not apply to materials, “specially designed” or formulated for any of the following applications:
a. “Laser” marking of polymers; or

b. "Laser" welding of polymers.

c. Intrinsically conductive polymeric materials with a 'bulk electrical conductivity' exceeding 10,000 S/m (Siemens per meter) or a 'sheet (surface) resistivity' of less than 100 ohms/square, based on any of the following polymers:

c.1. Polyaniline;

c.2. Polypyrrole;

c.3. Polythiophene;

c.4. Poly phenylene-vinylene; *or*

c.5. Poly thienylene-vinylene.

Note: 1C001.c does not apply to materials in a liquid form.

Technical Note: For the purposes of 1C001.c, 'bulk electrical conductivity' and 'sheet (surface) resistivity' should be determined using ASTM D-257 or national equivalents.

1C002 Metal alloys, metal alloy powder and alloyed materials, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, NP, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
NP applies to 1C002.b.3 or b.4 if they exceed the parameters stated in 1C202	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3000; N/A for NP

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry. (2) Also see ECCN 1C202. (3) Aluminum alloys and titanium alloys in physical forms and finished products “especially designed” or prepared for use in separating uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definition: N/A

Items:

> *Note: 1C002 does not control metal alloys, metal alloy powder and alloyed materials, specially formulated for coating purposes.*

> *Technical Note: For the purposes of 1C002, metal alloys are those containing a higher percentage by weight of the stated metal than of any other element.*

a. Aluminides, as follows:

a.1. Nickel aluminides containing a minimum of 15% by weight aluminum, a maximum of 38% by weight aluminum and at least one additional alloying element;

a.2. Titanium aluminides containing 10% by weight or more aluminum and at least one additional alloying element;

b. Metal alloys, as follows, made from the powder or particulate material controlled by 1C002.c:

b.1. Nickel alloys having any of the following:

b.1.a. A 'stress-rupture life' of 10,000 hours or longer at 923 K (650 °C) at a stress of 676 MPa; *or*

b.1.b. A 'low cycle fatigue life' of 10,000 cycles or more at 823 K (550 °C) at a maximum stress of 1,095 MPa;

b.2. Niobium alloys having any of the following:

b.2.a. A 'stress-rupture life' of 10,000 hours or longer at 1,073 K (800 °C) at a stress of 400 MPa; *or*

b.2.b. A 'low cycle fatigue life' of 10,000 cycles or more at 973 K (700 °C) at a maximum stress of 700 MPa;

b.3. Titanium alloys having any of the following:

b.3.a. A 'stress-rupture life' of 10,000 hours or longer at 723 K (450 °C) at a stress of 200 MPa; *or*

b.3.b. A 'low cycle fatigue life' of 10,000 cycles or more at 723 K (450 °C) at a maximum stress of 400 MPa;

b.4 Aluminum alloys having any of the following:

b.4.a. A tensile strength of 240 MPa or more at 473 K (200 °C); *or*

b.4.b. A tensile strength of 415 MPa or more at 298 K (25 °C);

b.5. Magnesium alloys having all the following:

b.5.a. A tensile strength of 345 MPa or more; and

b.5.b. A corrosion rate of less than 1 mm/year in 3% sodium chloride aqueous solution measured in accordance with ASTM standard G-31 or national equivalents;

> *Technical Notes: For the purposes of 1C002.b:*
> *1. 'Stress-rupture life' should be measured in accordance with ASTM standard E-139 or national equivalents.*
>
> *2. 'Low cycle fatigue life' should be measured in accordance with ASTM Standard E-606 'Recommended Practice for Constant-Amplitude Low-Cycle Fatigue Testing' or national equivalents. Testing should be axial with an average stress ratio equal to 1 and a stress-concentration factor (K_t) equal to 1. The average stress ratio is defined as maximum stress minus minimum stress divided by maximum stress.*

c. Metal alloy powder or particulate material, having all of the following:

c.1. Made from any of the following composition systems:

> *Technical Note: For the purposes of 1C002.c.1, X equals one or more alloying elements.*

c.1.a. Nickel alloys (Ni-Al-X, Ni-X-Al) qualified for turbine engine “parts” or “components,” *i.e.,* with less than 3 non-metallic particles (introduced during the manufacturing process) larger than 100 µm in 109 alloy particles;

c.1.b. Niobium alloys (Nb-Al-X or Nb-X-Al, Nb-Si-X or Nb-X-Si, Nb-Ti-X or Nb-X-Ti);

c.1.c. Titanium alloys (Ti-Al-X or Ti-X-Al);

c.1.d. Aluminum alloys (Al-Mg-X or Al-X-Mg, Al-Zn-X or Al-X-Zn, Al-Fe-X or Al-X-Fe); *or*

c.1.e. Magnesium alloys (Mg-Al-X or Mg-X-Al);

c.2. Made in a controlled environment by any of the following processes:

c.2.a. 'Vacuum atomization';

c.2.b. 'Gas atomization';

c.2.c. 'Rotary atomization';

c.2.d. 'Splat quenching';

c.2.e. 'Melt spinning' and 'comminution';

c.2.f. 'Melt extraction' and 'comminution';

c.2.g. 'Mechanical alloying'; *or*

c.2.h. 'Plasma atomization'; *and*

c.3. Capable of forming materials controlled by 1C002.a or 1C002.b;

d. Alloyed materials, having all the following:

d.1. Made from any of the composition systems specified by 1C002.c.1;

d.2. In the form of uncomminuted flakes, ribbons or thin rods; *and*

d.3. Produced in a controlled environment by any of the following:

d.3.a. 'Splat quenching';

d.3.b. 'Melt spinning'; *or*

d.3.c. 'Melt extraction'.

Technical Notes: For the purposes of 1C002:
1. 'Vacuum atomization' is a process to reduce a molten stream of metal to droplets of a diameter of 500 μm or less by the rapid evolution of a dissolved gas upon exposure to a vacuum.

2. 'Gas atomization' is a process to reduce a molten stream of metal alloy to droplets of 500 μm diameter or less by a high pressure gas stream.

3. 'Rotary atomization' is a process to reduce a stream or pool of molten metal to droplets of a diameter of 500 μm or less by centrifugal force.

4. 'Splat quenching' is a process to 'solidify rapidly' a molten metal stream impinging upon a chilled block, forming a flake-like product.

5. 'Melt spinning' is a process to 'solidify rapidly' a molten metal stream impinging upon a rotating chilled block, forming a flake, ribbon or rod-like product.

6. 'Comminution' is a process to reduce a material to particles by crushing or grinding.

7. 'Melt extraction' is a process to 'solidify rapidly' and extract a ribbon-like alloy product by the insertion of a short segment of a rotating chilled block into a bath of a molten metal alloy.

8. 'Mechanical alloying' is an alloying process resulting from the bonding, fracturing and rebonding of elemental and master alloy powders by mechanical impact. Non-metallic particles may be incorporated in the alloy by addition of the appropriate powders.

9. 'Plasma atomization' is a process to reduce a molten stream or solid metal to droplets of 500 μm diameter or less, using plasma torches in an inert gas environment.

10. For the purposes of 1C002 Technical Notes, 'solidify rapidly' is a process involving the solidification of molten material at cooling rates exceeding 1000 K/sec.

1C003 Magnetic metals, of all types and of whatever form, having any of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3000

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

a. Initial relative permeability of 120,000 or more and a thickness of 0.05 mm or less;

> *Technical Note: For the purposes of 1C003.a, measurement of initial relative permeability must be performed on fully annealed materials.*

b. Magnetostrictive alloys having any of the following:

b.1. A saturation magnetostriction of more than 5×104^{-4}; *or*

b.2. A magnetomechanical coupling factor (k) of more than 0.8; *or*

c. Amorphous or 'nanocrystalline' alloy strips, having all of the following:

c.1. A composition having a minimum of 75% by weight of iron, cobalt or nickel;

c.2. A saturation magnetic induction (B_s) of 1.6 T or more; *and*

c.3. Any of the following:

c.3.a. A strip thickness of 0.02 mm or less; *or*

c.3.b. An electrical resistivity of 2×10^{-4} ohm cm or more.

> *Technical Note: For the purposes of 1C003.c, 'nanocrystalline' materials are those materials having a crystal grain size of 50 nm or less, as determined by X-ray diffraction.*

1C004 Uranium titanium alloys or tungsten alloys with a “matrix” based on iron, nickel or copper, having all of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $3000

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 1C117 and 1C226.

Related Definitions: N/A

Items: a. A density exceeding 17.5 g/cm^3;

b. An elastic limit exceeding 880 MPa;

c. An ultimate tensile strength exceeding 1,270 MPa; *and*

d. An elongation exceeding 8%.

1C005 "Superconductive" "composite" conductors in lengths exceeding 100 m or with a mass exceeding 100 g, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1500

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

a. “Superconductive” “composite” conductors containing one or more niobium-titanium 'filaments', having all of the following:

a.1. Embedded in a “matrix” other than a copper or copper-based mixed “matrix”; *and*

a.2. Having a cross-section area less than 0.28×10^{-4} mm^2 (6 μm in diameter for circular 'filaments');

b. “Superconductive” “composite” conductors consisting of one or more “superconductive” 'filaments' other than niobium-titanium, having all of the following:

b.1. A “critical temperature” at zero magnetic induction exceeding 9.85 K (−263.31 °C); and

b.2. Remaining in the “superconductive” state at a temperature of 4.2 K (−268.96 °C) when exposed to a magnetic field oriented in any direction perpendicular to the longitudinal axis of conductor and corresponding to a magnetic induction of 12 T with critical current density exceeding 1750 A/mm^2 on overall cross-section of the conductor.

c. “Superconductive” “composite” conductors consisting of one or more “superconductive” 'filaments' which remain “superconductive” above 115 K (−158.16 °C).

Technical Note: For the purposes of 1C005, 'filaments' may be in wire, cylinder, film, tape or ribbon form.

1C006 Fluids and lubricating materials, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3000

GBS: Yes for 1C006.d

LIST OF ITEMS CONTROLLED

Related Controls: See also *1C996.*

Related Definitions: N/A

Items:

a. [Reserved]

b. Lubricating materials containing, as their principal ingredients, phenylene or alkylphenylene ethers or thio-ethers, or their mixtures, containing more than two ether or thio-ether functions or mixtures thereof.

c. Damping or flotation fluids having all of the following:

c.1. Purity exceeding 99.8%;

c.2. Containing less than 25 particles of 200 μm or larger in size per 100 ml; and

c.3. Made from at least 85% of any of the following:

c.3.a. Dibromotetrafluoroethane (CAS 25497-30-7, 124-73-2, 27336-23-8);

c.3.b. Polychlorotrifluoroethylene (oily and waxy modifications only); *or*

c.3.c. Polybromotrifluoroethylene;

d. Fluorocarbon fluids designed for electronic cooling and having all of the following:

d.1. Containing 85% by weight or more of any of the following, or mixtures thereof:

d.1.a. Monomeric forms of perfluoropolyalkylether-triazines or perfluoroaliphatic-ethers;

d.1.b. Perfluoroalkylamines;

d.1.c. Perfluorocycloalkanes; *or*

d.1.d. Perfluoroalkanes;

d.2. Density at 298 K (25 °C) of 1.5 g/ml or more;

d.3. In a liquid state at 273 K (0 °C); *and*

d.4. Containing 60% or more by weight of fluorine.

> *Note: 1C006.d does not apply to materials specified and packaged as medical products.*

1C007 Ceramic powders, ceramic “matrix” “composite” materials and 'precursor materials,' as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
MT applies to items in 1C007.c when the dielectric constant is less than 6 at any frequency from 100 MHz to 100 GHz for use in “missile” radomes	MT Column 1
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $5,000, except N/A for MT and for 1C007.e

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in 1C007.c entry to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: See also 1C107

Related Definitions: N/A

Items: a. Ceramic powders of titanium diboride (TiB_2) (CAS 12045-63-5) having total metallic impurities, excluding intentional additions, of less than 5,000 ppm, an average particle size equal to or less than 5 μm and no more than 10% of the particles larger than 10 μm;

b. [Reserved]

c. Ceramic “matrix” “composite” materials as follows:

c.1. Ceramic-ceramic “composite” materials with a glass or oxide-“matrix” and reinforced with any of the following:

c.1.a. Continuous fibers made from any of the following materials:

c.1.a.1. Al_2O_3 (CAS 1344-28-1); or

c.1.a.2. Si-C-N; or

> *Note: 1C007.c.1.a does not apply to "composites" containing fibers with a tensile strength of less than 700 MPa at 1,273 K (1,000 °C) or tensile creep resistance of more than 1% creep strain at 100 MPa load and 1,273 K (1,000 °C) for 100 hours.*

c.1.b. Fibers being all of the following:

c.1.b.1. Made from any of the following materials:

c.1.b.1.a. Si-N;

c.1.b.1.b. Si-C;

c.1.b.1.c. Si-Al-O-N; *or*

c.1.b.1.d. Si-O-N; *and*

c.1.b.2. Having a "specific tensile strength" exceeding 12.7×10^3 m;

c.2. Ceramic "matrix" "composite" materials with a "matrix" formed of carbides or nitrides of silicon, zirconium or boron;

> *N.B.: For items previously specified by 1C007.c see 1C007.c.1.b.*

d. [Reserved]

> *N.B.: For items previously specified by 1C007.d see 1C007.c.2.*

e. 'Precursor materials' "specially designed" for the "production" of materials controlled by 1C007.c, as follows:

e.1. Polydiorganosilanes;

e.2. Polysilazanes;

e.3. Polycarbosilazanes;

> *Technical Note: For the purposes of 1C007, 'precursor materials' are special purpose polymeric or*

metallo-organic materials used for the "production" of silicon carbide, silicon nitride, or ceramics with silicon, carbon and nitrogen.

f. [Reserved]

N.B.: For items previously specified by 1C007.f see 1C007.c.1.a.

1C008 Non-fluorinated polymeric substances as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $200

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 1A003.

Related Definitions: N/A

Items:

a. Imides as follows:

a.1. Bismaleimides;

a.2. Aromatic polyamide-imides (PAI) having a 'glass transition temperature (Tg)' exceeding 563 K (290 °C);

a.3. Aromatic polyimides having a 'glass transition temperature (Tg)' exceeding 505 K (232 °C);

a.4. Aromatic polyetherimides having a 'glass transition temperature (Tg)' exceeding 563 K (290 °C);

Note: 1C008.a controls the substances in liquid or solid "fusible" form, including resin, powder, pellet, film, sheet, tape, or ribbon.

N.B.: For non-"fusible" aromatic polyimides in film, sheet, tape, or ribbon form, see ECCN 1A003.

b. [Reserved]

c. [Reserved]

d. Polyarylene ketones;

e. Polyarylene sulfides, where the arylene group is biphenylene, triphenylene or combinations thereof;

f. Polybiphenylenethersulphone having a 'glass transition temperature (Tg)' exceeding 563 K (290 °C).

Technical Notes: 1. For the purposes of 1C008.a.2 thermoplastic materials, 1C008.a.4 materials, and 1C008.f materials, the 'glass transition temperature (Tg)' is determined using the method described in ISO 11357-2 (1999) or national equivalents.
2. For the purposes of 1C008.a.2 thermosetting materials and 1C008.a.3 materials, the 'glass transition temperature (Tg)' is determined using the 3-point bend method described in ASTM D 7028-07 or equivalent national standard. The test is to be performed using a dry test specimen which has attained a minimum of 90% degree of cure as specified by ASTM E 2160-04 or equivalent national standard, and was cured using the combination of standard- and post-cure processes that yield the highest Tg.

1C009 Unprocessed fluorinated compounds as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $5000

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 1A001.

Related Definitions: N/A

Items: a. [Reserved]

b. Fluorinated polyimides containing 10% by weight or more of combined fluorine;

c. Fluorinated phosphazene elastomers containing 30% by weight or more of combined fluorine.

1C010 "Fibrous or filamentary materials" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, NP, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
NP applies to 1C010.a (aramid "fibrous or filamentary materials", b (carbon "fibrous and filamentary materials"), and e.1 for "fibrous and filamentary materials" that meet or exceed the control criteria of ECCN 1C210	NP Column 1
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1500, N/A for NP

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in 1C010.c to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 1E001 ("development" and "production") and 1E201 ("use") for technology for items controlled by this entry. (2) Also see ECCNs 1C210 and 1C990. (3) See also 9C110 for material not controlled by 1C010.e, as defined by notes 1 or 2.

Related Definitions: (1) "Specific modulus": Young's modulus in pascals, equivalent to N/m2 divided by specific weight in N/m^3, measured at a temperature of (296+2) K ((23+2) °C) and a relative humidity of (50+5) %. (2) "Specific tensile strength": ultimate tensile strength in pascals, equivalent to N/m2 divided by specific weight in N/m^3, measured at a temperature of (296+2) K ((23+2) °C) and a relative humidity of (50+5) %.

Items:

> *Technical Notes: 1. For the purposes of calculating "specific tensile strength", "specific modulus" or specific weight of "fibrous or filamentary materials" in 1C010.a, 1C010.b, 1C010.c, or 1C010.e.1.b the tensile strength and modulus should be determined by using Method A described in ISO 10618 (2004) or national equivalents.*
> *2. For the purposes of assessing the "specific tensile strength", "specific modulus" or specific weight of non-unidirectional "fibrous or filamentary materials" (e.g., fabrics, random mats or braids) in 1C010, this is to be based on the mechanical properties of the constituent unidirectional monofilaments (e.g., monofilaments, yarns, rovings or tows) prior to processing into the non-unidirectional "fibrous or filamentary materials".*

a. Organic "fibrous or filamentary materials", having all of the following:

a.1. "Specific modulus" exceeding 12.7×10^6 m; *and*

a.2. "Specific tensile strength" exceeding 23.5×10^4 m;

> *Note: 1C010.a does not control polyethylene.*

b. Carbon "fibrous or filamentary materials", having all of the following:

b.1. "Specific modulus" exceeding 14.65×10^6 m; *and*

b.2. "Specific tensile strength" exceeding 26.82×10^4 m;

> *Note: 1C010.b does not control:*

a. "Fibrous or filamentary materials", for the repair of "civil aircraft" structures or laminates, having all of the following:

1. An area not exceeding 1 m^2;

2. A length not exceeding 2.5 m; and

3. A width exceeding 15 mm.

b. Mechanically chopped, milled or cut carbon "fibrous or filamentary materials" 25.0 mm or less in length.

c. Inorganic "fibrous or filamentary materials", having all of the following:

c.1. Having any of the following:

c.1.a. Composed of 50% or more by weight silicon dioxide (SiO_2) and having a "specific modulus" exceeding 2.54 × 10^6 m; *or*

c.1.b. Not specified in 1C010.c.1.a and having a "specific modulus" exceeding 5.6 × 10^6 m; *and*

c.2. Melting, softening, decomposition or sublimation point exceeding 1,922 K (1,649 °C) in an inert environment;

Note: 1C010.c does not control:
a. Discontinuous, multiphase, polycrystalline alumina fibers in chopped fiber or random mat form, containing 3% by weight or more silica, with a "specific modulus" of less than 10 × 10^6 m;

b. Molybdenum and molybdenum alloy fibers;

c. Boron fibers;

d. Discontinuous ceramic fibers with a melting, softening, decomposition or sublimation point lower than 2,043 K (1,770 °C) in an inert environment.

d. "Fibrous or filamentary materials", having any of the following:

d.1. Composed of any of the following:

d.1.a. Polyetherimides controlled by 1C008.a; *or*

d.1.b. Materials controlled by 1C008.b to 1C008.f; *or*

d.2. Composed of materials controlled by 1C010.d.1.a or 1C010.d.1.b and 'commingled' with other fibers controlled by 1C010.a, 1C010.b or 1C010.c;

Technical Note: For the purposes of 1C010.d.2, 'commingled' is filament to filament blending of thermoplastic fibers and reinforcement fibers in order to produce a fiber reinforcement "matrix" mix in total fiber form.

e. Fully or partially resin impregnated or pitch impregnated "fibrous or filamentary materials" (prepregs), metal or carbon coated "fibrous or filamentary materials" (preforms) or 'carbon fiber preforms', having all of the following:

e.1. Having any of the following:

e.1.a. Inorganic "fibrous or filamentary materials" controlled by 1C010.c; *or*

e.1.b. Organic or carbon "fibrous or filamentary materials", having all of the following:

e.1.b.1. "Specific modulus" exceeding 10.15×10^6 m; and

e.1.b.2 "Specific tensile strength" exceeding 17.7×10^4m; and

e.2. Having any of the following:

e.2.a. Resin or pitch, controlled by 1C008 or 1C009.b;

e.2.b. 'Dynamic Mechanical Analysis glass transition temperature (DMA T_g)' equal to or exceeding 453 K (180 °C) and having a phenolic resin; *or*

e.2.c. 'Dynamic Mechanical Analysis glass transition temperature (DMA T_g)' equal to or exceeding 505 K (232 °C) and having a resin or pitch, not specified by 1C008 or 1C009.b, and not being a phenolic resin;

Note 1: Metal or carbon coated "fibrous or filamentary materials" (preforms) or 'carbon fiber preforms', not impregnated with resin or pitch, are specified by "fibrous or filamentary materials" in 1C010.a, 1C010.b or 1C010.c.

Note 2: 1C010.e does not apply to: a. Epoxy resin "matrix" impregnated carbon "fibrous or filamentary materials" (prepregs) for the repair of "civil aircraft" structures or laminates, having all of the following:
1. An area not exceeding 1 m^2

2. A length not exceeding 2.5 m; and

3. A width exceeding 15 mm;

b. Fully or partially resin-impregnated or pitch-impregnated mechanically chopped, milled or cut carbon "fibrous or filamentary materials" 25.0 mm or less in length when using a resin or pitch other than those specified by 1C008 or 1C009.b.

Technical Notes: 1. For the purposes of 1C010.e and Note 1, 'carbon fiber preforms' are an ordered arrangement of uncoated or coated fibers intended to constitute a framework of a part before the "matrix" is introduced to form a "composite".
2. For the purposes of 1C010.e.2, 'Dynamic Mechanical Analysis glass transition temperature (DMA Tg)' is determined using the method described in ASTM D 7028 -07, or equivalent national standard, on a dry test specimen. In the case of thermoset materials, degree of cure of a dry test specimen shall be a minimum of 90% as defined by ASTM E 2160 04 or equivalent national standard.

1C011 Metals and compounds, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, MT, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
MT applies to 1C011.a and .b for items that meet or exceed the parameters in 1C111.	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See also ECCNs 1C111 and 1C608. (2) All of the following are "subject to the ITAR" (see 22 CFR parts 120 through 130): (a) Materials controlled by 1C011.a, and metal fuels in particle form, whether spherical, atomized, spheroidal, flaked or ground, manufactured from material consisting of 99 percent or more of items controlled by 1C011.b; and (b) Metal powders mixed with other substances to form a mixture formulated for military purposes.

Related Definitions: N/A

Items:

a. Metals in particle sizes of less than 60 µm whether spherical, atomized, spheroidal, flaked or ground, manufactured from material consisting of 99% or more of zirconium, magnesium and alloys thereof;

> *Technical Note: For the purposes of 1C011.a, the natural content of hafnium in the zirconium (typically 2% to 7%) is counted with the zirconium.*

> *Note: The metals or alloys specified by 1C011.a also refer to metals or alloys encapsulated in aluminum, magnesium, zirconium or beryllium.*

b. Boron or boron alloys, with a particle size of 60 µm or less, as follows:

b.1. Boron with a purity of 85% by weight or more;

b.2. Boron alloys with a boron content of 85% by weight or more;

> *Note: The metals or alloys specified by 1C011.b also refer to metals or alloys encapsulated in aluminum, magnesium, zirconium or beryllium.*

c. Guanidine nitrate (CAS 506-93-4);

d. Nitroguanidine (NQ) (CAS 556-88-7).

1C018 Commercial charges and devices containing energetic materials on the Wassenaar Arrangement Munitions List and certain chemicals.

No items currently are in this ECCN. (1) See ECCN 1C608.b. through .m for items that, immediately prior to July 1, 2014 were classified under 1C018.b through .m. (2) See ECCNs 1C011, 1C111, and 1C239 for additional controlled energetic materials, including chlorine trifluoride (ClF_3), which is controlled under ECCN 1C111.a.3.f. (3) See ECCN 1A008 for shaped charges, detonating cord, and cutters and severing tools.

1C101 Materials for Reduced Observables such as Radar Reflectivity, Ultraviolet/Infrared Signatures and Acoustic Signatures (i.e., Stealth Technology), Other than Those Controlled by 1C001, for applications usable in rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300km, and their subsystems.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) Materials controlled by this entry include structural materials and coatings (including paints), "specially designed" for reduced or tailored reflectivity or emissivity in the microwave, infrared or ultraviolet spectra. (2) This entry does not control coatings (including paints) when specially used for the thermal control of satellites. (3) For commodities that meet the definition of defense articles under 22 CFR 120.3 of the International Traffic in Arms Regulations (ITAR), which describes similar commodities "subject to the ITAR" (See 22 CFR parts 120 through 130, including USML Category XIII).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1C102 Resaturated pyrolized carbon-carbon materials designed for space launch vehicles specified in 9A004 or sounding rockets specified in 9A104. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

1C107 Graphite and Ceramic Materials, Other Than Those Controlled by 1C007, Which Can be Machined to Any of the Following Products as Follows (See List of Items Controlled).

License Requirements

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See also 1C004, 1C007, and 1C298. (2) For commodities that meet the definition of defense articles under 22 CFR 120.3 of the ITAR, which describes similar commodities "subject to the ITAR" (See 22 CFR parts 120 through 130, including USML Category XIII). (3) "Special fissile materials" and "other fissile materials"; except, four "effective grams" or less when contained in a sensing component in instruments are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: a. Fine grain graphites with a bulk density of 1.72 g/cm^3 or greater, measured at 15 °C, and having a grain size of 100 micrometers or less, usable for rocket nozzles and reentry vehicle nose tips as follows:

a.1. Cylinders having a diameter of 120 mm or greater and a length of 50 mm or greater;

a.2. Tubes having an inner diameter of 65 mm or greater and a wall thickness of 25 mm or greater and a length of 50 mm or greater;

a.3. Blocks having a size of 120 mm × 120 mm × 50 mm or greater.

b. Pyrolytic or fibrous reinforced graphites, usable for rocket nozzles and reentry vehicle nose tips;

c. Ceramic composite materials (dielectric constant is less than 6 at any frequency from 100 MHz to 100 GHz) for use in radomes useable in rockets, missiles, and unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km; *or*

d. High-temperature ceramic materials, useable in rockets, missiles, and unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km, as follows:

d.1. Bulk machinable silicon-carbide reinforced unfired ceramic, usable for nose tips.

d.2. Reinforced silicon-carbide ceramic composites usable for nose tips, re-entry vehicles, nozzle flaps.

d.3. Bulk machinable ceramic composite materials consisting of an 'Ultra High Temperature Ceramic (UHTC)' matrix with a melting point equal to or greater than 3000 °C and reinforced with fibers or filaments, usable for missile components (such as nose tips, re-entry vehicles, leading edges, jet vanes, control surfaces, or rocket motor throat inserts).

> *Note: ECCN 1C107.d.3. does not control 'Ultra High Temperature Ceramic (UHTC)' materials in non-composite form.*

Technical Note: 'Ultra High Temperature Ceramics (UHTC)' includes: Titanium diboride (TiB_2), zirconium diboride (ZrB_2), niobium diboride (NbB_2), hafnium diboride (HfB_2), tantalum diboride (TaB_2), titanium carbide (TiC), zirconium carbide (ZrC), niobium carbide (NbC), hafnium carbide (HfC), tantalum carbide (TaC).

1C111 Propellants and constituent chemicals for propellants, other than those specified in 1C011, as follows (see List of Items Controlled).

License Requirements

Reason for Control: MT, NP, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.
NP applies to 1C111.a.3.f only	NP Column 1.
RS applies to 1C111.d.3 only	RS Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See USML Category V(e)(7) for controls on HTPB (hydroxyl terminated polybutadiene) with a hydroxyl functionality equal to or greater than 2.2 and less than or equal to 2.4, a hydroxyl value of less than 0.77 meq/g, and a viscosity at 30 °C of less than 47 poise (CAS #69102-90-5). (2) See USML Category V for controls on ferrocene derivatives, including butacene. (3) See ECCN 1C608 for controls on oxidizers that are composed of fluorine and also other halogens, oxygen, or nitrogen, except for chlorine trifluoride, which is controlled under this ECCN 1C111.a.3.f. (4) See ECCN 1C011.b for controls on boron and boron alloys not controlled under this ECCN 1C111.a.2.b. (5) See USML Category V for controls on Inhibited Red Fuming Nitric Acid (IRFNA) (CAS 8007-58-7).

Related Definitions: Particle size is the mean particle diameter on a weight or volume basis. Best industrial practices must be used in sampling, and in determining particle size, and the controls may not be undermined by the addition of larger or smaller sized material to shift the mean diameter.

Items:

a. Propulsive substances:

a.1. Spherical or spheroidal aluminum powder (C.A.S. 7429-90-5) in particle size of less than 200×10^{-6} m (200 μm) and an aluminum content of 97% by weight or more, if at least 10% of the total weight is made up of particles of less than 63 μm, according to ISO 2591-1:1988 or national equivalents.

> *Technical Note: A particle size of 63 μm (ISO R-565) corresponds to 250 mesh (Tyler) or 230 mesh (ASTM standard E-11).*

a.2. Metal powders and alloys where at least 90% of the total particles by particle volume or weight are made up of particles of less than 60 μ (determined by measurement techniques such as using a sieve, laser diffraction or optical scanning), whether spherical, atomized, spheroidal, flaked or ground, as follows:

a.2.a. Consisting of 97% by weight or more of any of the following:

a.2.a.1. Zirconium (C.A.S. #7440-67-7);

a.2.a.2. Beryllium (C.A.S. #7440-41-7); *or*

a.2.a.3. Magnesium (C.A.S. #7439-95-4);

a.2.b. Boron or boron alloys with a boron content of 85% or more by weight.

> *Technical Note: The natural content of hafnium in the zirconium (typically 2% to 7%) is counted with the zirconium.*

> *Note: In a multimodal particle distribution (e.g., mixtures of different grain sizes) in which one or more modes are controlled, the entire powder mixture is controlled.*

a.3. Oxidizer substances usable in liquid propellant rocket engines, as follows:

a.3.a. Dinitrogen trioxide (CAS 10544-73-7);

a.3.b. Nitrogen dioxide (CAS 10102-44-0)/dinitrogen tetroxide (CAS 10544-72-6);

a.3.c. Dinitrogen pentoxide (CAS 10102-03-1);

a.3.d. Mixed oxides of nitrogen (MON);

a.3.e. [Reserved];

a.3.f. Chlorine trifluoride (ClF_3).

Technical Note: Mixed oxides of nitrogen (MON) are solutions of nitric oxide (NO) in dinitrogen tetroxide/nitrogen dioxide (N_2O_4/NO_2) that can be used in missile systems. There are a range of compositions that can be denoted as MONi or MONij, where i and j are integers representing the percentage of nitric oxide in the mixture (e.g., MON3 contains 3% nitric oxide, MON25 25% nitric oxide. An upper limit is MON40, 40% by weight).

b. Polymeric substances:

b.1. Carboxy-terminated polybutadiene (including carboxyl-terminated polybutadiene) (CTPB);

b.2. Hydroxy-terminated polybutadiene (including hydroxyl-terminated polybutadiene) (HTPB) (CAS 69102-90-5), except for hydroxyl-terminated polybutadiene as specified in USML Category V (see 22 CFR 121.1) (also see Related Controls Note #1 for this ECCN);

b.3. Polybutadiene acrylic acid (PBAA);

b.4. Polybutadiene acrylic acid acrylonitrile (PBAN) (CAS 25265-19-4/CAS 68891-50-9);

b.5. Polytetrahydrofuran polyethylene glycol (TPEG).

Technical Note: Polytetrahydrofuran polyethylene glycol (TPEG) is a block copolymer of poly 1,4-Butanediol (CAS 110-63-4) and polyethylene glycol (PEG) (CAS 25322-68-3).

c. Other propellant energetic materials, additives, or agents:

c.1. [Reserved]

c.2. Triethylene glycol dinitrate (TEGDN);

c.3. 2 Nitrodiphenylamine (2-NDPA);

c.4. Trimethylolethane trinitrate (TMETN);

c.5. Diethylene glycol dinitrate (DEGDN).

d. Hydrazine and derivatives as follows:

d.1. Hydrazine (C.A.S. #302-01-2) in concentrations of 70% or more;

d.2. Monomethyl hydrazine (MMH) (C.A.S. #60-34-4);

d.3. Symmetrical dimethyl hydrazine (SDMH) (C.A.S. #540-73-8);

d.4. Unsymmetrical dimethyl hydrazine (UDMH) (C.A.S. #57-14-7);

d.5. Trimethylhydrazine (C.A.S. #1741-01-1);

d.6. Tetramethylhydrazine (C.A.S. #6415-12-9);

d.7. N,N diallylhydrazine (CAS 5164-11-4);

d.8. Allylhydrazine (C.A.S. #7422-78-8);

d.9. Ethylene dihydrazine (CAS 6068-98-0);

d.10. Monomethylhydrazine dinitrate;

d.11. Unsymmetrical dimethylhydrazine nitrate;

d.12. 1,1-Dimethylhydrazinium azide (CAS 227955-52-4)/1,2-Dimethylhydrazinium azide (CAS 299177-50-7);

d.13. Hydrazinium azide (C.A.S. #14546-44-2);

d.14. Hydrazinium dinitrate (CAS 13464-98-7);

d.15. Diimido oxalic acid dihydrazine (C.A.S. #3457-37-2);

d.16. 2-hydroxyethylhydrazine nitrate (HEHN);

d.17. Hydrazinium diperchlorate (C.A.S. #13812-39-0);

d.18. Methylhydrazine nitrate (MHN) (CAS 29674-96-2);

d.19. 1,1-Diethylhydrazine nitrate (DEHN)/1,2-Diethylhydrazine nitrate (DEHN) (CAS 363453-17-2);

d.20. 3,6-dihydrazino tetrazine nitrate (DHTN), also referred to as 1,4-dihydrazine nitrate.

e. Hydrazine replacement fuels as follows:

e.1. 2-Dimethylaminoethylazide (DMAZ) (CAS 86147-04-8);

e.2. [Reserved]

1C116 Maraging steels having both of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
NP applies to items that meet or exceed the parameters of 1C216	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 1E001 (“development” and “production”) and 1E101 (“use”) for technology for items controlled by this entry. (2) Also see ECCN 1C216. (3) Maraging steel, in physical forms and finished products and “specially designed” or prepared for use in separating uranium isotopes, is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: a. Having an ultimate tensile strength, measured at 20 °C, equal to or greater than:

a.1. 0.9 GPa in the solution annealed stage; *or*

a.2. 1.5 GPa in the precipitation hardened stage; *and*

b. Any of the following forms:

b.1 Sheet, plate or tubing with a wall or plate thickness equal to or less than 5.0 mm;

or

b.2 Tubular forms with a wall thickness equal to or less than 50 mm and having an inner diameter equal to or greater than 270 mm.

> *Technical Note: Maraging steels are iron alloys that are generally*:

a. Characterized by high nickel, very low carbon content and use substitutional elements or precipitates to produce strengthening and age-hardening of the alloy; and

b. Subjected to heat treatment cycles to facilitate the martensitic transformation process (solution annealed stage) and subsequently age hardened (precipitation hardened stage).

1C117 Materials for the fabrication of missile "parts" or "components" for rockets or missiles capable of achieving a "range" equal to or greater than 300 km, as follows (see List of Items Controlled).

License Requirements

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See 1C226.

Related Definitions: N/A

Items: a. Tungsten and alloys in particulate form with a tungsten content of 97% by weight or more and a particle size of 50×10^{-6} m (50 μm) or less;

b. Molybdenum and alloys in particulate form with a molybdenum content of 97% by weight or more and a particle size of 50×10^{-6} m (50 μm) or less;

c. Tungsten materials in the solid form having all of the following:

c.1. Any of the following material compositions:

c.1.a. Tungsten and alloys containing 97% by weight or more of tungsten;

c.1.b. Copper infiltrated tungsten containing 80% by weight or more of tungsten; *or*

c.1.c. Silver infiltrated tungsten containing 80% by weight or more of tungsten; *and*

c.2. Able to be machined to any of the following products:

c.2.a. Cylinders having a diameter of 120 mm or greater and a length of 50 mm or greater;

c.2.b. Tubes having an inner diameter of 65 mm or greater and a wall thickness of 25 mm or greater and a length of 50 mm or greater; *or*

c.2.c. Blocks having a size of 120 mm × 120 mm × 50 mm or greater.

1C118 Titanium-stabilized duplex stainless steel (Ti-DSS), having all of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Having all of the following characteristics:

a.1. Containing 17.0-23.0% by weight of chromium and 4.5-7.0% by weight of nickel;

a.2. Having a titanium content of greater than 0.10% by weight; *and*

a.3. A ferritic-austenitic microstructure (also referred to as a two-phase microstructure) of which at least 10% by volume (according to ASTM E-1181-87 or national equivalents) is austenite; *and*

b. Having any of the following forms:

b.1. Ingots or bars having a size of 100 mm or more in each dimension;

b.2. Sheets having a width of 600 mm or more and a thickness of 3 mm or less; *or*

b.3. Tubes having an outer diameter of 600 mm or more and a wall thickness of 3 mm or less.

1C202 Alloys other than those controlled by 1C002.b.3 or 1C002.b.4 as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry. (2) Also see ECCN 1C002. (3) Aluminum alloys and titanium alloys, in physical forms and finished products and “specially designed” or prepared for use in separating uranium isotopes, are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: The phrase “capable of” refers to aluminum alloys and titanium alloys either before or after heat treatment.

Items: a. Aluminum alloys having both of the following characteristics:

a.1. “Capable of” an ultimate tensile strength of 460 MPa or more at 293 K (20 °C); *and*

a.2. In the form of tubes or cylindrical solid forms (including forgings) with an outside diameter of more than 75 mm;

b. Titanium alloys having both of the following characteristics:

b.1. “Capable of” an ultimate tensile strength of 900 MPa or more at 293 K (20 °C); *and*

b.2. In the form of tubes or cylindrical solid forms (including forgings) with an outside diameter of more than 75 mm.

1C210 “Fibrous or filamentary materials” or prepregs, other than those controlled by 1C010.a, .b or .e, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry. (2) Also see ECCNs 1C010 and 1C990.

Related Definitions: For the purpose of this entry, the term “fibrous or filamentary materials” is restricted to continuous “monofilaments”, “yarns”, “rovings”, “tows”, or “tapes”. Definitions for other terms used in this entry:

Filament or Monofilament is the smallest increment of fiber, usually several μm in diameter.

Strand is a bundle of filaments (typically over 200) arranged approximately parallel.

Roving is a bundle (typically 12-120) of approximately parallel strands.

Yarn is a bundle of twisted strands.

Tow is a bundle of filaments, usually approximately parallel.

Tape is a material constructed of interlaced or unidirectional filaments, strands, rovings, tows, or yarns, etc., usually preimpregnated with resin.

Specific modulus is the Young's modulus in N/m^2 divided by the specific weight in N/m^3, measured at a temperature of (296 ±2) K ((23 ±2) °C) and a relative humidity of 50 ±5 percent.

Specific tensile strength is the ultimate tensile strength in N/m^2 divided by specific weight in N/m^3, measured at a temperature of (296 ±2) K ((23 ±2) °C) and a relative humidity of 50 ±5 percent.

Items: a. Carbon or aramid “fibrous or filamentary materials” having a “specific modulus” of 12.7×10^6 m or greater or a “specific tensile strength” of 235×10^3 m or greater *except* Aramid “fibrous or filamentary materials” having 0.25 percent or more by weight of an ester based fiber surface modifier;

b. Glass “fibrous or filamentary materials” having a “specific modulus” of 3.18×10^6 m or greater and a “specific tensile strength” of 76.2×10^3 m or greater; *or*

c. Thermoset resin impregnated continuous “yarns”, “rovings”, “tows” or “tapes” with a width no greater than 15 mm (prepregs), made from carbon or glass “fibrous or filamentary materials” controlled by 1C210.a or .b.

Technical Note: The resin forms the matrix of the composite.

1C216 Maraging steel, other than that controlled by 1C116, “capable of” an ultimate tensile strength of 1,950 MPa or more, at 293 K (20 °C).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry.

(2) Also see ECCN 1C116.

(3) Maraging steel, in physical form and finished products "specially designed" or prepared for use in separating uranium isotopes, is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: The phrase "capable of" in the ECCN heading refers to maraging steel either before or after heat treatment.

ECCN Controls: This entry does not control forms in which all linear dimensions are 75 mm or less.

Items: The list of items controlled is contained in the ECCN heading.

1C225 Boron enriched in the boron-10 (^{10}B) isotope to greater than its natural isotopic abundance, as follows: elemental boron, compounds, mixtures containing boron, manufactures thereof, waste or scrap of any of the foregoing.

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See ECCNs 1E001 ("development" and "production") and 1E201 ("use") for technology for items controlled by this entry.

Related Definitions: In this entry, mixtures containing boron include boron-loaded materials.

Items: The list of items controlled is contained in the ECCN heading.

> *Technical Note: The natural isotopic abundance of boron-10 is approximately 18.5 weight percent (20 atom percent).*

1C226 Tungsten, tungsten carbide, and alloys containing more than 90% tungsten by weight, having both of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry.

Related Definitions: N/A

ECCN Controls: This entry does not control manufactures “specially designed” as weights or gamma-ray collimators.

Items: a. In forms with a hollow cylindrical symmetry (including cylinder segments) with an inside diameter between 100 and 300 mm; *and*

b. A mass greater than 20 kg.

1C227 Calcium having both of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry.

Related Definitions: N/A

Items: a. Containing less than 1,000 parts per million by weight of metallic impurities other than magnesium; *and*

b. Containing less than 10 parts per million by weight of boron.

1C228 Magnesium having both of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry.

Related Definitions: N/A

Items: a. Containing less than 200 parts per million by weight of metallic impurities other than calcium; *and*

b. Containing less than 10 parts per million by weight of boron.

1C229 Bismuth having both of the following characteristics (see List of Items Controlled)

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry.

Related Definitions: N/A

Items: a. A purity of 99.99% or greater by weight; *and*

b. Containing less than 10 parts per million by weight of silver.

1C230 Beryllium metal, alloys containing more than 50% beryllium by weight, beryllium compounds, manufactures thereof, and waste or scrap of any of the foregoing.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See ECCNs 1E001 ("development" and "production") and 1E201 ("use") for technology for items controlled by this entry.

Related Definitions: N/A

ECCN Controls: This entry does not control the following:

a. Metal windows for X-ray machines, or for bore-hole logging devices;

b. Oxide shapes in fabricated or semi-fabricated forms "specially designed" for electronic component parts or as substrates for electronic circuits;

c. Beryl (silicate of beryllium and aluminum) in the form of emeralds or aquamarines.

Items: The list of items controlled is contained in the ECCN heading.

1C231 Hafnium metal, hafnium alloys and compounds containing more than 60% hafnium by weight, manufactures thereof, and waste or scrap of any of the foregoing.

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1C232 Helium-3 (^{3}He), mixtures containing helium-3, and products or devices containing any of the foregoing.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry.

Related Definitions: N/A

ECCN Controls: This entry does not control a product or device containing less than 1 g of helium-3.

Items: The list of items controlled is contained in the ECCN heading.

1C233 Lithium enriched in the lithium-6 (^{6} Li) isotope to greater than its natural isotopic abundance, and products or devices containing enriched lithium, as follows: elemental lithium, alloys, compounds, mixtures containing lithium, manufactures thereof, and waste or scrap of any of the foregoing.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry. (2) See ECCN 1B233 for lithium isotope separation facilities or plants, and equipment therefor. (3) Certain facilities or plants for the separation of lithium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: The natural isotopic abundance of lithium-6 is approximately 6.5 weight percent (7.5 atom percent).

ECCN Controls: This entry does not control thermoluminescent dosimeters.

Items: The list of items controlled is contained in the ECCN heading.

1C234 Zirconium with a hafnium content of less than 1 part hafnium to 500 parts zirconium by weight, as follows: metal, alloys containing more than 50% zirconium by weight, compounds, manufactures thereof, and waste or scrap of any of the foregoing.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry. (2) Zirconium metal and alloys in the form of tubes or assemblies of tubes, “specially designed” or prepared for use in a reactor, are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

ECCN Controls: This entry does not control zirconium in the form of foil having a thickness of 0.10 mm (0.004 in.) or less.

Items: The list of items controlled is contained in the ECCN heading.

1C235 Tritium, tritium compounds, mixtures containing tritium in which the ratio of tritium to hydrogen atoms exceeds 1 part in 1,000, and products or devices containing any of the foregoing.

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry. (2) Also see ECCN 1B231. (3) Tritium that is byproduct material (*e.g.,* produced in a nuclear reactor) is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

ECCN Controls: (1) This entry does not control tritium, tritium compounds, and mixtures that are byproduct material (e.g., produced in a nuclear reactor)—such materials are subject to the licensing jurisdiction of the Nuclear Regulatory Commission (see Related Controls paragraph for this entry). (2) This entry does not control a product or device containing less than 1.48×10^3 GBq (40 Ci) of tritium.

Items: The list of items controlled is contained in the ECCN heading.

1C236 Radionuclides appropriate for making neutron sources based on alpha-n reaction and products or devices containing such radionuclides (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry. (2) Certain alpha-emitting radionuclides are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

ECCN Controls: This entry does not control a product or device containing less than 3.7 GBq (100 millicuries) of activity.

Items: a. Radionuclides identified in 1C236.a.1 in any of the forms described in 1C236.a.2:

a.1. Radionuclides, as follows, appropriate for making neutron sources based on alpha-n reactions:

a.1.a. Actinium 225;

a.1.b. Actinium 227;

a.1.c. Californium 253;

a.1.d. Curium 240;

a.1.e. Curium 241;

a.1.f. Curium 242;

a.1.g. Curium 243;

a.1.h. Curium 244;

a.1.i. Einsteinium 253;

a.1.j. Einsteinium 254;

a.1.k. Gadolinium 148;

a.1.l. Plutonium 236;

a.1.m. Plutonium 238;

a.1.n. Polonium 208;

a.1.o. Polonium 209;

a.1.p. Polonium 210;

a.1.q. Radium 223;

a.1.r. Thorium 227;

a.1.s. Thorium 228;

a.1.t. Uranium 230;

a.1.u. Uranium 232; *and*

a.2. In any of the following forms:

a.2.a. Elemental;

a.2.b. Compounds having a total activity of 37 GBq (1 curie) per kg or greater; *or*

a.2.c. Mixtures having a total activity of 37 GBq (1 curie) per kg or greater.

b. Products or devices containing radionuclides identified in 1C236.a.1 in any of the forms described in 1C236.a.2.

1C237 Radium-226 (^{226}Ra), radium-226 alloys, radium-226 compounds, mixtures containing radium-226, manufactures thereof, and products or devices containing any of the foregoing.

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry.

Related Definitions: N/A

ECCN Controls: This entry does not control the following:

a. Medical applicators;

b. A product or device containing less than 0.37 GBq (10 millicuries) of radium-226.

Items: The list of items controlled is contained in the ECCN heading.

1C239 High explosives, other than those controlled by the U.S. Munitions List, or substances or mixtures containing more than 2% by weight thereof, with a crystal density greater than 1.8 g/cm^3 and having a detonation velocity greater than 8,000 m/s.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 1E001 (“development” and “production”) and 1E201 (“use”) for technology for items controlled by this entry. (2) See ECCNs 1C608 (energetic materials and related commodities on the Wassenaar Arrangement Munitions List) and 1C992 (commercial charges and devices containing energetic materials, n.e.s and nitrogen trifluoride in a gaseous state). (3) High explosives for military use are “subject to the ITAR” (see 22 CFR Part 121.1).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1C240 Nickel powder or porous nickel metal, other than nickel powder or porous nickel metal, specially prepared for the manufacture of gaseous diffusion barriers subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110), as follows (see List of Items Controlled).

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 1E001 ("development" and "production") and 1E201 ("use") for technology for items controlled by this entry. (2) Nickel powder and porous nickel metal, "specially designed" or prepared for use in separating uranium isotopes, are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

ECCN Controls: This entry does not control the following:

a. Filamentary nickel powders;

b. Single porous nickel sheets with an area of 1,000 cm^2 per sheet or less.

Items: a. Nickel powder having both of the following characteristics:

a.1. A nickel purity content of 99.0% or greater by weight; and

a.2. A mean particle size of less than 10 micrometers measured by American Society for Testing and Materials (ASTM) B330 standard;

b. Porous nickel metal produced from materials controlled by 1C240.a.

> *Technical Note: 1C240.b refers to porous metal formed by compacting and sintering the materials in 1C240.a to form a metal material with fine pores interconnected throughout the structure.*

1C241 Rhenium and alloys containing rhenium (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items: a. Rhenium and alloys containing rhenium, as follows, having both of the characteristics described in 1C241.b:

a.1. Alloys containing 90% by weight or more of rhenium;

a.2. Alloys containing 90% by weight or more of any combination of rhenium and tungsten; *and*

b. Having both of the following characteristics:

b.1. In forms with a hollow cylindrical symmetry (including cylinder segments) with an inside diameter between 100 mm and 300 mm; *and*

b.2. A mass greater than 20 kg.

1C298 Graphite and deuterium that is intended for use other than in a nuclear reactor, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NP

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 2.

License Requirement Note: The graphite and deuterium, as defined in this entry, when intended for use in a nuclear reactor, is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See also 1C107. (2) Graphite having a purity level of less than 5 parts per million "boron equivalent" as measured according to ASTM standard C-1233-98 and intended for use in a nuclear reactor is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (3) Deuterium and any deuterium compound, including heavy water, in which the ratio of deuterium atoms to hydrogen atoms exceeds 1:5000; and intended for use in a nuclear reactor is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: For the purpose of this entry, graphite with a purity level better than 5 parts per million boron equivalent is determined according to ASTM standard C1233-98. In applying ASTM standard C1233-98, the boron equivalence of the element carbon is not included in the boron equivalence calculation, since carbon is not considered an impurity. For the purpose of this entry, 'Deuterium' means deuterium and any deuterium compound, including heavy water, in which the ratio of deuterium atoms to hydrogen atoms exceeds 1:5000.

Items:

a. Graphite with a boron content of less than 5 parts per million and a density greater than 1.5 grams per cubic centimeter that is intended for use other than in a nuclear reactor;

b. 'Deuterium' not for use in a nuclear reactor.

1C350 Chemicals that may be used as precursors for toxic chemical agents (see List of Items Controlled).

License Requirements

Reason for Control: CB, CW, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
CB applies to entire entry CB Column 2.	

CW applies to 1C350.b and .c. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for CW reasons. A license is required, for CW reasons, to export or reexport Schedule 2 chemicals and mixtures identified in 1C350.b to States not Party to the CWC (destinations not listed in Supplement No. 2 to part 745 of the EAR). A license is required, for CW reasons, to export Schedule 3 chemicals and mixtures identified in 1C350.c to States not Party to the CWC, unless an End-Use Certificate issued by the government of the importing country has been obtained by the exporter prior to export. A license is required, for CW reasons, to reexport Schedule 3 chemicals and mixtures identified in 1C350.c from a State not Party to the CWC to any other State not Party to the CWC. (See § 742.18 of the EAR for license requirements and policies for toxic and precursor chemicals controlled for CW reasons. See § 745.2 of the EAR for End-Use Certificate requirements that apply to exports of Schedule 3 chemicals to countries not listed in Supplement No. 2 to part 745 of the EAR.)

AT applies to entire entry. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for AT reasons in 1C350. A license is required, for AT reasons, to export or reexport items controlled by 1C350 to a country in Country Group E:1 of Supplement No. 1 to part 740 of the EAR. (See part 742 of the EAR for additional information on the AT controls that apply to Iran, North Korea, and Syria. See part 746 of the EAR for additional information on sanctions that apply to Iran, North Korea, and Syria.)

License Requirement Notes 1. SAMPLE SHIPMENTS: Subject to the following requirements and restrictions, a license is not required for sample shipments when the cumulative total of these shipments does not exceed a 55-gallon container or 200 kg of a single chemical to any one consignee during a calendar year. A consignee that receives a sample shipment under this exclusion may not resell, transfer, or reexport the sample shipment, but may use the sample shipment for any other legal purpose unrelated to chemical weapons.
a. Chemicals Not Eligible

A. [Reserved]

B. CWC Schedule 2 chemicals (States not Party to the CWC). No CWC Schedule 2 chemical or mixture identified in 1C350.b is eligible for sample shipment to States not Party to the CWC (destinations not listed in Supplement No. 2 to part 745 of the EAR) without a license.

b. Countries Not Eligible: Countries in Country Group E:1 of Supplement No. 1 to part 740 of the EAR are not eligible to receive sample shipments of any chemicals controlled by this ECCN without a license.

c. Sample shipments that require an End-Use Certificate for CW reasons: No CWC Schedule 3 chemical or mixture identified in 1C350.c is eligible for sample shipment to States not Party to the CWC (destinations not listed in Supplement No. 2 to part 745 of the EAR) without a license, unless an End-Use Certificate issued by the government of the importing country is obtained by the exporter prior to export (see § 745.2 of the EAR for End-Use Certificate requirements).

d. Sample shipments that require a license for reasons set forth elsewhere in the EAR: Sample shipments, as described in this Note 1, may require a license for reasons set forth elsewhere in the EAR. See, in particular, the end-use/end-user restrictions in part 744 of the EAR, and the restrictions that apply to embargoed countries in part 746 of the EAR.

e. Annual report requirement. The exporter is required to submit an annual written report for shipments of samples made under this Note 1. The report must be on company letterhead stationery (titled "Report of Sample Shipments of Chemical Precursors" at the top of the first page) and identify the chemical(s), Chemical Abstract Service Registry (C.A.S.) number(s), quantity(ies), the ultimate consignee's name and address, and the date of export for all sample shipments that were made during the previous calendar year. The report must be submitted no later than February 28 of the year following the calendar year in which the sample shipments were made, to: U.S. Department of Commerce, Bureau of Industry and Security, 14th Street and Pennsylvania Ave. NW, Room 2099B, Washington, DC 20230, Attn: "Report of Sample Shipments of Chemical Precursors."

2. MIXTURES:

a. Mixtures that contain precursor chemicals identified in ECCN 1C350, in concentrations that are below the levels indicated in 1C350.b through .d, are controlled by ECCN 1C395 or 1C995 and are subject to the licensing requirements specified in those ECCNs.

b. *A license is not required under this ECCN for a mixture, when the controlled chemical in the mixture is a normal ingredient in consumer goods packaged for retail sale for personal use. Such consumer goods are designated EAR99. However, a license may be required for reasons set forth elsewhere in the EAR.*

Note to Mixtures: Calculation of concentrations of AG-controlled chemicals:

a. Exclusion. No chemical may be added to the mixture (solution) for the sole purpose of circumventing the Export Administration Regulations;

b. Percent Weight Calculation. When calculating the percentage, by weight, of ingredients in a chemical mixture, include all ingredients of the mixture, including those that act as solvents.

3. COMPOUNDS. Compounds created with any chemicals identified in this ECCN 1C350 may be shipped NLR (No License Required), without obtaining an End-Use Certificate, unless those compounds are also identified in this entry or require a license for reasons set forth elsewhere in the EAR.

4. TESTING KITS: Certain medical, analytical, diagnostic, and food testing kits containing small quantities of chemicals identified in this ECCN 1C350, are excluded from the scope of this ECCN and are controlled under ECCN 1C395 or 1C995. (Note that replacement reagents for such kits are controlled by this ECCN 1C350 if the reagents contain one or more of the precursor chemicals identified in 1C350 in concentrations equal to or greater than the control levels for mixtures indicated in 1C350.)

Technical Notes: 1. For purposes of this entry, a "mixture" is defined as a solid, liquid or gaseous product made up of two or more ingredients that do not react together under normal storage conditions.
2. The scope of this control applicable to Hydrogen Fluoride (see 1C350.d.14 in the List of Items Controlled) includes its liquid, gaseous, and aqueous phases, and hydrates.

3. Precursor chemicals in ECCN 1C350 are listed by name, Chemical Abstract Service (CAS) number and CWC Schedule (where applicable). Precursor chemicals of the same structural formula (e.g., hydrates, isotopically-labeled forms or all possible stereoisomers) are controlled by ECCN 1C350, regardless of name or CAS number. CAS numbers are shown to assist in identifying whether a particular precursor chemical or mixture is controlled under ECCN 1C350, irrespective of nomenclature. However, CAS numbers cannot be used as unique identifiers in all situations because some forms of the listed precursor chemical have different CAS numbers, and mixtures containing a precursor chemical listed in ECCN 1C350 may also have different CAS numbers.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See USML Category XIV for related chemical agent binary precursors and key precursors "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: See § 770.2(k) of the EAR for synonyms for the chemicals listed in this entry.

Items:

a. [Reserved]

b. Australia Group-controlled precursor chemicals also identified as Schedule 2 chemicals under the CWC, as follows, and mixtures in which at least one of the following chemicals constitutes 30 percent or more of the weight of the mixture:

b.1. (C.A.S. #7784-34-1) Arsenic trichloride;

b.2. (C.A.S. #76-93-7) Benzilic acid;

b.3. (C.A.S. #78-38-6) Diethyl ethylphosphonate;

b.4. (C.A.S. #683-08-9) Diethyl methylphosphonate;

b.5. (C.A.S. #15715-41-0) Diethyl methylphosphonite;

b.6. (C.A.S. #2404-03-7) Diethyl-N,N-dimethylphosphoroamidate;

b.7. (C.A.S. #41480-75-5) N,N-Diisopropylaminoethanethiol hydrochloride;

b.8. (C.A.S. #5842-07-9) N,N-Diisopropyl-beta-aminoethane thiol;

b.9. (C.A.S. #96-80-0) N,N-Diisopropyl-beta-aminoethanol;

b.10. (C.A.S. #96-79-7), N,N-Diisopropyl-beta-aminoethyl chloride;

b.11. (C.A.S. #4261-68-1) N,N-Diisopropyl-beta-aminoethyl chloride hydrochloride;

b.12. (C.A.S. #6163-75-3) Dimethyl ethylphosphonate;

b.13. (C.A.S. #756-79-6) Dimethyl methylphosphonate;

b.14. (C.A.S. #677-43-0) N,N-dimethylamino-phosphoryl dichloride;

b.15. (C.A.S. #1498-40-4) Ethyl phosphonous dichloride [Ethyl phosphinyl dichloride];

b.16. (C.A.S. #430-78-4) Ethyl phosphonus difluoride [Ethyl phosphinyl difluoride];

b.17. (C.A.S. #1066-50-8) Ethyl phosphonyl dichloride;

b.18. (C.A.S. #993-13-5) Methylphosphonic acid;

b.19. (C.A.S. #676-98-2) Methylphosphonothioic dichloride.

b.20. (C.A.S. #464-07-3) Pinacolyl alcohol;

b.21. (C.A.S. #1619-34-7) 3-Quinuclidinol;

b.22. (C.A.S. #111-48-8) Thiodiglycol.

c. Australia Group-controlled precursor chemicals also identified as Schedule 3 chemicals under the CWC, as follows, and mixtures in which at least one of the following chemicals constitutes 30 percent or more of the weight of the mixture:

c.1. (C.A.S. #762-04-9) Diethyl phosphite;

c.2. (C.A.S. #868-85-9) Dimethyl phosphite (dimethyl hydrogen phosphite);

c.3. (C.A.S. #139-87-7) Ethyldiethanolamine;

c.4. (C.A.S. #10025-87-3) Phosphorus oxychloride;

c.5. (C.A.S. #10026-13-8) Phosphorus pentachloride;

c.6. (C.A.S. #7719-12-2) Phosphorus trichloride;

c.7. (C.A.S. #10545-99-0) Sulfur dichloride;

c.8. (C.A.S. #10025-67-9) Sulfur monochloride;

c.9. (C.A.S. #7719-09-7) Thionyl chloride;

c.10. (C.A.S. #102-71-6) Triethanolamine;

c.11. (C.A.S. #122-52-1) Triethyl phosphite;

c.12. (C.A.S. #121-45-9) Trimethyl phosphite.

d. Other Australia Group-controlled precursor chemicals not also identified as Schedule 1, 2, or 3 chemicals under the CWC, as follows, and mixtures in which at least one of the following chemicals constitutes 30 percent or more of the weight of the mixture:

d.1. (C.A.S. #1341-49-7) Ammonium hydrogen fluoride;

d.2. (C.A.S. #107-07-3) 2-Chloroethanol;

d.3. (C.A.S. #109-89-7) Diethylamine;

d.4. (C.A.S. #100-37-8) N,N-Diethylaminoethanol;

d.5. (C.A.S. #589-57-1) Diethyl chlorophosphite;

d.6. (C.A.S. #298-06-6) O,O-Diethyl phosphorodithioate;

d.7. (C.A.S. #2465-65-8) O,O-Diethyl phosphorothioate;

d.8. (C.A.S. #108-18-9) Di-isopropylamine;

d.9. (C.A.S. #124-40-3) Dimethylamine;

d.10. (C.A.S. #506-59-2) Dimethylamine hydrochloride;

d.11. (C.A.S. #142-84-7) Dipropylamine

d.12. (C.A.S. #762-77-6) Ethyl chlorofluorophosphate;

d.13. (C.A.S. #1498-51-7) Ethyl dichlorophosphate;

d.14. (C.A.S. #460-52-6) Ethyl difluorophosphate;

d.15. (C.A.S. #7664-39-3) Hydrogen fluoride;

d.16. (C.A.S. #3554-74-3) 3-Hydroxyl-1-methylpiperidine;

d.17. (C.A.S. #76-89-1) Methyl benzilate;

d.18. (C.A.S. #754-01-8) Methyl chlorofluorophosphate;

d.19. (C.A.S. #677-24-7) Methyl dichlorophosphate;

d.20. (C.A.S. #22382-13-4) Methyl difluorophosphate;

d.21. (C.A.S. #14277-06-6) N,N Diethylacetamidine;

d.22. (C.A.S. #53510-30-8) N,N-Diethylbutanamidine;

d.23. (C.A.S. #90324-67-7) N,N-Diethylformamidine;

d.24. (C.A.S. #1342789-47-2) N,N Diethylisobutanamidine;

d.25. (C.A.S. #84764-73-8) N,N-Diethylpropanamidine;

d.26. (C.A.S. #1315467-17-4) N,N-Diisopropylbutanamidine;

d.27. (C.A.S. #857522-08-8) N,N-Diisopropylformamidine;

d.28. (C.A.S. #2909-14-0) N,N-Dimethylacetamidine;

d.29. (C.A.S. #1340437-35-5) N,N-Dimethylbutanamidine;

d.30. (C.A.S. #44205-42-7) N,N-Dimethylformamidine;

d.31. (C.A.S. #321881-25-8) N,N-Dimethylisobutanamidine;

d.32. (C.A.S. #56776-14-8) N,N-Dimethylpropanamidine;

d.33. (C.A.S. #1339586-99-0) N,N-Dipropylacetamidine;

d.34. C.A.S. #1342422-35-8) N,N-Dipropylbutanamidine;

d.35. (C.A.S. #48044-20-8) N,N-Dipropylformamidine;

d.36. (C.A.S. #1342700-45-1) N,N-Dipropylisobutanamidine;

d.37. (C.A.S. #1341496-89-6) N,N-Dipropylpropanamidine;

d.38. (C.A.S. #1314-80-3) Phosphorus pentasulfide;

d.39. (C.A.S. #75-97-8) Pinacolone;

d.40. (C.A.S. #7789-29-9) Potassium bifluoride;

d.41. (C.A.S. #151-50-8) Potassium cyanide;

d.42. (C.A.S. #7789-23-3) Potassium fluoride;

d.43. (C.A.S. #3731-38-2) 3-Quinuclidone;

d.44. (C.A.S. #1333-83-1) Sodium bifluoride;

d.45. (C.A.S. #143-33-9) Sodium cyanide;

d.46. (C.A.S. #7681-49-4) Sodium fluoride;

d.47. (C.A.S. #16893-85-9) Sodium hexafluorosilicate;

d.48. (C.A.S. #1313-82-2) Sodium sulfide;

d.49. (C.A.S. #637-39-8) Triethanolamine hydrochloride;

d.50. (C.A.S. #116-17-6) Tri-isopropyl phosphite.

1C351 Human and animal pathogens and "toxins," as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: CB, CW, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
CB applies to items controlled by 1C351.d.15 and .16	CB Column 1.
CB applies to entire entry	CB Column 2.

CW applies to 1C351.d.15 and .d.16 and a license is required for CW reasons for all destinations, including Australia, Canada, and the United Kingdom, as follows: CW applies to 1C351.d.15 for ricin in the form of (1) Ricinus communis AgglutininII (RCA_{II}), also known as ricin D or Ricinus Communis LectinIII (RCL_{III}) and (2) Ricinus communis LectinIV (RCL_{IV}), also known as ricin E. CW applies to 1C351.d.16 for saxitoxin identified by C.A.S. #35523-89-8. See § 742.18 of the EAR for licensing information pertaining to chemicals subject to restriction pursuant to the Chemical Weapons Convention (CWC). The Commerce Country Chart is not designed to determine licensing requirements for items controlled for CW reasons.

Control(s)	Country Chart (see Supp. No. 1 to part 738)
AT applies to entire entry	Column 1.

License Requirement Notes 1. All vaccines and 'immunotoxins' are excluded from the scope of this entry. Certain medical products and diagnostic and food testing kits that contain biological toxins controlled under 1C351.d, with the exception of toxins controlled for CW reasons under 1C351.d.15 or .d.16, are excluded from the scope of this entry. Vaccines, 'immunotoxins', certain medical products, and diagnostic and food testing kits excluded from the scope of this entry are controlled under ECCN 1C991.
2. Clostridium perfringens strains, other than the epsilon toxin-producing strains of Clostridium perfringens described in 1C351.c.12, are excluded from the scope of this entry, since they may be used as positive control cultures for food testing and quality control.

3. Unless specified elsewhere in this ECCN 1C351 (e.g., in License Requirement Notes 1-3), this ECCN controls all biological agents and "toxins," regardless of quantity or attenuation, that are identified in the List of Items Controlled for this ECCN, including small quantities or attenuated strains of select biological agents or "toxins" that are excluded from the lists of select biological agents or "toxins" by the Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture (USDA), or

the Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services (HHS), in accordance with their regulations in 9 CFR part 121 and 42 CFR part 73, respectively.

4. Biological agents and pathogens are controlled under this ECCN 1C351 when they are an isolated live culture of a pathogen agent, or a preparation of a toxin agent that has been isolated or extracted from any source or material, including living material that has been deliberately inoculated or contaminated with the agent. Isolated live cultures of a pathogen agent include live cultures in dormant form or in dried preparations, whether the agent is natural, enhanced or modified.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) Certain forms of ricin and saxitoxin in 1C351.d.15 and .d.16 are CWC Schedule 1 chemicals (see § 742.18 of the EAR). The U.S. Government must provide advance notification and annual reports to the OPCW of all exports of Schedule 1 chemicals. See § 745.1 of the EAR for notification procedures. See 22 CFR part 121, Category XIV for CWC Schedule 1 chemicals that are "subject to the ITAR." (2) The Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture, and the Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, maintain controls on the possession, use, and transfer within the United States of certain items controlled by this ECCN (for APHIS, see 7 CFR 331.3(b), 9 CFR 121.3(b), and 9 CFR 121.4(b); for CDC, see 42 CFR 73.3(b) and 42 CFR 73.4(b)). (3) See USML Category XIV for modified biological agents and biologically derived substances that are "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: For the purposes of this entry, 'immunotoxins' are monoclonal antibodies linked to a toxin with the intention of destroying a specific target cell while leaving adjacent cells intact.

Items:

a. Viruses identified on the Australia Group (AG) "List of Human and Animal Pathogens and Toxins for Export Control," as follows:

a.1. African horse sickness virus;

a.2. African swine fever virus;

a.3. Andes virus;

a.4. Avian influenza (AI) viruses identified as having high pathogenicity (HP), as follows:

a.4.a. AI viruses that have an intravenous pathogenicity index (IVPI) in 6-week-old chickens greater than 1.2; *or*

a.4.b. AI viruses that cause at least 75% mortality in 4- to 8-week-old chickens infected intravenously.

> *Note: Avian influenza (AI) viruses of the H5 or H7 subtype that do not have either of the characteristics described in 1C351.a.4 (specifically, 1C351.a.4.a or .a.4.b) should be sequenced to determine whether multiple basic amino acids are present at the cleavage site of the haemagglutinin molecule (HA0). If the amino acid motif is similar to that observed for other HPAI isolates, then the isolate being tested should be considered as HPAI and the virus is controlled under 1C351.a.4.*

a.5. Bluetongue virus;

a.6. Chapare virus;

a.7. Chikungunya virus;

a.8. Choclo virus;

a.9. Classical swine fever virus (Hog cholera virus);

a.10. Crimean-Congo hemorrhagic fever virus;

a.11. Dobrava-Belgrade virus;

a.12. Eastern equine encephalitis virus;

a.13. Ebolavirus (includes all members of the Ebolavirus genus);

a.14. Foot-and-mouth disease virus;

a.15. Goatpox virus;

a.16. Guanarito virus;

a.17. Hantaan virus;

a.18. Hendra virus (Equine morbillivirus);

a.19. Japanese encephalitis virus;

a.20. Junin virus;

a.21. Kyasanur Forest disease virus;

a.22. Laguna Negra virus;

a.23. Lassa virus;

a.24. Louping ill virus;

a.25. Lujo virus;

a.26. Lumpy skin disease virus;

a.27. Lymphocytic choriomeningitis virus;

a.28. Machupo virus;

a.29. Marburgvirus (includes all members of the Marburgvirus genus);

a.30. Middle East respiratory syndrome-related coronavirus (MERS-related coronavirus);

a.31. Monkeypox virus;

a.32. Murray Valley encephalitis virus;

a.33. Newcastle disease virus;

a.34. Nipah virus;

a.35. Omsk hemorrhagic fever virus;

a.36. Oropouche virus;

a.37. Peste-des-petits ruminants virus;

a.38. Porcine Teschovirus;

a.39. Powassan virus;

a.40. Rabies virus and all other members of the Lyssavirus genus;

a.41. Reconstructed 1918 influenza virus;

> *Technical Note: 1C351.a.41 includes reconstructed replication competent forms of the 1918 pandemic influenza virus containing any portion of the coding regions of all eight gene segments.*

a.42. Rift Valley fever virus;

a.43. Rinderpest virus;

a.44. Rocio virus;

a.45. Sabia virus;

a.46. Seoul virus;

a.47. Severe acute respiratory syndrome-related coronavirus (SARS-related coronavirus);

a.48. Sheeppox virus;

a.49. Sin Nombre virus;

a.50. St. Louis encephalitis virus;

a.51. Suid herpesvirus 1 (Pseudorabies virus; Aujeszky's disease);

a.52. Swine vesicular disease virus;

a.53. Tick-borne encephalitis virus (Far Eastern subtype, formerly known as Russian Spring-Summer encephalitis virus—see 1C351.b.3 for Siberian subtype);

a.54. Variola virus;

a.55. Venezuelan equine encephalitis virus;

a.56. Vesicular stomatitis virus;

a.57. Western equine encephalitis virus; *or*

a.58. Yellow fever virus.

b. Viruses identified on the APHIS/CDC “select agents” lists (see Related Controls paragraph #2 for this ECCN), but not identified on the Australia Group (AG) “List of Human and Animal Pathogens and Toxins for Export Control,” as follows:

b.1. [Reserved];

b.2. [Reserved]; *or*

b.3. Tick-borne encephalitis virus (Siberian subtype, formerly West Siberian virus—see 1C351.a.53 for Far Eastern subtype).

c. Bacteria identified on the Australia Group (AG) “List of Human and Animal Pathogens and Toxins for Export Control,” as follows:

c.1. Bacillus anthracis;

c.2. Brucella abortus;

c.3. Brucella melitensis;

c.4. Brucella suis;

c.5. Burkholderia mallei (Pseudomonas mallei);

c.6. Burkholderia pseudomallei (Pseudomonas pseudomallei);

c.7. Chlamydia psittaci (Chlamydophila psittaci);

c.8. Clostriduim argentinense (formerly known as Clostridium botulinum Type G), botulinum neurotoxin producing strains;

c.9. Clostridium baratii, botulinum neurotoxin producing strains;

c.10. Clostridium botulinum;

c.11. Clostridium butyricum, botulinum neurotoxin producing strains;

c.12. Clostridium perfringens, epsilon toxin producing types;

c.13. Coxiella burnetii;

c.14. Francisella tularensis;

c.15. Mycoplasma capricolum subspecies capripneumoniae (“strain F38”);

c.16. Mycoplasma mycoides subspecies mycoides SC (small colony) (a.k.a. contagious bovine pleuropneumonia);

c.17. Rickettsia prowazekii;

c.18. Salmonella enterica subspecies enterica serovar Typhi (Salmonella typhi);

c.19. Shiga toxin producing Escherichia coli (STEC) of serogroups O26, O45, O103, O104, O111, O121, O145, O157, and other shiga toxin producing serogroups;

> *Note: Shiga toxin producing Escherichia coli (STEC) includes, inter alia, enterohaemorrhagic E. coli (EHEC), verotoxin producing E. coli (VTEC) or verocytotoxin producing E. coli (VTEC).*

c.20. Shigella dysenteriae;

c.21. Vibrio cholerae; *or*

c.22. Yersinia pestis.

d. “Toxins” identified on the Australia Group (AG) “List of Human and Animal Pathogens and Toxins for Export Control,” as follows, or their subunits:

d.1. Abrin;

d.2. Aflatoxins;

d.3. Botulinum neurotoxins;

d.4. Brevetoxins;

d.5. Clostridium perfringens alpha, beta 1, beta 2, epsilon and iota toxins;

d.6. Conotoxins;

d.7. Diacetoxyscirpenol;

d.8. Gonyautoxins;

d.9. HT-2 toxin;

d.10. Microcystins (Cyanginosins);

d.11. Modeccin;

d.12. Neosaxitoxin (NEO);

d.13. Nodularins;

d.14. Palytoxin;

d.15. Ricin;

d.16. Saxitoxin;

d.17. Shiga toxins (shiga-like toxins, verotoxins, and verocytotoxins);

d.18. Staphylococcus aureus enterotoxins, hemolysin alpha toxin, and toxic shock syndrome toxin (formerly known as Staphylococcus enterotoxin F);

d.19. T-2 toxin;

d.20. Tetrodotoxin;

d.21. Viscumin (Viscum album lectin 1); *or*

d.22. Volkensin.

e. “Fungi”, as follows:

e.1. Coccidioides immitis; *or*

e.2. Coccidioides posadasii.

1C353 Genetic elements and genetically modified organisms, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: CB, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
CB applies to genetic elements of items controlled by 1C351.d.15 and .16	CB Column 1.
CB applies to entire entry	CB Column 2.
AT applies to entire entry	AT Column 1.

License Requirements Notes:

1. Vaccines that contain genetic elements or genetically modified organisms identified in this ECCN are controlled by ECCN 1C991.

2. Unless specified elsewhere in this ECCN 1C353 (e.g., in License Requirement Note 1), this ECCN controls genetic elements or genetically modified organisms for all biological agents and “toxins,” regardless of quantity or attenuation, that are identified in the List of Items Controlled for this ECCN, including genetic elements or genetically modified organisms for attenuated strains of select biological agents or “toxins” that are excluded from the lists of select biological agents or “toxins” by the Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture, or the Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, in accordance with the APHIS regulations in 7 CFR part 331 and 9 CFR part 121 and the CDC regulations in 42 CFR part 73.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) The Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture, and the Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, maintain controls on the possession, use, and transfer within the United States of certain items controlled by this ECCN, including (but not limited to) certain genetic elements, recombinant nucleic acids, and recombinant organisms associated with the agents or toxins in ECCN 1C351 or 1C354 (for APHIS, see 7 CFR 331.3(c), 9 CFR 121.3(c), and 9 CFR 121.4(c); for CDC, see 42 CFR 73.3(c) and 42 CFR 73.4(c)). (2) See USML Category XIV for modified biological agents and biologically derived substances that are "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definition: N/A

Items:

a. Any genetically modified organism that contains, or any genetic element that codes for, any of the following:

a.1. Any gene, genes, translated product or translated products specific to any virus controlled by 1C351.a or .b or 1C354.c;

a.2. Any gene or genes specific to any bacterium controlled by 1C351.c or 1C354.a, or any fungus controlled by 1C351.e or 1C354.b, and which;

a.2.a. In itself or through its transcribed or translated products represents a significant hazard to human, animal or plant health; *or*

a.2.b. Could endow or enhance pathogenicity; *or*

a.3. Any toxins, or their subunits, controlled by 1C351.d.

b. [Reserved].

Technical Notes: 1. Genetically modified organisms include organisms in which the nucleic acid sequences have been created or altered by deliberate molecular manipulation.
2. "Genetic elements" include, inter alia, chromosomes, genomes, plasmids, transposons, vectors, and inactivated organisms containing recoverable nucleic acid fragments, whether genetically modified or unmodified, or chemically synthesized in whole or in part. For the purposes of this ECCN 1C353, nucleic acids from an inactivated organism, virus, or sample are considered to be 'recoverable' if the inactivation and preparation of the material is intended or known to facilitate isolation, purification, amplification, detection, or identification of nucleic acids.

3. This ECCN does not control nucleic acid sequences of shiga toxin producing Escherichia coli of serogroups O26, O45, O103, O104, O111, O121, O145, O157, and other shiga toxin producing serogroups, other than those genetic elements coding for shiga toxin, or for its subunits.

4. 'Endow or enhance pathogenicity' is defined as when the insertion or integration of the nucleic acid sequence or sequences is/are likely to enable or increase a recipient organism's ability to be used to deliberately cause disease or death. This might include alterations to, inter alia: virulence, transmissibility, stability, route of infection, host range, reproducibility, ability to evade or suppress host immunity, resistance to medical countermeasures, or detectability.

1C354 Plant pathogens, as follows (see List of Items Controlled).

License Requirements

Reason for Control: CB, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
CB applies to entire entry	CB Column 2
AT applies to entire entry	AT Column 1

License Requirements Notes: 1. All vaccines are excluded from the scope of this ECCN. See ECCN 1C991 for vaccines.
2. Unless specified elsewhere in this ECCN 1C354 (e.g., in License Requirement Note 1), this ECCN controls all biological agents, regardless of quantity or attenuation, that are identified in the List of Items Controlled for this ECCN, including small quantities or attenuated strains of select biological agents that are excluded from the list of PPQ select agents and "toxins" by the Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture, in accordance with their regulations in 7 CFR part 331.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) The Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture, maintains controls on the possession, use, and transfer within the United States of certain items controlled by this ECCN (see 7 CFR 331.3(c), 9 CFR 121.3(c), and 9 CFR 121.4(c)). (2) See 22 CFR part 121, Category XIV(b), for modified biological agents and biologically derived substances that are subject to the export licensing jurisdiction of the U.S. Department of State, Directorate of Defense Trade Controls.

Related Definitions: N/A

Items:

a. Bacteria, as follows:

a.1. *Xanthomonas albilineans;*

a.2. *Xanthomonas citri pv. citri (Xanthomonas axonopodis* pv. *citri, Xanthomonas campestris* pv. *citri);*

a.3. *Xanthomonas oryzae* [this species of proteobacteria is identified on the APHIS "select agents" list (see Related Controls paragraph for this ECCN), but only the pathovar *Xanthomonas oryzae* pv. *oryzae* (syn. *Pseudomonas campestris* pv. *oryzae*) is identified on the Australia Group (AG) "List of Plant Pathogens for Export Control"];

a.4. *Clavibacter michiganensis* subsp. *sepedonicus* (*Clavibacter sepedonicus, Clavibacter michiganense* subsp. *sepedonicus, Corynebacterium michiganensis* subsp. *sepedonicum, Corynebacterium sepedonicum*);

a.5. *Ralstonia solanacearum,* race 3, biovar 2;

a.6. *Raythayibactor toxicus* [this bacterium is identified on the APHIS "select agents" list (see the Related Controls paragraph for this ECCN), but is not identified on the Australia Group (AG) "List of Plant Pathogens for Export Control"].

b. Fungi, as follows:

b.1. *Bipolaris oryzae* (*Cochliobolus miyabeanus, Helminthosporium oryzae*);

b.2. *Colletotrichum kahawae* (*Colletotrichum coffeanum* var. *virulans*);

b.3. *Pseudocercospora ulei* (*Microcyclus ulei, Dothidella ulei*);

b.4. *Puccinnia graminis* ssp. *graminis* var. *graminis/Puccinia graminis* ssp. *graminis* var. *stakmanii* (*Puccinia graminis* [syn. *Puccinia graminis* f. sp. *tritici*]);

b.5. *Puccinia striiformis* (syn. *Puccinia glumarum*);

b.6. *Magnaporthe oryzae* (Pyricularia oryzae);

b.7. *Peronosclerospora philippinensis* (*Peronosclerospora sacchari*);

b.8. *Sclerophthora rayssiae* var. *zeae;*

b.9. *Synchytrium endobioticum;*

b.10. *Tilletia indica;*

b.11. *Thecaphora solani;*

b.12. *Phoma glycinicola* (formerly *Pyrenochaeta glycines*) [this fungus is identified on the APHIS "select agents" list (see the Related Controls paragraph for this ECCN), but is not identified on the Australia Group (AG) "List of Plant Pathogens for Export Control"].

c. Viruses, as follows:

c.1. Andean potato latent virus (Potato Andean latent tymovirus);

c.2. Potato spindle tuber viroid.

1C355 Chemical Weapons Convention (CWC) Schedule 2 and 3 chemicals and families of chemicals not controlled by ECCN 1C350 or "subject to the ITAR" (see 22 CFR parts) (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: CW, AT.

Control(s)

CW applies to entire entry. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for CW reasons. A license is required to export or reexport CWC Schedule 2 chemicals and mixtures identified in 1C355.a to States not Party to the CWC (destinations not listed in Supplement No. 2 to part 745 of the EAR). A license is required to export CWC Schedule 3 chemicals and mixtures identified in 1C355.b to States not Party to the CWC, unless an End Use Certificate issued by the government of the importing country is obtained by the exporter, prior to export. A license is required to reexport CWC Schedule 3 chemicals and mixtures identified in 1C355.b from a State not Party to the CWC to any other State not Party to the CWC. (See § 742.18 of the EAR for license requirements and policies for toxic and precursor chemicals controlled for CW reasons.)

AT applies to entire entry. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for AT reasons in 1C350. A license is required, for AT reasons, to export or reexport items controlled by 1C350 to a country in Country Group E:1 of Supplement No. 1 to part 740 of the EAR. (See part 742 of the EAR for additional information on the AT controls that apply to Iran, North Korea, and Syria. See part 746 of the EAR for additional information on sanctions that apply to Iran, North Korea, and Syria.)

License Requirements Notes:

1. MIXTURES:

a. Mixtures containing toxic and precursor chemicals identified in ECCN 1C355, in concentrations that are below the control levels indicated in 1C355.a and .b, are controlled by ECCN 1C995 and are subject to the license requirements specified in that ECCN.

b. Mixtures containing chemicals identified in this entry are not controlled by ECCN 1C355 when the controlled chemical is a normal ingredient in consumer goods packaged for retail sale for personal use or packaged for individual use. Such consumer goods are classified as EAR99.

> *Note to mixtures: Calculation of concentrations of CW-controlled chemicals:*
> *a. Exclusion. No chemical may be added to the mixture (solution) for the sole purpose of circumventing the Export Administration Regulations;*
>
> *b. Percent Weight Calculation. When calculating the percentage, by weight, of ingredients in a chemical mixture, include all ingredients of the mixture, including those that act as solvents.*

2. COMPOUNDS: Compounds created with any chemicals identified in this ECCN 1C355 may be shipped NLR (No License Required), without obtaining an End-Use Certificate, unless those compounds are also identified in this entry or require a license for reasons set forth elsewhere in the EAR.

> *Technical Notes: For purposes of this entry, a "mixture" is defined as a solid, liquid or gaseous product made up of two or more ingredients that do not react together under normal storage conditions.*

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also ECCNs *1C350 1C351, 1C395,* and *1C995.* See §§ 742.18 and 745.2 of the EAR for End-Use Certification requirements.

Related Definitions: N/A

Items:

a. CWC Schedule 2 chemicals and mixtures containing Schedule 2 chemicals:

a.1. Toxic chemicals, as follows, and mixtures containing toxic chemicals:

a.1.a. PFIB: 1,1,3,3,3-Pentafluoro-2-(trifluoromethyl)-1-propene (C.A.S. 382-21-8) and mixtures in which PFIB constitutes more than 1 percent of the weight of the mixture;

a.1.b. [Reserved]

a.2. Precursor chemicals, as follows, and mixtures in which at least one of the following precursor chemicals constitutes more than 10 percent of the weight of the mixture:

a.2.a. Chemicals, except for those listed in Schedule 1, containing a phosphorus atom to which is bonded one methyl, ethyl, or propyl (normal or iso) group but not further carbon atoms.

Note: 1C355.a.2.a does not control Fonofos: O-Ethyl S-phenyl ethylphosphonothiolothionate (C.A.S. 944-22-9).

a.2.b. FAMILY: N,N-Dialkyl (Me, Et, n-Pr or i-Pr) phosphoramidic dihalides;

a.2.c. FAMILY: Dialkyl (Me, Et, n-Pr or i-Pr) N,N-dialkyl (Me, Et, n-Pr, or i-Pr)-phosphoramidates;

a.2.d. FAMILY: N,N-Dialkyl (Me, Et, n-Pr or i-Pr) aminoethyl-2-chlorides and corresponding protonated salts;

a.2.e. FAMILY: N,N-Dialkyl (Me, Et, n-Pr or i-Pr) aminoethane-2-ols and corresponding protonated salts;

Note: 1C355.a.2.e. does not control N,N-Dimethylaminoethanol and corresponding protonated salts (C.A.S. 108-01-0) or N,N-Diethylaminoethanol and corresponding protonated salts (C.A.S. 100-37-8).

a.2.f. FAMILY: N,N-Dialkyl (Me, Et, n-Pr or i-Pr) aminoethane-2-thiols and corresponding protonated salts.

b. CWC Schedule 3 chemicals and mixtures containing Schedule 3 chemicals:

b.1. Toxic chemicals, as follows, and mixtures in which at least one of the following toxic chemicals constitutes 30 percent or more of the weight of the mixture:

b.1.a. Phosgene: Carbonyl dichloride (C.A.S. 75-44-5);

b.1.b. Cyanogen chloride (C.A.S. 506-77-4);

b.1.c. Hydrogen cyanide (C.A.S. 74-90-8);

b.1.d. Chloropicrin: Trichloronitromethane (CAS 76-06-2).

b.2. Precursor chemicals, as follows, and mixtures in which at least one of the following precursor chemicals constitutes 30 percent or more of the weight of the mixture:

b.2.a. [Reserved];

b.2.b. Methyldiethanolamine (C.A.S. 105-59-9).

1C395 Mixtures and Medical, Analytical, Diagnostic, and Food Testing Kits Not Controlled by ECCN 1C350, as follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: CB, CW, AT

Control(s): CB applies to entire entry. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for CB reasons in 1C395. A license is required, for CB reasons, to export or reexport mixtures controlled by 1C395.a and test kits controlled by 1C395.b to States not Party to the CWC (destinations not listed in Supplement No. 2 to part 745 of the EAR).

CW applies to entire entry. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for CW reasons. A license is required for CW reasons, as follows, to States not Party to the CWC (destinations not listed in Supplement No. 2 to part 745 of the EAR): (1) Exports and reexports of mixtures controlled by 1C395.a, (2) exports and reexports of test kits controlled by 1C395.b that contain CWC Schedule 2 chemicals controlled by ECCN 1C350, (3) exports of test kits controlled by 1C395.b that contain CWC Schedule 3 chemicals controlled by ECCN 1C350, except that a license is not required, for CW reasons, to export test kits containing CWC Schedule 3 chemicals if an End-Use Certificate issued by the government of the importing country is obtained by the exporter prior to export, and (4) reexports from States not Party to the CWC of test kits controlled by 1C395.b that contain CWC Schedule 3 chemicals. (See § 742.18 of the EAR for license requirements and policies for toxic and precursor chemicals controlled for CW reasons.)

AT applies to entire entry. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for AT reasons in 1C395. A license is required, for AT reasons, to export or reexport items controlled by 1C395 to a country in Country Group E:1 of Supplement No. 1 to part 740 of the EAR. (See part 742 of the EAR for additional information on the AT controls that apply to Iran, North Korea, Sudan, and Syria. See part 746 of the EAR for additional information on sanctions that apply to Iran, North Korea, and Syria.)

> *License Requirements Notes: 1. 1C395.b does not control mixtures that contain precursor chemicals identified in ECCN 1C350.b or .c in concentrations below the control levels for mixtures indicated in 1C350.b or .c. 1C395.a and 1C995.a.1 and a.2.a control such mixtures, unless they are consumer goods, as described in License Requirements Note 2 of this ECCN.*
> *2. This ECCN does not control mixtures when the controlled chemicals are normal ingredients in consumer goods packaged for retail sale for personal use. Such consumer goods are classified as EAR99.*

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: 1. ECCN 1C350 controls mixtures containing 30 percent or higher concentrations, by weight, of any single CWC Schedule 2 chemical identified in ECCN 1C350.b; ECCN 1C995 controls such mixtures containing concentrations of 10 percent or less. 2. ECCN 1C995 controls “medical, analytical, diagnostic, and food testing kits”

(as defined in the Related Definitions paragraph of this ECCN) that contain precursor chemicals listed in ECCN 1C350.d. ECCN 1C350 controls any such kits in which the amount of any single chemical listed in 1C350.b, .c, or .d exceeds 300 grams by weight.

Related Definitions: For the purpose of this entry, "medical, analytical, diagnostic, and food testing kits" are pre-packaged materials of defined composition that are specifically developed, packaged and marketed for medical, analytical, diagnostic, or public health purposes. Replacement reagents for medical, analytical, diagnostic, and food testing kits described in 1C395.b are controlled by ECCN 1C350 if the reagents contain at least one of the precursor chemicals identified in that ECCN in concentrations equal to or greater than the control levels for mixtures indicated in 1C350.b. or .c.

Items: a. Mixtures containing more than 10 percent, but less than 30 percent, by weight of any single CWC Schedule 2 chemical identified in ECCN 1C350.b (For controls on other mixtures containing these chemicals, see Note 1 in the Related Controls paragraph of this ECCN.).

b. "Medical, analytical, diagnostic, and food testing kits" (as defined in the Related Definitions for this ECCN) that contain CWC Schedule 2 or 3 chemicals controlled by ECCN 1C350.b or .c in an amount *not* exceeding 300 grams per chemical. (For controls on other such test kits containing these and other controlled chemicals, see Note 2 in the Related Controls paragraph of this ECCN.)

1C607 Tear Gases, Riot Control Agents and materials for the detection and decontamination of chemical warfare agents (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to Part 738)
NS applies to entire entry, except 1C607.a.10, .a.11, .a.12, and .a.14	NS Column 1.
RS applies to entire entry	RS Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 1C607.

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCN 1A984 for controls on other riot control agents. (2) See 22 CFR 121.1 (USML), Category XIV(b), for modified biological agents and biologically derived substances that are subject to the ITAR. (3) See 22 CFR 121.1 (USML), Category XIV(g), for ITAR controls on antibodies, recombinant protective antigens, polynucleotides, biopolymers or biocatalysts (including the expression vectors, viruses, plasmids, or cultures of specific cells used to produce them) that are "specially designed" for use with articles controlled under USML Category XIV(f). (4) See ECCN 0A919 for "military commodities" located and produced outside the United States that incorporate more than a *de minimis* amount of US-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. Tear gases and riot control agents including:

a.1. CA (Bromobenzyl cyanide) (CAS 5798-79-8);

a.2. CS (o-Chlorobenzylidenemalononitrile or o-Chlorobenzalmalononitrile) (CAS 2698-41-1);

a.3. CN (Phenylacyl chloride or w-Chloroacetophenone) (CAS 532-27-4);

a.4. CR (Dibenz-(b,f)-1,4-oxazephine) (CAS 257-07-8);

a.5. Adamsite (Diphenylamine chloroarsine or DM) (CAS 578-94-9);

a.6. N-Nonanoylmorpholine, (MPA) (CAS 5299-64-9);

a.7. Dibromodimethyl ether (CAS 4497-29-4);

a.8. Dichlorodimethyl ether (ClCi) (CAS 542-88-1);

a.9. Ethyldibromoarsine (CAS 683-43-2);

a.10. Bromo acetone (CAS 598-31-2);

a.11. Bromo methylethylketone (CAS 816-40-0);

a.12. Iodo acetone (CAS 3019-04-3);

a.13. Phenylcarbylamine chloride (CAS 622-44-6);

a.14. Ethyl iodoacetate (CAS 623-48-3);

Note to 1C607.a: ECCN 1C607.a. does not control the following: formulations containing 1% or less

of CN or CS; individually packaged tear gases or riot control agents for personal self-defense purposes that are controlled by ECCN 1A984; or active constituent chemicals, and combinations thereof, identified and packaged for food production or medical purposes.

b. "Biopolymers," not controlled by USML Category XIV(g) "specially designed" or processed for the detection or identification of chemical warfare agents specified by USML Category XIV(a), and the cultures of specific cells used to produce them.

c. "Biocatalysts," and biological systems therefor, not controlled by USML Category XIV(g) "specially designed" for the decontamination or degradation of chemical warfare agents controlled in USML Category XIV (a), as follows:

c.1. "Biocatalysts" "specially designed" for the decontamination or degradation of chemical warfare agents controlled in USML Category XIV(a) resulting from directed laboratory selection or genetic manipulation of biological systems;

c.2. Biological systems containing the genetic information specific to the production of "biocatalysts" specified by 1C607.c.1, as follows:

c.2.a. "Expression vectors;"

c.2.b. Viruses; *or*

c.2.c. Cultures of cells.

Note to 1C607.b and .c: The cultures of cells and biological systems are exclusive and these sub-items do not apply to cells or biological systems for civil purposes, such as agricultural, pharmaceutical, medical, veterinary, environmental, waste management, or in the food industry.

d. Chemical mixtures not controlled by USML Category XIV(f) "specially designed" for military use for the decontamination of objects contaminated with materials specified by USML Category XIV(a) or (b).

1C608 "Energetic materials" and related commodities (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, MT, AT, UN

Control(s)	Country chart (see Supp. no. 1 to part 738)
NS applies to entire entry	NS Column 1

Control(s)	Country chart (see Supp. no. 1 to part 738)
RS applies to entire entry	RS Column 1
MT applies to 1C608.m	MT Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) of the EAR for UN controls

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1,500

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 1C608.

List of Items Controlled

Related Controls: (1) The EAR does not control devices or charges containing materials controlled by USML subparagraphs V(c)(6), V(h), or V(i). The USML controls devices containing such materials. (2) The USML in Categories III, IV, or V controls devices and charges in this entry if they contain materials controlled by Category V (other than slurries) and such materials can be easily extracted without destroying the device or charge. (3) See also explosives and other items enumerated in ECCNs 1A006, 1A007, 1A008, 1C011, 1C111, 1C239, and 1C992. (4) See ECCN 0A919 for foreign-made “military commodities” that incorporate more than a *de minimis* amount of US-origin “600 series” controlled content.

Related Definitions: (1) For purposes of this entry, the term 'controlled materials' means controlled energetic materials enumerated in ECCNs 1C011, 1C111, 1C239, 1C608, or USML Category V. (2) For the purposes of this entry, the term 'propellants' means substances or mixtures that react chemically to produce large volumes of hot gases at controlled rates to perform mechanical work.

Items: a. 'Single base', 'double base', and 'triple base' 'propellants' having nitrocellulose with nitrogen content greater than 12.6% in the form of either:

a.1. 'Sheetstock' or 'carpet rolls'; *or*

a.2. Grains with diameter greater than 0.10 inches.

> *Note: This entry does not control 'propellant' grains used in shotgun shells, small arms cartridges, or rifle cartridges.*

Technical Notes: 1. 'Sheetstock' is 'propellant' that has been manufactured in the form of a sheet suitable for further processing.
2. A 'carpet roll' is 'propellant' that has been manufactured as a sheet, often cut to a desired width, and subsequently rolled up (like a carpet).

3. 'Single base' is 'propellant' which consists mostly of nitrocellulose.

4. 'Double base' 'propellant' consist mostly of nitrocellulose and nitroglycerine.

5. 'Triple base' consists mostly of nitrocellulose, nitroglycerine, and nitroguanidine. Such 'propellants' contain other materials, such as resins or stabilizers, that could include carbon, salts, burn rate modifiers, nitrodiphenylamine, wax, polyethylene glycol (PEG), polyglycol adipate (PGA).

b. Shock tubes containing greater than 0.064 kg per meter (300 grains per foot), but not more than 0.1 kg per meter (470 grains per foot) of 'controlled materials.'

c. Cartridge power devices containing greater than 0.70 kg, but not more than 1.0 kg of 'controlled materials.'

d. Detonators (electric or nonelectric) and “specially designed” assemblies therefor containing greater than 0.01 kg, but not more than 0.1 kg of 'controlled materials'.

e. Igniters not controlled by USML Categories III or IV that contain greater than 0.01 kg, but not more than 0.1 kg of 'controlled materials'.

f. Oil well cartridges containing greater than 0.015 kg, but not more than 0.1 kg of 'controlled materials'.

g. Commercial cast or pressed boosters containing greater than 1.0 kg, but not more than 5.0 kg of 'controlled materials'.

h. Commercial prefabricated slurries and emulsions containing greater than 10 kg and less than or equal to thirty-five percent by weight of USML 'controlled materials'.

i. [Reserved]

j. “Pyrotechnic” devices “specially designed” for commercial purposes (*e.g.,* theatrical stages, motion picture special effects, and fireworks displays), and containing greater than 3.0 kg, but not more than 5.0 kg of 'controlled materials'.

k. Other commercial explosive devices or charges “specially designed” for commercial applications, not controlled by 1C608.c through .g above, containing greater than 1.0 kg, but not more than 5.0 kg of 'controlled materials'.

l. Propyleneimine (2 methylaziridine) (C.A.S. #75-55-8).

m. Any oxidizer or 'mixture' thereof that is a compound composed of fluorine and any of the following: other halogens, oxygen, or nitrogen.

Note 1 to 1C608.m: Nitrogen trifluoride (NF3) (CAS 7783-54-2) in a gaseous state is controlled under ECCN 1C992 and not under ECCN 1C608.m.

Note 2 to 1C608.m: Chlorine trifluoride (ClF3) (CAS 7790-91-2) is controlled under ECCN 1C111.a.3.f and not under ECCN 1C608.m.

Note 3 to 1C608.m: Oxygen difluoride (OF2) is controlled under USML Category V.d.10 (see 22 CFR 121.1) and not under ECCN 1C608.m.

Note to 1C608.l and m: If a chemical in ECCN 1C608.l or .m is incorporated into a commercial charge or device described in ECCN 1C608.c through .k or in ECCN 1C992, the classification of the commercial charge or device applies to the item.

Technical Note to 1C608.m: 'Mixture' refers to a composition of two or more substances with at least one substance being enumerated in 1C011, 1C111, 1C239, 1C608, USML Category V, or elsewhere on the USML.

n. Any explosives, 'propellants', oxidizers, “pyrotechnics”, fuels, binders, or additives that are “specially designed” for military application and not enumerated or otherwise described in USML Category V or elsewhere on the USML.

Note 1: 1C608.n does not apply to the following “aircraft” fuels: JP-4, JP-5, and JP-8.

Note 2: “Aircraft” fuels specified by 1C608.n, Note 1 are finished products, not their constituents.

1C980 Inorganic chemicals listed in Supplement No. 1 to part 754 of the EAR that were produced or derived from the Naval Petroleum Reserves (NPR) or became available for export as a result of an exchange of any NPR produced or derived commodities.

LICENSE REQUIREMENTS

Reason for Control: SS

Control(s): SS applies to entire entry. For licensing requirements (and possible License Exceptions) proceed directly to part 754 of the EAR. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for SS reasons

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1C982 Other petroleum products listed in Supplement No. 1 to part 754 of the EAR that were produced or derived from the Naval Petroleum Reserves (NPR) or became available for export as a result of an exchange of any NPR produced or derived commodities.

LICENSE REQUIREMENTS

Reason for Control: SS

Control(s): SS applies to entire entry. For licensing requirements (and possible License Exceptions) proceed directly to part 754 of the EAR. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for SS reasons

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1C983 Natural gas liquids and other natural gas derivatives listed in Supplement No. 1 to part 754 of the EAR that were produced or derived from the Naval Petroleum Reserves (NPR) or became available for export as a result of an exchange of any NPR produced or derived commodities.

LICENSE REQUIREMENTS

Reason for Control: SS

Control(s): SS applies to entire entry. For licensing requirements (and possible License Exceptions) proceed directly to part 754 of the EAR. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for SS reasons.

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1C984 Manufactured gas and synthetic natural gas (except when commingled with natural gas and thus subject to export authorization from the Department of Energy) listed in Supplement No. 1 to part 754 of the EAR that were produced or derived from the Naval Petroleum Reserves (NPR) or became available for export as a result of an exchange of any NPR produced or derived commodities.

LICENSE REQUIREMENTS

Reason for Control: SS

Control(s): SS applies to entire entry. For licensing requirements (and possible License Exceptions) proceed directly to part 754 of the EAR. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for SS reasons

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1C988 Unprocessed western red cedar (thuja plicata) logs and timber, and rough, dressed and worked lumber containing wane, as described in § 754.4 of the EAR.

LICENSE REQUIREMENTS

Reason for Control: SS

Control(s): SS applies to entire entry. For licensing requirements (and possible License Exceptions) proceed directly to part 754 of the EAR. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for SS reasons

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: For a non-exhaustive list of 10-digit Harmonized System-based Schedule B commodity numbers that may apply to unprocessed Western Red Cedar products subject to § 754.4 and related definitions, see Supplement No. 2 to part 754 of the EAR.

Items: The list of items controlled is contained in the ECCN heading.

1C990 Fibrous and filamentary materials, not controlled by 1C010 or 1C210, for use in "composite" structures and with a specific modulus of 3.18×10^6 m or greater and a specific tensile strength of 7.62×10^4 m or greater.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1C991 Vaccines, immunotoxins, medical products, diagnostic and food testing kits, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: CB, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
CB applies to 1C991.c	CB Column 3.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) Medical products containing ricin or saxitoxin, as follows, are controlled for CW reasons under ECCN 1C351:

(a) Ricinus communis AgglutininII (RCA_{II}), also known as ricin D, or Ricinus Communis LectinIII (RCL_{III});

(b) Ricinus communis LectinIV (RCL_{IV}), also known as ricin E; *or*

(c) Saxitoxin identified by C.A.S. #35523-89-8.

(2) The export of a “medical product” that is an “Investigational New Drug” (IND), as defined in 21 CFR 312.3, is subject to certain U.S. Food and Drug Administration (FDA) requirements that are independent of the export requirements specified in this ECCN or elsewhere in the EAR. These FDA requirements are described in 21 CFR 312.110 and must be satisfied in addition to any requirements specified in the EAR.

(3) Also see 21 CFR 314.410 for FDA requirements concerning exports of new drugs and new drug substances.

Related Definitions: For the purpose of this entry, 'immunotoxins' are monoclonal antibodies linked to a toxin with the intention of destroying a specific target cell while leaving adjacent cells intact. For the purpose of this entry, 'medical products' are: (1) Pharmaceutical formulations designed for testing and human (or veterinary) administration in the treatment of medical conditions; (2) prepackaged for distribution as clinical or medical products; and (3) approved by the U.S. Food and Drug Administration either to be marketed as clinical or medical products or for use as an “Investigational New Drug” (IND) (see 21 CFR part 312). For the purpose of this entry, 'diagnostic and food testing kits' are specifically developed, packaged and marketed for diagnostic or public health purposes. Biological toxins in any other configuration, including bulk shipments, or for any other end-uses are controlled by ECCN 1C351. For the purpose of this entry, 'vaccine' is defined as a medicinal (or veterinary) product in a pharmaceutical formulation, approved by the U.S. Food and Drug Administration or the U.S. Department of Agriculture to be marketed as a medical (or veterinary) product or for use in clinical trials, that is intended to stimulate a protective immunological response in humans or animals in order to prevent disease in those to whom or to which it is administered.

Items:

> *Technical Note: For purposes of the controls described in this ECCN, 'toxins' refers to those toxins, or their subunits, controlled under ECCN 1C351.d.*

a. Vaccines containing, or designed for use against, items controlled by ECCN 1C351, 1C353 or 1C354.

b. Immunotoxins containing toxins controlled by 1C351.d;

c. Medical products that contain any of the following:

c.1. Toxins controlled by ECCN 1C351.d (except for botulinum neurotoxins controlled by ECCN 1C351.d.3, conotoxins controlled by ECCN 1C351.d.6, or items controlled for CW reasons under ECCN 1C351.d.15 or .d.16); *or*

c.2. Genetically modified organisms or genetic elements controlled by ECCN 1C353.a.3 (except for those that contain, or code for, botulinum neurotoxins controlled by ECCN 1C351.d.3 or conotoxins controlled by ECCN 1C351.d.6);

d. Medical products not controlled by 1C991.c that contain any of the following:

d.1. Botulinum neurotoxins controlled by ECCN 1C351.d.3;

d.2. Conotoxins controlled by ECCN 1C351.d.6; *or*

d.3. Genetically modified organisms or genetic elements controlled by ECCN 1C353.a.3 that contain, or code for, botulinum neurotoxins controlled by ECCN 1C351.d.3 or conotoxins controlled by ECCN 1C351.d.6;

e. Diagnostic and food testing kits containing toxins controlled by ECCN 1C351.d (except for items controlled for CW reasons under ECCN 1C351.d.15 or .d.16).

1C992 Commercial charges and devices containing energetic materials, n.e.s. and nitrogen trifluoride in a gaseous state (see List of Items Controlled).

License Requirements

Reason for Control: AT, RS, foreign policy

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.
RS applies to entire entry	A license is required for items controlled by this entry for export or reexport to Iraq and transfer within Iraq for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§ 742.6 and 746.3 of the EAR for additional information.
Russian industry sector sanctions apply to entire entry	See § 746.8 for specific license requirements and license review policy.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) Commercial charges and devices "subject to the EAR," contain energetic materials described on the USML that exceed the quantities noted or that are not covered by this entry are controlled under ECCN 1C608. (2) Nitrogen trifluoride when not in a gaseous state is controlled under ECCN 1C608.

Related Definitions: (1) Items controlled by this entry ECCN 1C992 are those materials not controlled by ECCN 1C608 and not "subject to the ITAR." (2) For purposes of this entry, the term "controlled materials" means controlled energetic materials (see ECCNs 1C011, 1C111, 1C239, and 1C608; see also 22 CFR 121.1, Category V). (3) The individual energetic materials described on the USML, even when compounded with other materials, remain "subject to the ITAR" when not incorporated into explosive devices or charges. (4) Commercial prefabricated slurries and emulsions containing greater than 35% of energetic materials described on the USML are "subject to the ITAR." (5) For purposes of this entry, the mass of aluminum powder, potassium perchlorate, and any of the substances listed in the note to the USML (see 22 CFR 121.12) (such as ammonium pictrate, black powder, etc.) contained in commercial explosive devices and in the charges are omitted when determining the total mass of controlled material.

Items:

a. Shaped charges "specially designed" for oil well operations, utilizing one charge functioning along a single axis, that upon detonation produce a hole, and

a.1. Contain any formulation of controlled materials;

a.2. Have only a uniform shaped conical liner with an included angle of 90 degrees or less;

a.3. Contain more than 0.010 kg but less than or equal to 0.090 kg of controlled materials; and

a.4. Have a diameter not exceeding 4.5 inches;

b. Shaped charges "specially designed" for oil well operations containing less than or equal to 0.010 kg of controlled materials;

c. Detonation cord or shock tubes containing less than or equal to 0.064 kg per meter (300 grains per foot) of controlled materials;

d. Cartridge power devices, that contain less than or equal to 0.70 kg of controlled materials in the deflagration material;

e. Detonators (electric or nonelectric) and assemblies thereof, that contain less than or equal to 0.01 kg of controlled materials;

f. Igniters, that contain less than or equal to 0.01 kg of controlled materials;

g. Oil well cartridges, that contain less than or equal to 0.015 kg of controlled energetic materials;

h. Commercial cast or pressed boosters containing less than or equal to 1.0 kg of controlled materials;

i. Commercial prefabricated slurries and emulsions containing less than or equal to 10.0 kg and less than or equal to thirty-five percent by weight of materials described on the USML;

j. Cutters and severing tools containing less than or equal to 3.5 kg of controlled materials;

k. Pyrotechnic devices when designed exclusively for commercial purposes (*e.g.*, theatrical stages, motion picture special effects, and fireworks displays) and containing less than or equal to 3.0 kg of controlled materials; or

l. Other commercial explosive devices and charges not controlled by 1C992.a through .k containing less than or equal to 1.0 kg of controlled materials.

Note: 1C992.l includes automotive safety devices; extinguishing systems; cartridges for riveting guns; explosive charges for agricultural, oil and gas operations, sporting goods, commercial mining, or public works purposes; and delay tubes used in the assembly of commercial explosive devices.

m. Nitrogen trifluoride (NF_3) in a gaseous state.

1C995 Mixtures not controlled by ECCN 1C350, ECCN 1C355 or ECCN 1C395 that contain chemicals controlled by ECCN 1C350 or ECCN 1C355 and medical, analytical, diagnostic, and food testing kits not controlled by ECCN 1C350 or ECCN 1C395 that contain chemicals controlled by ECCN 1C350.d, as follows (see List of Items controlled).

LICENSE REQUIREMENTS

Reason for Control: AT, RS

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.
RS applies to entire entry.	A license is required for items controlled by this entry for export or reexport to Iraq or transfer within Iraq for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§ 742.6 and 746.3 of the EAR for additional information.

License Requirement Notes: 1. This ECCN does not control mixtures containing less than 0.5% of any single toxic or precursor chemical controlled by ECCN 1C350.b, .c, or .d or ECCN 1C355 as unavoidable by-products or impurities. Such mixtures are classified as EAR99.

2. 1C995.c does not control mixtures that contain precursor chemicals identified in 1C350.d in concentrations below the levels for mixtures indicated in 1C350.d. 1C995.a.2.b controls such mixtures, unless they are consumer goods as described in License Requirements Note 3 of this ECCN.

3. This ECCN does not control mixtures when the controlled chemicals are normal ingredients in consumer goods packaged for retail sale for personal use. Such consumer goods are classified as EAR99.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: 1. ECCN 1C350 controls mixtures containing 30 percent or higher concentrations of any single CWC Schedule 2 chemical identified in ECCN 1C350.b. ECCN 1C395 controls mixtures containing concentrations of more than 10 percent, but less than 30 percent, of any single CWC Schedule 2 chemical identified in ECCN 1C350.b. 2. ECCN 1C350 controls mixtures containing chemicals identified in ECCN 1C350.c or .d that exceed the concentration levels indicated in 1C995.a.2. 3. ECCN 1C355 controls mixtures containing chemicals identified in ECCN 1C355 that exceed the concentration levels indicated in 1C995.b. 4. ECCN 1C395 controls “medical, analytical, diagnostic, and food testing kits” (as defined in the Related Controls paragraph of this ECCN) that contain CWC Schedule 2 or 3 chemicals listed in 1C350.b or .c. ECCN 1C350 controls any such testing kits in which the amount of any single chemical listed in 1C350.b, .c., or .d exceeds 300 grams by weight.

Related Definitions: For the purpose of this entry, “medical, analytical, diagnostic, and food testing kits” are pre-packaged materials of defined composition that are specifically developed, packaged and marketed for medical, analytical, diagnostic, or public health purposes. Replacement reagents for medical, analytical, diagnostic, and food testing kits described in 1C995.c are controlled by ECCN 1C350 if the reagents contain at least one of the precursor chemicals identified in that ECCN in concentrations equal to or greater than the control levels for mixtures indicated in 1C350.d.

Items: a. Mixtures containing the following concentrations of precursor chemicals controlled by ECCN 1C350 (For controls on other mixtures containing these chemicals, see Notes 1 and 2 in the Related Controls paragraph of this ECCN.):

a.1. Mixtures containing 10 percent or less, by weight, of any single CWC Schedule 2 chemical controlled by ECCN 1C350.b;

a.2. Mixtures containing less than 30 percent, by weight, of:

a.2.a. Any single CWC Schedule 3 chemical controlled by ECCN 1C350.c; or

a.2.b. Any single precursor chemical controlled by ECCN 1C350.d.

b. Mixtures containing the following concentrations of toxic or precursor chemicals controlled by ECCN 1C355 (For controls on other mixtures containing these chemicals, see Note 3 in the Related Controls paragraph of this ECCN.):

b.1. Mixtures containing the following concentrations of CWC Schedule 2 chemicals controlled by ECCN 1C355.a:

b.1.a. Mixtures containing 1 percent or less, by weight, of any single CWC Schedule 2 chemical controlled by ECCN 1C355.a.1 (i.e., mixtures containing PFIB); or

b.1.b. Mixtures containing 10 percent or less, by weight, of any single CWC Schedule 2 chemical controlled by 1C355.a.2;

b.2. Mixtures containing less than 30 percent, by weight, of any single CWC Schedule 3 chemical controlled by ECCN 1C355.b.

c. “Medical, analytical, diagnostic, and food testing kits” (as defined in the Related Definitions for this ECCN) that contain precursor chemicals controlled by ECCN 1C350.d in an amount *not* exceeding 300 grams per chemical. (For controls on other such test kits containing these and other controlled chemicals, see Note 4 in the Related Controls paragraph of this ECCN.)

1C996 Hydraulic fluids containing synthetic hydrocarbon oils, not controlled by 1C006, having all the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

*Reason for Control:*AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. A flash point exceeding 477 K (204 °C);

b. A pour point at 239 K (−-34 °C) or less;

c. A viscosity index of 75 or more; *and*

d. A thermal stability at 616 K (343 °C).

1C997 Ammonium Nitrate, Including Fertilizers and Fertilizer Blends Containing More Than 15% by Weight Ammonium Nitrate, Except Liquid Fertilizers (Containing Any Amount of Ammonium Nitrate) or Dry Fertilizers Containing Less Than 15% by Weight Ammonium Nitrate.

LICENSE REQUIREMENTS

Reason for Control: AT, RS

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.
RS applies to entire entry.	A license is required for items controlled by this entry for export or reexport to Iraq or transfer within Iraq for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§ 742.6 and 746.3 of the EAR for additional information.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1C998 Non-fluorinated polymeric substances, not controlled by 1C008, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Polyarylene ether ketones, as follows:

a.1 Polyether ether ketone (PEEK);

a.2. Polyether ketone ketone (PEKK);

a.3. Polyether ketone (PEK);

a.4. Polyether ketone ether ketone ketone (PEKEKK);

b. [Reserved]

1C999 Specific Materials, n.e.s., as Follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT, RS

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT license requirements for this entry. See § 742.19 of the EAR for additional information.

Control(s)	Country Chart (See Supp. No. 1 to part 738)
RS applies to entire entry.	A license is required for items controlled by this entry for export or reexport to Iraq or transfer within Iraq for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§ 742.6 and 746.3 of the EAR for additional information.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See also 1C236.

Related Definitions: N/A

Items: a. Hardened steel and tungsten carbide precision ball bearings (3mm or greater diameter);

b. 304 and 316 stainless steel plate, n.e.s.;

c. Monel plate;

d. Tributyl phosphate;

e. Nitric acid in concentrations of 20 weight percent or greater;

f. Fluorine;

g. Alpha-emitting radionuclides, n.e.s.

D. “Software”

1D001 “Software” “specially designed” or modified for the “development”, “production” or “use” of equipment controlled by 1B001 to 1B003.

License Requirements

Reason for Control: NS, MT, NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to "software" for the "development," "production," operation, or maintenance of items controlled by 1B001 for MT reasons	MT Column 1
NP applies to "software" for the "development", "production" or "use" of items controlled by 1B001 for NP reasons	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: Yes, except N/A for MT

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 1E101 ("use") and 1E102 ("development" and "production") for technology for items controlled by this entry. (2) Also see 1D002, 1D101, 1D201, and 1D999.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1D002 "Software" for the "development" of organic "matrix", metal "matrix" or carbon "matrix" laminates or "composites".

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations

LIST OF ITEMS CONTROLLED

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: Yes

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit "software" for the "development" of organic "matrix", metal "matrix" or carbon "matrix" laminates or "composites" specified in ECCN 1A002 to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

Related Controls: "Software" for items controlled by *1A102* are "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1D003 "Software" "specially designed" or modified to enable equipment to perform the functions of equipment controlled under 1A004.c or 1A004.d.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2.
RS applies to software for equipment controlled by 1A004.d	RS Column 2.
AT applies to entire entry	AT Column 1.

REPORTING REQUIREMENTS See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations

SPECIAL CONDITIONS FOR STA

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1D018 "Software" "specially designed" or modified for the "development," "production," or "use" of items controlled by 1B018.b.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
MT applies to "software" for the "development", "production", operation, or maintenance of items controlled by 1B018 for MT reasons	
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCN 1D608 for "software" for items classified under ECCN 1B608 that, immediately prior to July 1, 2014, were classified under 1B018.a.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1D101 "Software" "specially designed" or modified for the operation or maintenance of commodities controlled by 1B101, 1B102, 1B115, 1B117, 1B118, or 1B119.

LICENSE REQUIREMENTS

Reason for Control: MT, NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.
NP applies to "software" for the "use" of items controlled by 1B101.a	NP Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 1E101 ("use") and 1E102 ("development" and "production") for technology for items controlled by this entry.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1D103 "Software" "specially designed" for reduced observables such as radar reflectivity, ultraviolet/infrared signatures and acoustic signatures, for applications usable in rockets, missiles, or unmanned aerial vehicles capable of delivering at least a 500 kg payload to a "range" equal to or greater than 300 km and their complete subsystems.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) This entry includes "software" "specially designed" for analysis of signature reduction. (2) For software that meets the definition of defense articles under 22 CFR 120.3 of the International Traffic in Arms Regulations (ITAR), which describes similar software that are "subject to the ITAR" (see 22 CFR parts 120 through 130, including USML Category XIII).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1D201 "Software" "specially designed" or modified for the "use" of items controlled by 1B201.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 1E201 ("use") and 1E203 ("development" and "production") for technology for items controlled by this entry.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1D390 "Software" for process control that is specifically configured to control or initiate "production" of chemicals controlled by 1C350.

LICENSE REQUIREMENTS

Reason for Control: CB, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CB applies to entire entry	CB Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: See Section 772.1 of the EAR for the definitions of "software," "program," and "microprogram."

Items: The list of items controlled is contained in the ECCN heading.

1D607 "Software" "specially designed" for the "development," "production," operation, or maintenance of items controlled by 1A607, 1B607 or 1C607 (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to Part 738)
NS applies to entire entry, except "software" for 1C607.a.10, .a.11, .a.12, and .a.14	NS Column 1.
RS applies to entire entry	RS Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 1D607.

LIST OF ITEMS CONTROLLED

Related Controls: (1) "Software" directly related to articles enumerated or otherwise described in USML Category XIV is subject to the ITAR (see 22 CFR § 121.1, Category XIV(m)). "Software" controlled by USML Category XIV(m) includes "software" directly related to any equipment containing reagents, algorithms, coefficients, software, libraries, spectral databases, or alarm set point levels developed under U.S. Department of Defense contract or funding for the detection, identification, warning or monitoring of items controlled in paragraphs (a) or (b) of USML Category XIV, or for chemical or biological agents specified by U.S. Department of Defense funding or contract. (2) See ECCN 0A919 for "military commodities" located and produced outside the United States that incorporate more than a *de minimis* amount of US-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCN 1A607, 1B607, or 1C607.

b. [Reserved]

1D608 "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by 1B608 or 1C608 (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, MT, AT, UN

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
MT applies to "software" "specially designed" for the "use" of 1B608 equipment in the "production" and handling of materials controlled by 1C608.m or MT articles in USML Category V	MT Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 1D608.

LIST OF ITEMS CONTROLLED

Related Controls: (1) Software directly related to articles enumerated or otherwise described in USML Categories III, IV or V is subject to the controls of those USML Categories, respectively. (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" items.

Related Definitions: N/A

Items: a. "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCN 1B608 or 1C608.

b. [Reserved]

1D613 "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by 1A613 or 1B613, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 1D613.y	NS Column 1.
RS applies to entire entry except 1D613.y	RS Column 1.
RS applies to 1D613.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry, except 1D613.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any "software" in 1D613.

LIST OF ITEMS CONTROLLED

Related Controls: (1) "Software" directly related to articles controlled by USML Category X is subject to the control of USML paragraph X(e) of the ITAR. (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a de minimis amount of US-origin "600 series" controlled content.

Related Definitions: N/A

Items:

a. "Software" (other than "software" controlled in paragraph .y of this entry) "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCNs 1A613 (except 1A613.y) or 1B613 (except 1B613.y).

b. to x. [Reserved]

y. Specific "software" "specially designed" for the "production," "development," operation, or maintenance of commodities controlled by ECCN 1A613.y.

1D993 "Software" "specially designed" for the "development," "production" or "use" of materials controlled by 1C210.b, or 1C990.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1D999 Specific Software, n.e.s., as Follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s):

Country Chart. AT applies to entire entry. A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT licensing requirements for this entry. See § 742.19 of the EAR for additional information.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 1B999.

Related Definitions: N/A

Items: a. Software "specially designed" for industrial process control hardware/systems controlled by 1B999, n.e.s.;

b. Software "specially designed" for equipment for the production of structural composites, fibers, prepregs and preforms controlled by 1B999, n.e.s.

E. "Technology"

1E001 "Technology" according to the General Technology Note for the "development" or "production" of items controlled by 1A002, 1A003, 1A004, 1A005, 1A006.b, 1A007, 1A008 1A101, 1A231, 1B (except 1B608, 1B613 or 1B999), or 1C (except 1C355, 1C608, 1C980 to 1C984, 1C988, 1C990, 1C991, 1C995 to 1C999).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, NP, CB, RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to "technology" for items controlled by 1A002, 1A003, 1A005, 1A006.b, 1A007,	NS

Control(s)	Country Chart (see Supp. No. 1 to part 738)
1B001 to 1B003, 1B018, 1C001 to 1C011, or 1C018	Column 1.
NS applies to “technology” for items controlled by 1A004	NS Column 2.
MT applies to “technology” for items controlled by 1A101, 1B001, 1B101, 1B102, 1B115 to 1B119, 1C001, 1C007, 1C011, 1C101, 1C102, 1C107, 1C111, 1C116, 1C117, or 1C118 for MT reasons	MT Column 1.
NP applies to “technology” for items controlled by 1A002, 1A007, 1A231, 1B001, 1B101, 1B201, 1B225, 1B226, 1B228 to 1B234, 1C002, 1C010, 1C111, 1C116, 1C202, 1C210, 1C216, 1C225 to 1C237, or 1C239 to 1C241 for NP reasons	NP Column 1.
CB applies to “technology” for items controlled by 1C351.d.15 and .16 and the 1C353 genetic elements of toxins in ECCN 1C351.d.15 and .16	CB Column 1.
CB applies to “technology” for items controlled by 1C351, 1C353, or 1C354; and CB applies to “technology” for materials controlled by 1C350 and for chemical detection systems and dedicated detectors therefor, in 1A004.c, that also have the technical characteristics described in 2B351.a	CB Column 2.
RS applies to technology for equipment controlled in 1A004.d	RS Column 2.
AT applies to entire entry	AT Column 1.

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except for the following:

(1) Items controlled for MT reasons; or

(2) Exports and reexports to destinations outside of those countries listed in Country Group A:5 (See Supplement No. 1 to part 740 of the EAR) of "technology" for the "development" or production" of the following:

(a) Items controlled by 1C001; or

(b) Items controlled by 1A002.a which are composite structures or laminates having an organic "matrix" and being made from materials listed under 1C010.c or 1C010.d.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit "technology" according to the General Technology Note for the "development" or "production" of equipment and materials specified by ECCNs 1A002, 1C001, 1C007.c, 1C010.c or d or 1C012 to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls (1) Also see ECCNs 1E101, 1E201, and 1E202. (2) See ECCN 1E608 for "technology" for items classified under ECCN 1B608 or 1C608 that, immediately prior to July 1, 2014, were classified under ECCN 1B018.a or 1C018.b through .m (note that ECCN 1E001 controls "development" and "production" "technology" for chlorine trifluoride controlled by ECCN 1C111.a.3.f—see ECCN 1E101 for controls on "use" "technology" for chlorine trifluoride). (3) See ECCN 1E002.g for control libraries (parametric technical databases) "specially designed" or modified to enable equipment to perform the functions of equipment controlled under ECCN 1A004.c (Nuclear, biological and chemical (NBC) detection systems) or ECCN 1A004.d (Equipment for detecting or identifying explosives residues). (4) "Technology" for lithium isotope separation (see related ECCN 1B233) and "technology" for items described in ECCN 1C012 are subject to the export licensing authority of the Department of Energy (see 10 CFR part 810). (5) "Technology" for items described in ECCN 1A102 is "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

1E002 Other "technology" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, NP, AT

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry, except 1E002.g	NS Column 1
NS applies to 1E002.g	NS Column 2
MT applies to 1E002.e	MT Column 1
NP applies to "technology" for items controlled by 1A002 for NP reasons	NP Column 1
AT applies to entire entry	AT Column 1

Reporting Requirements

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except for 1E002.e and .f.

> *License Exceptions Note: License Exception TSU is not applicable for the repair "technology" controlled by 1E002.e or .f, see supplement no. 2 to this part.*

Special Conditions for STA

STA: License Exception STA may not be used to ship or transmit any item in 1E002.e or .f to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

List of Items Controlled

Related Controls: See also 1E001, 1E101,1E102, 1E202, and 1E994 for "technology" related to 1E002.e or .f.

Related Definitions: N/A

Items: a. "Technology" for the "development" or "production" of polybenzothiazoles or polybenzoxazoles;

b. "Technology" for the "development" or "production" of fluoroelastomer compounds containing at least one vinylether monomer;

c. "Technology" for the design or "production" of the following ceramic powders or non-"composite" ceramic materials:

c.1. Ceramic powders having all of the following:

c.1.a. Any of the following compositions:

c.1.a.1. Single or complex oxides of zirconium and complex oxides of silicon or aluminum;

c.1.a.2. Single nitrides of boron (cubic crystalline forms);

c.1.a.3. Single or complex carbides of silicon or boron; or

c.1.a.4. Single or complex nitrides of silicon;

c.1.b. Any of the following total metallic impurities (excluding intentional additions):

c.1.b.1. Less than 1,000 ppm for single oxides or carbides; or

c.1.b.2. Less than 5,000 ppm for complex compounds or single nitrides; and

c.1.c. Being any of the following:

c.1.c.1. Zirconia (CAS 1314-23-4) with an average particle size equal to or less than 1 μm and no more than 10% of the particles larger than 5 μm; *or*

c.1.c.2. Other ceramic powders with an average particle size equal to or less than 5 μm and no more than 10% of the particles larger than 10 μm;

c.2. Non-"composite" ceramic materials composed of the materials described in 1E002.c.1;

> *Note: 1E002.c.2 does not control "technology" for abrasives.*

d. [Reserved]

e. "Technology" for the installation, maintenance or repair of materials controlled by 1C001;

f. "Technology" for the repair of "composite" structures, laminates or materials controlled by 1A002 or 1C007.c;

> *Note: 1E002.f does not control "technology" for the repair of "civil aircraft" structures using carbon "fibrous or filamentary materials" and epoxy resins, contained in "aircraft" manufacturers' manuals.*

g. "Libraries" "specially designed" or modified to enable equipment to perform the functions of equipment controlled under 1A004.c or 1A004.d.

1E101 "Technology", in accordance with the General Technology Note, for the "use" of commodities and "software" controlled by 1A101, 1A102, 1B001, 1B101, 1B102, 1B115 to 1B119, 1C001, 1C007, 1C011, 1C101, 1C107, 1C111, 1C116, 1C117, 1C118, 1D001, 1D101, or 1D103.

LICENSE REQUIREMENTS

Reason for Control: MT, NP, AT

Control(s)	Country chart (See Supp. No. 1 to part 738)
MT applies to "technology" for commodities and software controlled by 1A101, 1A102, 1B001, 1B101, 1B102, 1B115 to 1B119, 1C001, 1C007, 1C011, 1C101, 1C107, 1C111, 1C116, 1C117, 1C118, 1D001, 1D101, or 1D103 for MT reasons	MT Column 1
NP applies to "technology" for items controlled by 1B001, 1B101, 1C111, 1C116, 1D001, or 1D101 for NP reasons	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: "Technology" for items controlled by *1A102* is "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1E102 "Technology" according to the General Technology Note for the "development" of software controlled by 1D001, 1D101 or 1D103.

LICENSE REQUIREMENTS

Reason for Control: MT, NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.
NP applies to "technology" for items controlled by 1D001 and 1D101 for NP reasons	NP Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: This entry includes databases "specially designed" for analysis of signature reduction.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1E103 "Technical data" (including processing conditions) and procedures for the regulation of temperature, pressure or atmosphere in autoclaves or hydroclaves, when used for the "production" of "composites" or partially processed "composites", usable for equipment or materials specified in 1C007, 1C102, 1C107, 1C116, 1C117, 1C118, 9A110, and 9C110.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 1E203

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1E104 "Technology" for the "production" of pyrolytically derived materials formed on a mold, mandrel or other substrate from precursor gases which decompose in the 1,573 K (1,300 °C) to 3,173 K (2,900 °C) temperature range at pressures of 130 Pa (1 mm Hg) to 20 kPa (150 mm Hg), including "technology" for the composition of precursor gases, flow-rates and process control schedules and parameters.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1E201 "Technology" according to the General Technology Note for the "use" of items controlled by 1A002, 1A007, 1A202, 1A225 to 1A227, 1A231, 1B201, 1B225, 1B226, 1B228 to 1B232, 1B233.b, 1B234, 1C002.b.3 and b.4, 1C010.a, 1C010.b, 1C010.e.1, 1C202, 1C210, 1C216, 1C225 to 1C237, 1C239 to 1C241 or 1D201.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NP applies to entire entry, for items controlled for NP reasons	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1E202 "Technology" according to the General Technology Note for the "development" or "production" of goods controlled by 1A202 or 1A225 to 1A227.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1E203 "Technology" according to the General Technology Note for the "development" or "production" of "software" controlled by 1D201.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1E350 "Technology" according to the "General Technology Note" for facilities designed or intended to produce chemicals controlled by 1C350.

LICENSE REQUIREMENTS

Reason for Control: CB, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CB applies to entire entry	CB Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1E351 "Technology" according to the "General Technology Note" for the disposal of chemicals or microbiological materials controlled by 1C350, 1C351, 1C353, or 1C354.

LICENSE REQUIREMENTS

Reason for Control: CB, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
CB applies to "technology" for the disposal of items controlled by 1C351.d.15 and .16 and the 1C353 genetic elements of toxins in ECCN 1C351.d.15 and .16	CB Column 1.
CB applies to "technology" for the disposal of items controlled by 1C351, 1C353, or 1C354; and CB applies to "technology" for the disposal of items controlled by 1C350	CB Column 2.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

1E355 Technology for the production of Chemical Weapons Convention (CWC) Schedule 2 and 3 chemicals, as follows (see List of Items Controlled):

LICENSE REQUIREMENTS

Reason for Control: CW, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CW applies to entire entry. A license is required for CW reasons to CWC non-States Parties (destinations not listed in Supplement No. 2 to part 745), except for Israel and Taiwan. See § 742.18 of the EAR. The Commerce Country Chart is not designed to determine licensing requirements for items controlled for CW reasons	
AT applies to the entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Technology for the production of the following CWC Schedule 2 toxic chemicals:

a.1. PFIB: 1,1,3,3,3-Pentafluoro-2-(trifluoromethyl)-1-propene (382-21-8);

a.2. [Reserved]

b. Technology for the production of the following CWC Schedule 3 toxic chemicals:

b.1. Phosgene: Carbonyl dichloride (75-44-5);

b.2. Cyanogen chloride (506-77-4);

b.3. Hydrogen cyanide (74-90-8).

1E607 "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of items controlled by ECCN 1A607, 1B607, 1C607, or 1D607 (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to Part 738)
NS applies to entire entry, except "technology" for 1C607.a.10, .a.11, .a.12, and .a.14 and for 1D607 "software" therefor	NS Column 1.
RS applies to entire entry	RS Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 1E607.

List of Items Controlled

Related Controls: Technical data directly related to defense articles enumerated or otherwise described in USML Category XIV are subject to the ITAR (see 22 CFR § 121.1, Category XIV(m)). Technical data controlled by USML Category XIV(m) include technical data directly related to any equipment containing reagents, algorithms, coefficients, software, libraries, spectral databases, or alarm set point levels developed under U.S. Department of Defense contract or funding for the detection, identification, warning or monitoring of items controlled in paragraphs (a) or (b) of USML Category XIV, or for chemical or biological agents specified by U.S. Department of Defense funding or contract.

Related Definitions: N/A

Items: a. "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of items controlled by ECCN 1A607, 1B607, 1C607 or 1D607.

Note to 1E607.a: ECCN 1E607.a includes "technology" "required" exclusively for the incorporation of "biocatalysts" controlled by ECCN 1C607.c.1 into military carrier substances or military material.

b. [Reserved]

1E608 "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of equipment controlled in 1B608 or materials controlled by 1C608 (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, MT, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
MT applies to "technology" "required" for 1C608.m	MT Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a Description of all License Exceptions)

TSR: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 1E608.

List of Items Controlled

Related Controls: (1) Technical data directly related to articles enumerated or otherwise described in USML Categories III, IV, or V are subject to the controls of those USML Categories, respectively.

(2) "Technology" for chlorine trifluoride is controlled under ECCN 1E001 ("development" and "production") and ECCN 1E101 ("use").

Related Definitions: N/A

Items: a. "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of equipment controlled by ECCN 1B608 or materials controlled by ECCN 1C608.

b. "Technology" "required" for the "development" or "production" of nitrocellulose with nitrogen content over 12.6% and at rates greater than 2000 pounds per hour.

c. "Technology" "required" for the "development" or "production" of nitrate esters (e.g., nitroglycerine) at rates greater than 2000 pounds per hour.

1E613 "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities controlled by 1A613 or 1B613 or "software" controlled by 1D613, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 1E613.y	NS Column 1.
RS applies to entire entry except 1E613.y	RS Column 1.
RS applies to 1E613.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry, except 1E613.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any "technology" in 1E613.

List of Items Controlled

Related Controls: Technical data directly related to articles controlled by USML Category X are subject to the control of USML paragraph X(e) of the ITAR.

Related Definitions: N/A

Items:

a. "Technology" (other than "technology" controlled by paragraph .y of this entry) "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities or "software" controlled by ECCNs 1A613 (except 1A613.y), 1B613 or 1D613 (except 1D613.y).

b. through x. [Reserved]

y. Specific “technology” “required” for the “production,” “development,” operation, installation, maintenance, repair, overhaul, or refurbishing of commodities or software controlled by ECCN 1A613.y or 1D613.y.

1E994 “Technology” for the “development”, “production”, or “use” of fibrous and filamentary materials controlled by 1C990.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

1E998 “Technology” for the “development” or “production” of processing equipment controlled by 1B999, and materials controlled by 1C996, 1C997, 1C998, or 1C999.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

EAR99 Items Subject to the EAR That Are *Not* Elsewhere Specified in This CCL Category *or* in Any Other Category in the CCL Are Designated by the Number EAR99.

Annex to Category 1

List of Explosives (See ECCNs 1A004 and 1A008)

1. ADNBF (aminodinitrobenzofuroxan or 7 amino 4,6 dinitrobenzofurazane 1 oxide) (CAS 97096 78 1);

2. BNCP (cis bis (5 nitrotetrazolato) tetra amine cobalt (III) perchlorate) (CAS 117412 28 9);

3. CL 14 (diamino dinitrobenzofuroxan or 5,7 diamino 4,6 dinitrobenzofurazane 1 oxide) (CAS 117907 74 1);

4. CL 20 (HNIW or Hexanitrohexaazaisowurtzitane) (CAS 135285 90 4); chlathrates of CL 20;

5. CP (2 (5 cyanotetrazolato) penta amine cobalt (III) perchlorate) (CAS 70247 32 4);

6. DADE (1,1 diamino 2,2 dinitroethylene, FOX-7) (CAS 145250-81-3);

7. DATB (diaminotrinitrobenzene) (CAS 1630 08 6);

8. DDFP (1,4 dinitrodifurazanopiperazine);

9. DDPO (2,6 diamino 3,5 dinitropyrazine 1 oxide, PZO) (CAS 194486 77 6);

10. DIPAM (3,3' diamino 2,2',4,4',6,6' hexanitrobiphenyl or dipicramide) (CAS 17215 44 0);

11. DNGU (DINGU or dinitroglycoluril) (CAS 55510 04 8);

12. Furazans as follows:

a. DAAOF (diaminoazoxyfurazan);

b. DAAzF (diaminoazofurazan) (CAS 78644 90 3);

13. HMX and derivatives, as follows:

a. HMX (Cyclotetramethylenetetranitramine, octahydro 1,3,5,7 tetranitro 1,3,5,7 tetrazine, 1,3,5,7 tetranitro 1,3,5,7 tetraza cyclooctane, octogen or octogene) (CAS 2691 41 0);

b. Difluoroaminated analogs of HMX;

c. K 55 (2,4,6,8 tetranitro 2,4,6,8 tetraazabicyclo [3,3,0] octanone 3, tetranitrosemiglycouril or keto bicyclic HMX) (CAS 130256 72 3);

14. HNAD (hexanitroadamantane) (CAS 143850 71 9);

15. HNS (hexanitrostilbene) (CAS 20062 22 0);

16. Imidazoles as follows:

a. BNNII (Octahydro 2,5 bis(nitroimino)imidazo [4,5 d]imidazole);

b. DNI (2,4 dinitroimidazole) (CAS 5213 49 0);

c. FDIA (1 fluoro 2,4 dinitroimidazole);

d. NTDNIA (N (2 nitrotriazolo) 2,4 dinitroimidazole);

e. PTIA (1 picryl 2,4,5 trinitroimidazole);

17. NTNMH (1 (2 nitrotriazolo) 2 dinitromethylene hydrazine);

18. NTO (ONTA or 3 nitro 1,2,4 triazol 5 one) (CAS 932 64 9);

19. Polynitrocubanes with more than four nitro groups;

20. PYX (2,6 Bis(picrylamino) 3,5 dinitropyridine) (CAS 38082 89 2);

21. RDX and derivatives, as follows:

a. RDX (cyclotrimethylenetrinitramine, cyclonite, T4, hexahydro 1,3,5 trinitro 1,3,5 triazine, 1,3,5 trinitro 1,3,5 triaza cyclohexane, hexogen or hexogene) (CAS 121 82 4);

b. Keto RDX (K 6 or 2,4,6 trinitro 2,4,6 triazacyclohexanone) (CAS 115029 35 1);

22. TAGN (triaminoguanidinenitrate) (CAS 4000 16 2);

23. TATB (triaminotrinitrobenzene) (CAS 3058 38 6);

24. TEDDZ (3,3,7,7 tetrabis(difluoroamine) octahydro 1,5 dinitro 1,5 diazocine);

25. Tetrazoles as follows:

a. NTAT (nitrotriazol aminotetrazole);

b. NTNT (1 N (2 nitrotriazolo) 4 nitrotetrazole);

26. Tetryl (trinitrophenylmethylnitramine) (CAS 479 45 8);

27. TNAD (1,4,5,8 tetranitro 1,4,5,8 tetraazadecalin) (CAS 135877 16 6);

28. TNAZ (1,3,3 trinitroazetidine) (CAS 97645 24 4);

29. TNGU (SORGUYL or tetranitroglycoluril) (CAS 55510 03 7);

30. TNP (1,4,5,8 tetranitro pyridazino[4,5 d]pyridazine) (CAS 229176 04 9);

31. Triazines as follows:

a. DNAM (2 oxy 4,6 dinitroamino s triazine) (CAS 19899 80 0);

b. NNHT (2 nitroimino 5 nitro hexahydro 1,3,5 triazine) (CAS 130400 13 4);

32. Triazoles as follows:

a. 5 azido 2 nitrotriazole;

b. ADHTDN (4 amino 3,5 dihydrazino 1,2,4 triazole dinitramide) (CAS 1614 08 0);

c. ADNT (1 amino 3,5 dinitro 1,2,4 triazole);

d. BDNTA ((bis dinitrotriazole)amine);

e. DBT (3,3' dinitro 5,5 bi 1,2,4 triazole) (CAS 30003 46 4);

f. DNBT (dinitrobistriazole) (CAS 70890 46 9);

g. [Reserved]

h. NTDNT (1 N (2 nitrotriazolo) 3,5 dinitrotriazole);

i. PDNT (1 picryl 3,5 dinitrotriazole);

j. TACOT (tetranitrobenzotriazolobenzotriazole) (CAS 25243 36 1);

33. “Explosives” not listed elsewhere in this list having a detonation velocity exceeding 8,700 m/s, at maximum density, or a detonation pressure exceeding 34 GPa (340 kbar);

34. [Reserved]

35. Nitrocellulose (containing more than 12.5% nitrogen) (CAS 9004-70-0);

36. Nitroglycol (CAS 628-96-6);

37. Pentaerythritol tetranitrate (PETN) (CAS 78-11-5);

38. Picryl chloride (CAS 88-88-0);

39. 2,4,6 Trinitrotoluene (TNT) (CAS 118-96-7);

40. Nitroglycerine (NG) (CAS 55-63-0);

41. Triacetone Triperoxide (TATP) (CAS 17088-37-8);

42. Guanidine nitrate (CAS 506-93-4);

43. Nitroguanidine (NQ) (CAS 556 88 7);

44. DNAN (2,4-dinitroanisole) (CAS 119-27-7);

45. TEX (4,10-Dinitro-2,6,8,12-tetraoxa-4,10-diazaisowurtzitane);

46. GUDN (Guanylurea dinitramide) FOX-12 (CAS 217464-38-5);

47. Tetrazines as follows:

a. BTAT (Bis(2,2,2-trinitroethyl)-3,6-diaminotetrazine);

b. LAX-112 (3,6-diamino-1,2,4,5-tetrazine-1,4-dioxide);

48. Energetic ionic materials melting between 343 K (70 °C) and 373 K (100 °C) and with detonation velocity exceeding 6,800 m/s or detonation pressure exceeding 18 GPa (180 kbar);

49. BTNEN (Bis(2,2,2-trinitroethyl)-nitramine) (CAS 19836-28-3);

50. FTDO (5,6-(3',4'-furazano)- 1,2,3,4-tetrazine-1,3-dioxide);

51. EDNA (Ethylenedinitramine) (CAS 505-71-5);

52. TKX-50 (Dihydroxylammonium 5,5'-bistetrazole-1,1'-diolate).

Category 2—Materials Processing

Note: For quiet running bearings, see the U.S. Munitions List.

A. “End Items”, “Equipment”, “Accessories”, “Attachments”, “Parts”, “Components” and “Systems”

2A001 Anti-friction bearings, bearing systems and “components,” as follows, (see List of Items Controlled).

License Requirements

Reason for Control: NS, MT, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
MT applies to radial ball bearings having all tolerances specified in accordance with ISO 492 Tolerance Class 2 (or ANSI/ABMA Std 20 Tolerance Class ABEC-9, or other national equivalents) or better and having all the following characteristics: an inner ring bore diameter between 12 and 50 mm; an outer ring outside diameter between 25 and 100 mm; and a width between 10 and 20 mm.	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3000, N/A for MT

GBS: Yes, for 2A001.a,

N/A for MT

List of Items Controlled

Related Controls: (1) See also 2A991. (2) Quiet running bearings are “subject to the ITAR” (see 22 CFR parts 120 through 130.)

Related Definitions: Annular Bearing Engineers Committee (ABEC).

Items:

> *Note: 2A001.a includes ball bearing and roller elements "specially designed" for the items specified therein.*

a. Ball bearings and solid roller bearings, having all tolerances specified by the manufacturer in accordance with ISO 492 Tolerance Class 2 or Class 4 (or national equivalents), or better, and having both 'rings' and 'rolling elements', made from monel or beryllium;

> *Note: 2A001.a does not control tapered roller bearings.*

> *Technical Notes: For the purposes of 2A001.a:*
> *1. 'Ring'—is an annular part of a radial rolling bearing incorporating one or more raceways (ISO 5593:1997).*
>
> *2. 'Rolling element'—is a ball or roller which rolls between raceways (ISO 5593:1997).*

b. [Reserved]

c. Active magnetic bearing systems using any of the following, and "specially designed" components therefor:

c.1. Materials with flux densities of 2.0 T or greater and yield strengths greater than 414 MPa;

c.2. All-electromagnetic 3D homopolar bias designs for actuators; *or*

c.3. High temperature (450 K (177 °C) and above) position sensors.

2A101 Radial Ball Bearings Having all Tolerances Specified in Accordance With ISO 492 Tolerance Class 2 (or ANSI/ABMA Std 20 Tolerance Class ABEC-9 or Other National Equivalents), or Better and Having all of the Following Characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See ECCN 2A001.

Related Definitions: N/A

Items:

a. An inner ring bore diameter between 12 and 50 mm;

b. An outer ring outside diameter between 25 and 100 mm; *and*

c. A width between 10 and 20 mm.

2A225 Crucibles made of materials resistant to liquid actinide metals (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E201 ("use") for technology for items controlled under this entry.

Related Definitions: N/A

Items: a. Crucibles having both of the following characteristics:

a.1. A volume of between 150 cm^3 (150 ml) and 8,000 cm^3 (8 liters); *and*

a.2. Made of, or coated with, any of the following materials, or combination of the following materials, having an overall impurity level of 2% or less by weight:

a.2.a. Calcium fluoride (CaF_2);

a.2.b. Calcium zirconate (metazirconate) ($CaZrO_3$);

a.2.c. Cerium sulfide (Ce_2S_3);

a.2.d. Erbium oxide (erbia) (Er_2O_3);

a.2.e. Hafnium oxide (hafnia) (HfO_2);

a.2.f. Magnesium oxide (MgO);

a.2.g. Nitrided niobium-titanium-tungsten alloy (approximately 50% Nb, 30% Ti, 20% W);

a.2.h. Yttrium oxide (yttria) (Y_2O_3); *or*

a.2.i. Zirconium oxide (zirconia) (ZrO_2);

b. Crucibles having both of the following characteristics:

b.1. A volume of between 50 cm^3 (50 ml) and 2,000 cm^3 (2 liters); *and*

b.2. Made of or lined with tantalum, having a purity of 99.9% or greater by weight;

c. Crucibles having all of the following characteristics:

c.1. A volume of between 50 cm^3 (50 ml) and 2,000 cm^3 (2 liters);

c.2. Made of or lined with tantalum, having a purity of 98% or greater by weight; *and*

c.3. Coated with tantalum carbide, nitride, boride, or any combination thereof.

2A226 Valves having all of the following characteristics (see List of Items Controlled).

License Requirements

*Reason for Control:*NP, CB, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1.
CB applies to valves that also meet or exceed the technical parameters in 2B350.g	CB Column 2.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCNs 2E001 (“development”), 2E002 (“production”), and 2E201 (“use”) for technology for items controlled under this entry. (2) Also see ECCNs 2A992, 2B350.g and 2B999. (3) Valves “specially designed” or prepared for certain nuclear uses are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: For valves with different inlet and outlet diameters, the “nominal size” in 2A226 refers to the smallest diameter.

Items: a. A “nominal size” of 5 mm or greater;

b. Having a bellows seal; *and*

c. Wholly made of or lined with aluminum, aluminum alloy, nickel, or nickel alloy containing more than 60% nickel by weight.

2A290 Generators and other equipment “specially designed”, prepared, or intended for use with nuclear plants.

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCN 2D290 for software for items controlled under this entry. (2) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E290 ("use") for technology for items controlled under this entry. (3) Also see ECCN 2A291. (4) Certain nuclear equipment "specially designed" or prepared for use in nuclear plants is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: a. Generators, turbine-generator sets, steam turbines, heat exchangers, and heat exchanger type condensers designed or intended for use in a nuclear reactor;

b. Process control systems intended for use with the equipment controlled by 2A290.a.

2A291 Equipment, except items controlled by 2A290, related to nuclear material handling and processing and to nuclear reactors, and "parts," "components" and "accessories" therefor (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCN 2D290 for software for items controlled under this entry. (2) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E290 ("use") for technology for items controlled under this entry. (3) Also see ECCN 2A290. (4) Certain equipment "specially designed" or prepared for use in a nuclear reactor or in nuclear material handling is subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (5) Nuclear radiation detection and measurement devices "specially designed" or modified for military purposes are "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items: a. Process control systems intended for use with nuclear reactors.

b. Simulators "specially designed" for "nuclear reactors".

c. Casks that are "specially designed" for transportation of high-level radioactive material and that weigh more than 1,000 kg.

d. Commodities, "parts," "components" and "accessories" "specially designed" or prepared for use with nuclear plants (*e.g.,* snubbers, airlocks, pumps, reactor fuel charging and discharging equipment, containment equipment such as hydrogen recombiner and penetration seals, and reactor and fuel inspection equipment, including ultrasonic or eddy current test equipment).

e. Radiation detectors and monitors "specially designed" for detecting or measuring "special nuclear material" (as defined in 10 CFR part 110) or for nuclear reactors.

> *Technical Notes: 1. 2A291.e does not control neutron flux detectors and monitors. These are subject to the export licens ing authority of the Nuclear Regulatory Commission, pursuant to 10 CFR part 110. 2. 2A291.e does not control general purpose radiation detection equipment, such as geiger counters and dosimeters. These items are controlled by ECCN 1A999.*

2A983 Explosives or detonator detection equipment, both bulk and trace based, consisting of an automated device, or combination of devices for automated decision making to detect the presence of different types of explosives, explosive residue, or detonators; and "parts" and "components," n.e.s.

LICENSE REQUIREMENTS

*Reason for Control:*RS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
RS applies to entire entry	RS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: Also see 1A004 and 1A995.

Related Definitions: (1) For the purpose of this entry, automated decision making is the ability of the equipment to detect explosives or detonators at the design or operator-selected level of sensitivity and provide an automated alarm when explosives or detonators at or above the sensitivity level are detected. This entry does not control equipment that depends on operator interpretation of indicators such as inorganic/organic color mapping of the items(s) being scanned.

(2) Explosives and detonators include commercial charges and devices controlled by 1C018 and 1C992 and energetic materials controlled by ECCNs 1C011, 1C111, 1C239 and 22 CFR 121.1 Category V.

Items:

> *Note: Explosives or detonation detection equipment in 2A983 includes equipment for screening people, documents, baggage, other personal effects, cargo and/or mail.*

a. Explosives detection equipment for automated decision making to detect and identify bulk explosives utilizing, but not limited to, x-ray (*e.g.,* computed tomography, dual energy, or coherent scattering), nuclear (*e.g.,* thermal neutron analysis, pulse fast neutron analysis, pulse fast neutron transmission spectroscopy, and gamma resonance absorption), or electromagnetic techniques (*e.g.,* quadropole resonance and dielectrometry).

b. [Reserved]

c. Detonator detection equipment for automated decision making to detect and identify initiation devices (*e.g.* detonators, blasting caps) utilizing, but not limited to, x-ray (*e.g.* dual energy or computed tomography) or electromagnetic techniques.

2A984 Concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution of 0.1 milliradian up to and including 1 milliradian at a standoff distance of 100 meters; and "parts" and "components," n.e.s.

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
RS applies to entire entry	RS Column 2.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

*LVS:*N/A

*GBS:*N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) Concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution less than 0.1 milliradian (a lower milliradian number means a more accurate image resolution) at a standoff distance of 100 meters is "subject to the ITAR" under USML Category XII(c). (2) Concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution greater than 1 milliradian (a higher milliradian number means a less accurate image resolution) at a standoff distance of 100 meters is designated as EAR99. (3) See ECCNs 2D984 and 2E984 for related software and technology controls.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

> *Note: Concealed object detection equipment includes but is not limited to equipment for screening people, documents, baggage, other personal effects, cargo and/or mail.*

> *Technical Note: The range of frequencies span what is generally considered as the millimeter-wave, submillimeter-wave and terahertz frequency regions.*

2A991 Bearings and bearing systems not controlled by 2A001 (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) This entry does not control balls with tolerance specified by the manufacturer in accordance with ISO 3290 as grade 5 or worse. (2) Quiet running bearings are “subject to the ITAR” (see 22 CFR parts 120 through 130).

Related Definitions: (1) (a) DN is the product of the bearing bore diameter in mm and the bearing rotational velocity in rpm. (b) Operating temperatures include those temperatures obtained when a gas turbine engine has stopped after operation. (2) Annular Bearing Engineers Committee (ABEC); American National Standards Institute (ANSI); Anti-Friction Bearing Manufacturers Association (AFBMA)

Items: a. Ball bearings or Solid ball bearings, having tolerances specified by the manufacturer in accordance with ABEC 7, ABEC 7P, or ABEC 7T or ISO Standard Class 4 or better (or equivalents) and having any of the following characteristics.

a.1. Manufactured for use at operating temperatures above 573 K (300 °C) either by using special materials or by special heat treatment; *or*

a.2. With lubricating elements or “part” or “component” modifications that, according to the manufacturer's specifications, are “specially designed” to enable the bearings to operate at speeds exceeding 2.3 million DN.

b. Solid tapered roller bearings, having tolerances specified by the manufacturer in accordance with ANSI/AFBMA Class 00 (inch) or Class A (metric) or better (or equivalents) and having either of the following characteristics.

b.1. With lubricating elements or “part” or “component” modifications that, according to the manufacturer's specifications, are “specially designed” to enable the bearings to operate at speeds exceeding 2.3 million DN; or

b.2. Manufactured for use at operating temperatures below 219 K (−54 °C) or above 423 K (150 °C).

c. Gas-lubricated foil bearing manufactured for use at operating temperatures of 561 K (288 °C) or higher and a unit load capacity exceeding 1 MPa.

d. Active magnetic bearing systems.

e. Fabric-lined self-aligning or fabric-lined journal sliding bearings manufactured for use at operating temperatures below 219 K (−54 °C) or above 423 K (150 °C).

2A992 Piping, fittings and valves made of, or lined with stainless, copper-nickel alloy or other alloy steel containing 10% or more nickel and/or chromium.

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country chart (see supp. no. 1 to part 738)
RS applies to entire entry	A license is required for items controlled by this entry for export or reexport to Pakistan or transfer within Pakistan for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See § 742.6(a)(12) of the EAR for additional information.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls:

(1) See ECCN 2D993 for software for items controlled under this entry.

(2) See ECCNs 2E001 (“development”), 2E002 (“production”), and 2E993 (“use”) for technology for items controlled under this entry.

(3) Also see ECCNs 2A226, 2B350 and 2B999. Related Definitions: N/A

Items:

a. Pressure tube, pipe, and fittings of 200 mm (8 in.) or more inside diameter, and suitable for operation at pressures of 3.4 MPa (500 psi) or greater;

b. Pipe valves having all of the following characteristics that are not controlled by ECCN 2B350.g:

b.1. A pipe size connection of 200 mm (8 in.) or more inside diameter; *and*

b.2. Rated at 10.3 MPa (1,500 psi) or more.

2A993 Pumps designed to move molten metals by electromagnetic forces.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country chart (see supp. no. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCN 2D993 for software for items controlled under this entry. (2) See ECCNs 2E001 (“development”), 2E002 (“production”), and 2E993 (“use”) for technology for items controlled under this entry. (3) Pumps for use in liquid-metal-cooled reactors are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2A994 Portable electric generators and “specially designed” “parts” and “components”.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s): AT applies to entire entry. A license is required for items controlled by this entry to Iran and North Korea. The Commerce Country Chart is not designed to determine licensing requirements for this entry. See part 746 of the EAR for additional information on Iran. See § 742.19 of the EAR for additional information on North Korea.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See also 2D994 and 2E994.

Related Definitions: 'Portable electric generators' - The generators that are in 2A994 are portable - 5,000 lbs. or less on wheels or transportable in a $2^{1}/_{2}$ ton truck without a special set up requirement.

Items: The list of items controlled is contained in the ECCN heading.

2A999 Specific Processing Equipment, n.e.s., as Follows (See List of Items Controlled).

License Requirements

Reason for Control: AT

Control(s):

Country Chart. AT applies to entire entry. A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT licensing requirements for this entry. See § 742.19 of the EAR for additional information.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See also 2A226, 2B350.

Related Definitions: N/A

Items: a. Bellows sealed valves;

b. Reserved.

B. "Test", "Inspection" and "Production Equipment"

Technical Notes for 2B001 to 2B009, 2B201, and 2B991 to 2B999: 1. Secondary parallel contouring axes, (e.g., the w-axis on horizontal boring mills or a secondary rotary axis the center line of which is parallel to the primary rotary axis) are not counted in the total number of contouring axes. Rotary axes need not rotate over 360°. A rotary axis can be driven by a linear device (e.g., a screw or a rack-and-pinion).
2. The number of axes which can be coordinated simultaneously for "contouring control" is the number of axes along or around which, during processing of the workpiece, simultaneous and interrelated motions are performed between the workpiece and a tool. This does not include any additional axes along or around which other relative motions within the machine are performed, such as:

2.a. Wheel-dressing systems in grinding machines;

2.b. Parallel rotary axes designed for mounting of separate workpieces;

2.c. Co-linear rotary axes designed for manipulating the same workpiece by holding it in a chuck from different ends.

3. Axis nomenclature shall be in accordance with International Standard ISO 841:2001, Industrial automation systems and integration—Numerical control of machines—Coordinate system and motion nomenclature.

4. A "tilting spindle" is counted as a rotary axis.

5. 'Stated "unidirectional positioning repeatability" ' may be used for each specific machine model as an alternative to individual machine tests, and is determined as follows:

5.a. Select five machines of a model to be evaluated;

5.b. Measure the linear axis repeatability (R↑,R↓) according to ISO 230-2:2014 and evaluate "unidirectional positioning repeatability" for each axis of each of the five machines;

5.c. Determine the arithmetic mean value of the "unidirectional positioning repeatability"-values for each axis of all five machines together. These arithmetic mean values "unidirectional positioning repeatability" (UPR) become the stated value of each axis for the model...) (UPR_x, UPR_y, . . .);

5.d. Since the Category 2 list refers to each linear axis there will be as many 'stated "unidirectional positioning repeatability" ' values as there are linear axes;

5.e. If any axis of a machine model not controlled by 2B001.a. to 2B001.c. has a 'stated "unidirectional positioning repeatability" ' equal to or less than the specified "unidirectional positioning repeatability" of each machine tool model plus 0.7 μm, the builder should be required to reaffirm the accuracy level once every eighteen months.

6. For the purpose of 2B, measurement uncertainty for the "unidirectional positioning repeatability" of machine tools, as defined in the International Standard ISO 230-2:2014, shall not be considered.

7. For the purpose of 2B, the measurement of axes shall be made according to test procedures in 5.3.2. of ISO 230-2:2014. Tests for axes longer than 2 meters shall be made over 2 m segments. Axes longer than 4 m require multiple tests (e.g., two tests for axes longer than 4 m and up to 8 m, three tests for axes longer than 8 m and up to 12 m), each over 2 m segments and distributed in equal intervals over the axis length. Test segments are equally spaced along the full axis length, with any excess length equally divided at the beginning, in between, and at the end of the test segments. The smallest "unidirectional positioning repeatability"-value of all test segments is to be reported.

2B001 Machine tools and any combination thereof, for removing (or cutting) metals, ceramics or "composites", which, according to the manufacturer's technical specifications, can be equipped with electronic devices for "numerical control"; as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, NP, AT

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2.
NP applies to 2B001.a, .b, .c, and .d, EXCEPT: (1) turning machines under 2B001.a with a capacity no greater than 35 mm diameter; (2) bar machines (Swissturn), limited to machining only bar feed through, if maximum bar diameter is equal to or less than 42 mm and there is no capability of mounting chucks. (Machines may have drilling and/or milling capabilities for machining "parts" or "components" with diameters less than 42 mm); or (3) milling machines under 2B001.b with x-axis travel greater than two meters and overall positioning accuracy according to ISO 230/2 (2006) on the x-axis more (worse) than 22.5 µm.	NP Column 1.
AT applies to entire entry	AT Column

Control(s)	Country chart (See Supp. No. 1 to part 738)
	1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCN 2B002 for optical finishing machines. (2) See ECCNs 2D001 and 2D002 for software for items controlled under this entry. (3) See ECCNs 2E001 (“development”), 2E002 (“production”), and 2E201 (“use”) for technology for items controlled under this entry. (4) Also see ECCNs 2B201 and 2B991.

Related Definitions: N/A

Items:

Note 1: 2B001 does not control special purpose machine tools limited to the manufacture of gears. For such machines, see 2B003.

Note 2: 2B001 does not control special purpose machine tools limited to the manufacture of any of the following:
a. Crank shafts or cam shafts;

b. Tools or cutters;

c. Extruder worms;

d. Engraved or faceted jewelry parts; or

e. Dental prostheses.

Note 3: A machine tool having at least two of the three turning, milling or grinding capabilities (e.g., a turning machine with milling capability), must be evaluated against each applicable entry 2B001.a, .b or .c.

Note 4: A machine tool having an additive manufacturing capability in addition to a turning, milling or grinding capability must be evaluated against each applicable entry 2B001.a, .b or .c.

a. Machine tools for turning having two or more axes which can be coordinated simultaneously for “contouring control” having any of the following:

a.1. “Unidirectional positioning repeatability” equal to or less (better) than 0.9 μm along one or more linear axis with a travel length less than 1.0 m; *or*

a.2. “Unidirectional positioning repeatability” equal to or less (better) than 1.1 μm along one or more linear axis with a travel length equal to or greater than 1.0 m;

Note 1: 2B001.a does not control turning machines “specially designed” for producing contact lenses, having all of the following:
a. Machine controller limited to using ophthalmic based “software” for part programming data input; and

b. No vacuum chucking.

Note 2: 2B001.a does not apply to bar machines (Swissturn), limited to machining only bar feed thru, if maximum bar diameter is equal to or less than 42 mm and there is no capability of mounting chucks. Machines may have drilling or milling capabilities for machining parts with diameters less than 42 mm.

b. Machine tools for milling having any of the following:

b.1. Three linear axes plus one rotary axis which can be coordinated simultaneously for “contouring control” having any of the following:

b.1.a. “Unidirectional positioning repeatability” equal to or less (better) than 0.9 μm along one or more linear axis with a travel length less than 1.0 m; *or*

b.1.b. “Unidirectional positioning repeatability” equal to or less (better) than 1.1 μm along one or more linear axis with a travel length equal to or greater than 1.0 m;

b.2. Five or more axes which can be coordinated simultaneously for “contouring control” having any of the following:

b.2.a. “Unidirectional positioning repeatability” equal to or less (better) than 0.9 μm along one or more linear axis with a travel length less than 1.0 m;

b.2.b. “Unidirectional positioning repeatability” equal to or less (better) than 1.4 μm along one or more linear axis with a travel length equal to or greater than 1 m and less than 4 m; *or*

b.2.c. “Unidirectional positioning repeatability” equal to or less (better) than 6.0 μm along one or more linear axis with a travel length equal to or greater than 4 m;

b.3. A “unidirectional positioning repeatability” for jig boring machines, equal to or less (better) than 1.1 μm along one or more linear axis; *or*

b.4. Fly cutting machines having all of the following:

b.4.a. Spindle “run-out” and “camming” less (better) than 0.0004 mm TIR; *and*

b.4.b. Angular deviation of slide movement (yaw, pitch and roll) less (better) than 2 seconds of arc, TIR, over 300 mm of travel;

c. Machine tools for grinding having any of the following:

c.1. Having all of the following:

c.1.a. “Unidirectional positioning repeatability” equal to or less (better) than 1.1 μm along one or more linear axis; *and*

c.1.b. Three or four axes which can be coordinated simultaneously for “contouring control”; *or*

c.2. Five or more axes which can be coordinated simultaneously for “contouring control” having any of the following:

c.2.a. “Unidirectional positioning repeatability” equal to or less (better) than 1.1 μm along one or more linear axis with a travel length less than 1m;

c.2.b. “Unidirectional positioning repeatability” equal to or less (better) than 1.4 μm along one or more linear axis with a travel length equal to or greater than 1 m and less than 4 m; *or*

c.2.c. “Unidirectional positioning repeatability” equal to or less (better) than 6.0 μm along one or more linear axis with a travel length equal to or greater than 4 m.

Notes: 2B001.c does not control grinding machines as follows:
a. Cylindrical external, internal, and external-internal grinding machines, having all of the following:

a.1. Limited to cylindrical grinding; and

a.2. Limited to a maximum workpiece capacity of 150 mm outside diameter or length.

b. Machines designed specifically as jig grinders that do not have a z-axis or a w-axis, with a "unidirectional positioning repeatability" less (better) than 1.1 µm.

c. Surface grinders.

d. Electrical discharge machines (EDM) of the non-wire type which have two or more rotary axes which can be coordinated simultaneously for "contouring control";

e. Machine tools for removing metals, ceramics or "composites", having all of the following:

e.1. Removing material by means of any of the following:

e.1.a. Water or other liquid jets, including those employing abrasive additives;

e.1.b. Electron beam; or

e.1.c. "Laser" beam; and

e.2. At least two rotary axes having all of the following:

e.2.a. Can be coordinated simultaneously for "contouring control"; and

e.2.b. A positioning "accuracy" of less (better) than 0.003°;

f. Deep-hole-drilling machines and turning machines modified for deep-hole-drilling, having a maximum depth-of-bore capability exceeding 5m.

2B002 Numerically controlled optical finishing machine tools equipped for selective material removal to produce non-spherical optical surfaces having all of the following characteristics (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 2B001.

Related Definitions: For the purposes of 2B002, 'MRF' is a material removal process using an abrasive magnetic fluid whose viscosity is controlled by a magnetic field. 'ERF' is a removal process using an abrasive fluid whose viscosity is controlled by an electric field. 'Energetic particle beam finishing' uses Reactive Atom Plasmas (RAP) or ion-beams to selectively remove material. 'Inflatable membrane tool finishing' is a process that uses a pressurized membrane that deforms to contact the workpiece over a small area.'Fluid jet finishing' makes use of a fluid stream for material removal.

Items: a. Finishing the form to less (better) than 1.0 μm;

b. Finishing to a roughness less (better) than 100 nm rms;

c. Four or more axes which can be coordinated simultaneously for "contouring control"; *and*

d. Using any of the following processes:

d.1. 'Magnetorheological finishing (MRF)';

d.2. 'Electrorheological finishing (ERF)';

d.3. 'Energetic particle beam finishing';

d.4. 'Inflatable membrane tool finishing'; *or*

d.5. 'Fluid jet finishing'.

2B003 "Numerically controlled" machine tools, "specially designed" for the shaving, finishing, grinding or honing of hardened (R_c = 40 or more) spur, helical and double-helical gears having all of the following.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $5,000

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also *2B993*

Related Definitions: N/A

Items:

a. A pitch diameter exceeding 1,250 mm;

b. A face width of 15% of pitch diameter or larger; *and*

c. A finished quality of AGMA 14 or better (equivalent to ISO 1328 class 3).

2B004 Hot "isostatic presses" having all of the characteristics described in the List of Items Controlled, and "specially designed" "components" and "accessories" therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, MT NP, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
MT applies to entire entry	MT Column 1
NP applies to entire entry, except 2B004.b.3 and presses with maximum working pressures below 69 MPa	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCN 2D001 for software for items controlled under this entry. (2) See ECCNs 2E001 (“development”), 2E002 (“production”), and 2E101 (“use”) for technology for items controlled under this entry. (3) For “specially designed” dies, molds and tooling, see ECCNs 0B501, 0B602, 0B606, 1B003, 9B004, and 9B009. (4) For additional controls on dies, molds and tooling, see ECCNs 1B101.d, 2B104 and 2B204. (5) Also see ECCNs 2B117 and 2B999.a.

Related Definitions: N/A

Items:

a. A controlled thermal environment within the closed cavity and possessing a chamber cavity with an inside diameter of 406 mm or more; *and*

b. Having any of the following:

b.1. A maximum working pressure exceeding 207 MPa;

b.2. A controlled thermal environment exceeding 1,773 K (1,500 °C); *or*

b.3. A facility for hydrocarbon impregnation and removal of resultant gaseous degradation products.

> *Technical Note: For the purposes of 2B004, the inside chamber dimension is that of the chamber in which both the working temperature and the working pressure are achieved and does not include*

fixtures. That dimension will be the smaller of either the inside diameter of the pressure chamber or the inside diameter of the insulated furnace chamber, depending on which of the two chambers is located inside the other.

2B005 Equipment "specially designed" for the deposition, processing and in-process control of inorganic overlays, coatings and surface modifications, as follows, for substrates specified in column 2, by processes shown in column 1 in the "Materials Processing Table; Deposition Techniques" following 2E003.f (see List of Items Controlled), and "specially designed" automated handling, positioning, manipulation and control "components" therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1000

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) This entry does not control chemical vapor deposition, cathodic arc, sputter deposition, ion plating or ion implantation equipment, "specially designed" for cutting or machining tools. (2) Vapor deposition equipment for the production of filamentary materials are controlled by 1B001 or 1B101. (3) Chemical Vapor Deposition furnaces designed or modified for densification of carbon-carbon composites are controlled by *2B105.* (4) *See also 2B999.i.*

Related Definitions: N/A

Items: a. Chemical vapor deposition (CVD)"production equipment"having all of the following:

a.1. A process modified for one of the following:

a.1.a. Pulsating CVD;

a.1.b. Controlled nucleation thermal deposition (CNTD); or

a.1.c. Plasma enhanced or plasma assisted CVD; and

a.2. Having any of the following:

a.2.a. Incorporating high vacuum (equal to or less than 0.01 Pa) rotating seals; or

a.2.b. Incorporating in situ coating thickness control;

b. Ion implantation “production equipment” having beam currents of 5 mA or more;

c. Electron beam physical vapor deposition (EB-PVD) “production equipment” incorporating power systems rated for over 80 kW and having any of the following:

c.1. A liquid pool level “laser” control system which regulates precisely the ingots feed rate; *or*

c.2. A computer controlled rate monitor operating on the principle of photo-luminescence of the ionized atoms in the evaporant stream to control the deposition rate of a coating containing two or more elements;

d. Plasma spraying “production equipment” having any of the following:

d.1. Operating at reduced pressure controlled atmosphere (equal or less than 10 kPa measured above and within 300 mm of the gun nozzle exit) in a vacuum chamber capable of evacuation down to 0.01 Pa prior to the spraying process; *or*

d.2. Incorporating in situ coating thickness control;

e. Sputter deposition “production equipment” capable of current densities of 0.1 mA/mm^2 or higher at a deposition rate 15 μm/h or more;

f. Cathodic arc deposition “production equipment” incorporating a grid of electromagnets for steering control of the arc spot on the cathode;

g. Ion plating “production equipment” capable of *in situ* measurement of any of the following:

g.1. Coating thickness on the substrate and rate control; *or*

g.2. Optical characteristics.

2B006 Dimensional inspection or measuring systems, equipment, position feedback units and “electronic assemblies”, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, NP, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
NP applies to those items in 2B006.a, b.1, b.3, and .c (angular displacement measuring instruments) that meet or exceed the technical parameters in 2B206.	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCNs 2D001 and 2D002 for "software" for items controlled under this entry. (2) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E201 ("use") for technology for items controlled under this entry. (3) Also see ECCNs 2B206 and 2B996.

Related Definitions: N/A

Items:

a. Computer controlled or "numerically controlled" Coordinate Measuring Machines (CMM), having a three dimensional length (volumetric) maximum permissible error of length measurement ($E_{0,MPE}$) at any point within the operating range of the machine (*i.e.,* within the length of axes) equal to or less (better) than (1.7 + L/1,000) μm (L is the measured length in mm) according to ISO 10360-2 (2009);

> *Technical Note: For the purposes of 2B006.a, $E_{0,MPE}$ of the most accurate configuration of the CMM specified by the manufacturer (e.g.,best of the following: Probe, stylus length, motion parameters, environment) and with "all compensations available" shall be compared to the 1.7 + L/1,000 μm threshold.*

b. Linear displacement measuring instruments or systems, linear position feedback units, and "electronic assemblies", as follows:

> *Note: Interferometer and optical-encoder measuring systems containing a "laser" are only specified*

by 2B006.b.3.

b.1. 'Non-contact type measuring systems' with a 'resolution' equal to or less (better) than 0.2 μm within 0 to 0.2 mm of the 'measuring range';

Technical Notes: For the purposes of 2B006.b.1:
1. 'Non-contact type measuring systems' are designed to measure the distance between the probe and measured object along a single vector, where the probe or measured object is in motion.

2. 'Measuring range' means the distance between the minimum and maximum working distance.

b.2. Linear position feedback units “specially designed” for machine tools and having an overall “accuracy” less (better) than (800 + (600 × L/1,000)) nm (L equals effective length in mm);

b.3. Measuring systems having all of the following:

b.3.a. Containing a “laser”;

b.3.b. A 'resolution' over their full scale of 0.200 nm or less (better); *and*

b.3.c. Capable of achieving a “measurement uncertainty” equal to or less (better) than (1.6 + L/2,000) nm (L is the measured length in mm) at any point within a measuring range, when compensated for the refractive index of air and measured over a period of 30 seconds at a temperature of 20±0.01 °C;

Technical Note: For the purposes of 2B006.b, 'resolution' is the least increment of a measuring device; on digital instruments, the least significant bit.

b.4. “Electronic assemblies” “specially designed” to provide feedback capability in systems controlled by 2B006.b.3;

c. Rotary position feedback units “specially designed” for machine tools or angular displacement measuring instruments, having an angular position “accuracy” equal to or less (better) than 0.9 second of arc;

Note: 2B006.c does not control optical instruments, such as autocollimators, using collimated light (e.g., “laser” light) to detect angular displacement of a mirror.

d. Equipment for measuring surface roughness (including surface defects), by measuring optical scatter with a sensitivity of 0.5 nm or less (better).

Note: 2B006 includes machine tools, other than those specified by 2B001, that can be used as measuring machines, if they meet or exceed the criteria specified for the measuring machine

function.

2B007 "Robots" having any of the following characteristics described in the List of Items Controlled and "specially designed" controllers and "end-effectors" therefor.

License Requirements

Reason for Control: NS, NP, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
NP applies to equipment that meets or exceeds the criteria in ECCNs 2B207	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $5,000, except 2B007.b and .c

GBS: N/A

List of Items Controlled

Related Controls:

(1) See ECCN 2D001 for "software" for items controlled under this entry. (2) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E201 ("use") for technology for items controlled under this entry. (3) Also see ECCNs 2B207, 2B225 and 2B997.

Related Definitions: N/A

Items: a. [Reserved]

b. "Specially designed" to comply with national safety standards applicable to potentially explosive munitions environments;

Note: 2B007.b does not apply to "robots" "specially designed" for paint-spraying booths.

c. "Specially designed" or rated as radiation-hardened to withstand a total radiation dose greater than 5×10^3 Gy (silicon) without operational degradation; *or*

Technical Note: The term Gy (silicon) refers to the energy in Joules per kilogram absorbed by an unshielded silicon sample when exposed to ionizing radiation.

d. "Specially designed" to operate at altitudes exceeding 30,000 m.

2B008 'Compound rotary tables' and "tilting spindles", "specially designed" for machine tools, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 2B998.

Related Definition: N/A

Items:

a. [Reserved]

b. [Reserved]

c. 'Compound rotary tables' having all of the following:

c.1. Designed for machine tools for turning, milling or grinding; *and*

c.2. Two rotary axes designed to be coordinated simultaneously for "contouring control".

Technical Note: For the purposes of 2B008.c, a 'compound rotary table' is a table allowing the

workpiece to rotate and tilt about two non-parallel axes.

d. “Tilting spindles” having all of the following:

d.1. Designed for machine tools for turning, milling or grinding; *and*

d.2. Designed to be coordinated simultaneously for “contouring control”.

2B009 Spin-forming machines and flow-forming machines, which, according to the manufacturer's technical specifications, can be equipped with “numerical control” units or a computer control and having all of the following characteristics (see List of Items Controlled).

License Requirements

Reason for Control: NS, MT, NP, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
MT applies to: spin-forming machines combining the functions of spin-forming and flow-forming; and flow-forming machines that meet or exceed the parameters of 2B009.a and 2B109	MT Column 1
NP applies to flow-forming machines, and spin-forming machines capable of flow-forming functions, that meet or exceed the parameters of 2B209	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCN 2D001 for “software” for items controlled under this entry. (2) See ECCNs 2E001 (“development”), 2E002 (“production”), and 2E101 (“use”) for technology for items controlled under this entry. (3) Also see ECCNs 2B109 and 2B209 for additional flow-forming machines for MT and NP reasons.

Related Definitions: N/A

Items:

a. Three or more axes which can be coordinated simultaneously for “contouring control”; *and*

b. A roller force more than 60 kN.

> *Technical Note: For the purposes of 2B009, machines combining the function of spin-forming and flow-forming are regarded as flow-forming machines.*

2B018 Equipment on the Wassenaar Arrangement Munitions List.

No commodities currently are controlled by this entry. Commodities formerly controlled by paragraphs .a through .d, .m, and .s of this entry are controlled in ECCN 0B606. Commodities formerly controlled by paragraphs .e through .l of this entry are controlled by ECCN 0B602. Commodities formerly controlled by paragraphs .o through .r of this entry are controlled by ECCN 0B501. Commodities formerly controlled by paragraph .n of this entry are controlled in ECCN 0B501 if they are “specially designed” for the “production” of the items controlled in ECCNs 0A501.a through .x, 0A506, 0A507, or 0A509 or USML Category I and controlled in ECCN 0B602 if they are of the kind exclusively designed for use in the manufacture of items in ECCN 0A602 or USML Category II.

2B104 “Isostatic presses”, other than those controlled by 2B004, having all of the following characteristics (see List of Items Controlled).

License Requirements

Reason for Control: MT, NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.
NP applies to entire entry	NP Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCN 2D101 for “software” for items controlled under this entry. (2) See ECCNs 2E001 (“development”), 2E002 (“production”), and 2E101 (“use”) for technology for items controlled under this entry. (3) Also see ECCNs 2B004, 2B204, and 2B117.

Related Definitions: The inside chamber dimension is that of the chamber in which both the working temperature and the working pressure are achieved and does not include fixtures. That dimension will be the smaller of either the inside diameter of the pressure chamber or the inside diameter of the insulated chamber, depending on which of the two chambers is located inside the other.

Items: a. Maximum working pressure equal to or greater than 69 MPa;

b. Designed to achieve and maintain a controlled thermal environment of 873 K (600 °C) or greater; and

c. Possessing a chamber cavity with an inside diameter of 254 mm or greater.

2B105 Chemical vapor deposition (CVD) furnaces, other than those controlled by 2B005.a, designed or modified for the densification of carbon-carbon composites.

LICENSE REQUIREMENTS

*Reason for Control:*MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCN 2D101 for "software" for items controlled under this entry. (2) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E101 ("use") for technology for items controlled under this entry. (3) Also see ECCNs 2B005, 2B117, 2B226 and 2B227.

Related Definitions: N/A

Items: The list of items controlled in contained in the ECCN heading.

2B109 Flow-forming machines, other than those controlled by 2B009, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, NP, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
NP applies to items controlled by this entry that meet or exceed the technical parameters in 2B209	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCN 2D101 for "software" for items controlled under this entry. (2) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E101 ("use") for technology for items controlled under this entry. (3) Also see ECCNs 2B009 and 2B209.

Related Definitions: N/A

Items: a. Flow-forming machines, usable in the "production" of propulsion components and equipment (e.g., motor cases and interstages) for "missiles", having all of the following:

a.1. Equipped with, or according to the manufacturer's technical specification are capable of being equipped with, "numerical control" units or a computer control, even when not equipped with such units at delivery; *and*

a.2. More than two axes which can be coordinated simultaneously for "contouring control."

b. "Specially designed" "parts" and "components" for flow-forming machines controlled in 2B009 for MT reasons or 2B109.a.

> *Technical Note: 1. Machines combining the function of spin-forming and flow-forming are for the purpose of 2B109 regarded as flow-forming machines.*

2B116 Vibration test systems and equipment, usable for rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km and their subsystems, and "parts" and "components" therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.
NP applies to electrodynamic vibration test systems in 2B116.a and to all items in 2B116.b, .c, and .d	NP Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCN 2D101 for "software" for items controlled under this entry. (2) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E101 ("use") for technology for items controlled under this entry. (3) Also see ECCNs 9B106 and 9B990.

Related Definitions: Vibration test systems incorporating a digital controller are those systems, the functions of which are, partly or entirely, automatically controlled by stored and digitally coded electrical signals.

Items: a. Vibration test systems employing feedback or closed loop techniques and incorporating a digital controller, capable of vibrating a system at an acceleration equal to or greater than 10 g rms between 20 Hz to 2,000 Hz while imparting forces equal to or greater than 50 kN (11,250 lbs.), measured 'bare table';

b. Digital controllers, combined with "specially designed" vibration test "software", with a 'real-time control bandwidth' greater than 5 kHz and designed for use with vibration test systems described in 2B116.a;

c. Vibration thrusters (shaker units), with or without associated amplifiers, capable of imparting a force equal to or greater than 50 kN (11,250 lbs.), measured 'bare table', and usable in vibration test systems described in 2B116.a;

d. Test piece support structures and electronic units designed to combine multiple shaker units into a complete shaker system capable of providing an effective combined force equal to or greater than 50 kN, measured 'bare table', and usable in vibration test systems described in 2B116.a.

Technical Notes: (1) 'Bare table' means a flat table, or surface, with no fixture or fitting.

(2) 'Real-time control bandwidth' is defined as the maximum rate at which a controller can execute complete cycles of sampling, processing data and transmitting control signals.

2B117 Equipment and process controls, other than those controlled by 2B004, 2B005.a, 2B104 or 2B105, designed or modified for the densification and pyrolysis of structural composite rocket nozzles and reentry vehicle nose tips.

LICENSE REQUIREMENTS

Reason for Control:MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCN 2D101 for "software" for items controlled under this entry. (2) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E101 ("use") for technology for items controlled under this entry. (3) *Also see* ECCN s 2B004, 2B005, 2B104, 2B105, and 2B204.

Related Definitions: N/A

Items: The list of items controlled in contained in the ECCN heading.

2B119 Balancing machines and related equipment, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See also 7B101.

Related Definitions: N/A

Items:

a. Balancing machines having all of the following characteristics:

a.1. Not capable of balancing rotors/assemblies having a mass greater than 3 kg;

a.2. Capable of balancing rotors/assemblies at speeds greater than 12,500 rpm;

a.3. Capable of correcting unbalance in two planes or more; and

a.4. Capable of balancing to a residual specific unbalance of 0.2 g mm per kg of rotor mass.

> *Note: 2B119.a. does not control balancing machines designed or modified for dental or other medical equipment.*

b. Indicator heads designed or modified for use with machines specified in 2B119.a.

> *Note: Indicator heads are sometimes known as balancing instrumentation.*

2B120 Motion simulators or rate tables (equipment capable of simulating motion), having all of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) Rate tables not controlled by 2B120 and providing the characteristics of a positioning table are to be evaluated according to 2B121. (2) Equipment that has the characteristics specified in 2B121, which also meets the characteristics of 2B120 will be treated as equipment specified in 2B120. (3) See also 2B008, 2B121, 7B101 and 7B994.

Related Definitions: N/A

Items: a. Two or more axes;

b. Designed or modified to incorporate sliprings or integrated non-contact devices capable of transferring electrical power, signal information, or both; *and*

c. Having any of the following characteristics:

c.1. For any single axis having all of the following:

c.1.a. Capable of rates of rotation of 400 degrees/s or more, or 30 degrees/s or less, *and*

c.1.b. A rate resolution equal to or less than 6 degrees/s and an accuracy equal to or less than 0.6 degrees/s; *or*

c.2. Having a worst-case rate stability equal to or better (less) than plus or minus 0.05% averaged over 10 degrees or more; *or*

c.3. A positioning “accuracy” equal to or better than 5 arc-second.

Note: 2B120 does not control rotary tables designed or modified for machine tools or for medical equipment. For controls on machine tool rotary tables see 2B008.

2B121 Positioning tables (equipment capable of precise rotary position in any axis), other than those controlled in 2B120, having all the following characteristics (See List of Items Controlled).

License Requirements

Reason for Control: MT, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) Equipment that has the characteristics specified in 2B121, which also meets the characteristics of 2B120 will be treated as equipment specified in 2B120. (2) See also 2B008, 2B120, 7B101, and 7B994.

Related Definitions: N/A

Items: a. Two or more axes; *and*

b. A positioning “accuracy” equal to or better than 5 arc-second.

Note: 2B121 does not control rotary tables designed or modified for machine tools or for medical equipment. For controls on machine tool rotary tables see 2B008.

2B122 Centrifuges capable of imparting accelerations greater than 100 g and designed or modified to incorporate sliprings or integrated non-contact devices capable of transferring electrical power, signal information, or both.

License Requirements

Reason for Control: MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 7B101.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2B201 Machine tools, and any combination thereof, other than those controlled by 2B001, for removing or cutting metals, ceramics or "composites," which, according to manufacturer's technical specifications, can be equipped with electronic devices for simultaneous "contouring control" in two or more axes.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 2D002 and 2D202 for "software" for items controlled by this entry. "Numerical control" units are controlled by their associated "software". (2) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E201 ("use") for technology for items controlled under this entry. (3) Also see ECCNs 2B001 and 2B991.

Related Definitions: N/A

Items:

> *Note: 2B201 does not control special purpose machine tools limited to the manufacture of any of the following parts:*
> *a. Gears;*
>
> *b. Crank shafts or cam shafts;*
>
> *c. Tools or cutters;*
>
> *d. Extruder worms;*

> *Technical Note: The identified positioning accuracy values in this entry are based on ISO 230/2 (2006), which equates to the values based on ISO 230/2 (1988) that are used by the Nuclear Supplier's Group (NSG). In 2B201.a and .b.1, this results in a change from 6 μm to 4.5 μm. In paragraph .b of the Note to 2B201.b, the resulting change is from 30 μm to 22.5 μm, In 2B201.c, the resulting change is from 4 μm to 3 μm.*

a. Machine tools for turning, that have positioning accuracies according to ISO 230/2 (2006) with all compensations available better (less) than 4.5 μm along any linear axis (overall positioning) for machines capable of machining diameters greater than 35 mm;

> *Note to 2B201.a: 2B201.a does not control bar machines (Swissturn), limited to machining only bar feed thru, if maximum bar diameter is equal to or less than 42 mm and there is no capability of mounting chucks. Machines may have drilling and/or milling capabilities for machining parts with diameters less than 42 mm.*

b. Machine tools for milling, having any of the following characteristics:

b.1. Positioning accuracies according to ISO 230/2 (2006) with "all compensations available" equal to or less (better) than 4.5 μm along any linear axis (overall positioning);

b.2. Two or more contouring rotary axes; *or*

b.3. Five or more axes which can be coordinated simultaneously for "contouring control."

Note to 2B201.b: 2B201.b does not control milling machines having the following characteristics:
a. X-axis travel greater than 2 m; and

b. Overall positioning accuracy according to ISO 230/2 (2006) on the x-axis more (worse) than 22.5 µm.

c. Machine tools for grinding, having any of the following characteristics:

c.1. Positioning accuracies according to ISO 230/2 (2006) with "all compensations available" equal to or less (better) than 3 µm along any linear axis (overall positioning);

c.2. Two or more contouring rotary axes; or

c.3. Five or more axes which can be coordinated simultaneously for "contouring control."

Note to 2B201.c: 2B201.c does not control the following grinding machines:
a. Cylindrical external, internal, and external-internal grinding machines having all of the following characteristics:

1. Limited to a maximum workpiece capacity of 150 mm outside diameter or length; and

2. Axes limited to x, z and c.

b. Jig grinders that do not have a z-axis or a w-axis with an overall positioning accuracy less (better) than 3 microns. Positioning accuracy is according to ISO 230/2 (2006).

Technical Note: 2B201.b.3 and c.3 include machines based on a parallel linear kinematic design (e.g. hexapods) that have 5 or more axes none of which are rotary axes.

2B204 "Isostatic presses", other than those controlled by 2B004 or 2B104, and related equipment, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCN 2D201 for "software" for items controlled under this entry. (2) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E201 ("use") for technology for items controlled under this entry. (3) *Also see* ECCNs 2B004 and 2B104.

Related Definitions: The inside chamber dimension is that of the chamber in which both the working temperature and working pressure are achieved and does not include fixtures. That dimension will be the smaller of either the inside diameter of the pressure chamber or the inside diameter of the insulated chamber, depending on which of the two chambers is located inside the other.

Items: a. "Isostatic presses" having both of the following characteristics:

a.1. Capable of achieving a maximum working pressure of 69 MPa or greater; *and*

a.2. A chamber cavity with an inside diameter in excess of 152 mm;

b. Dies, molds and controls, "specially designed" for "isostatic presses" controlled by 2B204.a.

2B206 Dimensional inspection machines, instruments or systems, other than those described in 2B006, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCNs *2D002* and *2D201* for "software" for items controlled under this entry. (2) See ECCNs *2E001* ("development"), *2E002* ("production"), and *2E201* ("use") for technology for items controlled under this entry. (3) Also see ECCNs *2B006* and *2B996*.

Related Definitions: N/A

Items:

Control Notes to ECCN 2B206: (1) Machine tools that can be used as measuring machines are controlled by ECCN 2B206 if they meet or exceed the control parameters specified in this entry for the measuring machine function. (2) The machines described in ECCN 2B206 are controlled by this entry if they exceed the specified control threshold anywhere in their operating range.

Technical Note to ECCN 2B206: All parameters of measurement values in this entry represent plus/minus, i.e., not total band.

a. Computer controlled or numerically controlled coordinate measuring machines (CMM) with either of the following characteristics:

a.1. Having only two axes with a maximum permissible error of length measurement along any axis (one dimension), identified as any combination of $E_{0x\ MPE}$, $E_{0y\ MPE}$ or $E_{0z\ MPE}$, equal to or less (better) than (1.25 + L/1,000) µm (where L is the measured length in mm) at any point within the operating range of the machine (*i.e.,* within the length of the axis), according to ISO 10360-2 (2009); *or*

a.2. Having three or more axes with a three dimensional (volumetric) maximum permissible error of length measurement, identified as $E_{0,MPE}$, equal to or less (better) than (1.7 + L/800) µm (where L is the measured length in mm) at any point within the operating range of the machine (*i.e.,* within the length of the axis), according to ISO 10360-2 (2009).

Technical Note to 2B206.a.2: The $E_{0,MPE}$ *of the most accurate configuration of the CMM specified according to ISO 10360-2 (2009) by the manufacturer (e.g., best of the following: Probe, stylus length, motion parameters, environment) and with all compensations available shall be compared to the 1.7 + L/800 µm threshold.*

b. Systems for simultaneous linear-angular inspection of hemishells, having both of the following characteristics:

b.1. “Measurement uncertainty” along any linear axis equal to or less (better) than 3.5 µm per 5 mm; *and*

b.2. “Angular position deviation” equal to or less than 0.02°.

c. Linear displacement measuring systems having both of the following characteristics:

c.1. Containing a “laser;” *and*

c.2. Capable of maintaining, for at least 12 hours over a temperature range of ± 1 K around a standard temperature and a standard pressure, both:

c.2.a. A “resolution” over their full scale of 0.1 µm or better; *and*

c.2.b. A “measurement uncertainty” equal to or better (less) than (0.2 + L/2,000) µm (L is the measured length in millimeters).

Control Note to 2B206.c: 2B206.c does not control measuring interferometer systems, without closed or open loop feedback, containing a “laser” to measure slide movement errors of machine tools, dimensional inspection machines, or similar equipment.

Technical Note to 2B206.c: In 2B206.c, “linear displacement” means the change of distance between the measuring probe and the measured object.

d. Linear Variable Differential Transformer (LVDT) systems having all of the following:

d.1. Having any of the following:

d.1.a. “Linearity” equal to or less (better) than 0.1% measured from 0 to the full operating range, for LVDTs with a full operating range up to and including ±5 mm; *or*

d.1.b. “Linearity” equal to or less (better) than 0.1% measured from 0 to 5 mm for LVDTs with a 'full operating range' greater than ±5 mm; *and*

d.2. Drift equal to or less (better) than 0.1% per day at a standard ambient test room temperature ±1 K.

2B207 "Robots", "end-effectors" and control units, other than those controlled by 2B007, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCN 2D201 for "software" for items controlled under this entry. (2) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E201 ("use") for technology for items controlled under this entry. (3) *Also see* ECCNs 2B007, 2B225, and 2B997.

Related Definitions: N/A

ECCN Controls: This entry does not control "robots" "specially designed" for non-nuclear industrial applications, such as automobile paint-spraying booths.

Items: a. "Robots" or "end-effectors" "specially designed" to comply with national safety standards applicable to handling high explosives (for example, meeting electrical code ratings for high explosives);

b. Control units "specially designed" for any of the "robots" or "end-effectors" controlled by 2B207.a.

2B209 Flow forming machines, spin forming machines capable of flow forming functions, other than those controlled by 2B009 or 2B109, and mandrels, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCN 2D201 for "software" for items controlled under this entry. (2) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E201 ("use") for technology for items controlled under this entry. (3) Also see ECCNs 2B009 and 2B109.

Related Definitions: N/A

Items:

a. Machines having both of the following characteristics:

a.1. Three or more rollers (active or guiding); *and*

a.2. According to the manufacturer's technical specifications, can be equipped with "numerical control" units or a computer control;

> *Note: 2B209.a includes machines that have only a single roller designed to deform metal, plus two auxiliary rollers that support the mandrel, but do not participate directly in the deformation process.*

b. Rotor-forming mandrels designed to form cylindrical rotors of inside diameter between 75 mm and 650 mm.

2B225 Remote manipulators that can be used to provide remote actions in radiochemical separation operations or hot cells, having either of the following characteristics (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E201 ("use") for technology for items controlled under this entry. (2) *Also see* ECCNs 2B007 and 2B207. (3) Remote manipulators "specially designed" or prepared for use in fuel reprocessing or for use in a reactor are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: a. A capability of penetrating 0.6 m or more of hot cell wall (through-the-wall operation); *or*

b. A capability of bridging over the top of a hot cell wall with a thickness of 0.6 m or more (over-the-wall operation).

> *Technical Note: Remote manipulators provide translation of human operator actions to a remote operating arm and terminal fixture. They may be of "master/slave" type or operated by joystick or keypad.*

2B226 Controlled atmosphere (vacuum or inert gas) induction furnaces, and power supplies therefor, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E201 ("use") for technology for items controlled under this entry. (2) Also see ECCN 2B227 and Category 3B.

Related Definitions: N/A

ECCN Controls: 2B226.a does not control furnaces designed for the processing of semiconductor wafers.

Items: a. Furnaces having all of the following characteristics:

a.1. Capable of operation above 1,123 K (850 °C);

a.2. Induction coils 600 mm or less in diameter; *and*

a.3. Designed for power inputs of 5 kW or more;

b. Power supplies, with a specified power output of 5 kW or more, "specially designed" for furnaces controlled by 2B226.a.

2B227 Vacuum or other controlled atmosphere metallurgical melting and casting furnaces and related equipment, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCN 2D201 for "software" for items controlled under this entry. (2) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E201 ("use") for technology for items controlled under this entry. (2) Also see ECCN 2B226.

Related Definitions: N/A

Items: a. Arc remelt and casting furnaces having both of the following characteristics:

a.1. Consumable electrode capabilities between 1,000 cm^3 and 20,000 cm^3; *and*

a.2. Capable of operating with melting temperatures above 1,973 K (1,700 °C);

b. Electron beam melting furnaces and plasma atomization and melting furnaces, having both of the following characteristics:

b.1. A power of 50 kW or greater; *and*

b.2. Capable of operating with melting temperatures above 1,473 K (1,200 °C);

c. Computer control and monitoring systems specially configured for any of the furnaces controlled by 2B227.a or .b.

2B228 Rotor fabrication and assembly equipment, rotor straightening equipment, bellows-forming mandrels and dies, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See ECCNs 2E001 (“development”), 2E002 (“production”), and 2E201 (“use”) for technology for items controlled under this entry.

Related Definitions: N/A

Items:

a. Rotor assembly equipment for assembly of gas centrifuge rotor tube sections, baffles, and end-caps;

Note: 2B228.a includes precision mandrels, clamps, and shrink fit machines.

b. Rotor straightening equipment for alignment of gas centrifuge rotor tube sections to a common axis;

Technical Note: The rotor straightening equipment in 2B228.b normally consists of precision measuring probes linked to a computer that subsequently controls the action of, for example, pneumatic rams used for aligning the rotor tube sections.

c. Bellows-forming mandrels and dies for producing single-convolution bellows.

Technical Note: In 2B228.c, the bellows have all of the following characteristics:
1. Inside diameter between 75 mm and 650 mm;

2. Length equal to or greater than 12.7 mm;

3. Single convolution depth greater than 2 mm; and

4. Made of high-strength aluminum alloys, maraging steel or high strength "fibrous or filamentary materials".

2B229 Centrifugal multiplane balancing machines, fixed or portable, horizontal or vertical, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCN 2D201 for "software" for items controlled under this entry. (2) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E201 ("use") for technology for items controlled under this entry.

Related Definitions: N/A

Items: a. Centrifugal balancing machines designed for balancing flexible rotors having a length of 600 mm or more and having all of the following characteristics:

a.1. Swing or journal diameter greater than 75 mm;

a.2. Mass capability of from 0.9 to 23 kg; *and*

a.3. Capable of balancing speed of revolution greater than 5,000 r.p.m.;

b. Centrifugal balancing machines designed for balancing hollow cylindrical rotor "parts" or "components" and having all of the following characteristics:

b.1. Journal diameter greater than 75 mm;

b.2. Mass capability of from 0.9 to 23 kg;

b.3. A minimum achievable residual specific unbalance equal to or less than 10 g-mm/kg per plane; *and*

b.4. Belt drive type.

2B230 All types of "pressure transducers" capable of measuring absolute pressures and having all of the characteristics described in this ECCN (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E201 ("use") for technology for items controlled under this entry.

Related Definitions: (1) For purposes of this entry, "pressure transducers" are devices that convert pressure measurements into a signal. (2) For purposes of this entry, "accuracy" includes non-linearity, hysteresis and repeatability at ambient temperature.

Items: a. Pressure sensing elements made of or protected by aluminum, aluminum alloy, aluminum oxide (alumina or sapphire), nickel, nickel alloy with more than 60% nickel by weight, or fully fluorinated hydrocarbon polymers;

b. Seals, if any, essential for sealing the pressure sensing element, and in direct contact with the process medium, made of or protected by aluminum, aluminum alloy, aluminum oxide (alumina or sapphire), nickel, nickel alloy with more than 60% nickel by weight, or fully fluorinated hydrocarbon polymers; and

c. Either of the following characteristics:

c.1. A full scale of less 13 kPa and an “accuracy” of better than ±1% of full scale; *or*

c.2. A full scale of 13 kPa or greater and an “accuracy” of better than ±130 Pa when measuring at 13 kPa.

2B231 Vacuum pumps having all of the characteristics described in this ECCN (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 2E001 (“development”), 2E002 (“production”), and 2E201 (“use”) for “technology” for items controlled under this entry. (2) Also see bellows-sealed scroll-type compressors and bellows-sealed scroll-type vacuum pumps controlled under ECCN 2B233. (3) Vacuum pumps “specially designed” or prepared for the separation of uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: (1) The pumping speed is determined at the measurement point with nitrogen gas or air. (2) The ultimate vacuum is determined at the input of the pump with the input of the pump blocked off.

Items: a. Input throat size equal to or greater than 380 mm;

b. Pumping speed equal to or greater than 15 m^3/s; *and*

c. Capable of producing an ultimate vacuum better than 13.3 mPa.

2B232 High-velocity gun systems (propellant, gas, coil, electromagnetic, and electrothermal types, and other advanced systems) capable of accelerating projectiles to 1.5 km/s or greater.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 2E001 (“development”), 2E002 (“production”), and 2E201 (“use”) for technology for items controlled under this entry.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2B233 Bellows-sealed scroll-type compressors and bellows-sealed scroll-type vacuum pumps having all of the characteristics described in this ECCN (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 2E001 (“development”), 2E002 (“production”), and 2E201 (“use”) for “technology” for items controlled under this entry. (2) Also see vacuum pumps controlled under ECCN 2B231. (3) Vacuum pumps “specially designed” or prepared for the separation of uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: a. Capable of an inlet volume flow rate of 50 m^3/h or greater;

b. Capable of a pressure ratio of 2:1 or greater; *and*

c. Having all surfaces that come in contact with the process gas made from any of the following:

c.1. Aluminum or aluminum alloy;

c.2. Aluminum oxide;

c.3. Stainless steel;

c.4. Nickel or nickel alloy;

c.5. Phosphor bronze; *or*

c.6. Fluoropolymers.

Technical Notes: 1. In a scroll compressor or vacuum pump, crescent-shaped pockets of gas are trapped between one or more pairs of intermeshed spiral vanes, or scrolls, one of which moves while the other remains stationary. The moving scroll orbits the stationary scroll; it does not rotate. As the moving scroll orbits the stationary scroll, the gas pockets diminish in size (i.e., they are compressed) as they move toward the outlet port of the machine.
2. In a bellows-sealed scroll compressor or vacuum pump, the process gas is totally isolated from the lubricated parts of the pump and from the external atmosphere by a metal bellows. One end of the bellows is attached to the moving scroll and the other end is attached to the stationary housing of the pump.

3. Fluoropolymers include, but are not limited to, the following materials:

a. Polytetrafluoroethylene (PTFE);

b. Fluorinated Ethylene Propylene (FEP);

c. Perfluoroalkoxy (PFA);

d. Polychlorotrifluoroethylene (PCTFE); and

e. Vinylidene fluoride-hexafluoropropylene copolymer.

2B350 Chemical manufacturing facilities and equipment, except valves controlled by 2A226, as follows (see List of Items Controlled).

License Requirements

Reason for Control: CB, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CB applies to entire entry	CB Column 2
AT applies to entire entry	AT Column 1

License Requirement Note: *This ECCN does not control equipment that is both: (1) "Specially Designed" for use in civil applications e.g., food processing, pulp and paper processing, or water purification) and (2) inappropriate, by the nature of its design, for use in storing, processing, producing or conducting and controlling the flow of the chemical weapons precursors controlled by 1C350.*

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $2,000 for all Country Group B destinations, except those also listed under Country Group D:3 (see Supplement No. 1 to part 740 of the EAR).

GBS: N/A

List of Items Controlled

Related Controls: See also ECCNs 2A226, 2A992, 2A993, 2B231, and 2B999.

Related Definitions: For purposes of this entry the term 'chemical warfare agents' includes those agents "subject to the ITAR" (see 22 CFR parts 120 through 130).

Items: a. Reaction vessels, reactors and prefabricated repair assemblies therefor, as follows:

a.1. Reaction vessels or reactors, with or without agitators, with total internal (geometric) volume greater than 0.1 m^3 (100 liters) and less than 20 m^3 (20,000 liters), where all surfaces that come in direct contact with the chemical(s) being processed or contained are made from any of the following materials:

a.1.a Alloys with more than 25% nickel and 20% chromium by weight;

a.1.b. Nickel or alloys with more than 40% nickel by weight;

a.1.c. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);

a.1.d. Glass (including vitrified or enameled coating or glass lining);

a.1.e. Tantalum or tantalum alloys;

a.1.f. Titanium or titanium alloys;

a.1.g. Zirconium or zirconium alloys; *or*

a.1.h. Niobium (columbium) or niobium alloys;

a.2. Prefabricated repair assemblies, and their specially designed components, that:

a.2.a. Are designed for mechanical attachment to glass-lined reaction vessels or reactors described in 2B350.a.1; *and*

a.2.b. Have metallic surfaces that are made from tantalum or tantalum alloys and come in direct contact with the chemical(s) being processed.

b. Agitators designed for use in reaction vessels or reactors described in 2B350.a.1, and impellers, blades or shafts designed for such agitators, where all surfaces that come in direct contact with the chemical(s) being processed or contained are made from any of the following materials:

b.1. Alloys with more than 25% nickel and 20% chromium by weight;

b.2. Nickel or alloys with more than 40% nickel by weight;

b.3. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);

b.4. Glass (including vitrified or enameled coatings or glass lining);

b.5. Tantalum or tantalum alloys;

b.6. Titanium or titanium alloys;

b.7. Zirconium or zirconium alloys; *or*

b.8. Niobium (columbium) or niobium alloys.

c. Storage tanks, containers, receivers and prefabricated repair assemblies therefor, as follows:

c.1. Storage tanks, containers or receivers with a total internal (geometric) volume greater than 0.1 m^3 (100 liters) where all surfaces that come in direct contact with the chemical(s) being processed or contained are made from any of the following materials:

c.1.a. Alloys with more than 25% nickel and 20% chromium by weight;

c.1.b. Nickel or alloys with more than 40% nickel by weight;

c.1.c. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);

c.1.d. Glass (including vitrified or enameled coatings or glass lining);

c.1.e. Tantalum or tantalum alloys;

c.1.f. Titanium or titanium alloys;

c.1.g. Zirconium or zirconium alloys; *or*

c.1.h. Niobium (columbium) or niobium alloys;

c.2. Prefabricated repair assemblies, and their specially designed components, that:

c.2.a. Are designed for mechanical attachment to glass-lined storage tanks, containers or receivers described in 2B350.c.1; *and*

c.2.b. Have metallic surfaces that are made from tantalum or tantalum alloys and come in direct contact with the chemical(s) being processed.

d. Heat exchangers or condensers with a heat transfer surface area of less than 20 m^2, but greater than 0.15 m^2, and tubes, plates, coils or blocks (cores) designed for such heat exchangers or condensers, where all surfaces that come in direct contact with the chemical(s) being processed are made from any of the following materials:

d.1. Alloys with more than 25% nickel and 20% chromium by weight;

d.2. Nickel or alloys with more than 40% nickel by weight;

d.3. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);

d.4. Glass (including vitrified or enameled coatings or glass lining);

d.5. Tantalum or tantalum alloys;

d.6. Titanium or titanium alloys;

d.7. Zirconium or zirconium alloys;

d.8. Niobium (columbium) or niobium alloys;

d.9. Graphite or carbon-graphite;

d.10. Silicon carbide; *or*

d.11. Titanium carbide.

e. Distillation or absorption columns of internal diameter greater than 0.1 m, and liquid distributors, vapor distributors or liquid collectors designed for such distillation or absorption columns, where all surfaces that come in direct contact with the chemical(s) being processed are made from any of the following materials:

e.1. Alloys with more than 25% nickel and 20% chromium by weight;

e.2. Nickel or alloys with more than 40% nickel by weight;

e.3. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);

e.4. Glass (including vitrified or enameled coatings or glass lining);

e.5. Tantalum or tantalum alloys;

e.6. Titanium or titanium alloys;

e.7. Zirconium or zirconium alloys;

e.8. Niobium (columbium) or niobium alloys; *or*

e.9. Graphite or carbon-graphite.

f. Remotely operated filling equipment in which all surfaces that come in direct contact with the chemical(s) being processed are made from any of the following materials:

f.1. Alloys with more than 25% nickel and 20% chromium by weight; *or*

f.2. Nickel or alloys with more than 40% nickel by weight.

g. Valves, as follows:

g.1. Valves having both of the following characteristics:

g.1.a. A nominal size greater than 1.0 cm ($^{3}/_{8}$ in.); *and*

g.1.b. All surfaces that come in direct contact with the chemical(s) being produced, processed, or contained are made from materials identified in Technical Note 1 to 2B350.g.

g.2. Valves, except for valves controlled by 2B350.g.1, having all of the following characteristics:

g.2.a. A nominal size equal to or greater than 2.54 cm (1 inch) and equal to or less than 10.16 cm (4 inches);

g.2.b. Casings (valve bodies) or preformed casing liners controlled by 2B350.g.3, in which all surfaces that come in direct contact with the chemical(s) being produced, processed, or contained are made from materials identified in Technical Note 1 to 2B350.g; *and*

g.2.c. A closure element designed to be interchangeable.

g.3. Casings (valve bodies) and preformed casing liners having both of the following characteristics:

g.3.a. Designed for valves in 2B350.g.1 or .g.2; *and*

g.3.b. All surfaces that come in direct contact with the chemical(s) being produced, processed, or contained are made from materials identified in Technical Note 1 to 2B350.g.

Technical Note 1 to 2B350.g: All surfaces of the valves controlled by 2B350.g.1, and the casings (valve bodies) and preformed casing liners controlled by 2B350.g.3, that come in direct contact with the chemical(s) being produced, processed, or contained are made from the following materials:
a. Alloys with more than 25% nickel and 20% chromium by weight;

b. Nickel or alloys with more than 40% nickel by weight;

c. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);

d. Glass (including vitrified or enameled coating or glass lining);

e. Tantalum or tantalum alloys;

f. Titanium or titanium alloys;

g. Zirconium or zirconium alloys;

h. Niobium (columbium) or niobium alloys; or

i. Ceramic materials, as follows:

i.1. Silicon carbide with a purity of 80% or more by weight;

i.2. Aluminum oxide (alumina) with a purity of 99.9% or more by weight; or

i.3. Zirconium oxide (zirconia).

Technical Note 2 to 2B350.g: The 'nominal size' is defined as the smaller of the inlet and outlet port diameters.

h. Multi-walled piping incorporating a leak detection port, in which all surfaces that come in direct contact with the chemical(s) being processed or contained are made from any of the following materials:

h.1. Alloys with more than 25% nickel and 20% chromium by weight;

h.2. Nickel or alloys with more than 40% nickel by weight;

h.3. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);

h.4. Glass (including vitrified or enameled coatings or glass lining);

h.5. Tantalum or tantalum alloys;

h.6. Titanium or titanium alloys;

h.7. Zirconium or zirconium alloys;

h.8. Niobium (columbium) or niobium alloys; *or*

h.9. Graphite or carbon-graphite.

i. Multiple-seal and seal-less pumps with manufacturer's specified maximum flow-rate greater than 0.6 m^3/hour (600 liters/hour), or vacuum pumps with manufacturer's specified maximum flow-rate greater than 5 m^3/hour (5,000 liters/hour) (under standard temperature (273 K (0 °C)) and pressure (101.3 kPa) conditions), and casings (pump bodies), preformed casing liners, impellers, rotors or jet pump nozzles designed for such pumps, in which all surfaces that come into direct contact with the chemical(s) being processed are made from any of the following materials:

i.1. Alloys with more than 25% nickel and 20% chromium by weight;

i.2. Nickel or alloys with more than 40% nickel by weight;

i.3. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);

i.4. Glass (including vitrified or enameled coatings or glass lining);

i.5. Tantalum or tantalum alloys;

i.6. Titanium or titanium alloys;

i.7. Zirconium or zirconium alloys;

i.8. Niobium (columbium) or niobium alloys.

i.9. Graphite or carbon-graphite;

i.10. Ceramics; *or*

i.11. Ferrosilicon (high silicon iron alloys).

Technical Note to 2B350.i: The seals referred to in 2B350.i come into direct contact with the chemical(s) being processed (or are designed to do so), and provide a sealing function where a rotary or reciprocating drive shaft passes through a pump body.

j. Incinerators designed to destroy chemical warfare agents, chemical weapons precursors controlled by 1C350, or chemical munitions having "specially designed" waste supply systems, special handling facilities and an average combustion chamber temperature greater than 1000 °C in which all surfaces in the waste supply system that come into direct contact with the waste products are made from or lined with any of the following materials:

j.1. Alloys with more than 25% nickel and 20% chromium by weight;

j.2. Nickel or alloys with more than 40% nickel by weight; *or*

j.3. Ceramics.

Technical Note 1: Carbon-graphite is a composition consisting primarily of graphite and amorphous carbon, in which the graphite is 8 percent or more by weight of the composition.

Technical Note 2: For the items listed in 2B350, the term 'alloy,' when not accompanied by a specific elemental concentration, is understood as identifying those alloys where the identified metal is present in a higher percentage by weight than any other element.

Technical Note 3: The materials used for gaskets, packing, seals, screws or washers, or other materials performing a sealing function, do not determine the control status of the items in this ECCN, provided that such components are designed to be interchangeable.

Note: See Categories V and XIV of the United States Munitions List for all chemicals that are "subject to the ITAR" (see 22 CFR parts 120 through 130).

2B351 Toxic gas monitors and monitoring systems, and their dedicated detecting "parts" and "components" (*i.e.,* DETECTORS, SENSOR DEVICES, AND REPLACEABLE SENSOR CARTRIDGES), AS FOLLOWS, EXCEPT THOSE SYSTEMS AND DETECTORS CONTROLLED BY ECCN 1A004.C (SEE LIST OF ITEMS CONTROLLED).

LICENSE REQUIREMENTS

Reason for Control: CB, AT

Control(s)	Country Chart *(see Supp. No. 1 to part 738)*
CB applies to entire entry	CB Column 2.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See ECCN 2D351 for “software” for toxic gas monitors and monitoring systems, and their dedicated detecting “parts” and “components,” controlled by this ECCN. Also see ECCN 1A004, which controls chemical detection systems and “specially designed” “parts” and “components” therefor that are “specially designed” or modified for detection or identification of chemical warfare agents, but not “specially designed” for military use, and ECCN 1A995, which controls certain detection equipment, “parts” and “components” not controlled by ECCN 1A004 or by this ECCN.

Related Definitions: (1) For the purposes of this entry, the term “dedicated” means committed entirely to a single purpose or device. (2) For the purposes of this entry, the term “continuous operation” describes the capability of the equipment to operate on line without human intervention. The intent of this entry is to control toxic gas monitors and monitoring systems capable of collection and detection of samples in environments such as chemical plants, rather than those used for batch-mode operation in laboratories.

Items:

a. Designed for continuous operation and usable for the detection of chemical warfare agents or precursor chemicals controlled by 1C350 'minimum detection limit' of 0.3 mg/m^3; *or*

b. Designed for the detection of cholinesterase-inhibiting activity.

> *Technical note: The 'minimum detection limit' of toxic gas monitors or monitoring systems is the lowest detectable concentration of the analyte required to produce a signal greater than three times the standard deviation of the toxic gas monitor's or monitoring system's signal when measuring a blank sample.*

In the case of toxic gas monitors or monitoring systems having a deadband or programmed zero suppression, the 'minimum detection limit' is the lowest detectable concentration required to produce a reading.

2B352 Equipment Capable of Use in Handling Biological Materials, as Follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: CB, AT

Control(s)	Country Chart *(see Supp. No. 1 to part 738)*
CB applies to entire entry	CB Column 2.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 1A004 and 1A995 for protective equipment that is not covered by this entry. Also see ECCN 9A120 for controls on certain “UAV” systems designed or modified to dispense an aerosol and capable of carrying elements of a payload in the form of a particulate or liquid, other than fuel “parts” or “components” of such vehicles, of a volume greater than 20 liters.

Related Definitions: (1) “Lighter than air vehicles”—balloons and airships that rely on hot air or on lighter-than-air gases, such as helium or hydrogen, for their lift. (2) “UAVs”—Unmanned Aerial Vehicles. (3) “VMD”—Volume Median Diameter.

Items:

a. Containment facilities and related equipment, as follows:

a.1. Complete containment facilities at P3 or P4 containment level.

Technical Note to 2B352.a.1: P3 or P4 (BL3, BL4, L3, L4) containment levels are as specified in the

WHO Laboratory Biosafety Manual (3rd edition, Geneva, 2004).

a.2. Equipment designed for fixed installation in containment facilities specified in paragraph a.1 of this ECCN, as follows:

a.2.a. Double-door pass-through decontamination autoclaves;

a.2.b. Breathing air suit decontamination showers;

a.2.c. Mechanical-seal or inflatable-seal walkthrough doors.

b. Fermenters and components as follows:

b.1. Fermenters capable of cultivation of micro-organisms or of live cells for the production of viruses or toxins, without the propagation of aerosols, having a total internal volume of 20 liters or greater.

b.2. Components designed for such fermenters, as follows:

b.2.a. Cultivation chambers designed to be sterilized or disinfected in situ;

b.2.b. Cultivation chamber holding devices; *or*

b.2.c. Process control units capable of simultaneously monitoring and controlling two or more fermentation system parameters (*e.g.,* temperature, pH, nutrients, agitation, dissolved oxygen, air flow, foam control).

Technical Notes to 2B352.b: 1. Fermenters include bioreactors (including single-use (disposable) bioreactors), chemostats and continuous-flow systems.
2. Cultivation chamber holding devices controlled by 2B352.b.2.b include single-use cultivation chambers with rigid walls.

c. Centrifugal separators capable of continuous separation, without the propagation of aerosols, having a flow rate greater than 100 liters per hour, as follows:

c.1. Centrifugal separators having all of the following characteristics:

c.1.a. One or more sealing joints within the steam containment area;

c.1.b. Components of polished stainless steel or titanium; *and*

c.1.c. Capable of in-situ steam sterilization in a closed state.

c.2. Single-use centrifugal separators, in which all components that come in direct contact with the substances being processed are disposable or single-use.

Technical Note to 2B352.c: Centrifugal separators and single-use centrifugal separators include decanters.

d. Cross (tangential) flow filtration equipment and "accessories", as follows:

d.1. Cross (tangential) flow filtration equipment capable of separation of microorganisms, viruses, toxins or cell cultures having all of the following characteristics:

d.1.a. A total filtration area equal to or greater than 1 square meter (1 m^2); *and*

d.1.b. Having any of the following characteristics:

d.1.b.1. Capable of being sterilized or disinfected in-situ; *or*

d.1.b.2. Using disposable or single-use filtration "parts" or "components".

N.B.: 2B352.d.1 does not control reverse osmosis and hemodialysis equipment, as specified by the manufacturer.

d.2. Cross (tangential) flow filtration "parts" or "components" (*e.g.,* modules, elements, cassettes, cartridges, units or plates) with filtration area equal to or greater than 0.2 square meters (0.2 m^2) for each "part" or "component" and designed for use in cross (tangential) flow filtration equipment controlled by 2B352.d.1.

Technical Note: In this ECCN, "sterilized" denotes the elimination of all viable microbes from the equipment through the use of either physical (e.g., steam) or chemical agents. "Disinfected" denotes a process to reduce the number of microorganisms, but not usually of bacterial spores, through the use of chemical agents, without necessarily killing or removing all organisms.

e. Steam, gas or vapor sterilizable freeze-drying equipment with a condenser capacity of 10 kg of ice or greater in 24 hours (10 liters of water or greater in 24 hours) and less than 1000 kg of ice in 24 hours (less than 1,000 liters of water in 24 hours).

f. Spray-drying equipment capable of drying toxins or pathogenic microorganisms having all of the following characteristics:

f.1. A water evaporation capacity of ≥0.4 kg/h and ≤400 kg/h;

f.2. The ability to generate a typical mean product particle size of ≤10 micrometers with existing fittings or by minimal modification of the spray-dryer with atomization nozzles enabling generation of the required particle size; *and*

f.3. Capable of being sterilized or disinfected in situ.

g. Protective and containment equipment, as follows:

g.1. Protective full or half suits, or hoods dependent upon a tethered external air supply and operating under positive pressure.

> *Technical Note to 2B352.g.1: 2B352.g.1 does not control suits designed to be worn with self-contained breathing apparatus.*

g.2. Biocontainment chambers, isolators, or biological safety cabinets having all of the following characteristics, for normal operation:

g.2.a. Fully enclosed workspace where the operator is separated from the work by a physical barrier;

g.2.b. Able to operate at negative pressure;

g.2.c. Means to safely manipulate items in the workspace; *and*

g.2.d. Supply and exhaust air to and from the workspace is high-efficiency particulate air (HEPA) filtered.

> *Note 1 to 2B352.g.2: 2B352.g.2 controls class III biosafety cabinets, as specified in the WHO Laboratory Biosafety Manual (3rd edition, Geneva, 2004) or constructed in accordance with national standards, regulations or guidance.*

> *Note 2 to 2B352.g.2: 2B352.g.2 controls any isolator having all of the characteristics described in 2B352.g.2.a through g.2.d, regardless of its intended use and its designation, except for medical isolators "specially designed" for barrier nursing or transportation of infected patients.*

h. Aerosol inhalation equipment designed for aerosol challenge testing with microorganisms, viruses or toxins, as follows:

h.1. Whole-body exposure chambers having a capacity of 1 cubic meter or greater;

h.2. Nose-only exposure apparatus utilizing directed aerosol flow and having a capacity for the exposure of 12 or more rodents, or two or more animals other than rodents, and closed animal restraint tubes designed for use with such apparatus.

i. Spraying or fogging systems and "parts" and "components" therefor, as follows:

i.1. Complete spraying or fogging systems, "specially designed" or modified for fitting to aircraft, "lighter than air vehicles," or "UAVs," capable of delivering, from a liquid suspension, an initial droplet "VMD" of less than 50 microns at a flow rate of greater than 2 liters per minute;

i.2. Spray booms or arrays of aerosol generating units, “specially designed” or modified for fitting to aircraft, “lighter than air vehicles,” or “UAVs,” capable of delivering, from a liquid suspension, an initial droplet “VMD” of less than 50 microns at a flow rate of greater than 2 liters per minute;

i.3. Aerosol generating units “specially designed” for fitting to the systems as specified in paragraphs i.1 and i.2 of this ECCN.

Technical Notes to 2B352.i: 1. Aerosol generating units are devices “specially designed” or modified for fitting to aircraft and include nozzles, rotary drum atomizers and similar devices.
2. This ECCN does not control spraying or fogging systems, “parts” and “components,” as specified in 2B352.i, that are demonstrated not to be capable of delivering biological agents in the form of infectious aerosols.

3. Droplet size for spray equipment or nozzles “specially designed” for use on aircraft or “UAVs” should be measured using either of the following methods (pending the adoption of internationally accepted standards):

a. Doppler laser method,

b. Forward laser diffraction method.

j. Nucleic acid assemblers and synthesizers that are both:

j.1 Partly or entirely automated; *and*

j.2. Designed to generate continuous nucleic acids greater than 1.5 kilobases in length with error rates less than 5% in a single run.

k. Peptide synthesizers that are both:

k.1 Partly or entirely automated; *and*

k.2 Capable of generating peptides at a 'system synthesis scale' of 1 mmol or greater.

Technical Note to 2B352.k: 'System synthesis scale' denotes the maximum amount of peptide (mmol) that can be produced by the instrument using the largest compatible reaction vessels (L). For multiple peptides produced in parallel, this is the sum of the largest compatible reaction vessels (L).

N.B. to paragraph .k: See ECCN 2B350 for other chemical reaction vessels or reactors.

2B910 Additive manufacturing equipment, designed to produce metal or metal alloy components, having all of the following (see List of Items Controlled), and “specially designed” “components” therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: For related “technology” see ECCN 2E910.

Related Definitions: N/A

Items:

a. Having at least one of the following consolidation sources:

a.1. “Laser”;

a.2. Electron beam; *or*

a.3. Electric arc;

b. Having a controlled process atmosphere of any of the following:

b.1. Inert gas; *or*

b.2. Vacuum (equal to or less than 100 Pa);

c. Having any of the following 'in-process monitoring' equipment in a 'co-axial configuration' or 'paraxial configuration':

c.1. Imaging camera with a peak response in the wavelength range exceeding 380 nm but not exceeding 14,000 nm;

c.2. Pyrometer designed to measure temperatures greater than 1,273.15K (1,000 °C); *or*

c.3. Radiometer or spectrometer with a peak response in the wavelength range exceeding 380 nm but not exceeding 3,000 nm; *and*

d. A closed loop control system designed to modify the consolidation source parameters, build path, or equipment settings during the build cycle in response to feedback from 'in-process monitoring' equipment specified in 2B910.c.

Technical Notes: For the purposes of 2B910:
1. 'In-process monitoring', also known as in-situ process monitoring, pertains to the observation and measurement of the additive manufacturing process including electromagnetic, or thermal, emissions from the melt pool.

2. 'Co-axial configuration', also known as on-axis or inline configuration, pertains to one or more sensors that are mounted in an optical path shared by the "laser" consolidation source.

3. 'Paraxial configuration' pertains to one or more sensors that are physically mounted onto or integrated into the "laser", electron beam, or electric arc consolidation source component.

4. For both 'co-axial configuration' and 'paraxial configuration', the field of view of the sensor(s) is fixed to the moving reference frame of the consolidation source and moves in the same scan trajectories of the consolidation source throughout the build process.

2B991 Numerical control units for machine tools and "numerically controlled" machine tools, n.e.s. (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See also ECCNs 2B001 and 2B201.

Related Definitions: N/A

Items: a. "Numerical control" units for machine tools:

a.1. Having four interpolating axes that can be coordinated simultaneously for "contouring control;" or

a.2. Having two or more axes that can be coordinated simultaneously for "contouring control" and a minimum programmable increment better (less) than 0.001 mm;

a.3. "Numerical control" units for machine tools having two, three or four interpolating axes that can be coordinated simultaneously for "contouring control," and capable of receiving directly (on-line) and processing computer-aided-design (CAD) data for internal preparation of machine instructions; *or*

b. "Motion control boards" "specially designed" for machine tools and having any of the following characteristics:

b.1. Interpolation in more than four axes;

b.2. Capable of "real-time processing" of data to modify tool path, feed rate and spindle data, during the machining operation, by any of the following:

b.2.a. Automatic calculation and modification of part program data for machining in two or more axes by means of measuring cycles and access to source data; *or*

b.2.b. "Adaptive control" with more than one physical variable measured and processed by means of a computing model (strategy) to change one or more machining instructions to optimize the process.

b.3. Capable of receiving and processing CAD data for internal preparation of machine instructions; *or*

c. “Numerically controlled” machine tools that, according to the manufacturer's technical specifications, can be equipped with electronic devices for simultaneous “contouring control” in two or more axes and that have both of the following characteristics:

c.1. Two or more axes that can be coordinated simultaneously for contouring control; *and*

c.2. Positioning accuracies according to ISO 230/2 (2006), with all compensations available:

c.2.a. Better than 15 μm along any linear axis (overall positioning) for grinding machines;

c.2.b. Better than 15 μm along any linear axis (overall positioning) for milling machines; *or*

c.2.c. Better than 15 μm along any linear axis (overall positioning) for turning machines; *or*

d. Machine tools, as follows, for removing or cutting metals, ceramics or composites, that, according to the manufacturer's technical specifications, can be equipped with electronic devices for simultaneous “contouring control” in two or more axes:

d.1. Machine tools for turning, grinding, milling or any combination thereof, having two or more axes that can be coordinated simultaneously for “contouring control” and having any of the following characteristics:

d.1.a. One or more contouring “tilting spindles;”

> *Note: 2B991.d.1.a. applies to machine tools for grinding or milling only.*

d.1.b. “Camming” (axial displacement) in one revolution of the spindle less (better) than 0.0006 mm total indicator reading (TIR);

> *Note: 2B991.d.1.b. applies to machine tools for turning only.*

d.1.c. “Run out” (out-of-true running) in one revolution of the spindle less (better) than 0.0006 mm total indicator reading (TIR);

d.1.d. The “positioning accuracies”, with all compensations available, are less (better) than: 0.001° on any rotary axis;

d.2. Electrical discharge machines (EDM) of the wire feed type that have five or more axes that can be coordinated simultaneously for “contouring control.”

2B992 Non-“numerically controlled” machine tools for generating optical quality surfaces, (see List of Items Controlled) and “specially designed” “parts” and “components” therefor.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Turning machines using a single point cutting tool and having all of the following characteristics:

a.1. Slide positioning accuracy less (better) than 0.0005 mm per 300 mm of travel;

a.2. Bidirectional slide positioning repeatability less (better) than 0.00025 mm per 300 mm of travel;

a.3. Spindle “run out” and “camming” less (better) than 0.0004 mm total indicator reading (TIR);

a.4. Angular deviation of the slide movement (yaw, pitch and roll) less (better) than 2 seconds of arc, TIR, over full travel; *and*

a.5. Slide perpendicularity less (better) than 0.001 mm per 300 mm of travel;

> *Technical Note: The bidirectional slide positioning repeatability (R) of an axis is the maximum value of the repeatability of positioning at any position along or around the axis determined using the procedure and under the conditions specified in part 2.11 of ISO 230/2: 1988.*

b. Fly cutting machines having all of the following characteristics:

b.1. Spindle “run out” and “camming” less (better) than 0.0004 mm TIR; *and*

b.2. Angular deviation of slide movement (yaw, pitch and roll) less (better) than 2 seconds of arc, TIR, over full travel.

2B993 Gearmaking and/or finishing machinery not controlled by 2B003 capable of producing gears to a quality level of better than AGMA 11.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2B996 Dimensional inspection or measuring systems or equipment not controlled by 2B006 or 2B206, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Manual dimensional inspection machines, having both of the following characteristics:

a.1. Two or more axes; *and*

a.2. A measurement uncertainty equal to or less (better) than (3 + L/300) micrometer in any axes (L measured length in mm).

2B997 "Robots" not controlled by 2B007 or 2B207 that are capable of employing feedback information in real-time processing from one or more sensors to generate or modify "programs" or to generate or modify numerical program data.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2B998 Assemblies, circuit boards or inserts "specially designed" for machine tools controlled by 2B991, or for equipment controlled by 2B993, 2B996 or 2B997.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: This entry does not control measuring interferometer systems, without closed or open loop feedback, containing a laser to measure slide movement errors of machine-tools, dimensional inspection machines or similar equipment.

Related Definition: N/A

Items: a. Spindle assemblies, consisting of spindles and bearings as a minimal assembly, with radial ("run out") or axial ("camming") axis motion in one revolution of the spindle less (better) than 0.0006 mm total indicator reading (TIR);

b. Single point diamond cutting tool inserts, having all of the following characteristics:

b.1. Flawless and chip-free cutting edge when magnified 400 times in any direction;

b.2. Cutting radius from 0.1 to 5 mm inclusive; *and*

b.3. Cutting radius out-of-roundness less (better) than 0.002 mm TIR.

c. "Specially designed" printed circuit boards with mounted "parts" or "components" capable of upgrading, according to the manufacturer's specifications, "numerical control" units, machine tools or feed-back devices to or above the levels specified in ECCNs 2B991, 2B993, 2B996, 2B997, or 2B998.

2B999 Specific Processing Equipment, n.e.s., as Follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country chart (see supp. no. 1 to part 738)
RS applies to entire entry except 2B999.h.2	A license is required for items controlled by this entry, other than 2B999.h.2, for export or reexport to Pakistan or transfer within Pakistan for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See § 742.6(a)(12) of the EAR for additional information.
AT applies to entire entry	A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT licensing requirements for this entry. See § 742.19 of the EAR for additional information.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See also 1B233, 2A992, 2A993, 2B001.f, 2B004, 2B009, 2B104, 2B109, 2B204, 2B209, 2B228, 2B229, 2B231, and 2B350. (2) Certain nuclear related processing equipment is subject to the export licensing authority of the Nuclear Regulatory Commission (see *10 CFR part 110*).

Related Definitions: N/A

Items:

a. Isostatic presses, n.e.s.

b. Bellows manufacturing equipment, including hydraulic forming equipment and bellows forming dies.

c. Laser welding machines.

d. MIG welders.

e. E-beam welders.

f. Monel equipment, including valves, piping, tanks and vessels.

g. 304 and 316 stainless steel valves, piping, tanks and vessels.

Note: Fittings are considered part of "piping" for purposes of 2B999.g.

h. Mining and drilling equipment, as follows:

h.1. Large boring equipment capable of drilling holes greater than two feet in diameter.

h.2. Large earth-moving equipment used in the mining industry.

i. Electroplating equipment designed for coating parts with nickel or aluminum.

j. Pumps designed for industrial service and for use with an electrical motor of 5 HP or greater.

k. Vacuum valves, piping, flanges, gaskets and related equipment "specially designed" for use in high-vacuum service, n.e.s.

l. Spin forming and flow forming machines, n.e.s.

m. Centrifugal multiplane balancing machines, n.e.s.

n. Austenitic stainless-steel plate, valves, piping, tanks and vessels.

C. "Materials" [Reserved]

D. "Software"

2D001 "Software", other than that controlled by 2D002, as follows (See list of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to "software" for equipment controlled by 2B004 and 2B009 for MT reasons	MT Column 1
NP applies to "specially designed" or modified "software" for equipment controlled by 2B001 for NP reasons, and to "specially designed" "software" for equipment controlled by 2B004, 2B006, 2B007, or 2B009 for NP reasons	NP Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: Yes, except N/A for MT

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit "software", other than that specified by ECCN 2D002, "specially designed" for the "development" or "production" of equipment as follows: ECCN 2B001 entire entry; or "Numerically controlled" or manual machine tools as specified in 2B003 to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 2E001 ("development") and 2E101 ("use") for technology for "software" controlled under this entry. (2) *Also see* ECCNs 2D101 and 2D201.

Related Definitions: N/A

Items: a. "Software" "specially designed" or modified for the "development" or "production" of equipment controlled by 2A001 or 2B001 to 2B009;

b. "Software" "specially designed" or modified for the "use" of equipment specified by 2A001.c., 2B001, or 2B003 to 2B009.

> *Note: 2D001 does not apply to part programming "software" that generates "numerical control" codes for machining various parts.*

2D002 "Software" for electronic devices, even when residing in an electronic device or system, enabling such devices or systems to function as a "numerical control" unit, capable of coordinating simultaneously more than 4 axes for "contouring control".

LICENSE REQUIREMENTS

Reason for Control: NS, NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
NP applies to entire entry	NP Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: Yes

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 2E001 ("development") and 2E201 ("use") for technology for "software" controlled under this entry. (2) Also see ECCN 2D202.

Related Definitions: N/A

Items:

> *Note 1: 2D002 does not control "software" "specially designed" or modified for the operation of items not specified by Category 2.*

> *Note 2: 2D002 does not control "software" for items specified by 2B002. See 2D001 and 2D003 for "software" for items specified by 2B002.*

> *Note 3: 2D002 does not apply to "software" that is exported with, and the minimum necessary for the operation of, items not specified by Category 2.*

The list of items controlled is contained in the ECCN heading.

2D003 "Software", designed or modified for the operation of equipment specified by 2B002, that converts optical design, workpiece measurements and material removal functions into "numerical control" commands to achieve the desired workpiece form.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: Yes.

LIST OF ITEMS CONTROLLED

Related Controls: See ECCN *2E001* ("development") for technology for "software" controlled under this entry.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2D018 "Software" for the "development," "production," or "use" of equipment controlled by 2B018.

No software is currently controlled under this entry. See ECCNs 0D501, 0D602, and 0D606 for software formerly controlled under this entry.

2D101 "Software" "specially designed" or modified for the "use" of equipment controlled by 2B104, 2B105, 2B109, 2B116, 2B117, or 2B119 to 2B122.

LICENSE REQUIREMENTS

Reason for Control: MT, NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.
NP applies to "software" "specially designed" for the use" of items controlled by 2B104, 2B109, or 2B116 for NP reasons	NP Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 2E001 (“development”) and 2E101 (“use”) for technology for “software” controlled under this entry. (2) *Also see* ECCN 9D004.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2D201 “Software” “specially designed” or modified for the “use” of equipment controlled by 2B204, 2B206, 2B207, 2B209, 2B227, or 2B229.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 2E001 (“development”) and 2E201 (“use”) for technology for “software” controlled under this entry. (2) Also see ECCNs 2D002 and 2D202.

Related Definitions: N/A

ECCN Controls: “Software” “specially designed” or modified for systems controlled by 2B206.b includes “software” for simultaneous measurements of wall thickness and contour.

Items: The list of items controlled is contained in the ECCN heading.

2D202 “Software” “specially designed” or modified for the “development”, “production” or “use” of equipment controlled by 2B201.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

ECCN Controls: ECCN 2D202 does not control part programming "software" that generates "numerical control" command codes, but does not allow direct use of equipment for machining various parts.

Items: The list of items controlled is contained in the ECCN heading.

2D290 "Software" "specially designed" or modified for the "development," "production," or "use" of items controlled by 2A290 or 2A291.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCN 2E001 ("development") for technology for "software" controlled under this entry.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2D351 Dedicated "software" for toxic gas monitors and monitoring systems, and their dedicated detecting "parts" and "components," controlled by ECCN 2B351.

LICENSE REQUIREMENTS

Reason for Control: CB, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CB applies to entire entry	CB Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: (1) For the purposes of this entry, the term "dedicated" means committed entirely to a single purpose or device. (2) See Section 772.1 of the EAR for the definitions of "software," "program," and "microprogram."

Items: The list of items controlled is contained in the ECCN heading.

2D352 "Software" designed for nucleic acid assemblers and synthesizers controlled by 2B352.j that is capable of designing and building functional genetic elements from digital sequence data.

LICENSE REQUIREMENTS

Reason for Control: CB, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
CB applies to entire entry	CB Column 2.

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCN 1E001 for "development" or "production "technology" for genetic elements controlled by ECCN 1C353.

Related Definitions: See Section 772.1 of the EAR for the definitions of "software," "program," and "microprogram."

Items: The list of items controlled is contained in the ECCN heading.

2D910 "Software", not specified elsewhere, "specially designed" or modified for the "development" or "production" of equipment specified in ECCN 2B910.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2D983 "Software" "specially designed" or modified for the "development", "production" or "use" of equipment controlled by 2A983.

LICENSE REQUIREMENTS

*Reason for Control:*RS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
RS applies to entire entry	RS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2D984 "Software" "required" for the "development", "production" or "use" of concealed object detection equipment controlled by 2A984.

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
RS applies to entire entry	RS Column 2.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) "Software" "required" for the "development," "production" or "use" of concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution less than 0.5 milliradian (a lower milliradian number means a more accurate image resolution) at a standoff distance of 100 meters is "subject to the ITAR" (see 22 CFR parts 120 through 130). (2) "Software" "required" for the "development", "production" or "use" of concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution greater than 1 milliradian spatial resolution (a higher milliradian number means a less accurate image resolution) at a standoff distance of 100 meters is designated as EAR99. (3) See ECCNs 2A984 and 2E984 for related commodity and technology controls.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2D991 "Software" "specially designed" for the "development", "production", or "use" of equipment controlled by 2B991, 2B993, or 2B996, 2B997, and 2B998.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2D992 Specific "software", as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. "Software" to provide "adaptive control" and having both of the following characteristics:

a.1. For "flexible manufacturing units" (FMUs) which consist at least of equipment described in b.1 and b.2 of the definition of "flexible manufacturing unit" contained in part 772 of the EAR; *and*

a.2. Capable of generating or modifying, in "real-time processing", programs or data by using the signals obtained simultaneously by means of at least two detection techniques, such as:

a.2.a. Machine vision (optical ranging);

a.2.b. Infrared imaging;

a.2.c. Acoustical imaging (acoustical ranging);

a.2.d. Tactile measurement;

a.2.e. Inertial positioning;

a.2.f. Force measurement; *and*

a.2.g. Torque measurement.

> *Note: 2D992.a does not control "software" which only provides rescheduling of functionally identical equipment within "flexible manufacturing units" using pre-stored part programs and a pre-stored strategy for the distribution of the part programs.*

b. Reserved.

2D993 "Software" "specially designed" or modified for the "development," "production," or "use" of items controlled by 2A992 or 2A993.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country chart (see supp. no. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See part 740 for a Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCN 2E001 ("development") for "technology" for "software" controlled under this entry.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2D994 "Software" "specially designed" for the "development" or "production" of portable electric generators controlled by 2A994.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s): AT applies to entire entry. A license is required for items controlled by this entry to Iran and North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine licensing requirements for this entry. See part 746 of the EAR for additional information on Iran. See § 742.19 of the EAR for additional information on North Korea.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

E. "Technology"

2E001 "Technology" according to the General Technology Note for the "development" of equipment or "software" controlled by 2A (except 2A983, 2A984, 2A991, or 2A994), 2B (except 2B991, 2B993, 2B996, 2B997, 2B998, or 2B999), or 2D (except 2D983, 2D984, 2D991, 2D992, or 2D994).

License Requirements

Reason for Control: NS, MT, NP, CB, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to "technology" for items controlled by 2A001, 2B001 to 2B009, 2D001 or 2D002	NS Column 1.
MT applies to "technology" for items controlled by 2B004, 2B009, 2B104, 2B105, 2B109, 2B116, 2B117, 2B119 to 2B122, 2D001, or 2D101 for MT reasons	MT Column 1.
NP applies to "technology" for items controlled by 2A225, 2A226, 2B001, 2B004, 2B006, 2B007, 2B009, 2B104, 2B109, 2B116, 2B201, 2B204, 2B206, 2B207, 2B209, 2B225 to 2B233, 2D001, 2D002, 2D101, 2D201, or 2D202 for NP reasons	NP Column 1.
NP applies to "technology" for items controlled by 2A290, 2A291, or 2D290 for NP	NP

Control(s)	Country chart (see Supp. No. 1 to part 738)
reasons	Column 2.
CB applies to “technology” for equipment controlled by 2B350 to 2B352, valves controlled by 2A226 having the characteristics of those controlled by 2B350.g, and software controlled by 2D351 or 2D352	CB Column 2.
AT applies to entire entry	AT Column 1.

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except N/A for MT

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit “technology” according to the General Technology Note for the “development” of “software” specified in the License Exception STA paragraph in the License Exception section of ECCN 2D001 or for the “development” of equipment as follows: ECCN 2B001 entire entry; or “Numerically controlled” or manual machine tools as specified in 2B003 to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: See also 2E101, 2E201, and 2E301

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

Note 1 to 2E001: ECCN 2E001 includes "technology" for the integration of probe systems into coordinate measurement machines specified by 2B006.a.

2E002 "Technology" according to the General Technology Note for the "production" of equipment controlled by 2A (except 2A983, 2A984, 2A991, or 2A994), or 2B (except 2B991, 2B993, 2B996, 2B997, 2B998, or 2B999).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, NP, CB, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to "technology" for equipment controlled by 2A001, 2B001 to 2B009	NS Column 1
MT applies to "technology" for equipment controlled by 2B004, 2B009, 2B104, 2B105, 2B109, 2B116, 2B117, or 2B119 to 2B122 for MT reasons	MT Column 1
NP applies to "technology" for equipment controlled by 2A225, 2A226, 2B001, 2B004, 2B006, 2B007, 2B009, 2B104, 2B109, 2B116, 2B201, 2B204, 2B206, 2B207, 2B209, 2B225 to 2B233 for NP reasons	NP Column 1
NP applies to "technology" for equipment controlled by 2A290 or 2A291 for NP reasons	NP Column 2
CB applies to "technology" for equipment Controlled by 2B350 to 2B352 and for valves controlled by 2A226 having the characteristics of those controlled by 2B350.g	CB Column 2
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except N/A for MT

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit "technology" according to the General Technology Note for the "production" of equipment as follows: ECCN 2B001 entire entry; or "Numerically controlled" or manual machine tools as specified in 2B003 to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

2E003 Other "technology", as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except 2E003.b, .e and .f

LIST OF ITEMS CONTROLLED

Related Controls: (1) See 2E001, 2E002, and 2E101 for "development" and "use" technology for equipment that are designed or modified for densification of carbon-carbon composites, structural composite rocket nozzles and reentry vehicle nose tips. (2) See 2E903 for "technology", not specified elsewhere, for the "development" or "production" of coating systems (as defined in 2E903).

Related Definitions: N/A

Items:

a. [Reserved]

b. “Technology” for metal-working manufacturing processes, as follows:

b.1. “Technology” for the design of tools, dies or fixtures “specially designed” for any of the following processes:

b.1.a. “Superplastic forming”;

b.1.b. “Diffusion bonding”; *or*

b.1.c. 'Direct-acting hydraulic pressing';

b.2. [Reserved]

N.B.: For “technology” for metal-working manufacturing processes for gas turbine engines and components, see 9E003 and USML Category XIX.

Technical Note: For the purposes of 2E003.b.1.c, 'direct-acting hydraulic pressing' is a deformation process which uses a fluid-filled flexible bladder in direct contact with the workpiece.

c. “Technology” for the “development” or “production” of hydraulic stretch-forming machines and dies therefor, for the manufacture of airframe structures;

d. [Reserved]

e. “Technology” for the “development” of integration “software” for incorporation of expert systems for advanced decision support of shop floor operations into “numerical control” units;

f. “Technology” for the application of inorganic overlay coatings or inorganic surface modification coatings (specified in column 3 of the following table) to non-electronic substrates (specified in column 2 of the following table), by processes specified in column 1 of the following table and defined in the Technical Note.

Category 2E—Materials Processing Table; Deposition Techniques

1. Coating process (1) [1]	2. Substrate	3. Resultant coating
A. Chemical Vapor Deposition (CVD)	“Superalloys”	Aluminides for internal passages
	Ceramics (19) and Low-expansion glasses (14)	Silicides Carbides Dielectric layers (15) Diamond Diamond-like carbon (17)
	Carbon-carbon, Ceramic, and	Silicides

[1] *The numbers in parenthesis refer to the Notes following this Table.*

1. Coating process (1) [1]	2. Substrate	3. Resultant coating
	Metal “matrix” “composites”	Carbides Refractory metals, Mixtures thereof (4) Dielectric layers (15) Aluminides Alloyed aluminides (2) Boron nitride
	Cemented tungsten carbide (16), Silicon Carbide (18)	Carbides Tungsten Mixtures thereof (4) Dielectric layers (15)
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Dielectric layers (15) Diamond Diamond-like carbon (17)
	Sensor window materials (9)	Dielectric layers (15) Diamond Diamond-like carbon (17)
B. Thermal Evaportation Physical Vapor		
1. Physical Vapor Deposition (PVD): Deposition (TE-PVD) Electron-Beam (EB-PVD)	“Superalloys”	Alloyed silicides Alloyed aluminides (2) McrAlX (5) Modified zirconia (12) Silicides Aluminides Mixtures thereof (4)
	Ceramics (19) and Low-expansion glasses (14)	Dielectric layers (15)
	Corrosion resistant steel (7)	MCrAlX (5) Modified zirconia (12) Mixtures thereof (4)
	Carbon-carbon, Ceramic and Metal “matrix” “composites”	Silicides Carbides Refractory metals Mixtures thereof (4) Dielectric layers (15) Boron nitride
	Cemented tungsten carbide (16), Silicon carbide (18)	Carbides Tungsten

[1] *The numbers in parenthesis refer to the Notes following this Table.*

1. Coating process (1) [1]	2. Substrate	3. Resultant coating
		Mixtures thereof (4) Dielectric layers (15)
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Dielectric layers (15) Borides Beryllium
	Sensor window materials (9)	Dielectric layers (15)
	Titanium alloys (13)	Borides Nitrides
2. Ion assisted resistive heating. Physical Vapor Deposition (PVD) (Ion Plating)	Ceramics (19) and Low-expansion glasses (14)	Dielectric layers (15) Diamond-like carbon (17)
	Carbon-carbon, Ceramic and Metal “matrix” “composites”	Dielectric layers (15)
	Cemented tungsten carbide (16), Silicon carbide	Dielectric layers (15)
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Dielectric layers (15)
	Sensor window materials (9)	Dielectric layers (15) Diamond-like carbon (17)
3. Physical Vapor Deposition (PVD): “Laser” Vaporization	Ceramics (19) and Low-expansion glasses (14)	Silicides Dielectric layers (15) Diamond-like carbon (17)
	Carbon-carbon, Ceramic and Metal “matrix” “composites”	Dielectric layers (15)
	Cemented tungsten carbide (16), Silicon carbide	Dielectric layers (15)
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Dielectric layers (15)
	Sensor window materials (9)	Dielectric layers (15) Diamond-like carbon
4. Physical Vapor Deposition (PVD): Cathodic Arc Discharge	“Superalloys”	Alloyed silicides Alloyed Aluminides (2) MCrAlX (5)
	Polymers (11) and Organic “matrix” “composites”	Borides Carbides Nitrides Diamond-like carbon (17)

[1] *The numbers in parenthesis refer to the Notes following this Table.*

1. Coating process (1) [1]	2. Substrate	3. Resultant coating
C. Pack cementation (see A above for out-of-pack cementation) (10)	Carbon-carbon, Ceramic and Metal "matrix" "composites"	Silicides Carbides Mixtures thereof (4)
	Titanium alloys (13)	Silicides Aluminides Alloyed aluminides (2)
	Refractory metals and alloys (8)	Silicides Oxides
D. Plasma spraying	"Superalloys"	MCrAlX (5) Modified zirconia (12) Mixtures thereof (4) Abradable Nickel-Graphite Abradable materials containing Ni-Cr-Al Abradable Al-Si-Polyester Alloyed aluminides (2)
	Aluminum alloys (6)	MCrAlX (5) Modified zirconia (12) Silicides Mixtures thereof (4)
	Refractory metals and alloys (8), Carbides, Corrosion resistant steel (7)	Aluminides Silicides MCrAlX (5) Modified zirconia (12) Mixtures thereof (4)
	Titanium alloys (13)	Carbides Aluminides Silicides Alloyed aluminides (2)
	Abradable, Nickel-Graphite	Abradable materials containing Ni-Cr-Al Abradable Al-Si-Polyester
E. Slurry Deposition	Refractory metals and alloys (8)	Fused silicides Fused aluminides except for resistance heating elements
	Carbon-carbon, Ceramic and Metal "matrix" "composites"	Silicides Carbides Mixtures thereof (4)
F. Sputter Deposition	"Superalloys"	Alloyed silicides Alloyed aluminides (2)

[1] *The numbers in parenthesis refer to the Notes following this Table.*

1. Coating process (1) [1]	2. Substrate	3. Resultant coating
		Noble metal modified aluminides (3) McrAlX (5) Modified zirconia (12) Platinum Mixtures thereof (4)
	Ceramics and Low-expansion glasses (14)	Silicides Platinum Mixtures thereof (4) Dielectric layers (15) Diamond-like carbon (17)
	Titanium alloys (13)	Borides Nitrides Oxides Silicides Aluminides Alloyed aluminides (2) Carbides
	Carbon-carbon, Ceramic and Metal “matrix” “Composites”	Silicides Carbides Refractory metals Mixtures thereof (4) Dielectric layers (15) Boron nitride
	Cemented tungsten carbide (16), Silicon carbide (18)	Carbides Tungsten Mixtures thereof (4) Dielectric layers (15) Boron nitride
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Borides Dielectric layers (15) Beryllium
	Sensor window materials (9)	Dielectric layers (15) Diamond-like carbon (17)
	Refractory metals and alloys (8)	Aluminides Silicides Oxides Carbides
G. Ion Implantation	High temperature bearing steels	Additions of Chromium, Tantalum, or Niobium

[1] *The numbers in parenthesis refer to the Notes following this Table.*

1. Coating process (1) [1]	2. Substrate	3. Resultant coating
		(Columbium)
	Titanium alloys (13)	Borides Nitrides
	Beryllium and Beryllium alloys	Borides
	Cemented tungsten carbide (16)	Carbides Nitrides

[1] *The numbers in parenthesis refer to the Notes following this Table.*

Notes to Table on Deposition Techniques 1. The term 'coating process' includes coating repair and refurbishing as well as original coating. 2. The term 'alloyed aluminide coating' includes single or multiple-step coatings in which an element or elements are deposited prior to or during application of the aluminide coating, even if these elements are deposited by another coating process. It does not, however, include the multiple use of single-step pack cementation processes to achieve alloyed aluminides.
3. The term 'noble metal modified aluminide' coating includes multiple-step coatings in which the noble metal or noble metals are laid down by some other coating process prior to application of the aluminide coating.

4. The term 'mixtures thereof' includes infiltrated material, graded compositions, co-deposits and multilayer deposits and are obtained by one or more of the coating processes specified in the Table.

5. MCrAlX refers to a coating alloy where M equals cobalt, iron, nickel or combinations thereof and X equals hafnium, yttrium, silicon, tantalum in any amount or other intentional additions over 0.01% by weight in various proportions and combinations, except:

a. CoCrAlY coatings which contain less than 22% by weight of chromium, less than 7% by weight of aluminum and less than 2% by weight of yttrium;

b. CoCrAlY coatings which contain 22 to 24% by weight of chromium, 10 to 12% by weight of aluminum and 0.5 to 0.7% by weight of yttrium; or

c. NiCrAlY coatings which contain 21 to 23% by weight of chromium, 10 to 12% by weight of aluminum and 0.9 to 1.1% by weight of yttrium.

6. The term 'aluminum alloys' refers to alloys having an ultimate tensile strength of 190 MPa or more measured at 293 K (20 °C).

7. The term 'corrosion resistant steel' refers to AISI (American Iron and Steel Institute) 300 series or equivalent national standard steels.

8. 'Refractory metals and alloys' include the following metals and their alloys: niobium (columbium), molybdenum, tungsten and tantalum.

9. 'Sensor window materials', as follows: alumina, silicon, germanium, zinc sulfide, zinc selenide, gallium arsenide, diamond, gallium phosphide, sapphire and the following metal halides: sensor window materials of more than 40 mm diameter for zirconium fluoride and hafnium fluoride.

10. Category 2 does not include "technology" for single-step pack cementation of solid airfoils.

11. 'Polymers', as follows: Polyimide, polyester, polysulfide, polycarbonates and polyurethanes.

12. 'Modified zirconia' refers to additions of other metal oxides, (e.g., calcia, magnesia, yttria, hafnia, rare earth oxides) to zirconia in order to stabilize certain crystallographic phases and phase compositions. Thermal barrier coatings made of zirconia, modified with calcia or magnesia by mixing or fusion, are not controlled.

13. 'Titanium alloys' refers only to aerospace alloys having an ultimate tensile strength of 900 MPa or more measured at 293 K (20 °C).

14. 'Low-expansion glasses' refers to glasses which have a coefficient of thermal expansion of 1 × 10^{-7} K^{-1} or less measured at 293 K (20 °C).

15. 'Dielectric layers' are coatings constructed of multi-layers of insulator materials in which the interference properties of a design composed of materials of various refractive indices are used to reflect, transmit or absorb various wavelength bands. Dielectric layers refers to more than four dielectric layers or dielectric/metal "composite" layers.

16. 'Cemented tungsten carbide' does not include cutting and forming tool materials consisting of tungsten carbide/(cobalt, nickel), titanium carbide/(cobalt, nickel), chromium carbide/nickel-chromium and chromium carbide/nickel.

17. "Technology" for depositing diamond-like carbon on any of the following is not controlled: magnetic disk drives and heads, equipment for the manufacture of disposables, valves for faucets, acoustic diaphragms for speakers, engine parts for automobiles, cutting tools, punching-pressing dies, office automation equipment, microphones, medical devices or molds, for casting or molding of plastics, manufactured from alloys containing less than 5% beryllium.

18. 'Silicon carbide' does not include cutting and forming tool materials.

19. Ceramic substrates, as used in this entry, does not include ceramic materials containing 5% by weight, or greater, clay or cement content, either as separate constituents or in combination.

Technical Note to Table on Deposition Techniques: Processes specified in Column 1 of the Table are defined as follows:
a. Chemical Vapor Deposition (CVD) is an overlay coating or surface modification coating process wherein a metal, alloy, "composite", dielectric or ceramic is deposited upon a heated substrate. Gaseous reactants are decomposed or combined in the vicinity of a substrate resulting in the deposition of the desired elemental, alloy or compound material on the substrate. Energy for this decomposition or chemical reaction process may be provided by the heat of the substrate, a glow discharge plasma, or "laser" irradiation.

Note 1: CVD includes the following processes: Directed gas flow out-of-pack deposition, pulsating CVD, controlled nucleation thermal decomposition (CNTD), plasma enhanced or plasma assisted CVD processes.

Note 2: Pack denotes a substrate immersed in a powder mixture.

Note 3: The gaseous reactants used in the out-of-pack process are produced using the same basic reactions and parameters as the pack cementation process, except that the substrate to be coated is not in contact with the powder mixture.

b. Thermal Evaporation-Physical Vapor Deposition (TE-PVD) is an overlay coating process conducted in a vacuum with a pressure less than 0.1 Pa wherein a source of thermal energy is used to vaporize the coating material. This process results in the condensation, or deposition, of the evaporated species onto appropriately positioned substrates. The addition of gases to the vacuum chamber during the coating process to synthesize compound coatings is an ordinary modification of the process. The use of ion or electron beams, or plasma, to activate or assist the coating's deposition is also a common modification in this technique. The use of monitors to provide in-process measurement of optical characteristics and thickness of coatings can be a feature of these processes. Specific TE-PVD processes are as follows:

1. Electron Beam PVD uses an electron beam to heat and evaporate the material which forms the coating;

2. Ion Assisted Resistive Heating PVD employs electrically resistive heating sources in combination with impinging ion beam(s) to produce a controlled and uniform flux of evaporated coating species;

3. "Laser" Vaporization uses either pulsed or continuous wave "laser" beams to vaporize the material which forms the coating;

4. Cathodic Arc Deposition employs a consumable cathode of the material which forms the coating and has an arc discharge established on the surface by a momentary contact of a ground trigger. Controlled motion of arcing erodes the cathode surface creating a highly ionized plasma. The anode can be either a cone attached to the periphery of the cathode, through an insulator, or the chamber. Substrate biasing is used for non line-of-sight deposition;

Note: This definition does not include random cathodic arc deposition with non-biased substrates.

5. Ion Plating is a special modification of a general TE-PVD process in which a plasma or an ion source is used to ionize the species to be deposited, and a negative bias is applied to the substrate in order to facilitate the extraction of the species from the plasma. The introduction of reactive species, evaporation of solids within the process chamber, and the use of monitors to provide in-process measurement of optical characteristics and thicknesses of coatings are ordinary modifications of the process.

c. Pack Cementation is a surface modification coating or overlay coating process wherein a substrate is immersed in a powder mixture (a pack), that consists of:

1. The metallic powders that are to be deposited (usually aluminum, chromium, silicon or combinations thereof);

2. An activator (normally a halide salt); and

3. An inert powder, most frequently alumina.

Note: The substrate and powder mixture is contained within a retort which is heated to between 1,030 K (757 °C) to 1,375 K (1,102 °C) for sufficient time to deposit the coating.

d. Plasma Spraying is an overlay coating process wherein a gun (spray torch) which produces and controls a plasma accepts powder or wire coating materials, melts them and propels them towards a substrate, whereon an integrally bonded coating is formed. Plasma spraying constitutes either low pressure plasma spraying or high velocity plasma spraying.

>Note 1: Low pressure means less than ambient atmospheric pressure.

Note 2: High velocity refers to nozzle-exit gas velocity exceeding 750 m/s calculated at 293 K (20 °C) at 0.1 MPa.

e. Slurry Deposition is a surface modification coating or overlay coating process wherein a metallic or ceramic powder with an organic binder is suspended in a liquid and is applied to a substrate by either spraying, dipping or painting, subsequent air or oven drying, and heat treatment to obtain the desired coating.

f. Sputter Deposition is an overlay coating process based on a momentum transfer phenomenon, wherein positive ions are accelerated by an electric field towards the surface of a target (coating material). The kinetic energy of the impacting ions is sufficient to cause target surface atoms to be released and deposited on an appropriately positioned substrate.

Note 1: The Table refers only to triode, magnetron or reactive sputter deposition which is used to increase adhesion of the coating and rate of deposition and to radio frequency (RF) augmented sputter deposition used to permit vaporization of non-metallic coating materials.

Note 2: Low-energy ion beams (less than 5 keV) can be used to activate the deposition.

g. Ion Implantation is a surface modification coating process in which the element to be alloyed is ionized, accelerated through a potential gradient and implanted into the surface region of the substrate. This includes processes in which ion implantation is performed simultaneously with electron beam physical vapor deposition or sputter deposition.

Accompanying Technical Information to Table on Deposition Techniques:

1. Technical information for pretreatments of the substrates listed in the Table, as follows:

a. Chemical stripping and cleaning bath cycle parameters, as follows:

1. Bath composition;

a. For the removal of old or defective coatings corrosion product or foreign deposits;

b. For preparation of virgin substrates;

2. Time in bath;

3. Temperature of bath;

4. Number and sequences of wash cycles;

b. Visual and macroscopic criteria for acceptance of the cleaned part;

c. Heat treatment cycle parameters, as follows:

1. Atmosphere parameters, as follows:

a. Composition of the atmosphere;

b. Pressure of the atmosphere;

2. Temperature for heat treatment;

3. Time of heat treatment;

d. Substrate surface preparation parameters, as follows:

1. Grit blasting parameters, as follows:

a. Grit composition;

b. Grit size and shape;

c. Grit velocity;

2. Time and sequence of cleaning cycle after grit blast;

3. Surface finish parameters;

4. Application of binders to promote adhesion;

e. Masking technique parameters, as follows:

1. Material of mask;

2. Location of mask;

2. Technical information for in situ quality assurance techniques for evaluation of the coating processes listed in the Table, as follows:

a. Atmosphere parameters, as follows:

1. Composition of the atmosphere;

2. Pressure of the atmosphere;

b. Time parameters;

c. Temperature parameters;

d. Thickness parameters;

e. Index of refraction parameters;

f. Control of composition;

3. Technical information for post deposition treatments of the coated substrates listed in the Table, as follows:

a. Shot peening parameters, as follows:

1. Shot composition;

2. Shot size;

3. Shot velocity;

b. Post shot peening cleaning parameters;

c. Heat treatment cycle parameters, as follows:

1. Atmosphere parameters, as follows:

a. Composition of the atmosphere;

b. Pressure of the atmosphere;

2. Time-temperature cycles;

d. Post heat treatment visual and macroscopic criteria for acceptance of the coated substrates;

4. Technical information for quality assurance techniques for the evaluation of the coated substrates listed in the Table, as follows:

a. Statistical sampling criteria;

b. Microscopic criteria for:

1. Magnification;

2. Coating thickness, uniformity;

3. Coating integrity;

4. Coating composition;

5. Coating and substrates bonding;

6. Microstructural uniformity.

c. Criteria for optical properties assessment (measured as a function of wavelength):

1. Reflectance;

2. Transmission;

3. Absorption;

4. Scatter;

5. Technical information and parameters related to specific coating and surface modification processes listed in the Table, as follows:

a. For Chemical Vapor Deposition (CVD):

1. Coating source composition and formulation;

2. Carrier gas composition;

3. Substrate temperature;

4. Time-temperature-pressure cycles;

5. Gas control and part manipulation;

b. For Thermal Evaporation-Physical Vapor Deposition (PVD):

1. Ingot or coating material source composition;

2. Substrate temperature;

3. Reactive gas composition;

4. Ingot feed rate or material vaporization rate;

5. Time-temperature-pressure cycles;

6. Beam and part manipulation;

7. "Laser" parameters, as follows:

a. Wave length;

b. Power density;

c. Pulse length;

d. Repetition ratio;

e. Source;

c. For Pack Cementation:

1. Pack composition and formulation;

2. Carrier gas composition;

3. Time-temperature-pressure cycles;

d. For Plasma Spraying:

1. Powder composition, preparation and size distributions;

2. Feed gas composition and parameters;

3. Substrate temperature;

4. Gun power parameters;

5. Spray distance;

6. Spray angle;

7. Cover gas composition, pressure and flow rates;

8. Gun control and part manipulation;

e. For Sputter Deposition:

1. Target composition and fabrication;

2. Geometrical positioning of part and target;

3. Reactive gas composition;

4. Electrical bias;

5. Time-temperature-pressure cycles;

6. Triode power;

7. Part manipulation;

f. For Ion Implantation:

1. Beam control and part manipulation;

2. Ion source design details;

3. Control techniques for ion beam and deposition rate parameters;

4. Time-temperature-pressure cycles.

g. For Ion Plating:

1. Beam control and part manipulation;

2. Ion source design details;

3. Control techniques for ion beam and deposition rate parameters;

4. Time-temperature-pressure cycles;

5. Coating material feed rate and vaporization rate;

6. Substrate temperature;

7. Substrate bias parameters.

2E018 "Technology" for the "use" of equipment controlled by 2B018.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
MT applies to "technology" for equipment controlled by 2B018 for MT reasons	MT Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry.	See § 746.1(b) for UN controls.

TSR: Yes.

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2E101 "Technology" according to the General Technology Note for the "use" of equipment or "software" controlled by 2B004, 2B009, 2B104, 2B105, 2B109, 2B116, 2B117, 2B119 to 2B122, 2D001, 2D002 or 2D101.

LICENSE REQUIREMENTS

Reason for Control: MT, NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to "technology" for items controlled by 2B004, 2B009, 2B104, 2B105, 2B109, 2B116, 2B117, 2B119 to 2B122, 2D001, or 2D101 for MT reasons	MT Column 1
NP applies to "technology" for items controlled by 2B004, 2B009, 2B104, 2B109, 2B116, 2D001, 2D002 or 2D101 for NP reasons	NP Column 1
AT applies to entire entry.	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) This entry controls only "technology" for 2B009 and 2B109 for spin forming machines combining the functions of spin forming and flow forming, and flow forming machines. (2) Also see 2E201.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2E201 "Technology" according to the General Technology Note for the "use" of equipment or "software" controlled by 2A225, 2A226, 2B001, 2B006, 2B007.b, 2B007.c, 2B201, 2B204, 2B206, 2B207, 2B209, 2B225 to 2B233, 2D002, 2D201 or 2D202 for NP reasons.

LICENSE REQUIREMENTS

Reason for Control: NP, CB, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1.
CB applies to "technology" for valves controlled by 2A226 that meet or exceed the technical parameters in 2B350.g	CB Column 2.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: Also see 2E290 and 2E991.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2E290 "Technology" according to the General Technology Note for the "use" of equipment controlled by 2A290 or 2A291.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart (see supp. no. 1 to part 738)
NP applies to entire entry	NP Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2E301 "Technology" according to the "General Technology Note" for the "use" of items controlled by 2B350, 2B351 and 2B352.

LICENSE REQUIREMENTS

Reason for Control: CB, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CB applies to entire entry	CB Column 2.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The lists of items controlled are contained in the ECCN headings.

2E903 "Technology", not specified elsewhere, for the "development" or "production" of 'coating systems' having all of the following: (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

Special Conditions for STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR).

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items:

a. Designed to protect ceramic “matrix” “composite” materials specified by ECCN 1C007 from corrosion; *and*

b. Designed to operate at temperatures exceeding 1,373.15 K (1,100 °C).

> *Technical Note: For the purposes of 2E903, 'coating systems' consist of one or more layers (e.g., bond, interlayer, top coat) of material deposited on the substrate.*

2E910 “Technology”, not specified elsewhere, “specially designed” or modified for the “development” or “production” of equipment specified in ECCN 2B910.

License Requirements

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2E983 "Technology" "specially designed" or modified for the "development", "production" or "use" of equipment controlled by 2A983, or the "development" of software controlled by 2D983.

LICENSE REQUIREMENTS

Reason for Control:RS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
RS applies to entire entry	RS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2E984 "Technology" "required" for the "development", "production" or "use" of equipment controlled by 2A984 or "required" for the "development" of "software" controlled by 2D984.

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
RS applies to entire entry	RS Column 2.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) "Technology" "required" for the "development," "production" or "use" of concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution less than 0.5 milliradian (a lower milliradian number means a more accurate image resolution) at a standoff distance of 100 meters or "required" for the "development" of "software" "required" for the "development," "production" or "use" of concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution less than 0.5 milliradian at a standoff distance of 100 meters is "subject to the ITAR" (see 22 CFR parts 120 through 130). (2) "Technology" "required" for the "development", "production" or "use" of concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution greater than 1 milliradian spatial resolution (a higher milliradian number means a less accurate image resolution) at a standoff distance of 100 meters or "required" for the "development" of "software" "required" for the "development", "production" or "use" of concealed object detection equipment operating in the frequency range from 30 GHz to 3000 GHz and having a spatial resolution greater than 1 milliradian spatial resolution (a higher milliradian number means a less accurate image resolution) at a standoff distance of 100 meters is designated as EAR99. (3) See ECCNs 2A984 and 2D984 for related commodity and software controls.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2E991 "Technology" for the "use" of equipment controlled by 2B991, 2B993, 2B996, or 2B997.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2E993 "Technology" according to the General Technology Note for the "use" of equipment controlled by 2A992 or 2A993.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country chart (see supp. no. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See part 740 for a Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

2E994 "Technology" for the "use" of portable electric generators controlled by 2A994.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s): AT applies to entire entry. A license is required for items controlled by this entry to Iran and North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine licensing requirements for this entry. See part 746 of the EAR for additional information on Iran. See § 742.19 of the EAR for additional information on North Korea.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

EAR99 Items Subject to the EAR That Are *Not* Elsewhere Specified in This CCL Category *or* in Any Other Category in the CCL Are Designated by the Number EAR99.

Category 3—Electronics

A. "End Items," "Equipment," "Accessories," "Attachments," "Parts," "Components," and "Systems"

Note 1: The control status of equipment and "components" described in 3A001(other than those described in 3A001.a.3 to 3A001.a.10, 3A001.a.12 to 3A001.a.14, 3A001.b.12, or 3A001.z), 3A002, 3A901, which are "specially designed" for or which have the same functional characteristics as other equipment is determined by the control status of the other equipment.

Note 2: The control status of integrated circuits described in 3A001.a.3 to 3A001.a.9, 3A001.a.12 to

3A001.a.14, 3A001.z or 3A901 that are unalterably programmed or designed for a specific function for other equipment is determined by the control status of the other equipment.

N.B.: When the manufacturer or applicant cannot determine the control status of the other equipment, the control status of the integrated circuits is determined in 3A001.a.3 to 3A001.a.9, or 3A001.a.12 to 3A001.a.14, 3A001.z and 3A901.

Note 3: The status of wafers (finished or unfinished), in which the function has been determined, is to be evaluated against the parameters of items in 3A.

3A001 Electronic items as follows (see List of Items Controlled).

Reason for Control: NS, RS, MT, NP, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to "Monolithic Microwave Integrated Circuit" ("MMIC") amplifiers in 3A001.b.2 and discrete microwave transistors in 3A001.b.3, except those 3A001.b.2 and b.3 items being exported or reexported for use in civil telecommunications applications	NS Column 1.
NS applies to entire entry	NS Column 2.
RS applies "Monolithic Microwave Integrated Circuit" ("MMIC") amplifiers in 3A001.b.2 and discrete microwave transistors in 3A001.b.3, except those 3A001.b.2 and b.3 items being exported or reexported for use in civil telecommunications applications	RS Column 1.
RS applies to 3A001.z.1.a, z.2.a, z.3.a, z.4.a	To or within any destination worldwide. *See* § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to 3A001.z.1.b, z.2.b, z.3.b, z.4.b	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any destination also specified in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
MT applies to 3A001.a.1.a when usable in "missiles"; and to 3A001.a.5.a when "designed or modified" for military use, hermetically sealed and	MT Column 1.

Control(s)	Country Chart (see Supp. No. 1 to part 738)
rated for operation in the temperature range from below −54 °C to above +125 °C; and 3A001.z.2	
NP applies to pulse discharge capacitors in 3A001.e.2 and superconducting solenoidal electromagnets in 3A001.e.3 that meet or exceed the technical parameters in 3A201.a and 3A201.b, respectively; and 3A001.z.3	NP Column 1.
AT applies to entire entry	AT Column 1.

REPORTING REQUIREMENTS: See § 743.1 of the EAR for reporting requirements for exports under 3A001.b.2 or b.3 under License Exceptions, and Validated End-User authorizations.

License Requirements: See § 744.17 of the EAR for additional license requirements for microprocessors having a processing speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more, including those incorporating “information security” functionality, and associated “software” and “technology” for the “production” or “development” of such microprocessors.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A for MT, NP; N/A for “Monolithic Microwave Integrated Circuit” (“MMIC”) amplifiers in 3A001.b.2, discrete microwave transistors in 3A001.b.3, except those that are being exported or reexported for use in civil telecommunications applications; N/A for and 3A001.z.

Yes for:

$1500: 3A001.c.

$3000: 3A001.b.1, b.2 (exported or reexported for use in civil telecommunications applications), b.3 (exported or reexported for use in civil telecommunications applications), b.9, .d, .e, .f, and .g.

$5000: 3A001.a (except a.1.a and a.5.a when controlled for MT), b.4 to b.7, and b.12.

GBS: Yes for 3A001.a.1.b, a.2 to a.14 (except .a.5.a when controlled for MT), b.2 (exported or reexported for use in civil telecommunications applications), b.8 (except for “vacuum electronic devices” exceeding 18 GHz), b.9., b.10, .g, .h, .i, and z.1.b (exported or reexported for use in civil telecommunications applications).

NAC/ACA: Yes, for 3A001.z.

AIA: Yes for 3A001.z.1.a, z.2.a, z.3.a, z.4.a

ACM: Yes for 3A001.z

LPP: Yes for 3A001.z.1.a, z.2.a, z.3.a, z.4.a

> *Note: See § 740.2(a)(9)(ii) of the EAR for license exception restrictions for ECCN 3A001.z.*

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in 3A001.b.2 or b.3, except those that are being exported or reexported for use in civil telecommunications applications, or 3A001.z to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) See Category XV of the USML for certain “space-qualified” electronics and Category XI of the USML for certain ASICs, 'transmit/receive modules,' 'transmit modules,' or 'MMICs' “subject to the ITAR.” (2) See also 3A090, 3A101, 3A201, 3A611, 3A901 for cryogenic CMOS integrated circuits and parametric signal amplifiers or quantum limited amplifiers not controlled by 3A001, 3A991, and 9A515.

Related Definitions: 'Microcircuit' means a device in which a number of passive or active elements are considered as indivisibly associated on or within a continuous structure to perform the function of a circuit. For the purposes of integrated circuits in 3A001.a.1, 5×10^3 Gy(Si) = 5×10^5 Rads (Si); 5×10^6 Gy (Si)/s = 5×10^8 Rads (Si)/s.

Items:

a. General purpose integrated circuits, as follows:

> *Note 1: Integrated circuits include the following types:*
> *—“Monolithic integrated circuits”;*
>
> *—“Hybrid integrated circuits”;*
>
> *—“Multichip integrated circuits”;*
>
> *—“Film type integrated circuits”, including silicon-on-sapphire integrated circuits;*
>
> *—“Optical integrated circuits”;*
>
> *—“Three dimensional integrated circuits”;*
>
> *—“Monolithic Microwave Integrated Circuits” (“MMICs”).*

a.1. Integrated circuits designed or rated as radiation hardened to withstand any of the following:

a.1.a. A total dose of 5×10^3 Gy (Si), or higher;

a.1.b. A dose rate upset of 5×10^6 Gy (Si)/s, or higher; *or*

a.1.c. A fluence (integrated flux) of neutrons (1 MeV equivalent) of 5×10^{13} n/cm^2 or higher on silicon, or its equivalent for other materials;

Note: 3A001.a.1.c does not apply to Metal Insulator Semiconductors (MIS).

a.2. “Microprocessor microcircuits,” “microcomputer microcircuits,” microcontroller microcircuits, storage integrated circuits manufactured from a compound semiconductor, analog-to-digital converters, integrated circuits that contain analog-to-digital converters and store or process the digitized data, digital-to-analog converters, electro-optical or “optical integrated circuits” designed for “signal processing”, field programmable logic devices, custom integrated circuits for which either the function is unknown or the control status of the equipment in which the integrated circuit will be used in unknown, Fast Fourier Transform (FFT) processors, Static Random-Access Memories (SRAMs), or 'non-volatile memories,' having any of the following:

Technical Note: For the purposes of 3A001.a.2, 'non-volatile memories' are memories with data retention over a period of time after a power shutdown.

a.2.a. Rated for operation at an ambient temperature above 398 K (+125 °C);

a.2.b. Rated for operation at an ambient temperature below 218 K (−55 °C); *or*

a.2.c. Rated for operation over the entire ambient temperature range from 218 K (−55 °C) to 398 K (+125 °C);

N.B.: For cryogenic CMOS integrated circuits not specified by 3A001.a.2, see 3A901.a.

Note: 3A001.a.2 does not apply to integrated circuits designed for civil automobile or railway train applications.

a.3. “Microprocessor microcircuits”, “microcomputer microcircuits” and microcontroller microcircuits, manufactured from a compound semiconductor and operating at a clock frequency exceeding 40 MHz;

Note: 3A001.a.3 includes digital signal processors, digital array processors and digital coprocessors.

a.4. [Reserved]

a.5. Analog-to-Digital Converter (ADC) and Digital-to-Analog Converter (DAC) integrated circuits, as follows:

a.5.a. ADCs having any of the following:

a.5.a.1. A resolution of 8 bit or more, but less than 10 bit, with a “sample rate” greater than 1.3 Giga Samples Per Second (GSPS);

a.5.a.2. A resolution of 10 bit or more, but less than 12 bit, with a “sample rate” greater than 600 Mega Samples Per Second (MSPS);

a.5.a.3. A resolution of 12 bit or more, but less than 14 bit, with a “sample rate” greater than 400 MSPS;

a.5.a.4. A resolution of 14 bit or more, but less than 16 bit, with a “sample rate” greater than 250 MSPS; *or*

a.5.a.5. A resolution of 16 bit or more with a “sample rate” greater than 65 MSPS;

N.B.: For integrated circuits that contain analog-to-digital converters and store or process the digitized data see 3A001.a.14.

Technical Notes: For the purposes of 3A001.a.5.a:
1. A resolution of n bit corresponds to a quantization of 2^n levels.

2. The resolution of the ADC is the number of bits of the digital output that represents the measured analog input. Effective Number of Bits (ENOB) is not used to determine the resolution of the ADC.

3. For “multiple channel ADCs”, the “sample rate” is not aggregated and the “sample rate” is the maximum rate of any single channel.

4. For “interleaved ADCs” or for “multiple channel ADCs” that are specified to have an interleaved mode of operation, the “sample rates” are aggregated and the “sample rate” is the maximum combined total rate of all of the interleaved channels.

a.5.b. Digital-to-Analog Converters (DAC) having any of the following:

a.5.b.1. A resolution of 10-bit or more but less than 12-bit, with an 'adjusted update rate' of exceeding 3,500 MSPS; *or*

a.5.b.2. A resolution of 12-bit or more and having any of the following:

a.5.b.2.a. An 'adjusted update rate' exceeding 1,250 MSPS but not exceeding 3,500 MSPS, and having any of the following:

a.5.b.2.a.1. A settling time less than 9 ns to arrive at or within 0.024% of full scale from a full scale step; *or*

a.5.b.2.a.2. A 'Spurious Free Dynamic Range' (SFDR) greater than 68 dBc (carrier) when synthesizing a full scale analog signal of 100 MHz or the highest full scale analog signal frequency specified below 100 MHz; *or*

a.5.b.2.b. An 'adjusted update rate' exceeding 3,500 MSPS;

Technical Notes: For the purposes of 3A001.a.5.b:
1. 'Spurious Free Dynamic Range' (SFDR) is defined as the ratio of the RMS value of the carrier frequency (maximum signal component) at the input of the DAC to the RMS value of the next largest noise or harmonic distortion component at its output.

2. SFDR is determined directly from the specification table or from the characterization plots of SFDR versus frequency.

3. A signal is defined to be full scale when its amplitude is greater than −3 dBfs (full scale).

4. 'Adjusted update rate' for DACs is:

a. For conventional (non-interpolating) DACs, the 'adjusted update rate' is the rate at which the digital signal is converted to an analog signal and the output analog values are changed by the DAC. For DACs where the interpolation mode may be bypassed (interpolation factor of one), the DAC should be considered as a conventional (non-interpolating) DAC.

b. For interpolating DACs (oversampling DACs), the 'adjusted update rate' is defined as the DAC update rate divided by the smallest interpolating factor. For interpolating DACs, the 'adjusted update rate' may be referred to by different terms including:

• *input data rate*

• *input word rate*

• *input sample rate*

• *maximum total input bus rate*

• *maximum DAC clock rate for DAC clock input*

a.6. Electro-optical and “optical integrated circuits”, designed for “signal processing” and having all of the following:

a.6.a. One or more than one internal “laser” diode;

a.6.b. One or more than one internal light detecting element; *and*

a.6.c. Optical waveguides;

a.7. 'Field programmable logic devices' having any of the following:

a.7.a. A maximum number of single-ended digital input/outputs of greater than 700; *or*

a.7.b. An 'aggregate one-way peak serial transceiver data rate' of 500 Gb/s or greater;

Note: 3A001.a.7 includes:
—Complex Programmable Logic Devices (CPLDs);

—Field Programmable Gate Arrays (FPGAs);

—Field Programmable Logic Arrays (FPLAs);

—Field Programmable Interconnects (FPICs).

N.B.: For integrated circuits having field programmable logic devices that are combined with an analog-to-digital converter, see 3A001.a.14.

Technical Notes: For the purposes of 3A001.a.7:
1. Maximum number of digital input/outputs in 3A001.a.7.a is also referred to as maximum user input/outputs or maximum available input/outputs, whether the integrated circuit is packaged or bare die.

2. 'Aggregate one-way peak serial transceiver data rate' is the product of the peak serial one-way transceiver data rate times the number of transceivers on the FPGA.

a.8. [Reserved]

a.9. [Reserved]

a.10. Custom integrated circuits for which the function is unknown, or the control status of the equipment in which the integrated circuits will be used is unknown to the manufacturer, having any of the following:

a.10.a. More than 1,500 terminals;

a.10.b. A typical “basic gate propagation delay time” of less than 0.02 ns; *or*

a.10.c. An operating frequency exceeding 3 GHz;

a.11. Digital integrated circuits, other than those described in 3A001.a.3 to 3A001.a.10 and 3A001.a.12, based upon any compound semiconductor and having any of the following:

a.11.a. An equivalent gate count of more than 3,000 (2 input gates); *or*

a.11.b. A toggle frequency exceeding 1.2 GHz;

a.12. Fast Fourier Transform (FFT) processors having a rated execution time for an N-point complex FFT of less than $(N \log_2 N)/20{,}480$ ms, where N is the number of points;

Technical Note: For the purposes of 3A001.a.12, when N is equal to 1,024 points, the formula in 3A001.a.12 gives an execution time of 500 µs.

a.13. Direct Digital Synthesizer (DDS) integrated circuits having any of the following:

a.13.a. A Digital-to-Analog Converter (DAC) clock frequency of 3.5 GHz or more and a DAC resolution of 10 bit or more, but less than 12 bit; *or*

a.13.b. A DAC clock frequency of 1.25 GHz or more and a DAC resolution of 12 bit or more;

Technical Note: For the purposes of 3A001.a.13, the DAC clock frequency may be specified as the master clock frequency or the input clock frequency.

a.14. Integrated circuits that perform or are programmable to perform all of the following:

a.14.a. Analog-to-digital conversions meeting any of the following:

a.14.a.1. A resolution of 8 bit or more, but less than 10 bit, with a “sample rate” greater than 1.3 Giga Samples Per Second (GSPS);

a.14.a.2. A resolution of 10 bit or more, but less than 12 bit, with a “sample rate” greater than 1.0 GSPS;

a.14.a.3. A resolution of 12 bit or more, but less than 14 bit, with a “sample rate” greater than 1.0 GSPS;

a.14.a.4. A resolution of 14 bit or more, but less than 16 bit, with a “sample rate” greater than 400 Mega Samples Per Second (MSPS); *or*

a.14.a.5. A resolution of 16 bit or more with a “sample rate” greater than 180 MSPS; *and*

a.14.b. Any of the following:

a.14.b.1. Storage of digitized data; *or*

a.14.b.2. Processing of digitized data;

N.B.: *1: For analog-to-digital converter integrated circuits see 3A001.a.5.a.*

N.B.: *2: For field programmable logic devices see 3A001.a.7.*

Technical Notes: For the purposes of 3A001.a.14:
1. A resolution of n bit corresponds to a quantization of 2^n levels.

2. The resolution of the ADC is the number of bits of the digital output of the ADC that represents the measured analog input. Effective Number of Bits (ENOB) is not used to determine the resolution of the ADC.

3. For integrated circuits with non- interleaving "multiple channel ADCs", the "sample rate" is not aggregated and the "sample rate" is the maximum rate of any single channel.

4. For integrated circuits with "interleaved ADCs" or with "multiple channel ADCs" that are specified to have an interleaved mode of operation, the "sample rates" are aggregated and the "sample rate" is the maximum combined total rate of all of the interleaved channels.

b. Microwave or millimeter wave items, as follows:

Technical Note: For the purposes of 3A001.b, the parameter peak saturated power output may also be referred to on product data sheets as output power, saturated power output, maximum power output, peak power output, or peak envelope power output.

N.B.: For parametric signal amplifiers or Quantum-limited amplifiers (QLAs) not specified by 3A001.b, see ECCN 3A901.b.

b.1. "Vacuum electronic devices" and cathodes, as follows:

Note 1: 3A001.b.1 does not control "vacuum electronic devices" designed or rated for operation in any frequency band and having all of the following:
a. Does not exceed 31.8 GHz; and

b. Is "allocated by the ITU" for radio-communications services, but not for radio-determination.

Note 2: 3A001.b.1 does not control non-"space-qualified" "vacuum electronic devices" having all the following:
a. An average output power equal to or less than 50 W; and

b. Designed or rated for operation in any frequency band and having all of the following:

1. Exceeds 31.8 GHz but does not exceed 43.5 GHz; and

2. Is "allocated by the ITU" for radio-communications services, but not for radio-determination.

b.1.a. Traveling-wave “vacuum electronic devices,” pulsed or continuous wave, as follows:

b.1.a.1. Devices operating at frequencies exceeding 31.8 GHz;

b.1.a.2. Devices having a cathode heater with a turn on time to rated RF power of less than 3 seconds;

b.1.a.3. Coupled cavity devices, or derivatives thereof, with a “fractional bandwidth” of more than 7% or a peak power exceeding 2.5 kW;

b.1.a.4. Devices based on helix, folded waveguide, or serpentine waveguide circuits, or derivatives thereof, having any of the following:

b.1.a.4.a. An “instantaneous bandwidth” of more than one octave, and average power (expressed in kW) times frequency (expressed in GHz) of more than 0.5;

b.1.a.4.b. An “instantaneous bandwidth” of one octave or less, and average power (expressed in kW) times frequency (expressed in GHz) of more than 1;

b.1.a.4.c. Being “space-qualified”; *or*

b.1.a.4.d. Having a gridded electron gun;

b.1.a.5. Devices with a “fractional bandwidth” greater than or equal to 10%, with any of the following:

b.1.a.5.a. An annular electron beam;

b.1.a.5.b. A non-axisymmetric electron beam; *or*

b.1.a.5.c. Multiple electron beams;

b.1.b. Crossed-field amplifier “vacuum electronic devices” with a gain of more than 17 dB;

b.1.c. Thermionic cathodes, designed for “vacuum electronic devices,” producing an emission current density at rated operating conditions exceeding 5 A/cm^2 or a pulsed (non-continuous) current density at rated operating conditions exceeding 10 A/cm^2;

b.1.d. “Vacuum electronic devices” with the capability to operate in a 'dual mode.'

> *Technical Note: For the purposes of 3A001.b.1.d, 'dual mode' means the “vacuum electronic device” beam current can be intentionally changed between continuous-wave and pulsed mode operation by use of a grid and produces a peak pulse output power greater than the continuous-wave output power.*

b.2. “Monolithic Microwave Integrated Circuit” (“MMIC”) amplifiers that any of the following:

N.B.: *For "MMIC" amplifiers that have an integrated phase shifter see 3A001.b.12.*

b.2.a. Rated for operation at frequencies exceeding 2.7 GHz up to and including 6.8 GHz with a "fractional bandwidth" greater than 15%, and having any of the following:

b.2.a.1. A peak saturated power output greater than 75 W (48.75 dBm) at any frequency exceeding 2.7 GHz up to and including 2.9 GHz;

b.2.a.2. A peak saturated power output greater than 55 W (47.4 dBm) at any frequency exceeding 2.9 GHz up to and including 3.2 GHz;

b.2.a.3. A peak saturated power output greater than 40 W (46 dBm) at any frequency exceeding 3.2 GHz up to and including 3.7 GHz; *or*

b.2.a.4. A peak saturated power output greater than 20 W (43 dBm) at any frequency exceeding 3.7 GHz up to and including 6.8 GHz;

b.2.b. Rated for operation at frequencies exceeding 6.8 GHz up to and including 16 GHz with a "fractional bandwidth" greater than 10%, and having any of the following:

b.2.b.1. A peak saturated power output greater than 10 W (40 dBm) at any frequency exceeding 6.8 GHz up to and including 8.5 GHz; *or*

b.2.b.2. A peak saturated power output greater than 5 W (37 dBm) at any frequency exceeding 8.5 GHz up to and including 16 GHz;

b.2.c. Rated for operation with a peak saturated power output greater than 3 W (34.77 dBm) at any frequency exceeding 16 GHz up to and including 31.8 GHz, and with a "fractional bandwidth" of greater than 10%;

b.2.d. Rated for operation with a peak saturated power output greater than 0.1 nW (−70 dBm) at any frequency exceeding 31.8 GHz up to and including 37 GHz;

b.2.e. Rated for operation with a peak saturated power output greater than 1 W (30 dBm) at any frequency exceeding 37 GHz up to and including 43.5 GHz, and with a "fractional bandwidth" of greater than 10%;

b.2.f. Rated for operation with a peak saturated power output greater than 31.62 mW (15 dBm) at any frequency exceeding 43.5 GHz up to and including 75 GHz, and with a "fractional bandwidth" of greater than 10%;

b.2.g. Rated for operation with a peak saturated power output greater than 10 mW (10 dBm) at any frequency exceeding 75 GHz up to and including 90 GHz, and with a "fractional bandwidth" of greater than 5%; *or*

b.2.h. Rated for operation with a peak saturated power output greater than 0.1 nW (−70 dBm) at any frequency exceeding 90 GHz;

Note 1: [Reserved]

Note 2: The control status of the "MMIC" whose rated operating frequency includes frequencies listed in more than one frequency range, as defined by 3A001.b.2.a through 3A001.b.2.h, is determined by the lowest peak saturated power output control threshold.

Note 3: Notes 1 and 2 following the Category 3 heading for product group A. Systems, Equipment, and Components mean that 3A001.b.2 does not control "MMICs" if they are "specially designed" for other applications, e.g., telecommunications, radar, automobiles.

b.3. Discrete microwave transistors that are any of the following:

b.3.a. Rated for operation at frequencies exceeding 2.7 GHz up to and including 6.8 GHz and having any of the following:

b.3.a.1. A peak saturated power output greater than 400 W (56 dBm) at any frequency exceeding 2.7 GHz up to and including 2.9 GHz;

b.3.a.2. A peak saturated power output greater than 205 W (53.12 dBm) at any frequency exceeding 2.9 GHz up to and including 3.2 GHz;

b.3.a.3. A peak saturated power output greater than 115 W (50.61 dBm) at any frequency exceeding 3.2 GHz up to and including 3.7 GHz; *or*

b.3.a.4. A peak saturated power output greater than 60 W (47.78 dBm) at any frequency exceeding 3.7 GHz up to and including 6.8 GHz;

b.3.b. Rated for operation at frequencies exceeding 6.8 GHz up to and including 31.8 GHz and having any of the following:

b.3.b.1. A peak saturated power output greater than 50 W (47 dBm) at any frequency exceeding 6.8 GHz up to and including 8.5 GHz;

b.3.b.2. A peak saturated power output greater than 15 W (41.76 dBm) at any frequency exceeding 8.5 GHz up to and including 12 GHz;

b.3.b.3. A peak saturated power output greater than 40 W (46 dBm) at any frequency exceeding 12 GHz up to and including 16 GHz; *or*

b.3.b.4. A peak saturated power output greater than 7 W (38.45 dBm) at any frequency exceeding 16 GHz up to and including 31.8 GHz;

b.3.c. Rated for operation with a peak saturated power output greater than 0.5 W (27 dBm) at any frequency exceeding 31.8 GHz up to and including 37 GHz;

b.3.d. Rated for operation with a peak saturated power output greater than 1 W (30 dBm) at any frequency exceeding 37 GHz up to and including 43.5 GHz;

b.3.e. Rated for operation with a peak saturated power output greater than 0.1 nW (−70 dBm) at any frequency exceeding 43.5 GHz; *or*

b.3.f. Other than those specified by 3A001.b.3.a to 3A001.b.3.e and rated for operation with a peak saturated power output greater than 5 W (37.0 dBm) at all frequencies exceeding 8.5 GHz up to and including 31.8 GHz;

Note 1: The control status of a transistor in 3A001.b.3.a through 3A001.b.3.e, whose rated operating frequency includes frequencies listed in more than one frequency range, as defined by 3A001.b.3.a through 3A001.b.3.e, is determined by the lowest peak saturated power output control threshold.

Note 2: 3A001.b.3 includes bare dice, dice mounted on carriers, or dice mounted in packages. Some discrete transistors may also be referred to as power amplifiers, but the status of these discrete transistors is determined by 3A001.b.3.

b.4. Microwave solid state amplifiers and microwave assemblies/modules containing microwave solid state amplifiers, that are any of the following:

b.4.a. Rated for operation at frequencies exceeding 2.7 GHz up to and including 6.8 GHz with a “fractional bandwidth” greater than 15%, and having any of the following:

b.4.a.1. A peak saturated power output greater than 500 W (57 dBm) at any frequency exceeding 2.7 GHz up to and including 2.9 GHz;

b.4.a.2. A peak saturated power output greater than 270 W (54.3 dBm) at any frequency exceeding 2.9 GHz up to and including 3.2 GHz;

b.4.a.3. A peak saturated power output greater than 200 W (53 dBm) at any frequency exceeding 3.2 GHz up to and including 3.7 GHz; *or*

b.4.a.4. A peak saturated power output greater than 90 W (49.54 dBm) at any frequency exceeding 3.7 GHz up to and including 6.8 GHz;

b.4.b. Rated for operation at frequencies exceeding 6.8 GHz up to and including 31.8 GHz with a “fractional bandwidth” greater than 10%, and having any of the following:

b.4.b.1. A peak saturated power output greater than 70 W (48.45 dBm) at any frequency exceeding 6.8 GHz up to and including 8.5 GHz;

b.4.b.2. A peak saturated power output greater than 50 W (47 dBm) at any frequency exceeding 8.5 GHz up to and including 12 GHz;

b.4.b.3. A peak saturated power output greater than 30 W (44.77 dBm) at any frequency exceeding 12 GHz up to and including 16 GHz; *or*

b.4.b.4. A peak saturated power output greater than 20 W (43 dBm) at any frequency exceeding 16 GHz up to and including 31.8 GHz;

b.4.c. Rated for operation with a peak saturated power output greater than 0.5 W (27 dBm) at any frequency exceeding 31.8 GHz up to and including 37 GHz;

b.4.d. Rated for operation with a peak saturated power output greater than 2 W (33 dBm) at any frequency exceeding 37 GHz up to and including 43.5 GHz, and with a “fractional bandwidth” of greater than 10%;

b.4.e. Rated for operation at frequencies exceeding 43.5 GHz and having any of the following:

b.4.e.1. A peak saturated power output greater than 0.2 W (23 dBm) at any frequency exceeding 43.5 GHz up to and including 75 GHz, and with a “fractional bandwidth” of greater than 10%;

b.4.e.2. A peak saturated power output greater than 20 mW (13 dBm) at any frequency exceeding 75 GHz up to and including 90 GHz, and with a “fractional bandwidth” of greater than 5%; *or*

b.4.e.3. A peak saturated power output greater than 0.1 nW (−70 dBm) at any frequency exceeding 90 GHz; *or*

b.4.f. [Reserved]

N.B.: 1. For “MMIC” amplifiers see 3A001.b.2.
2. For 'transmit/receive modules' and 'transmit modules' see 3A001.b.12.

3. For converters and harmonic mixers, designed to extend the operating or frequency range of signal analyzers, signal generators, network analyzers or microwave test receivers, see 3A001.b.7.

Note 1: [Reserved]

Note 2: The control status of an item whose rated operating frequency includes frequencies listed in more than one frequency range, as defined by 3A001.b.4.a through 3A001.b.4.e, is determined by the lowest peak saturated power output control threshold.

b.5. Electronically or magnetically tunable band-pass or band-stop filters, having more than 5 tunable resonators capable of tuning across a 1.5:1 frequency band (f_{max}/f_{min}) in less than 10 ms and having any of the following:

b.5.a. A band-pass bandwidth of more than 0.5% of center frequency; *or*

b.5.b. A band-stop bandwidth of less than 0.5% of center frequency;

b.6. [Reserved]

b.7. Converters and harmonic mixers, that are any of the following:

b.7.a. Designed to extend the frequency range of “signal analyzers” beyond 90 GHz;

b.7.b. Designed to extend the operating range of signal generators as follows:

b.7.b.1. Beyond 90 GHz;

b.7.b.2. To an output power greater than 100 mW (20 dBm) anywhere within the frequency range exceeding 43.5 GHz but not exceeding 90 GHz;

b.7.c. Designed to extend the operating range of network analyzers as follows:

b.7.c.1. Beyond 110 GHz;

b.7.c.2. To an output power greater than 31.62 mW (15 dBm) anywhere within the frequency range exceeding 43.5 GHz but not exceeding 90 GHz;

b.7.c.3. To an output power greater than 1 mW (0 dBm) anywhere within the frequency range exceeding 90 GHz but not exceeding 110 GHz; *or*

b.7.d. Designed to extend the frequency range of microwave test receivers beyond 110 GHz;

b.8. Microwave power amplifiers containing “vacuum electronic devices” controlled by 3A001.b.1 and having all of the following:

b.8.a. Operating frequencies above 3 GHz;

b.8.b. An average output power to mass ratio exceeding 80 W/kg; *and*

b.8.c. A volume of less than 400 cm^3;

> *Note: 3A001.b.8 does not control equipment designed or rated for operation in any frequency band which is “allocated by the ITU” for radio-communications services, but not for radio-determination.*

b.9. Microwave Power Modules (MPM) consisting of, at least, a traveling-wave “vacuum electronic device,” a “Monolithic Microwave Integrated Circuit” (“MMIC”) and an integrated electronic power conditioner and having all of the following:

b.9.a. A 'turn-on time' from off to fully operational in less than 10 seconds;

b.9.b. A volume less than the maximum rated power in Watts multiplied by 10 cm^3/W; *and*

b.9.c. An “instantaneous bandwidth” greater than 1 octave ($f_{max} > 2f_{min}$) and having any of the following:

b.9.c.1. For frequencies equal to or less than 18 GHz, an RF output power greater than 100 W; *or*

b.9.c.2. A frequency greater than 18 GHz;

Technical Notes: For the purposes of 3A001.b.9:
1. To calculate the volume in 3A001.b.9.b, the following example is provided: for a maximum rated power of 20 W, the volume would be: 20 W × 10 cm^3/W = 200 cm^3.

2. The 'turn-on time' in 3A001.b.9.a refers to the time from fully-off to fully operational, i.e., it includes the warm-up time of the MPM.

b.10. Oscillators or oscillator assemblies, specified to operate with a single sideband (SSB) phase noise, in dBc/Hz, less (better) than $-(126 + 20\log_{10}F - 20\log_{10}f)$ anywhere within the range of 10 Hz ≤ F ≤ 10 kHz;

Technical Note: For the purposes of 3A001.b.10, F is the offset from the operating frequency in Hz and f is the operating frequency in MHz.

b.11. 'Frequency synthesizer' “electronic assemblies” having a “frequency switching time” as specified by any of the following:

b.11.a. Less than 143 ps;

b.11.b. Less than 100 μs for any frequency change exceeding 2.2 GHz within the synthesized frequency range exceeding 4.8 GHz but not exceeding 31.8 GHz;

b.11.c. [Reserved]

b.11.d. Less than 500 μs for any frequency change exceeding 550 MHz within the synthesized frequency range exceeding 31.8 GHz but not exceeding 37 GHz;

b.11.e. Less than 100 μs for any frequency change exceeding 2.2 GHz within the synthesized frequency range exceeding 37 GHz but not exceeding 75 GHz;

b.11.f. Less than 100 μs for any frequency change exceeding 5.0 GHz within the synthesized frequency range exceeding 75 GHz but not exceeding 90 GHz; *or*

b.11.g. Less than 1 ms within the synthesized frequency range exceeding 90 GHz;

Technical Note: For the purposes of 3A001.b.11, a 'frequency synthesizer' is any kind of frequency source, regardless of the actual technique used, providing a multiplicity of simultaneous or alternative output frequencies, from one or more outputs, controlled by, derived from or disciplined by a lesser number of standard (or master) frequencies.

N.B.: For general purpose “signal analyzers”, signal generators, network analyzers and microwave test receivers, see 3A002.c, 3A002.d, 3A002.e and 3A002.f, respectively.

b.12. 'Transmit/receive modules, 'transmit/receive MMICs, 'transmit modules,' and 'transmit MMICs,' rated for operation at frequencies above 2.7 GHz and having all of the following:

b.12.a. A peak saturated power output (in watts), P_{sat}, greater than 505.62 divided by the maximum operating frequency (in GHz) squared [P_{sat}>505.62 W*GHz^2/f_{GHz}^2] for any channel;

b.12.b. A “fractional bandwidth” of 5% or greater for any channel;

b.12.c. Any planar side with length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [$d \leq 15cm*GHz*N/f_{GHz}$] where N is the number of transmit or transmit/receive channels; *and*

b.12.d. An electronically variable phase shifter per channel;

Technical Notes: For the purposes of 3A001.b.12:
1. A 'transmit/receive module' is a multifunction “electronic assembly” that provides bi-directional amplitude and phase control for transmission and reception of signals.

2. A 'transmit module' is an “electronic assembly” that provides amplitude and phase control for transmission of signals.

3. A 'transmit/receive MMIC' is a multifunction “MMIC” that provides bi-directional amplitude and phase control for transmission and reception of signals.

4. A 'transmit MMIC' is a “MMIC” that provides amplitude and phase control for transmission of signals.

*5. 2.7 GHz should be used as the lowest operating frequency (f_{GHz}) in the formula in 3A001.b.12.c for transmit/receive or transmit modules that have a rated operation range extending downward to 2.7 GHz and below [d≤15cm*GHz*N/2.7 GHz].*

6. 3A001.b.12 applies to 'transmit/receive modules' or 'transmit modules' with or without a heat sink. The value of d in 3A001.b.12.c does not include any portion of the 'transmit/receive module' or 'transmit module' that functions as a heat sink.

7. 'Transmit/receive modules' or 'transmit modules,' 'transmit/receive MMICs' or 'transmit MMICs' may or may not have N integrated radiating antenna elements where N is the number of transmit or transmit/receive channels.

c. Acoustic wave devices as follows and “specially designed” “components” therefor:

c.1. Surface acoustic wave and surface skimming (shallow bulk) acoustic wave devices, having any of the following:

c.1.a. A carrier frequency exceeding 6 GHz;

c.1.b. A carrier frequency exceeding 1 GHz, but not exceeding 6 GHz and having any of the following:

c.1.b.1. A 'frequency side-lobe rejection' exceeding 65 dB;

c.1.b.2. A product of the maximum delay time and the bandwidth (time in μs and bandwidth in MHz) of more than 100;

c.1.b.3. A bandwidth greater than 250 MHz; *or*

c.1.b.4. A dispersive delay of more than 10 μs; *or*

c.1.c. A carrier frequency of 1 GHz or less and having any of the following:

c.1.c.1. A product of the maximum delay time and the bandwidth (time in μs and bandwidth in MHz) of more than 100;

c.1.c.2. A dispersive delay of more than 10 μs; *or*

c.1.c.3. A 'frequency side-lobe rejection' exceeding 65 dB and a bandwidth greater than 100 MHz;

> *Technical Note: For the purposes of 3A001.c.1, 'frequency side-lobe rejection' is the maximum rejection value specified in data sheet.*

c.2. Bulk (volume) acoustic wave devices that permit the direct processing of signals at frequencies exceeding 6 GHz;

c.3. Acoustic-optic “signal processing” devices employing interaction between acoustic waves (bulk wave or surface wave) and light waves that permit the direct processing of signals or images, including spectral analysis, correlation or convolution;

> *Note: 3A001.c does not control acoustic wave devices that are limited to a single band pass, low pass, high pass or notch filtering, or resonating function.*

d. Electronic devices and circuits containing “components,” manufactured from “superconductive” materials, “specially designed” for operation at temperatures below the “critical temperature” of at least one of the “superconductive” constituents and having any of the following:

d.1. Current switching for digital circuits using “superconductive” gates with a product of delay time per gate (in seconds) and power dissipation per gate (in watts) of less than 10^{-14} J; *or*

d.2. Frequency selection at all frequencies using resonant circuits with Q-values exceeding 10,000;

e. High energy devices as follows:

e.1. 'Cells' as follows:

e.1.a 'Primary cells' having any of the following at 20 °C:

e.1.a.1. 'Energy density' exceeding 550 Wh/kg and a 'continuous power density' exceeding 50 W/kg; *or*

e.1.a.2. 'Energy density' exceeding 50 Wh/kg and a 'continuous power density' exceeding 350 W/kg;

e.1.b. 'Secondary cells' having an 'energy density' exceeding 350 Wh/kg at 20 °C;

Technical Notes: 1. For the purposes of 3A001.e.1, 'energy density' (Wh/kg) is calculated from the nominal voltage multiplied by the nominal capacity in ampere-hours (Ah) divided by the mass in kilograms. If the nominal capacity is not stated, energy density is calculated from the nominal voltage squared then multiplied by the discharge duration in hours divided by the discharge load in Ohms and the mass in kilograms.
2. For the purposes of 3A001.e.1, a 'cell' is defined as an electrochemical device, which has positive and negative electrodes, an electrolyte, and is a source of electrical energy. It is the basic building block of a battery.

3. For the purposes of 3A001.e.1.a, a 'primary cell' is a 'cell' that is not designed to be charged by any other source.

4. For the purposes of 3A001.e.1.b, a 'secondary cell' is a 'cell' that is designed to be charged by an external electrical source.

5. For the purposes of 3A001.e.1.a, 'continuous power density' (W/kg) is calculated from the nominal voltage multiplied by the specified maximum continuous discharge current in ampere (A) divided by the mass in kilograms. 'Continuous power density' is also referred to as specific power.

Note: 3A001.e does not control batteries, including single-cell batteries.

e.2. High energy storage capacitors as follows:

e.2.a. Capacitors with a repetition rate of less than 10 Hz (single shot capacitors) and having all of the following:

e.2.a.1. A voltage rating equal to or more than 5 kV;

e.2.a.2. An energy density equal to or more than 250 J/kg; *and*

e.2.a.3. A total energy equal to or more than 25 kJ;

e.2.b. Capacitors with a repetition rate of 10 Hz or more (repetition rated capacitors) and having all of the following:

e.2.b.1. A voltage rating equal to or more than 5 kV;

e.2.b.2. An energy density equal to or more than 50 J/kg;

e.2.b.3. A total energy equal to or more than 100 J; *and*

e.2.b.4. A charge/discharge cycle life equal to or more than 10,000;

e.3. “Superconductive” electromagnets and solenoids, “specially designed” to be fully charged or discharged in less than one second and having all of the following:

> *Note: 3A001.e.3 does not control “superconductive” electromagnets or solenoids “specially designed” for Magnetic Resonance Imaging (MRI) medical equipment.*

e.3.a. Energy delivered during the discharge exceeding 10 kJ in the first second;

e.3.b. Inner diameter of the current carrying windings of more than 250 mm; *and*

e.3.c. Rated for a magnetic induction of more than 8 T or “overall current density” in the winding of more than 300 A/mm^2;

e.4. Solar cells, cell-interconnect-coverglass (CIC) assemblies, solar panels, and solar arrays, which are “space-qualified,” having a minimum average efficiency exceeding 20% at an operating temperature of 301 K (28 °C) under simulated 'AM0' illumination with an irradiance of 1,367 Watts per square meter (W/m^2);

> *Technical Note: For the purposes of 3A001.e.4, 'AM0', or 'Air Mass Zero', refers to the spectral irradiance of sun light in the earth's outer atmosphere when the distance between the earth and sun is one astronomical unit (AU).*

f. Rotary input type absolute position encoders having an “accuracy” equal to or less (better) than 1.0 second of arc and “specially designed” encoder rings, discs or scales therefor;

g. Solid-state pulsed power switching thyristor devices and 'thyristor modules', using either electrically, optically, or electron radiation controlled switch methods and having any of the following:

g.1. A maximum turn-on current rate of rise (di/dt) greater than 30,000 A/μs and off-state voltage greater than 1,100 V; *or*

g.2. A maximum turn-on current rate of rise (di/dt) greater than 2,000 A/μs and having all of the following:

g.2.a. An off-state peak voltage equal to or greater than 3,000 V; *and*

g.2.b. A peak (surge) current equal to or greater than 3,000 A;

> *Note 1: 3A001.g. includes:*

—Silicon Controlled Rectifiers (SCRs)

—Electrical Triggering Thyristors (ETTs)

—Light Triggering Thyristors (LTTs)

—Integrated Gate Commutated Thyristors (IGCTs)

—Gate Turn-off Thyristors (GTOs)

—MOS Controlled Thyristors (MCTs)

—Solidtrons

Note 2: 3A001.g does not control thyristor devices and 'thyristor modules' incorporated into equipment designed for civil railway or "civil aircraft" applications.

Technical Note: For the purposes of 3A001.g, a 'thyristor module' contains one or more thyristor devices.

h. Solid-state power semiconductor switches, diodes, or 'modules', having all of the following:

h.1. Rated for a maximum operating junction temperature greater than 488 K (215 °C);

h.2. Repetitive peak off-state voltage (blocking voltage) exceeding 300 V; *and*

h.3. Continuous current greater than 1 A.

Technical Note: For the purposes of 3A001.h, 'modules' contain one or more solid-state power semiconductor switches or diodes.

Note 1: Repetitive peak off-state voltage in 3A001.h includes drain to source voltage, collector to emitter voltage, repetitive peak reverse voltage and peak repetitive off-state blocking voltage.

Note 2: 3A001.h includes:
—Junction Field Effect Transistors (JFETs)

—Vertical Junction Field Effect Transistors (VJFETs)

—Metal Oxide Semiconductor Field Effect Transistors (MOSFETs)

—Double Diffused Metal Oxide Semiconductor Field Effect Transistor (DMOSFET)

—Insulated Gate Bipolar Transistor (IGBT)

—High Electron Mobility Transistors (HEMTs)

—Bipolar Junction Transistors (BJTs)

—Thyristors and Silicon Controlled Rectifiers (SCRs)

—Gate Turn-Off Thyristors (GTOs)

—Emitter Turn-Off Thyristors (ETOs)

—PiN Diodes

—Schottky Diodes

Note 3: 3A001.h does not apply to switches, diodes, or 'modules', incorporated into equipment designed for civil automobile, civil railway, or "civil aircraft" applications.

i. Intensity, amplitude, or phase electro-optic modulators, designed for analog signals and having any of the following:

i.1. A maximum operating frequency of more than 10 GHz but less than 20 GHz, an optical insertion loss equal to or less than 3 dB and having any of the following:

i.1.a. A 'half-wave voltage' ('Vπ') less than 2.7 V when measured at a frequency of 1 GHz or below; *or*

i.1.b. A 'Vπ' of less than 4 V when measured at a frequency of more than 1 GHz; *or*

i.2. A maximum operating frequency equal to or greater than 20 GHz, an optical insertion loss equal to or less than 3 dB and having any of the following:

i.2.a. A 'Vπ' less than 3.3 V when measured at a frequency of 1 GHz or below; *or*

i.2.b. A 'Vπ' less than 5 V when measured at a frequency of more than 1 GHz.

Note: 3A001.i includes electro-optic modulators having optical input and output connectors (e.g.,

fiber-optic pigtails).

Technical Note: For the purposes of 3A001.i, a 'half-wave voltage' ('Vπ') is the applied voltage necessary to make a phase change of 180 degrees in the wavelength of light propagating through the optical modulator.

j. through y. [Reserved]

z. Any commodity described in 3A001 that meets or exceeds the performance parameters in 3A090, as follows:

z.1.a “Monolithic Microwave Integrated Circuit” (“MMIC”) amplifiers described in 3A001.b.2 and discrete microwave transistors in 3A001.b.3 that also meet or exceed the performance parameters in ECCN 3A090.a, except those 3A001.b.2 and b.3 items being exported or reexported for use in civil telecommunications applications;

z.1.b “Monolithic Microwave Integrated Circuit” (“MMIC”) amplifiers described in 3A001.b.2 and discrete microwave transistors in 3A001.b.3 that also meet or exceed the performance parameters in ECCN 3A090.b, except those 3A001.b.2 and b.3 items being exported or reexported for use in civil telecommunications applications;

z.2.a Commodities that are described in 3A001.a.1.a when usable in “missiles” that also meet or exceed the performance parameters in ECCN 3A090.a; and to 3A001.a.5.a when “designed or modified” for military use, hermetically sealed and rated for operation in the temperature range from below −54 °C to above +125 °C and that also meet or exceed the performance parameters in ECCN 3A090.a;

z.2.b Commodities that are described in 3A001.a.1.a when usable in “missiles” that also meet or exceed the performance parameters in ECCN 3A090.b; and to 3A001.a.5.a when “designed or modified” for military use, hermetically sealed and rated for operation in the temperature range from below −54 °C to above +125 °C and that also meet or exceed the performance parameters in ECCN 3A090.b;

z.3.a. Pulse discharge capacitors described in 3A001.e.2 and superconducting solenoidal electromagnets in 3A001.e.3 that meet or exceed the technical parameters in 3A201.a and 3A201.b, respectively and that also meet or exceed the performance parameters in ECCN 3A090.a;

z.3.b Pulse discharge capacitors described in 3A001.e.2 and superconducting solenoidal electromagnets in 3A001.e.3 that meet or exceed the technical parameters in 3A201.a and 3A201.b, respectively and that also meet or exceed the performance parameters in ECCN 3A090.b;

z.4.a. All other commodities specified in this ECCN that meet or exceed the performance parameters of ECCN 3A090.a; or

z.4.b All other commodities specified in this ECCN that meet or exceed the performance parameters of ECCN 3A090.b.

3A002 General purpose “electronic assemblies,” modules and equipment, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
MT applies to 3A002.h when the parameters in 3A101.a.2.b are met or exceeded	MT Column 1
AT applies to entire entry	AT Column 1

Reporting Requirements: See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3000: 3A002.a, .e, .f, and .g

$5000: 3A002.c to .d, and .h (unless controlled for MT);

GBS: Yes, for 3A002.h (unless controlled for MT)

Special Conditions for STA

STA: License Exception STA may not be used to ship any item in 3A002.g.1 to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

List of Items Controlled

Related Controls: See Category XV(e)(9) of the USML for certain "space-qualified" atomic frequency standards "subject to the ITAR" (see 22 CFR parts 120 through 130). See also 3A101, 3A992 and 9A515.x.

Related Definitions: Constant percentage bandwidth filters are also known as octave or fractional octave filters.

Items:

a. Recording equipment and oscilloscopes, as follows:

a.1. to a.5. [Reserved]

> *N.B.: For waveform digitizers and transient recorders, see 3A002.h.*

a.6. Digital data recorders having all of the following:

a.6.a. A sustained 'continuous throughput' of more than 6.4 Gbit/s to disk or solid-state drive memory; *and*

a.6.b. “Signal processing” of the radio frequency signal data while it is being recorded;

> *Technical Notes: For the purposes of 3A002.a.6:*
> *1. For recorders with a parallel bus architecture, the 'continuous throughput' rate is the highest word rate multiplied by the number of bits in a word.*
>
> *2. 'Continuous throughput' is the fastest data rate the instrument can record to disk or solid-state drive memory without the loss of any information while sustaining the input digital data rate or digitizer conversion rate.*

a.7. Real-time oscilloscopes having a vertical root-mean-square (rms) noise voltage of less than 2% of full-scale at the vertical scale setting that provides the lowest noise value for any input 3dB bandwidth of 60 GHz or greater per channel;

> *Note: 3A002.a.7 does not apply to equivalent-time sampling oscilloscopes.*

b. [Reserved]

c. “Signal analyzers” as follows:

c.1. “Signal analyzers” having a 3 dB resolution bandwidth (RBW) exceeding 40 MHz anywhere within the frequency range exceeding 31.8 GHz but not exceeding 37 GHz;

c.2. “Signal analyzers” having a Displayed Average Noise Level (DANL) less (better) than −150 dBm/Hz anywhere within the frequency range exceeding 43.5 GHz but not exceeding 90 GHz;

c.3. “Signal analyzers” having a frequency exceeding 90 GHz;

c.4. “Signal analyzers” having all of the following:

c.4.a. 'Real-time bandwidth' exceeding 170 MHz; *and*

c.4.b. Having any of the following:

c.4.b.1. 100% probability of discovery, with less than a 3 dB reduction from full amplitude due to gaps or windowing effects, of signals having a duration of 15 µs or less; *or*

c.4.b.2. A 'frequency mask trigger' function, with 100% probability of trigger (capture) for signals having a duration of 15 µs or less;

> *Technical Notes: 1. For the purposes of 3A002.c.4.a, 'real-time bandwidth' is the widest frequency*

range for which the analyzer can continuously transform time-domain data entirely into frequency-domain results, using a Fourier or other discrete time transform that processes every incoming time point, without a reduction of measured amplitude of more than 3 dB below the actual signal amplitude caused by gaps or windowing effects, while outputting or displaying the transformed data.
2. For the purposes of 3A002.c.4.b.1., probability of discovery is also referred to as probability of intercept or probability of capture.

3. For the purposes of 3A002.c.4.b.1, the duration for 100% probability of discovery is equivalent to the minimum signal duration necessary for the specified level measurement uncertainty.

4. For the purposes of 3A002.c.4.b.2, a 'frequency mask trigger' is a mechanism where the trigger function is able to select a frequency range to be triggered on as a subset of the acquisition bandwidth while ignoring other signals that may also be present within the same acquisition bandwidth. A 'frequency mask trigger' may contain more than one independent set of limits.

Note: 3A002.c.4 does not apply to those "signal analyzers" using only constant percentage bandwidth filters (also known as octave or fractional octave filters).

c.5. [Reserved]

d. Signal generators having any of the following:

d.1. Specified to generate pulse-modulated signals having all of the following, anywhere within the frequency range exceeding 31.8 GHz but not exceeding 37 GHz:

d.1.a. 'Pulse duration' of less than 25 ns; *and*

d.1.b. On/off ratio equal to or exceeding 65 dB;

d.2. An output power exceeding 100 mW (20 dBm) anywhere within the frequency range exceeding 43.5 GHz but not exceeding 90 GHz;

d.3. A "frequency switching time" as specified by any of the following:

d.3.a. [Reserved]

d.3.b. Less than 100 μs for any frequency change exceeding 2.2 GHz within the frequency range exceeding 4.8 GHz but not exceeding 31.8 GHz;

d.3.c. [Reserved]

d.3.d. Less than 500 μs for any frequency change exceeding 550 MHz within the frequency range exceeding 31.8 GHz but not exceeding 37 GHz;

d.3.e. Less than 100 μs for any frequency change exceeding 2.2 GHz within the frequency range exceeding 37 GHz but not exceeding 75 GHz; *or*

d.3.f. [Reserved]

d.3.g. Less than 100 μs for any frequency change exceeding 5.0 GHz within the frequency range exceeding 75 GHz but not exceeding 90 GHz.

d.4. A single sideband (SSB) phase noise, in dBc/Hz, specified as being any of the following:

d.4.a. Less (better) than $-(126 + 20 \log_{10} F - 20 \log_{10} f)$ for anywhere within the range of 10 Hz ≤ F ≤ 10 kHz anywhere within the frequency range exceeding 3.2 GHz but not exceeding 90 GHz; *or*

d.4.b. Less (better) than $-(206 - 20 \log_{10} f)$ for anywhere within the range of 10 kHz < F ≤ 100 kHz anywhere within the frequency range exceeding 3.2 GHz but not exceeding 90 GHz;

> *Technical Note: For the purposes of 3A002.d.4, F is the offset from the operating frequency in Hz and f is the operating frequency in MHz.*

d.5. An 'RF modulation bandwidth' of digital baseband signals as specified by any of the following:

d.5.a. Exceeding 2.2 GHz within the frequency range exceeding 4.8 GHz but not exceeding 31.8 GHz;

d.5.b. Exceeding 550 MHz within the frequency range exceeding 31.8 GHz but not exceeding 37 GHz;

d.5.c. Exceeding 2.2 GHz within the frequency range exceeding 37 GHz but not exceeding 75 GHz;

d.5.d. Exceeding 5.0 GHz within the frequency range exceeding 75 GHz but not exceeding 90 GHz; *or*

> *Technical Note: For the purposes of 3A002.d.5, 'RF modulation bandwidth' is the Radio Frequency (RF) bandwidth occupied by a digitally encoded baseband signal modulated onto an RF signal. It is also referred to as information bandwidth or vector modulation bandwidth. I/Q digital modulation is the technical method for producing a vector-modulated RF output signal, and that output signal is typically specified as having an 'RF modulation bandwidth'.*

d.6. A maximum frequency exceeding 90 GHz;

> *Note 1: For the purposes of 3A002.d, signal generators include arbitrary waveform and function generators.*

> *Note 2: 3A002.d does not control equipment in which the output frequency is either produced by the addition or subtraction of two or more crystal oscillator frequencies, or by an addition or subtraction*

followed by a multiplication of the result.

Technical Notes: 1. For the purposes of 3A002.d, the maximum frequency of an arbitrary waveform or function generator is calculated by dividing the sample rate, in samples/second, by a factor of 2.5. 2. For the purposes of 3A002.d.1.a, 'pulse duration' is defined as the time interval from the point on the leading edge that is 50% of the pulse amplitude to the point on the trailing edge that is 50% of the pulse amplitude.

e. Network analyzers having any of the following:

e.1. An output power exceeding 31.62 mW (15 dBm) anywhere within the operating frequency range exceeding 43.5 GHz but not exceeding 90 GHz;

e.2. An output power exceeding 1 mW (0 dBm) anywhere within the operating frequency range exceeding 90 GHz but not exceeding 110 GHz;

e.3. 'Nonlinear vector measurement functionality' at frequencies exceeding 50 GHz but not exceeding 110 GHz; *or*

Technical Note: For the purposes of 3A002.e.3, 'nonlinear vector measurement functionality' is an instrument's ability to analyze the test results of devices driven into the large-signal domain or the non-linear distortion range.

e.4. A maximum operating frequency exceeding 110 GHz;

f. Microwave test receivers having all of the following:

f.1. Maximum operating frequency exceeding 110 GHz; *and*

f.2. Being capable of measuring amplitude and phase simultaneously;

g. Atomic frequency standards being any of the following:

g.1. “Space-qualified”;

g.2. Non-rubidium and having a long-term stability less (better) than 1×10^{-11}/month; *or*

g.3. Non-“space-qualified” and having all of the following:

g.3.a. Being a rubidium standard;

g.3.b. Long-term stability less (better) than 1×10^{-11}/month; *and*

g.3.c. Total power consumption of less than 1 Watt.

h. “Electronic assemblies,” modules or equipment, specified to perform all of the following:

h.1. Analog-to-digital conversions meeting any of the following:

h.1.a. A resolution of 8 bit or more, but less than 10 bit, with a “sample rate” greater than 1.3 Giga Samples Per Second (GSPS);

h.1.b. A resolution of 10 bit or more, but less than 12 bit, with a “sample rate” greater than 1.0 GSPS;

h.1.c. A resolution of 12 bit or more, but less than 14 bit, with a “sample rate” greater than 1.0 GSPS;

h.1.d. A resolution of 14 bit or more but less than 16 bit, with a “sample rate” greater than 400 Mega Samples Per Second (MSPS); *or*

h.1.e. A resolution of 16 bit or more with a “sample rate” greater than 180 MSPS; *and*

h.2. Any of the following:

h.2.a. Output of digitized data;

h.2.b. Storage of digitized data; *or*

h.2.c. Processing of digitized data;

N.B.: Digital data recorders, oscilloscopes, “signal analyzers,” signal generators, network analyzers and microwave test receivers, are specified by 3A002.a.6, 3A002.a.7, 3A002.c, 3A002.d, 3A002.e and 3A002.f, respectively.

Technical Notes: For the purposes of 3A002.h:
1. A resolution of n bit corresponds to a quantization of 2^n levels.

2. The resolution of the ADC is the number of bits of the digital output of the ADC that represents the measured analog input word. Effective Number of Bits (ENOB) is not used to determine the resolution of the ADC.

3. For non-interleaved multiple-channel “electronic assemblies”, modules, or equipment, the “sample rate” is not aggregated and the “sample rate” is the maximum rate of any single channel.

4. For interleaved channels on multiple-channel “electronic assemblies”, modules, or equipment, the “sample rates” are aggregated and the “sample rate” is the maximum combined total rate of all the interleaved channels.

Note: 3A002.h includes ADC cards, waveform digitizers, data acquisition cards, signal acquisition boards and transient recorders.

3A003 Spray cooling thermal management systems employing closed loop fluid handling and reconditioning equipment in a sealed enclosure where a dielectric fluid is sprayed onto electronic "components" using "specially designed" spray nozzles that are designed to maintain electronic "components" within their operating temperature range, and "specially designed" "components" therefore.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3A069 Specific Laboratory Equipment as Follows (See List of Items Controlled)

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2.

Control(s)	Country Chart (See Supp. No. 1 to part 738)
RS applies to entire entry	To or within Macau or a destination specified in Country Group D:5 of supplement no. 1 to part 740 of the EAR. See § 742.6(a)(12) of the EAR.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: Yes, except N/A for destinations subject to the RS control in 3A999.

List of Items Controlled

Related Controls: See also 3A999 for specific processing equipment, n.e.s.. See also 3E069 for technology for the "development" and "production" of items detailed in 3A069.

> *License Requirement Note: Excluded from the scope of this entry are flow cytometers and mass spectrometers that are devices, as defined in section 201(h) of the Federal Food, Drug, and Cosmetic Act (FD&C Act), 21 U.S.C. 321(h), that have been authorized for marketing by the Food and Drug Administration under section 510(k), section 513, or section 515 of the FD&C Act, 21 U.S.C. 360(k), 21 U.S.C. 360c, 21 U.S.C. 360e, or are exempt from the requirement of premarket notification under section 510(k) of the FD&C Act, 21 U.S.C. 360(k), and that are included in a list required by section 510(j) of the FD&C Act, 21 U.S.C. 360(j).*

Related Definitions: N/A

Items:

a. Flow cytometers and cell sorters that are "specially designed" for spectral analysis or contain 26 or greater detectors or channels.

b. Liquid chromatography mass spectrometry instruments (LC/MS and LC-MS/MS) "specially designed" for top-down proteomic analysis.

3A090 Integrated circuits as follows (see List of Items Controlled).

License Requirements

Reason for Control: RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies to 3A090.a	To or within any destination worldwide, see § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to 3A090.b	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any destination also specified in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
RS applies to 3A090.c	To or within Macau or a destination specified in Country Group D:5 of supplement no. 1 to part 740 of the EAR. See § 742.6(a)(6)(i)(B) of the EAR.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

NAC/ACA: Yes, for 3A090.a, if the item is not designed or marketed for use in datacenters and has a 'total processing performance' of 4800 or more; yes, for 3A090.b, if the item is designed or marketed for use in datacenters. N/A for 3A090.c.

HBM: Yes, for 3A090.c. See § 740.25 of the EAR.

AIA: Yes, for 3A090.a.

ACM: Yes

LPP: Yes, for 3A090.a.

List of Items Controlled

Related Controls: (1) See ECCNs 3D001, 3E001, 5D002.z, and 5D992.z for associated technology and software controls. (2) See ECCNs 3A001.z, 5A002.z, 5A004.z, and 5A992.z.

Related Definitions: N/A

Items:

a. Integrated circuits having one or more digital processing units having either of the following:

a.1. A 'total processing performance' of 4800 or more; *or*

a.2. A 'total processing performance' of 1600 or more and a 'performance density' of 5.92 or more.

NOTE 1 TO 3A090.A: *When a "front-end fabricator" or "OSAT" company is seeking to export, reexport, or transfer (in-country) an "applicable advanced logic integrated circuit," there is a presumption that the item is 3A090.a and designed or marketed for datacenters. If the "front-end fabricator" or "OSAT" company cannot overcome this presumption, then it must comply with all license requirements applicable to items specified in 3A090.a. However, this presumption does not apply to any entity other than the "front-end fabricator" or "OSAT" company. A "front-end fabricator" or "OSAT" company can overcome this presumption in any of the following three ways outlined in paragraphs a. through c. of this Note 1.*

a. If the designer of the "applicable advanced logic integrated circuit" is an approved or authorized integrated circuit designer, then a datasheet or other attestation of the 'total processing performance' and the 'performance density' from the approved or authorized integrated circuit designer indicating that the IC is not specified in 3A090.a will overcome the presumption for the "front-end fabricator" or "OSAT" company that the IC is specified in ECCN 3A090.a.

(1) Approved integrated circuit designers are listed in supplement no. 6 to this part of the EAR;

(2) Prior to April 13, 2026, authorized integrated circuit designers include all integrated circuit designers:

(i) Headquartered in Taiwan or a destination specified in Country Group A:1 or A:5, that are neither located in nor have an ultimate parent headquartered in Macau or a destination specified in Country Group D:5 of supplement no. 1 to part 740 of the EAR; and

(ii) That have agreed to submit applicable information described in § 743.9(b) to the "front-end fabricator," which the "front-end fabricator" must then report to BIS.

(3) After April 13, 2026, authorized integrated circuit designers include any integrated circuit designer that both meets the criteria specified in subparagraph (2) and has submitted an application to become an approved integrated circuit designer. However, any company deemed an authorized IC designer after April 13, 2026, will cease to be an authorized IC designer 180 days after the submission of its application to become an approved IC designer.

b. If the integrated circuit die is packaged by the "front-end fabricator" at a location outside of Macau or a destination specified in Country Group D:5 in supplement no. 1 to part 740, then the attestation of the "front-end fabricator" that (a) the "aggregated approximated transistor count" of the final packaged IC is below 30 billion transistors, or (b) the final packaged IC does not contain high-bandwidth memory and that the "aggregated approximated transistor count" of the final packaged IC is below (i) 35 billion transistors for any exports, reexports, or transfers (in-country) completed in 2027; or (ii) 40 billion transistors for any exports, reexports, or transfers (in-country) completed in 2029 or thereafter, then this overcomes the presumption by the "front-end fabricator" or "OSAT" company that the IC is specified in ECCN 3A090.a.

c. If the integrated circuit is packaged by an approved "OSAT" company listed in supplement no. 7 to part 740 of the EAR, then the attestation of the approved "OSAT" company that (a) the "aggregated approximated transistor count" of the final packaged IC is below 30 billion transistors, or (b) the final packaged IC does not contain high-bandwidth memory and that the "aggregated approximated transistor count" of the final packaged IC is below (i) 35 billion transistors for any exports, reexports, or transfers (in-country) completed in 2027; or (ii) 40 billion transistors for any exports, reexports, or transfers (in-country) completed in 2029 or thereafter, then this overcomes the presumption by the "front-end fabricator" or "OSAT" company that the IC is specified in ECCN 3A090.a.

d. It is not sufficient for the "front-end fabricator" or "OSAT" company to confirm the ECCN by relying on the attestation of the end user or other party to the transaction, except under one of the three ways enumerated in paragraphs a. through c. of this note. In the absence of an attestation of the 'total processing performance' and the 'performance density' by an approved integrated circuit designer listed in supplement no. 6 to part 740 of the EAR, the "front-end fabricator" or "OSAT" company must presume that any logic integrated circuit produced using the "16/14 nanometer node" or below, or using a non-planar transistor architecture and destined for a commodity with an (a) "aggregated approximated transistor count" of the final packaged IC is below 30 billion transistors, or (b) the final packaged IC does not contain high-bandwidth memory and that the "aggregated approximated transistor count" of the final packaged IC is below (i) 35 billion transistors for any exports, reexports, or transfers (in-country) completed in 2027; or (ii) 40 billion transistors for any exports, reexports, or transfers (in-country) completed in 2029 or thereafter, or where the "aggregated approximated transistor count," of the final, packaged integrated circuit cannot be confirmed by the "front-end fabricator," or an approved "OSAT" company listed in supplement no. 7 to part 740 of the EAR, is specified in ECCN 3A090.a and designed or marketed for a datacenter.

TECHNICAL NOTE 1 TO 3A090.A: *The 'approximated transistor count' of a die is the 'transistor density' of the die multiplied by the area of the die measured in square millimeters. The 'transistor density' of the die is the number of transistors that can be fabricated per square millimeter for the process node used to manufacture the die. To calculate the number of 'approximated transistor count' of a die, a "front end fabricator" or "OSAT" company has two options. First, the "front end fabricator" or "OSAT" company may take the transistor density of the process node used to manufacture the die and multiply this density by the area of the die. This number may be significantly higher than the true transistor count, but if the result is below the relevant transistor threshold, then the "front end fabricator" or "OSAT" company can be confident that the die in question will not exceed that threshold. Second, to adjudicate edge cases, the "front end fabricator" or "OSAT" company may use standard design verification tools to estimate the number of (both active and passive) transistors on the die using the GDS file.*

b. Integrated circuits having one or more digital processing units having either of the following:

b.1. A 'total processing performance' of 2400 or more and less than 4800 and a 'performance density' of 1.6 or more and less than 5.92, or

b.2. A 'total processing performance' of 1600 or more and a 'performance density' of 3.2 or more and less than 5.92.

NOTE 2 TO 3A090.A AND 3A090.B: *3A090.a and 3A090.b do not apply to items that are not designed or marketed for use in datacenters and do not have a 'total processing performance' of 4800 or more. For 3A090.a and 3A090.b items that are not designed or marketed for use in datacenters and that have a 'total processing performance' of 4800 or more, see license exceptions NAC and ACA.*

NOTE 3 TO 3A090.A AND 3A090.B: *Integrated circuits specified by 3A090 include graphical processing units (GPUs), tensor processing units (TPUs), neural processors, in-memory processors, vision processors, text processors, co-processors/accelerators, adaptive processors, field-programmable logic devices (FPLDs), and application-specific integrated circuits (ASICs). Examples of integrated circuits are in the Note to 3A001.a.*

NOTE 4 TO 3A090.A AND 3A090.B: *For integrated circuits that are excluded from ECCN 3A090 under Note 2 or 3 to 3A090, those ICs are also not applicable for classifications made under ECCNs 3A001.z, 4A003.z, 4A004.z, 4A005.z, 4A090, 5A002.z, 5A004.z, 5A992.z, 5D002.z, or 5D992.z because those other CCL classifications are based on the incorporation of an integrated circuit that meets the control parameters under ECCN 3A090 or otherwise meets or exceeds the control parameters or ECCNs 3A090 or 4A090. The performance parameters under ECCN 3A090.c are not used for determining whether an item is classified in a .z ECCN. See the Related Controls paragraphs of ECCNs 3A001.z, 4A003.z, 4A004.z, 4A005.z, 4A090, 5A002.z, 5A004.z, 5A992.z, 5D002.z, or 5D992.z.*

TECHNICAL NOTE 2 TO 3A090.A AND 3A090.B:

1. 'Total processing performance' ('TPP') is 2 × 'MacTOPS' × 'bit length of the operation', aggregated over all processing units on the integrated circuit.

a. For purposes of 3A090, 'MacTOPS' is the theoretical peak number of Tera (10^{12}) operations per second for multiply-accumulate computation (D = A × B + C).

b. The 2 in the 'TPP' formula is based on industry convention of counting one multiply-accumulate computation, D = A × B + C, as 2 operations for purpose of datasheets. Therefore, 2 × MacTOPS may correspond to the reported TOPS or FLOPS on a datasheet.

c. For purposes of 3A090, 'bit length of the operation' for a multiply-accumulate computation is the largest bit-length of the inputs to the multiply operation.

d. Aggregate the TPPs for each processing unit on the integrated circuit to arrive at a total. 'TPP' = TPP1 + TPP2 + ... + TPPn (where n is the number or processing units on the integrated circuit).

2. The rate of 'MacTOPS' is to be calculated at its maximum value theoretically possible. The rate of 'MacTOPS' is assumed to be the highest value the manufacturer claims in annual or brochure for the integrated circuit. For example, the 'TPP' threshold of 4800 can be met with 600 tera integer operations (or 2 × 300 'MacTOPS') at 8 bits or 300 tera FLOPS (or 2 × 150 'MacTOPS') at 16 bits. If the integrated circuit is designed for MAC computation with multiple bit lengths that achieve different 'TPP' values, the highest 'TPP' value should be evaluated against parameters in 3A090.

3. For integrated circuits specified by 3A090 that provide processing of both sparse and dense matrices, the 'TPP' values are the values for processing of dense matrices (e.g., without sparsity).

4. 'Performance density' is 'TPP' divided by 'applicable die area'. For purposes of 3A090, 'applicable die area' is measured in millimeters squared and includes all die area of logic dies manufactured with a process node that uses a non-planar transistor architecture.

c. High bandwidth memory (HBM) having a 'memory bandwidth density' greater than 2 gigabytes per second per square millimeter.

Technical Note 1 to 3A090.c: *'Memory bandwidth density' is the memory bandwidth measured in gigabytes per second divided by the area of the package or stack measured in square millimeters. In the case where a stack is contained in a package, use the memory bandwidth of the packaged device and the area of the package. High bandwidth memory (HBM) includes dynamic random access memory integrated circuits, regardless of whether they conform to the JEDEC standards for high bandwidth memory (HBM), provided they have a 'memory bandwidth density' greater than 2 gigabytes per second per square millimeter. This control does not cover co-packaged integrated circuits with both HBM and logic integrated circuit where the dominant function of the co-packaged integrated circuit is processing. It does include HBM permanently affixed to a logic integrated circuit designed as a control interface and incorporating a physical layer (PHY) function.*

3A101 Electronic equipment, devices, "parts" and "components," other than those controlled by 3A001, as follows (see List of Items Controlled).

License Requirements

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See also ECCN 3A002.h for controls on analog-to-digital "electronic assemblies," modules or equipment.

Related Definitions: N/A

Items: a. Analog-to-digital converters usable in "missiles," and having any of the following characteristics:

a.1. "Specially designed" to meet military specifications for ruggedized equipment;

a.2. "Specially designed" for military use and being any of the following types:

a.2.a. Analog-to-digital converter microcircuits which are radiation-hardened or have all of the following characteristics:

a.2.a.1. Rated for operation in the temperature range from below −54 °C to above +125 °C; *and*

a.2.a.2. Hermetically sealed; *or*

a.2.b. Electrical input type analog-to-digital converter printed circuit boards or modules, having all of the following characteristics:

a.2.b.1. Rated for operation in the temperature range from below −45 °C to above +80 °C; *and*

a.2.b.2. Incorporating microcircuits identified in 3A101.a.2 .a;

b. Accelerators capable of delivering electromagnetic radiation produced by bremsstrahlung from accelerated electrons of 2 MeV or greater, and systems containing those accelerators, usable for the “missiles” or the subsystems of “missiles”.

Note: 3A101.b above does not include equipment “specially designed” for medical purposes.

3A201 Electronic “parts” and “components,” other than those controlled by 3A001, as follows (see List of Items Controlled).

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 3E001 (“development” and “production”) and 3E201 (“use”) for technology for items controlled under this entry. (2) *Also see* 3A001.e.2 (capacitors) and 3A001.e.3 (superconducting electromagnets). (3) Superconducting electromagnets “specially designed” or prepared for use in separating uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: a. Pulse discharge capacitors having either of the following sets of characteristics:

a.1. Voltage rating greater than 1.4 kV, energy storage greater than 10 J, capacitance greater than 0.5 µF, *and* series inductance less than 50 nH; *or*

a.2. Voltage rating greater than 750 V, capacitance greater than 0.25 µF, *and* series inductance less than 10 nH;

b. Superconducting solenoidal electromagnets having all of the following characteristics:

b.1. Capable of creating magnetic fields greater than 2 T;

b.2. A ratio of length to inner diameter greater than 2;

b.3. Inner diameter greater than 300 mm; *and*

b.4. Magnetic field uniform to better than 1% over the central 50% of the inner volume;

> *Note: 3A201.b does not control magnets "specially designed" for and exported "as parts of" medical nuclear magnetic resonance (NMR) imaging systems. The phrase "as part of" does not necessarily mean physical part in the same shipment; separate shipments from different sources are allowed, provided the related export documents clearly specify that the shipments are dispatched "as part of" the imaging systems.*

c. Flash X-ray generators or pulsed electron accelerators having either of the following sets of characteristics:

c.1. An accelerator peak electron energy of 500 keV or greater, but less than 25 MeV, *and* with a "figure of merit" (K) of 0.25 or greater; *or*

c.2. An accelerator peak electron energy of 25 MeV or greater, *and* a "peak power" greater than 50 MW;

> *Note: 3A201.c does not control accelerators that are "parts" or "components" of devices designed for purposes other than electron beam or X-ray radiation (electron microscopy, for example) nor those designed for medical purposes.*

> *Technical Notes: (1) The "figure of merit" K is defined as: $K = 1.7 \times 10^3 V^{2.65} Q$. V is the peak electron energy in million electron volts. If the accelerator beam pulse duration is less than or equal to 1 µs, then Q is the total accelerated charge in Coulombs. If the accelerator beam pulse duration is greater than 1 µs, then Q is the maximum accelerated charge in 1 µs. Q equals the intergral of i with respect to t, over the lesser of 1 µs or the time duration of the beam pulse $Q = \int i dt$), where i is beam current in amperes and t is time in seconds.*

(2) "Peak power" = (peak potential in volts) × (peak beam current in amperes).

(3) In machines based on microwave accelerating cavities, the time duration of the beam pulse is the lesser of 1 μs or the duration of the bunched beam packet resulting from one microwave modulator pulse.

(4) In machines based on microwave accelerating cavities, the peak beam current is the average current in the time duration of a bunched beam packet.

3A225 Frequency changers (a.k.a. converters or inverters) and generators, except those subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110), that are usable as a variable frequency or fixed frequency motor drive and have all of the characteristics described in this ECCN (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCN 3D201 for "software" "specially designed" for the "use" of equipment described in this entry. (2) See ECCN 3D202 for "software" "specially designed" to enhance or release the performance characteristics of frequency changers or generators to meet or exceed the level of the performance characteristics described in this entry. (3) See ECCNs 3E001 ("development" and "production") and 3E201 ("use") for "technology" for items controlled under this entry. (4) Frequency changers (a.k.a. converters or inverters) "specially designed" or prepared for use in separating uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: a. Multiphase output providing a power of 40 VA or greater;

b. Operating at a frequency of 600 Hz or more; *and*

c. Frequency control better (less) than 0.2%.

Notes: 1. This ECCN controls frequency changers intended for use in specific industrial machinery and/or consumer goods (machine tools, vehicles, etc.) only if the frequency changers can meet the performance characteristics described in this entry when removed from the machinery and/or goods. This Note does not exclude from control under this entry any frequency changer described herein that is the principal element of a non-controlled item and can feasibly be removed or used for other purposes.
2. To determine whether a particular frequency changer meets or exceeds the performance characteristics described in this entry, both hardware and "software" performance constraints must be considered.

Technical Notes: 1. Frequency changers controlled by this ECCN are also known as converters or inverters.
2. The performance characteristics described in this ECCN also may be met by certain equipment marketed as: Generators, electronic test equipment, AC power supplies, variable speed motor drives, variable speed drives (VSDs), variable frequency drives (VFDs), adjustable frequency drives (AFDs), or adjustable speed drives (ASDs).

3A226 High-power direct current power supplies having both of the following characteristics (see List of Items Controlled), excluding items that are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 3E001 ("development" and "production") and 3E201 ("use") for technology for items controlled under this entry. (2) Also see ECCN 3A227. (3) Direct current power supplies "specially designed" or prepared for use in separating uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: a. Capable of continuously producing, over a time period of 8 hours, 100 V or greater with current output of 500 A or greater; *and*

b. Current or voltage stability better than 0.1% over a time period of 8 hours.

3A227 High-voltage direct current power supplies, having both of the following characteristics (see List of Items Controlled), excluding items that are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 3E001 ("development" and "production") and 3E201 ("use") for technology for items controlled under this entry. (2) Also see ECCN 3A226. (3) Direct current power supplies "specially designed" or prepared for use in separating uranium isotopes are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: a. Capable of continuously producing, over a time period of 8 hours, 20 kV or greater with current output of 1 A or greater; *and*

b. Current or voltage stability better than 0.1% over a time period of 8 hours.

3A228 Switching devices, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 3E001 (“development” and “production”) and 3E201 (“use”) for technology for items controlled under this entry.

(2) Also see ECCN 3A991.k.

Related Definitions: N/A

Items: a. Cold-cathode tubes, whether gas filled or not, operating similarly to a spark gap, having all of the following characteristics:

a.1. Containing three or more electrodes;

a.2. Anode peak voltage rating of 2.5 kV or more;

a.3. Anode peak current rating of 100 A or more; *and*

a.4. Anode delay time of 10 μs or less.

> *Technical Note: 3A228.a includes gas krytron tubes and vacuum sprytron tubes.*

b. Triggered spark-gaps having both of the following characteristics:

b.1. An anode delay time of 15 µs or less; *and*

b.2. Rated for a peak current of 500 A or more.

c. Modules or assemblies with a fast switching function having all of the following characteristics:

c.1. Anode peak voltage rating greater than 2 kV;

c.2. Anode peak current rating of 500 A or more; *and*

c.3. Turn-on time of 1 µs or less.

3A229 Firing sets and equivalent high-current pulse generators for detonators controlled by 3A232 (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT, foreign policy

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1.
AT applies to entire entry	AT Column 1.
Russian industry sector sanctions apply to entire entry	See § 746.8 for specific license requirements and license review policy.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCNs 3E001 and 1E001 (“development” and “production”) and 3E201 and 1E201 (“use”) for technology for items controlled under this entry. (2) See 1A007.a for explosive detonator firing sets designed to drive explosive detonators controlled by 1A007.b. (3) High explosives and related equipment for military use are “subject to the ITAR” (see 22 CFR parts 120 through 130).

Related Definitions: N/A

ECCN Controls: (1) Optically driven firing sets include both those employing laser initiation and laser charging. (2) Explosively driven firing sets include booth explosive ferroelectric and explosive ferromagnetic firing set types. (3) 3A229.b includes xenon flash-lamp drivers.

Items:

a. Detonator firing sets (initiation systems, firesets), including electronically-charged, explosively-driven and optically-driven firing sets designed to drive multiple controlled detonators controlled by 3A232;

b. Modular electrical pulse generators (pulsers) having all of the following characteristics:

b.1. Designed for portable, mobile, or ruggedized use;

b.2. Capable of delivering their energy in less than 15 μs into loads of less than 40 Ω (ohms);

b.3. Having an output greater than 100 A;

b.4. No dimension greater than 30 cm;

b.5. Weight less than 30 kg; *and*

b.6. Specified for use over an extended temperature range 223 K (−50 °C) to 373 K (100 °C) or specified as suitable for aerospace applications.

c. Micro-firing units having all of the following characteristics:

c.1. No dimension greater than 35 mm;

c.2. Voltage rating of equal to or greater than 1 kV; *and*

c.3. Capacitance of equal to or greater than 100 nF.

3A230 High-speed pulse generators, and pulse heads therefor, having both of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCNs 3E001 ("development" and "production") and 3E201 ("use") for technology for items controlled under this entry. (2) See ECCNs 3A002.d.1, 3A992.a and 3A999.d.

Related Definitions: 1. In 3A230.b, the term "pulse transition time" is defined as the time interval between 10% and 90% voltage amplitude. 2. Pulse heads are impulse forming networks designed to accept a voltage step function and shape it into a variety of pulse forms that can include rectangular, triangular, step, impulse, exponential, or monocycle types. Pulse heads can be an integral part of the pulse generator, they can be a plug-in module to the device or they can be an externally connected device.

Items: a. Output voltage greater than 6 V into a resistive load of less than 55 ohms; *and*

b. "Pulse transition time" less than 500 ps.

3A231 Neutron generator systems, including tubes, having both of the characteristics described in this ECCN (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT, foreign policy

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1.
AT applies to entire entry	AT Column 1.
Russian industry sector sanctions apply to entire entry	See § 746.8 for specific license requirements and license review policy.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 3E001 ("development" and "production") and 3E201 ("use") for technology for items controlled under this entry.

Related Definitions: N/A

Items:

a. Designed for operation without an external vacuum system; and

b. Utilizing electrostatic acceleration to induce:

b.1. A tritium-deuterium nuclear reaction; *or*

b.2. A deuterium-deuterium nuclear reaction and capable of an output of 3×10^9 neutrons/s or greater.

3A232 Detonators and multipoint initiation systems, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT, RS, foreign policy

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1.
AT applies to entire entry	AT Column 1.
Russian industry sector sanctions apply to entire entry	See § 746.8 for specific license requirements and license review policy.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 0A604 and 1A007 for electrically driven explosive detonators. (2) See ECCNs 3E001 ("development" and "production") and 3E201 ("use") for technology for items controlled under this entry. (3) High explosives and related equipment for military use are "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: N/A

ECCN Controls: This entry does not control detonators using only primary explosives, such as lead azide.

Items:

a. [Reserved]

b. Arrangements using single or multiple detonators designed to nearly simultaneously initiate an explosive surface over an area greater than 5,000 mm^2 from a single firing signal with an initiation timing spread over the surface of less than 2.5 μs.

Technical Note: The word initiator is sometimes used in place of the word detonator.

3A233 Mass spectrometers, capable of measuring ions of 230 u or greater and having a resolution of better than 2 parts in 230, and ion sources therefor, excluding items that are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 3E001 (“development” and “production”) and 3E201 (“use”) for technology for items controlled under this entry. (2) Mass spectrometers “specially designed” or prepared for analyzing on-line samples of UF_6 gas streams are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items:

a. Inductively coupled plasma mass spectrometers (ICP/MS);

b. Glow discharge mass spectrometers (GDMS);

c. Thermal ionization mass spectrometers (TIMS);

d. Electron bombardment mass spectrometers having both of the following features:

d.1. A molecular beam inlet system that injects a collimated beam of analyte molecules into a region of the ion source where the molecules are ionized by an electron beam; *and*

d.2. One or more cold traps that can be cooled to a temperature of 193 K (−80 °C) or less in order to trap analyte molecules that are not ionized by the electron beam;

e. Mass spectrometers equipped with a microfluorination ion source designed for actinides or actinide fluorides.

Technical Notes: 1. ECCN 3A233.d controls mass spectrometers that are typically used for isotopic analysis of UF_6 gas samples.
2. Electron bombardment mass spectrometers in ECCN 3A233.d are also known as electron impact mass spectrometers or electron ionization mass spectrometers.

3. In ECCN 3A233.d.2, a “cold trap” is a device that traps gas molecules by condensing or freezing them on cold surfaces. For the purposes of this ECCN, a closed-loop gaseous helium cryogenic vacuum pump is not a cold trap.

3A234 Striplines to provide low inductance path to detonators with the following characteristics (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items: a. Voltage rating greater than 2 kV; *and*

b. Inductance of less than 20 nH.

3A611 Military electronics, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 3A611.y	NS Column 1.
RS applies to entire entry except 3A611.y	RS Column 1.
RS applies to 3A611.y	China, Russia, or Venezuela (see § 742.6(a)(7))
AT applies to entire entry	AT Column 1.
UN applies to entire entry except 3A611.y	See § 746.1(b) for UN controls.

List Based License Exceptions (see Part 740 for a Description of All License Exceptions)

LVS: $1,500 for 3A611.a, .d through .h and .x; N/A for ECCN 3A611.c.

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 3A611.

LIST OF ITEMS CONTROLLED

Related Controls: (1) Electronic items that are enumerated in USML Category XI or other USML categories, and technical data (including software) directly related thereto, are subject to the ITAR. (2) Application specific integrated circuits (ASICs) and programmable logic devices (PLD) that are programmed for defense articles that are subject to the ITAR are controlled in USML Category XI(c)(1). (3) See ECCN 3A001.a.7 for controls on unprogrammed programmable logic devices (PLD). (4) Printed circuit boards and populated circuit cards with a layout that is "specially designed" for defense articles are controlled in USML Category XI(c)(2). (5) Multichip modules for which the pattern or layout is "specially designed" for defense articles are controlled in USML Category XI(c)(3). (6) Electronic items "specially designed" for military application that are not controlled in any USML category but are within the scope of another "600 series" ECCN or a 9x515 ECCN are controlled by that "600 series" ECCN or 9x515 ECCN. For example, electronic components not enumerated on the USML or a "600 series" other than 3A611 that are "specially designed" for a military aircraft controlled by USML Category VIII or ECCN 9A610 are controlled by the catch-all control in ECCN 9A610.x. Electronic components not enumerated on the USML or another "600 series" entry that are "specially designed" for a military vehicle controlled by USML Category VII or ECCN 0A606 are controlled by ECCN 0A606.x. Electronic components not enumerated on the USML that are "specially designed" for a missile controlled by USML Category IV are controlled by ECCN 9A604.(7) Certain radiation-hardened microelectronic circuits are controlled by ECCN 9A515.d or 9A515.e, when "specially designed" for defense articles, "600 series" items, or items controlled by 9A515.

Related Definitions: N/A

Items:

a. Electronic "equipment," "end items," and "systems" "specially designed" for a military application that are not enumerated or otherwise described in either a USML category or another "600 series" ECCN.

> *Note to 3A611.a: ECCN 3A611.a includes any radar, telecommunications, acoustic or computer equipment, end items, or systems "specially designed" for military application that are not enumerated or otherwise described in any USML category or controlled by another "600 series" ECCN.*

b.-d. [Reserved]

e. High frequency (HF) surface wave radar that maintains the positional state of maritime surface or low altitude airborne objects of interest in a received radar signal through time.

> *Note to 3A611.e: ECCN 3A611.e does not apply to systems, equipment, and assemblies "specially*

designed" for marine traffic control.

f. Application specific integrated circuits (ASICs) and programmable logic devices (PLD) that are not controlled by paragraph .y of this entry and that are programmed for "600 series" items.

Note to paragraph .f: In this paragraph, the term 'application specific integrated circuit' means an integrated circuit developed and produced for a specific application or function regardless of number of customers for which the integrated circuit is developed or produced.

g. Printed circuit boards and populated circuit card assemblies that are not controlled by paragraph .y of this entry and for which the layout is "specially designed" for "600 series" items.

h. Multichip modules that are not controlled by paragraph .y of this entry and for which the pattern or layout is "specially designed" for "600 series" items.

i. through w. [Reserved]

x. "Parts," "components," "accessories," and "attachments" that are "specially designed" for a commodity controlled by this entry or for an article controlled by USML Category XI, and not enumerated or described in any USML category or in any paragraph other than the .x paragraph of another 600 series ECCN or in paragraph .y of this entry.

Note 1 to ECCN 3A611.x: ECCN 3A611.x includes "parts," "components," "accessories," and "attachments" "specially designed" for a radar, telecommunications, acoustic system or equipment or computer "specially designed" for military application that are neither controlled in any USML category nor controlled in any paragraph other than the .x paragraph of another "600 series" ECCN.

Note 2 to ECCN 3A611.x: ECCN 3A611.x controls "parts" and "components" "specially designed" for underwater sensors or projectors controlled by USML Category XI(c)(12) containing single-crystal lead magnesium niobate lead titanate (PMN-PT) based piezoelectrics.

Note 3 to ECCN 3A611.x: "Parts," "components," "accessories," and "attachments" subject to the EAR and within the scope of any 600 series .x entry that are of a type that are or would potentially be for use in or with multiple platforms (e.g., military electronics, military vehicles, and military aircraft) may be classified under 3A611.x.

y. Specific "parts," "components," "accessories," and "attachments" "specially designed" for a commodity subject to control in a "600 series" ECCN or a defense article and not elsewhere specified in any paragraph other than the .y paragraph of a "600 series" ECCN or the USML as follows, and "parts," "components," "accessories," and "attachments" "specially designed" therefor:

y.1. Electrical connectors;

y.2. Electric fans;

y.3. Heat sinks;

y.4. Joysticks;

y.5. Mica paper capacitors;

y.6. Microphones;

y.7. Potentiometers;

y.8. Rheostats;

y.9. Electric connector backshells;

y.10. Solenoids;

y.11. Speakers;

y.12. Trackballs;

y.13. Electric transformers;

y.14. Application specific integrated circuits (ASICs) and programmable logic devices (PLD) that are programmed for commodities controlled in the .y paragraph of any “600 series” ECCN;

y.15. Printed circuit boards and populated circuit card assemblies for which the layout is “specially designed” for an item controlled by the .y paragraph of any “600 series” ECCN;

y.16. Multichip modules for which the pattern or layout is “specially designed” for an item in the .y paragraph of a “600 series” ECCN;

y.17. Circuit breakers;

y.18. Ground fault circuit interrupters;

y.19. Electrical contacts;

y.20. Electrical guide pins;

y.21. Filtered and unfiltered mechanical switches;

y.22. Thumbwheels;

y.23. Fixed resistors;

y.24. Electrical jumpers;

y.25. Grounding straps;

y.26. Indicator dials;

y.27. Contactors;

y.28. Touchpads;

y.29. Mechanical caps;

y.30. Mechanical plugs;

y.31. Finger barriers;

y.32. Flip-guards;

y.33. Identification plates and nameplates;

y.34. Knobs;

y.35. Hydraulic, pneumatic, fuel and lubrication gauges.

Note to ECCN 3A611: When applying the "specially designed" definition to determine whether a printed circuit board, populated circuit card assembly or multichip module is controlled by paragraph .g, .h, .y.15 or .y.16 of this entry, the layout of the board or assembly and the pattern and layout of the module are the only characteristics that need be evaluated under the "specially designed" definition.

3A901 Electronic items, not specified by ECCN 3A001, as follows (see List of Items Controlled).

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: For related "software" see ECCN 3D901 and for "technology" see ECCN 3E901.

Related Definitions: N/A

Items:

a. Complementary Metal Oxide Semiconductor (CMOS) integrated circuits, not specified by 3A001.a.2, designed to operate at an ambient temperature equal to or less (better) than 4.5 K (−268.65 °C).

> *Technical Note: For the purposes of 3A901.a, CMOS integrated circuits are also referred to as cryogenic CMOS or cryo-CMOS.*

b. Parametric signal amplifiers having all of the following:

b.1. Designed for operation at an ambient temperature below 1 K (−272.15 °C);

b.2. Designed for operation at any frequency from 2 GHz up to and including 15 GHz; *and*

b.3. A noise figure less (better) than 0.015 dB at any frequency from 2 GHz up to and including 15 GHz at 1 K (−272.15 °C).

> *Note: For the purposes of 3A901.b, parametric signal amplifiers include Travelling Wave Parametric Amplifiers (TWPAs).*

> *Technical Note: For the purposes of 3A901.b, parametric signal amplifiers may also be referred to as Quantum-limited amplifiers (QLAs).*

3A904 Cryogenic cooling systems and components, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to the entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

Special Conditions for STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No. 1 to part 740 of the EAR).

List of Items Controlled

Related Controls: See ECCN 3E901 for related technology controls for the “development” or “production” of this ECCN.

Related Definitions: N/A

Items:

a. Systems rated to provide a cooling power greater than or equal to 600 μW at or below a temperature of 0.1 K (−273.05 °C) for a period of greater than 48 hours;

b. Two-stage pulse tube cryocoolers rated to maintain a temperature below 4 K (−269.15 °C) and provide a cooling power greater than or equal to 1.5 W at or below a temperature of 4.2 K (−268.95 °C).

3A980 Voice print identification and analysis equipment and “specially designed” “components” therefor, n.e.s.

License Requirements

Reason for Control: CC

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CC applies to entire entry	CC Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3A981 Polygraphs (except biomedical recorders designed for use in medical facilities for monitoring biological and neurophysical responses); fingerprint analyzers, cameras and equipment, n.e.s.; automated fingerprint and identification retrieval systems, n.e.s.; psychological stress analysis equipment; electronic monitoring restraint devices; and "specially designed" "components" and "accessories" therefor, n.e.s.

License Requirements

Reason for Control: CC

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CC applies to entire entry	CC Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See ECCN 0A982 for other types of restraint devices.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

Note to ECCN 3A981. In this ECCN, electronic monitoring restraint devices are devices used to record or report the location of confined persons for law enforcement or penal reasons. The term does not include devices that confine memory impaired patents to appropriate medical facilities.

3A991 Electronic devices, and "components" not controlled by 3A001.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

License Requirements Note: See § 744.17 of the EAR for additional license requirements for microprocessors having a processing speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more, including those incorporating "information security" functionality, and associated "software" and "technology" for the "production" or "development" of such microprocessors.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) For associated "software" for commodities in this ECCN, see 3D991 and for associated "technology for commodities in this ECCN, see 3E991. (2) See also ECCNs 5A002.z, 5A004.z, and 5A992.z.

Related Definitions: N/A

Items:

a. "Microprocessor microcircuits", "microcomputer microcircuits", and microcontroller microcircuits having any of the following:

a.1. A performance speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more;

a.2. A clock frequency rate exceeding 25 MHz; *or*

a.3. More than one data or instruction bus or serial communication port that provides a direct external interconnection between parallel “microprocessor microcircuits” with a transfer rate of 2.5 Mbyte/s;

b. Storage integrated circuits, as follows:

b.1. Electrical erasable programmable read-only memories (EEPROMs) with a storage capacity;

b.1.a. Exceeding 16 Mbits per package for flash memory types; *or*

b.1.b. Exceeding either of the following limits for all other EEPROM types:

b.1.b.1. Exceeding 1 Mbit per package; *or*

b.1.b.2. Exceeding 256 kbit per package and a maximum access time of less than 80 ns;

b.2. Static random access memories (SRAMs) with a storage capacity:

b.2.a. Exceeding 1 Mbit per package; *or*

b.2.b. Exceeding 256 kbit per package and a maximum access time of less than 25 ns;

c. Analog-to-digital converters having any of the following:

c.1. A resolution of 8 bit or more, but less than 12 bit, with an output rate greater than 200 million words per second;

c.2. A resolution of 12 bit with an output rate greater than 105 million words per second;

c.3. A resolution of more than 12 bit but equal to or less than 14 bit with an output rate greater than 10 million words per second; *or*

c.4. A resolution of more than 14 bit with an output rate greater than 2.5 million words per second;

d. Field programmable logic devices having a maximum number of single-ended digital input/outputs between 200 and 700;

e. Fast Fourier Transform (FFT) processors having a rated execution time for a 1,024 point complex FFT of less than 1 ms;

f. Custom integrated circuits for which either the function is unknown, or the control status of the equipment in which the integrated circuits will be used is unknown to the manufacturer, having any of the following:

f.1. More than 144 terminals; *or*

f.2. A typical “basic propagation delay time” of less than 0.4 ns;

g. Traveling-wave “vacuum electronic devices,” pulsed or continuous wave, as follows:

g.1. Coupled cavity devices, or derivatives thereof;

g.2. Helix devices based on helix, folded waveguide, or serpentine waveguide circuits, *or* derivatives thereof, with any of the following:

g.2.a. An “instantaneous bandwidth” of half an octave or more; *and*

g.2.b. The product of the rated average output power (expressed in kW) and the maximum operating frequency (expressed in GHz) of more than 0.2;

g.2.c. An “instantaneous bandwidth” of less than half an octave; *and*

g.2.d. The product of the rated average output power (expressed in kW) and the maximum operating frequency (expressed in GHz) of more than 0.4;

h. Flexible waveguides designed for use at frequencies exceeding 40 GHz;

i. Surface acoustic wave and surface skimming (shallow bulk) acoustic wave devices (*i.e.,* “signal processing” devices employing elastic waves in materials), having either of the following:

i.1. A carrier frequency exceeding 1 GHz; *or*

i.2. A carrier frequency of 1 GHz or less; *and*

i.2.a. A frequency side-lobe rejection exceeding 55 Db;

i.2.b. A product of the maximum delay time and bandwidth (time in microseconds and bandwidth in MHz) of more than 100; *or*

i.2.c. A dispersive delay of more than 10 microseconds;

j. Cells as follows:

j.1. Primary cells having an energy density of 550 Wh/kg or less at 293 K (20 °C);

j.2. Secondary cells having an energy density of 350 Wh/kg or less at 293 K (20 °C);

Note: 3A991.j does not control batteries, including single cell batteries.

Technical Notes: 1. For the purposes of 3A991.j energy density (Wh/kg) is calculated from the

nominal voltage multiplied by the nominal capacity in ampere-hours divided by the mass in kilograms. If the nominal capacity is not stated, energy density is calculated from the nominal voltage squared then multiplied by the discharge duration in hours divided by the discharge load in Ohms and the mass in kilograms.
2. For the purposes of 3A991.j, a 'cell' is defined as an electrochemical device, which has positive and negative electrodes, and electrolyte, and is a source of electrical energy. It is the basic building block of a battery.

3. For the purposes of 3A991.j.1, a 'primary cell' is a 'cell' that is not designed to be charged by any other source.

4. For the purposes of 3A991.j.2, a 'secondary cell' is a 'cell' that is designed to be charged by an external electrical source.

k. “Superconductive” electromagnets or solenoids “specially designed” to be fully charged or discharged in less than one minute, having all of the following:

Note: 3A991.k does not control “superconductive” electromagnets or solenoids designed for Magnetic Resonance Imaging (MRI) medical equipment.

k.1. Maximum energy delivered during the discharge divided by the duration of the discharge of more than 500 kJ per minute;

k.2. Inner diameter of the current carrying windings of more than 250 mm; *and*

k.3. Rated for a magnetic induction of more than 8T or “overall current density” in the winding of more than 300 A/mm^2;

l. Circuits or systems for electromagnetic energy storage, containing “components” manufactured from “superconductive” materials “specially designed” for operation at temperatures below the “critical temperature” of at least one of their “superconductive” constituents, having all of the following:

l.1. Resonant operating frequencies exceeding 1 MHz;

l.2. A stored energy density of 1 MJ/M^3 or more; *and*

l.3. A discharge time of less than 1 ms;

m. Hydrogen/hydrogen-isotope thyratrons of ceramic-metal construction and rate for a peak current of 500 A or more;

n. Digital integrated circuits based on any compound semiconductor having an equivalent gate count of more than 300 (2 input gates);

o. Solar cells, cell-interconnect-coverglass (CIC) assemblies, solar panels, and solar arrays, which are “space qualified” and not controlled by 3A001.e.4;

p. Integrated circuits, n.e.s., having any of the following:

p.1. A processing performance of 8 TOPS or more; or

p.2. An aggregate bidirectional transfer rate over all inputs and outputs of 150 Gbyte/s or more to or from integrated circuits other than volatile memories.

Technical Notes: For the purposes of 3A991.p:
1. This ECCN includes but is not limited to central processing units (CPU), graphics processing units (GPU), tensor processing units (TPU), neural processors, in-memory processors, vision processors, text processors, co-processors/accelerators, adaptive processors, and field-programmable logic devices (FPLDs).

2. TOPS is Tera Operations Per Second or 10^{12} Operations per Second.

3. For purposes of 3A991.p, TOPS is 2 × 'MacTOPS' aggregated over all processing units on the integrated circuit.

a. For purposes of 3A991.p, 'MacTOPS' is the theoretical peak number of Tera (10^12) operations per second for multiply-accumulate computation (D = A × B + C).

b. The 2 in the formula is based on industry convention of counting one multiply-accumulate computation, D = A × B + C, as 2 operations for purpose of datasheets. Therefore, 2 × 'MacTOPS' may correspond to the reported TOPS or FLOPS on a datasheet.

3A992 General purpose electronic equipment, not controlled by 3A002, as Follows (See List of Items Controlled).

License Requirements

Reason for Control: RS, AT

Control(s)	Country chart (see supp. no. 1 to part 738)
RS applies to entire entry.	A license is required for items controlled by this entry for export or reexport to Pakistan or transfer within Pakistan for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See § 742.6(a)(12) of the EAR for additional information.
AT	AT Column 1.

Control(s)	Country chart (see supp. no. 1 to part 738)
applies to entire entry	

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items:

a. Electronic test equipment, n.e.s.

b. Digital instrumentation magnetic tape data recorders having any of the following characteristics;

b.1. A maximum digital interface transfer rate exceeding 60 Mbit/s and employing helical scan techniques;

b.2. A maximum digital interface transfer rate exceeding 120 Mbit/s and employing fixed head techniques; *or*

b.3. “Space qualified”.

c. Equipment, with a maximum digital interface transfer rate exceeding 60 Mbit/s, designed to convert digital video magnetic tape recorders for use as digital instrumentation data recorders.

d. Non-modular analog oscilloscopes having a bandwidth of 1 GHz or greater.

e. Modular analog oscilloscope systems having either of the following characteristics:

e.1. A mainframe with a bandwidth of 1 GHz or greater; *or*

e.2. Plug-in modules with an individual bandwidth of 4 GHz or greater.

f. Analog sampling oscilloscopes for the analysis of recurring phenomena with an effective bandwidth greater than 4 GHz.

g. Digital oscilloscopes and transient recorders, using analog-to-digital conversion techniques, capable of storing transients by sequentially sampling single-shot inputs at successive intervals of less than 1 ns (greater than 1 gigasample per second), digitizing to 8 bits or greater resolution and storing 256 or more samples.

Note: *This ECCN controls the following "specially designed" "parts" and "components" for analog oscilloscopes:*
1. Plug-in units;

2. External amplifiers;

3. Pre-amplifiers;

4. Sampling devices;

5. Cathode ray tubes.

3A999 Specific Processing Equipment, n.e.s., as Follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies to entire entry	A license is required for items controlled by this entry for export or reexport to Iraq or Pakistan or transfer within Iraq or Pakistan for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§ 742.6 and 746.3 of the EAR for additional information.
AT applies to entire entry	A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT licensing requirements for this entry. See § 742.19 of the EAR for additional information.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See also 3A225 (for frequency changers capable of operating in the frequency range of 600 Hz and above) and 3A233. (2) Certain auxiliary systems, equipment, "parts" and "components" for isotope separation plants made of or protected by UF_6 resistant materials are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (3) See also 3A069 for flow cytometers and cell sorters that are "specially designed" for spectral analysis or contain 26 or greater detectors or channels as well as liquid chromatography mass spectrometry instruments (LC/MS and LC-MS/MS) "specially designed" for top-down proteomic analysis.

Related Definitions: N/A

Items:

a. Frequency changers capable of operating in the frequency range from 300 up to 600 Hz, n.e.s;

b. Mass spectrometers n.e.s;

c. All flash x-ray machines, and "parts" or "components" of pulsed power systems designed thereof, including Marx generators, high power pulse shaping networks, high voltage capacitors, and triggers;

d. Pulse amplifiers, n.e.s.;

e. Electronic equipment for time delay generation or time interval measurement, as follows:

e.1. Digital time delay generators with a resolution of 50 nanoseconds or less over time intervals of 1 microsecond or greater; *or*

e.2. Multi-channel (three or more) or modular time interval meter and chronometry equipment with resolution of 50 nanoseconds or less over time intervals of 1 microsecond or greater;

f. Chromatography and spectrometry analytical instruments, n.e.s.

B. "Test", "Inspection" and "Production Equipment"

3B001 Equipment for the manufacturing of semiconductor devices, materials, or related equipment, as follows (see List of Items Controlled) and "specially designed" "components" and "accessories" therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to 3B001.c.1.a, 3B001.c.1.c, and 3B001.q	Worldwide control. See § 742.4(a)(5) and (b)(10) of the EAR.
RS applies to 3B001.c.1.a, 3B001.c.1.c, and 3B001.q	Worldwide control. See § 742.6(a)(10) and (b)(11) of the EAR.
NS applies to 3B001.a.1 to a.3, b, e, f.2 to f.4, g to j	NS Column 2.
NS applies to 3B001.a.4, c, d, f.1, f.5, f.6, k to n, p.2, p.4, r	To or within Macau or a destination specified in Country Group D:5 of supplement no. 1 to part 740 of the EAR. See § 742.4(a)(4) of the EAR.
RS applies to 3B001.a.4, c, d, f.1, f.5, f.6, k to n, p.2, p.4, r	To or within Macau or a destination specified in Country Group D:5 of supplement no. 1 to part 740 of the EAR. See § 742.6(a)(6) of the EAR.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $500, except semiconductor manufacturing equipment specified in 3B001.a.4, c, d, f.1, f.5, f.6, k to n, p.2, p.4, r.

GBS: Yes, except a.3 (molecular beam epitaxial growth equipment using gas sources), c.1.a (Equipment designed or modified for isotropic dry etching), c.1.c (Equipment designed or modified for anisotropic dry etching), .e (automatic loading multi-chamber central wafer handling systems *only* if connected to equipment controlled by 3B001.a.3, or .f), .f (lithography equipment) and .q ("EUV" masks and reticles designed for integrated circuits, not specified by 3B001.g, and having a mask "substrate blank" specified by 3B001.j).

IEC: Yes, for 3B001.c.1.a, c.1.c, and .q, see § 740.2(a)(22) and § 740.24 of the EAR.

Special Conditions for STA

STA: License Exception STA may not be used to ship 3B001.c.1.a, c.1.c, and .q to any of the destinations listed in Country Group A:5 or A:6 (See supplement no. 1 to part 740 of the EAR).

List of Items Controlled

Related Controls: See also 3B903 and 3B991. See ECCNs 3D001, 3D992, 3E001, and 3E992 for related "software" and "technology" controls.

Related Definitions: N/A

Items:

a. Equipment designed for epitaxial growth as follows:

a.1. Equipment designed or modified to produce a layer of any material other than silicon with a thickness uniform to less than ±2.5% across a distance of 75 mm or more;

Note: 3B001.a.1 includes atomic layer epitaxy (ALE) equipment.

a.2. Metal Organic Chemical Vapor Deposition (MOCVD) reactors designed for compound semiconductor epitaxial growth of material having two or more of the following elements: aluminum, gallium, indium, arsenic, phosphorus, antimony, oxygen, or nitrogen;

a.3. Molecular beam epitaxial growth equipment using gas or solid sources;

a.4. Equipment designed for epitaxial growth of silicon (Si) or silicon germanium (SiGe), and having all of the following:

a.4.a. At least one preclean chamber designed to provide a surface preparation means to clean the surface of the wafer; *and*

a.4.b. An epitaxial deposition chamber designed to operate at a temperature equal to or below 958 K (685 °C).

b. Semiconductor wafer fabrication equipment designed for ion implantation and having any of the following:

b.1. [Reserved]

b.2. Being designed and optimized to operate at a beam energy of 20 keV or more and a beam current of 10 mA or more for hydrogen, deuterium, or helium implant;

b.3. Direct write capability;

b.4. A beam energy of 65 keV or more and a beam current of 45 mA or more for high energy oxygen implant into a heated semiconductor material “substrate”; *or*

b.5. Being designed and optimized to operate at beam energy of 20 keV or more and a beam current of 10mA or more for silicon implant into a semiconductor material “substrate” heated to 600 °C or greater;

c. Etch equipment.

c.1. Equipment designed for dry etching as follows:

c.1.a. Equipment designed or modified for isotropic dry etching, having a largest 'silicon germanium-to-silicon (SiGe:Si) etch selectivity' of greater than or equal to 100:1; *or*

c.1.b. [Reserved]

c.1.c. Equipment designed or modified for anisotropic dry etching, having all of the following;

c.1.c.1. Radio Frequency (RF) power source(s) with at least one pulsed RF output;

c.1.c.2. One or more fast gas switching valve(s) with switching time less than 300 milliseconds; *and*

c.1.c.3. Electrostatic chuck with twenty or more individually controllable variable temperature elements;

c.2. Equipment designed for wet chemical processing and having a largest 'silicon germanium-to-silicon (SiGe:Si) etch selectivity' of greater than or equal to 100:1;

c.3. Equipment designed for anisotropic dry etching having all of following:

c.3.a Two or more RF independent sources;

c.3.b Two or more independent gas sources;

c.3.c 'Process uniformity tuning' for wafer thickness variation compensation; and

c.3.d Through Silicon Via (TSV) reveal Endpoint Detection (EPD);

c.4. Equipment designed for Through Silicon Via (TSV) etch having all of the following:

c.4.a. Silicon etch rate greater than 7 microns per minute;

c.4.b. Within wafer (WIW) etch depth non-uniformity of less than or equal 2 percent; *and*

c.4.c. A Through Silicon Via (TSV) aspect ratio greater than or equal to 10:1.

Note 1: 3B001.c includes etching by 'radicals', ions, sequential reactions, or non-sequential reaction.

Note 2: 3B001.c.1.c includes etching using RF pulse excited plasma, pulsed duty cycle excited plasma, pulsed voltage on electrodes modified plasma, cyclic injection and purging of gases combined with a plasma, plasma atomic layer etching, or plasma quasi-atomic layer etching.

Technical Notes: 1. For the purposes of 3B001.c, 'silicon germanium-to-silicon (SiGe:Si) etch selectivity' is measured for a Ge concentration of greater than or equal to 30% ($Si_{0.70}Ge_{0.30}$).
2. For the purposes of 3B001.c Note 1 and 3B001.d.14, 'radical' is defined as an atom, molecule, or ion that has an unpaired electron in an open electron shell configuration.

3. For the purposes of 3B001.c.3, 'process uniformity tuning' is the process of compensating for incoming wafer thickness variations after grinding.

d. Semiconductor manufacturing deposition equipment, as follows:

d.1. Equipment designed for cobalt (Co) electroplating or cobalt electroless-plating deposition processes;

> *Note: 3B001.d.1 controls semiconductor wafer processing equipment.*

d.2. Equipment designed for:

d.2.a. Chemical vapor deposition of cobalt (Co) fill metal; or

d.2.b. Selective bottom-up chemical vapor deposition of tungsten (W) fill metal;

d.3. Semiconductor manufacturing equipment designed to fabricate a metal contact by multistep processing within a single chamber by performing all of the following:

d.3.a. Deposition of a tungsten layer, using an organometallic compound, while maintaining the wafer substrate temperature greater than 100 °C and less than 500 °C; and

d.3.b. Surface treatment plasma process using hydrogen (H2), hydrogen and nitrogen (H2+N2), or ammonia (NH3).

d.4. Equipment or systems designed for multistep processing in multiple chambers or stations, as follows:

d.4.a. Equipment designed to fabricate a metal contact by performing all of the following processes:

d.4.a.1. Surface treatment plasma process using hydrogen (H_2), including hydrogen and nitrogen ($H_2 + N_2$) or ammonia (NH_3), while maintaining the wafer substrate at a temperature greater than 100 °C and less than 500 °C;

d.4.a.2. Surface treatment plasma process using oxygen (O_2) or ozone (O_3), while maintaining the wafer substrate at a temperature greater than 40 °C and less than 500 °C; *and*

d.4.a.3. Deposition of a tungsten (W) layer while maintaining the wafer substrate temperature greater than 100 °C and less than 500 °C;

d.4.b. Equipment designed to fabricate a metal contact by performing all of the following processes:

d.4.b.1 Surface treatment process using a remote plasma generator and an ion filter; *and*

d.4.b.2. Deposition of a cobalt (Co) layer selectively onto copper (Cu) using an organometallic compound;

> *Note: This control does not apply to equipment that is non-selective.*

d.4.c. Equipment designed to fabricate a metal contact by performing all the following processes:

d.4.c.1. Deposition of a titanium nitride (TiN) or tungsten carbide (WC) layer, using an organometallic compound, while maintaining the wafer substrate at a temperature greater than 20 °C and less than 500 °C;

d.4.c.2. Deposition of a cobalt (Co) layer using a physical sputter deposition technique and having a process pressure greater than 133.3 mPa and less than 13.33 Pa, while maintaining the wafer substrate at a temperature below 500 °C; *and*

d.4.c.3. Deposition of a cobalt (Co) layer using an organometallic compound and having a process pressure greater than 133.3 Pa and less than 13.33 kPa, while maintaining the wafer substrate at a temperature greater than 20 °C and less than 500 °C;

d.4.d. Equipment designed to fabricate copper (Cu) interconnects by performing all of the following processes:

d.4.d.1. Deposition of a cobalt (Co) or ruthenium (Ru) layer using an organometallic compound and having a process pressure greater than 133.3 Pa and less than 13.33 kPa, while maintaining the wafer substrate at a temperature greater than 20 °C and less than 500 °C; *and*

d.4.d.2. Deposition of a copper layer using a physical vapor deposition technique and having a process pressure greater than 133.3 mPa and less than 13.33 Pa, while maintaining the wafer substrate at a temperature below 500 °C;

d.5. Equipment designed for plasma enhanced chemical vapor deposition of carbon hard masks more than 2 um thick and with density of greater than 1.7g/cc;

d.6. Atomic Layer Deposition (ALD) equipment designed for area selective deposition of a barrier or liner using an organometallic compound;

> *Note: 3B001.d.6 includes equipment capable of area selective deposition of a barrier layer to enable fill metal contact to an underlying electrical conductor without a barrier layer at the fill metal via interface to an underlying electrical conductor.*

d.7. Equipment designed for Atomic Layer Deposition (ALD) of tungsten (W) to fill an entire interconnect or in a channel less than 40 nm wide, while maintaining the wafer substrate at a temperature less than 500 °C.

d.8. Equipment designed for Atomic Layer Deposition (ALD) of 'work function metal' having all of the following:

d.8.a. More than one metal source of which one is designed for an aluminum (Al) precursor;

d.8.b. Precursor vessel designed and enabled to operate at a temperature greater than 30 °C; *and*

d.8.c. Designed for depositing a 'work function metal' having all of the following:

d.8.c.1. Deposition of titanium-aluminum carbide (TiAlC); *and*

d.8.c.2. Enabling a work function greater than 4.0 eV;

> *Technical Note: For the purposes of 3B001.d.8, 'work function metal' is a material that controls the*

threshold voltage of a transistor.

d.9. Spatial Atomic Layer Deposition (ALD) equipment having a wafer support platform that rotates around an axis having any of the following:

d.9.a. A spatial plasma enhanced atomic layer deposition mode of operation;

d.9.b. A plasma source; *or*

d.9.c. A plasma shield or means to confine the plasma to the plasma exposure process region;

d.10. Equipment designed for Atomic Layer Deposition (ALD) or Chemical Vapor Deposition (CVD) of plasma enhanced of low fluorine tungsten (FW) (fluorine (F) concentration less than 10^{19} atoms/cm^3) films;

d.11. [Reserved]

d.12. Equipment designed for depositing a metal layer, and having any of the following:

d.12.a. Selective tungsten (W) growth without a barrier; *or*

d.12.b. Selective molybdenum (Mo) growth without a barrier;

d.13. Equipment designed for depositing a ruthenium layer (Ru) using an organometallic compound, while maintaining the wafer substrate at a temperature greater than 20 °C and less than 500 °C;

d.14. Equipment designed for deposition assisted by remotely generated 'radicals', enabling the fabrication of a silicon (Si) and carbon (C) containing film, and having all of the following properties of the deposited film:

d.14.a. A dielectric constant (k) of less than 4.4;

d.14.b. In features with an aspect ratio greater than 5:1 with lateral openings of less than 35 nm; *and*

d.14.c. A feature-to-feature pitch of less than 45 nm;

d.15. Equipment designed for void free plasma enhanced deposition of a low-k dielectric layer in gaps between metal lines less than 25 nm and having an aspect ratio greater than or equal to 1:1 with a less than 3.3 dielectric constant;

d.16. [Reserved]

d.17. Equipment designed for plasma enhanced chemical vapor deposition (PECVD) or radical assisted chemical vapor deposition and UV curing in a single platform of a dielectric film, while maintaining a substrate temperature below 500 °C, having all of the following:

d.17.a. A thickness of more than 6 nm and less than 20 nm on metal features having less than 24 nm pitch and having an aspect ratio equal to or greater than 1:1.8; *and*

d.17.b. A dielectric constant less than 3.0;

d.18. Equipment designed or modified for Atomic Layer Deposition (ALD) of molybdenum (Mo), ruthenium (Ru), or combinations Mo or Ru, and having all of the following:

d.18.a. A metal precursor source designed or modified to operate at a temperature greater 75 °C; *and*

d.18.b. A process chamber (module) using a reducing agent containing hydrogen (H) at a pressure greater than or equal to 30 Torr (4 kPa).

Note: For the purposes of paragraph d.18.a, the metal precursor source need not be integrated with the equipment. The metal precursor could be delivered by an on-tool source or from a sub-fab source.

d.19. Deposition equipment having direct-liquid injection of more than two metal precursors, designed or modified to deposit a conformal dielectric film with a dielectric constant (K) greater than 40 in features with aspect ratio greater than 200:1 in a single deposition chamber.

d.20. Physical vapor deposition equipment having electromagnets for ion flux guidance, and “specially designed” to deposit tungsten (W) metal into features having an aspect ratio of 3:1 or greater.

e. Automatic loading multi-chamber central wafer handling systems having all of the following:

e.1. Interfaces for wafer input and output, to which more than two functionally different 'semiconductor process tools' controlled by 3B001.a, .b., .c, and .d are designed to be connected; *and*

e.2. Designed to form an integrated system in a vacuum environment for 'sequential multiple wafer processing';

Note: 3B001.e does not control automatic robotic wafer handling systems “specially designed” for parallel wafer processing.

Technical Notes: 1. For the purposes of 3B001.e, 'semiconductor process tools' refers to modular tools that provide physical processes for semiconductor “production” that are functionally different, such as deposition, implant or thermal processing.
2. For the purposes of 3B001.e, 'sequential multiple wafer processing' means the capability to process each wafer in different 'semiconductor process tools', such as by transferring each wafer from one tool to a second tool and on to a third tool with the automatic loading multi-chamber central wafer handling systems.

f. Lithography commodities as follows:

f.1. Align and expose step and repeat (direct step on wafer) or step and scan (scanner) equipment for wafer processing using photo-optical or X-ray methods and having any of the following:

f.1.a. A light source wavelength shorter than 193 nm; *or*

f.1.b. A light source wavelength equal to or longer than 193 nm and having all of the following:

f.1.b.1. The capability to produce a pattern with a “Minimum Resolvable Feature size” (MRF) of 45 nm or less; *and*

f.1.b.2. A maximum 'dedicated chuck overlay' value of less than or equal to 1.50 nm;

Technical Notes: For the purposes of 3B001.f.1.b:
1. The 'Minimum Resolvable Feature size' (MRF) (*i.e., resolution*) *is calculated by the following formula:*

$$MRF = \frac{\text{(an exposure light source wavelength in nm) x (K factor)}}{\text{maximum numerical aperture}}$$

where, for the purposes of 3B001.f.1.b, the K factor = 0.25 'MRF' is also known as resolution.
2. 'Dedicated chuck overlay' is the alignment accuracy of a new pattern to an existing pattern printed on a wafer by the same lithographic system. 'Dedicated chuck overlay' is also known as single machine overlay.

f.2. Imprint lithography equipment capable of production features of 45 nm or less;

Note: 3B001.f.2 includes:
—Micro contact printing tools

—Hot embossing tools

—Nano-imprint lithography tools

—Step and flash imprint lithography (S-FIL) tools

f.3. Equipment “specially designed” for mask making having all of the following:

f.3.a. A deflected focused electron beam, ion beam or “laser” beam; *and*

f.3.b. Having any of the following:

f.3.b.1. A Full-Width Half-Maximum (FWHM) spot size smaller than 65 nm and an image placement less than 17 nm (mean + 3 sigma); *or*

f.3.b.2. [Reserved]

f.3.b.3. A second-layer overlay error of less than 23 nm (mean + 3 sigma) on the mask;

f.4. Equipment designed for device processing using direct writing methods, having all of the following:

f.4.a. A deflected focused electron beam; *and*

f.4.b. Having any of the following:

f.4.b.1. A minimum beam size equal to or smaller than 15 nm; *or*

f.4.b.2. An overlay error less than 27 nm (mean + 3 sigma);

f.5. Imprint lithography equipment having an overlay accuracy less (better) than 1.5;

f.6. Commodities not specified by 3B001.f.1, designed or modified to perform all of the following in or with deep-ultraviolet immersion photolithography equipment:

f.6.a. Decrease the minimum resolvable feature specified by 3B001.f.1.b; *and*

f.6.b. Decrease the maximum 'dedicated chuck overlay' of a deep-ultraviolet immersion lithography tool below or equal to 1.5 nm.

g. Masks and reticles, designed for integrated circuits controlled by 3A001;

h. Multi-layer masks with a phase shift layer not specified by 3B001.g and designed to be used by lithography equipment having a light source wavelength less than 245 nm;

> *Note: 3B001.h does not control multi-layer masks with a phase shift layer designed for the fabrication of memory devices not controlled by 3A001.*

> *N.B.: For masks and reticles, "specially designed" for optical sensors, see 6B002.*

i. Imprint lithography templates designed for integrated circuits by 3A001;

j. Mask "substrate blanks" with multilayer reflector structure consisting of molybdenum and silicon, and having all of the following:

j.1. "Specially designed" for "Extreme Ultraviolet" ("EUV") lithography; *and*

j.2. Compliant with SEMI Standard P37;

k. Equipment designed for ion beam deposition or physical vapor deposition of a multi-layer reflector for “EUV” masks;

l. “EUV” pellicles;

m. Equipment for manufacturing “EUV” pellicles;

n. Equipment designed for coating, depositing, baking, or developing photoresist formulated for “EUV” lithography;

o. [Reserved]

p. Removal and cleaning equipment as follows:

p.1. [Reserved]

p.2. Single wafer wet cleaning equipment with surface modification drying; *or*

p.3. [Reserved]

p.4. Equipment designed for single wafer cleaning using supercritical CO_2 or sublimation drying;

q. “EUV” masks and “EUV” reticles, designed for integrated circuits, not specified by 3B001.g, and having a mask “substrate blank” specified by 3B001.j; *or*

> *Technical Notes: For the purposes of 3B001.q, masks or reticles with a mounted pellicle are considered masks and reticles.*

r. Equipment designed for EUV 'pattern shaping.'

> *Technical Note: For the purposes of 3B001.r, 'pattern shaping' is a deposition or removal process used to improve overall patterning by reshaping or trimming patterns produced using EUV lithography with non-vertical directed particles including ions, neutral particles, clusters, radicals, or light.*

3B002 Test or inspection equipment “specially designed” for testing or inspecting finished or unfinished semiconductor devices as follows (see List of Items Controlled) and “specially designed” “components” and “accessories” therefor.

License Requirements

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to 3B002.a and b	NS Column 2.
NS applies to 3B002.c	To or within Macau or a destination specified in Country Group D:5 of supplement no. 1 to part 740 of the EAR. See § 742.4(a)(4) of the EAR.
RS applies to 3B002.c	To or within Macau or a destination specified in Country Group D:5 of supplement no. 1 to part 740 of the EAR. See § 742.6(a)(6) of the EAR.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $500, except semiconductor manufacturing equipment specified in 3B002.c.

GBS: Yes

List of Items Controlled

Related Controls: See also 3A999.a, 3B992, and 3B993.

Related Definitions: N/A

Items:

a. For testing S-parameters of items specified by 3A001.b.3.

b. For testing microwave integrated circuits controlled by 3A001.b.2.

c. Inspection equipment designed for “EUV” mask blanks or “EUV” patterned masks.

3B611 Test, inspection, and production commodities for military electronics, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (see Part 740 for a description of all license exceptions)

LVS: $1500.

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 3B611.

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items: a. Test, inspection, and production end items and equipment "specially designed" for the "development," "production," repair, overhaul or refurbishing of items controlled in ECCN 3A611 (except 3A611.y) or USML Category XI that are not enumerated in USML Category XI or controlled by another "600 series" ECCN.

b. through w. [Reserved]

x. "Parts," "components," "accessories" and "attachments" that are "specially designed" for a commodity listed in this entry and that are not enumerated on the USML or controlled by another "600 series" ECCN.

3B903 Scanning Electron Microscope (SEM) equipment designed for imaging semiconductor devices or integrated circuits, having all of the following (See List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to the entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs *3D901* for related “development” or “production” “software”, ECCN *3E901* for related “development” and “production” “technology”.

Related Definition: N/A

Items:

a. Stage placement accuracy less (better) than 30 nm;

b. Stage positioning measurement performed using laser interferometry;

c. Position calibration within a field-of-view (FOV) based on laser interferometer length-scale measurement;

d. Collection and storage of images having more than 2×10^8 pixels;

e. FOV overlap of less than 5 percent in vertical and horizontal directions;

f. Stitching overlap of FOV less than 50 nm; *and*

g. Accelerating voltage more than 21 kV.

Note 1: 3B903 includes SEM equipment designed for chip design recovery.

Note 2: 3B903 does not apply to SEM equipment designed to accept a Semiconductor Equipment and Materials International (SEMI) standard wafer carrier, such as a 200 mm or larger Front Opening Unified Pod (FOUP).

3B904 Cryogenic wafer probing "equipment", having all of the following (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to the entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

Special Conditions for STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No. 1 to part 740 of the EAR).

List of Items Controlled

Related Controls: See ECCN 3E901 for related technology controls for the "development" or "production" of this ECCN.

Related Definitions: N/A

Items:

a. Designed to test devices at temperatures less than or equal to 4.5 K (−268.65 °C); *and*

b. Designed to accommodate wafer diameters greater than or equal to 100 mm.

3B991 Equipment not controlled by 3B001, 3B993, or 3B994, for the manufacture of electronic "parts," "components," and materials, and "specially designed" "parts," "components," and "accessories" therefor.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: 'Sputtering' is an overlay coating process wherein positively charged ions are accelerated by an electric field towards the surface of a target (coating material). The kinetic energy of the impacting ions is sufficient to cause target surface atoms to be released and deposited on the substrate. Note: Triode, magnetron or radio frequency sputtering to increase adhesion of coating and rate of deposition are ordinary modifications of the process.

Items:

a. Equipment "specially designed" for the manufacture of electron tubes, optical elements, and "specially designed" "parts" and "components" therefor controlled by 3A001 or 3A991;

b. Equipment "specially designed" for the manufacture of semiconductor devices, integrated circuits and "electronic assemblies," as follows, and systems incorporating or having the characteristics of such equipment:

Note: *3B991.b also controls equipment used or modified for use in the manufacture of other devices, such as imaging devices, electro-optical devices, acoustic-wave devices.*

b.1. Equipment for the processing of materials for the manufacture of devices, “parts,” and “components” as specified in the heading of 3B991.b, as follows:

Note: 3B991 does not control quartz furnace tubes, furnace liners, paddles, boats (except “specially designed” caged boats), bubblers, cassettes or crucibles “specially designed” for the processing equipment controlled by 3B991.b.1.

b.1.a. Equipment for producing polycrystalline silicon and materials controlled by 3C001;

b.1.b. Equipment “specially designed” for purifying or processing III/V and II/VI semiconductor materials controlled by ECCNs 3C001, 3C002, 3C003, 3C004, or 3C005 except crystal pullers, for which see 3B991.b.1.c below;

b.1.c. Crystal pullers and furnaces, as follows:

Note: 3B991.b.1.c does not control diffusion and oxidation furnaces.

b.1.c.1. Annealing or recrystallizing equipment other than constant temperature furnaces employing high rates of energy transfer capable of processing wafers at a rate exceeding 0.005 m^2 per minute;

b.1.c.2. “Stored program controlled” crystal pullers having any of the following characteristics:

b.1.c.2.a. Rechargeable without replacing the crucible container;

b.1.c.2.b. Capable of operation at pressures above 2.5×10^5 Pa; *or*

b.1.c.2.c. Capable of pulling crystals of a diameter exceeding 100 mm;

b.1.d. “Stored program controlled” equipment for epitaxial growth having any of the following characteristics:

b.1.d.1. Capable of producing silicon layer with a thickness uniform to less than ±2.5% across a distance of 200 mm or more;

b.1.d.2. Capable of producing a layer of any material other than silicon with a thickness uniformity across the wafer of equal to or better than ±3.5%; *or*

b.1.d.3. Rotation of individual wafers during processing;

b.1.e. Molecular beam epitaxial growth equipment;

b.1.f. Magnetically enhanced 'sputtering' equipment with “specially designed” integral load locks capable of transferring wafers in an isolated vacuum environment;

b.1.g. Equipment "specially designed" for ion implantation, ion-enhanced, or photo-enhanced diffusion, having any of the following characteristics:

b.1.g.1. Patterning capability;

b.1.g.2. Beam energy (accelerating voltage) exceeding 200 keV;

b.1.g.3 Optimized to operate at a beam energy (accelerating voltage) of less than 10 keV; *or*

b.1.g.4. Capable of high energy oxygen implant into a heated "substrate";

b.1.h. "Stored program controlled" equipment for the selective removal (*i.e.,* etching) by means of anisotropic dry methods (*e.g.,* plasma), as follows:

b.1.h.1. Batch types having either of the following:

b.1.h.1.a. End-point detection, other than optical emission spectroscopy types; *or*

b.1.h.1.b. Reactor operational (etching) pressure of 26.66 Pa or less;

b.1.h.2. Single wafer types having any of the following:

b.1.h.2.a. End-point detection, other than optical emission spectroscopy types;

b.1.h.2.b. Reactor operational (etching) pressure of 26.66 Pa or less; *or*

b.1.h.2.c. Cassette-to-cassette and load locks wafer handling;

> *Note 1: "Batch types" refers to machines not "specially designed" for production processing of single wafers. Such machines can process two or more wafers simultaneously with common process parameters (e.g., RF power, temperature, etch gas species, flow rates).*

> *Note 2: "Single wafer types" refers to machines "specially designed" for production processing of single wafers. These machines may use automatic wafer handling techniques to load a single wafer into the equipment for processing. The definition includes equipment that can load and process several wafers but where the etching parameters (e.g., RF power or end point) can be independently determined for each individual wafer.*

b.1.i. "Chemical vapor deposition" (CVD) equipment (*e.g.,* plasma-enhanced CVD (PECVD) or photo-enhanced CVD) for semiconductor device manufacturing, having either of the following capabilities, for deposition of oxides, nitrides, metals, or polysilicon:

b.1.i.1. "Chemical vapor deposition" equipment operating below 10^5 Pa; *or*

b.1.i.2. PECVD equipment operating either below 60 Pa (450 millitorr) or having automatic cassette-to-cassette and load lock wafer handling;

> *Note: 3B991.b.1.i does not control low pressure "chemical vapor deposition" (LPCVD) systems or reactive "sputtering" equipment.*

b.1.j. Electron beam systems "specially designed" or modified for mask making or semiconductor device processing having any of the following characteristics:

b.1.j.1. Electrostatic beam deflection;

b.1.j.2. Shaped, non-Gaussian beam profile;

b.1.j.3. Digital-to-analog conversion rate exceeding 3 MHz;

b.1.j.4. Digital-to-analog conversion accuracy exceeding 12 bit; *or*

b.1.j.5. Target-to-beam position feedback control precision of 1 micrometer or finer;

> *Note: 3B991.b.1.j does not control electron beam deposition systems or general purpose scanning electron microscopes.*

b.1.k. Surface finishing equipment for the processing of semiconductor wafers as follows:

b.1.k.1. "Specially designed" equipment for backside processing of wafers thinner than 100 micrometer and the subsequent separation thereof; *or*

b.1.k.2. "Specially designed" equipment for achieving a surface roughness of the active surface of a processed wafer with a two-sigma value of 2 micrometer or less, total indicator reading (TIR);

> *Note: 3B991.b.1.k does not control single-side lapping and polishing equipment for wafer surface finishing.*

b.1.l. Interconnection equipment which includes common single or multiple vacuum chambers "specially designed" to permit the integration of any equipment controlled by 3B991 into a complete system;

b.1.m. "Stored program controlled" equipment using "lasers" for the repair or trimming of "monolithic integrated circuits" with either of the following characteristics:

b.1.m.1. Positioning accuracy less than ±1 micrometer; *or*

b.1.m.2. Spot size (kerf width) less than 3 micrometer.

b.2. Masks, mask “substrates,” mask-making equipment and image transfer equipment for the manufacture of devices, “parts” and “components” as specified in the heading of 3B991, as follows:

Note: The term “masks” refers to those used in electron beam lithography, X-ray lithography, and ultraviolet lithography, as well as the usual ultraviolet and visible photo-lithography.

b.2.a. Finished masks, reticles and designs therefor, except:

b.2.a.1. Finished masks or reticles for the production of unembargoed integrated circuits; *or*

b.2.a.2. Masks or reticles, having both of the following characteristics:

b.2.a.2.a. Their design is based on geometries of 2.5 micrometer or more; *and*

b.2.a.2.b. The design does not include special features to alter the intended use by means of production equipment or “software”;

b.2.b. Mask “substrates” as follows:

b.2.b.1. Hard surface (*e.g.,* chromium, silicon, molybdenum) coated “substrates” (*e.g.,* glass, quartz, sapphire) for the preparation of masks having dimensions exceeding 125 mm x 125 mm; *or*

b.2.b.2. “Substrates” “specially designed” for X-ray masks;

b.2.c. Equipment, other than general purpose computers, “specially designed” for computer aided design (CAD) of semiconductor devices or integrated circuits;

b.2.d. Equipment or machines, as follows, for mask or reticle fabrication:

b.2.d.1. Photo-optical step and repeat cameras capable of producing arrays larger than 100 mm x 100 mm, or capable of producing a single exposure larger than 6 mm x 6 mm in the image (*i.e.,* focal) plane, or capable of producing line widths of less than 2.5 micrometer in the photoresist on the “substrate”;

b.2.d.2. Mask or reticle fabrication equipment using ion or “laser” beam lithography capable of producing line widths of less than 2.5 micrometer; *or*

b.2.d.3. Equipment or holders for altering masks or reticles or adding pellicles to remove defects;

Note: 3B991.b.2.d.1 and b.2.d.2 do not control mask fabrication equipment using photo-optical methods which was either commercially available before the 1st of January, 1980, or has a performance no better than such equipment.

b.2.e. “Stored program controlled” equipment for the inspection of masks, reticles or pellicles with:

b.2.e.1. A resolution of 0.25 micrometer or finer; *and*

b.2.e.2. A precision of 0.75 micrometer or finer over a distance in one or two coordinates of 63.5 mm or more;

> *Note: 3B991.b.2.e does not control general purpose scanning electron microscopes except when "specially designed" and instrumented for automatic pattern inspection.*

b.2.f. Align and expose equipment for wafer production using photo-optical or X-ray methods (*e.g.,* lithography equipment) including both projection image transfer equipment and step and repeat (*i.e.,* direct step on wafer) or step and scan (scanner) equipment, capable of performing any of the following functions:

> *Note: 3B991.b.2.f does not control photo-optical contact and proximity mask align and expose equipment or contact image transfer equipment.*

b.2.f.1. Production of a pattern size of less than 2.5 micrometer;

b.2.f.2. Alignment with a precision finer than ±0.25 micrometer (3 sigma);

b.2.f.3. Machine-to-machine overlay no better than ±0.3 micrometer; *or*

b.2.f.4. A light source wavelength shorter than 400 nm;

b.2.g. Electron beam, ion beam or X-ray equipment for projection image transfer capable of producing patterns less than 2.5 micrometer;

> *Note: For focused, deflected-beam systems(direct write systems), see 3B991.b.1.j or b.10.*

b.2.h. Equipment using "lasers" for direct write on wafers capable of producing patterns less than 2.5 micrometer.

b.3. Equipment for the assembly of integrated circuits, as follows:

b.3.a. "Stored program controlled" die bonders having all of the following characteristics:

b.3.a.1. "Specially designed" for "hybrid integrated circuits";

b.3.a.2. X-Y stage positioning travel exceeding 37.5 × 37.5 mm; *and*

b.3.a.3. Placement accuracy in the X-Y plane of finer than ±10 micrometer;

b.3.b. "Stored program controlled" equipment for producing multiple bonds in a single operation (*e.g.,* beam lead bonders, chip carrier bonders, tape bonders);

b.3.c. Semi-automatic or automatic hot cap sealers, in which the cap is heated locally to a higher temperature than the body of the package, "specially designed" for ceramic microcircuit packages controlled by 3A001 and that have a throughput equal to or more than one package per minute.

Note: 3B991.b.3 does not control general purpose resistance type spot welders.

b.4. Filters for clean rooms capable of providing an air environment of 10 or less particles of 0.3 micrometer or smaller per 0.02832 m^3 and filter materials therefor.

3B992 Equipment not controlled by 3B002, 3B993, or 3B994, for the inspection or testing of electronic "components" and materials, (see List of Items Controlled) and "specially designed" "parts," "components" and "accessories" therefor.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 3A992.a.

Related Definitions: N/A

Items:

a. Equipment "specially designed" for the inspection or testing of electron tubes, optical elements and "specially designed" "parts" and "components" therefor controlled by 3A001 or 3A991;

b. Equipment "specially designed" for the inspection or testing of semiconductor devices, integrated circuits and "electronic assemblies", as follows, and systems incorporating or having the characteristics of such equipment:

Note: 3B992.b also controls equipment used or modified for use in the inspection or testing of other devices, such as imaging devices, electro-optical devices, acoustic-wave devices.

b.1. “Stored program controlled” inspection equipment for the automatic detection of defects, errors or contaminants of 0.6 micrometer or less in or on processed wafers, “substrates”, other than printed circuit boards or chips, using optical image acquisition techniques for pattern comparison;

Note: 3B992.b.1 does not control general purpose scanning electron microscopes, except when “specially designed” and instrumented for automatic pattern inspection.

b.2. “specially designed” “stored program controlled” measuring and analysis equipment, as follows:

b.2.a. “specially designed” for the measurement of oxygen (O) or carbon (C) content in semiconductor materials;

b.2.b. Equipment for line width measurement with a resolution of 1 micrometer or finer;

b.2.c. “specially designed” flatness measurement instruments capable of measuring deviations from flatness of 10 micrometer or less with a resolution of 1 micrometer or finer.

b.3. “Stored program controlled” wafer probing equipment having any of the following characteristics:

b.3.a. Positioning accuracy finer than 3.5 micrometer;

b.3.b. Capable of testing devices having more than 68 terminals; *or*

b.3.c. Capable of testing at a frequency exceeding 1 GHz;

b.4. Test equipment as follows:

b.4.a. “Stored program controlled” equipment “specially designed” for testing discrete semiconductor devices and unencapsulated dice, capable of testing at frequencies exceeding 18 GHz;

Technical Note: Discrete semiconductor devices include photocells and solar cells.

b.4.b. “Stored program controlled” equipment “specially designed” for testing integrated circuits and “electronic assemblies” thereof, capable of functional testing:

b.4.b.1. At a 'pattern rate' exceeding 20 MHz; *or*

b.4.b.2. At a 'pattern rate' exceeding 10 MHz but not exceeding 20 MHz and capable of testing packages of more than 68 terminals.

Note: 3B992.b.4.b does not control test equipment “specially designed” for testing:
1. memories;

2. "Assemblies" or a class of "electronic assemblies" for home and entertainment applications; and

3. Electronic "parts," "components," "assemblies" and integrated circuits not controlled by 3A001 or 3A991 provided such test equipment does not incorporate computing facilities with "user accessible programmability."

Technical Note: For purposes of 3B992.b.4.b, 'pattern rate' is defined as the maximum frequency of digital operation of a tester. It is therefore equivalent to the highest data rate that a tester can provide in non-multiplexed mode. It is also referred to as test speed, maximum digital frequency or maximum digital speed.

b.4.c. Equipment "specially designed" for determining the performance of focal-plane arrays at wavelengths of more than 1,200 nm, using "stored program controlled" measurements or computer aided evaluation and having any of the following characteristics:

b.4.c.1. Using scanning light spot diameters of less than 0.12 mm;

b.4.c.2. Designed for measuring photosensitive performance parameters and for evaluating frequency response, modulation transfer function, uniformity of responsivity or noise; *or*

b.4.c.3. Designed for evaluating arrays capable of creating images with more than 32 × 32 line elements;

b.5. Electron beam test systems designed for operation at 3 keV or below, or "laser" beam systems, for non-contactive probing of powered-up semiconductor devices having any of the following:

b.5.a. Stroboscopic capability with either beam blanking or detector strobing;

b.5.b. An electron spectrometer for voltage measurements with a resolution of less than 0.5 V; *or*

b.5.c. Electrical tests fixtures for performance analysis of integrated circuits;

Note: 3B992.b.5 does not control scanning electron microscopes, except when "specially designed" and instrumented for non-contactive probing of a powered-up semiconductor device.

b.6. "Stored program controlled" multifunctional focused ion beam systems "specially designed" for manufacturing, repairing, physical layout analysis and testing of masks or semiconductor devices and having either of the following characteristics:

b.6.a. Target-to-beam position feedback control precision of 1 micrometer or finer; *or*

b.6.b. Digital-to-analog conversion accuracy exceeding 12 bit;

b.7. Particle measuring systems employing “lasers” designed for measuring particle size and concentration in air having both of the following characteristics:

b.7.a. Capable of measuring particle sizes of 0.2 micrometer or less at a flow rate of 0.02832 m^3 per minute or more; *and*

b.7.b. Capable of characterizing Class 10 clean air or better.

3B993 Specified semiconductor manufacturing equipment as follows (see list of items controls), and “specially designed” “components” and “accessories” therefor.

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies to entire entry	See § 742.6(a)(11) of the EAR.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 3D993 and 3E993 for associated “software” and “technology” controls. (2) For additional controls that apply to this ECCN, see also § 744.11(a)(2)(v) and § 744.23(a)(4) of the EAR.

Related Definitions: N/A

Items:

a. [Reserved]

b. Semiconductor wafer fabrication equipment for 300 mm wafers designed for ion implantation and having any of the following:

b.1. Equipment designed for plasma doping, having all of the following:

b.1.a. One or more Radio Frequency (RF) power source(s);

b.1.b. One or more pulsed DC Power Source; *and*

b.1.c. One or more n-type or p-type dopant implants.

b.2 [Reserved]

c. Etch equipment as follows:

c.1. Equipment designed or modified for anisotropic etching of dielectric materials and enabling the fabrication of high aspect ratio features with aspect ratio greater than 30:1 and a lateral dimension on the top surface of less than 100 nm, and having all of the following:

c.1.a. Radio Frequency (RF) power source(s) with at least one pulsed RF output; *and*

c.1.b. One or more fast gas switching valve(s) with switching time less than 300 milliseconds.

> *Note: 3B993.c.1 includes etching by 'radicals', ions, sequential reactions, or non-sequential reaction.*

> *Technical Note: For the purposes of the Note to 3B993.c.1, 'radical' is defined as an atom, molecule, or ion that has an unpaired electron in an open electron shell configuration.*

c.2. Equipment, not specified by 3B993.c.1, designed for anisotropic etching of dielectric material and enabling the fabrication of high aspect ratio features having all of the following:

c.2.a. An aspect ratio greater than 30:1; *and*

c.2.b. A lateral dimension on the top surface of less than 40 nm.

> *Note: 3B993.c.2 does not apply to equipment designed for wafer diameters less than 300 mm.*

c.3. Equipment, not specified by 3B001.c.1.c, designed or modified for anisotropic dry etching, having all of the following:

c.3.a. Radio Frequency (RF) power source(s) with at least one pulsed RF output;

c.3.b. One or more fast gas switching valve(s) with switching time less than 500 milliseconds; *and*

c.3.c. Electrostatic chuck with greater than or equal to 10 individually controllable variable temperature elements.

d. Semiconductor manufacturing deposition equipment as follows:

d.1. Equipment designed, not specified by 3B001.d.14, for deposition assisted by remotely generated 'radicals', enabling the fabrication of a silicon (Si) and carbon (C) containing film, and having all of the following properties of the deposited film:

d.1.a. A dielectric constant (k) of less than 5.3;

d.1.b. In features with an aspect ratio greater than 5:1 with lateral openings of less than 70 nm; *and*

d.1.c. A feature-to-feature pitch of less than 100 nm.

d.2. Equipment designed for deposition of a film, containing silicon and carbon, and having a dielectric constant (k) of less than 5.3, into lateral openings having widths of less than 70 nm and aspect ratios greater than 5:1 (depth: width) and a feature-to-feature pitch of less than 100 nm, while maintaining the wafer substrate at a temperature greater than 400 °C and less than 650 °C, and having all of the following:

d.2.a. Boat designed to hold multiple vertically stacked wafers;

d.2.b. Two or more vertical injectors; and

d.2.c. A silicon source and propene are introduced to a different injector than a nitrogen source or an oxygen source.

d.3. Equipment designed for chemical vapor deposition of a carbon material layer with a density more than 1.6 g/cm^3.

d.4. Deposition equipment, not specified by 3B001.d.19, having direct-liquid injection of more than two metal precursors, designed or modified to deposit a conformal dielectric film with a dielectric constant (K) greater than 35 in features with aspect ratio greater than 50:1 in a single deposition chamber.

e. [Reserved]

f. Lithography commodities as follows:

f.1. Align and expose step and repeat (direct step on wafer) or step and scan (scanner) lithography equipment for wafer processing using photo-optical or X-ray methods and having all of the following:

f.1.a. [Reserved]

f.1.b. A light source wavelength equal to or longer than 193 nm and having all of the following:

f.1.b.1 The capability to produce a pattern with a 'Minimum Resolvable Feature size' ('MRF') of 45 nm or less; *and*

f.1.b.2. A maximum 'dedicated chuck overlay' value greater than 1.50 nm and less than or equal to 2.40 nm.

Technical Notes for paragraph 3B993.f.1: 1. The 'Minimum Resolvable Feature size' ('MRF') is

calculated by the following formula:

$$'MRF' = \frac{\text{(an exposure light source wavelength in nm) x (K factor)}}{\text{maximum numerical aperture}}$$

where, for the purposes of 3B993.f.1, the K factor = 0.25.
'MRF' is also known as resolution.

2. 'Dedicated chuck overlay' is the alignment accuracy of a new pattern to an existing pattern printed on a wafer by the same lithographic system. 'Dedicated chuck overlay' is also known as single machine overlay.

f.2. Imprint lithography equipment having an overlay accuracy above 1.5 nm and less (better) than or equal to 4.0 nm.

f.3. Commodities designed or modified to increase the number of wafers processed per hour, averaged over any time interval, by greater than 1%, of equipment specified in 3B001.f.1 or 3B993.f.1.

f.4. Commodities not specified by 3B993.f.1 designed or modified to perform all of the following in or with deep-ultraviolet immersion photolithography equipment:

f.4.a. Decrease the minimum resolvable feature specified by 3B993.f.1.b.1; and

f.4.b. Decrease the maximum 'dedicated chuck overlay' of deep-ultraviolet immersion lithography equipment above 1.5 nm and below or equal to 2.4 nm.

g. through n. [Reserved]

o. Annealing equipment designed for 300 mm wafers as follows:

o.1 Annealing equipment, operating in a vacuum (equal to or less than 0.01 Pa) environment, performing any of the following:

o.1.a Reflow of copper (Cu) to minimize or eliminate voids or seams in copper (Cu) metal interconnects; *or*

o.1.b Reflow of cobalt (Co) or tungsten (W) fill metal to minimize or eliminate voids or seams;

o.2. Equipment designed to heat a semiconductor wafer to a temperature greater than 1000 °C (1832 °F) for a 'duration' less than 2 ms.

Technical Note: For the purposes of 3B993.o.2, 'duration' is the period above stated temperature.

p. Removal and cleaning equipment as follows:

p.1. Equipment designed for removing polymeric residue and copper oxide (CuO) film and enabling deposition of copper (Cu) metal in a vacuum (equal to or less than 0.01 Pa) environment.

p.2. [Reserved]

p.3. Equipment designed for dry surface oxide removal preclean or dry surface decontamination.

Note to 3B993.p.1 and p.3: These controls do not apply to deposition equipment.

q. Inspection and metrology equipment as follows:

q.1. Patterned wafer defect metrology or patterned wafer defect inspection equipment, designed or modified to accept wafers greater than or equal to 300 mm in diameter, and having all of the following:

q.1.a. Designed or modified to detect defects having a size equal to or less than 21 nm; *and*

q.1.b. Having any of the following:

q.1.b.1. A light source with an optical wavelength less than 400 nm;

q.1.b.2. An electron-beam source with a resolution less (better) than or equal to 1.65 nm;

q.1.b.3. A Cold Field Emission (CFE) electron-beam source; *or*

q.1.b.4. Two or more electron-beam sources.

q.2. Metrology equipment as follows:

q.2.a. Stand-alone equipment designed to measure wafer shape parameters prior to lithography exposure and utilize measurements to improve overlay or focus of a deep ultraviolet (DUV) lithography system having an immersion lens having a numerical aperture more than 1.3 or an Extreme Ultraviolet lithography (EUV) system; *or*

q.2.b. Metrology equipment designed to measure focus or overlay after resist development or after etch on product wafers using image-based overlay or diffraction-based measurements techniques, with an overlay measurement accuracy less (better) than or equal to 0.5 nm having any of the following:

q.2.b.1 designed for integration to a 'track'; *or*

q.2.b.2 'fast wavelength switching functionality';

Technical Notes: 1. For the purposes of 3B993.q.2, a 'track' is equipment designed for coating and developing photoresist formulated for lithography.
2. For the purposes of 3B993.q.2, 'fast wavelength switching functionality' is defined as having the ability the change the measurement wavelength and acquire a measurement in less than 25 ms.

3B994 Semiconductor manufacturing equipment that enables "advanced-node integrated circuit" production, as follows (see list of items controls), and "specially designed" "components" and "accessories" therefor.

License Requirements

Reason for Control: RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies to entire entry	See § 742.6(a)(11) of the EAR.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

Special Conditions for STA

STA: License Exception STA may not be used to ship or transmit commodities specified in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See supplement no.1 to part 740 of the EAR).

List of Items Controlled

Related Controls: (1) See ECCNs 3D994 and 3E994 for associated software and technology controls. (2) For additional controls that apply to this ECCN, see also § 744.11(a)(2)(v) and § 744.23(a)(4) of the EAR.

Related Definitions: N/A

Items:

Note for 3B994: Equipment specified in this ECCN 3B994 are limited to equipment designed for volume production, such as equipment designed to accept a SEMI standard wafer carrier such as a

200 mm or larger Front Opening Unified Pod or be connected to a multi-chamber wafer handling system.

a. [Reserved]

b. Semiconductor wafer fabrication equipment designed for ion implantation of 300mm wafers as follows:

b.1. [Reserved]

b.2. Ion implantation equipment as follows:

b.2.a. Having all of the following:

b.2.a.1. Beam current greater than 1uA and less than 5mA; *and*

b.2.a.2. Beam energy greater than 5 keV and less than 300 keV; *or*

b.2.b. Having all of the following:

b.2.b.1. Beam current greater than 5 mA; *and*

b.2.b.2. Beam energy less than 5 keV; *or*

b.2.c. Having angular accuracy equal to or less (better) than 0.1 degrees.

c. through p. [Reserved]

q. Inspection and metrology equipment as follows:

q.1. and q.2. [Reserved]

q.3. Optical thin film metrology equipment or optical critical dimension metrology equipment designed for 300mm wafers and containing software designed for measuring non-planar transistors.

C. “Materials”

3C001 Hetero-epitaxial materials consisting of a “substrate” having stacked epitaxially grown multiple layers of any of the following (see List of Items Controlled).

License Requirements

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3,000

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) This entry does not control equipment or material whose functionality has been unalterably disabled. (2) See also ECCNs 3C907 (Epitaxial materials), 3C908 (Fluorides, hydrides, chlorides, of silicon or germanium), and 3C909 (Silicon, silicon oxides, germanium or germanium oxides).

Related Definitions: N/A

Items:

a. Silicon (Si);

b. Germanium (Ge);

c. Silicon Carbide (SiC); *or*

d. "III/V compounds" of gallium or indium.

> *Note: 3C001.d does not apply to a "substrate" having one or more P-type epitaxial layers of GaN, InGaN, AlGaN, InAlN, InAlGaN, GaP, GaAs, AlGaAs, InP, InGaP, AlInP or InGaAlP, independent of the sequence of the elements, except if the P-type epitaxial layer is between N-type layers.*

e. Gallium Oxide (Ga_2O_3); *or*

f. Diamond.

> *N.B.: For materials having layers of isotopically enriched Silicon or Germanium isotopes, see 3C907.*

3C002 Resist materials as follows (see List of Items Controlled) and "substrates" coated with the following resists.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3,000

GBS: Yes for 3C002.a provided that they are not also controlled by 3C002.b through .e.

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Resists designed for semiconductor lithography as follows:

a.1. Positive resists adjusted (optimized) for use at wavelengths less than 193 nm but equal to or greater than 15 nm;

a.2. Resists adjusted (optimized) for use at wavelengths less than 15 nm but greater than 1 nm;

b. All resists designed for use with electron beams or ion beams, with a sensitivity of 0.01 μcoulomb/mm^2 or better;

c. [Reserved]

d. All resists optimized for surface imaging technologies;

e. All resists designed or optimized for use with imprint lithography equipment specified by 3B001.f.2 that use either a thermal or photo-curable process.

3C003 Organo-inorganic compounds as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $3000

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: This entry controls only compounds whose metallic, partly metallic or non-metallic element is directly linked to carbon in the organic part of the molecule.

Related Definition: N/A

Items: a. Organo-metallic compounds of aluminum, gallium or indium, having a purity (metal basis) better than 99.999%;

b. Organo-arsenic, organo-antimony and organo-phosphorus compounds, having a purity (inorganic element basis) better than 99.999%.

3C004 Hydrides of phosphorus, arsenic or antimony, having a purity better than 99.999%, even diluted in inert gases or hydrogen.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $3000

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definition: N/A

Items: The list of items controlled is contained in the ECCN heading.

> *Note: This entry does not control hydrides containing 20% molar or more of inert gases or hydrogen.*

3C005 High resistivity materials as follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3,000

GBS: Yes

LIST OF ITEMS CONTROLLED

Related Controls: See ECCN 3E001 for related development and production technology, and ECCN 3B991.b.1.b for related production equipment.

Related Definition: N/A

Items:

a. Silicon Carbide (SiC), Gallium Nitride (GaN), Aluminum Nitride (AlN), Aluminum Gallium Nitride (AlGaN), Gallium Oxide (Ga_2O_3), or diamond semiconductor “substrates”, or ingots, boules, or other preforms of those materials, having resistivities greater than 10,000 ohm-cm at 20 °C;

b. Polycrystalline “substrates” or polycrystalline ceramic “substrates”, having resistivities greater than 10,000 ohm-cm at 20 °C and having at least one non-epitaxial single-crystal layer of Silicon (Si), Silicon Carbide (SiC), Gallium Nitride (GaN), Aluminum Nitride (AlN), Aluminum Gallium Nitride (AlGaN), Gallium Oxide (Ga_2O_3), or diamond on the surface of the “substrate”.

3C006 Materials, not specified by 3C001, consisting of a “substrate” specified by 3C005 with at least one epitaxial layer of Silicon Carbide (SiC), Gallium Nitride (GaN), Aluminum Nitride (AlN), Aluminum Gallium Nitride (AlGaN), Gallium Oxide (Ga2O3) or diamond.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3,000

GBS: Yes

LIST OF ITEMS CONTROLLED

Related Controls: See ECCN 3D001 for related “development” or “production” “software”, ECCN 3E001 for related “development” and “production” “technology”, and ECCN 3B991.b.1.b for related “production” equipment.

Related Definition: N/A

Items:

The list of items controlled is contained in the ECCN heading.

3C907 Epitaxial materials consisting of a “substrate” having at least one epitaxially grown layer of any of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to the entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry.	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

Special Conditions for STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR).

List of Items Controlled

Related Controls: See ECCN 3E901 for related technology controls for the “development” or “production” of this ECCN.

Related Definitions: N/A

Items:

a. Silicon having an isotopic impurity less than 0.08% of silicon isotopes other than silicon-28 or silicon-30; or

b. Germanium having an isotopic impurity less than 0.08% of germanium isotopes other than germanium-70, germanium-72, germanium-74, or germanium-76.

3C908 Fluorides, hydrides, chlorides, of silicon or germanium, containing any of the following (See List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

Special Conditions for STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No. 1 to part 740 of the EAR).

List of Items Controlled

Related Controls: See ECCN 3E901 for related technology controls for the “development” or “production” of this ECCN.

Related Definitions: N/A

Items:

a. Silicon having an isotopic impurity less than 0.08% of silicon isotopes other than silicon-28 or silicon-30; *or*

b. Germanium having an isotopic impurity less than 0.08% of germanium isotopes other than germanium-70, germanium-72, germanium-74, or germanium-76.

3C909 Silicon, silicon oxides, germanium or germanium oxides, containing any of the following (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to the entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

Special Conditions for STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR).

List of Items Controlled

Related Controls See ECCN 3E901 for related technology controls for the “development” or “production” of this ECCN.

Related Definitions: N/A

Items:

a. Silicon having an isotopic impurity less than 0.08% of silicon isotopes other than silicon-28 or silicon-30; *or*

b. Germanium having an isotopic impurity less than 0.08% of germanium isotopes other than germanium-70, germanium-72, germanium-74, or germanium-76.

Note: 3C909 includes “substrates”, lumps, ingots, boules and preforms.

N.B.: For materials having layers of isotopically enriched silicon (Si) or germanium (Ge) isotopes, see 3C907.

3C992 Positive resists designed for semiconductor lithography specially adjusted (optimized) for use at wavelengths between 370 and 193 nm.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

D. "Software"

3D001 "Software" "specially designed" for the "development" or "production" of commodities controlled by 3A001.b to 3A002.h, 3A090, or 3B (except 3B001.a.4, c, d, f.1, f.5, k to n, p.2, p.4, r, 3B002.c, 3B903, 3B904, 3B991, 3B992, 3B993, or 3B994).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to "software" for equipment controlled by 3B001.q	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to "software" for equipment controlled by 3B001.q	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
NS applies to "software" for commodities controlled by 3A001.b to 3A001.h, 3A001.z, and 3B (except as specified in the heading)	NS Column 1.
RS applies to "software" for commodities controlled by 3A001.z.1.a, z.2.a, z.3.a, z.4.a and 3A090.a	To or within any destination worldwide. *See* § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to "software" for commodities controlled by 3A001.z. 1.b, z.2.b, z.3.b, z.4.b and 3A090.b	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any destination also specified in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
RS applies to "software" for commodities controlled by 3A090.c	To or within Macau or a destination specified in Country Group D:5 of supplement no. 1 to part 740 of the EAR. *See* § 742.6(a)(6)(i) of the EAR.
AT applies to entire entry	AT Column 1.

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except for "software" "specially designed" for the "development" or "production" of Traveling Wave Tube Amplifiers described in 3A001.b.8 having operating frequencies exceeding 18 GHz; or commodities specified in 3A090.

AIA: Yes for "software" for commodities controlled by 3A001.z.1.a, z.2.a, z.3.a, z.4.a, and 3A090.a

ACM: Yes for "software" for commodities controlled by 3A001.z

Note: See § 740.2(a)(9)(ii) of the EAR for license exception restrictions for ECCN 3D001 "software"

for commodities controlled by 3A001.z and 3A090.

IEC: Yes, for "software" for equipment controlled by 3B001.q, see § 740.2(a)(22) and § 740.24 of the EAR.

Special Conditions for STA

STA: License Exception STA may not be used to ship or transmit "software" "specially designed" for the "development" or "production" of equipment specified by 3A090.a or 3B001. q to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR); and 3A090.b or 3A002.g.1 to any of the destinations listed in Country Group A:6.

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3D002 "Software" "specially designed" for the "use" of equipment controlled by 3B001.a to .f, or 3B002.

License Requirements

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
NS applies to "software" for equipment controlled by 3B001.c.1.a or c.1.c	Worldwide control. See § 742.4(a)(5) and (b)(10) of the EAR.
RS applies to "software" for equipment controlled by 3B001.c.1.a or c.1.c	Worldwide control. See § 742.6(a)(10) and (b)(11) of the EAR.
AT applies to entire entry	AT Column 1.

License Requirements Note: See § 744.17 of the EAR for additional license requirements for microprocessors having a processing speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more, including those incorporating "information security" functionality, and associated "software" and "technology" for the "production" or "development" of such microprocessors.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except N/A for RS.

IEC: Yes, for "software" for equipment controlled by 3B001.c.1.a and 3B001.c.1.c, see § 740.2(a)(22) and § 740.24 of the EAR.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit "software" "specially designed" for the "use" of equipment specified by 3B001.c.1.a or c.1.b to any of the destinations listed in Country Group A:5 or A:6 (See supplement no.1 to part 740 of the EAR)

LIST OF ITEMS CONTROLLED

Related Controls: Also see 3D991.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3D003 'Computational lithography' "software" "specially designed" for the "development" of patterns on "EUV"-lithography masks or reticles.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: For the purposes of 3D003, 'computational lithography' is the use of computer modelling to predict, correct, optimize and verify imaging performance of the lithography process over a range of patterns, processes, and system conditions.

Items:

The list of items controlled is contained in the ECCN heading.

3D004 "Software" "specially designed" for the "development" of equipment controlled by 3A003.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: Yes

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3D005 "Software" "specially designed" to restore normal operation of a microcomputer, "microprocessor microcircuit" or "microcomputer microcircuit" within 1 ms after an Electromagnetic Pulse (EMP) or Electrostatic Discharge (ESD) disruption, without loss of continuation of operation.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit “software” to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

3D006 ' Electronic Computer-Aided Design ' (' ECAD ') “ software” “specially designed” for the “development” of integrated circuits having any “Gate-All-Around Field-Effect Transistor ” (“ GAAFET ”) structure, and having any of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

a. “Specially designed” for implementing 'Register Transfer Level' ('RTL') to 'Geometrical Database Standard II' ('GDSII') or equivalent standard; *or*

b. “Specially designed” for optimization of power or timing rules.

Technical Notes: For the purposes of 3D006:
1. 'Electronic Computer-Aided Design' ('ECAD') is a category of “software” tools used for designing, analyzing, optimizing, and validating the performance of an integrated circuit or printed circuit board.

2. 'Register Transfer Level' ('RTL') is a design abstraction which models a synchronous digital circuit in terms of the flow of digital signals between hardware registers and the logical operations performed on those signals.

3. 'Geometrical Database Standard II' ('GDSII') is a database file format for data exchange of integrated circuit or integrated circuit layout artwork.

3D101 “Software” “specially designed” or modified for the “use” of equipment controlled by 3A101.b.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3D201 "Software" "specially designed" for the "use" of equipment described in ECCN 3A225.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCN 3E202 ("development," "production," and "use") for "technology" for items controlled under this entry.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3D202 "Software" "specially designed" to enhance or release the performance characteristics of frequency changers or generators to meet or exceed the level of the performance characteristics described in ECCN 3A225.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCN 3E202 ("development," "production," and "use") for "technology" for items controlled under this entry.

Related Definitions: N/A

Items: a. "Software" or encryption keys/codes "specially designed" to enhance or release the performance characteristics of equipment not controlled by ECCN 3A225, so that such equipment meets or exceeds the performance characteristics of equipment controlled by that ECCN.

b. "Software" "specially designed" to enhance or release the performance characteristics of equipment controlled by ECCN 3A225.

3D611 "Software" "specially designed" for military electronics, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 3D611.y	NS Column 1.
RS applies to entire entry except 3D611.y	RS Column 1.
RS applies to 3D611.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry except 3D611.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: 1. Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any "software" in 3D611.

2. Except for "build-to-print" software, License Exception STA is not eligible for software enumerated in ECCN 3D611.b.

LIST OF ITEMS CONTROLLED

Related Controls: "Software" directly related to articles enumerated in USML Category XI is controlled in USML Category XI(d).

Related Definitions: N/A

Items:

a. "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCN 3A611 (other than 3A611.y) and 3B611.

b. "Software" "specially designed" for the "development," "production," operation or maintenance of technology in ECCN 3E611.b.

c. through x. [Reserved]

y. "Software" "specially designed" for the "production," "development," operation or maintenance of commodities enumerated in ECCNs 3A611.y.

3D901 "Software", not specified elsewhere, "specially designed" or modified for the "development" or "production" of items specified in ECCN 3A901.b, 3B903, or 3B904.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry	AT Column 1.

Special Reporting: Deemed exports and deemed reexports of "software" specified in this ECCN for commodities in ECCNs 3A901.b, and 3B904 are subject to reporting requirements in accordance with § 743.8 of the EAR.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3D907 "Software" designed to extract "GDSII" or equivalent standard layout data and perform layer-to-layer alignment from SEM images, and generate multi-layer "GDSII" data or the circuit netlist.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to the entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: An example of an equivalent standard to "GDSII" would be Open Artwork System Interchange Standard (OASIS).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3D980 "Software" "specially designed" for the "development," "production" or "use" of commodities controlled by 3A980 and 3A981.

LICENSE REQUIREMENTS

Reason for Control: CC, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CC applies to entire entry	CC Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3D991 "Software" "specially designed" for the "development," "production" or "use" of electronic devices, "parts" or "components" controlled by 3A991, general purpose electronic equipment controlled by 3A992, or manufacturing and test equipment controlled by 3B991 and 3B992; or "software" "specially designed" for the "use" of equipment controlled by 3B001.g and .h.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

License Requirements Note: See § 744.17 of the EAR for additional license requirements for

microprocessors having a processing speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more, including those incorporating "information security" functionality, and associated "software" and "technology" for the "production" or "development" of such microprocessors.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3D992 "Software" for the "development" or "production" of commodities specified in 3B001.a.4, c, d, f.1, f.5, f.6, k to n, p.2, p.4, r, or 3B002.c and "software" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to the entire entry	To or within Macau or a destination specified in Country Group D:5 of supplement no. 1 to part 740 of the EAR. *See* § 742.4(a)(4) of the EAR.
RS applies to the entire entry	To or within Macau or a destination specified in Country Group D:5 of supplement no. 1 to part 740 of the EAR. See § 742.6(a)(6)(i) of the EAR.
NS applies to "software" for equipment controlled by 3B001.c.1.a or c.1.c	Worldwide control. See § 742.4(a)(5) and (b)(10) of the EAR.
RS applies to "software" for equipment controlled by 3B001.c.1.a or c.1.c	Worldwide control. See § 742.6(a)(10) and (b)(11) of the EAR.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

IEC: Yes, for “software” for equipment controlled by 3B001.c.1.a and 3B001.c.1.c, see § 740.2(a)(22) and § 740.24 of the EAR.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit “software” specified in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See supplement no.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: For additional controls that apply to this ECCN, see also § 744.11(a)(2)(v) and (a)(3) and § 744.23(a)(4)(iii) of the EAR.

Related Definitions: N/A

Items:

a. “Software” “specially designed” for the “development” or “production,” of commodities specified in 3B001.a.4, c, d, f.1, f.5, f.6, k to n, p.2, p.4, r, or 3B002.c.

b. 'Electronic Computer-Aided Design' ('ECAD') “software” designed for the integration of multiple dies into a 'multi-chip' integrated circuit, and having all of the following:

b.1. Floor planning; *and*

b.2. Co-design or co-simulation of die and package.

> *Technical Note: For the purposes of 3D992.b, 'multi-chip' includes multi-die and multi-chiplet.*

c. “Software” not specified by 3D992.a designed or modified to perform all of the following in or with deep-ultraviolet immersion photolithography equipment:

c.1. Decrease the minimum resolvable feature specified by 3B001.f.1.b; and

c.2. Decrease the maximum 'dedicated chuck overlay' of deep-ultraviolet immersion lithography equipment below or equal to 1.5 nm.

3D993 “Software” for the “development” or “production” of commodities specified in 3B993 and “software” as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies to entire entry	See § 742.6(a)(11) of the EAR.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit “software” specified in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (see supplement no.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: For additional controls that apply to this ECCN, see also § 744.11(a)(2)(v) and (a)(3) and § 744.23(a)(4)(iii) of the EAR.

Related Definitions: N/A

Items:

a. “Software” “specially designed” for the “development” or “production” of commodities specified in 3B993.

b. 'Electronic Computer-Aided Design' ('ECAD') “software” designed or modified for the “development” or “production” of integrated circuits using multipatterning.

c. 'Computational lithography' “software” designed or modified for the “development” or “production” of patterns on DUV lithography masks or reticles.

> *Technical Note: For the purposes of 3D993, 'computational lithography' is the use of computer modelling to predict, correct, optimize and verify imaging performance of the lithography process over a range of patterns, processes, and system conditions.*

d. “Software” designed or modified to increase the number of wafers processed per hour, averaged over any time interval, by greater than 1%, of equipment specified in 3B001.f.1 or 3B993.f.1.

e. “Software” not specified by 3D993.a designed or modified to perform all of the following in or with deep-ultraviolet immersion photolithography equipment:

e.1. Decrease the minimum resolvable feature specified by 3B993.f.1.b.1; *and*

e.2. Decrease the maximum 'dedicated chuck overlay' of deep-ultraviolet immersion lithography equipment above 1.5 nm and below or equal to 2.4 nm.

3D994 “Software” “specially designed” for the “development” or “production” of commodities specified in 3B994 and “software” as follows (see List of Items Controlled).

License Requirements

Reason for Control: RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies to entire entry	See § 742.6(a)(11) of the EAR.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: License Exception STA may not be used to ship or transmit “software” specified in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (see supplement no. 1 to part 740 of the EAR).

List of Items Controlled

Related Controls: For additional controls that apply to this ECCN, see also § 744.11(a)(2)(v) and (a)(3) and § 744.23(a)(4)(iii) of the EAR.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

E. “Technology”

Note 1 to Cat 3 Product Group E: 3E001 and 3E905 do not apply to 'Process Design Kits' ('PDKs')

unless they include libraries implementing functions or technologies for items specified by 3A001.

Technical Note: For the purposes of 3E001 and 3E905, a 'Process Design Kit' ('PDK') is a software tool provided by a semiconductor manufacturer to ensure that the required design practices and rules are taken into account in order to successfully produce a specific integrated circuit design in a specific semiconductor process, in accordance with technological and manufacturing constraints (each semiconductor manufacturing process has its particular 'PDK').

3E001 "Technology" according to the General Technology Note for the "development" or "production" of commodities controlled by 3A (except 3A069, 3A901, 3A904, 3A980, 3A981, 3A991, 3A992, or 3A999), 3B (except 3B001.a.4, c, d, f.1, f.5, k to n, p.2, p.4, r, 3B002.c, 3B903, 3B904, 3B991, 3B992, 3B993, or 3B994) or 3C (except 3C907, 3C908, 3C909, or 3C992).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, NP, RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to "technology" for commodities controlled by 3A001, 3A002, 3A003, 3B001 (except as noted in the heading), 3B002 (except 3B002.c), or 3C001 to 3C006	NS Column 1.
MT applies to "technology" for commodities controlled by 3A001 or 3A101 for MT Reasons	MT Column 1.
NP applies to "technology" for commodities controlled by 3A001, 3A201, or 3A225 to 3A234 for NP reasons	NP Column 1.
RS applies to "technology" for commodities controlled in 3A090, when exported from Macau or a destination specified in Country Group D:5	Worldwide (see § 742.6(a)(6)(ii)).
RS applies to "technology" for commodities controlled by 3A001.z, 3A090 (except for 3A090.c)	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any destination also specified in Country Groups A:5 or A:6. See § 742.6(a)(6)(iii) of the EAR.
RS applies to "technology" for commodities controlled by 3A090.c	To or within Macau or a destination specified in Country Group D:5 of supplement no. 1 to part 740 of the EAR. See § 742.6(a)(6)(i)(B) of the EAR.

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies to "technology" for commodities controlled by 3A001.a.15 or b.13, 3A004, 3B003, 3C007, 3C008, or 3C009	RS Column 2.
AT applies to entire entry	AT Column 1.

License Requirements Note: See § 744.17 of the EAR for additional license requirements for microprocessors having a processing speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more, including those incorporating "information security" functionality, and associated "software" and "technology" for the "production" or "development" of such microprocessors.

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except N/A for MT, and "technology" for the "development" or "production" of: (a) vacuum electronic device amplifiers described in 3A001.b.8, having operating frequencies exceeding 19 GHz; (b) solar cells, coverglass-interconnect-cells or covered-interconnect-cells (CIC) "assemblies," solar arrays and/or solar panels described in 3A001.e.4; (c) "Monolithic Microwave Integrated Circuit" ("MMIC") amplifiers in 3A001.b.2; (d) discrete microwave transistors in 3A001.b.3; and (e) commodities described in 3A090.

Note: See § 740.2(a)(9)(ii) of the EAR for license exception restrictions for ECCN 3E001 "technology" for commodities controlled by 3A001.z, 3A090.

IEC: Yes, for "technology" for equipment controlled by 3B001.q, see § 740.2(a)(22) and § 740.24 of the EAR.

SPECIAL CONDITIONS FOR STRATEGIC TRADE AUTHORIZATION (STA)

STA: License Exception STA may not be used to ship or transmit "technology" according to the General Technology Note for the "development" or "production" of equipment specified by ECCNs 3A002.g.1 or 3B001.a.2 to any of the destinations listed in Country Group A:6 (see supplement no.1 to part 740 of the EAR). License Exception STA may not be used to ship or transmit "technology" according to the General Technology Note for the "development" or "production" of components specified by ECCN 3A001.b.2, b.3, commodities specified in 3A090, to any of the destinations listed in Country Group A:5 or A:6 (see supplement no. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) "Technology" according to the General Technology Note for the "development" or "production" of certain "space-qualified" atomic frequency standards described in Category XV(e)(9), MMICs described in Category XV(e)(14), and oscillators described in Category XV(e)(15) of the USML are "subject to the ITAR" (see 22 CFR parts 120 through 130). See also ECCNs 3E101, 3E201 and 9E515. (2) "Technology" for "development" or "production" of "Microwave Monolithic Integrated Circuits" ("MMIC") amplifiers in 3A001.b.2 is controlled in this ECCN 3E001; 5E001.d refers only to that additional "technology" "required" for telecommunications.

Related Definition: N/A.

Items: The list of items controlled is contained in the ECCN heading.

Note 1: 3E001 does not control "technology" for equipment or "components" controlled by 3A003.

Note 2: 3E001 does not control "technology" for integrated circuits controlled by 3A001.a.3 to a.14 or z, having all of the following:
(a) Using "technology" at or above 0.130 µm; and

(b) Incorporating multi-layer structures with three or fewer metal layers.

3E002 " Technology " according to the General Technology Note other than that controlled in 3E001 for the " development " or " production " of a " microprocessor microcircuit ", " micro-computer microcircuit " and microcontroller microcircuit core, having an arithmetic logic unit with an access width of 32 bits or more and any of the following features or characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
AT applies to entire entry	AT Column 1

License Requirements Note: See § 744.17 of the EAR for additional license requirements for microprocessors having a processing speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more, including those incorporating "information security" functionality, and associated "software" and "technology" for the "production" or "development" of such

microprocessors.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

a. A 'vector processor unit' designed to perform more than two calculations on 'floating-point' vectors (one-dimensional arrays of 32-bit or larger numbers) simultaneously;

Technical Note: For the purposes of 3E002.a, a 'vector processor unit' is a processor element with built-in instructions that perform multiple calculations on 'floating-point' vectors (one-dimensional arrays of 32-bit or larger numbers) simultaneously, having at least one vector arithmetic logic unit and vector registers of at least 32 elements each.

b. Designed to perform more than four 64-bit or larger 'floating-point' operation results per cycle; *or*

c. Designed to perform more than eight 16-bit 'fixed-point' multiply-accumulate results per cycle (*e.g.,* digital manipulation of analog information that has been previously converted into digital form, also known as digital “signal processing”).

Note 1: 3E002 does not control “technology” for multimedia extensions.

Note 2: 3E002 does not control “technology” for microprocessor cores, having all of the following: a. Using “technology” at or above 0.130 μm; and
b. Incorporating multi-layer structures with five or fewer metal layers.

Note 3: 3E002 includes “technology” for the “development” or “production” of digital signal processors and digital array processors.

Technical Notes: 1. For the purposes of 3E002.a and 3E002.b, 'floating-point' is defined by IEEE-754.

2. For the purposes of 3E002.c, 'fixed-point' refers to a fixed-width real number with both an integer component and a fractional component, and which does not include integer-only formats.

3E003 Other "technology" for the "development" or "production" of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except .f and .g

LIST OF ITEMS CONTROLLED

Related Controls: See 3E001 for Silicon-On-Insulation (SOI) technology for the "development" or "production" related to radiation hardening of integrated circuits.

Related Definitions: N/A

Items:

a. Vacuum microelectronic devices;

b. Hetero-structure semiconductor electronic devices such as high electron mobility transistors (HEMT), hetero-bipolar transistors (HBT), quantum well and super lattice devices;

Note: 3E003.b does not control "technology" for high electron mobility transistors (HEMT) operating at frequencies lower than 31.8 GHz and hetero-junction bipolar transistors (HBT) operating at frequencies lower than 31.8 GHz.

c. "Superconductive" electronic devices;

d. Substrates of diamond for electronic components;

e. Substrates of Silicon-On-Insulator (SOI) for integrated circuits in which the insulator is Silicon Dioxide (SiO_2);

f. Substrates of Silicon Carbide (SiC) for electronic components;

g. “Vacuum electronic devices” operating at frequencies of 31.8 GHz or higher;

h. Substrates of Gallium Oxide (Ga_2O_3) for electronic components.

3E004 “Technology” “required” for the slicing, grinding and polishing of 300 mm diameter silicon wafers to achieve a 'Site Front least sQuares Range' ('SFQR') less than or equal to 20 nm at any site of 26 mm x 8 mm on the front surface of the wafer and an edge exclusion less than or equal to 2 mm.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: Yes

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: For the purpose of 3E004, 'Site Front least sQuares Range' ('SFQR') is the range of maximum deviation and minimum deviation from front reference plane, calculated by least square method with all front surface data including site boundary within a site.

Items:

The list of items controlled is contained in the ECCN heading.

3E069 “Technology” according to the General Technology Note for the “development” or “production” of items controlled by 3A069.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2.
RS applies to entire entry	To or within Macau or a destination specified in Country Group D:5 of supplement no. 1 to part 740 of the EAR. See § 742.6(a)(13) of the EAR.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except N/A for Macau, destinations in Country Group D:5, or destinations subject to the RS control in 3A999.

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3E101 "Technology" according to the General Technology Note for the "use" of equipment or "software" controlled by 3A001.a.1 or .2, 3A101, or 3D101.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3E102 "Technology" according to the General Technology Note for the "development" of "software" controlled by 3D101.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3E201 "Technology" according to the General Technology Note for the "use" of equipment controlled by 3A001.e.2 or .e.3, 3A201 or 3A225 to 3A234.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to "technology" for equipment controlled by 3A001.e.2, or .e.3, 3A201 or 3A225 to 3A234 for NP reasons	NP Column 1.

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3E202 "Technology" according to the General Technology Note for the "development," "production," or "use" of "software" controlled by 3D201 or 3D202.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3E611 "Technology" "required" for military electronics, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 3E611.y	NS Column 1.
RS applies to entire entry except 3E611.y	RS Column 1.
RS applies to 3E611.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry except 3E611.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: 1. Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any "technology" in 3E611.

2. Except for "build-to-print technology," License Exception STA is not eligible for "technology" enumerated in ECCN 3E611.b.

LIST OF ITEMS CONTROLLED

Related Controls: Technical data directly related to articles enumerated in USML Category XI is controlled in USML Category XI(d).

Related Definitions: N/A

Items:

a. "Technology" (other than that controlled by 3E611.b or 3E611.y) "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities or software controlled by ECCN 3A611, 3B611 or 3D611.

b. "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of the following if controlled by ECCN 3A611, including 3A611.x:

b.1. Helix traveling wave tubes (TWTs);

b.2. Transmit/receive or transmit modules.

c. through x. [Reserved]

y. "Technology" "required" for the "production," "development," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities or software enumerated in ECCNs 3A611.y or 3D611.y.

3E901 "Technology" according to the General Technology Note for the "development" or "production" of items controlled by ECCN 3A901, 3A904, 3B903, 3B904, 3C907, 3C908, or 3C909.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to the entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry	AT Column 1.

Special Reporting: Deemed exports and deemed reexports of "technology" specified in this ECCN are subject to reporting requirements in accordance with § 743.8 of the EAR.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

3E905 "Technology" according to the General Technology Note for the "development" or "production" of integrated circuits or devices, using "Gate all-around Field-Effect Transistor" ("GAAFET") structures.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to the entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR).

> *Note: See General Order No. 6 in supplement no. 1 to part 736 for additional authorization that may apply for exports, reexports, or transfers (in-country) of this item.*

LIST OF ITEMS CONTROLLED

Related Controls: 1. ECCN 3E905 applies to process "technology" exclusively for the "development" or "production" of GAAFET structures of integrated circuits at a semiconductor wafer production facility. ECCN 3E905 does not, for example, control an integrated circuit design such as the physical layout file in "GDSII" format or EDA tools, or any other technology used to produce the physical layout file for integrated circuit design. 2. ECCN 3E905 does not apply to vertical GAAFET architectures, *e.g.,* those used for 3D NAND.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

> *Note 1: 3E905 includes 'process recipes'.*

Note 2: 3E905. does not apply for tool qualification or maintenance.

Technical Note: For the purposes of Note 1 to 3E905, a 'process recipe' is a set of conditions and parameters for a particular process step.

3E980 "Technology" "specially designed" for "development," "production" or "use" of commodities controlled by 3A980 and 3A981.

LICENSE REQUIREMENTS

Reason for Control: CC, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CC applies to entire entry	CC Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3E991 "Technology" for the "development," "production" or "use" of electronic devices, "parts" or "components" controlled by 3A991, general purpose electronic equipment controlled by 3A992, or manufacturing and test equipment controlled by 3B991 or 3B992, or materials controlled by 3C992.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

License Requirements Note: See § 744.17 of the EAR for additional license requirements for microprocessors having a processing speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more, including those incorporating "information security" functionality, and associated "software" and "technology" for the "production" or "development" of such microprocessors.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

3E992 "Technology" for the "production" or "development" of commodities specified in 3B001.a.4, c, d, f.1, f.5, f.6, k to n, p.2, p.4, r; and 3B002.c; and "technology" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to the entire entry	To or within Macau or a destination specified in Country Group D:5 of supplement no. 1 to part 740 of the EAR. See § 742.4(a)(4) of the EAR.
RS applies to the entire entry	To or within Macau or a destination specified in Country Group D:5 of supplement no. 1 to part 740 of the EAR. See § 742.6(a)(6)(i) of the EAR.

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to "software" for equipment controlled by 3B001.c.1.a or c.1.c	Worldwide control. See § 742.4(a)(5) and (b)(10) of the EAR.
RS applies to "software" for equipment controlled by 3B001.c.1.a or c.1.c	Worldwide control. See § 742.6(a)(10) and (b)(11) of the EAR.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

IEC: Yes, for "technology" for equipment controlled by 3B001.c.1.a, and 3B001.c.1.c, see § 740.2(a)(22) and § 740.24 of the EAR.

Special Conditions for STA

STA: License Exception STA may not be used to ship or transmit "technology" specified in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (see supplement no. 1 to part 740 of the EAR).

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items:

a. "Technology" "specially designed" for the "development" or "production" of commodities specified in 3B001.a.4, c, d, f.1, f.5, f.6, k to n, p.2, p.4, r; or 3B002.c.

b. "Technology" not specified by 3E992.a designed or modified to perform all of the following in or with deep-ultraviolet immersion photolithography equipment:

b.1. Decrease the minimum resolvable feature specified by 3B001.f.1.b; *and*

b.2. Decrease the maximum 'dedicated chuck overlay' of deep-ultraviolet immersion lithography equipment below or equal to 1.5 nm.

3E993 "Technology" for the "development" or "production" of commodities specified in 3B993; and "technology" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies to entire entry	See § 742.6(a)(11) of the EAR.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit “technology” specified in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (see supplement no. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: For additional controls that apply to this ECCN, see also § 744.11(a)(2)(v) and (a)(3) and § 744.23(a)(4)(iii) of the EAR.

Related Definitions: N/A

Items:

a. “Technology” “specially designed” for the “development” or “production” of commodities specified by 3B993.

b. “Technology” designed or modified to increase the number of wafers processed per hour, averaged over any time interval, by greater than 1%, of equipment specified in 3B001.f.1 or 3B993.f.1.

c. “Technology” not specified by 3E993.a designed or modified to perform all of the following in or with deep-ultraviolet immersion photolithography equipment:

c.1. Decrease the minimum resolvable feature specified by 3B993.f.1.b.1; *and*

c.2. Decrease the maximum 'dedicated chuck overlay' of a deep-ultraviolet immersion lithography equipment above 1.5 nm and below or equal to 2.4 nm.

3E994 “Technology” “specially designed” for the “development” or “production” of commodities specified in 3B994 and “technology” as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies to entire entry	See § 742.6(a)(11) of the EAR.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit "technology" specified in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (see supplement no. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: For additional controls that apply to this ECCN, see also § 744.11(a)(2)(v) and (a)(3) and § 744.23(a)(4)(iii) of the EAR.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

EAR99 Items subject to the EAR that are not elsewhere specified in this CCL Category or in any other category in the CCL are designated by the number EAR99.

Category 4—Computers

Note 1: Computers, related equipment and "software" performing telecommunications or "local area network" functions must also be evaluated against the performance characteristics of Category 5, Part 1 (Telecommunications).

Note 2: Control units that directly interconnect the buses or channels of central processing units, 'main storage' or disk controllers are not regarded as telecommunications equipment described in Category 5, Part 1 (Telecommunications).

Note 3: Commodities and "software" in ECCNs 4A005 and 4D004 that are also controlled in ECCNs 5A002.a, 5A002.z.1, 5A002.z.6, 5A004.a, 5A004.b, 5A004.z, 5D002.c.1, 5D002.c.3, 5D002.z.6, 5D002.z.8, or 5D002.z.9, remain controlled in Category 5—Part 2 by those entries. Category 5—Part 2 does not apply to elements of source code that implement functionality controlled by these Category 4 ECCNs, or to any item subject to the EAR where Encryption Item (EI) functionality is absent, removed or otherwise non-existent.

Note 4: Items in ECCNs 4A005, 4D001.a (for 4A005 or 4D004), 4D004, and "technology" specified in ECCN 4E001.a (for 4A005, 4D001.a (for 4A005 or 4D004) or 4D004) and 4E001.c that are also controlled for Surreptitious Listening (SL) reasons under another ECCN, will continue to be classified under the SL ECCN.

N.B.: For the control status of "software" "specially designed" for packet switching, see ECCN 5D001. (Telecommunications).

Technical Note: 'Main storage' is the primary storage for data or instructions for rapid access by a central processing unit. It consists of the internal storage of a "digital computer" and any hierarchical extension thereto, such as cache storage or non-sequentially accessed extended storage.

A. "End Items", "Equipment", "Accessories", "Attachments", "Parts", "Components" and "Systems"

4A001 Electronic computers and related equipment, having any of the following (see List of Items Controlled), and "electronic assemblies" and "specially designed" "components" therefor.

License Requirements

Reason for Control: NS, MT, AT, NP

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS

Control(s)	Country chart (see Supp. No. 1 to part 738)
	Column 2.
MT applies to items in 4A001.a when the parameters in 4A101 are met or exceeded	MT Column 1.
AT applies to entire entry	AT Column 1.
NP applies, unless a License Exception is available. See § 742.3(b) of the EAR for information on applicable licensing review policies	N/A.

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $5000 for 4A001.a; N/A for MT.

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any commodity in 4A001.a.2 to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) See also 4A101 and 4A994. Equipment designed or rated for transient ionizing radiation is "subject to the ITAR" (see 22 CFR parts 120 through 130). (2) The act of incorporating a radiation hardened integrated circuit into a computer that is specified under ECCN 4A994 or designated as EAR99 does not, in and of itself, cause the computer to meet the parameters of ECCN paragraph 4A001.a.2.

Related Definitions: For the purposes of integrated circuits in 4A001.a.2, 5×10^3 Gy(Si) = 5×10^5 Rads (Si); 5×10^6 Gy (Si)/s = 5×10^8 Rads (Si)/s.

Items:

a. "Specially designed" to have any of the following:

a.1. [Reserved]

a.2. Radiation hardened to exceed any of the following specifications:

a.2.a. A total dose of 5×10^3 Gy (Si);

a.2.b. A dose rate upset of 5×10^6 Gy (Si)/s; or

a.2.c. Single Event Upset of 1×10^{-8} Error/bit/day;

Note: 4A001.a.2 does not apply to computers "specially designed" for "civil aircraft" applications.

b. [Reserved]

4A003 "Digital computers", "electronic assemblies", and related equipment therefor, as follows (see List of Items Controlled) and "specially designed" "components" therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, CC, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to 4A003.b, .c, and .z.1	NS Column 1.
NS applies to 4A003.g and z.2	NS Column 2.
RS applies to 4A003.z.1.a, z.2.a	To or within any destination worldwide. *See* § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to 4A003.z.1.b, z.2.b	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any destination also specified in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
CC applies to "digital computers" for computerized finger-print equipment	CC Column 1.
AT applies to entire entry (refer to 4A994 for controls on "digital computers" with an APP	AT Column 1.

Control(s)	Country Chart (see Supp. No. 1 to part 738)
>0.0128 but ≤70 WT)	

Note: For all destinations, except those countries in Country Group E:1 or E:2 of Supplement No. 1 to part 740 of the EAR, no license is required (NLR) for computers with an "Adjusted Peak Performance" ("APP") not exceeding 70 Weighted TeraFLOPS (WT) and for "electronic assemblies" described in 4A003.c that are not capable of exceeding an "Adjusted Peak Performance" ("APP") exceeding 70 Weighted TeraFLOPS (WT) in aggregation, except certain transfers as set forth in § 746.3 (Iraq).

REPORTING REQUIREMENTS

Special Post Shipment Verification reporting and recordkeeping requirements for exports of computers to destinations in Computer Tier 3 may be found in § 743.2 of the EAR.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $5000; N/A for 4A003.b, c, and z.

GBS: Yes, for 4A003.g and "specially designed" "parts" and "components" therefor, exported separately or as part of a system.

APP: Yes, for computers controlled by 4A003.b, and "electronic assemblies" controlled by 4A003.c, to the exclusion of other technical parameters. See § 740.7 of the EAR.

NAC/ACA: Yes, for 4A003.z.

AIA: Yes for 4A003.z.1.a, z.2.a

ACM: Yes for 4A003.z

LPP: Yes for 4A003.z.1.a, z.2.a

Note to List Based License Exceptions: See § 740.2(a)(9)(ii) of the EAR for license exception restrictions for ECCN 4A003.z.

LIST OF ITEMS CONTROLLED

Related Controls: See also ECCNs 4A090, 4A994 and 4A980.

Related Definitions: N/A

Items:

Note 1: 4A003 includes the following:
—'Vector processors' (as defined in Note 7 of the "Technical Note on "Adjusted Peak Performance" ("APP")");

—Array processors;

—Digital signal processors;

—Logic processors;

—Equipment designed for "image enhancement."

Note 2: The control status of the "digital computers" and related equipment described in 4A003 is determined by the control status of other equipment or systems provided:
a. The "digital computers" or related equipment are essential for the operation of the other equipment or systems;

b. The "digital computers" or related equipment are not a "principal element" of the other equipment or systems; and

N.B. 1: The control status of "signal processing" or "image enhancement" equipment "specially designed" for other equipment with functions limited to those required for the other equipment is determined by the control status of the other equipment even if it exceeds the "principal element" criterion.

N.B. 2: For the control status of "digital computers" or related equipment for telecommunications equipment, see Category 5, Part 1 (Telecommunications).
c. The "technology" for the "digital computers" and related equipment is determined by 4E.

a. [Reserved]

b. "Digital computers" having an "Adjusted Peak Performance" ("APP") exceeding 70 Weighted TeraFLOPS (WT);

c. "Electronic assemblies" "specially designed" or modified to be capable of enhancing performance by aggregation of processors so that the "APP" of the aggregation exceeds the limit in 4A003.b.;

Note 1: 4A003.c applies only to "electronic assemblies" and programmable interconnections not exceeding the limit in 4A003.b when shipped as unintegrated "electronic assemblies."

Note 2: 4A003.c does not control "electronic assemblies" "specially designed" for a product or family of products whose maximum configuration does not exceed the limit of 4A003.b.

d. to f. [Reserved]

N.B.: *For "electronic assemblies," modules or equipment, performing analog-to-digital conversions, see 3A002.h.*

g. Equipment "specially designed" for aggregating the performance of "digital computers" by providing external interconnections which allow communications at unidirectional data rates exceeding 2.0 Gbyte/s per link.

Note: 4A003.g does not control internal interconnection equipment (e.g., backplanes, buses) passive interconnection equipment, "network access controllers" or "communication channel controllers".

h. through y. [Reserved]

z. Commodities specified in this ECCN 4A003 that also meet or exceed the performance parameters in 4A090.

z.1.a. Commodities specified in 4A003.b or .c that also meet or exceed the performance parameters in ECCN 4A090.a;

z.1.b Commodities specified in 4A003.b or .c that also meet or exceed the performance parameters in ECCN 4A090.b;

z.2.a. Commodities specified in 4A003.g that also meet or exceed the performance parameters in ECCN 4A090a; or

z.2.b Commodities specified in 4A003.g that also meet or exceed the performance parameters in ECCN 4A090.b.

4A004 Computers as follows (see List of Items Controlled) and "specially designed" related equipment, "electronic assemblies" and "components" therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2.
RS applies to 4A004.z.1	To or within any destination worldwide. *See* § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to 4A004.z.2	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any destination also specified in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $5000, N/A for 4A004.z

GBS: N/A

NAC/ACA: Yes, for 4A004.z.

AIA: Yes for 4A004.z.1

LPP: Yes for 4A004.z.1

Note: See § 740.2(a)(9)(ii) of the EAR for license exception restrictions for ECCN 4A004.z.

List of Items Controlled

Related Controls: See also ECCN 4A090.

Related Definitions: N/A

Items:

a. 'Systolic array computers';

b. 'Neural computers';

c. 'Optical computers'.

Technical Notes: 1. For the purposes of 4A004.a, 'systolic array computers' are computers where the flow and modification of the data is dynamically controllable at the logic gate level by the user.
2. For the purposes of 4A004.b, 'neural computers' are computational devices designed or modified to mimic the behavior of a neuron or a collection of neurons, i.e., computational devices which are distinguished by their hardware capability to modulate the weights and numbers of the interconnections of a multiplicity of computational components based on previous data.

3. For the purposes of 4A004.c, 'optical computers' are computers designed or modified to use light to represent data and whose computational logic elements are based on directly coupled optical devices.

d. through y. [Reserved]

z.1. Commodities that are described in 4A004 and that also meet or exceed the performance parameters in 4A090.a; or

z.2 Commodities that are described in 4A004 and that also meet or exceed the performance parameters in 4A090.b.

4A005 “Systems,” “equipment,” and “components” therefor, “specially designed” or modified for the generation, command and control, or delivery of “intrusion software” (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
RS applies to items controlled by 4A005.z.1	To or within any destination worldwide. *See* § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to items	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any destination also specified

Control(s)	Country Chart (see Supp. No. 1 to part 738)
controlled by 4A005.z.2	in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
AT applies to entire entry	AT Column 1.

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

APP: N/A

ACE: Yes, except to Country Group E:1 or E:2. See § 740.22 of the EAR for eligibility criteria.

NAC/ACA: Yes, for 4A005.z.

AIA: Yes for 4A005.z.1

ACM: Yes for 4A005.z

LPP: Yes for 4A005.z.1

> *Note: See § 740.2(a)(9)(ii) of the EAR for license exception restrictions for ECCN 4A005.z.*

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship items specified by ECCN 4A005.

LIST OF ITEMS CONTROLLED

Related Controls: (1) Defense articles described in USML Category XI(b), and software directly related to a defense article, are "subject to the ITAR" (see 22 CFR parts 120 through 130). (2) See also ECCN 4A090.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading, except for the commodities controlled under 4A005.z.

a. through y. [Reserved]

z.1. Commodities that are specified in 4A005 that also meet or exceed the performance parameters in 4A090.a.

z.2 Commodities that are specified in 4A005 that also meet or exceed the performance parameters in 4A090.b.

4A090 Computers as follows (see List of Items Controlled) and related equipment, "electronic assemblies," and "components" therefor.

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies to 4A090.a	To or within any destination worldwide. *See* § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to 4A090.b	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any destination also specified in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

NAC/ACA: Yes

AIA: Yes for 4A090.a

ACM: Yes

LPP: Yes for 4A090.a

LIST OF ITEMS CONTROLLED

Related Controls: (1) For associated "software" for commodities in this ECCN, see 4D090, 5D002.z, and 5D992.z and for associated "technology" for commodities in this ECCN, see 4E001. (2) Also ECCNs 4A003.z, 4A004.z, 4A005.z, 5A002.z, 5A004.z, and 5A992.z.

Related Definitions: N/A

Items:

a. Computers, "electronic assemblies," and "components" containing integrated circuits, any of which meets or exceeds the limits in 3A090.a.

b. Computers, "electronic assemblies," and "components" containing integrated circuits, any of which meets or exceeds the limits in 3A090.b.

> *Technical Note: For purposes of 4A090.a and .b, computers include "digital computers," "hybrid computers," and analog computers.*

4A101 Analog computers, "digital computers" or digital differential analyzers, other than those controlled by 4A001 designed or modified for use in "missiles", having any of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: The act of incorporating a radiation hardened integrated circuit into a computer that is specified under ECCN 4A994 or designated as EAR99 does not, in and of itself, cause the computer to meet the parameters of ECCN paragraph 4A101.b.

Related Definitions: N/A

Items:

a. Rated for continuous operation at temperatures from below 228 K (−45 °C) to above 328 K (+55 °C); *or*

b. Designed as ruggedized or 'radiation hardened'.

> *Note: For the purposes of 4A101, 'radiation hardened' means that the "part," "component" or equipment is designed or rated to withstand radiation levels which meet or exceed a total irradiation dose of 5×10^5 rads (Si).*

4A102 "Hybrid computers" "specially designed" for modelling, simulation or design integration of "missiles" or their subsystems. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

4A611 Computers, and "parts," "components," "accessories," and "attachments" "specially designed" therefor, "specially designed" for a military application that are not enumerated in any USML category are controlled by ECCN 3A611.

4A906 Quantum computers and related "electronic assemblies," and "components" therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to the entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: See ECCN 4D906 for related “software” controls for the “development” or “production” of this ECCN. See ECCN 4E906 for related “technology” controls for the “development” or “production” of this ECCN.

Related Definitions: N/A

Items:

a. Quantum computers, as follows:

a.1. Quantum computers supporting 34 or more, but fewer than 100, 'fully controlled', 'connected' and 'working' 'physical qubits', and having a 'C-NOT error' of less than or equal to 10^{-4};

a.2. Quantum computers supporting 100 or more, but fewer than 200, 'fully controlled', 'connected' and 'working' 'physical qubits', and having a 'C-NOT error' of less than or equal to 10^{-3};

a.3. Quantum computers supporting 200 or more, but fewer than 350, 'fully controlled', 'connected' and 'working' 'physical qubits', and having a 'C-NOT error' of less than or equal to 2×10^{-3};

a.4. Quantum computers supporting 350 or more, but fewer than 500, 'fully controlled', 'connected' and 'working' 'physical qubits', and having a 'C-NOT error' of less than or equal to 3×10^{-3};

a.5. Quantum computers supporting 500 or more, but fewer than 700, 'fully controlled', 'connected' and 'working' 'physical qubits', and having a 'C-NOT error' of less than or equal to 4×10^{-3};

a.6. Quantum computers supporting 700 or more, but fewer than 1,100, 'fully controlled', 'connected' and 'working' 'physical qubits', and having a 'C-NOT error' of less than or equal to 5×10^{-3};

a.7. Quantum computers supporting 1,100 or more, but fewer than 2,000, 'fully controlled', 'connected' and 'working' 'physical qubits', and having a 'C-NOT error' of less than or equal to 6×10^{-3};

a.8. Quantum computers supporting 2,000 or more 'fully controlled', 'connected' and 'working' 'physical qubits';

b. Qubit devices and qubit circuits, containing or supporting arrays of 'physical qubits', *and* “specially designed” for items specified by 4A906.a;

c. Quantum control components and quantum measurement devices, “specially designed” for items specified by 4A906.a;

Note 1: 4A906 applies to circuit model (or gate-based) and one-way (or measurement-based) quantum computers. This entry does not apply to adiabatic (or annealing) quantum computers.

Note 2: Items specified by 4A906 may not necessarily physically contain any qubits. For example, quantum computers based on photonic schemes do not permanently contain a physical item that can be identified as a qubit. Instead, the photonic qubits are generated while the computer is operating and then later discarded.

Note 3: Items specified by 4A906.b include semiconductor, superconducting, and photonic qubit chips and chip arrays; surface ion trap arrays; other qubit confinement technologies; and coherent interconnects between such items.

Note 4: 4A906.c applies to items designed for calibrating, initializing, manipulating or measuring the resident qubits of a quantum computer.

Technical Notes: For the purposes of 4A906:
1. A 'physical qubit' is a two-level quantum system used to represent the elementary unit of quantum logic by means of manipulations and measurements that are not error corrected. 'Physical qubits' are distinguished from logical qubits, in that logical qubits are error-corrected qubits comprised of many 'physical qubits'.

2. 'Fully controlled' means the 'physical qubit' can be calibrated, initialized, gated, and read out, as necessary.

3. 'Connected' means that two-qubit gate operations can be performed between any arbitrary pair of the available 'working' 'physical qubits'. This does not necessarily entail all-to-all connectivity.

4. 'Working' means that the 'physical qubit' performs universal quantum computational work according to the system specifications for qubit operational fidelity.

5. Supporting 34 or more 'fully controlled', 'connected', 'working' 'physical qubits' refers to the capability of a quantum computer to confine, control, measure and process the quantum information embodied in 34 or more 'physical qubits'.

6. 'C-NOT error' is the average physical gate error for the nearest-neighbor two-'physical qubit' Controlled-NOT (C-NOT) gates.

4A980 Computers for fingerprint equipment, n.e.s.

LICENSE REQUIREMENTS

Reason for Control: CC, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CC applies to entire entry	CC Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

> *Note: 4A980 does not control equipment limited to one finger and designed for user authentication or access control.*

4A994 Computers, "electronic assemblies" and related equipment, not controlled by 4A001 or 4A003, and "specially designed" "parts" and "components" therefor (see List of Items Controlled).

License Requirements

Reason for Control: AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) For associated "software" for commodities in this ECCN, see 4D994 and for associated "technology" for commodities in this ECCN, see 4E992. (2) See also ECCNs 4A003.z, 4A004.z, 4A005.z, 5A002.z, 5A004.z, and 5A992.z.

Related Definitions: N/A

Items:

> *Note 1: The control status of the "digital computers" and related equipment described in 4A994 is determined by the control status of other equipment or systems provided:*
> *a. The "digital computers" or related equipment are essential for the operation of the other equipment or systems;*
>
> *b. The "digital computers" or related equipment are not a "principal element" of the other equipment or systems; and*
>
> *N.B. 1: The control status of "signal processing" or "image enhancement" equipment "specially designed" for other equipment with functions limited to those required for the other equipment is determined by the control status of the other equipment even if it exceeds the "principal element" criterion.*
>
> *N.B. 2: For the control status of "digital computers" or related equipment for telecommunications equipment, see Category 5, Part 1 (Telecommunications).*
>
> *c. The "technology" for the "digital computers" and related equipment is determined by 4E.*

a. Electronic computers and related equipment, and "electronic assemblies" and "specially designed" "parts" and "components" therefor, rated for operation at an ambient temperature above 343 K (70 °C);

b. "Digital computers", including equipment of "signal processing" or image enhancement", having an "Adjusted Peak Performance" ("APP") equal to or greater than 0.0128 Weighted TeraFLOPS (WT);

c. "Electronic assemblies" that are "specially designed" or modified to enhance performance by aggregation of processors, as follows:

c.1. Designed to be capable of aggregation in configurations of 16 or more processors;

c.2. [Reserved];

> *Note 1: 4A994.c applies only to "electronic assemblies" and programmable interconnections with a "APP" not exceeding the limits in 4A994.b, when shipped as unintegrated "electronic assemblies". It*

does not apply to "electronic assemblies" inherently limited by nature of their design for use as related equipment controlled by 4A994.k.

Note 2: 4A994.c does not control any "electronic assembly" "specially designed" for a product or family of products whose maximum configuration does not exceed the limits of 4A994.b.

d. [Reserved];

e. [Reserved];

f. Equipment for "signal processing" or "image enhancement" having an "Adjusted Peak Performance" ("APP") equal to or greater than 0.0128 Weighted TeraFLOPS WT;

g. [Reserved];

h. [Reserved];

i. Equipment containing "terminal interface equipment" exceeding the limits in 5A991;

j. Equipment "specially designed" to provide external interconnection of "digital computers" or associated equipment that allows communications at data rates exceeding 80 Mbyte/s.

Note: 4A994.j does not control internal interconnection equipment (e.g., backplanes, buses) passive interconnection equipment, "network access controllers" or "communication channel controllers".

k. "Hybrid computers" and "electronic assemblies" and "specially designed" "parts" and "components" therefor containing analog-to-digital converters having all of the following characteristics:

k.1. 32 channels or more; and

k.2. A resolution of 14 bit (plus sign bit) or more with a conversion rate of 200,000 conversions/s or more.

l. Computers, "electronic assemblies," and "components," n.e.s., containing integrated circuits, any of which meets or exceeds the limit of ECCN 3A991.p.

Technical Note: For the purposes of 4A994.l, computers include "digital computers," "hybrid computers," and analog computers.

B. "Test", "Inspection" and "Production Equipment" [Reserved]

C. "Materials" [Reserved]

D. "Software"

Note: The control status of "software" for equipment described in other Categories is dealt with in the appropriate Category.

4D001 "Software" as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, CC, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
RS applies to "software" for commodities controlled by 4A003.z.1.a, z.2.a, 4A004.z.1, and 4A005.z.1	To or within any destination worldwide. *See* § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to "software" for commodities controlled by 4A003.z.1.b, z.2.b, 4A004.z.2, and 4A005.z.2	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any destination also specified in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
CC applies to "software" for computerized finger-print equipment controlled by 4A003 for CC reasons	CC Column 1.
AT applies to entire entry	AT Column 1.

Reporting Requirements

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except for "software" for the following:

(1) The "development" or "production" of commodities with an "Adjusted Peak Performance" ("APP") exceeding 29 WT;

(2) The "development" or "production" of commodities controlled by 4A005 or "software" controlled by 4D004; or

(3) Commodities controlled by 4A003.z, 4A004.z, and 4A005.z

APP: Yes to specific countries (see § 740.7 of the EAR for eligibility criteria).

ACE: Yes for 4D001.a (for the "development", "production" or "use" of equipment or "software" specified in ECCN 4A005 or 4D004), except to Country Group E:1 or E:2. See § 740.22 of the EAR for eligibility criteria.

AIA: Yes for "software" for commodities controlled by 4A003.z.1.a, z.2.a, 4A004.z.1, and 4A005.z.1

ACM: Yes for "software" for commodities controlled by 4A003.z

> *Note: See § 740.2(a)(9)(ii) for license exception restrictions for "software" for commodities controlled by 4A003.z, 4A004.z, and 4A005.z.*

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit "software" "specially designed" or modified for the "development" or "production" of equipment specified by ECCN 4A001.a.2 or for the "development" or "production" of "digital computers" having an 'Adjusted Peak Performance' ('APP') exceeding 29 Weighted TeraFLOPS (WT) to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR); may not be used to ship or transmit "software" specified in 4D001.a "specially designed" for the "development" or "production" of equipment specified by ECCN 4A005; and may not be used to ship or transmit "software" for commodities controlled by 4A003.z.1.a, z.2.a, 4A004.z.1, and 4A005.z.1 to any of the destinations listed in Country Group A:5 or A:6.

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

a. "Software" "specially designed" or modified for the "development" or "production", of equipment or "software" controlled by 4A001, 4A003, 4A004, 4A005 or 4D (except 4D090, 4D906, 4D980, 4D993 or 4D994).

b. "Software", other than that controlled by 4D001.a, "specially designed" or modified for the "development" or "production" of equipment as follows:

b.1. "Digital computers" having an "Adjusted Peak Performance" ("APP") exceeding 24 Weighted TeraFLOPS (WT);

b.2. "Electronic assemblies" "specially designed" or modified for enhancing performance by aggregation of processors so that the "APP" of the aggregation exceeds the limit in 4D001.b.1.

4D004 "Software" "specially designed" or modified for the generation, command and control, or delivery of "intrusion software."

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

APP: N/A

ACE: Yes, except to Country Group E:1 or E:2. See § 740.22 of the EAR for eligibility criteria.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit "software" specified by ECCN 4D004.

LIST OF ITEMS CONTROLLED

Related Controls: Software described in USML Category XI(b), and software directly related to a defense article, is "subject to the ITAR"; see § 120.10(a)(4).

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

Note: 4D004 does not apply to "software" specially designed and limited to provide "software" updates or upgrades meeting all the following:
a. The update or upgrade operates only with the authorization of the owner or administrator of the system receiving it; and

b. After the update or upgrade, the "software" updated or upgraded is not any of the following:

1. "Software" specified by 4D004; or

2. "Intrusion software."

4D090 "Software" "specially designed" or modified for the "development" or "production," of computers and related equipment, "electronic assemblies," and "components" therefor specified in ECCN 4A090.

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies to "software" for commodities controlled by 4A090.a	To or within any destination worldwide. *See* § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to "software" for commodities controlled by 4A090.b	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any destination also specified in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

AIA: Yes for commodities controlled by 4A090.a

ACM: Yes

LIST OF ITEMS CONTROLLED

Related Controls: For associated "technology" for software in this ECCN, see 4E001.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

4D906 "Software" "specially designed" or modified for the "development" or "production" of commodities controlled by 4A906.b or 4A906.c.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to the entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry	AT Column 1.

Special Reporting: Deemed exports and deemed reexports of "software" specified in this ECCN are subject to reporting requirements in accordance with § 743.8 of the EAR.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: See ECCN 4E906 for related "technology" controls for the "development" or "production" of this ECCN.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

4D980 "Software" "specially designed" for the "development," "production" or "use" of commodities controlled by 4A980.

LICENSE REQUIREMENTS

Reason for Control: CC, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CC applies to entire entry	CC Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

4D993 "Program" proof and validation "software," "software" allowing the automatic generation of "source codes," and operating system "software" that are "specially designed" for "real-time processing" equipment (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: "Global interrupt latency time" is the time taken by the computer system to recognize an interrupt due to the event, service the interrupt and perform a context switch to an alternate memory-resident task waiting on the interrupt.

Items: a. "Program" proof and validation "software" using mathematical and analytical techniques and designed or modified for "programs" having more than 500,000 "source code" instructions;

b. "Software" allowing the automatic generation of "source codes" from data acquired online from external sensors described in the Commerce Control List; *or*

c. Operating system "software" "specially designed" for "real-time processing" equipment that guarantees a "global interrupt latency time" of less than 20 microseconds.

4D994 "Software" other than that controlled in 4D001 "specially designed" or modified for the "development," "production," or "use" of commodities controlled by 4A101 or 4A994.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

E. "Technology"

4E001 "Technology" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, CC, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to entire entry, except for "technology" for 4A090 or "software" specified by 4D090	NS Column 1.
MT applies to "technology" for items controlled by 4A001.a and 4A101 for MT reasons	MT Column 1.
RS applies to "technology" for commodities controlled by 4A003.z.1.a, z.2.a, 4A004.z.1, 4A005.z.1, 4A090.a or "software" specified by 4D001 (for 4A003.z.1.a, z.2.a, 4A004.z.1 and 4A005.z.1), or 4D090.a	To or within any destination worldwide. *See* § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to "technology" for commodities controlled by 4A003.z.1.b, z.2.b, 4A004.z.2, 4A005.z.2, 4A090.b or "software" specified by 4D001 (for 4A003.z.1.b, z.2.b, 4A004.z.2, and 4A005.z.2), or 4D090.b	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any destination also specified in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
CC applies to "technology" for computerized finger-print equipment controlled by 4A003 for CC reasons	CC Column 1.
AT applies to entire entry	AT Column 1.

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except for the following:

(1) "Technology" for the "development" or "production" of commodities with an "Adjusted Peak Performance" ("APP") exceeding 70 WT or for the "development" or "production" of commodities controlled by 4A005 or "software" controlled by 4D004;

(2) "Technology" for the "development" of "intrusion software"; or

(3) "Technology" for commodities controlled by 4A003.z, 4A004.z, 4A005.z, 4A090 or "software" specified by 4D001 (for 4A003.z, 4A004.z, and 4A005.z), or 4D090

APP: Yes, to specific countries (see § 740.7 of the EAR for eligibility criteria).

ACE: Yes for 4E001.a (for the "development", "production" or "use" of equipment or "software" specified in ECCN 4A005 or 4D004); and for 4E001.c, except to Country Group E:1 or E:2. See § 740.22 of the EAR for eligibility criteria.

AIA: Yes for "technology" for commodities controlled by 4A003.z.1.a, z.2.a, 4A004.z.1, 4A005.z.1, 4A090.a or "software" specified by 4D001 (for 4A003.z.1.a, z.2.a, 4A004.z.1 and 4A005.z.1), or 4D090.a

ACM: Yes for "technology" for commodities controlled by 4A003.z, 4A004.z, 4A005.z, 4A090 or "software" specified by 4D001 (for 4A003.z, 4A004.z and 4A005.z), or 4D090.

> *Note: See § 740.2(a)(9)(ii) of the EAR for license exception restrictions for technology for .z paragraphs under ECCNs 4A003, 4A004, 4A005 or 4A090, or "software" specified by 4D001 (for 4A003.z, 4A004.z, 4A005.z, and 4A090).*

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit "technology" according to the General Technology Note for the "development" or "production" of any of the following equipment or "software": a. Equipment specified by ECCN 4A001.a.2; b. "Digital computers" having an 'Adjusted Peak Performance' ('APP') exceeding 70 Weighted TeraFLOPS (WT); c. "software" specified in the License Exception STA paragraph found in the License Exception section of ECCN 4D001; or "technology" for commodities controlled by 4A003.z.1.b, z.2.b, 4A004.z.2, 4A005.z.2, 4A090.b or "software" specified by 4D001 (for 4A003.z.1.b, z.2.b, 4A004.z.2, and 4A005.z.2), or 4D090.b to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR). License Exception STA may not be used to ship or transmit "technology" for commodities controlled by 4A003.z.1.a, z.2.a, 4A004.z.1, 4A005.z.1, 4A090.a or "software" specified by 4D001 (for 4A003.z.1.a, z.2.a, 4A004.z.1 and 4A005.z.1), or 4D090.a to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

a. "Technology" according to the General Technology Note, for the "development", "production", or "use" of equipment or "software" controlled by 4A (except 4A906, 4A980 or 4A994 and "use" of equipment controlled under 4A090) or 4D (except 4D906, 4D980, 4D993, 4D994 and "use" of software controlled under 4D090).

b. "Technology" according to the General Technology Note, other than that controlled by 4E001.a, for the "development" or "production" of equipment as follows:

b.1. “Digital computers” having an “Adjusted Peak Performance” (“APP”) exceeding 24 Weighted TeraFLOPS (WT);

b.2. “Electronic assemblies” “specially designed” or modified for enhancing performance by aggregation of processors so that the “APP” of the aggregation exceeds the limit in 4E001.b.1.

c. “Technology” for the “development” of “intrusion software.”

Note 1: 4E001.a and .c do not apply to “vulnerability disclosure” or “cyber incident response”.

Note 2: Note 1 does not diminish national authorities' rights to ascertain compliance with 4E001.a and .c.

4E091 'Parameters' for an artificial intelligence model trained utilizing 10^{26} or more 'operations.'

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies entire entry	To or within any destination worldwide. See § 742.6(a)(13).
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

AIA: Yes

ACM: No

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit “technology” specified by ECCN 4E091 to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definition: N/A

Items: The list of items controlled is contained in the ECCN heading.

Technical Notes: For the purposes of 4E091:
1. 'Parameters' refers to any value learned during training (e.g., network weights, biases, etc.). 'Parameters' for an artificial intelligence model are also known as model weights.

*2. 'Operations' refers to mathematical operations used for pre-training and any subsequent training, such as fine-tuning the pre-trained model, but does not include the collection and curation of the input training data. Training 'operations' should account for operations required to perform all steps in the pre-training and subsequent training process, including those for forward and backward propagation for all relevant layers, pooling, and convolutions, regardless of the implementation and hardware limitations, and applied to all relevant operations. For example, consider a model composed of a single densely connected layer with I input neurons, O output neurons, and no biases being trained with backpropagation. Such a model would have a total of N = I * O learned parameters. Each forward pass would require N multiply accumulate operations, or (assuming floating point arithmetic) 2N FLOP. Each backward pass would require 2N multiply accumulate operations, or 4N FLOP. Then, in total, each training data point would require 6N FLOP. Training on a data set of size D would require 6ND total FLOP.*

3. If more than ten percent of the 'operations' involve training on data that was not "published" as defined in § 734.7(a) and was generated by a single data-generation model, then 'operations' the data-generation model used to generate the data should be counted, and if the data-generation model's 'parameters' were not "published," then the training 'operations' used to train the data-generating model should be counted as well. A single data-generation model includes variants of the same model, such as different checkpoints or fine-tuned variants. If multiple models with 'parameters' that were not "published" were used to generate data used for more than ten percent of the training 'operations,' then only the training 'operations' of the data-generation model using the most training 'operations' should be counted. No actual training 'operation' should be counted more than once, so if data-generation model A is used to train data-generation model B and data-generation model C, and models B and C are used to train model D, then the operations to train A are only added to the number of operations for model D once.

Notes: 1. In accordance with § 734.7 of the EAR, 4E091 does not control the 'parameters' of any artificial intelligence model that have been "published" as defined in § 734.7(a). 4E091 also does not control the 'parameters' of any artificial intelligence model derived from a model whose parameters have been 'published,' except where the model has been derived using additional training 'operations' that constitute more than 2.5×10^{25} 'operations' or more than 25 percent of the training 'operations' defined in Note 2, whichever is higher.
2. 4E091 does not control the 'parameters' of any artificial intelligence model trained utilizing fewer 'operations' than the number needed, based on the most efficient "published" methods to train artificial intelligence models, to train an artificial intelligence model as capable, according to an

aggregate of widely used benchmarks, as the most advanced artificial intelligence model that has been "published" as defined in § 734.7(a) of the EAR. To provide certainty for this exclusion, the number of 'operations' needed should not decrease with algorithmic improvements.

2.a. An exporter may determine whether an AI model falls within this exclusion by either:

2.a.1. Self classifying by relying on guidance published by BIS or technical opinions issued by the U.S. AI Safety Institute and the Department of Energy, should such opinions have been published, or

2.a.2. A classification request to BIS in accordance with the procedures in §§ 748.1 and 748.3 of the EAR.

4E906 "Technology" according to the General Technology Note as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	Worldwide control. *See § 742.4(a)(5) and (b)(10) of the EAR.*
RS applies to the entire entry	Worldwide control. *See § 742.6(a)(10) and (b)(11) of the EAR.*
AT applies to entire entry	AT Column 1.

Special Reporting: Deemed exports and deemed reexports of "technology" specified in this ECCN are subject to reporting requirements in accordance with § 743.8 of the EAR.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

IEC: Yes, see § 740.2(a)(22) and § 740.24 of the EAR.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any item in this ECCN to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

a. "Technology" for the "development" or "production" of items controlled by 4A906.b, 4A906.c, or 4D906;

b. "Technology" for "use" of "software" controlled by 4D906.

4E980 "Technology" for the "development," "production" or "use" of commodities controlled by 4A980.

LICENSE REQUIREMENTS

Reason for Control: CC, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CC applies to entire entry	CC Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

4E992 " Technology" other than that controlled in 4E001 for the "development," "production," or "use" of equipment controlled by 4A994, or "software" controlled by 4D993 or 4D994.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

4E993 " Technology" for the "development" or "production" of equipment designed for "multi-data-stream processing."

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

EAR99 Items subject to the EAR that are not elsewhere specified in this CCL Category or in any other category in the CCL are designated by the number EAR99.

Technical Note on "Adjusted Peak Performance" ("APP")

"APP" is an adjusted peak rate at which "digital computers" perform 64-bit or larger floating point additions and multiplications.

Abbreviations used in this Technical Note n number of processors in the "digital computer"
I processor number (i . . . . n)

t_i *processor cycle time* ($t_i = 1/F_i$)

F_i *processor frequency*

R_i *peak floating point calculating rate*

W_i *architecture adjustment factor*

"APP" is expressed in Weighted TeraFLOPS (WT), in units of 10^{12} *adjusted floating point operations per second.*

Outline of "APP" calculation method 1. For each processor i, determine the peak number of 64-bit or larger floating-point operations, FPO_i*, performed per cycle for each processor in the "digital computer".*

Note In determining FPO, include only 64-bit or larger floating point additions or multiplications. All floating point operations must be expressed in operations per processor cycle; operations requiring multiple cycles may be expressed in fractional results per cycle. For processors not capable of performing calculations on floating-point operands of 64-bits or more the effective calculating rate R is zero.
2. Calculate the floating point rate R for each processor

$R_i = FPO_i/t_i$.

3. Calculate "APP" as

"APP" = $W_1 \times R_1 + W_2 \times R_2 + . . . + W_n \times R_n$.

4. For 'vector processors', W_i = 0.9. *For non-'vector processors',* W_i = 0.3.

Note 1: For processors that perform compound operations in a cycle, such as an addition and multiplication, each operation is counted.

Note 2: For a pipelined processor the effective calculating rate R is the faster of the pipelined rate, once the pipeline is full, or the non-pipelined rate.

Note 3: The calculating rate R of each contributing processor is to be calculated at its maximum value theoretically possible before the "APP" of the combination is derived. Simultaneous operations are assumed to exist when the computer manufacturer claims concurrent, parallel, or simultaneous operation or execution in a manual or brochure for the computer.

Note 4: Do not include processors that are limited to input/output and peripheral functions (e.g., disk drive, communication and video display) when calculating "APP".

Note 5: "APP" values are not to be calculated for processor combinations(inter)connected by "Local Area Networks", Wide Area Networks, I/O shared connections/devices, I/O controllers and any communication interconnection implemented by "software".

Note 6: "APP" values must be calculated for processor combinations containing processors "specially designed" to enhance performance by aggregation, operating simultaneously and sharing memory.

Technical Notes 1. Aggregate all processors and accelerators operating simultaneously and located on the same die.
2. Processor combinations share memory when any processor is capable of accessing any memory location in the system through the hardware transmission of cache lines or memory words, without the involvement of any software mechanism, which may be achieved using "electronic assemblies" specified in 4A003.c, z.1, or z.3.

Note 7: A 'vector processor' is defined as a processor with built-in instructions that perform multiple calculations on floating-point vectors (one-dimensional arrays of 64-bit or larger numbers) simultaneously, having at least 2 vector functional units and at least 8 vector registers of at least 64 elements each.

Category 5—Telecommunications and "Information Security"

Part 1—Telecommunications

Notes: 1. The control status of "components", test and "production" equipment, and "software" therefor which are "specially designed" for telecommunications equipment or systems is determined in Category 5, Part 1.

N.B.: For "lasers" "specially designed" for telecommunications equipment or systems, see ECCN 6A005.

2. "Digital computers", related equipment or "software", when essential for the operation and support of telecommunications equipment described in this Category, are regarded as "specially designed" "components", provided they are the standard models customarily supplied by the manufacturer. This includes operation, administration, maintenance, engineering or billing computer systems.

3. Commodities in ECCN 5A001.j, and related "software" specified in 5D001.c (for 5A001.j) that are also controlled in ECCNs 5A002.a, 5A002.z.1, 5A002.z.6, 5A004.a, 5A004.b, 5A004.z, 5D002.c.1, 5D002.c.3, 5D002.z.6, 5D002.z.8, or z 5D002.z.9, remain controlled in Category 5—Part 2 by those entries. Category 5—Part 2 does not apply to elements of source code that implement functionality controlled by these Category 5 Part 1 ECCNs, or to any item subject to the EAR where Encryption Item (EI) functionality is absent, removed or otherwise non-existent.

4. Items in ECCN 5A001.j, 5B001.a (for 5A001.j), related "software" specified in 5D001.a (for 5A001.j) and 5D001.c (for 5A001.j or 5B001.a (for 5A001.j)) and related "technology" specified in ECCN 5E001.a (for 5A001.j and 5D001.a (for 5A001.j)) that are also controlled for Surreptitious Listening (SL) reasons under another ECCN, will continue to be classified under the SL ECCN.

A. "End Items", "Equipment", "Accessories", "Attachments", "Parts", "Components" and "Systems"

5A001 Telecommunications systems, equipment, "components" and "accessories," as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, SL, AT

Control(s)	Country chart (see Supp. No.1 to part 738)
NS applies to 5A001.a, b.5, .e, .f.3 and .h	NS Column 1.
NS applies to 5A001.b (except .b.5), .c, .d, .f (except f.3), .g, and .j	NS Column 2.
SL applies to 5A001.f.1	A license is required for all destinations, as specified in § 742.13 of the EAR. Accordingly, a column specific to this control does not appear on the Commerce Country Chart (Supplement No. 1 to Part 738 of the EAR). NOTE TO SL PARAGRAPH: *This licensing requirement does not supersede, nor does it implement, construe or limit the scope of any criminal statute, including, but not limited to the Omnibus Safe Streets Act of 1968, as amended*.
AT applies to entire entry	AT Column 1.

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A for 5A001.a, b.5, .e, f.3 and .h; $5000 for 5A001.b.1, .b.2, .b.3, .b.6, .d, f.2, f.4, and .g; $3000 for 5A001.c.

GBS: Yes, except 5A001.a, b.5, e, and h.

ACE: Yes for 5A001.j, except to Country Group E:1 or E:2. See § 740.22 of the EAR for eligibility criteria.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any commodity in 5A001.j to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No. 1 to part 740 of the EAR), or any commodity in 5A001.b.3, .b.5 or .h to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) See USML Category XI for controls on direction-finding "equipment" including types of "equipment" in ECCN 5A001.e and any other military or intelligence electronic "equipment" that is "subject to the ITAR." (2) See USML Category XI(a)(4)(iii) for controls on electronic attack and jamming "equipment" defined in 5A001.f and .h that are subject to the ITAR. (3) The act of incorporating a radiation hardened integrated circuit into telecommunications equipment that is specified under ECCN 5A991 or designated as EAR99 does not, in and of itself, cause the telecommunications equipment to meet the specifications of ECCN paragraph 5A001.a.2. (4) See also ECCNs 5A101, 5A980, and 5A991.

a. Any type of telecommunications equipment having any of the following characteristics, functions or features:

a.1. "Specially designed" to withstand transitory electronic effects or electromagnetic pulse effects, both arising from a nuclear explosion;

a.2. Specially hardened to withstand gamma, neutron or ion radiation;

a.3. "Specially designed" to operate below 218 K (−55 °C); *or*

a.4. "Specially designed" to operate above 397 K (124 °C);

> *Note: 5A001.a.3 and 5A001.a.4 apply only to electronic equipment.*

b. Telecommunication systems and equipment, and "specially designed" "components" and "accessories" therefor, having any of the following characteristics, functions or features:

b.1 Being underwater untethered communications systems having any of the following:

b.1.a. An acoustic carrier frequency outside the range from 20 kHz to 60 kHz;

b.1.b. Using an electromagnetic carrier frequency below 30 kHz; *or*

b.1.c. Using electronic beam steering techniques; *or*

b.1.d. Using "lasers" or light-emitting diodes (LEDs), with an output wavelength greater than 400 nm and less than 700 nm, in a "local area network";

b.2. Being radio equipment operating in the 1.5 MHz to 87.5 MHz band and having all of the following:

b.2.a.. Automatically predicting and selecting frequencies and "total digital transfer rates" per channel to optimize the transmission; *and*

b.2.b. Incorporating a linear power amplifier configuration having a capability to support multiple signals simultaneously at an output power of 1 kW or more in the frequency range of 1.5 MHz or more but less than 30 MHz, or 250 W or more in the frequency range of 30 MHz or more but not exceeding 87.5 MHz, over an "instantaneous bandwidth" of one octave or more and with an output harmonic and distortion content of better than −80 dB;

b.3. Being radio equipment employing “spread spectrum” techniques, including “frequency hopping” techniques, not controlled in 5A001.b.4 and having any of the following:

b.3.a. User programmable spreading codes; *or*

b.3.b. A total transmitted bandwidth which is 100 or more times the bandwidth of any one information channel and in excess of 50 kHz;

> *Note: 5A001.b.3.b does not control radio equipment “specially designed” for use with any of the following:*
> *a. Civil cellular radio-communications systems; or*
>
> *b. Fixed or mobile satellite Earth stations for commercial civil telecommunications.*

> *Note: 5A001.b.3 does not control equipment operating at an output power of 1 W or less.*

b.4. Being radio equipment employing ultra-wideband modulation techniques, having user programmable channelizing codes, scrambling codes, or network identification codes and having any of the following:

b.4.a. A bandwidth exceeding 500 MHz; *or*

b.4.b. A “fractional bandwidth” of 20% or more;

b.5. Being digitally controlled radio receivers having all of the following:

b.5.a. More than 1,000 channels;

b.5.b. A 'channel switching time' of less than 1 ms;

b.5.c. Automatic searching or scanning of a part of the electromagnetic spectrum; *and*

b.5.d. Identification of the received signals or the type of transmitter; *or*

> *Note: 5A001.b.5 does not control radio equipment “specially designed” for use with civil cellular radio-communications systems.*

> *Technical Note: For the purposes of 5A001.b.5.b, 'channel switching time' means the time (i.e., delay) to change from one receiving frequency to another, to arrive at or within ±0.05% of the final specified receiving frequency. Items having a specified frequency range of less than ±0.05% around their center frequency are defined to be incapable of channel frequency switching.*

b.6. Employing functions of digital “signal processing” to provide 'voice coding' output at rates of less than 700 bit/s.

Technical Notes: 1. For variable rate 'voice coding', 5A001.b.6 applies to the 'voice coding' output of continuous speech.
2. For the purposes of 5A001.b.6, 'voice coding' is defined as the technique to take samples of human voice and then convert these samples of human voice into a digital signal taking into account specific characteristics of human speech.

c. Optical fibers of more than 500 m in length and specified by the manufacturer as being capable of withstanding a 'proof test' tensile stress of 2×10^9 N/m^2 or more;

N.B.: For underwater umbilical cables, see 8A002.a.3.

Technical Note: For the purposes of 5A001.c, 'proof test' is the on-line or off-line production screen testing that dynamically applies a prescribed tensile stress over a 0.5 to 3 m length of fiber at a running rate of 2 to 5 m/s while passing between capstans approximately 150 mm in diameter. The ambient temperature is a nominal 293 K (20 °C) and relative humidity 40%. Equivalent national standards may be used for executing the proof test.

d. “Electronically steerable phased array antennae” as follows:

d.1. Rated for operation above 31.8 GHz, but not exceeding 57 GHz, and having an Effective Radiated Power (ERP) equal to or greater than +20 dBm (22.15 dBm Effective Isotropic Radiated Power (EIRP));

d.2. Rated for operation above 57 GHz, but not exceeding 66 GHz, and having an ERP equal to or greater than +24 dBm (26.15 dBm EIRP);

d.3. Rated for operation above 66 GHz, but not exceeding 90 GHz, and having an ERP equal to or greater than +20 dBm (22.15 dBm EIRP);

d.4. Rated for operation above 90 GHz;

Note 1: 5A001.d does not control 'electronically steerable phased array antennae' for landing systems with instruments meeting ICAO standards covering Microwave Landing Systems (MLS).

Note 2: 5A001.d does not apply to antennae “specially designed” for any of the following:
a. Civil cellular or WLAN radio-communications systems;

b. IEEE 802.15 or wireless HDMI; or

c. Fixed or mobile satellite earth stations for commercial civil telecommunications.

Technical Note: For the purposes of 5A001.d, 'electronically steerable phased array antenna' is an antenna which forms a beam by means of phase coupling, (i.e., the beam direction is controlled by the complex excitation coefficients of the radiating elements) and the direction of that beam can be varied (both in transmission and reception) in azimuth or in elevation, or both, by application of an electrical signal.

e. Radio direction finding equipment operating at frequencies above 30 MHz and having all of the following, and “specially designed” “components” therefor:

e.1. “Instantaneous bandwidth” of 10 MHz or more; and

e.2. Capable of finding a Line Of Bearing (LOB) to non-cooperating radio transmitters with a signal duration of less than 1 ms;

f. Mobile telecommunications interception or jamming equipment, and monitoring equipment therefor, as follows, and “specially designed” “components” therefor:

f.1. Interception equipment designed for the extraction of voice or data, transmitted over the air interface;

f.2. Interception equipment not specified in 5A001.f.1, designed for the extraction of client device or subscriber identifiers (*e.g.,* IMSI, TIMSI or IMEI), signaling, or other metadata transmitted over the air interface;

f.3. Jamming equipment “specially designed” or modified to intentionally and selectively interfere with, deny, inhibit, degrade or seduce mobile telecommunication services and performing any of the following:

f.3.a. Simulate the functions of Radio Access Network (RAN) equipment;

f.3.b. Detect and exploit specific characteristics of the mobile telecommunications protocol employed (*e.g.,* GSM); *or*

f.3.c. Exploit specific characteristics of the mobile telecommunications protocol employed (*e.g.,* GSM);

f.4. Radio Frequency (RF) monitoring equipment designed or modified to identify the operation of items specified in 5A001.f.1, 5A001.f.2 or 5A001.f.3.

Note: 5A001.f.1 and 5A001.f.2 do not apply to any of the following:

a. Equipment "specially designed" for the interception of analog Private Mobile Radio (PMR), IEEE 802.11 WLAN;

b. Equipment designed for mobile telecommunications network operators; or

c. Equipment designed for the "development" or "production" of mobile telecommunications equipment or systems.

N.B. 1: See also the International Traffic in Arms Regulations (ITAR) (22 CFR parts 120-130). For items specified by 5A001.f.1 (including as previously specified by 5A001.i), see also 5A980 and the U.S. Munitions List (22 CFR part 121).

N.B. 2: For radio receivers see 5A001.b.5.

g. Passive Coherent Location (PCL) systems or equipment, "specially designed" for detecting and tracking moving objects by measuring reflections of ambient radio frequency emissions, supplied by non-radar transmitters.

Technical Note: For the purposes of 5A001.g, non-radar transmitters may include commercial radio, television or cellular telecommunications base stations.

Note: 5A001.g. does not control:
a. Radio-astronomical equipment; or

b. Systems or equipment, that require any radio transmission from the target.

h. Counter Improvised Explosive Device (IED) equipment and related equipment, as follows:

h.1. Radio Frequency (RF) transmitting equipment, not specified by 5A001.f, designed or modified for prematurely activating or preventing the initiation of Improvised Explosive Devices (IEDs);

h.2. Equipment using techniques designed to enable radio communications in the same frequency channels on which co-located equipment specified by 5A001.h.1 is transmitting.

N.B.: See also Category XI of the International Traffic in Arms Regulations (ITAR) (22 CFR parts 120-130).

i. [Reserved]

N.B.: *See 5A001.f.1 for items previously specified by 5A001.i.*

j. IP network communications surveillance systems or equipment, and "specially designed" components therefor, having all of the following:

j.1. Performing all of the following on a carrier class IP network (*e.g.,* national grade IP backbone):

j.1.a. Analysis at the application layer (*e.g.,* Layer 7 of Open Systems Interconnection (OSI) model (ISO/IEC 7498-1));

j.1.b. Extraction of selected metadata and application content (*e.g.,* voice, video, messages, attachments); *and*

j.1.c. Indexing of extracted data; *and*

j.2. Being "specially designed" to carry out all of the following:

j.2.a. Execution of searches on the basis of "hard selectors"; *and*

j.2.b. Mapping of the relational network of an individual or of a group of people.

Note: 5A001.j does not apply to "systems" or "equipment", "specially designed" for any of the following:
a. Marketing purpose;

b. Network Quality of Service (QoS); or

c. Quality of Experience (QoE).

N.B.: See also the International Traffic in Arms Regulations (ITAR) (22 CFR parts 120-130). Defense articles described in USML Category XI(b) are "subject to the ITAR."

5A101 Telemetering and telecontrol equipment, including ground equipment, designed or modified for unmanned aerial vehicle (including cruise missiles, target drones, and reconnaissance drones) or rocket systems (including ballistic missiles, space launch vehicles, and sounding rockets) capable of a maximum "range" equal to or greater than 300 km.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

Note: 5A101 does not control:
1. Telecontrol equipment "specially designed" to be used for remote control of recreational model planes, boats or vehicles and having an electric field strength of not more than 200 microvolts per meter at a distance of 500 meters;

2. Equipment designed or modified for manned aircraft or satellites;

3. Ground based equipment designed or modified for terrestrial or marine applications;

4. Equipment designed for commercial, civil, or safety of life (e.g., data integrity or flight safety) Global Navigation Satellite System services.

Note: ECCN 5A101 does not include items not designed or modified for unmanned aerial vehicles (including cruise missiles, target drones, and reconnaissance drones) or rocket systems (including ballistic missiles, space launch vehicles and sounding rockets) capable of a maximum "range" equal to or greater than 300km (e.g., telemetry circuit cards limited by design to reception only and designed for use in personal computers).

5A611 Telecommunications equipment, and "parts," "components," "accessories," and "attachments" "specially designed" therefor, "specially designed" for a military application that are not enumerated in any USML category are controlled by ECCN 3A611.

5A980 Devices primarily useful for the surreptitious interception of wire, oral, or electronic communications, other than those controlled under 5A001.f.1; and "parts," "components" and "accessories" therefor.

LICENSE REQUIREMENTS

Reason for Control: SL, AT

Control(s): SL and AT apply to entire entry. A license is required for all destinations, as specified in § 742.13 of the EAR. Accordingly, a column specific to this control does not appear on the Commerce Country Chart (Supplement No. 1 to Part 738 of the EAR).

> *Note: This licensing requirement does not supersede, nor does it implement, construe or limit the scope of any criminal statute, including, but not limited to the Omnibus Safe Streets Act of 1968, as amended.*

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: (1) See ECCN 5A001.f.1 for systems or equipment, "specially designed" or modified to intercept and process the air interface of 'mobile telecommunications', and "specially designed" components therefor. (2) See ECCN 5D980 for "software" for the "development", "production" or "use" of equipment controlled by 5A980. (3) See ECCN 5E980 for the "technology" for the "development", "production", and "use" of equipment controlled by 5A980.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

5A991 Telecommunication equipment, not controlled by 5A001 (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 5E101 and 5E991.

Related Definitions: (1) "Asynchronous transfer mode" ("ATM") is a transfer mode in which the information is organized into cells; it is asynchronous in the sense that the recurrence of cells depends on the required or instantaneous bit rate. (2) "Bandwidth of one voice channel" is data communication equipment designed to operate in one voice channel of 3,100 Hz, as defined in CCITT Recommendation G.151. (3) "Communications channel controller" is the physical interface that controls the flow of synchronous or asynchronous digital information. It is an assembly that can be integrated into computer or telecommunications equipment to provide communications access. (4) "Datagram" is a self-contained, independent entity of data carrying sufficient information to be routed from the source to the destination data terminal equipment without reliance on earlier exchanges between this source and destination data terminal equipment and the transporting network. (5) "Fast select" is a facility applicable to virtual calls that allows data terminal equipment to expand the possibility to transmit data in call set-up and clearing "packets" beyond the basic capabilities of a virtual call. (6) "Gateway" is the function, realized by any combination of equipment and "software", to carry out the conversion of conventions for representing, processing or communicating information used on one system into the corresponding, but different conventions used in another system. (7) "Integrated Services Digital Network" (ISDN) is a unified end-to-end digital network, in which data originating from all types of communication (*e.g.*, voice, text, data, still and moving pictures) are transmitted from one port (terminal) in the exchange (switch) over one access line to and from the subscriber. (8) "Packet" is a group of binary digits including data and call control signals that is switched as a composite whole. The data, call control signals, and possible error control information are arranged in a specified format.

Items: a. Any type of telecommunications equipment, not controlled by 5A001.a, "specially designed" to operate outside the temperature range from 219 K (−54 °C) to 397 K (124 °C).

b. Telecommunication transmission equipment and systems, and "specially designed" "parts," "components" and "accessories" therefor, having any of the following characteristics, functions or features:

> *Note*: *Telecommunication transmission equipment:*

a. Categorized as follows, or combinations thereof:

1. Radio equipment (e.g., transmitters, receivers and transceivers);

2. Line terminating equipment;

3. Intermediate amplifier equipment;

4. Repeater equipment;

5. Regenerator equipment;

6. Translation encoders (transcoders);

7. Multiplex equipment (statistical mutiplex included);

8. Modulators/demodulators (modems);

9. Transmultiplex equipment (see CCITT Rec. G701);

10. "Stored program controlled" digital crossconnection equipment;

11. "Gateways" and bridges;

12. "Media access units"; and

b. Designed for use in single or multi-channel communication via any of the following:

1. Wire (line);

2. Coaxial cable;

3. Optical fiber cable;

4. Electromagnetic radiation; or

5. Underwater acoustic wave propagation.

b.1. Employing digital techniques, including digital processing of analog signals, and designed to operate at a "digital transfer rate" at the highest multiplex level exceeding 45 Mbit/s or a "total digital transfer rate" exceeding 90 Mbit/s;

Note: 5A991.b.1 does not control equipment "specially designed" to be integrated and operated in

any satellite system for civil use.

b.2. Modems using the “bandwidth of one voice channel” with a “data signaling rate” exceeding 9,600 bits per second;

b.3. Being “stored program controlled” digital cross connect equipment with “digital transfer rate” exceeding 8.5 Mbit/s per port.

b.4. Being equipment containing any of the following:

b.4.a. “Network access controllers” and their related common medium having a “digital transfer rate” exceeding 33 Mbit/s; *or*

b.4.b. “Communication channel controllers” with a digital output having a “data signaling rate” exceeding 64,000 bit/s per channel;

Note: If any uncontrolled equipment contains a “network access controller”, it cannot have any type of telecommunications interface, except those described in, but not controlled by 5A991.b.4.

b.5. Employing a “laser” and having any of the following characteristics:

b.5.a. A transmission wavelength exceeding 1,000 nm; *or*

b.5.b. Employing analog techniques and having a bandwidth exceeding 45 MHz;

Note: 5A991.b.5.b does not control commercial TV systems.

b.5.c. Employing coherent optical transmission or coherent optical detection techniques (also called optical heterodyne or homodyne techniques);

b.5.d. Employing wavelength division multiplexing techniques; *or*

b.5.e. Performing “optical amplification”;

b.6. Radio equipment operating at input or output frequencies exceeding:

b.6.a. 31 GHz for satellite-earth station applications; *or*

b.6.b. 26.5 GHz for other applications;

Note: 5A991.b.6. does not control equipment for civil use when conforming with an International Telecommunications Union (ITU) allocated band between 26.5 GHz and 31 GHz.

b.7. Being radio equipment employing any of the following:

b.7.a. Quadrature-amplitude-modulation (QAM) techniques above level 4 if the “total digital transfer rate” exceeds 8.5 Mbit/s;

b.7.b. QAM techniques above level 16 if the “total digital transfer rate” is equal to or less than 8.5 Mbit/s;

b.7.c. Other digital modulation techniques and having a “spectral efficiency” exceeding 3 bit/s/Hz; or

b.7.d. Operating in the 1.5 MHz to 87.5 MHz band and incorporating adaptive techniques providing more than 15 dB suppression of an interfering signal.

Notes: 1. 5A991.b.7 does not control equipment “specially designed” to be integrated and operated in any satellite system for civil use.
2. 5A991.b.7 does not control radio relay equipment for operation in an ITU allocated band:

a. Having any of the following:

a.1. Not exceeding 960 MHz; or

a.2. With a “total digital transfer rate” not exceeding 8.5 Mbit/s; and

b. Having a “spectral efficiency” not exceeding 4 bit/s/Hz.

c. “Stored program controlled” switching equipment and related signaling systems, having any of the following characteristics, functions or features, and “specially designed” “parts,” “components” and “accessories” therefor:

Note: Statistical multiplexers with digital input and digital output which provide switching are treated as “stored program controlled” switches.

c.1. “Data (message) switching” equipment or systems designed for “packet-mode operation” and “parts,” electronic assemblies and “components” therefor, n.e.s.

c.2. [Reserved]

c.3. Routing or switching of “datagram” packets;

c.4. [Reserved]

Note: The restrictions in 5A991.c.3 do not apply to networks restricted to using only “network access controllers” or to “network access controllers” themselves.

c.5. Multi-level priority and pre-emption for circuit switching;

> *Note: 5A991.c.5 does not control single-level call preemption.*

c.6. Designed for automatic hand-off of cellular radio calls to other cellular switches or automatic connection to a centralized subscriber data base common to more than one switch;

c.7. Containing “stored program controlled” digital cross connect equipment with “digital transfer rate” exceeding 8.5 Mbit/s per port.

c.8. “Common channel signaling” operating in either non-associated or quasi-associated mode of operation;

c.9. “Dynamic adaptive routing”;

c.10. Being packet switches, circuit switches and routers with ports or lines exceeding any of the following:

c.10.a. A “data signaling rate” of 64,000 bit/s per channel for a “communications channel controller”; *or*

> *Note: 5A991.c.10.a does not control multiplex composite links composed only of communication channels not individually controlled by 5A991.b.1.*

c.10.b. A “digital transfer rate” of 33 Mbit/s for a “network access controller” and related common media;

> *Note: 5A991.c.10 does not control packet switches or routers with ports or lines not exceeding the limits in 5A991.c.10.*

c.11. “Optical switching”;

c.12. Employing “Asynchronous Transfer Mode” (“ATM”) techniques.

d. Optical fibers and optical fiber cables of more than 50 m in length designed for single mode operation;

e. Centralized network control having all of the following characteristics:

e.1. Receives data from the nodes; *and*

e.2. Process these data in order to provide control of traffic not requiring operator decisions, and thereby performing “dynamic adaptive routing”;

> *Note: 5A991.e does not preclude control of traffic as a function of predictable statistical traffic conditions.*

f. Phased array antennas, operating above 10.5 GHz, containing active elements and distributed "parts" or "components," and designed to permit electronic control of beam shaping and pointing, except for landing systems with instruments meeting International Civil Aviation Organization (ICAO) standards (microwave landing systems (MLS)).

g. Mobile communications equipment, n.e.s., and "parts," electronic assemblies and "components" therefor; *or*

h. Radio relay communications equipment designed for use at frequencies equal to or exceeding 19.7 GHz and "parts" and "components" therefor, n.e.s.

B. "Test", "Inspection" and "Production Equipment"

5B001 Telecommunication test, inspection and production equipment, "components" and "accessories," as follows (See List of Items Controlled).

License Requirements

Reason for Control: NS, AT

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2.
AT applies to entire entry	AT Column 1.

Reporting Requirements

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $5000, except N/A for 5B001.a (for 5A001.j)

GBS: Yes, except N/A for 5B001.a (for 5A001.j)

ACE: Yes for 5B001.a (for equipment and "specially designed" "components" or "accessories" therefor, "specially designed" for the "development" or "production" of equipment, functions or features, controlled by 5A001.j), except to Country Group E:1 or E:2. See § 740.22 of the EAR for eligibility criteria.

Special Conditions for STA

STA: License Exception STA may not be used to ship 5B001.a equipment and "specially designed" components or "accessories" therefor, "specially designed" for the "development" or "production" of equipment, functions or features specified by in ECCN 5A001.b.3, .b.5 or .h to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR) and 5A001.j to any of the destinations listed in Country Group A:5 or A:6.

LIST OF ITEMS CONTROLLED

Related Controls: See also 5B991.

Related Definition: N/A

Items:

a. Equipment and "specially designed" "components" or "accessories" therefor, "specially designed" for the "development" or "production" of equipment, functions or features, controlled by 5A001;

Note: 5B001.a does not apply to optical fiber characterization equipment.

b. Equipment and "specially designed" "components" or "accessories" therefor, "specially designed" for the "development" of any of the following telecommunication transmission or switching equipment:

b.1. [Reserved]

b.2. Equipment employing a "laser" and having any of the following:

b.2.a. A transmission wavelength exceeding 1750 nm; or

b.2.b. [Reserved]

b.2.c. [Reserved]

b.2.d. Employing analog techniques and having a bandwidth exceeding 2.5 GHz; or

Note: 5B001.b.2.d. does not include equipment "specially designed" for the "development" of commercial TV systems.

b.3. [Reserved]

b.4. Radio equipment employing Quadrature-Amplitude-Modulation (QAM) techniques above level 1,024.

5B991 Telecommunications test equipment, n.e.s.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

C. "Materials"

5C991 Preforms of glass or of any other material optimized for the manufacture of optical fibers controlled by 5A991.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

D. "Software"

5D001 "Software" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, SL, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
SL applies to the entire entry as applicable for equipment, functions, features, or characteristics controlled by 5A001.f.1	A license is required for all destinations, as specified in § 742.13 of the EAR. Accordingly, a column specific to this control does not appear on the Commerce Country Chart (Supplement No. 1 to Part 738 of the EAR). *Note to SL paragraph: This licensing requirement does not supersede, nor does it implement, construe or limit the scope of any criminal statute, including, but not limited to the Omnibus Safe Streets Act of 1968, as amended.*
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

LIST BASED LICENSE EXCEPTIONS

(See Part 740 for a description of all license exceptions).

TSR: Yes, except for exports and reexports to destinations outside of those countries listed in Country Group A:5 (See Supplement No. 1 to part 740 of the EAR) of "software" controlled by 5D001.a and "specially designed" for items controlled by 5A001.b.5 and 5A001.h, and N/A for "software" classified under ECCN 5D001.a (for 5A001.j) or 5D001.c (for 5A001.j or 5B001.a (for 5A001.j)).

ACE: Yes for 5D001.a (for 5A001.j) and 5D001.c (for 5A001.j or 5B001.a (for 5A001.j)), except to Country Group E:1 or E:2. See § 740.22 of the EAR for eligibility criteria.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit 5D001.a "software" "specially designed" for the "development" or "production" of equipment, functions or features, specified by ECCN 5D001.a (for 5A001.j) and 5D001.c (for 5A001.j or 5B001.a (for 5A001.j)) to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR); 5A001.b.3, .b.5 or .h; and for 5D001.b. for "software" "specially designed" or modified to support "technology" specified by the STA paragraph in the License Exception section of ECCN 5E001 to any of the destinations listed in Country Group A:6.

LIST OF ITEMS CONTROLLED

Related Controls: See also 5D980 and 5D991.

Related Definitions: N/A

Items:

a. "Software" "specially designed" or modified for the "development", "production" or "use" of equipment, functions or features controlled by 5A001;

b. [Reserved]

c. Specific "software" "specially designed" or modified to provide characteristics, functions or features of equipment, controlled by 5A001 or 5B001;

d. "Software" "specially designed" or modified for the "development" of any of the following telecommunication transmission or switching equipment:

d.1. [Reserved]

d.2. Equipment employing a "laser" and having any of the following:

d.2.a. A transmission wavelength exceeding 1,750 nm; *or*

d.2.b. Employing analog techniques and having a bandwidth exceeding 2.5 GHz; *or*

Note: 5D001.d.2.b does not control "software" "specially designed" or modified for the "development" of commercial TV systems.

d.3. [Reserved]

d.4. Radio equipment employing Quadrature-Amplitude-Modulation (QAM) techniques above level 1,024.

e. “Software”, other than that specified by 5D001.a or 5D001.c, “specially designed” or modified for monitoring or analysis by law enforcement, providing all of the following:

e.1. Execution of searches on the basis of “hard selectors” of either the content of communication or metadata acquired from a communications service provider using a 'handover interface'; *and*

Technical Notes:

1. For the purposes of 5D001.e, a 'handover interface' is a physical and logical interface, designed for use by an authorised law enforcement authority, across which targeted interception measures are requested from a communications service provider and the results of interception are delivered from a communications service provider to the requesting authority. The 'handover interface' is implemented within systems or equipment (e.g., mediation devices) that receive and validate the interception request, and deliver to the requesting authority only the results of interception that fulfil the validated request.

2. 'Handover interfaces' may be specified by international standards (including but not limited to ETSI TS 101 331, ETSI TS 101 671, 3GPP TS 33.108) or national equivalents.

e.2. Mapping of the relational network or tracking the movement of targeted individuals based on the results of searches on content of communication or metadata or searches as described in 5D001.e.1.

Note: 5D001.e does not apply to “software” “specially designed” or modified for any of the following:

a. Billing purposes;

b. Network Quality of Service (QoS);

c. Quality of Experience (QoE);

d. Mediation devices; or

e. Mobile payment or banking use.

5D101 “Software” “specially designed” or modified for the “use” of equipment controlled by 5A101.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

5D980 Other "software", other than that controlled by 5D001 (for the equipment, functions, features, or characteristics controlled by 5A001. f.1, or to support certain "technology" controlled by 5E001.a), as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: SL, AT

Controls: SL and AT apply to entire entry. A license is required for all destinations, as specified in § 742.13 of the EAR. Accordingly, a column specific to this control does not appear on the Commerce Country Chart (Supplement No. 1 to Part 738 of the EAR).

> *Note: This licensing requirement does not supersede, nor does it implement, construe or limit the scope of any criminal statute, including, but not limited to the Omnibus Safe Streets Act of 1968, as amended.*

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 5D001.a and .c for software controls for equipment, functions, features or characteristics controlled by 5A001.f.1 and also 5D001.b for controls on "software" "specially designed" or modified to support "technology" controlled by 5E001.a (for 5A001.f.1 equipment, functions or features, and for 5D001.a "software" for 5A001.f.1 equipment). See 5E980 for "technology" for the "development", "production", and "use" of equipment controlled by 5A980 or "software" controlled by 5D980.

Related Definitions: N/A

Items: a. "Software" primarily useful for the surreptitious interception of wire, oral, and electronic communications.

b. "Software" primarily useful for the "development", "production", or "use" of equipment controlled by 5A980.

5D991 "Software" "specially designed" or modified for the "development," "production" or "use" of equipment controlled by 5A991 and 5B991, and dynamic adaptive routing software as described as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. "Software", other than in machine-executable form, "specially designed" for "dynamic adaptive routing".

b. [Reserved]

E. "Technology"

5E001 "Technology" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, SL, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
SL applies to "technology" for the "development" or "production" of equipment, functions or features controlled by 5A001.f.1, or for the "development" or "production" of "software" controlled by ECCN 5D001.a (for 5A001.f.1)	A license is required for all destinations, as specified in § 742.13 of the EAR. Accordingly, a column specific to this control does not appear on the Commerce Country Chart (Supplement No. 1 to Part 738 of the EAR). *Note to SL paragraph: This licensing requirement does not supersede, implement, construe or limit the scope of any criminal statute, including, but not limited to, the Omnibus Safe Streets Act of 1968, as amended.*
AT applies to entire entry	AT Column 1.

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for Description of All License Exceptions)

TSR: Yes, except for exports or reexports to destinations outside of those countries listed in Country Group A:5 (See Supplement No. 1 to part 740 of the EAR) of "technology" controlled by 5E001 for the "development" or "production" of the following:

(1) Items controlled by 5A001.b.5, .h or .j;

(2) "Software" controlled by 5D001.a that is "specially designed" for the "development" or "production" of equipment, functions or features controlled by 5A001.b.5, 5A001.h, 5A001.j, or 5B001.a (for 5A001.j); or

(3) "Software" controlled by 5D001.c (for 5A001.j or 5B001.a (for 5A001.j)).

ACE: Yes, for 5E001.a (for 5A001.j, 5B001.a (for 5A001.j), 5D001.a (for 5A001.j), or 5D001.c (for 5A001.j or 5B001.a (for 5A001.j))) except to Country Group E:1 or E:2. See § 740.22 of the EAR for eligibility criteria.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit "technology" according to the General Technology Note for the "development" or "production" of equipment, functions or features specified by 5A001.b.3, .b.5 or .h; or for "software" in 5D001.a or .c, that is specified in the STA paragraph in the License Exception section of ECCN 5D001 to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR); or

"technology" specified in 5E001.a according to the General Technology Note for the "development" or "production" of equipment, functions or features specified by 5A001.j, 5B001.a (for 5A001.j), 5D001.a (for 5A001.j), 5D001.c (for 5A001.j or 5B001.a) to any destinations listed in Country Group A:5 or A:6.

LIST OF ITEMS CONTROLLED

Related Controls: (1) See also 5E101, 5E980 and 5E991. (2) "Technology" for "development" or "production" of "Monolithic Microwave Integrated Circuit" ("MMIC") amplifiers that meet the control criteria given at 3A001.b.2 or .z (for commodities also described in 3A001.b.2) is controlled in 3E001; 5E001.d refers only to that additional "technology" "required" for telecommunications.

Related Definitions: N/A

Items:

a. "Technology" according to the General Technology Note for the "development", "production" or "use" (excluding operation) of equipment, functions or features, controlled by 5A001 or "software" controlled by 5D001.a or 5D001.e.

b. Specific "technology", as follows:

b.1. "Technology" "required" for the "development" or "production" of telecommunications equipment "specially designed" to be used on board satellites;

b.2. "Technology" for the "development" or "use" of "laser" communication techniques with the capability of automatically acquiring and tracking signals and maintaining communications through exoatmosphere or sub-surface (water) media;

b.3. "Technology" for the "development" of digital cellular radio base station receiving equipment whose reception capabilities that allow multi-band, multi-channel, multi-mode, multi-coding algorithm or multi-protocol operation can be modified by changes in "software";

b.4. "Technology" for the "development" of "spread spectrum" techniques, including "frequency hopping" techniques.

> *Note: 5E001.b.4 does not apply to "technology" for the "development" of any of the following:*
> *a. Civil cellular radio-communications systems; or*
>
> *b. Fixed or mobile satellite Earth stations for commercial civil telecommunications.*

c. "Technology" according the General Technology Note for the "development" or "production" of any of the following:

c.1. [Reserved]

c.2. Equipment employing a "laser" and having any of the following:

c.2.a. A transmission wavelength exceeding 1,750 nm;

c.2.b. [Reserved]

c.2.c. [Reserved]

c.2.d. Employing wavelength division multiplexing techniques of optical carriers at less than 100 GHz spacing; *or*

c.2.e. Employing analog techniques and having a bandwidth exceeding 2.5 GHz;

> *Note: 5E001.c.2.e does not control "technology" for commercial TV systems.*

> *N.B.: For "technology" for the "development" or "production" of non-telecommunications equipment employing a "laser", see Product Group E of Category 6, e.g., 6E00x*

c.3. Equipment employing "optical switching" and having a switching time less than 1 ms; *or*

c.4. Radio equipment having any of the following:

c.4.a. Quadrature-Amplitude-Modulation (QAM) techniques above level 1,024; *or*

c.4.b. Operating at input or output frequencies exceeding 31.8 GHz; *or*

> *Note: 5E001.c.4.b does not control "technology" for equipment designed or modified for operation in any frequency band which is "allocated by the ITU" for radio-communications services, but not for radio-determination.*

c.4.c. Operating in the 1.5 MHz to 87.5 MHz band and incorporating adaptive techniques providing more than 15 dB suppression of an interfering signal; *or*

c.5. [Reserved]

c.6. Mobile equipment having all of the following:

c.6.a. Operating at an optical wavelength greater than or equal to 200nm and less than or equal to 400nm; *and*

c.6.b. Operating as a "local area network";

d. "Technology" according to the General Technology Note for the "development" or "production" of "Monolithic Microwave Integrated Circuit" ("MMIC") amplifiers "specially designed" for telecommunications and that are any of the following:

Technical Note: For purposes of 5E001.d, the parameter peak saturated power output may also be referred to on product data sheets as output power, saturated power output, maximum power output, peak power output, or peak envelope power output.

d.1. Rated for operation at frequencies exceeding 2.7 GHz up to and including 6.8 GHz with a "fractional bandwidth" greater than 15%, and having any of the following:

d.1.a. A peak saturated power output greater than 75 W (48.75 dBm) at any frequency exceeding 2.7 GHz up to and including 2.9 GHz;

d.1.b. A peak saturated power output greater than 55 W (47.4 dBm) at any frequency exceeding 2.9 GHz up to and including 3.2 GHz;

d.1.c. A peak saturated power output greater than 40 W (46 dBm) at any frequency exceeding 3.2 GHz up to and including 3.7 GHz; *or*

d.1.d. A peak saturated power output greater than 20 W (43 dBm) at any frequency exceeding 3.7 GHz up to and including 6.8 GHz;

d.2. Rated for operation at frequencies exceeding 6.8 GHz up to and including 16 GHz with a "fractional bandwidth" greater than 10%, and having any of the following:

d.2.a. A peak saturated power output greater than 10W (40 dBm) at any frequency exceeding 6.8 GHz up to and including 8.5 GHz; or

d.2.b. A peak saturated power output greater than 5W (37 dBm) at any frequency exceeding 8.5 GHz up to and including 16 GHz;

d.3. Rated for operation with a peak saturated power output greater than 3 W (34.77 dBm) at any frequency exceeding 16 GHz up to and including 31.8 GHz, and with a "fractional bandwidth" of greater than 10%;

d.4. Rated for operation with a peak saturated power output greater than 0.1 nW (−70 dBm) at any frequency exceeding 31.8 GHz up to and including 37 GHz;

d.5. Rated for operation with a peak saturated power output greater than 1 W (30 dBm) at any frequency exceeding 37 GHz up to and including 43.5 GHz, and with a "fractional bandwidth" of greater than 10%;

d.6. Rated for operation with a peak saturated power output greater than 31.62 mW (15 dBm) at any frequency exceeding 43.5 GHz up to and including 75 GHz, and with a "fractional bandwidth" of greater than 10%;

d.7. Rated for operation with a peak saturated power output greater than 10 mW (10 dBm) at any frequency exceeding 75 GHz up to and including 90 GHz, and with a "fractional bandwidth" of greater than 5%; or

d.8. Rated for operation with a peak saturated power output greater than 0.1 nW (−70 dBm) at any frequency exceeding 90 GHz;

e. "Technology" according to the General Technology Note for the "development" or "production" of electronic devices and circuits, "specially designed" for telecommunications and containing "components" manufactured from "superconductive" materials, "specially designed" for operation at temperatures below the "critical temperature" of at least one of the "superconductive" constituents and having any of the following:

e.1. Current switching for digital circuits using "superconductive" gates with a product of delay time per gate (in seconds) and power dissipation per gate (in watts) of less than 10^{-14} J; *or*

e.2. Frequency selection at all frequencies using resonant circuits with Q-values exceeding 10,000.

5E101 "Technology" according to the General Technology Note for the "development," "production" or "use" of equipment or software controlled by 5A101 or 5D101.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

5E980 "Technology", other than that controlled by 5E001.a (for 5A001.f.1, and for 5D001.a (for 5A001.f.1)), primarily useful for the "development", "production", or "use" of equipment, functions or features, of equipment controlled by 5A980 or "software" controlled by 5D980.

LICENSE REQUIREMENTS

Reason for Control: SL, AT

Controls: SL and AT apply to entire entry. A license is required for all destinations, as specified in § 742.13 of the EAR. Accordingly, a column specific to this control does not appear on the Commerce Country Chart (Supplement No. 1 to Part 738 of the EAR).

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 5D001.a and .c (for 5A001.f.1 equipment), 5D001.b (supporting 5E001.a "technology" for 5A001.f.1 equipment, or for 5D001.a "software" (for 5A001.f.1equipment)), and 5E001.a (for 5A001.f.1 equipment, or for 5D001.a "software" for 5A001.f.1 equipment).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

5E991 "Technology" for the "Development", "Production" or "Use" of Equipment Controlled by 5A991 or 5B991, or "Software" Controlled by 5D991, and Other "Technologies" as Follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: (1) "Synchronous digital hierarchy" (SDH) is a digital hierarchy providing a means to manage, multiplex, and access various forms of digital traffic using a synchronous transmission format on different types of media. The format is based on the Synchronous Transport Module (STM) that is defined by CCITT Recommendation G.703, G.707, G.708, G.709 and others yet to be published. The first level rate of 'SDH' is 155.52 Mbits/s. (2) 'Synchronous optical network' (SONET) is a network providing a means to manage, multiplex and access various forms of digital traffic using a synchronous transmission format on fiber optics. The format is the

North America version of 'SDH' and also uses the Synchronous Transport Module (STM). However, it uses the Synchronous Transport Signal (STS) as the basic transport module with a first level rate of 51.81 Mbits/s. The SONET standards are being integrated into those of 'SDH'.

Items: a. Specific "technologies" as follows:

a.1. "Technology" for the processing and application of coatings to optical fiber "specially designed" to make it suitable for underwater use;

a.2. "Technology" for the "development" of equipment employing 'Synchronous Digital Hierarchy' ('SDH') or 'Synchronous Optical Network' ('SONET') techniques.

Part 2—"Information Security"

Note 1: [Reserved]

Note 2: Category 5—Part 2, "information security" products, when accompanying their user for the user's personal use or as tools of trade, are eligible for License Exceptions TMP or BAG, subject to the terms and conditions of these license exceptions.

Note 3: Cryptography Note: ECCNs 5A002, 5D002.a.1, .b, .c.1, z.1, z.5, and z.6, do not control items as follows:
a. Items meeting all of the following:

1. Generally available to the public by being sold, without restriction, from stock at retail selling points by means of any of the following:

a. Over-the-counter transactions;

b. Mail order transactions;

c. Electronic transactions; or

d. Telephone call transactions;

2. The cryptographic functionality cannot be easily changed by the user;

3. Designed for installation by the user without further substantial support by the supplier; and

4. When necessary, details of the items are accessible and will be provided, upon request, to the appropriate authority in the exporter's country in order to ascertain compliance with conditions described in paragraphs a.1 through a.3 of this Note;

b. Hardware components or 'executable software', of existing items described in paragraph a. of this Note, that have been designed for these existing items, and meeting all of the following:

1. "Information security" is not the primary function or set of functions of the component or 'executable software';

2. The component or 'executable software' does not change any cryptographic functionality of the existing items, or add new cryptographic functionality to the existing items;

3. The feature set of the component or 'executable software' is fixed and is not designed or modified to customer specification; and

4. When necessary, as determined by the appropriate authority in the exporter's country, details of the component or 'executable software', and details of relevant end-items are accessible and will be provided to the authority upon request, in order to ascertain compliance with conditions described above.

Technical Note: For the purpose of the Cryptography Note, 'executable software' means "software" in executable form, from an existing hardware component excluded from 5A002, by the Cryptography Note.

Note: 'Executable software' does not include complete binary images of the "software" running on an end-item.

Note to the Cryptography Note: 1. To meet paragraph a. of Note 3, all of the following must apply:
a. The item is of potential interest to a wide range of individuals and businesses; and

b. The price and information about the main functionality of the item are available before purchase without the need to consult the vendor or supplier. A simple price inquiry is not considered to be a consultation.

2. In determining eligibility of paragraph a. of Note 3, BIS may take into account relevant factors such as quantity, price, required technical skill, existing sales channels, typical customers, typical use or any exclusionary practices of the supplier.

N.B. to Note 3 (Cryptography Note): You must submit a classification request or self-classification report to BIS for certain mass market encryption commodities and software eligible for the Cryptography Note employing a key length greater than 64 bits for the symmetric algorithm (or, for commodities and software not implementing any symmetric algorithms, employing a key length

greater than 768 bits for asymmetric algorithms described by Technical note 2.b to 5A002.a or greater than 128 bits for elliptic curve algorithms, or any asymmetric algorithm described by Technical Note 2.c to 5A002.a) in accordance with the requirements of § 740.17(b) of the EAR in order to be released from the "EI" and "NS" controls of ECCN 5A002 or 5D002. For mass market commodities and software that do not require a self-classification report pursuant to § 740.17(b) and (e)(3) of the EAR, such items are also released from "EI" and "NS" controls and controlled under ECCN 5A992 or 5D992.

A. "End Items," "Equipment," "Accessories," "Attachments," "Parts," "Components," and "Systems"

I. Cryptographic "Information Security"

5A002 "Information security" systems, equipment and "components," as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, EI

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
RS applies to items controlled by 5A002.z.1.a, z.2.a, z.3.a, z.4.a, z.5.a	To or within any destination worldwide. *See* § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to items controlled by 5A002.z.1.b, z.2.b, z.3.b, z.4.b, z.5.b	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any destination also specified in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
AT applies to entire entry	AT Column 1.
EI applies to entire entry	Refer to § 742.15 of the EAR.

License Requirements Note: See § 744.17 of the EAR for additional license requirements for

microprocessors having a processing speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more, including those incorporating "information security" functionality, and associated "software" and "technology" for the "production" or "development" of such microprocessors.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: Yes: $500 for "components,"

N/A for systems and equipment. N/A for 5A002.z.

GBS: N/A

ENC: Yes for certain EI controlled commodities, see § 740.17 of the EAR for eligibility.

NAC/ACA: Yes, for 5A002.z.1.b, z.2.b

AIA: Yes 5A002.z.1.a, z.2.a, z.3.a, z.4.a, z.5.a

ACM: Yes for 5A002.z

LPP: Yes for 5A002.z.1.a, z.2.a, z.3.a, z.4.a, z.5.a

Note: See § 740.2(a)(9)(ii) of the EAR for license exception restrictions for ECCN 5A002.z.

LIST OF ITEMS CONTROLLED

Related Controls: (1) ECCN 5A002.a controls "components" providing the means or functions necessary for "information security." All such "components" are presumptively "specially designed" and controlled by 5A002.a. (2) See USML Categories XI (including XI(b)) and XIII(b) (including XIII(b)(2)) for controls on systems, equipment, and components described in 5A002.d or .e that are "subject to the ITAR" (see 22 CFR parts 120 through 130). (3) For "satellite navigation system" receiving equipment containing or employing decryption see 7A005, and for related decryption "software" and "technology" see 7D005 and 7E001. (4) Noting that items may be controlled elsewhere on the CCL, examples of items not controlled by ECCN 5A002.a.4 include the following: (a) An automobile where the only 'cryptography for data confidentiality' having a 'described security algorithm' is performed by a Category 5—Part 2 Note 3 eligible mobile telephone that is built into the car. In this case, secure phone communications support a non-primary function of the automobile but the mobile telephone (equipment), as a standalone item, is not controlled by ECCN 5A002 because it is excluded by the Cryptography Note (Note 3) (See ECCN 5A992.c). (b) An exercise bike with an embedded Category 5—Part 2 Note 3 eligible web browser, where the only controlled cryptography is performed by the web browser. In this case, secure web browsing supports a non-primary function of the exercise bike but the web browser ("software"), as a standalone item, is not controlled by ECCN 5D002 because it is excluded by the Cryptography Note (Note 3) (See ECCN 5D992.c). (5) After classification or self-classification in accordance with § 740.17(b) of the EAR, mass market encryption commodities that meet eligibility requirements are released from "EI" and "NS" controls. These commodities are designated 5A992.c. (6) See also ECCNs 3A090 and 4A090.

Related Definitions: N/A

Items:

a. Designed or modified to use 'cryptography for data confidentiality' having a 'described security algorithm', where that cryptographic capability is usable, has been activated, or can be activated by any means other than secure “cryptographic activation”, as follows:

a.1. Items having “information security” as a primary function;

a.2. Digital communication or networking systems, equipment or components, not specified in paragraph 5A002.a.1;

a.3. Computers, other items having information storage or processing as a primary function, and components therefor, not specified in paragraphs 5A002.a.1 or .a.2;

> *N.B.*: *For operating systems see also 5D002.a.1 and .c.1.*

a.4. Items, not specified in paragraphs 5A002.a.1 to a.3, where the 'cryptography for data confidentiality' having a 'described security algorithm' meets all of the following:

a.4.a. It supports a non-primary function of the item; *and*

a.4.b. It is performed by incorporated equipment or “software” that would, as a standalone item, be specified by ECCNs 5A002, 5A003, 5A004, 5B002 or 5D002.

> *N.B. to paragraph a.4: See Related Control Paragraph (4) of this ECCN 5A002 for examples of items not controlled by 5A002.a.4.*

> *Technical Notes: 1. For the purposes of 5A002.a, 'cryptography for data confidentiality' means “cryptography” that employs digital techniques and performs any cryptographic function other than any of the following:*
> *1.a. “Authentication;”*
>
> *1.b. Digital signature;*
>
> *1.c. Data integrity;*
>
> *1.d. Non-repudiation;*
>
> *1.e. Digital rights management, including the execution of copy-protected “software;”*

1.f. Encryption or decryption in support of entertainment, mass commercial broadcasts or medical records management; or

1.g. Key management in support of any function described in paragraphs 1.a to 1.f of this Technical Note paragraph 1.

2. For the purposes of 5A002.a, 'described security algorithm' means any of the following:

2.a. A "symmetric algorithm" employing a key length in excess of 56 bits, not including parity bits;

2.b. An "asymmetric algorithm" where the security of the algorithm is based on any of the following:

2.b.1. Factorization of integers in excess of 512 bits (e.g., RSA);

2.b.2. Computation of discrete logarithms in a multiplicative group of a finite field of size greater than 512 bits (e.g., Diffie-Hellman over Z/pZ); or

2.b.3. Discrete logarithms in a group other than mentioned in paragraph 2.b.2 of this Technical Note in excess of 112 bits (e.g., Diffie-Hellman over an elliptic curve); or

2.c. An "asymmetric algorithm" where the security of the algorithm is based on any of the following:

2.c.1. Shortest vector or closest vector problems associated with lattices (e.g., NewHope, Frodo, NTRUEncrypt, Kyber, Titanium);

2.c.2. Finding isogenies between Supersingular elliptic curves (e.g., Supersingular Isogeny Key Encapsulation); or

2.c.3. Decoding random codes (e.g., McEliece, Niederreiter).

Technical Note: An algorithm described by Technical Note 2.c. may be referred to as being post-quantum, quantum-safe or quantum-resistant.

Note 1: Details of items must be accessible and provided upon request, in order to establish any of the following:
a. Whether the item meets the criteria of 5A002.a.1 to a.4; or

b. Whether the cryptographic capability for data confidentiality specified by 5A002.a is usable without "cryptographic activation."

Note 2: 5A002.a does not control any of the following items, or specially designed "information security" components therefor:
a. Smart cards and smart card 'readers/writers' as follows:

a.1. A smart card or an electronically readable personal document (e.g., token coin, e-passport) that meets any of the following:

a.1.a. The cryptographic capability meets all of the following:

a.1.a.1. It is restricted for use in any of the following:

a.1.a.1.a. Equipment or systems, not described by 5A002.a.1 to a.4;

a.1.a.1.b. Equipment or systems, not using 'cryptography for data confidentiality' having a 'described security algorithm'; or

a.1.a.1.c. Equipment or systems, excluded from 5A002.a by entries b. to f. of this Note; and

a.1.a.2. It cannot be reprogrammed for any other use; or

a.1.b. Having all of the following:

a.1.b.1. It is specially designed and limited to allow protection of 'personal data' stored within;

a.1.b.2. Has been, or can only be, personalized for public or commercial transactions or individual identification; and

a.1.b.3. Where the cryptographic capability is not user-accessible;

Technical Note to paragraph a.1.b.1 of Note 2: For the purposes of 5A002.a Note 2.-a.1.b.1, 'personal data' includes any data specific to a particular person or entity, such as the amount of money stored and data necessary for "authentication."
a.2. 'Readers/writers' specially designed or modified, and limited, for items specified by paragraph a.1 of this Note;

Technical Note to paragraph a.2 of Note 2: 'For the purposes of 5A002.a Note 2.a.2, 'readers/writers' include equipment that communicates with smart cards or electronically readable documents through a network.
b. Cryptographic equipment specially designed and limited for banking use or 'money transactions';

Technical Note to paragraph b. of Note 2: For the purposes of 5A002.a Note 2.b, 'money transactions' in 5A002 Note 2 paragraph b. includes the collection and settlement of fares or credit functions.
c. Portable or mobile radiotelephones for civil use (e.g., for use with commercial civil cellular radio communication systems) that are not capable of transmitting encrypted data directly to another radiotelephone or equipment (other than Radio Access Network (RAN) equipment), nor of passing encrypted data through RAN equipment (e.g., Radio Network Controller (RNC) or Base Station Controller (BSC));

d. Cordless telephone equipment not capable of end-to-end encryption where the maximum effective range of unboosted cordless operation (i.e., a single, unrelayed hop between terminal and home base station) is less than 400 meters according to the manufacturer's specifications;

e. Portable or mobile radiotelephones and similar client wireless devices for civil use, that implement only published or commercial cryptographic standards (except for anti-piracy functions, which may be non-published) and also meet the provisions of paragraphs a.2 to a.4 of the Cryptography Note (Note 3 in Category 5—Part 2), that have been customized for a specific civil industry application with features that do not affect the cryptographic functionality of these original non-customized devices;

f. Items, where the "information security" functionality is limited to wireless "personal area network " functionality implementing only published or commercial cryptographic standards;

g. Mobile telecommunications Radio Access Network (RAN) equipment designed for civil use, which also meet the provisions of paragraphs a.2 to a.4 of the Cryptography Note (Note 3 in Category 5—Part 2), having an RF output power limited to 0.1W (20 dBm) or less, and supporting 16 or fewer concurrent users;

h. Routers, switches, gateways or relays, where the "information security" functionality is limited to the tasks of "Operations, Administration or Maintenance" ("OAM") implementing only published or commercial cryptographic standards;

i. General purpose computing equipment or servers, where the "information security" functionality meets all of the following:

i.1. Uses only published or commercial cryptographic standards; and

i.2. Is any of the following:

i.2.a. Integral to a CPU that meets the provisions of Note 3 in Category 5—Part 2;

i.2.b. Integral to an operating system that is not specified by 5D002; or

i.2.c. Limited to "OAM" of the equipment; or

j. Items specially designed for a 'connected civil industry application', meeting all of the following:

j.1. Being any of the following:

j.1.a. A network-capable endpoint device meeting any of the following:

j.1.a.1. The "information security" functionality is limited to securing 'non-arbitrary data' or the tasks of "Operations, Administration or Maintenance" ("OAM"); or

j.1.a.2. The device is limited to a specific 'connected civil industry application'; or

j.1.b. Networking equipment meeting all of the following:

j.1.b.1. Being specially designed to communicate with the devices specified by paragraph j.1.a. above; and

j.1.b.2. The "information security" functionality is limited to supporting the 'connected civil industry application' of devices specified by paragraph j.1.a. above, or the tasks of "OAM" of this networking equipment or of other items specified by paragraph j. of this Note; and

j.2. Where the "information security" functionality implements only published or commercial cryptographic standards, and the cryptographic functionality cannot easily be changed by the user.

Technical Notes: 1. For the purposes of 5A002.a Note 2.j, 'connected civil industry application' means a network-connected consumer or civil industry application other than "information security", digital communication, general purpose networking or computing.
2. For the purposes of 5A002.a Note 2.j.1.a.1, 'non-arbitrary data' means sensor or metering data directly related to the stability, performance or physical measurement of a system (e.g., temperature, pressure, flow rate, mass, volume, voltage, physical location, etc.), that cannot be changed by the user of the device.

b. Being a 'cryptographic activation token';

Technical Note: For the purposes of 5A002.b, a 'cryptographic activation token' is an item designed or modified for any of the following:
1. Converting, by means of "cryptographic activation", an item not specified by Category 5—Part 2 into an item specified by 5A002.a or 5D002.c.1, and not released by the Cryptography Note (Note 3 in Category 5—Part 2); or

2. Enabling by means of "cryptographic activation", additional functionality specified by 5A002.a of an item already specified by Category 5—Part 2;

c. Designed or modified to use or perform "quantum cryptography";

Technical Note: For the purposes of 5A002.c,"quantum cryptography" is also known as Quantum Key Distribution (QKD).

d. Designed or modified to use cryptographic techniques to generate channelizing codes, scrambling codes or network identification codes, for systems using ultra-wideband modulation techniques and having any of the following:

d.1. A bandwidth exceeding 500 MHz; *or*

d.2. A "fractional bandwidth" of 20% or more;

e. Designed or modified to use cryptographic techniques to generate the spreading code for "spread spectrum" systems, not specified by 5A002.d, including the hopping code for "frequency hopping" systems.

f. through y. [Reserved]

z. Other commodities, as follows:

z.1.a. Commodities that are described in 5A002.a and that also meet or exceed the performance parameters in 3A090.a or 4A090.a;

z.1.b Commodities that are described in 5A002.a and that also meet or exceed the performance parameters in 3A090.b or 4A090.b;

z.2.a Commodities that are described in 5A002.b and that also meet or exceed the performance parameters in 3A090.a or 4A090.a;

z.2.b Commodities that are described in 5A002.b and that also meet or exceed the performance parameters in 3A090.b or 4A090.b;

z.3.a Commodities that are described in 5A002.c and that also meet or exceed the performance parameters in 3A090.a or 4A090.a;

z.3.b Commodities that are described in 5A002.c and that also meet or exceed the performance parameters in 3A090.b or 4A090.b;

z.4.a Commodities that are described in 5A002.d and that also meet or exceed the performance parameters in 3A090.a or 4A090.a;

z.4.b Commodities that are described in 5A002.d and that also meet or exceed the performance parameters in 3A090.b or 4A090.b;

z.5.a Commodities that are described in 5A002.e and that also meet or exceed the performance parameters in 3A090.a or 4A090.a; or

z.5.b Commodities that are described in 5A002.e and that also meet or exceed the performance parameters in 3A090.b or 4A090.b.

5A992 Equipment not controlled by 5A002 (see List of Items Controlled)

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies to items controlled by 5A992.z.1	To or within any destination worldwide. *See* § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to items controlled by 5A992.z.2	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any destination also specified in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
AT applies to entire entry	AT Column 1.

License Requirements Note: See § 744.17 of the EAR for additional license requirements for microprocessors having a processing speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more, including those incorporating "information security" functionality, and associated "software" and "technology" for the "production" or "development" of such microprocessors.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

NAC/ACA: Yes, for 5A992.z.2; N/A for all other 5A992 commodities.

AIA: Yes for 5A992.z.1

ACM: Yes for 5A992.z

LPP: Yes for 5A992.z.1

> *Note: See § 740.2(a)(9)(ii) of the EAR for license exception restrictions for ECCN 5A992.z.*

LIST OF ITEMS CONTROLLED

Related Controls: See also ECCNs 3A090 and 4A090.

Related Definitions: N/A

Items:

a. [Reserved]

b. [Reserved]

c. Commodities classified as mass market encryption commodities in accordance with § 740.17(b) of the EAR.

d. through y. [Reserved]

z.1. Commodities that are described in 5A992.c and that also meet or exceed the performance parameters in 3A090.a or 4A090.a; or

z.2 Commodities that are described in 5A992.c and that also meet or exceed the performance parameters in 3A090.b or 4A090.b.

II. NON-CRYPTOGRAPHIC "INFORMATION SECURITY"

5A003 "Systems," "equipment" and "components," for non-cryptographic "information security," as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2.

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: Yes: $500 for "components."

N/A for systems and equipment.

GBS: N/A

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items:

a. Communications cable systems designed or modified to use mechanical, electrical or electronic means to detect surreptitious intrusion;

> *Note*: *5A003.a applies only to physical layer security. For the purpose of 5A003.a, the physical layer includes Layer 1 of the Reference Model of Open Systems Interconnection (OSI) (ISO/IEC 7498-1).*

b. "Specially designed" or modified to reduce the compromising emanations of information-bearing signals beyond what is necessary for health, safety or electromagnetic interference standards.

III. DEFEATING, WEAKENING, OR BYPASSING "INFORMATION SECURITY"

5A004 "Systems," "equipment" and "components" for defeating, weakening or bypassing "information security," as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, EI

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
RS applies to items controlled by 5A004.z.1.a, z.2.a	To or within any destination worldwide. *See* § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to items controlled by 5A004.z.1.b, z.2.b	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any destination also specified in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
AT applies to entire entry	AT Column 1.
EI applies to entire entry	Refer to § 742.15 of the EAR.

LICENSE REQUIREMENTS

See § 744.17 of the EAR for additional license requirements for microprocessors having a processing speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more, including those incorporating "information security" functionality, and associated "software" and "technology" for the "production" or "development" of such microprocessors.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: Yes: $500 for "components"; N/A for 5A004.z. N/A for systems and equipment.

GBS: N/A

ENC: Yes for certain EI controlled commodities. See § 740.17 of the EAR for eligibility.

NAC/ACA: Yes, for 5A004.z.1.b, z.2.b

AIA: Yes for 5A004.z.1.a, z.2.a

ACM: Yes for 5A004.z

LPP: Yes for 5A004.z.1.a, z.2.a

Note: See § 740.2(a)(9)(ii) of the EAR for license exception restrictions for ECCN 5A004.z.

LIST OF ITEMS CONTROLLED

Related Controls: (1) ECCN 5A004.a controls “components” providing the means or functions necessary for “information security.” All such “components” are presumptively “specially designed” and controlled by 5A004.a. (2) See also ECCNs 3A090 and 4A090.

Related Definitions: N/A

Items:

a. Designed or modified to perform 'cryptanalytic functions.'

Note: 5A004.a includes systems or equipment, designed or modified to perform 'cryptanalytic functions' by means of reverse engineering.

Technical Note: For the purposes of 5A004.a, 'cryptanalytic functions' are functions designed to defeat cryptographic mechanisms in order to derive confidential variables or sensitive data, including clear text, passwords or cryptographic keys.

b. Items, not specified by ECCNs 4A005 or 5A004.a, designed to perform all of the following:

b.1. 'Extract raw data' from a computing or communications device; *and*

b.2. Circumvent “authentication” or authorization controls of the device, in order to perform the function described in 5A004.b.1.

Technical Note: For the purposes of 5A004.b.1, 'extract raw data' from a computing or communications device means to retrieve binary data from a storage medium, e.g., RAM, flash or hard disk, of the device without interpretation by the device's operating system or filesystem.

Note 1: 5A004.b does not apply to systems or equipment specially designed for the “development” or “production” of a computing or communications device.

Note 2: 5A004.b does not include:
a. Debuggers, hypervisors;

b. Items limited to logical data extraction;

c. Data extraction items using chip-off or JTAG; or

d. Items specially designed and limited to jail-breaking or rooting.

c. through y. [Reserved]

z. Other commodities, as follows:

z.1.a Commodities that are described in 5A004.a and that also meet or exceed the performance parameters in 3A090.a or 4A090.a;

z.1.b Commodities that are described in 5A004.a and that also meet or exceed the performance parameters in 3A090.b or 4A090.b;

z.2.a Commodities that are described in 5A004.b and that also meet or exceed the performance parameters in 3A090.a or 4A090.a; or

z.2.b Commodities that are described in 5A004.b and that also meet or exceed the performance parameters in 3A090.b or 4A090.b.

B. Test, Inspection and "Production Equipment"

5B002 "Information Security" test, inspection and "production" equipment, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

ENC: Yes for certain EI controlled equipment, see § 740.17 of the EAR for eligibility.

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items:

a. Equipment "specially designed" for the "development" or "production" of equipment controlled by 5A002, 5A003, 5A004 or 5B002.b;

b. Measuring equipment "specially designed" to evaluate and validate the "information security" functions of equipment controlled by 5A002, 5A003 or 5A004, or of "software" controlled by 5D002.a, z.1 through z.4, or 5D002.c or z.6 through z.9.

C. "Materials" [Reserved]

D. "Software"

5D002 "Software" as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, EI

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
RS applies to "software" controlled by 5D002.z.1.a, z.2.a, z.3.a, z.4.a, z.5.a, z.6.a, z.7.a, z.8.a, and z.9.a	To or within any destination worldwide. *See* § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to "software" controlled by 5D002.z.1.b, z.2.b, z.3.b, z.4.b, z.5.b, z.6.b, z.7.b, z.8.b, and z.9.b	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any destination also specified in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
AT applies to entire entry	AT Column 1.
EI applies to "software" in 5D002.a.1, a.3, .b, c.1 and c.3, for commodities or "software" controlled for EI	Refer to § 742.15 of the EAR. *Note: Encryption software is controlled because of its functional capacity, and not because of any informational value of such software; such software is not accorded the same treatment under the EAR as*

Control(s)	Country Chart (see Supp. No. 1 to part 738)
reasons in ECCN 5A002, 5A004 or 5D002	*other "software'; and for export licensing purposes, encryption software is treated under the EAR in the same manner as a commodity included in ECCN 5A002.*

License Requirements Note: See § 744.17 of the EAR for additional license requirements for microprocessors having a processing speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more, including those incorporating "information security" functionality, and associated "software" and "technology" for the "production" or "development" of such microprocessors.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

ENC: Yes for certain EI controlled software. See § 740.17 of the EAR for eligibility.

NAC/ACA: Yes, for 5D002.z.

AIA: Yes for 5D002.z.1.a, z.2.a, z.3.a, z.4.a, z.5.a, z.6.a, z.7.a, z.8.a, and z.9.a

ACM: Yes for 5D002.z

Note: See § 740.2(a)(9)(ii) of the EAR for license exception restrictions for ECCN 5D002.z.

LIST OF ITEMS CONTROLLED

Related Controls: (1) After classification or self-classification in accordance with § 740.17(b) of the EAR, mass market encryption software that meets eligibility requirements is released from "EI" and "NS" controls. This software is designated as 5D992.c. (2) See also ECCNs 3D001 as it applies to "software" for commodities controlled by 3A001.z and 3A090, and 4D001 as it applies to "software" for commodities controlled by 4A003.z, 4A004.z, and 4A005.z.

Related Definitions: 5D002.a controls "software" designed or modified to use "cryptography" employing digital or analog techniques to ensure "information security."

Items:

a. "Software" "specially designed" or modified for the "development," "production" or "use" of any of the following:

a.1. Equipment specified by 5A002 or “software” specified by 5D002.c.1;

a.2. Equipment specified by 5A003 or “software” specified by 5D002.c.2; *or*

a.3. Equipment or “software”, as follows:

a.3.a. Equipment specified by 5A004.a or “software” specified by 5D002.c.3.a;

a.3.b. Equipment specified by 5A004.b or “software” specified by 5D002.c.3.b;

b. “Software” having the characteristics of a 'cryptographic activation token' specified by 5A002.b;

c. “Software” having the characteristics of, or performing or simulating the functions of, any of the following:

c.1. Equipment specified by 5A002.a, .c, .d or .e;

> *Note: 5D002.c.1 does not apply to “software” limited to the tasks of “OAM” implementing only published or commercial cryptographic standards.*

c.2. Equipment specified by 5A003; *or*

c.3. Equipment, as follows:

c.3.a. Equipment specified by 5A004.a;

c.3.b. Equipment specified by 5A004.b.

> *Note: 5D002.c.3.b does not apply to “intrusion software”.*

d. [Reserved]

> *N.B.: See 5D002.b for items formerly specified in 5D002.d.*

e. through y. [Reserved]

z. Other software, as follows:

z.1.a Software that is described in 5D002.a.1, and that also meet or exceed the performance parameters in 3D001 for 3A090.a or 4D001 for 4A090.a;

z.1.b Software that is described in 5D002.a.1, and that also meet or exceed the performance parameters in 3D001 for 3A090.b or 4D001 for 4A090.b;

z.2.a Software that is described in 5D002.a.2, and that also meet or exceed the performance parameters in 3D001 for 3A090.a or 4D001 for 4A090.a;

z.2.b Software that is described in 5D002.a.2, and that also meet or exceed the performance parameters in 3D001 for 3A090.b or 4D001 for 4A090.b;

z.3.a Software that is described in 5D002.a.3a, and that also meet or exceed the performance parameters in 3D001 for 3A090.a or 4D001 for 4A090.a;

z.3.b Software that is described in 5D002.a.3a, and that also meet or exceed the performance parameters in 3D001 for 3A090.b or 4D001 for 4A090.b;

z.4.a Software that is described in 5D002.a.3.b, and that also meet or exceed the performance parameters in 3D001 for 3A090.a or 4D001 for 4A090.a;

z.4.b Software that is described in 5D002.a.3.b, and that also meet or exceed the performance parameters in 3D001 for 3A090.b or 4D001 for 4A090.b;

z.5.a Software that is described in 5D002.b and that also meet or exceed the performance parameters in 3D001 for 3A090.a or 4D001 for 4A090.a;

z.5.b Software that is described in 5D002.b and that also meet or exceed the performance parameters in 3D001 for 3A090.b or 4D001 for 4A090.b;

z.6.a Software that is described in 5D002.c.1 and that also meet or exceed the performance parameters in 3D001 for 3A090.a or 4D001 for 4A090.a;

z.6.b Software that is described in 5D002.c.1 and that also meet or exceed the performance parameters in 3D001 for 3A090.b or 4D001 for 4A090.b;

z.7.a Software that is described in 5D002.c.2 and that also meet or exceed the performance parameters in 3D001 for 3A090.a or 4D001 for 4A090.a;

z.7.b Software that is described in 5D002.c.2 and that also meet or exceed the performance parameters in 3D001 for 3A090.b or 4D001 for 4A090.b;

z.8.a Software that is described in 5D002.c.3.a and that also meet or exceed the performance parameters in 3D001 for 3A090.a or 4D001 for 4A090.a;

z.8.b Software that is described in 5D002.c.3.a and that also meet or exceed the performance parameters in 3D001 for 3A090.b or 4D001 for 4A090.b;

z.9.a Software that is described in 5D002.c.3.b and that also meet or exceed the performance parameters in 3D001 for 3A090.a or 4D001 for 4A090.a; or

z.9.b Software that is described in 5D002.c.3.b and that also meet or exceed the performance parameters in 3D001 for 3A090.b or 4D001 for 4A090.b.

5D992 "Information Security" "software," not controlled by 5D002, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies to "software" controlled by 5D992.z.1	To or within any destination worldwide. *See* § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to "software" controlled by 5D992.z.2	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any destination also specified in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
AT applies to entire entry	AT Column 1.

License Requirements Note: See § 744.17 of the EAR for additional license requirements for microprocessors having a processing speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more, including those incorporating "information security" functionality, and associated "software" and "technology" for the "production" or "development" of such microprocessors.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

NAC/ACA: Yes, for 5D992.z.

AIA: Yes for 5D992.z.1

ACM: Yes for 5D992.z

Note: See § 740.2(a)(9)(ii) of the EAR for license exception restrictions for ECCN 5D992.z.

LIST OF ITEMS CONTROLLED

Related Controls: (1) This entry does not control "software" designed or modified to protect against malicious computer damage, *e.g.,* viruses, where the use of "cryptography" is limited to authentication, digital signature and/or the decryption of data or files. (2) See also ECCNs 3D001 as it applies to "software" for commodities controlled by 3A001.z and 3A090, and 4D001 as it applies to "software" for commodities controlled by 4A003.z, 4A004.z, and 4A005.z.

Related Definitions: N/A

Items:

a. [Reserved]

b. [Reserved]

c. "Software" classified as mass market encryption software in accordance with § 740.17(b) of the EAR.

d. through y. [Reserved]

z.1 Other software that is described in 5D992 and that also meet or exceed the performance parameters in 3D001 for 3A090.a or 4D001 for 4A090.a; or

z.2 Other software that is described in 5D992 and that also meet or exceed the performance parameters in 3D001 for 3A090.b or 4D001 for 4A090.b.

E. "Technology"

5E002 "Technology" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, EI

Control(s)	Country Chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
RS applies to "technology" for commodities controlled by 5A002.z.1.a, z.2.a, z.3.a, z.4.a, z.5.a or 5A004.z.1.a, z.2.a or "software" specified by 5D002 (for 5A002.z.1.a, z.2.a, z.3.a, z.4.a, z.5.a or 5A004.z.1.a, z.2.a commodities)	To or within any destination worldwide. *See* § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to "technology" for commodities controlled by 5A002.z.1.b, z.2.b, z.3.b, z.4.b, z.5.b	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to

Control(s)	Country Chart (see Supp. No. 1 to part 738)
or 5A004.z.1.b, z.2.b or "software" specified by 5D002 (for 5A002.z.1.b, z.2.b, z.3.b, z.4.b, z.5.b or 5A004.z.1.b, z.2.b commodities)	part 740 of the EAR, excluding any destination also specified in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
AT applies to entire entry	AT Column 1.
EI applies to "technology" in 5E002.a for commodities or "software" controlled for EI reasons in ECCNs 5A002, 5A004 or 5D002, and to "technology" in 5E002.b	Refer to § 742.15 of the EAR.

License Requirements Notes: (1) See § 744.17 of the EAR for additional license requirements for microprocessors having a processing speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more, including those incorporating "information security" functionality, and associated "software" and "technology" for the "production" or "development" of such microprocessors.
(2) When a person performs or provides technical assistance that incorporates, or otherwise draws upon, "technology" that was either obtained in the United States or is of U.S.-origin, then a release of the "technology" takes place. Such technical assistance, when rendered with the intent to aid in the "development" or "production" of encryption commodities or software that would be controlled for "EI" reasons under ECCN 5A002, 5A004 or 5D002, may require authorization under the EAR even if the underlying encryption algorithm to be implemented is from the public domain or is not of U.S.-origin.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

ENC: Yes for certain EI controlled technology. See § 740.17 of the EAR for eligibility.

AIA: Yes for "technology" for commodities controlled by 5A002.z.1.a, z.2.a, z.3.a, z.4.a, z.5.a or 5A004.z.1.a, z.2.a or "software" specified by 5D002 (for 5A002.z.1.a, z.2.a, z.3.a, z.4.a, z.5.a or 5A004.z.1.a, z.2.a commodities)

ACM: Yes for "technology" for commodities controlled by 5A002.z or 5A004.z or "software" specified by 5D002 (for 5A002.z or 5A004.z commodities

Note: See § 740.2(a)(9)(ii) of the EAR for license exception restrictions for technology for .z paragraphs under ECCNs 5A002, 5A004 or "software" specified by 5D002 (for 5A002.z or 5A004.z

commodities).

LIST OF ITEMS CONTROLLED

Related Controls: See also 5E992. This entry does not control "technology" "required" for the "use" of equipment excluded from control under the Related Controls paragraph or the Technical Notes in ECCN 5A002 or "technology" related to equipment excluded from control under ECCN 5A002.

Related Definitions: N/A

Items:

a. "Technology" according to the General Technology Note for the "development," "production" or "use" of equipment controlled by 5A002, 5A003, 5A004 or 5B002, or of "software" controlled by 5D002.a, z.1 through z.3, or 5D002.c, z.6 through z.8.

Note: 5E002.a does not apply to "technology" for items specified by 5A004.b, z.3 or z.4, 5D002.a.3.b, z.4, or 5D002.c.3.b.

b. "Technology" having the characteristics of a 'cryptographic activation token' specified by 5A002.b, z.2.

Note: 5E002 includes "information security" technical data resulting from procedures carried out to evaluate or determine the implementation of functions, features or techniques specified in Category 5—Part 2.

5E992 "Information Security" "technology" according to the General Technology Note, not controlled by 5E002, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies to "technology" for commodities controlled by 5A992.z.1 or "software" controlled by 5D992.z.1	To or within any destination worldwide. *See* § 742.6(a)(6)(iii)(A) of the EAR.
RS applies to "technology" for commodities controlled by	To or within destinations specified in Country Groups D:1, D:4, and D:5 of supplement no. 1 to part 740 of the EAR, excluding any

Control(s)	Country Chart (see Supp. No. 1 to part 738)
5A992.z.2 or "software" controlled by 5D992.z.2	destination also specified in Country Groups A:5 or A:6. *See* § 742.6(a)(6)(iii)(B) of the EAR.
AT applies to entire entry	AT Column 1.

License Requirements Note: See § 744.17 of the EAR for additional license requirements for microprocessors having a processing speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more, including those incorporating "information security" functionality, and associated "software" and "technology" for the "production" or "development" of such microprocessors.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

NAC/ACA: N/A

AIA: Yes for "technology" for commodities controlled by 5A992.z.1 or "software" controlled by 5D992.z.1

ACM: Yes for "technology" for commodities controlled by 5A992.z or "software" controlled by 5D992.z

Note: See § 740.2(a)(9)(ii) of the EAR for license exception restrictions for technology for .z paragraphs under "technology" for commodities controlled by 5A992.z or "software" controlled by 5D992.z.

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

a. [Reserved]

b. "Technology", n.e.s., for the "use" of mass market commodities controlled by 5A992 or mass market "software" controlled by 5D992.

EAR99 Items subject to the EAR that are not elsewhere specified in this CCL Category or in any other category in the CCL are designated by the number EAR99.

Category 6—Sensors and Lasers

A. "End Items", "Equipment", "Accessories", "Attachments", "Parts", "Components" and "Systems"

6A001 Acoustic systems, equipment and "components," as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

Reporting Requirements

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3000; N/A for 6A001.a.1.b.1 object detection and location systems having a transmitting frequency below 5 kHz or a sound pressure level exceeding 210 dB (reference 1 μPa at 1 m) for equipment with an operating frequency in the band from 2 kHz to 30 kHz inclusive; 6A001.a.1.e, 6A001.a.2.a.1, a.2.a.2, 6A001.a.2.a.3, a.2.a.5, a.2.a.6, 6A001.a.2.b; processing equipment controlled by 6A001.a.2.c, and "specially designed" for real-time application with towed acoustic hydrophone arrays; a.2.e.1, a.2.e.2; and bottom or bay cable systems controlled by 6A001.a.2.f and having processing equipment "specially designed" for real-time application with bottom or bay cable systems.

GBS: Yes for 6A001.a.1.b.4.

Special Conditions for STA

STA: License Exception STA may not be used to ship commodities in 6A001.a.1.b, 6A001.a.1.e or 6A001.a.2 (except .a.2.a.4) to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

List of Items Controlled

Related Controls: See also 6A991.

Related Definitions: N/A

Items:

a. Marine acoustic systems, equipment and “specially designed” “components” therefor, as follows:

a.1. Active (transmitting or transmitting-and-receiving) systems, equipment and “specially designed” “components” therefor, as follows:

> *Note: 6A001.a.1 does not control equipment as follows:*
> *a. Depth sounders operating vertically below the apparatus, not including a scanning function exceeding ± 20°, and limited to measuring the depth of water, the distance of submerged or buried objects or fish finding;*
>
> *b. Acoustic beacons, as follows:*
>
> *1. Acoustic emergency beacons;*
>
> *2. Pingers “specially designed” for relocating or returning to an underwater position.*

a.1.a. Acoustic seabed survey equipment as follows:

a.1.a.1. Surface vessel survey equipment designed for sea bed topographic mapping and having all of the following:

a.1.a.1.a. Designed to take measurements at an angle exceeding 20° from the vertical;

a.1.a.1.b. Designed to measure seabed topography at seabed depths exceeding 600 m;

a.1.a.1.c.'Sounding resolution' less than 2; and

a.1.a.1.d. 'Enhancement' of the depth “accuracy” through compensation for all the following:

a.1.a.1.d.1. Motion of the acoustic sensor;

a.1.a.1.d.2. In-water propagation from sensor to the seabed and back; and

a.1.a.1.d.3. Sound speed at the sensor;

> *Technical Notes: 1. For the purposes of 6A001.a.1.a.1.c, 'sounding resolution' is the swath width (degrees) divided by the maximum number of soundings per swath.*

2. For the purposes of 6A001.a.1.a, 'enhancement' includes the ability to compensate by external means.

a.1.a.2. Underwater survey equipment designed for seabed topographic mapping and having any of the following:

Technical Note: For the purposes of 6A001.a.1.a.2, the acoustic sensor pressure rating determines the depth rating.

a.1.a.2.a. Having all of the following:

a.1.a.2.a.1. Designed or modified to operate at depths exceeding 300 m; and

a.1.a.2.a.2. 'Sounding rate' greater than 3,800 m/s; *or*

Technical Note: For the purposes of 6A001.a.1.a.2.a.2, 'sounding rate' is the product of the maximum speed (m/s) at which the sensor can operate and the maximum number of soundings per swath assuming 100% coverage. For systems that produce soundings in two directions (3D sonars), the maximum of the 'sounding rate' in either direction should be used.

a.1.a.2.b. Survey equipment, not specified by 6A001.a.1.a.2.a, having all of the following:

a.1.a.2.b.1. Designed or modified to operate at depths exceeding 100 m;

a.1.a.2.b.2. Designed to take measurements at an angle exceeding 20° from the vertical;

a.1.a.2.b.3. Having any of the following:

a.1.a.2.b.3.a. Operating frequency below 350 kHz; *or*

a.1.a.2.b.3.b. Designed to measure seabed topography at a range exceeding 200 m from the acoustic sensor; *and*

a.1.a.2.b.4. 'Enhancement' of the depth “accuracy” through compensation of all of the following:

a.1.a.2.b.4.a. Motion of the acoustic sensor;

a.1.a.2.b.4.b. In-water propagation from sensor to the seabed and back; *and*

a.1.a.2.b.4.c. Sound speed at the sensor.

a.1.a.3. Side Scan Sonar (SSS) or Synthetic Aperture Sonar (SAS), designed for seabed imaging and having all of the following, and “specially designed” transmitting and receiving acoustic arrays therefor:

a.1.a.3.a. Designed or modified to operate at depths exceeding 500 m; and

a.1.a.3.b. An 'area coverage rate' of greater than 570 m^2/s while operating at the maximum range that it can operate with an 'along track resolution' of less than 15 cm; *and*

a.1.a.3.c. An 'across track resolution' of less than 15 cm;

Technical Notes: For the purposes of 6A001.a.1.a.3:
1. 'Area coverage rate' (m_2/s) is twice the product of the sonar range (m) and the maximum speed (m/s) at which the sensor can operate at that range.

2. 'Along track resolution' (cm), for SSS only, is the product of azimuth (horizontal) beamwidth (degrees) and sonar range (m) and 0.873.

3. 'Across track resolution' (cm) is 75 divided by the signal bandwidth (kHz).

a.1.b Systems or transmitting and receiving arrays, designed for object detection or location, having any of the following:

a.1.b.1. A transmitting frequency below 10 kHz;

a.1.b.2. Sound pressure level exceeding 224dB (reference 1 µPa at 1 m) for equipment with an operating frequency in the band from 10 kHz to 24 kHz inclusive;

a.1.b.3. Sound pressure level exceeding 235 dB (reference 1 µPa at 1 m) for equipment with an operating frequency in the band between 24 kHz and 30 kHz;

a.1.b.4. Forming beams of less than 1° on any axis and having an operating frequency of less than 100 kHz;

a.1.b.5. Designed to operate with an unambiguous display range exceeding 5,120 m; *or*

a.1.b.6. Designed to withstand pressure during normal operation at depths exceeding 1,000 m and having transducers with any of the following:

a.1.b.6.a. Dynamic compensation for pressure; *or*

a.1.b.6.b. Incorporating other than lead zirconate titanate as the transduction element;

a.1.c. Acoustic projectors, including transducers, incorporating piezoelectric, magnetostrictive, electrostrictive, electrodynamic or hydraulic elements operating individually or in a designed combination and having any of the following:

Notes: 1. The control status of acoustic projectors, including transducers, "specially designed" for other equipment is determined by the control status of the other equipment.

2. 6A001.a.1.c does not control electronic sources that direct the sound vertically only, or mechanical (e.g., air gun or vapor-shock gun) or chemical (e.g., explosive) sources.

3. Piezoelectric elements specified in 6A001.a.1.c include those made from lead-magnesium-niobate/lead-titanate ($Pb(Mg_{1/3}Nb_{2/3})O_3$-$PbTiO_3$, or PMN-PT) single crystals grown from solid solution or lead-indium-niobate/lead-magnesium niobate/lead-titanate ($Pb(In_{1/2}Nb_{1/2})O_3$-$Pb(Mg_{1/3}Nb_{2/3})O_3$-$PbTiO_3$, or PIN-PMN-PT) single crystals grown from solid solution.

a.1.c.1. Operating at frequencies below 10 kHz and having any of the following:

a.1.c.1.a. Not designed for continuous operation at 100% duty cycle and having a radiated 'free-field Source Level (SLRMS)' exceeding (10log(f) + 169.77)dB (reference 1 µPa at 1 m) where f is the frequency in Hertz of maximum Transmitting Voltage Response (TVR) below 10 kHz; *or*

a.1.c.1.b. Designed for continuous operation at 100% duty cycle and having a continuously radiated 'free-field Source Level (SLRMS)' at 100% duty cycle exceeding (10log(f) + 159.77)dB (reference 1 µPa at 1 m) where f is the frequency in Hertz of maximum Transmitting Voltage Response (TVR) below 10 kHz; *or*

Technical Note: For the purposes of 6A001.a.1.c.1, the 'free-field Source Level (SL_{RMS})' is defined along the maximum response axis and in the far field of the acoustic projector. It can be obtained from the Transmitting Voltage Response using the following equation: SL_{RMS} = (TVR + 20log V_{RMS}) dB (ref 1µPa at 1 m), where SL_{RMS} is the source level, TVR is the Transmitting Voltage Response and V_{RMS} is the Driving Voltage of the Projector.

a.1.c.2. [Reserved]

N.B. See 6A001.a.1.c.1 for items previously specified in 6A001.a.1.c.2.

a.1.c.3. Side-lobe suppression exceeding 22 dB;

a.1.d. Acoustic systems and equipment, designed to determine the position of surface vessels or underwater vehicles and having all of the following, and “specially designed” “components” therefor:

a.1.d.1. Detection range exceeding 1,000 m; *and*

a.1.d.2. Determined position error of less than 10 m rms (root mean square) when measured at a range of 1,000 m;

Note: 6A001.a.1.d includes:

a. Equipment using coherent "signal processing" between two or more beacons and the hydrophone unit carried by the surface vessel or underwater vehicle;

b. Equipment capable of automatically correcting speed-of-sound propagation errors for calculation of a point.

a.1.e. Active individual sonars, "specially designed" or modified to detect, locate and automatically classify swimmers or divers, having all of the following, and "specially designed" transmitting and receiving acoustic arrays therefor:

a.1.e.1. Detection range exceeding 530 m;

a.1.e.2. Determined position error of less than 15 m rms (root mean square) when measured at a range of 530 m; *and*

a.1.e.3. Transmitted pulse signal bandwidth exceeding 3 kHz;

N.B.: For diver detection systems "specially designed" or modified for military use, see the U.S. Munitions List in the International Traffic in Arms Regulations (ITAR) (22 CFR part 121).

Note: For 6A001.a.1.e, where multiple detection ranges are specified for various environments, the greatest detection range is used.

a.2. Passive systems, equipment and "specially designed" "components" therefor, as follows:

Note: 6A001.a.2 also applies to receiving equipment, whether or not related in normal application to separate active equipment, and "specially designed" components therefor.

a.2.a. Hydrophones having any of the following:

Note: The control status of hydrophones "specially designed" for other equipment is determined by the control status of the other equipment.

Technical Notes: For the purposes of 6A001.a.2.a:
1. Hydrophones consist of one or more sensing elements producing a single acoustic output channel. Those that contain multiple elements can be referred to as a hydrophone group.

2. Underwater acoustic transducers designed to operate as passive receivers are hydrophones.

a.2.a.1. Incorporating continuous flexible sensing elements;

a.2.a.2. Incorporating flexible assemblies of discrete sensing elements with either a diameter or length less than 20 mm and with a separation between elements of less than 20 mm;

a.2.a.3. Having any of the following sensing elements:

a.2.a.3.a. Optical fibers;

a.2.a.3.b. 'Piezoelectric polymer films' other than polyvinylidene-fluoride (PVDF) and its co-polymers {P(VDF-TrFE) and P(VDF-TFE)};

a.2.a.3.c. 'Flexible piezoelectric composites';

a.2.a.3.d. Lead-magnesium- niobate/lead-titanate (*i.e.,* $Pb(Mg_{1/3}Nb_{2/3})O_3$-$PbTiO_3$, or PMN-PT) piezoelectric single crystals grown from solid solution; *or*

a.2.a.3.e. Lead-indium-niobate/lead-magnesium niobate/lead-titanate (*i.e.,* $Pb(In_{1/2}Nb_{1/2})O_3$-$Pb(Mg_{1/3}Nb_{2/3})O_3$-$PbTiO_3$, or PIN-PMN-PT) piezoelectric single crystals grown from solid solution;

a.2.a.4. A 'hydrophone sensitivity' better than −180dB at any depth with no acceleration compensation;

a.2.a.5. Designed to operate at depths exceeding 35 m with acceleration compensation; *or*

a.2.a.6. Designed for operation at depths exceeding 1,000 m and having a 'hydrophone sensitivity' better than −230 dB below 4 kHz;

Technical Notes: 1. For the purposes of 6A001.a.2.a.3.b, 'piezoelectric polymer film' sensing elements consist of polarized polymer film that is stretched over and attached to a supporting frame or spool (mandrel).
2. For the purposes of 6A001.a.2.a.3.c, 'flexible piezoelectric composite' sensing elements consist of piezoelectric ceramic particles or fibers combined with an electrically insulating, acoustically transparent rubber, polymer or epoxy compound, where the compound is an integral part of the sensing elements.

3. For the purposes of 6A001.a.2.a, 'hydrophone sensitivity' is defined as twenty times the logarithm to the base 10 of the ratio of rms output voltage to a 1 V rms reference, when the hydrophone sensor, without a pre-amplifier, is placed in a plane wave acoustic field with an rms pressure of 1 µPa. For example, a hydrophone of −160 dB (reference 1 V per µPa) would yield an output voltage of 10^{-8} V in such a field, while one of −180 dB sensitivity would yield only 10^{-9} V output. Thus, −160 dB is better than −180 dB.

a.2.b. Towed acoustic hydrophone arrays having any of the following:

Technical Note: For the purposes of 6A001.a.2.b, hydrophones arrays consist of a number of hydrophones providing multiple acoustic output channels.

a.2.b.1. Hydrophone group spacing of less than 12.5 m or 'able to be modified' to have hydrophone group spacing of less than 12.5 m;

a.2.b.2. Designed or 'able to be modified' to operate at depths exceeding 35m;

Technical Note: For the purposes of 6A001.a.2.b.2, 'able to be modified' in 6A001.a.2.b means having provisions to allow a change of the wiring or interconnections to alter hydrophone group spacing or operating depth limits. These provisions are: spare wiring exceeding 10% of the number of wires, hydrophone group spacing adjustment blocks or internal depth limiting devices that are adjustable or that control more than one hydrophone group.

a.2.b.3. Heading sensors controlled by 6A001.a.2.d;

a.2.b.4. Longitudinally reinforced array hoses;

a.2.b.5. An assembled array of less than 40 mm in diameter;

a.2.b.6. [Reserved];

a.2.b.7. Hydrophone characteristics controlled by 6A001.a.2.a; *or*

a.2.b.8. Accelerometer-based hydro-acoustic sensors specified by 6A001.a.2.g;

a.2.c. Processing equipment, “specially designed” for towed acoustic hydrophone arrays, having “user-accessible programmability” and time or frequency domain processing and correlation, including spectral analysis, digital filtering and beamforming using Fast Fourier or other transforms or processes;

a.2.d. Heading sensors having all of the following:

a.2.d.1. An “accuracy” of better than ± 0.5°; *and*

a.2.d.2. Designed to operate at depths exceeding 35 m or having an adjustable or removable depth sensing device in order to operate at depths exceeding 35 m;

N.B.: For inertial heading systems, see 7A003.c.

a.2.e. Bottom or bay-cable hydrophone arrays having any of the following:

a.2.e.1. Incorporating hydrophones controlled by 6A001.a.2.a;

a.2.e.2. Incorporating multiplexed hydrophone group signal modules having all of the following characteristics:

a.2.e.2.a. Designed to operate at depths exceeding 35 m or having an adjustable or removal depth sensing device in order to operate at depths exceeding 35 m; *and*

a.2.e.2.b. Capable of being operationally interchanged with towed acoustic hydrophone array modules; *or*

a.2.e.3. Incorporating accelerometer-based hydro-acoustic sensors specified by 6A001.a.2.g;

a.2.f. Processing equipment, “specially designed” for bottom or bay cable systems, having “user-accessible programmability” and time or frequency domain processing and correlation, including spectral analysis, digital filtering and beamforming using Fast Fourier or other transforms or processes;

a.2.g. Accelerometer-based hydro-acoustic sensors having all of the following:

a.2.g.1. Composed of three accelerometers arranged along three distinct axes;

a.2.g.2. Having an overall 'acceleration sensitivity' better than 48 dB (reference 1,000 mV rms per 1g);

a.2.g.3. Designed to operate at depths greater than 35 meters; *and*

a.2.g.4. Operating frequency below 20 kHz;

Note: 6A001.a.2.g does not apply to particle velocity sensors or geophones.

Technical Notes: 1. For the purposes of 6A001.a.2.g, accelerometer-based hydro-acoustic sensors are also known as vector sensors.
2. For the purposes of 6A001.a.2.g.2, 'acceleration sensitivity' is defined as twenty times the logarithm to the base 10 of the ratio of rms output voltage to a 1 V rms reference, when the hydro-acoustic sensor, without a preamplifier, is placed in a plane wave acoustic field with an rms acceleration of 1 g (i.e., 9.81 m/s^2).

b. Correlation-velocity and Doppler-velocity sonar log equipment designed to measure the horizontal speed of the equipment carrier relative to the sea bed, as follows:

b.1. Correlation-velocity sonar log equipment having any of the following characteristics:

b.1.a. Designed to operate at distances between the carrier and the sea bed exceeding 500 m; *or*

b.1.b. Having speed “accuracy” better than 1% of speed;

b.2. Doppler-velocity sonar log equipment having speed “accuracy” better than 1% of speed;

Note 1: 6A001.b does not apply to depth sounders limited to any of the following: a. Measuring the depth of water;
b. Measuring the distance of submerged or buried objects; or

c. Fish finding.

Note 2: 6A001.b does not apply to equipment "specially designed" for installation on surface vessels.

c. [Reserved]

N.B.: For diver deterrent acoustic systems, see 8A002.r.

6A002 Optical sensors and equipment, and "components" therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, CC, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
MT applies to optical detectors in 6A002.a.1, or a.3 that are "specially designed" or modified to protect "missiles" against nuclear effects (*e.g.,* Electromagnetic Pulse (EMP), X-rays, combined blast and thermal effects), and usable for "missiles"	MT Column 1
RS applies to 6A002.a.1, a.2, a.3 (except a.3.d.2.a and a.3.e for lead selenide based focal plane arrays (FPAs)), .c, and .f.	RS Column 1
CC applies to police-model infrared viewers in 6A002.c	CC Column 1
AT applies to entire entry	AT Column 1
UN applies to 6A002.a.1, a.2, a.3 and .c	See § 746.1(b) for UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
	controls

Reporting Requirements

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $500 for 6A002.f.

$3000; except N/A for MT and for 6A002.a.1, a.2, a.3, .c, and .f.

GBS: N/A

List of Items Controlled

Related Controls: (1) See USML Category XII(e) for infrared focal plane arrays, image intensifier tubes, and related parts and components, subject to the ITAR. (2) See USML Category XV(e) for space-qualified focal plane arrays subject to the ITAR. (3) See also ECCNs 6A102, 6A202, and 6A992. (4) See ECCN 0A919 for foreign-made military commodities that incorporate commodities described in 6A002. (5) Section 744.9 imposes a license requirement on commodities described in ECCN 6A002 if being exported, reexported, or transferred (in-country) for use by a military end-user or for incorporation into an item controlled by ECCN 0A919. (6) See USML Categories XII(e) and XV(e)(3) for read-out integrated circuits "subject to the ITAR." (7) See 6B002 for masks and reticles, "specially designed" for optical sensors specified by 6A002.a.1.b or 6A002.a.1.d.

Related Definitions: N/A

Items:

a. Optical detectors as follows:

a.1. "Space-qualified" solid-state detectors as follows:

> *Note: For the purposes of 6A002.a.1, solid-state detectors include "focal plane arrays".*

a.1.a. "Space-qualified" solid-state detectors having all of the following:

a.1.a.1. A peak response in the wavelength range exceeding 10 nm but not exceeding 300 nm; *and*

a.1.a.2. A response of less than 0.1% relative to the peak response at a wavelength exceeding 400 nm;

a.1.b. “Space-qualified” solid-state detectors having all of the following:

a.1.b.1. A peak response in the wavelength range exceeding 900 nm but not exceeding 1,200 nm; *and*

a.1.b.2. A response “time constant” of 95 ns or less;

a.1.c. “Space-qualified” solid-state detectors having a peak response in the wavelength range exceeding 1,200 nm but not exceeding 30,000 nm;

a.1.d. “Space-qualified” “focal plane arrays” having more than 2,048 elements per array and having a peak response in the wavelength range exceeding 300 nm but not exceeding 900 nm;

a.2. Image intensifier tubes and “specially designed” “components” therefor, as follows:

> *Note: 6A002.a.2 does not control non-imaging photomultiplier tubes having an electron sensing device in the vacuum space limited solely to any of the following:*
> *a. A single metal anode; or*
>
> *b. Metal anodes with a center to center spacing greater than 500 µm.*

> *Technical Note: For the purposes of 6A002.a.2, 'charge multiplication' is a form of electronic image amplification and is defined as the generation of charge carriers as a result of an impact ionization gain process. 'Charge multiplication' sensors may take the form of an image intensifier tube, solid state detector or “focal plane array”.*

a.2.a. Image intensifier tubes having all of the following:

a.2.a.1. A peak response in the wavelength range exceeding 400 nm but not exceeding 1,050 nm;

a.2.a.2. Electron image amplification using any of the following:

a.2.a.2.a. A microchannel plate with a hole pitch (center-to-center spacing) of 12 µm or less; *or*

a.2.a.2.b. An electron sensing device with a non-binned pixel pitch of 500 µm or less, “specially designed” or modified to achieve 'charge multiplication' other than by a microchannel plate; *and*

a.2.a.3. Any of the following photocathodes:

a.2.a.3.a. Multialkali photocathodes (*e.g.,* S-20 and S-5) having a luminous sensitivity exceeding 350 µA/lm;

a.2.a.3.b. GaAs or GaInAs photocathodes; *or*

a.2.a.3.c. Other “III-V compound” semiconductor photocathodes having a maximum “radiant sensitivity” exceeding 10 mA/W;

a.2.b. Image intensifier tubes having all of the following:

a.2.b.1. A peak response in the wavelength range exceeding 1,050 nm but not exceeding 1,800 nm;

a.2.b.2. Electron image amplification using any of the following:

a.2.b.2.a. A microchannel plate with a hole pitch (center-to-center spacing) of 12 μm or less; *or*

a.2.b.2.b. An electron sensing device with a non-binned pixel pitch of 500 μm or less, “specially designed” or modified to achieve 'charge multiplication' other than by a microchannel plate; *and*

a.2.b.3. “III/V compound” semiconductor (*e.g.,* GaAs or GaInAs) photocathodes and transferred electron photocathodes, having a maximum “radiant sensitivity” exceeding 15 mA/W;

a.2.c. “Specially designed” “components” as follows:

a.2.c.1. Microchannel plates having a hole pitch (center-to-center spacing) of 12 μm or less;

a.2.c.2. An electron sensing device with a non-binned pixel pitch of 500 μm or less, “specially designed” or modified to achieve 'charge multiplication' other than by a microchannel plate;

a.2.c.3. “III-V compound” semiconductor (*e.g.,* GaAs or GaInAs) photocathodes and transferred electron photocathodes;

Note: 6A002.a.2.c.3 does not control compound semiconductor photocathodes designed to achieve a maximum “radiant sensitivity” of any of the following:
a. 10 mA/W or less at the peak response in the wavelength range exceeding 400 nm but not exceeding 1,050 nm; or

b. 15 mA/W or less at the peak response in the wavelength range exceeding 1,050 nm but not exceeding 1,800 nm.

a.3. Non-“space-qualified” “focal plane arrays” as follows:

N.B.:

'Microbolometer' non-“space-qualified” “focal plane arrays” are only specified by 6A002.a.3.f.

Technical Note: For the purposes of 6A002.a.3, linear or two-dimensional multi-element detector arrays are referred to as "focal plane arrays";

Note 1: 6A002.a.3 includes photoconductive arrays and photovoltaic arrays.

Note 2: 6A002.a.3 does not control:
a. Multi-element (not to exceed 16 elements) encapsulated photoconductive cells using either lead sulphide or lead selenide;

b. Pyroelectric detectors using any of the following:

b.1. Triglycine sulphate and variants;

b.2. Lead-lanthanum-zirconium titanate and variants;

b.3. Lithium tantalate;

b.4. Polyvinylidene fluoride and variants; or

b.5. Strontium barium niobate and variants.

c. "Focal plane arrays" "specially designed" or modified to achieve 'charge multiplication' and limited by design to have a maximum "radiant sensitivity" of 10 mA/W or less for wavelengths exceeding 760 nm, having all of the following:

c.1. Incorporating a response limiting mechanism designed not to be removed or modified; and

c.2. Any of the following:

c.2.a. The response limiting mechanism is integral to or combined with the detector element; or

c.2.b. The "focal plane array" is only operable with the response limiting mechanism in place.

d. Thermopile arrays having less than 5,130 elements;

Technical Note: For the purposes of 6A002.a.3 Note 2.c.2.a, a response limiting mechanism integral to the detector element is designed not to be removed or modified without rendering the detector inoperable.

a.3.a. Non-"space-qualified" "focal plane arrays" having all of the following:

a.3.a.1. Individual elements with a peak response within the wavelength range exceeding 900 nm but not exceeding 1,050 nm; *and*

a.3.a.2. Any of the following:

a.3.a.2.a. A response “time constant” of less than 0.5 ns; *or*

a.3.a.2.b. “Specially designed” or modified to achieve 'charge multiplication' and having a maximum “radiant sensitivity” exceeding 10 mA/W;

a.3.b. Non-“space-qualified” “focal plane arrays” having all of the following:

a.3.b.1. Individual elements with a peak response in the wavelength range exceeding 1,050 nm but not exceeding 1,200 nm; *and*

a.3.b.2. Any of the following:

a.3.b.2.a. A response “time constant” of 95 ns or less; *or*

a.3.b.2.b. “Specially designed” or modified to achieve 'charge multiplication' and having a maximum “radiant sensitivity” exceeding 10 mA/W;

a.3.c. Non-“space-qualified” non-linear (2-dimensional) “focal plane arrays” having individual elements with a peak response in the wavelength range exceeding 1,200 nm but not exceeding 30,000 nm;

> *N.B.: Silicon and other material based 'microbolometer' non-“space-qualified” “focal plane arrays” are only specified by 6A002.a.3.f.*

a.3.d. Non-“space-qualified” linear (1-dimensional) “focal plane arrays” having all of the following:

a.3.d.1. Individual elements with a peak response in the wavelength range exceeding 1,200 nm but not exceeding 3,000 nm; *and*

a.3.d.2. Any of the following:

a.3.d.2.a. A ratio of 'scan direction' dimension of the detector element to the 'cross-scan direction' dimension of the detector element of less than 3.8; *or*

a.3.d.2.b. Signal processing in the detector elements;

> *Note: 6A002.a.3.d does not control “focal plane arrays” (not to exceed 32 elements) having detector elements limited solely to germanium material.*

Technical Note: For the purposes of 6A002.a.3.d, 'cross-scan direction' is defined as the axis parallel to the linear array of detector elements and the 'scan direction' is defined as the axis perpendicular to the linear array of detector elements.

a.3.e. Non-“space-qualified” linear (1-dimensional) “focal plane arrays” having individual elements with a peak response in the wavelength range exceeding 3,000 nm but not exceeding 30,000 nm;

a.3.f. Non-“space-qualified” non-linear (2-dimensional) infrared “focal plane arrays” based on 'microbolometer' material having individual elements with an unfiltered response in the wavelength range equal to or exceeding 8,000 nm but not exceeding 14,000 nm;

Technical Note: For the purposes of 6A002.a.3.f, 'microbolometer' is defined as a thermal imaging detector that, as a result of a temperature change in the detector caused by the absorption of infrared radiation, is used to generate any usable signal.

a.3.g. Non-“space-qualified” “focal plane arrays” having all of the following:

a.3.g.1. Individual detector elements with a peak response in the wavelength range exceeding 400 nm but not exceeding 900 nm;

a.3.g.2. “Specially designed” or modified to achieve 'charge multiplication' and having a maximum “radiant sensitivity” exceeding 10 mA/W for wavelengths exceeding 760 nm; *and*

a.3.g.3. Greater than 32 elements;

b. “Monospectral imaging sensors” and “multispectral imaging sensors”, designed for remote sensing applications and having any of the following:

b.1. An Instantaneous-Field-Of-View (IFOV) of less than 200 µrad (microradians); *or*

b.2. Specified for operation in the wavelength range exceeding 400 nm but not exceeding 30,000 nm and having all the following:

b.2.a. Providing output imaging data in digital format; *and*

b.2.b. Having any of the following characteristics:

b.2.b.1. “Space-qualified”; *or*

b.2.b.2. Designed for airborne operation, using other than silicon detectors, and having an IFOV of less than 2.5 mrad (milliradians);

Note: 6A002.b.1 does not control “monospectral imaging sensors” with a peak response in the

wavelength range exceeding 300 nm but not exceeding 900 nm and only incorporating any of the following non-"space-qualified" detectors or non -"space-qualified" "focal plane arrays":
a. Charge Coupled Devices (CCD) not designed or modified to achieve 'charge multiplication'; or

b. Complementary Metal Oxide Semiconductor (CMOS) devices not designed or modified to achieve 'charge multiplication'.

c. 'Direct view' imaging equipment incorporating any of the following:

c.1. Image intensifier tubes having the characteristics listed in 6A002.a.2.a or 6A002.a.2.b;

c.2. "Focal plane arrays" having the characteristics listed in 6A002.a.3; *or*

c.3. Solid state detectors specified by 6A002.a.1;

Technical Note: For the purposes of 6A002.c,'direct view' refers to imaging equipment that presents a visual image to a human observer without converting the image into an electronic signal for television display, and that cannot record or store the image photographically, electronically or by any other means.

Note: 6A002.c does not control equipment as follows, when incorporating other than GaAs or GaInAs photocathodes:
a. Industrial or civilian intrusion alarm, traffic or industrial movement control or counting systems;

b. Medical equipment;

c. Industrial equipment used for inspection, sorting or analysis of the properties of materials;

d. Flame detectors for industrial furnaces;

e. Equipment "specially designed" for laboratory use.

d. Special support "components" for optical sensors, as follows:

d.1. "Space-qualified" cryocoolers;

d.2. Non-"space-qualified" cryocoolers having a cooling source temperature below 218 K (−55 °C), as follows:

d.2.a. Closed cycle type with a specified Mean-Time-To-Failure (MTTF) or Mean-Time-Between-Failures (MTBF), exceeding 2,500 hours;

d.2.b. Joule-Thomson (JT) self-regulating minicoolers having bore (outside) diameters of less than 8 mm;

d.3. Optical sensing fibers specially fabricated either compositionally or structurally, or modified by coating, to be acoustically, thermally, inertially, electromagnetically or nuclear radiation sensitive.

Note: 6A002.d.3 does not apply to encapsulated optical sensing fibers "specially designed" for bore hole sensing applications.

e. [Reserved]

f. 'Read-Out Integrated Circuits' ('ROIC') "specially designed" for "focal plane arrays" specified by 6A002.a.3.

Note: 6A002.f does not apply to read-out integrated circuits "specially designed" for civil automotive applications.

Technical Note: For the purposes of 6A002.f, a 'Read-Out Integrated Circuit' ('ROIC') is an integrated circuit designed to underlie or be bonded to a "focal plane array" ("FPA") and used to read-out (i.e., extract and register) signals produced by the detector elements. At a minimum the 'ROIC' reads the charge from the detector elements by extracting the charge and applying a multiplexing function in a manner that retains the relative spatial position and orientation information of the detector elements for processing inside or outside the 'ROIC'.

6A003 Cameras, systems or equipment, and "components" therefor, as follows (see List of Items Controlled).

Reason for Control: NS, NP, RS, AT, UN

Control(s)	**Country Chart (see Supp. No. 1 to part 738)**
NS applies to entire entry	NS Column 2
NP applies to cameras controlled by 6A003.a.3 or a.4 and to plug-ins in 6A003.a.6 for cameras controlled by 6A003.a.3 or a.4	NP Column 1

Control(s)	Country Chart (see Supp. No. 1 to part 738)
RS applies to 6A003.b.3, 6A003.b.4.a, 6A003.b.4.c and to items controlled in 6A003.b.4.b that have a frame rate greater than 60 Hz or that incorporate a focal plane array with more than 111,000 elements, or to items in 6A003.b.4.b when being exported or reexported to be embedded in a civil product. (But see § 742.6(a)(2)(iii) and (v) for certain exemptions)	RS Column 1
RS applies to items controlled in 6A003.b.4.b that have a frame rate of 60 Hz or less and that incorporate a focal plane array with not more than 111,000 elements if not being exported or reexported to be embedded in a civil product	RS Column 2
AT applies to entire entry	AT Column 1
UN applies to 6A003.b.3 and b.4	See § 746.1(b) for UN controls

License Requirement Note: Commodities that are not subject to the ITAR but are of the type described in USML Category XII(c) are controlled as cameras in ECCN 6A003 when they incorporate a camera controlled in this ECCN.

REPORTING REQUIREMENTS

See § 743.3 of the EAR for thermal camera reporting for exports that are not authorized by an individually validated license of thermal imaging cameras controlled by ECCN 6A003.b.4.b to destinations in Country Group A:1 (see Supplement No. 1 to part 740 of the EAR), must be reported to BIS.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1500, except N/A for 6A003.a.3 through a.6, b.1, b.3 and b.4.

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any commodity in 6A003.b.3 or b.4 to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 6E001 (“development”), 6E002 (“production”), and 6E201 (“use”) for technology for items controlled under this entry. (2) Also see ECCN 6A203. (3) See ECCN 0A919 for foreign made military commodities that incorporate cameras described in 6A003. (4) Section 744.9 imposes a license requirement on cameras described in 6A003 if being exported, reexported, or transferred (in-country) for use by certain military end-users or for incorporation into a commodity controlled by ECCN 0A919. (5) See USML Category XII(c) and (e) for cameras subject to the ITAR. (6) Also see ECCN 6A293.

Related Definitions: N/A

Items:

a. Instrumentation cameras and “specially designed” “components” therefor, as follows:

> *Note: Instrumentation cameras, controlled by 6A003.a.3 to 6A003.a.5, with modular structures should be evaluated by their maximum capability, using plug-ins available according to the camera manufacturer's specifications.*

a.1. [Reserved]

a.2. [Reserved]

a.3. Electronic streak cameras having temporal resolution better than 50 ns;

a.4. Electronic framing cameras having a speed exceeding 1,000,000 frames/s;

a.5. Electronic cameras having all of the following:

a.5.a. An electronic shutter speed (gating capability) of less than 1μs per full frame; *and*

a.5.b. A read out time allowing a framing rate of more than 125 full frames per second;

a.6. Plug-ins having all of the following characteristics:

a.6.a. “Specially designed” for instrumentation cameras which have modular structures and that are controlled by 6A003.a; *and*

a.6.b. Enabling these cameras to meet the characteristics specified by 6A003.a.3, 6A003.a.4 or 6A003.a.5, according to the manufacturer's specifications;

b. Imaging cameras as follows:

> *Note: 6A003.b does not control television or video cameras “specially designed” for television*

broadcasting.

b.1. Video cameras incorporating solid state sensors, having a peak response in the wavelength range exceeding 10 nm, but not exceeding 30,000 nm and having all of the following:

b.1.a. Having any of the following:

b.1.a.1. More than 4 x 10^6 “active pixels” per solid state array for monochrome (black and white) cameras;

b.1.a.2. More than 4 x 10^6 “active pixels” per solid state array for color cameras incorporating three solid state arrays; *or*

b.1.a.3. More than 12 x 10^6 “active pixels” for solid state array color cameras incorporating one solid state array; *and*

b.1.b. Having any of the following:

b.1.b.1. Optical mirrors controlled by 6A004.a.;

b.1.b.2. Optical control equipment controlled by 6A004.d.; *or*

b.1.b.3. The capability for annotating internally generated 'camera tracking data';

Technical Notes: 1. For the purposes of 6A003.b.1, digital video cameras should be evaluated by the maximum number of “active pixels” used for capturing moving images.
2. For the purposes of 6A003.b.1.b.3, 'camera tracking data' is the information necessary to define camera line of sight orientation with respect to the earth. This includes: (1) the horizontal angle the camera line of sight makes with respect to the earth's magnetic field direction and; (2) the vertical angle between the camera line of sight and the earth's horizon.

b.2. Scanning cameras and scanning camera systems, having all of the following:

b.2.a. A peak response in the wavelength range exceeding 10 nm, but not exceeding 30,000 nm;

b.2.b. Linear detector arrays with more than 8,192 elements per array; *and*

b.2.c. Mechanical scanning in one direction;

Note: 6A003.b.2 does not apply to scanning cameras and scanning camera systems, “specially designed” for any of the following:
a. Industrial or civilian photocopiers;

b. Image scanners "specially designed" for civil, stationary, close proximity scanning applications (e.g., reproduction of images or print contained in documents, artwork, or photographs); or

c. Medical equipment.

b.3. Imaging cameras incorporating image intensifier tubes having the characteristics listed in 6A002.a.2.a or 6A002.a.2.b;

b.4. Imaging cameras incorporating "focal plane arrays" having any of the following:

b.4.a. Incorporating "focal plane arrays" controlled by 6A002.a.3.a to 6A002.a.3.e;

b.4.b. Incorporating "focal plane arrays" controlled by 6A002.a.3.f; *or*

b.4.c. Incorporating "focal plane arrays" controlled by 6A002.a.3.g;

Note 1: Imaging cameras described in 6A003.b.4 include "focal plane arrays" combined with sufficient "signal processing" electronics, beyond the read out integrated circuit, to enable as a minimum the output of an analog or digital signal once power is supplied.

Note 2: 6A003.b.4.a does not control imaging cameras incorporating linear "focal plane arrays" with 12 elements or fewer, not employing time-delay-and-integration within the element and designed for any of the following:
a. Industrial or civilian intrusion alarm, traffic or industrial movement control or counting systems;

b. Industrial equipment used for inspection or monitoring of heat flows in buildings, equipment, or industrial processes;

c. Industrial equipment used for inspection, sorting or analysis of the properties of materials;

d. Equipment "specially designed" for laboratory use; or

e. Medical equipment.

Note 3: 6A003.b.4.b does not control imaging cameras having any of the following:
a. A maximum frame rate equal to or less than 9 Hz;

b. Having all of the following:

1. Having a minimum horizontal or vertical 'Instantaneous-Field-of-View (IFOV)' of at least 2 mrad (milliradians);

2. Incorporating a fixed focal-length lens that is not designed to be removed;

3. Not incorporating a 'direct view' display; and

Technical Note: For the purposes of 6A003.b.4 Note 3.b.3, 'direct view' refers to an imaging camera operating in the infrared spectrum that presents a visual image to a human observer using a near-to-eye micro display incorporating any light-security mechanism.

4. Having any of the following:

a. No facility to obtain a viewable image of the detected field-of-view; or

b. The camera is designed for a single kind of application and designed not to be user modified; or

Technical Note: For the purposes of 6A003.b.4 Note 3.b.1, 'Instantaneous-Field-of-View (IFOV)' is the lesser figure of the 'Horizontal IFOV' or the 'Vertical IFOV'.
'Horizontal IFOV' = horizontal Field-of-View (FOV)/number of horizontal detector elements

'Vertical IFOV'= vertical Field-of-View (FOV)/number of vertical detector elements.

c. The camera is “specially designed” for installation into a civilian passenger land vehicle and having all of the following:

1. The placement and configuration of the camera within the vehicle are solely to assist the driver in the safe operation of the vehicle;

2. Is operable only when installed in any of the following:

a. The civilian passenger land vehicle for which it was intended and the vehicle weighs less than 4,500 kg (gross vehicle weight); or

b. A “specially designed”, authorized maintenance test facility; and

3. Incorporates an active mechanism that forces the camera not to function when it is removed from the vehicle for which it was intended.

Note: When necessary, details of the items will be provided, upon request, to the Bureau of Industry

and Security in order to ascertain compliance with the conditions described in Note 3.b.4 and Note 3.c in this Note to 6A003.b.4.b.

Note 4: 6A003.b.4.c does not apply to 'imaging cameras' having any of the following characteristics:
a. Having all of the following:

1. Where the camera is "specially designed" for installation as an integrated component into indoor and wall-plug-operated systems or equipment, limited by design for a single kind of application, as follows:

a. Industrial process monitoring, quality control, or analysis of the properties of materials;

b. Laboratory equipment "specially designed" for scientific research;

c. Medical equipment;

d. Financial fraud detection equipment; and

2. Is only operable when installed in any of the following:

a. The system(s) or equipment for which it was intended; or

b. A "specially designed," authorized maintenance facility; and

3. Incorporates an active mechanism that forces the camera not to function when it is removed from the system(s) or equipment for which it was intended;

b. Where the camera is "specially designed" for installation into a civilian passenger land vehicle or passenger and vehicle ferries and having all of the following:

1. The placement and configuration of the camera within the vehicle or ferry are solely to assist the driver or operator in the safe operation of the vehicle or ferry;

2. Is only operable when installed in any of the following:

a. The civilian passenger land vehicle for which it was intended and the vehicle weighs less than 4,500 kg (gross vehicle weight);

b. The passenger and vehicle ferry for which it was intended and having a length overall (LOA) 65 m or greater; or

c. A "specially designed", authorized maintenance test facility; and

3. Incorporates an active mechanism that forces the camera not to function when it is removed from the vehicle for which it was intended;

c. Limited by design to have a maximum "radiant sensitivity" of 10 mA/W or less for wavelengths exceeding 760 nm, having all of the following:

1. Incorporating a response limiting mechanism designed not to be removed or modified; and

2. Incorporates an active mechanism that forces the camera not to function when the response limiting mechanism is removed; and

3. Not "specially designed" or modified for underwater use; or

d. Having all of the following:

1. Not incorporating a 'direct view' or electronic image display;

2. Has no facility to output a viewable image of the detected field of view;

3. The "focal plane array" is only operable when installed in the camera for which it was intended; and

4. The "focal plane array" incorporates an active mechanism that forces it to be permanently inoperable when removed from the camera for which it was intended.

Note: When necessary, details of the item will be provided, upon request, to the Bureau of Industry and Security in order to ascertain compliance with the conditions described in Note 4 above.

b.5. Imaging cameras incorporating solid-state detectors specified by 6A002.a.1.

6A004 Optical equipment and "components," as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3000

GBS: Yes for 6A004.a.1, a.2, a.4, .b, d.2, and .f.

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA may not be used to ship any commodity in 6A004.c or .d to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) For optical mirrors or 'aspheric optical elements' “specially designed” for lithography “equipment,” see ECCN 3B001. (2) See USML Category XII(e) for gimbals “subject to the ITAR.” (3) See also 6A994.

Related Definitions: An 'aspheric optical element' is any element used in an optical system whose imaging surface or surfaces are designed to depart from the shape of an ideal sphere.

Items:

a. Optical mirrors (reflectors) as follows:

> *Technical Note: For the purposes of 6A004.a, Laser Induced Damage Threshold (LIDT) is measured according to ISO 21254-1:2011.*

a.1. 'Deformable mirrors' having an active optical aperture greater than 10 mm and having any of the following, and “specially designed” components therefor:

a.1.a. Having all the following:

a.1.a.1. A mechanical resonant frequency of 750 Hz or more; *and*

a.1.a.2. More than 200 actuators; *or*

a.1.b. A Laser Induced Damage Threshold (LIDT) being any of the following:

a.1.b.1. Greater than 1 kW/cm^2 using a “CW laser”; *or*

a.1.b.2. Greater than 2 J/cm^2 using 20 ns “laser” pulses at 20 Hz repetition rate;

Technical Notes: For the purposes of 6A004.a.1:
1. 'Deformable mirrors' are mirrors having any of the following:

a. A single continuous optical reflecting surface which is dynamically deformed by the application of individual torques or forces to compensate for distortions in the optical waveform incident upon the mirror; or

b. Multiple optical reflecting elements that can be individually and dynamically repositioned by the application of torques or forces to compensate for distortions in the optical waveform incident upon the mirror.

2. 'Deformable mirrors' are also known as adaptive optic mirrors.

a.2. Lightweight monolithic mirrors having an average “equivalent density” of less than 30 kg/m^2 and a total mass exceeding 10 kg;

a.3. Lightweight “composite” or foam mirror structures having an average “equivalent density” of less than 30 kg/m^2 and a total mass exceeding 2 kg;

Note: 6A004.a.2 and 6A004.a.3 do not apply to mirrors “specially designed” to direct solar radiation for terrestrial heliostat installations.

a.4. Mirrors “specially designed” for beam steering mirror stages specified in 6A004.d.2.a with a flatness of λ/10 or better (λ is equal to 633 nm) and having any of the following:

a.4.a. Diameter or major axis length greater than or equal to 100 mm; *or*

a.4.b. Having all of the following:

a.4.b.1. Diameter or major axis length greater than 50 mm but less than 100 mm; *and*

a.4.b.2. A Laser Induced Damage Threshold (LIDT) being any of the following:

a.4.b.2.a. Greater than 10 kW/cm2 using a “CW laser”; *or*

a.4.b.2.b. Greater than 20 J/cm2 using 20 ns “laser” pulses at 20 Hz repetition rate;

N.B. For optical mirrors “specially designed” for lithography equipment, see 3B001.

b. Optical “components” made from zinc selenide (ZnSe) or zinc sulfide (ZnS) with transmission in the wavelength range exceeding 3,000 nm but not exceeding 25,000 nm and having any of the following:

b.1. Exceeding 100 cm^3 in volume; *or*

b.2. Exceeding 80 mm in diameter or length of major axis and 20 mm in thickness (depth);

c. “Space-qualified” “components” for optical systems, as follows:

c.1. “Components” lightweighted to less than 20% “equivalent density” compared with a solid blank of the same aperture and thickness;

c.2. Raw substrates, processed substrates having surface coatings (single-layer or multi-layer, metallic or dielectric, conducting, semiconducting or insulating) or having protective films;

c.3. Segments or assemblies of mirrors designed to be assembled in space into an optical system with a collecting aperture equivalent to or larger than a single optic 1 m in diameter;

c.4. “Components” manufactured from “composite” materials having a coefficient of linear thermal expansion, in any coordinate direction, equal to or less than 5×10^{-6}/K;

d. Optical control equipment as follows:

d.1. Equipment “specially designed” to maintain the surface figure or orientation of the “space-qualified” “components” controlled by 6A004.c.1 or 6A004.c.3;

d.2. Steering, tracking, stabilisation and resonator alignment equipment as follows:

d.2.a. Beam steering mirror stages designed to carry mirrors having diameter or major axis length greater than 50 mm and having all of the following, and “specially designed” electronic control equipment therefor:

d.2.a.1. A maximum angular travel of ±26 mrad or more;

d.2.a.2. A mechanical resonant frequency of 500 Hz or more; *and*

d.2.a.3. An angular “accuracy” of 10 μrad (microradians) or less (better);

d.2.b. Resonator alignment equipment having bandwidths equal to or more than 100 Hz and an “accuracy” of 10 μrad or less (better);

d.3. Gimbals having all of the following:

d.3.a. A maximum slew exceeding 5°;

d.3.b. A bandwidth of 100 Hz or more;

d.3.c. Angular pointing errors of 200 μrad (microradians) or less; *and*

d.3.d. Having any of the following:

d.3.d.1. Exceeding 0.15 m but not exceeding 1 m in diameter or major axis length and capable of angular accelerations exceeding 2 rad (radians)/s^2; *or*

d.3.d.2. Exceeding 1 m in diameter or major axis length and capable of angular accelerations exceeding 0.5 rad (radians)/s^2;

d.4. [Reserved]

e. 'Aspheric optical elements' having all of the following:

e.1. Largest dimension of the optical-aperture greater than 400 mm;

e.2. Surface roughness less than 1 nm (rms) for sampling lengths equal to or greater than 1 mm; *and*

e.3. Coefficient of linear thermal expansion's absolute magnitude less than 3×10^{-6}/K at 25 °C;

Technical Note: 1. For the purposes of 6A004.e, an 'aspheric optical element' is any element used in an optical system whose imaging surface or surfaces are designed to depart from the shape of an ideal sphere.
2. For the purposes of 6A004.e.2, manufacturers are not required to measure the surface roughness unless the optical element was designed or manufactured with the intent to meet, or exceed, the control parameter.

Note: 6A004.e does not control 'aspheric optical elements' having any of the following:
a. Largest optical-aperture dimension less than 1 m and focal length to aperture ratio equal to or greater than 4.5:1;

b. Largest optical-aperture dimension equal to or greater than 1 m and focal length to aperture ratio equal to or greater than 7:1;

c. Designed as Fresnel, flyeye, stripe, prism or diffractive optical elements;

d. Fabricated from borosilicate glass having a coefficient of linear thermal expansion greater than 2.5 × 10^{-6}/K at 25 °C; or

e. An x-ray optical element having inner mirror capabilities (e.g., tube-type mirrors).

f. Dynamic wavefront measuring equipment having all of the following:

f.1. 'Frame rates' equal to or more than 1 kHz; *and*

f.2. A wavefront accuracy equal to or less (better) than λ/20 at the designed wavelength.

Technical Note: For the purposes of 6A004.f, 'frame rate' is a frequency at which all “active pixels” in

the "focal plane array" are integrated for recording images projected by the wavefront sensor optics.

6A005 "Lasers", "components" and optical equipment, as follows (see List of Items Controlled), excluding items that are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

License Requirements

Reason for Control: NS, NP, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
NP applies to lasers controlled by 6A005.a.2, a.3, a.4, b.2.b, b.3, b.4, b.6.c, c.1.b, c.2.b, d.2, d.3.c, or d.4.c that meet or exceed the technical parameters described in 6A205	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A for NP items

$3000 for all other items

GBS: Neodymium-doped (other than glass) "lasers" controlled by 6A005.b.6.d.2 (except 6A005.b.6.d.2.b) that have an output wavelength exceeding 1,000 nm, but not exceeding 1,100 nm, and an average or CW output power not exceeding 2 kW, and operate in a pulse-excited, non- "Q-switched" multiple-transverse mode, or in a continuously excited, multiple-transverse mode; Dye and Liquid Lasers controlled by 6A005.c.1, c.2 and c.3, except for a pulsed single longitudinal mode oscillator having an average output power exceeding 1 W and a repetition rate exceeding 1 kHz if the "pulse duration" is less than 100 ns; CO "lasers" controlled by 6A005.d.2 having a CW maximum rated single or multimode output power not exceeding 10 kW; CO_2 or CO/CO_2 "lasers" controlled by 6A005.d.3 having an output wavelength in the range from 9,000 to 11,000 nm and having a pulsed output not exceeding 2 J per pulse and a maximum rated average single or multimode output power not exceeding 5 kW; and CO_2 "lasers" controlled by 6A005.d.3 that operate in CW multiple-transverse mode, and having a CW output power not exceeding 15 kW.

List of Items Controlled

Related Controls (1) See ECCN *6D001* for "software" for items controlled under this entry. (2) See ECCNs *6E001* ("development"), *6E002* ("production"), and *6E201* ("use") for technology for items controlled under this entry. (3) Also see ECCNs *6A205* and *6A995.* (4) See ECCN 3B001 for excimer "lasers" "specially designed" for lithography equipment. (5) "Lasers" "especially designed" or prepared for use in isotope separation are subject to the export

licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110). (6) See USML Category XII(b) and (e) for laser systems or lasers subject to the ITAR. (7) See USML Category XVIII for certain laser-based directed energy weapon systems, equipment, and components subject to the ITAR.

Related Definitions: For the purposes of 6A005: (1) 'Wall-plug efficiency' is defined as the ratio of “laser” output power (or “average output power”) to total electrical input power required to operate the “laser”, including the power supply/conditioning and thermal conditioning/heat exchanger, see 6A005.a.6.b.1 and 6A005.b.6; (2) 'Non-repetitive pulsed' refers to “lasers” that produce either a single output pulse or that have a time interval between pulses exceeding one minute, see Note 2 of 6A005 and 6A005.d.6.

Items:

Notes: 1. Pulsed “lasers” include those that run in a continuous wave (CW) mode with pulses superimposed.
2. Excimer, semiconductor, chemical, CO, CO^2, and 'non-repetitive pulsed' Nd:glass “lasers” are only specified by 6A005.d.

Technical Note: For the purposes of 6A005 Note 2, 'non-repetitive pulsed' refers to “lasers” that produce either a single output pulse or that have a time interval between pulses exceeding one minute.
3. 6A005 includes fiber “lasers”.

4. The control status of “lasers” incorporating frequency conversion (i.e., wavelength change) by means other than one “laser” pumping another “laser” is determined by applying the control parameters for both the output of the source “laser” and the frequency-converted optical output.

5. 6A005 does not control “lasers” as follows:

a. Ruby with output energy below 20 J;

b. Nitrogen;

c. Krypton.

6. For the purposes of 6A005.a and 6A005.b, 'single transverse mode' refers to “lasers” with a beam profile having an M^2-factor of less than 1.3, while 'multiple transverse mode' refers to “lasers” with a beam profile having an M^2-factor of 1.3 or higher

a. Non-“tunable” continuous wave “(CW) lasers” having any of the following:

a.1. Output wavelength less than 150 nm and output power exceeding 1W;

a.2. Output wavelength of 150 nm or more but not exceeding 510 nm and output power exceeding 30 W;

Note: 6A005.a.2 does not control Argon "lasers" having an output power equal to or less than 50 W.

a.3. Output wavelength exceeding 510 nm but not exceeding 540 nm and any of the following:

a.3.a. 'Single transverse mode' output and output power exceeding 50 W; *or*

a.3.b. 'Multiple transverse mode' output and output power exceeding 150 W;

a.4. Output wavelength exceeding 540 nm but not exceeding 800 nm and output power exceeding 30 W;

a.5. Output wavelength exceeding 800 nm but not exceeding 975 nm and any of the following:

a.5.a. 'Single transverse mode' output and output power exceeding 50 W; *or*

a.5.b. 'Multiple transverse mode' output and output power exceeding 80 W;

a.6. Output wavelength exceeding 975 nm but not exceeding 1,150 nm and any of the following;

a.6.a. 'Single transverse mode' output and any of the following:

a.6.a.1. Output power exceeding 1,000 W; *or*

a.6.a.2. Having all of the following:

a.6.a.2.a. Output power exceeding 500 W; *and*

a.6.a.2.b. Spectral bandwidth less than 40 GHz; *or*

a.6.b. 'Multiple transverse mode' output and any of the following:

a.6.b.1. 'Wall-plug efficiency' exceeding 18% and output power exceeding 1,000 W; or

a.6.b.2. Output power exceeding 2 kW;

Note 1: 6A005.a.6.b does not control 'multiple transverse mode', industrial "lasers" with output power exceeding 2 kW and not exceeding 6 kW with a total mass greater than 1,200 kg. For the purpose of this note, total mass includes all "components" required to operate the "laser," e.g., "laser," power supply, heat exchanger, but excludes external optics for beam conditioning or delivery.

Note 2: 6A005.a.6.b does not apply to 'multiple transverse mode', industrial "lasers" having any of the following:

a. [Reserved];

b. Output power exceeding 1 kW but not exceeding 1.6 kW and having a BPP exceeding 1.25 mm·mrad;

c. Output power exceeding 1.6 kW but not exceeding 2.5 kW and having a BPP exceeding 1.7 mm·mrad;

d. Output power exceeding 2.5 kW but not exceeding 3.3 kW and having a BPP exceeding 2.5 mm·mrad;

e. Output power exceeding 3.3 kW but not exceeding 6 kW and having a BPP exceeding 3.5 mm·mrad;

f. [Reserved]

g. [Reserved]

h. Output power exceeding 6 kW but not exceeding 8 kW and having a BPP exceeding 12 mm·mrad; or

i. Output power exceeding 8 kW but not exceeding 10 kW and having a BPP exceeding 24 mm·mrad;

a.7. Output wavelength exceeding 1,150 nm but not exceeding 1,555 nm and any of the following:

a.7.a. 'Single transverse mode' and output power exceeding 50 W; *or*

a.7.b. 'Multiple transverse mode' and output power exceeding 80 W;

a.8. Output wavelength exceeding 1,555 nm but not exceeding 1,850 nm and output power exceeding 1 W;

a.9. Output wavelength exceeding 1,850 nm but not exceeding 2,100 nm, and any of the following:

a.9.a. 'Single transverse mode' and output power exceeding 1 W; *or*

a.9.b. 'Multiple transverse mode' output and output power exceeding 120 W; *or*

a.10. Output wavelength exceeding 2,100 nm and output power exceeding 1 W;

b. Non-“tunable” “pulsed lasers” having any of the following:

b.1. Output wavelength less than 150 nm and any of the following:

b.1.a. Output energy exceeding 50 mJ per pulse and “peak power” exceeding 1 W; *or*

b.1.b. “Average output power” exceeding 1 W;

b.2. Output wavelength of 150 nm or more but not exceeding 510 nm and any of the following:

b.2.a. Output energy exceeding 1.5 J per pulse and “peak power” exceeding 30 W; *or*

b.2.b. “Average output power” exceeding 30 W;

> *Note: 6A005.b.2.b does not control Argon “lasers” having an “average output power” equal to or less than 50 W.*

b.3. Output wavelength exceeding 510 nm, but not exceeding 540 nm and any of the following:

b.3.a. 'Single transverse mode' output and any of the following:

b.3.a.1. Output energy exceeding 1.5 J per pulse and “peak power” exceeding 50 W; *or*

b.3.a.2. “Average output power” exceeding 80 W; *or*

b.3.b. 'Multiple transverse mode' output and any of the following:

b.3.b.1. Output energy exceeding 1.5 J per pulse and “peak power” exceeding 150 W; or

b.3.b.2. “Average output power” exceeding 150 W;

b.4. Output wavelength exceeding 540 nm but not exceeding 800 nm and any of the following:

b.4.a. “Pulse duration” less than 1 ps and any of the following:

b.4.a.1. Output energy exceeding 0.005 J per pulse and “peak power” exceeding 5 GW; *or*

b.4.a.2. “Average output power” exceeding 20 W; *or*

b.4.b. “Pulse duration” equal to or exceeding 1 ps and any of the following:

b.4.b.1. Output energy exceeding 1.5 J per pulse and “peak power” exceeding 30 W; *or*

b.4.b.2. “Average output power” exceeding 30 W;

b.5. Output wavelength exceeding 800 nm but not exceeding 975 nm and any of the following:

b.5.a. “Pulse duration” less than 1ps and any of the following:

b.5.a.1. Output energy exceeding 0.005 J per pulse and “peak power” exceeding 5 GW; *or*

b.5.a.2. 'Single transverse mode' output and “average output power” exceeding 20 W;

b.5.b. “Pulse duration” equal to or exceeding 1 ps and not exceeding 1 μs and any of the following:

b.5.b.1. Output energy exceeding 0.5 J per pulse and “peak power” exceeding 50 W;

b.5.b.2. 'Single transverse mode' output and “average output power” exceeding 20 W; *or*

b.5.b.3. 'Multiple transverse mode' output and “average output power” exceeding 50 W; *or*

b.5.c. “Pulse duration” exceeding 1 μs and any of the following:

b.5.c.1. Output energy exceeding 2 J per pulse and “peak power” exceeding 50 W;

b.5.c.2. 'Single transverse mode' output and “average output power” exceeding 50 W; *or*

b.5.c.3. 'Multiple transverse mode' output and “average output power” exceeding 80 W.

b.6. Output wavelength exceeding 975 nm but not exceeding 1,150 nm and any of the following:

b.6.a. “Pulse duration” of less than 1 ps, and any of the following:

b.6.a.1. Output “peak power” exceeding 2 GW per pulse;

b.6.a.2. “Average output power” exceeding 30 W; *or*

b.6.a.3. Output energy exceeding 0.002 J per pulse;

b.6.b. “Pulse duration” equal to or exceeding 1 ps and less than 1 ns, and any of the following:

b.6.b.1. Output “peak power” exceeding 5 GW per pulse;

b.6.b.2. “Average output power” exceeding 50 W; *or*

b.6.b.3. Output energy exceeding 0.1 J per pulse;

b.6.c. “Pulse duration” equal to or exceeding 1 ns but not exceeding 1 μs and any of the following:

b.6.c.1. 'Single transverse mode' output and any of the following:

b.6.c.1.a. “Peak power” exceeding 100 MW;

b.6.c.1.b. “Average output power” exceeding 20 W limited by design to a maximum pulse repetition frequency less than or equal to 1 kHz;

b.6.c.1.c. 'Wall-plug efficiency' exceeding 12%, “average output power” exceeding 100 W and capable of operating at a pulse repetition frequency greater than 1 kHz;

b.6.c.1.d. “Average output power” exceeding 150 W and capable of operating at a pulse repetition frequency greater than 1 kHz; *or*

b.6.c.1.e. Output energy exceeding 2 J per pulse; *or*

b.6.c.2. 'Multiple transverse mode' output and any of the following:

b.6.c.2.a. “Peak power” exceeding 400 MW;

b.6.c.2.b. 'Wall-plug efficiency' exceeding 18% and “average output power” exceeding 500 W;

b.6.c.2.c. “Average output power” exceeding 2 kW; or

b.6.c.2.d. Output energy exceeding 4 J per pulse; *or*

b.6.d. “Pulse duration” exceeding 1 μs and any of the following:

b.6.d.1. 'Single transverse mode' output and any of the following:

b.6.d.1.a. “Peak power” exceeding 500 kW;

b.6.d.1.b. 'Wall-plug efficiency' exceeding 12% and “average output power” exceeding 100 W; *or*

b.6.d.1.c. “Average output power” exceeding 150 W; *or*

b.6.d.2. 'Multiple transverse mode' output and any of the following:

b.6.d.2.a. “Peak power” exceeding 1 MW;

b.6.d.2.b. 'Wall-plug efficiency' exceeding 18% and “average output power” exceeding 500 W; *or*

b.6.d.2.c. “Average output power” exceeding 2 kW;

b.7. Output wavelength exceeding 1,150 nm but not exceeding 1,555 nm and any of the following:

b.7.a. “Pulse duration” not exceeding 1 μs and any of the following:

b.7.a.1. Output energy exceeding 0.5 J per pulse and “peak power” exceeding 50 W;

b.7.a.2. 'Single transverse mode' output and “average output power” exceeding 20 W; *or*

b.7.a.3. 'Multiple transverse mode' output and “average output power” exceeding 50 W; *or*

b.7.b. “Pulse duration” exceeding 1 μs and any of the following:

b.7.b.1. Output energy exceeding 2 J per pulse and “peak power” exceeding 50 W;

b.7.b.2. 'Single transverse mode' output and “average output power” exceeding 50 W; *or*

b.7.b.3. 'Multiple transverse mode' output and “average output power” exceeding 80 W;

b.8. Output wavelength exceeding 1,555 nm but not exceeding 1,850 nm, and any of the following:

b.8.a. Output energy exceeding 100 mJ per pulse and “peak power” exceeding 1 W; *or*

b.8.b. “Average output power” exceeding 1 W;

b.9. Output wavelength exceeding 1,850 nm but not exceeding 2,100 nm, and any of the following:

b.9.a. 'Single transverse mode' and any of the following:

b.9.a.1. Output energy exceeding 100 mJ per pulse and “peak power” exceeding 1 W; *or*

b.9.a.2. “Average output power” exceeding 1 W;

b.9.b. 'Multiple transverse mode' and any of the following:

b.9.b.1. Output energy exceeding 100 mJ per pulse and “peak power” exceeding 10 kW; *or*

b.9.b.2. “Average output power” exceeding 120 W; *or*

b.10. Output wavelength exceeding 2,100 nm and any of the following:

b.10.a. Output energy exceeding 100 mJ per pulse and “peak power” exceeding 1 W; *or*

b.10.b. “Average output power” exceeding 1 W;

c. “Tunable” lasers having any of the following:

c.1. Output wavelength less than 600 nm and any of the following:

c.1.a. Output energy exceeding 50 mJ per pulse and “peak power” exceeding 1 W; *or*

c.1.b. Average or CW output power exceeding 1W;

Note: 6A005.c.1 does not apply to dye “lasers” or other liquid “lasers,” having a multimode output and a wavelength of 150 nm or more but not exceeding 600 nm and all of the following:

1. Output energy less than 1.5 J per pulse or a "peak power" less than 20 W; and

2. Average or CW output power less than 20 W.

c.2. Output wavelength of 600 nm or more but not exceeding 1,400 nm, and any of the following:

c.2.a. Output energy exceeding 1 J per pulse and "peak power" exceeding 20 W; *or*

c.2.b. Average or CW output power exceeding 20 W; *or*

c.3. Output wavelength exceeding 1,400 nm and any of the following:

c.3.a. Output energy exceeding 50 mJ per pulse and "peak power" exceeding 1 W; *or*

c.3.b. Average or CW output power exceeding 1 W;

d. Other "lasers", not controlled by 6A005.a, 6A005.b, or 6A005.c as follows:

d.1. Semiconductor "lasers" as follows:

Notes: 1. 6A005.d.1 includes semiconductor "lasers" having optical output connectors (e.g., fiber optic pigtails).
2. The control status of semiconductor "lasers" "specially designed" for other equipment is determined by the control status of the other equipment.

d.1.a. Individual single-transverse mode semiconductor "lasers" having any of the following:

d.1.a.1. Wavelength equal to or less than 1,570 nm and average or CW output power, exceeding 2.0 W; *or*

d.1.a.2. Wavelength greater than 1,570 nm and average or CW output power, exceeding 500 mW;

d.1.b. Individual 'multiple-transverse mode' semiconductor "lasers" having any of the following:

d.1.b.1. Wavelength of less than 1,400 nm and average or CW output power, exceeding 25 W;

d.1.b.2. Wavelength equal to or greater than 1,400 nm and less than 1,900 nm and average or CW output power, exceeding 2.5 W; *or*

d.1.b.3. Wavelength equal to or greater than 1,900 nm and average or CW output power, exceeding 1 W;

d.1.c. Individual semiconductor "laser" 'bars' having any of the following:

d.1.c.1. Wavelength of less than 1,400 nm and average or CW output power, exceeding 100 W;

d.1.c.2. Wavelength equal to or greater than 1,400 nm and less than 1,900 nm and average or CW output power, exceeding 25 W; *or*

d.1.c.3. Wavelength equal to or greater than 1,900 nm and average or CW output power, exceeding 10 W;

d.1.d. Semiconductor “laser” 'stacked arrays' (two dimensional arrays) having any of the following:

d.1.d.1. Wavelength less than 1,400 nm and having any of the following:

d.1.d.1.a. Average or CW total output power less than 3 kW and having average or CW output 'power density' greater than 500 W/cm^2;

d.1.d.1.b. Average or CW total output power equal to or exceeding 3 kW but less than or equal to 5 kW, and having average or CW output 'power density' greater than 350W/cm^2;

d.1.d.1.c. Average or CW total output power exceeding 5 kW;

d.1.d.1.d. Peak pulsed 'power density' exceeding 2,500 W/cm^2; *or*

> *Note: 6A005.d.1.d.1.d does not apply to epitaxially-fabricated monolithic devices.*

d.1.d.1.e. Spatially coherent average or CW total output power, greater than 150 W;

d.1.d.2. Wavelength greater than or equal to 1,400 nm but less than 1,900 nm, and having any of the following:

d.1.d.2.a. Average or CW total output power less than 250 W and average or CW output 'power density' greater than 150 W/cm2;

d.1.d.2.b. Average or CW total output power equal to or exceeding 250 W but less than or equal to 500 W, and having average or CW output 'power density' greater than 50W/cm^2;

d.1.d.2.c. Average or CW total output power exceeding 500 W;

d.1.d.2.d. Peak pulsed 'power density' exceeding 500 W/cm^2; *or*

> *Note: 6A005.d.1.d.2.d does not apply to epitaxially-fabricated monolithic devices.*

d.1.d.2.e. Spatially coherent average or CW total output power, exceeding 15 W;

d.1.d.3. Wavelength greater than or equal to 1,900 nm and having any of the following:

d.1.d.3.a. Average or CW output 'power density' greater than 50 W/cm^2;

d.1.d.3.b. Average or CW output power greater than 10 W; *or*

d.1.d.3.c. Spatially coherent average or CW total output power, exceeding 1.5 W; *or*

d.1.d.4. At least one “laser” 'bar' specified by 6A005.d.1.c;

Technical Note: For the purposes of 6A005.d.1.d, 'power density' means the total “laser” output power divided by the emitter surface area of the 'stacked array'.

d.1.e. Semiconductor “laser” 'stacked arrays', other than those specified by 6A005.d.1.d, having all of the following:

d.1.e.1. “Specially designed” or modified to be combined with other 'stacked arrays' to form a larger 'stacked array'; *and*

d.1.e.2. Integrated connections, common for both electronics and cooling;

Note 1: 'Stacked arrays', formed by combining semiconductor “laser” 'stacked arrays' specified by 6A005.d.1.e, that are not designed to be further combined or modified are specified by 6A005.d.1.d.

Note 2: 'Stacked arrays', formed by combining semiconductor “laser” 'stacked arrays' specified by 6A005.d.1.e, that are designed to be further combined or modified are specified by 6A005.d.1.e.

Note 3: 6A005.d.1.e does not apply to modular assemblies of single 'bars' designed to be fabricated into end to end stacked linear arrays.

Technical Notes: For the purposes of 6A005.d.1.e:
1. Semiconductor “lasers” are commonly called “laser” diodes.

2. A 'bar' (also called a semiconductor “laser” 'bar', a “laser” diode 'bar' or diode 'bar') consists of multiple semiconductor “lasers” in a one-dimensional array.

3. A 'stacked array' consists of multiple 'bars' forming a two-dimensional array of semiconductor “lasers”.

d.2. Carbon monoxide (CO) “lasers” having any of the following:

d.2.a. Output energy exceeding 2 J per pulse and “peak power” exceeding 5 kW; *or*

d.2.b. Average or CW output power, exceeding 5 kW;

d.3. Carbon dioxide (CO_2) “lasers” having any of the following:

d.3.a. CW output power exceeding 15 kW;

d.3.b. Pulsed output with “pulse duration” exceeding 10 μs and any of the following:

d.3.b.1. “Average output power” exceeding 10 kW; *or*

d.3.b.2. “Peak power” exceeding 100 kW; *or*

d.3.c. Pulsed output with a “pulse duration” equal to or less than 10 μs and any of the following:

d.3.c.1. Pulse energy exceeding 5 J per pulse; *or*

d.3.c.2. “Average output power” exceeding 2.5 kW;

d.4. Excimer “lasers” having any of the following:

d.4.a. Output wavelength not exceeding 150 nm and any of the following:

d.4.a.1. Output energy exceeding 50 mJ per pulse; *or*

d.4.a.2. “Average output power” exceeding 1 W;

d.4.b. Output wavelength exceeding 150 nm but not exceeding 190 nm and any of the following:

d.4.b.1. Output energy exceeding 1.5 J per pulse; *or*

d.4.b.2. “Average output power” exceeding 120 W;

d.4.c. Output wavelength exceeding 190 nm but not exceeding 360 nm and any of the following:

d.4.c.1. Output energy exceeding 10 J per pulse; *or*

d.4.c.2. “Average output power” exceeding 500 W; *or*

d.4.d. Output wavelength exceeding 360 nm and any of the following:

d.4.d.1. Output energy exceeding 1.5 J per pulse; *or*

d.4.d.2. “Average output power” exceeding 30 W;

> *Note: For excimer “lasers” “specially designed” for lithography equipment, see 3B001.*

d.5. “Chemical lasers” as follows:

d.5.a. Hydrogen Fluoride (HF) “lasers';

d.5.b. Deuterium Fluoride (DF) “lasers”;

d.5.c. 'Transfer lasers' as follows:

d.5.c.1. Oxygen Iodine (O_2-I) “lasers”;

d.5.c.2. Deuterium Fluoride-Carbon dioxide (DF-CO_2) “lasers”;

> *Technical Note: For the purposes of 6A005.d.5.c, 'transfer lasers' are “lasers” in which the lasing species are excited through the transfer of energy by collision of a non-lasing atom or molecule with a lasing atom or molecule species.*

d.6. 'Non-repetitive pulsed' Neodymium (Nd) glass “lasers” having any of the following:

d.6.a. A “pulse duration” not exceeding 1 μs and output energy exceeding 50 J per pulse; *or*

d.6.b. A “pulse duration” exceeding 1 μs and output energy exceeding 100 J per pulse;

e. “Components” as follows:

e.1. Mirrors cooled either by 'active cooling' or by heat pipe cooling;

> *Technical Note: For the purposes of 6A005.e.1, 'active cooling' is a cooling technique for optical “components” using flowing fluids within the subsurface (nominally less than 1 mm below the optical surface) of the optical component to remove heat from the optic.*

e.2. Optical mirrors or transmissive or partially transmissive optical or electro-optical-”components,” other than fused tapered fiber combiners and Multi-Layer Dielectric gratings (MLDs), “specially designed” for use with controlled “lasers”;

> *Note to 6A005.e.2: Fiber combiners and MLDs are specified by 6A005.e.3.*

e.3. Fiber “laser” “components” as follows:

e.3.a. Multimode to multimode fused tapered fiber combiners having all of the following:

e.3.a.1. An insertion loss better (less) than or equal to 0.3 dB maintained at a rated total average or CW output power (excluding output power transmitted through the single mode core if present) exceeding 1,000 W; *and*

e.3.a.2. Number of input fibers equal to or greater than 3;

e.3.b. Single mode to multimode fused tapered fiber combiners having all of the following:

e.3.b.1. An insertion loss better (less) than 0.5 dB maintained at a rated total average or CW output power exceeding 4,600 W;

e.3.b.2. Number of input fibers equal to or greater than 3; *and*

e.3.b.3. Having any of the following:

e.3.b.3.a. A Beam Parameter Product (BPP) measured at the output not exceeding 1.5 mm mrad for a number of input fibers less than or equal to 5; *or*

e.3.b.3.b. A BPP measured at the output not exceeding 2.5 mm mrad for a number of input fibers greater than 5;

e.3.c. MLDs having all of the following:

e.3.c.1. Designed for spectral or coherent beam combination of 5 or more fiber “lasers;” *and*

e.3.c.2. CW “Laser” Induced Damage Threshold (LIDT) greater than or equal to 10 kW/cm^2;

f. Optical equipment as follows:

> *N.B.: For shared aperture optical elements, capable of operating in “Super-High Power Laser” (“SHPL”) applications, see the U.S. Munitions List (22 CFR part 121).*

f.1. [Reserved]

> *N.B.: For items previously specified by 6A005.f.1, see 6A004.f.*

f.2. “Laser” diagnostic equipment “specially designed” for dynamic measurement of “SHPL” system angular beam steering errors and having an angular “accuracy” of 10 μrad (microradians) or less (better);

f.3. Optical equipment and “components”, “specially designed” for coherent beam combination in a phased-array “SHPL” system and having any of the following:

f.3.a. An “accuracy” of 0.1 μm or less, for wavelengths greater than 1 μm; *or*

f.3.b. An “accuracy” of λ/10 or less (better) at the designed wavelength, for wavelengths equal to or less than 1 μm;

f.4. Projection telescopes “specially designed” for use with “SHPL” systems;

g. 'Laser acoustic detection equipment' having all of the following:

g.1. CW “laser” output power greater than or equal to 20 mW;

g.2. “Laser” frequency stability equal to or better (less) than 10 MHz;

g.3. “Laser” wavelengths equal to or exceeding 1,000 nm but not exceeding 2,000 nm;

g.4. Optical system resolution better (less) than 1 nm; *and*

g.5. Optical Signal to Noise ratio equal to or exceeding 10^3.

Technical Note: For the purposes of 6A005.g, 'laser acoustic detection equipment' is sometimes referred to as a "Laser" Microphone or Particle Flow Detection Microphone.

6A006 "Magnetometers", "magnetic gradiometers", "intrinsic magnetic gradiometers", underwater electric field sensors, "compensation systems", and "specially designed" "components" therefor, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

Reporting Requirements

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1500, N/A for 6A006.a.1; "Magnetometers" and subsystems defined in 6A006.a.2 using optically pumped or nuclear precession (proton/Overhauser) having a 'sensitivity' lower (better) than 2 pT (rms) per square root Hz; and 6A006.d, and 6A006.e.

GBS: N/A

Special Conditions for STA

STA: License Exception STA may not be used to ship any commodity in: 6A006.a.1; or 6A006.a.2; or 6A006.c.1 "Magnetic gradiometers" using multiple "magnetometers" specified by 6A006.a.1 or 6.A006.a.2; or 6A006.d or .e (only for underwater receivers incorporating magnetometers specified in 6A006.a.1 or 6A006.a.2) to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

List of Items Controlled

Related Controls: See also 6A996. This entry does not control instruments "specially designed" for fishery applications or biomagnetic measurements for medical diagnostics.

Related Definitions: N/A

Items:

a. “Magnetometers” and subsystems, as follows:

a.1. “Magnetometers” using “superconductive” (SQUID) “technology” and having any of the following:

a.1.a. SQUID systems designed for stationary operation, without “specially designed” subsystems designed to reduce in-motion noise, and having a 'sensitivity' equal to or lower (better) than 50 fT (rms) per square root Hz at a frequency of 1 Hz; *or*

a.1.b. SQUID systems having an in-motion-magnetometer 'sensitivity' lower (better) than 20 pT (rms) per square root Hz at a frequency of 1 Hz and “specially designed” to reduce in-motion noise;

a.2. “Magnetometers” using optically pumped or nuclear precession (proton/Overhauser) “technology” having a 'sensitivity' lower (better) than 20 pT (rms) per square root Hz at a frequency of 1 Hz;

a.3. “Magnetometers” using fluxgate “technology” having a 'sensitivity' equal to or lower (better) than 10 pT (rms) per square root Hz at a frequency of 1 Hz;

a.4. Induction coil “magnetometers” having a 'sensitivity' lower (better) than any of the following:

a.4.a. 0.05 nT (rms)/square root Hz at frequencies of less than 1 Hz;

a.4.b. 1×10^{-3} nT (rms)/square root Hz at frequencies of 1 Hz or more but not exceeding 10 Hz; *or*

a.4.c. 1×10^{-4} nT (rms)/square root Hz at frequencies exceeding 10 Hz;

a.5. Fiber optic “magnetometers” having a 'sensitivity' lower (better) than 1 nT (rms) per square root Hz;

b. Underwater electric field sensors having a 'sensitivity' lower (better) than 8 nanovolt per meter per square root Hz when measured at 1 Hz;

c. “Magnetic gradiometers” as follows:

c.1. “Magnetic gradiometers” using multiple “magnetometers” controlled by 6A006.a;

c.2. Fiber optic “intrinsic magnetic gradiometers” having a magnetic gradient field 'sensitivity' lower (better) than 0.3 nT/m (rms) per square root Hz;

c.3. “Intrinsic magnetic gradiometers”, using “technology” other than fiber-optic “technology”, having a magnetic gradient field 'sensitivity' lower (better) than 0.015 nT/m (rms) per square root Hz;

d. “Compensation systems” for magnetic and underwater electric field sensors resulting in a performance equal to or better than the control parameters of 6A006.a, 6A006.b, and 6A006.c; and

e. Underwater electromagnetic receivers incorporating magnetic field sensors specified by 6A006.a or underwater electric field sensors specified by 6A006.b.

Technical Note: For the purposes of 6A006, 'sensitivity' (noise level) is the root mean square of the device-limited noise floor which is the lowest signal that can be measured.

6A007 Gravity meters (gravimeters) and gravity gradiometers, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, MT, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
MT applies to 6A007.b and .c when the accuracies in 6A007.b.1 and b.2 are met or exceeded	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3000; N/A for MT

GBS: N/A

List of Items Controlled

Related Controls: (1) See USML Category XII(d) for certain gravity meters (gravimeters) and gravity gradiometers subject to the ITAR. (2) See also ECCNs 6A107, 6A997, and 7A611.

Related Definitions: N/A

Items:

a. Gravity meters designed or modified for ground use and having a static “accuracy” of less (better) than 10 μGal;

Note: 6A007.a does not control ground gravity meters of the quartz element (Worden) type.

b. Gravity meters designed for mobile platforms and having all of the following:

b.1. A static “accuracy” of less (better) than 0.7 mGal; *and*

b.2. An in-service (operational) “accuracy” of less (better) than 0.7 mGal having a 'time-to-steady-state registration' of less than 2 minutes under any combination of attendant corrective compensations and motional influences;

> *Technical Note: For the purposes of 6A007.b.2, 'time-to-steady-state registration' (also referred to as the gravimeter's response time) is the time over which the disturbing effects of platform induced accelerations (high frequency noise) are reduced.*

c. Gravity gradiometers.

6A008 Radar systems, equipment and assemblies, having any of the following (see List of Items Controlled), and “specially designed” “components” therefor.

License Requirements

Reason for Control: NS, MT, RS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
MT applies to items that are designed for airborne applications and that are usable in systems controlled for MT reasons	MT Column 1
RS applies to 6A008.j.1	RS Column 1
AT applies to entire entry	AT Column 1

Reporting Requirements

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $5000; N/A for MT and for 6A008.j.1.

GBS: Yes, for 6A008.b, .c, and l.1 only

Special Conditions for STA

STA: License Exception STA may not be used to ship any commodity in 6A008.d, 6A008.h or 6A008.k to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) See also ECCNs 6A108 and 6A998. ECCN 6A998 controls, inter alia, the Light Detection and Ranging (LIDAR) equipment excluded by the note to paragraph j of this ECCN (6A008). (2) See USML Category XII(b) for certain LIDAR, Laser Detection and Ranging (LADAR), or range-gated systems subject to the ITAR.

Related Definitions: N/A

Items:

> *Note: 6A008 does not control:*
> *—Secondary surveillance radar (SSR);*
>
> *—Civil Automotive Radar;*
>
> *—Displays or monitors used for air traffic control (ATC);*
>
> *—Meteorological (weather) radar;*
>
> *—Precision Approach Radar (PAR) equipment conforming to ICAO standards and employing electronically steerable linear (1-dimensional) arrays or mechanically positioned passive antennas.*

a. Operating at frequencies from 40 GHz to 230 GHz and having any of the following:

a.1. An average output power exceeding 100 mW; *or*

a.2. Locating “accuracy” of 1 m or less (better) in range and 0.2 degree or less (better) in azimuth;

b. A tunable bandwidth exceeding ±6.25% of the 'center operating frequency';

> *Technical Note: For the purposes of 6A008.b, the 'center operating frequency' equals one half of the sum of the highest plus the lowest specified operating frequencies.*

c. Capable of operating simultaneously on more than two carrier frequencies;

d. Capable of operating in synthetic aperture (SAR), inverse synthetic aperture (ISAR) radar mode, or sidelooking airborne (SLAR) radar mode;

e. Incorporating electronically scanned array antennae;

> *Technical Note: For the purposes of 6A008.e, electronically scanned array antennae are also known as electronically steerable array antennae.*

f. Capable of heightfinding non-cooperative targets;

g. “Specially designed” for airborne (balloon or airframe mounted) operation and having Doppler “signal processing” for the detection of moving targets;

h. Employing processing of radar signals and using any of the following:

h.1. “Radar spread spectrum” techniques; *or*

h.2. “Radar frequency agility” techniques;

i. Providing ground-based operation with a maximum 'instrumented range' exceeding 185 km;

Note: 6A008.i does not control:
a. Fishing ground surveillance radar;

b. Ground radar equipment “specially designed” for en route air traffic control, and having all of the following:

1. A maximum 'instrumented range' of 500 km or less;

2. Configured so that radar target data can be transmitted only one way from the radar site to one or more civil ATC centers;

3. Contains no provisions for remote control of the radar scan rate from the en route ATC center; and

4. Permanently installed;

c. Weather balloon tracking radars.

Technical Note: For the purposes of 6A008.i, 'instrumented range' is the specified unambiguous display range of a radar.

j. Being “laser” radar or Light Detection and Ranging (LIDAR) equipment and having any of the following:

j.1. “Space-qualified”;

j.2. Employing coherent heterodyne or homodyne detection techniques and having an angular resolution of less (better) than 20 µrad (microradians); *or*

j.3. Designed for carrying out airborne bathymetric littoral surveys to International Hydrographic Organization (IHO) Order 1a Standard (5th Edition February 2008) for Hydrographic Surveys or better, and using one or more “lasers” with a wavelength exceeding 400 nm but not exceeding 600 nm;

Note 1: LIDAR equipment "specially designed" for surveying is only specified by 6A008.j.3.

Note 2: 6A008.j does not apply to LIDAR equipment "specially designed" for meteorological observation.

Note 3: Parameters in the IHO Order 1a Standard 5th Edition February 2008 are summarized as follows:
Horizontal Accuracy (95% Confidence Level)= 5 m + 5% of depth.

Depth Accuracy for Reduced Depths (95% confidence level) = ±√(a^2 + ($b*d)^2$) where:

a = 0.5 m = constant depth error, i.e., the sum of all constant depth errors

b = 0.013 = factor of depth dependent error

*b*d = depth dependent error, i.e., the sum of all depth dependent errors*

d = depth

Feature Detection = Cubic features > 2 m in depths up to 40 m; 10% of depth beyond 40 m.

k. Having "signal processing" sub-systems using "pulse compression" and having any of the following:

k.1. A "pulse compression" ratio exceeding 150; *or*

k.2. A compressed pulse width of less than 200 ns; *or*

Note: 6A008.k.2 does not apply to two dimensional 'marine radar' or 'vessel traffic service' radar, having all of the following:
a. "Pulse compression" ratio not exceeding 150;

b. Compressed pulse width of greater than 30 ns;

c. Single and rotating mechanically scanned antenna;

d. Peak output power not exceeding 250 W; and

e. Not capable of "frequency hopping".

l. Having data processing sub-systems and having any of the following:

l.1. 'Automatic target tracking' providing, at any antenna rotation, the predicted target position beyond the time of the next antenna beam passage; or

Note: 6A008.l.1 does not control conflict alert capability in ATC systems, or 'marine radar'.

Technical Note: For the purposes of 6A008.l.1, 'automatic target tracking' is a processing technique that automatically determines and provides as output an extrapolated value of the most probable position of the target in real time.

l.2. [Reserved]

l.3. [Reserved]

l.4. Configured to provide superposition and correlation, or fusion, of target data within six seconds from two or more 'geographically dispersed' radar sensors to improve the aggregate performance beyond that of any single sensor specified by 6A008.f, or 6A008.i.

Technical Note: For the purposes of 6A008.l.4, sensors are considered 'geographically dispersed' when each location is distant from any other more than 1,500 m in any direction. Mobile sensors are always considered 'geographically dispersed'.

N.B.: See also the U.S. Munitions List (22 CFR part 121).

Note: 6A008.l does not apply to systems, equipment and assemblies designed for 'vessel traffic services'.

Technical Notes: 1. For the purposes of 6A008, 'marine radar' is a radar that is designed to navigate safely at sea, inland waterways or near-shore environments.
2. For the purposes of 6A008, 'vessel traffic service' is a vessel traffic monitoring and control service similar to air traffic control for "aircraft."

6A102 Radiation hardened detectors, other than those controlled by 6A002, "specially designed" or modified for protecting against nuclear effects (e.g., Electromagnetic Pulse (EMP), X-rays, combined blast and thermal effects) and usable for "missiles," designed or rated to withstand radiation levels which meet or exceed a total irradiation dose of 5×10^5 rads (silicon).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: N/A

Related Definitions: In this entry, a detector is defined as a mechanical, electrical, optical or chemical device that automatically identifies and records, or registers a stimulus such as an environmental change in pressure or temperature, an electrical or electromagnetic signal or radiation from a radioactive material.

Items: The list of items controlled is contained in the ECCN heading.

6A103 Radomes designed to withstand a combined thermal shock greater than 100 cal/sq cm accompanied by a peak over pressure of greater than 50 kPa, usable in protecting "missiles" against nuclear effects (e.g., Electromagnetic Pulse (EMP), X-rays, combined blast and thermal effects), and usable for "missiles". (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

6A107 Gravity meters (gravimeters) or gravity gradiometers, other than those controlled by 6A007, designed or modified for airborne or marine use, as follows, (see List of Items Controlled) and "specially designed" "parts" and "components" therefor.

License Requirements

Reason for Control: MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See USML Category XII(d) for certain gravity meters (gravimeters) or gravity gradiometers subject to the ITAR. See also ECCN 7A611.

Related Definitions: 'Time to steady-state registration' (also referred to as the gravity meter's response time) is the time over which the disturbing effects of platform-induced acceleration (high frequency noise) are reduced.

Items:

a. Gravity meters having all of the following characteristics:

a.1. A static or operational accuracy equal to or less (better) than 0.7 milligal (mgal); *and*

a.2. A 'time to steady-state registration' of two minutes or less.

b. Gravity gradiometers

6A108 Radar systems and tracking systems, other than those controlled by 6A008, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) This entry does not control airborne civil weather radar conforming to international standards for civil weather radars provided that they do not incorporate any of the following: (a) Phased array antennas; (b) Frequency agility; (c) Spread spectrum; or (d) Signal processing "specially designed" for the tracking of vehicles. (2) Items in *6A108.a* that are "specially designed" or modified for "missiles" or for items on the U.S. Munitions List are "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: Laser radar systems are defined as those that embody specialized transmission, scanning, receiving and signal processing techniques for utilization of lasers for echo ranging, direction finding and discrimination of targets by location, radial speed and body reflection characteristics.

Items: a. Radar and laser radar systems designed or modified for use in "missiles";

> *Note: 6A108.a includes the following:*
> *a. Terrain contour mapping equipment;*
>
> *b. Imaging sensor equipment;*
>
> *c. Scene mapping and correlation (both digital and analog) equipment;*
>
> *d. Doppler navigation radar equipment.*

b. Precision tracking systems, usable for rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km, as follows:

b.1. Tracking systems which use a code translator installed on the rocket or unmanned aerial vehicle in conjunction with either surface or airborne references or navigation satellite systems to provide real-time measurements of in-flight position and velocity;

b.2. Range instrumentation radars including associated optical/infrared trackers with all of the following capabilities:

b.2.a. Angular resolution better than 1.5 milliradians;

b.2.b. Range of 30 km or greater with a range resolution better than 10 m rms;

b.2.c. Velocity resolution better than 3 m/s.

6A202 Photomultiplier tubes having both of the following characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 6E001 (“development”), 6E002 (“production”), and 6E201 (“use”) for technology for items controlled under this entry.

Related Definitions: N/A

Items: a. Photocathode area of greater than 20 cm^2; *and*

b. Anode pulse rise time of less than 1 ns.

6A203 High-speed cameras, imaging devices and “components” therefor, other than those controlled by 6A003 (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1.
AT applies to entire entry	AT Column 1.

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCNs 6E001 (“development”), 6E002 (“production”), and 6E201 (“use”) for technology for items controlled under this entry. (2) Also see ECCN 6A003.a.3 and a.4. (3) The act of incorporating a radiation hardened integrated circuit into a TV camera designated as EAR99 does not, in and of itself, cause the TV camera to meet the parameters of ECCN paragraph 6A203.d.

Related Definitions: N/A

Items:

a. Streak cameras and “specially designed” components therefor, as follows:

a.1. Streak cameras with writing speeds greater than 0.5 mm/μs;

a.2. Electronic streak cameras capable of 50 ns or less time resolution;

a.3. Streak tubes for cameras described in 6A203.a.2;

a.4. Plug-ins, “specially designed” for use with streak cameras having modular structures, that enable the performance characteristics described in 6A203.a.1 or .a.2;

a.5. Synchronizing electronics units, and rotor assemblies consisting of turbines, mirrors and bearings, that are “specially designed” for cameras described in 6A203.a.1.

b. Framing cameras and “specially designed” components therefor, as follows:

b.1. Framing cameras with recording rates greater than 225,000 frames per second;

b.2. Framing cameras capable of 50 ns or less frame exposure time;

b.3. Framing tubes, and solid-state imaging devices, that have a fast image gating (shutter) time of 50 ns or less and are "specially designed" for cameras described in 6A203.b.1 or .b.2;

b.4. Plug-ins, "specially designed" for use with framing cameras having modular structures, that enable the performance characteristics described in 6A203.b.1 or .b.2;

b.5. Synchronizing electronic units, and rotor assemblies consisting of turbines, mirrors and bearings, that are "specially designed" for cameras described in 6A203.b.1 or .b.2.

c. Solid-state or electron tube cameras and "specially designed" components therefor, as follows:

c.1. Solid-state cameras, or electron tube cameras, with a fast image gating (shutter) time of 50 ns or less;

c.2. Solid-state imaging devices, and image intensifiers tubes, that have a fast image gating (shutter) time of 50 ns or less and are "specially designed" for cameras described in 6A203.c.1;

c.3. Electro-optical shuttering devices (Kerr or Pockels cells) with a fast image gating (shutter) time of 50 ns or less;

c.4. Plug-ins, "specially designed" for use with cameras having modular structures, that enable the performance characteristics described in 6A203.c.1.

Technical Note: High speed single frame cameras can be used alone to produce a single image of a dynamic event, or several such cameras can be combined in a sequentially-triggered system to produce multiple images of an event.

d. Radiation-hardened TV cameras, or lenses therefor, "specially designed" or rated as radiation hardened to withstand a total radiation dose greater than 5×10^4 Gy (silicon) without operational degradation.

Technical Note: The term Gy (silicon) refers to the energy in Joules per kilogram absorbed by an unshielded silicon sample when exposed to ionizing radiation.

6A205 "Lasers," "laser" amplifiers and oscillators, other than those controlled by 6A005 (see List of Items Controlled), excluding items that are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCNs 6E001 ("development"), 6E002 ("production"), and 6E201 ("use") for technology for items controlled under this entry. (2) Also see ECCNs 6A005 and 6A995. (3) See ECCN 6A005.a.2 for additional controls on argon ion lasers; See ECCN 6A005.b.6.c for additional controls on neodymium-doped lasers. (4) "Lasers" "specially designed" or prepared for use in isotope separation are subject to the export licensing authority of the Nuclear Regulatory Commission (see 10 CFR part 110).

Related Definitions: N/A

Items: a. Copper vapor lasers having both of the following characteristics:

a.1. Operating at wavelengths between 500 nm and 600 nm; and

a.2. An average output power equal to or greater than 30 W;

b. Argon ion "lasers" having both of the following characteristics:

b.1. Operating at wavelengths between 400 nm and 515 nm; and

b.2. An average output power greater than 40 W;

c. Neodymium-doped (other than glass) lasers with an output wavelength between 1000 nm and 1100 nm having either of the following:

c.1. Pulse-excited and Q-switched with a pulse duration equal to or greater than 1 ns, and having either of the following:

c.1.a. A single-transverse mode output with an average output power greater than 40 W; *or*

c.1.b. A multiple-transverse mode output with an average output power greater than 50 W; *or*

c.2. Incorporating frequency doubling to give an output wavelength between 500 nm and 550 nm with an average output power of greater than 40 W.

d. Tunable pulsed single-mode dye laser oscillators having all of the following characteristics:

d.1. Operating at wavelengths between 300 nm and 800 nm;

d.2. An average output greater than 1 W;

d.3. A repetition rate greater than 1 kHz; and

d.4. Pulse width less than 100 ns;

e. Tunable pulsed dye laser amplifiers and oscillators having all of the following characteristics:

e.1. Operating at wavelengths between 300 nm and 800 nm;

e.2. An average output greater than 30 W;

e.3. A repetition rate greater than 1 kHz; and

e.4. Pulse width less than 100 ns;

Note to 6A205.e: 6A205.e does not control single mode oscillators.

f. Alexandrite lasers having all of the following characteristics:

f.1. Operating at wavelengths between 720 nm and 800 nm;

f.2. A bandwidth of 0.005 nm or less;

f.3. A repetition rate greater than 125 Hz; and

f.4. An average output power greater than 30 W;

g. Pulsed carbon dioxide “lasers” having all of the following characteristics:

g.1. Operating at wavelengths between 9,000 nm and 11,000 nm;

g.2. A repetition rate greater than 250 Hz;

g.3. An average output power greater than 500 W; and

g.4. Pulse width of less than 200 ns;

Note to 6A205.g: 6A205.g does not control the higher power (typically 1 kW to 5 kW) industrial CO_2 lasers used in applications such as cutting and welding, as these latter lasers are either continuous

wave or are pulsed with a pulse width greater than 200 ns.

h. Pulsed excimer lasers (XeF, XeCl, KrF) having all of the following characteristics:

h.1. Operating at wavelengths between 240 nm and 360 nm;

h.2. A repetition rate greater than 250 Hz; and

h.3. An average output power greater than 500 W;

i. Para-hydrogen Raman shifters designed to operate at 16 micrometer output wavelength and at a repetition rate greater than 250 Hz.;

j. Pulsed carbon monoxide lasers having all of the following characteristics:

j.1. Operating at wavelengths between 5,000 and 6,000 nm;

j.2. A repetition rate greater than 250 Hz;

j.3. An average output power greater than 200 W; *and*

j.4. Pulse width of less than 200 ns.

Note to ECCN 6A205.j: 6A205.j does not control the higher power (typically 1 kW to 5 kW) industrial CO lasers used in applications such as cutting and welding, because such lasers are either continuous wave or are pulsed with a pulse width greater than 200 ns.

6A225 Velocity interferometers for measuring velocities exceeding 1 km/s during time intervals of less than 10 microseconds.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 6E001 ("development"), 6E002 ("production"), and 6E201 ("use") for technology for items controlled under this entry.

Related Definitions: N/A

ECCN Controls: 6A225 includes velocity interferometers, such as VISARs (Velocity Interferometer Systems for Any Reflector), DLIs (Doppler Laser Interferometers) and PDV (Photonic Doppler Velocimeters) also known as Het-V (Heterodyne Velocimeters).

Items: The list of items controlled is contained in the ECCN heading.

6A226 Pressure sensors, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 6E001 ("development"), 6E002 ("production"), and 6E201 ("use") for technology for items controlled under this entry.

Related Definitions: N/A

Items: a. Shock pressure gauges capable of measuring pressures greater than 10 GPa (100 kilobars), including gauges made with manganin, ytterbium, and polyvinylidene bifluoride (PVBF, PVF_2);

b. Quartz pressure transducers for pressures greater than 10 GPa (100 kilobars).

6A293 Cameras not classified ECCNs 6A003 or 6A203 with all the following characteristics: (see List of Items Controlled).

License Requirements

Reason for Control: NP, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

Special Conditions for STA

STA: License Exception STA (§ 740.20 of the EAR) may not be used for ECCN 6A293.

List of Items Controlled

Related Controls: See ECCNs 6A003 and 6A203.

Related Definitions: N/A

Items:

a. Minimum exposure time of 1 microsecond or faster, and

b. a throughput of 13.43 Giga Pixels/s or greater when taken at 205,000 frames/s.

> *Technical Note: Throughput = Width (pixels) x Height (pixels) x Frames per Second. The width and Height in pixels are those that are achieved at 205,000 frames per second.*

> *Note: This entry includes cameras which may be referred to as high-speed digital imaging cameras, high-speed video cameras or slow-motion cameras or any other camera that meets these parameters.*

6A611 Acoustic systems and equipment, radar, and "parts," "components," "accessories," and "attachments" "specially designed" therefor, "specially designed" for a military application that are not enumerated in any USML category or other ECCN are controlled by ECCN 3A611. Military fire control, laser, imaging, and guidance equipment that are not enumerated in any USML category or ECCN are controlled by ECCN 7A611.

6A991 Marine or terrestrial acoustic equipment, n.e.s., capable of detecting or locating underwater objects or features or positioning surface vessels or underwater vehicles; and "specially designed" "parts" and "components," n.e.s.

LICENSE REQUIREMENTS

Reason for Control: AT, foreign policy

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 2.
Russian industry sector sanctions apply to entire entry	See § 746.8 for specific license requirements and license review policy.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

6A992 Optical Sensors, not controlled by 6A002, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT, RS

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

RS applies to entire entry. A license is required for items controlled by this entry for export or reexport to Iraq or transfer within Iraq for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See §§ 742.6 and 746.3 of the EAR for additional information.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items: a. Image intensifier tubes and "specially designed" "components" therefor, as follows:

a.1. Image intensifier tubes having all the following:

a.1.a. A peak response in wavelength range exceeding 400 nm, but not exceeding 1,050 nm;

a.1.b. A microchannel plate for electron image amplification with a hole pitch (center-to-center spacing) of less than 25 micrometers; *and*

a.1.c. Having any of the following:

a.1.c.1. An S-20, S-25 or multialkali photocathode; *or*

a.1.c.2. A GaAs or GaInAs photocathode;

a.2. "Specially designed" microchannel plates having both of the following characteristics:

a.2.a. 15,000 or more hollow tubes per plate; *and*

a.2.b. Hole pitch (center-to-center spacing) of less than 25 micrometers.

b. Direct view imaging equipment operating in the visible or infrared spectrum, incorporating image intensifier tubes having the characteristics listed in 6A992.a.1.

6A993 Cameras, not controlled by 6A003 or 6A203, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCN 0A919 for foreign made military commodities that incorporate cameras described in 6A993.a that meet the criteria specified in Note 3.a to 6A003.b.4.b (*i.e.,* having a maximum frame rate equal to or less than 9 Hz). (2) Section 744.9 imposes license requirements on cameras described in 6A993.a as a result of meeting the criteria specified in Note 3.a to 6A003.b.4.b (*i.e.,* having a maximum frame rate equal to or less than 9 Hz) if being exported, reexported, or transferred (in-country) for use by a military end-user or for incorporation into a commodity controlled by ECCN 0A919.

Related Definitions: N/A

Items: a. Cameras that meet the criteria of Note 3 to 6A003.b.4.

b. [Reserved]

6A994 Optics, not controlled by 6A004, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Optical filters:

a.1. For wavelengths longer than 250 nm, comprised of multi-layer optical coatings and having either of the following:

a.1.a. Bandwidths equal to or less than 1 nm Full Width Half Intensity (FWHI) and peak transmission of 90% or more; or

a.1.b. Bandwidths equal to or less than 0.1 nm FWHI and peak transmission of 50% or more;

> Note: 6A994 does not control optical filters with fixed air gaps or Lyot-type filters.

a.2. For wavelengths longer than 250 nm, and having all of the following:

a.2.a. Tunable over a spectral range of 500 nm or more;

a.2.b. Instantaneous optical bandpass of 1.25 nm or less;

a.2.c. Wavelength resettable within 0.1 ms to an accuracy of 1 nm or better within the tunable spectral range; and

a.2.d. A single peak transmission of 91% or more;

a.3. Optical opacity switches (filters) with a field of view of 30° or wider and a response time equal to or less than 1 ns;

b. “Fluoride fiber” cable, or optical fibers therefor, having an attenuation of less than 4 dB/km in the wavelength range exceeding 1,000 nm but not exceeding 3,000 nm.

6A995 “Lasers” as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Carbon dioxide (CO_2) “lasers” having any of the following:

a.1. A CW output power exceeding 10 kW;

a.2. A pulsed output with a “pulse duration” exceeding 10 microseconds; and

a.2.a. An average output power exceeding 10 kW; or

a.2.b. A pulsed “peak power” exceeding 100 kW; or

a.3. A pulsed output with a “pulse duration” equal to or less than 10 microseconds; and

a.3.a. A pulse energy exceeding 5 J per pulse and “peak power” exceeding 2.5 kW; or

a.3.b. An average output power exceeding 2.5 kW;

b. Semiconductor lasers, as follows:

b.1. Individual, single-transverse mode semiconductor “lasers” having:

b.1.a. An average output power exceeding 100 mW; or

b.1.b. A wavelength exceeding 1,050 nm;

b.2. Individual, multiple-transverse mode semiconductor “lasers”, or arrays of individual semiconductor “lasers”, having a wavelength exceeding 1,050 nm;

c. Ruby “lasers” having an output energy exceeding 20 J per pulse;

d. Non-“tunable” “pulsed lasers” having an output wavelength exceeding 975 nm but not exceeding 1,150 nm and having any of the following:

d.1. A “pulse duration” equal to or exceeding 1 ns but not exceeding 1 μs, and having any of the following:

d.1.a. A single transverse mode output and having any of the following:

d.1.a.1. A ‘wall-plug efficiency’ exceeding 12% and an “average output power” exceeding 10 W and capable of operating at a pulse repetition frequency greater than 1kHz; *or*

d.1.a.2. An “average output power” exceeding 20 W; or

d.1.b. A multiple transverse mode output and having any of the following:

d.1.b.1. A ‘wall-plug efficiency’ exceeding 18% and an “average output power” exceeding 30 W;

d.1.b.2. A “peak power” exceeding 200 MW; or

d.1.b.3. An “average output power” exceeding 50 W; or

d.2. A “pulse duration” exceeding 1 μs and having any of the following:

d.2.a. A single transverse mode output and having any of the following:

d.2.a.1. A ‘wall-plug efficiency’ exceeding 12% and an “average output power” exceeding 10 W and capable of operating at a pulse repetition frequency greater than 1 kHz; or

d.2.a.2. An “average output power” exceeding 20 W; or

d.2.b. A multiple transverse mode output and having any of the following:

d.2.b.1. A ‘wall-plug efficiency’ exceeding 18% and an “average output power” exceeding 30 W; or

d.2.b.2. An “average output power” exceeding 500 W;

e. Non-“tunable” continuous wave “(CW) lasers”, having an output wavelength exceeding 975 nm but not exceeding 1,150 nm and having any of the following:

e.1. A single transverse mode output and having any of the following:

e.1.a. A 'wall-plug efficiency' exceeding 12% and an "average output power" exceeding 10 W and capable of operating at a pulse repetition frequency greater than 1 kHz; or

e.1.b. An "average output power" exceeding 50 W; or

e.2. A multiple transverse mode output and having any of the following:

e.2.a. A 'wall-plug efficiency' exceeding 18% and an "average output power" exceeding 30 W; or

e.2.b. An "average output power" exceeding 500 W;

Note: 6A995.e.2.b does not control multiple transverse mode, industrial "lasers" with output power less than or equal to 2kW with a total mass greater than 1,200kg. For the purpose of this note, total mass includes all "components" required to operate the "laser," e.g., "laser," power supply, heat exchanger, but excludes external optics for beam conditioning and/or delivery.

f. Non-"tunable" "lasers", having a wavelength exceeding 1,400 nm, but not exceeding 1555 nm and having any of the following:

f.1. An output energy exceeding 100 mJ per pulse and a pulsed "peak power" exceeding 1 W; or

f.2. An average or CW output power exceeding 1 W.

g. Free electron "lasers".

6A996 "Magnetometers" not controlled by ECCN 6A006, "Superconductive" electromagnetic sensors, and "specially designed" "components" therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country chart (see supp. no. 1 to part 738)
RS applies to entire entry.	A license is required for items controlled by this entry for export or reexport to Pakistan or transfer within Pakistan for regional stability reasons. The Commerce Country Chart is not designed to determine RS license requirements for this entry. See § 742.6(a)(12) of the EAR for additional information.
AT applies to	AT Column 1.

Control(s)	Country chart (see supp. no. 1 to part 738)
entire entry	

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

a. “Magnetometers”, n.e.s., having a 'sensitivity' lower (better) than 1.0 nT (rms) per square root Hz.

> *Technical Note:*
> *For the purposes of 6A996, 'sensitivity' (noise level) is the root mean square of the device-limited noise floor which is the lowest signal that can be measured.*

b. “Superconductive” electromagnetic sensors, “components” manufactured from “superconductive” materials and having all the following:

b.1. Designed for operation at temperatures below the “critical temperature” of at least one of their “superconductive” constituents (including Josephson effect devices or “superconductive” quantum interference devices (SQUIDS));

b.2. Designed for sensing electromagnetic field variations at frequencies of 1 KHz or less; *and*

b.3. Having any of the following characteristics:

b.3.a. Incorporating thin-film SQUIDS with a minimum feature size of less than 2 μm and with associated input and output coupling circuits;

b.3.b. Designed to operate with a magnetic field slew rate exceeding 1×10^6 magnetic flux quanta per second;

b.3.c. Designed to function without magnetic shielding in the earth's ambient magnetic field; *or*

b.3.d. Having a temperature coefficient less (smaller) than 0.1 magnetic flux quantum/K.

6A997 Gravity meters (gravimeters) for ground use, n.e.s., as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Having a static accuracy of less (better) than 100 microgal; or

b. Being of the quartz element (Worden) type.

6A998 Radar systems, equipment and major "components," n.e.s., and "specially designed" "components" therefor, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
RS applies to 6A998.b	RS Column 1
RS applies to 6A998.c	RS Column 2

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Unit: $ value.

Related Controls: N/A

Related Definitions: N/A

Items: a. Airborne radar equipment, n.e.s., and “specially designed” “components” therefor.

b. “Space-qualified” “laser” radar or Light Detection and Ranging (LIDAR) equipment “specially designed” for surveying or for meteorological observation.

c. Millimeter wave enhanced vision radar imaging systems “specially designed” for rotary wing aircraft and having all of the following:

c.1. Operates at a frequency of 94 GHz;

c.2. An average output power of less than 20 mW;

c.3. Radar beam width of 1 degree; and

c.4. Operating range equal to or greater than 1500 m.

6A999 Specific processing equipment, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: RS AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
RS applies to 6A999.c	RS Column 2.
AT applies to entire entry	A license is required for items controlled by this entry to North Korea for anti-terrorism reasons. The Commerce Country Chart is not designed to determine AT licensing requirements for this entry. See § 742.19 of the EAR for additional information.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) The act of incorporating a radiation hardened integrated circuit into a TV camera designated as EAR99 does not, in and of itself, cause the TV camera to meet the specifications of ECCN paragraph 6A999.b. (2) See also 6A203.

Related Definitions: N/A

Items:

a. Seismic detection equipment not controlled in paragraph c.

b. Radiation hardened TV cameras, n.e.s.

c. Seismic intrusion detection systems that detect, classify and determine the bearing on the source of a detected signal.

B. “Test”, “Inspection” and “Production Equipment”

6B002 Masks and Reticles, “Specially Designed” for Optical Sensors Specified by 6A002.a.1.b or 6A002.a.1.d.

License Requirements

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $5,000

GBS: Yes

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

6B004 Optical equipment, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $5000

GBS: Yes for 6B004.b

LIST OF ITEMS CONTROLLED

Related Controls: This entry does not control microscopes.

Related Definitions: N/A

Items: a. Equipment for measuring absolute reflectance to an "accuracy" of equal to or better than 0.1% of the reflectance value;

b. Equipment other than optical surface scattering measurement equipment, having an unobscured aperture of more than 10 cm, "specially designed" for the non-contact optical measurement of a non-planar optical surface figure (profile) to an "accuracy" of 2 nm or less (better) against the required profile.

6B007 Equipment to produce, align and calibrate land-based gravity meters with a static "accuracy" of less (better) than 0.1 mGal.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $5000

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

6B008 Pulse radar cross-section measurement systems having transmit pulse widths of 100 ns or less, and "specially designed" "components" therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship any commodity in this entry to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

> *License Requirement Notes: See § 743.1 of the EAR for reporting requirements for exports under License Exceptions.*

LIST OF ITEMS CONTROLLED

Related Controls: See also 6B108

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

6B108 Systems, other than those controlled by 6B008, "specially designed" for radar cross section measurement usable for rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km and their subsystems.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

6B619 Test, inspection, and production "equipment" and related commodities "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities enumerated or otherwise described in USML Category XVIII (see List of Items Controlled)

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see supp. no. 1 to part 738)
NS applies to entire entry	NS Column 1.
RS applies to entire entry	RS Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See § 746.1(b) for UN controls.

License Exceptions

LVS: $1500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 6B619.

LIST OF ITEMS CONTROLLED

Related Controls: "Parts," "components," "accessories," "attachments," and associated systems or "equipment" "specially designed" for defense articles enumerated or otherwise described in paragraphs (a) or (b) of USML Category XVIII are subject to the ITAR (see 22 CFR 121.1, Category XVIII(e)).

Related Definitions: N/A

Items: a. Tooling, templates, jigs, mandrels, molds, dies, fixtures, alignment mechanisms, and test "equipment" not enumerated or otherwise described in USML Category XVIII and not elsewhere specified on the USML that are "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities controlled by USML Category XVIII.

b. through w. [Reserved]

x. "Parts," "components," "accessories," and "attachments" "specially designed" for a commodity subject to control under paragraph .a of this ECCN and not enumerated or otherwise described in USML Category XVIII and not elsewhere specified on the USML.

6B995 Equipment, including tools, dies, fixtures or gauges, and other "specially designed" "parts," "components" and "accessories" therefor, "specially designed" or modified for any of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. For the manufacture or inspection of:

a.1. Free electron “laser” magnet wigglers;

a.2. Free electron “laser” photo injectors;

b. For the adjustment, to required tolerances, of the longitudinal magnetic field of free electron “lasers”.

C. “Materials”

6C002 Optical sensor materials as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3000

GBS: N/A

List of Items Controlled

Related Controls: See also 6C992.

Related Definitions: N/A

Items:

a. Elemental tellurium (Te) of purity levels of 99.9995% or more;

b. Single crystals (including epitaxial wafers) of any of the following:

b.1. Cadmium zinc telluride (CdZnTe), with zinc content less than 6% by 'mole fraction';

b.2. Cadmium telluride (CdTe) of any purity level; *or*

b.3. Mercury cadmium telluride (HgCdTe) of any purity level.

> *Technical Note: For the purposes of 6C002.b.1, 'mole fraction' is defined as the ratio of moles of ZnTe to the sum of the moles of CdTe and ZnTe present in the crystal.*

6C004 Optical materials as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $1500

GBS: Yes for 6C004.a and .e

LIST OF ITEMS CONTROLLED

Related Controls: See also 6C994

Related Definitions: N/A

Items: a. Zinc selenide (ZnSe) and zinc sulfide (ZnS) “substrate blanks”, produced by the chemical vapor deposition process and having any of the following:

a.1. A volume greater than 100 cm^3; or

a.2. A diameter greater than 80 mm and a thickness of 20 mm or more;

b. Electro-optic materials and non-linear materials, as follows:

b.1. Potassium titanyl arsenate (KTA) (CAS 59400-80-5);

b.2. Silver gallium selenide ($AgGaSe_2$, also known as AGSE) (CAS 12002-67-4);

b.3. Thallium arsenic selenide (Tl_3AsSe_3, also known as TAS) (CAS 16142-89-5);

b.4. Zinc germanium phosphide ($ZnGeP_2$, also known as ZGP, zinc germanium biphosphide or zinc germanium diphosphide); *or*

b.5. Gallium selenide (GaSe) (CAS 12024-11-2);

c. Non-linear optical materials, other than those specified by 6C004.b, having any of the following:

c.1. Having all of the following:

c.1.a. Dynamic (also known as nonstationary) third order nonlinear susceptibility ($\chi^{(3)}$, chi 3) of 10^{-6} m^2/V^2 or more; *and*

c.1.b. Response time of less than 1 ms; *or*

c.2. Second order nonlinear susceptibility ($\chi^{(2)}$, chi 2) of 3.3×10^{-11} m/V or more;

d. “Substrate blanks” of silicon carbide or beryllium beryllium (Be/Be) deposited materials, exceeding 300 mm in diameter or major axis length;

e. Glass, including fused silica, phosphate glass, fluorophosphate glass, zirconium fluoride (ZrF_4) (CAS 7783-64-4) and hafnium fluoride (HfF_4) (CAS 13709-52-9) and having all of the following:

e.1. A hydroxyl ion (OH-) concentration of less than 5 ppm;

e.2. Integrated metallic purity levels of less than 1 ppm; and

e.3. High homogeneity (index of refraction variance) less than 5×10^{-6};

f. Synthetically produced diamond material with an absorption of less than 10^{-5} cm^{-1} for wavelengths exceeding 200 nm but not exceeding 14,000 nm.

6C005 “Laser” materials as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2

Control(s)	Country chart (see supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1500

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

a. Synthetic crystalline “laser” host material in unfinished form as follows:

a.1. Titanium doped sapphire;

a.2. [Reserved]

b. Rare-earth-metal doped double-clad fibers having any of the following:

b.1. Nominal “laser” wavelength of 975 nm to 1,150 nm and having all of the following:

b.1.a. Average core diameter equal to or greater than 25 μm; *and*

b.1.b. Core 'Numerical Aperture' ('NA') less than 0.065; *or*

> *Note to 6C005.b.1: 6C005.b.1 does not apply to double-clad fibers having an inner glass cladding diameter exceeding 150 μm and not exceeding 300 μm.*

b.2. Nominal “laser” wavelength exceeding 1,530 nm and having all of the following:

b.2.a. Average core diameter equal to or greater than 20 μm; *and*

b.2.b. Core 'NA' less than 0.1.

Technical Notes: 1. For the purposes of 6C005.b.1.b, the core 'Numerical Aperture' ('NA') is measured at the emission wavelengths of the fiber.
2. 6C005.b includes fibers assembled with end caps.

6C992 Optical sensing fibers not controlled by 6A002.d.3 that are modified structurally to have a ' beat length' of less than 500 mm (high birefringence) or optical sensor materials not described in 6C002.b and having a zinc content of equal to or more than 6% by ' mole fraction.'

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: (1) 'Mole fraction' is defined as the ratio of moles of ZnTe to the sum of the moles of CdTe and ZnTe present in the crystal. (2) 'Beat length' is the distance over which two orthogonally polarized signals, initially in phase, must pass in order to achieve a 2 Pi radian(s) phase difference.

Items: The list of items controlled is contained in the ECCN heading.

6C994 Optical materials, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: (1) 'Fluoride fibers' are fibers manufactured from bulk fluoride compounds. (2) 'Optical fiber preforms' are bars, ingots, or rods of glass, plastic or other materials that have been specially processed for use in fabricating optical fibers. The characteristics of the preform determine the basic parameters of the resultant drawn optical fibers.

Items: a. Low optical absorption materials, as follows:

a.1. Bulk fluoride compounds containing ingredients with a purity of 99.999% or better; *or*

> *Note: 6C994.a.1 controls fluorides of zirconium or aluminum and variants.*

a.2. Bulk fluoride glass made from compounds controlled by 6C004.e.1;

b. 'Optical fiber preforms' made from bulk fluoride compounds containing ingredients with a purity of 99.999% or better, "specially designed" for the manufacture of 'fluoride fibers' controlled by 6A994.b.

D. "Software"

6D001 "Software" "specially designed" for the "development" or "production" of equipment controlled by 6A004, 6A005, 6A008, or 6B008.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to "software" for equipment controlled by 6A004, 6A005, 6A008 or 6B008	NS Column 1.
MT applies to "software" for equipment controlled by 6A008 or 6B008 for MT reasons	MT Column 1.
RS applies to "software" for equipment controlled by 6A008.j.1	RS Column 1.
AT applies to entire entry	AT Column 1.

REPORTING REQUIREMENTS See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations

List Based License Exceptions (See Part 740 for a description of all license exceptions)

*TSR:*Yes, except for the following:

(1) Items controlled for MT reasons;

(2) "Software" "specially designed" for the "development" or "production" of "space qualified" "laser" radar or Light Detection and Ranging (LIDAR) equipment defined in 6A008.j.1; or

(3) Exports or reexports to destinations outside of those countries listed in Country Group A:5 (See Supplement No. 1 to part 740 of the EAR) of "software" "specially designed" for the "development" or "production" of equipment controlled by 6A004.c or d, 6A008.d, h, k or 6B008.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit "software" "specially designed" for the "development" or "production" of equipment specified by ECCNs 6A004.c, 6A004.d, 6A008.d, 6A008.h, 6A008.k, or 6B008 to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR)

LIST OF ITEMS CONTROLLED

Related Controls: See also 6D991, and ECCN 6E001 ("development") for "technology" for items controlled under this entry.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

6D002 "Software" "specially designed" for the "use" of equipment controlled by 6A002.b, 6A008, or 6B008.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
MT applies to "software" for equipment controlled by 6A008 or 6B008 for MT reasons	MT Column 1.
RS applies to "software" for equipment controlled by 6A008.j.1	RS Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: Yes, except N/A for the following: (1) Items controlled for MT reasons; (2) "Software" "specially designed" for the "use" of "space qualified" "laser" radar or Light Detection and Ranging (LIDAR) equipment defined in 6A008.j.1; or (3) "Software" "specially designed" for the "use" of commodities controlled by 6A002.b.

LIST OF ITEMS CONTROLLED

Related Controls: (1) "Software" "specially designed" for the "use" of "space-qualified" LIDAR "equipment" "specially designed" for surveying or for meteorological observation, released from control under the note in 6A008.j, is controlled in 6D991. (2) See also ECCNs 6D102, 6D991, and 6D992.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

6D003 Other "software" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to paragraph c	RS Column 1

Control(s)	Country chart (see supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except for 6D003.c and exports or reexports to destinations outside of those countries listed in Country Group A:5 (See Supplement No. 1 to part 740 of the EAR) of "software" for items controlled by 6D003.a.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit software in 6D003.a to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: See also ECCNs 6D103, 6D991, and 6D993.

Related Definitions: N/A

Items:

Acoustics

a. "Software" as follows:

a.1. "Software" "specially designed" for acoustic beam forming for the "real-time processing" of acoustic data for passive reception using towed hydrophone arrays;

a.2. "Source code" for the "real-time processing" of acoustic data for passive reception using towed hydrophone arrays;

a.3. "Software" "specially designed" for acoustic beam forming for the "real-time processing" of acoustic data for passive reception using bottom or bay cable systems;

a.4. "Source code" for the "real-time processing" of acoustic data for passive reception using bottom or bay cable systems;

a.5. “Software” or “source code”, “specially designed” for all of the following:

a.5.a. “Real-time processing” of acoustic data from sonar systems controlled by 6A001.a.1.e; *and*

a.5.b. Automatically detecting, classifying and determining the location of divers or swimmers;

> *N.B.: For diver detection “software” or “source code”, “specially designed” or modified for military use, see the U.S. Munitions List of the International Traffic in Arms Regulations (ITAR) (22 CFR part 121).*

b. Optical sensors. None.

Cameras

c. “Software” designed or modified for cameras incorporating “focal plane arrays” specified by 6A002.a.3.f and designed or modified to remove a frame rate restriction and allow the camera to exceed the frame rate specified in 6A003.b.4 Note 3.a;

Optics

d. “Software” “specially designed” to maintain the alignment and phasing of segmented mirror systems consisting of mirror segments having a diameter or major axis length equal to or larger than 1 m;

e. Lasers. None.

Magnetic and Electric Field Sensors

f. “Software” as follows:

f.1. “Software” “specially designed” for magnetic and electric field “compensation systems” for magnetic sensors designed to operate on mobile platforms;

f.2. “Software” “specially designed” for magnetic and electric field anomaly detection on mobile platforms;

f.3. “Software” “specially designed” for “real-time processing” of electromagnetic data using underwater electromagnetic receivers specified by 6A006.e;

f.4. “Source code” for “real-time processing” of electromagnetic data using underwater electromagnetic receivers specified by 6A006.e;

Gravimeters

g. “Software” “specially designed” to correct motional influences of gravity meters or gravity gradiometers;

Radar

h. “Software” as follows:

h.1. Air Traffic Control (ATC) “software” designed to be hosted on general purpose computers located at Air Traffic Control centers and capable of accepting radar target data from more than four primary radars;

h.2. “Software” for the design or “production” of radomes having all of the following:

h.2.a. “Specially designed” to protect the “electronically scanned array antennae” specified by 6A008.e; *and*

h.2.b. Resulting in an antenna pattern having an 'average side lobe level' more than 40 dB below the peak of the main beam level.

> *Technical Note: For the purposes of 6D003.h.2.b 'average side lobe level' is measured over the entire array excluding the angular extent of the main beam and the first two side lobes on either side of the main beam.*

6D102 “Software” “specially designed” or modified for the “use” of equipment controlled by 6A108.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

6D103 "Software" that processes post-flight, recorded data, enabling determination of vehicle position throughout its flight path, "specially designed" or modified for "missiles".

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Items: The list of items controlled is contained in the ECCN heading.

6D201 "Software" "specially designed" to enhance or release the performance characteristics of high-speed cameras and imaging devices, and components therefor, to meet or exceed the level of the performance characteristics described in ECCN 6A203.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 6E001 ("development") and 6E202 ("production" and "use") for "technology" for items controlled under this entry.

Related Definitions: N/A

Items: a. "Software" or encryption keys/codes "specially designed" to enhance or release the performance characteristics of equipment not controlled by ECCN 6A203, or not controlled for NP reasons by ECCN 6A003, so that such equipment meets or exceeds the performance characteristics of equipment described in ECCN 6A203.

b. "Software" or encryption keys/codes "specially designed" to enhance or release the performance characteristics of equipment controlled by ECCN 6A203 or equipment controlled by ECCN 6A003 that meets or exceeds the performance characteristics described in ECCN 6A203.

6D619 "Software" "specially designed" for the "development," "production," operation or maintenance of commodities controlled by 6B619.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see supp. no. 1 to part 738)
NS applies to entire entry	NS Column 1.
RS applies to entire entry	RS Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See § 746.1(b) for UN controls.

LICENSE EXCEPTIONS

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 6D619.

LIST OF ITEMS CONTROLLED

Related Controls: "Software" directly related to articles enumerated or otherwise described in USML Category XVIII is subject to the ITAR (See 22 CFR 121.1, Category XVIII(f)).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

6D991 "Software," n.e.s., "specially designed" for the "development", "production", or "use" of commodities controlled by 6A002, 6A003, 6A991, 6A996, 6A997, or 6A998.

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
RS applies to "software" for commodities controlled by 6A002, 6A003, or 6A998.b	RS Column 1
RS applies to "software" for commodities controlled by 6A998.c	RS Column 2
AT applies to entire entry, except "software" for commodities controlled by 6A991	AT Column 1
AT applies to "software" for commodities controlled by 6A991	AT Column 2

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCN 6D002 for "software" "specially designed" for the "use" of commodities controlled under ECCN 6A002.b. (2) See ECCN 6D003.c for "software" "specially designed" for cameras incorporating "focal plane arrays" specified by 6A002.a.3.f and "specially designed" to remove a frame rate restriction and allow the camera to exceed the frame rate specified in 6A003.b.4 Note 3.a.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

6D992 "Software" "specially designed" for the "development" or "production" of equipment controlled by 6A992, 6A994, or 6A995.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

6D993 Other "software," not controlled by 6D003, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
RS applies to 6D993.c	RS Column 1
RS applies to 6D993.b	RS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Air Traffic Control (ATC) "software" application "programs" hosted on general purpose computers located at Air Traffic Control centers, and capable of automatically handing over primary radar target data (if not correlated with secondary surveillance radar (SSR) data) from the host ATC center to another ATC center;

b. "Software" "specially designed" for seismic intrusion detection systems in 6A999.c.

c. "Source Code" "specially designed" for seismic intrusion detection systems in 6A999.c.

E. "Technology"

6E001 "Technology" According to the General Technology Note for the "Development" of Equipment, Materials or "Software" Controlled by 6A (Except 6A991, 6A992, 6A994, 6A995, 6A996, 6A997, 6A998, or 6A999.c), 6B (Except 6B995), 6C (Except 6C992 or 6C994), or 6D (Except 6D991, 6D992, or 6D993).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, NP, RS, CC, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to "technology" for items controlled by 6A001 to 6A008, 6B002 to 6B008, 6C002 to 6C005, or 6D001 to 6D003	NS Column 1
MT applies to "technology" for items controlled by 6A002, 6A007, 6A008, 6A102, 6A107, 6A108, 6B008, 6B108, 6D001, 6D002, 6D102 or 6D103 for MT reasons	MT Column 1
NP applies to "technology" for items controlled by 6A003, 6A005, 6A202, 6A203, 6A205, 6A225, 6A226, 6D001, or 6D201 for NP reasons	NP Column 1
RS applies to "technology" for items controlled by 6A002.a.1, .a.2, .a.3, .c, or .f, 6A003.b.3 or .b.4, or 6A008.j.1	RS Column 1
CC applies to "technology" for equipment controlled by 6A002 for CC reasons	CC Column 1
AT applies to entire entry	AT Column 1
UN applies to "technology" for equipment controlled by 6A002 or 6A003 for UN reasons	See § 746.1(b) for UN controls

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except for the following: (1) Items controlled for MT reasons; (2) "Technology" for commodities controlled by 6A002, 6A004.e or 6A008.j.1; (3) "Technology" for 6A003 cameras, unless for "technology" for the integration of 6A003 cameras into camera systems "specially designed" for civil automotive applications; (4) "Technology" for "software" "specially designed" for "space qualified" "laser" radar or Light Detection and Ranging (LIDAR) equipment defined in 6A008.j.1 and controlled by 6D001 or 6D002; or (5) Exports or reexports to destinations outside of those countries listed in Country Group A:5 (See Supplement No. 1 to part 740 of the EAR) of "technology" for the "development" of the following: (a) Items controlled by 6A001.a.1.b, 6A001.a.1.e, 6A001.a.2.a.1, 6A001.a.2.a.2, 6A001.a.2.a.3, 6A001.a.2.a.5, 6A001.a.2.a.6, 6A001.a.2.b, 6A001.a.2.d, 6A001.a.2.e., 6A004.c, 6A004.d, 6A006.a.2, 6A006.c.1, 6A006.d, 6A006.e, 6A008.d, 6A008.h, 6A008.k, 6B008, or 6D003.a; (b) Equipment controlled by 6A001.a.2.c or 6A001.a.2.f when "specially designed" for real time applications; or (c) "Software" controlled by 6D001 and "specially designed" for the "development" or "production" of equipment controlled by 6B008, or 6D003.a.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit any technology in this entry to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) Technical data directly related to satellites and all other items described in USML Category XV are subject to the ITAR under USML Category XV(f). (2) Technical data directly related to laser systems, infrared imaging systems, and all other items described in USML Category XII are subject to the ITAR under USML Category XII(f). (3) Technical data directly related to read-out integrated circuits described in USML Categories XII(e) or XV(e)(3) is subject to the ITAR under USML Categories XII(f) or XV(f), respectively. (4) See also 6E101, 6E201, and 6E991.

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

6E002 "Technology" According to the General Technology Note for the "Production" of Equipment or Materials Controlled by 6A (Except 6A991, 6A992, 6A994, 6A995, 6A996, 6A997, 6A998 or 6A999.c), 6B (Except 6B995) or 6C (except 6C992 or 6C994).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, NP, RS, CC, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to "technology" for equipment controlled by 6A001 to 6A008, 6B002 to 6B008, or 6C002 to 6C005	NS Column 1
MT applies to "technology" for equipment controlled by 6A002, 6A007, 6A008, 6A102, 6A107, 6A108, 6B008, or 6B108 for MT reasons	MT Column 1
NP applies to "technology" for items controlled by 6A003, 6A005, 6A202, 6A203, 6A205, 6A225 or 6A226 for NP reasons	NP Column 1
RS applies to "technology" for items controlled by 6A002.a.1, .a.2, .a.3, .c, or .f, 6A003.b.3 or .b.4, or 6A008.j.1	RS Column 1
CC applies to "technology" for equipment controlled by 6A002 for CC reasons	CC Column 1
AT applies to entire entry	AT Column 1
UN applies to "technology" for equipment controlled by 6A002 or 6A003 for UN reasons	See § 746.1(b) for UN controls

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except for the following:

(1) Items controlled for MT reasons;

(2) "Technology" for commodities controlled by 6A002, 6A004.e, or 6A008.j.1;

(3) "Technology" for 6A003 cameras, unless for "technology" for the integration of 6A003 cameras into camera systems "specially designed" for civil automotive applications ; or

(4) Exports or reexports to destinations outside of those countries listed in Country Group A:5 (See Supplement No. 1 to part 740 of the EAR) of "technology" for the "production" of the following: (a) Items controlled by 6A001.a.1.b, 6A001.a.1.e, 6A001.a.2.a.1, 6A001.a.2.a.2, 6A001.a.2.a.3, 6A001.a.2.a.5, 6A001.a.2.a.6, 6A001.a.2.b, 6A004.c, 6A004.d, 6A006.a.2, 6A006.c.1, 6A006.d, 6A006.e, 6A008.d, 6A008.h, 6A008.k, or 6B008; and (b) Items controlled by 6A001.a.2.c or 6A001.a.2.f when "specially designed" for real time applications.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit "technology" according to the General Technology Note for the "production" of equipment specified in the STA exclusion paragraphs found in the License Exception sections of by ECCNs 6A001, 6A002, 6A003, 6A004, 6A006, 6A008, or 6B008 to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) Technical data directly related to satellites and all other items described in USML Category XV are subject to the ITAR under USML Category XV(f). (2) Technical data directly related to laser systems, infrared imaging systems, and all other items described in USML Category XII are subject to the ITAR under USML Category XII(f). (3) Technical data directly related to read-out integrated circuits described in USML Categories XII(e) or XV(e)(3) is subject to the ITAR under USML Categories XII(f) or XV(f), respectively. (4) See also 6E992.

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

6E003 Other "technology" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes

LIST OF ITEMS CONTROLLED

Related Controls: See also 6E993.

Related Definitions: N/A

Items:

Acoustics

a. [Reserved]

Optical Sensors

b. [Reserved]

Cameras

c. [Reserved]

Optics

d. “Technology” as follows:

d.1. “Technology” “required” for the coating and treatment of optical surfaces to achieve an 'optical thickness' uniformity of 99.5% or better for optical coatings 500 mm or more in diameter or major axis length and with a total loss (absorption and scatter) of less than 5×10^{-3};

N.B.: See also 2E003.f.

Technical Note: For the purposes of 6E003.d.1, 'optical thickness' is the mathematical product of the index of refraction and the physical thickness of the coating.

d.2. “Technology” for the fabrication of optics using single point diamond turning techniques to produce surface finish “accuracies” of better than 10 nm rms on non-planar surfaces exceeding 0.5 m^2;

Lasers

e. “Technology” “required” for the “development,” “production” or “use” of “specially designed” diagnostic instruments or targets in test facilities for “SHPL” testing or testing or evaluation of materials irradiated by “SHPL” beams;

Magnetic and Electric Field Sensors

f. [Reserved]

Gravimeters

g. [Reserved]

Radar

h. [Reserved]

6E101 "Technology" according to the General Technology Note for the "use" of equipment or "software" controlled by 6A002, 6A007.b and .c, 6A008, 6A102, 6A107, 6A108, 6B108, 6D102 or 6D103.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: (1) This entry only controls "technology" for equipment controlled by 6A008 when it is designed for airborne applications and is usable in "missiles". (2) This entry only controls "technology" for items in 6A002.a.1 and a.3 that are "specially designed" or modified to protect "missiles" against nuclear effects (e.g., Electromagnetic Pulse (EMP), X-rays, combined blast and thermal effects), and usable for "missiles." (3) This entry only controls "technology" for items in 6A007.b and .c when the accuracies in 6A007.b.1 and b.2 are met or exceeded.

Items: The list of items controlled is contained in the ECCN heading.

6E201 "Technology" according to the General Technology Note for the "use" of equipment controlled by 6A003.a.3, 6A003.a.4; 6A005.a.2, 6A005.b.2.b, 6A005.b.3, 6A005.b.4.b.2, 6A005.b.6.c, 6A005.c.1.b, 6A005.c.2.b, 6A005.d.2, 6A005.d.3.c, or 6A005.d.4.c (that meet or exceed the parameters of 6A205); 6A202, 6A203, 6A205, 6A225 or 6A226.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

ECCN Controls: This entry only controls "technology" for "lasers" in 6A005 that are controlled for NP reasons.

Items: The list of items controlled is contained in the ECCN heading.

6E202 "Technology" according to the General Technology Note for the "production" or "use" of "software" controlled by 6D201.

LICENSE REQUIREMENTS

Reason for Control: NP, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NP applies to entire entry	NP Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

6E619 "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul or refurbishing of commodities controlled by 6B619 or "software" controlled by 6D619.

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see supp. no. 1 to part 738)
NS applies to entire entry	NS Column 1.
RS applies to entire entry	RS Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See § 746.1(b) for UN controls.

LICENSE EXCEPTIONS

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 6E619.

LIST OF ITEMS CONTROLLED

Related Controls: Technical data directly related to articles enumerated or otherwise described in USML Category XVIII are subject to the ITAR (See 22 CFR 121.1, Category XVIII(f)).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

6E991 "Technology" for the "development", "production" or "use" of equipment controlled by 6A991, 6A996, 6A997, 6A998 or 6A999.c.

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country chart (See Supp. No. 1 to part 738)
RS applies to "technology" for equipment controlled by 6A998.b, 6A998.c and 6A999.c	RS Column 1
AT applies to entire entry, except "technology" for equipment controlled by 6A991	AT Column 1
AT applies to "technology" for equipment controlled by 6A991	AT Column 2

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

6E992 "Technology" for the "development" or "production" of equipment, materials or "software" controlled by 6A992, 6A994, or 6A995, 6B995, 6C992, 6C994, or 6D993.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

6E993 Other "technology", not controlled by 6E003, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: RS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
RS applies to 6E993.e	RS Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Optical fabrication technologies for serially producing optical "parts" and "components" at a rate exceeding 10 m^2 of surface area per year on any single spindle and having all of the following:

a.1. Area exceeding 1 m^2; *and*

a.2. Surface figure exceeding λ/10 (rms) at the designed wavelength;

b. "Technology" for optical filters with a bandwidth equal to or less than 10 nm, a field of view (FOV) exceeding 40° and a resolution exceeding 0.75 line pairs per milliradian;

c. "Technology" for the "development" or "production" of cameras controlled by 6A993;

d. "Technology" "required" for the "development" or "production" of non-triaxial fluxgate "magnetometers" or non-triaxial fluxgate "magnetometer" systems, having any of the following:

d.1. 'Sensitivity' lower (better) than 0.05 nT (rms) per square root Hz at frequencies of less than 1 Hz; or

d.2. 'Sensitivity' lower (better) than 1×10^{-3} nT (rms) per square root Hz at frequencies of 1 Hz or more.

e. “Technology” “required” for the “development” or “production” of infrared up-conversion devices having all of the following:

e.1. A response in the wavelength range exceeding 700 nm but not exceeding 1500 nm; and

e.2. A combination of an infrared photodetector, light emitting diode (OLED), and nanocrystal to convert infrared light into visible light.

> *Technical Note: For the purposes of 6E993, ‘sensitivity’ (or noise level) is the root mean square of the device-limited noise floor which is the lowest signal that can be measured.*

EAR99 Items subject to the EAR that are not elsewhere specified in this CCL Category or in any other category in the CCL are designated by the number EAR99.

Category 7—Navigation and Avionics

A. “End Items”, “Equipment”, “Accessories”, “Attachments”, “Parts”, “Components” and “Systems”

> *N.B. 1: For automatic pilots for underwater vehicles, see Category 8. For radar, see Category 6.*

7A001 Accelerometers as follows (see List of Items Controlled) and “specially designed” “components” therefor.

License Requirements

Reason for Control: NS, MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
MT applies to commodities that meet or exceed the parameters of 7A101	MT Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See USML Category XII(e) for accelerometers subject to the ITAR. (2) See also ECCNs 7A101, 7A611, and 7A994. (3) For angular or rotational accelerometers, see ECCN7A001.b. (4) MT controls do not apply to accelerometers that are "specially designed" and developed as Measurement While Drilling (MWD) sensors for use in downhole well service applications.

Related Definitions: N/A

Items: a. Linear accelerometers having any of the following:

a.1. Specified to function at linear acceleration levels less than or equal to 15 g and having any of the following:

a.1.a. A "bias" "stability" of less (better) than 130 micro g with respect to a fixed calibration value over a period of one year; or

a.1.b. A "scale factor" "stability" of less (better) than 130 ppm with respect to a fixed calibration value over a period of one year;

a.2. Specified to function at linear acceleration levels exceeding 15 g but less than or equal to 100 g and having all of the following:

a.2.a. A "bias" "repeatability" of less (better) than 1,250 micro g over a period of one year; *and*

a.2.b. A "scale factor" "repeatability" of less (better) than 1,250 ppm over a period of one year; *or*

a.3. Designed for use in inertial navigation or guidance systems and specified to function at linear acceleration levels exceeding 100 g;

> *Note: 7A001.a.1 and 7A001.a.2 do not apply to accelerometers limited to measurement of only vibration or shock.*

b. Angular or rotational accelerometers, specified to function at linear acceleration levels exceeding 100 g.

7A002 Gyros or Angular Rate Sensors, Having any of the Following, and "Specially Designed" "Components" Therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to commodities that meet or exceed the parameters of 7A102	MT Column 1
AT applies to entire entry	AT Column 1

License Requirement Note: For the purpose of MT controls only, the term 'stability' is defined as a measure of the ability of a specific mechanism or performance coefficient to remain invariant when continuously exposed to a fixed operating condition. (This definition does not refer to dynamic or servo stability.) (IEEE STD 528-2001 paragraph 2.247)

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See USML Category XII(e) for gyros or angular rate sensors subject to the ITAR. (2) See also ECCNs *7A102,* 7A611, and 7A994. (3) For angular or rotational accelerometers, see ECCN 7A001.b.

Related Definitions: N/A

Items:

a. Specified to function at linear acceleration levels less than or equal to 100 g and having any of the following:

a.1. An angular rate range of less than 500 degrees per second and having any of the following:

a.1.a. A “bias” “stability” of less (better) than 0.5 degree per hour, when measured in a 1 g environment over a period of one month, and with respect to a fixed calibration value; *or*

a.1.b. An “angle random walk” of less (better) than or equal to 0.0035 degree per square root hour; *or*

Note: 7A002.a.1.b does not control “spinning mass gyros”.

a.2. An angular rate range greater than or equal to 500 degrees per second and having any of the following:

a.2.a. A “bias” “stability” of less (better) than 4 degrees per hour, when measured in a 1 g environment over a period of three minutes, and with respect to a fixed calibration value; *or*

a.2.b. An “angle random walk” of less (better) than or equal to 0.1 degree per square root hour; *or*

> *Note: 7A002.a.2.b does not apply to “spinning mass gyros”.*

b. Specified to function at linear acceleration levels exceeding 100 g.

7A003 'Inertial measurement equipment or systems', having any of the following.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to commodities in 7A003.d that meet or exceed the parameters of 7A103	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See also ECCNs 7A103, 7A611, and 7A994. (2) See USML Category XII(d) for guidance or navigation systems subject to the ITAR.

Related Definitions: N/A

Items:

7A003 does not apply to 'inertial measurement equipment or systems' which are certified for use on “civil aircraft” by civil aviation authorities of one or more Wassenaar Arrangement Participating States, see Supplement No. 1 to part 743 of the EAR.

Technical Notes: 1. For the purposes of 7A003, 'inertial measurement equipment or systems' incorporate accelerometers or gyroscopes to measure changes in velocity and orientation in order to determine or maintain heading or position without requiring an external reference once aligned. 'Inertial measurement equipment or systems' include:
Attitude and Heading Reference Systems (AHRSs);

Gyrocompasses;

Inertial Measurement Units (IMUs);

Inertial Navigation Systems (INSs);

Inertial Reference Systems (IRSs);

Inertial Reference Units (IRUs).

2. For the purposes of 7A003, 'positional aiding references' independently provide position, and include:

a. "Satellite navigation system";

b."Data-Based Referenced Navigation" ("DBRN").

a. Designed for "aircraft", land vehicles or vessels, providing position without the use of 'positional aiding references', and having any of the following "accuracies" subsequent to normal alignment:

a.1. 0.8 nautical miles per hour (nm/hr) "Circular Error Probable" ("CEP") rate or less (better);

a.2. 0.5% distanced travelled "CEP" or less (better); *or*

a.3. Total drift of 1 nautical mile "CEP" or less (better) in a 24 hr period;

Technical Note: For the purposes of 7A003.a.1, 7A003.a.2 and 7A003.a.3, the performance parameters typically apply to 'inertia measurement equipment or systems' designed for "aircraft", vehicles and vessels, respectively. These parameters result from the utilization of specialized non-'positional aiding references' (e.g., altimeter, odometer, velocity log). As a consequence, the specified performance values cannot be readily converted between these parameters. Equipment designed for multiple platforms are evaluated against each applicable entry 7A003.a.1, 7A003.a.2, or 7A003.a.3.

b. Designed for "aircraft", land vehicles or vessels, with an embedded 'positional aiding reference' and providing position after loss of all 'positional aiding references' for a period of up to 4 minutes, having an "accuracy" of less (better) than 10 meters "CEP";

Technical Note: For the purposes of 7A003.b, this entry refers to systems in which 'inertial measurement equipment or systems' and other independent 'positional aiding references' are built into a single unit (i.e., embedded) in order to achieve improved performance.

c. Designed for “aircraft”, land vehicles or vessels, providing heading or True North determination and having any of the following:

c.1. A maximum operating angular rate less (lower) than 500 deg/s and a heading “accuracy” without the use of 'positional aiding references' equal to or less (better) than 0.07 deg sec (Lat) (equivalent to 6 arc minutes rms at 45 degrees latitude); *or*

c.2. A maximum operating angular rate equal to or greater (higher) than 500 deg/s and a heading “accuracy” without the use of 'positional aiding references' equal to or less (better) than 0.2 deg sec (Lat) (equivalent to 17 arc minutes rms at 45 degrees latitude);

d. Providing acceleration measurements or angular rate measurements, in more than one dimension, and having any of the following:

d.1. Performance specified by 7A001 or 7A002 along any axis, without the use of any aiding references; *or*

d.2. Being “space-qualified” and providing angular rate measurements having an “angle random walk” along any axis of less (better) than or equal to 0.1 degree per square root hour.

Note: 7A003.d.2 does not apply to 'inertial measurement equipment or systems' that contain “spinning mass gyros” as the only type of gyro.

7A004 'Star trackers' and “components” therefor, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, MT, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See USML Category XV for certain 'star trackers' that are “subject to the ITAR” (see 22 CFR parts 120 through 130). (2) See also 7A104 and 7A994.

Related Definitions: N/A

Items:

a. 'Star trackers' with a specified azimuth “accuracy” of equal to or less (better) than 20 seconds of arc throughout the specified lifetime of the equipment;

b. “Components” “specially designed” for equipment specified in 7A004.a as follows:

b.1. Optical heads or baffles;

b.2. Data processing units.

> *Technical Note: For the purposes of 7A004.a, 'star trackers' are also referred to as stellar attitude sensors or gyro-astro compasses.*

7A005 “Satellite navigation system” receiving equipment having any of the following and “specially designed” “components” therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, MT and AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to 7A005.b	NS Column 1
MT applies to commodities in 7A005.b that meet or exceed the parameters of 7A105	MT Column 1
AT applies to 7A005.b	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See also ECCNs 7A105, 7A611 and 7A994. Commercially available "satellite navigation system" receivers do not typically employ decryption or adaptive antennae and are classified as 7A994. (2) See USML Category XII(d) for "satellite navigation system" receiving equipment subject to the ITAR and USML Category XI(c)(10) for antennae that are subject to the ITAR. (3) Items that otherwise would be covered by ECCN 7A005.a are "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items:

a. Employing a decryption algorithm "specially designed" or modified for government use to access the ranging code for position and time; *or*

b. Employing 'adaptive antenna systems'.

> *Note: 7A005.b does not apply to "satellite navigation system" receiving equipment that only uses "components" designed to filter, switch, or combine signals from multiple omni-directional antennas that do not implement adaptive antenna techniques.*

> *Technical Note: For the purposes of 7A005.b, 'adaptive antenna systems' dynamically generate one or more spatial nulls in an antenna array pattern by signal processing in the time domain or frequency domain.*

7A006 Airborne altimeters operating at frequencies other than 4.2 to 4.4 GHz inclusive and having any of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to commodities in this entry that meet or exceed the parameters of 7A106	MT Column 1

Control(s)	Country chart (see supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 7A106, 7A994 and Category 6 for controls on radar.

Related Definitions: N/A

Items:

a. 'Power management'; *or*

> *Technical Note: For the purposes of 7A006.a, 'power management' is changing the transmitted power of the altimeter signal so that received power at the "aircraft" altitude is always at the minimum necessary to determine the altitude.*

b. Using phase shift key modulation.

7A008 Underwater sonar navigation systems using Doppler velocity or correlation velocity logs integrated with a heading source and having a positioning "accuracy" of equal to or less (better) than 3% of distance traveled "Circular Error Probable" ("CEP") and "specially designed" "components" therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2.

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: 7A008 does not control systems "specially designed" for installation on surface vessels or systems requiring acoustic beacons or buoys to provide positioning data. See 6A001.a for acoustic systems, and 6A001.b for correlation-velocity and Doppler-velocity sonar log equipment. See 8A002 for other marine systems.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

7A101 Accelerometers, other than those controlled by 7A001 (see List of Items Controlled), and "specially designed" "parts" and "components" therefor.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See USML Category XII(e) for accelerometers subject to the ITAR. (2) See also ECCNs 7A001 and 7A611. (3) This entry does not control accelerometers that are "specially designed" and developed as MWD (Measurement While Drilling) sensors for use in downhole well service operations.

Related Definitions: N/A

Items: a. Linear accelerometers designed for use in inertial navigation systems or in guidance systems of all types, usable in "missiles" having all of the following characteristics, and "specially designed" "parts" and "components" therefor:

1. 'Scale factor' "repeatability" less (better) than 1250 ppm; and

2. 'Bias' "repeatability" less (better) than 1250 micro g.

> *Note: The measurement of 'bias' and 'scale factor' refers to one sigma standard deviation with respect to a fixed calibration over a period of one year.*

b. Accelerometers of any type, designed for use in inertial navigation systems or in guidance systems of all types, specified to function at acceleration levels greater than 100 g.

> *Note to paragraph b: This paragraph (b) does not include accelerometers that are designed to measure vibration or shock.*

7A102 Gyros, other than those controlled by 7A002 (see List of Items Controlled), and "specially designed" "parts" and "components" therefor.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See USML Category XII(e) for gyros or angular rate sensors subject to the ITAR. (2) See also ECCNs 7A002, 7A611, and 7A994.

Related Definitions: (1) Drift rate is defined as the time rate of output deviation from the desired output. It consists of random and systematic components and is expressed as an equivalent angular displacement per unit time with respect to inertial space. (2) Stability is defined as standard deviation (1 sigma) of the variation of a particular parameter from its calibrated value measured under stable temperature conditions. This can be expressed as a function of time.

Items: a. All types of gyros, usable in rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km, with a rated "drift rate" 'stability' of less than 0.5 degrees (1 sigma or rms) per hour in a 1 g environment.

b. Gyros of any type, designed for use in inertial navigation systems or in guidance systems of all types, specified to function at acceleration levels greater than 100 g.

> *Technical Note: In this entry, the term 'stability' is defined as a measure of the ability of a specific mechanism or performance coefficient to remain invariant when continuously exposed to a fixed operating condition. (This definition does not refer to dynamic or servo stability.) (IEEE STD 528-2001 paragraph 2.247).*

7A103 Instrumentation, navigation equipment and systems, other than those controlled by 7A003, and "specially designed" "parts" and "components" therefor, as follows (see List of Items Controlled).

License Requirements

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See ECCN 7A003 and 7A994. (2) Inertial navigation systems and inertial equipment, and "specially designed" "parts" and "components" therefor specifically designed, modified or configured for military use are "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: 'Inertial measurement equipment or systems' specified in 7A103.a. incorporate accelerometers or gyros to measure changes in velocity and orientation in order to determine or maintain heading or position without requiring an external reference once aligned.

Items: a. 'Inertial measurement equipment or systems' using accelerometers or gyros controlled by 7A001, 7A002, 7A101 or 7A102, and "specially designed" "parts" and "components" therefor;

Note 1: 7A103.a does not control equipment containing accelerometers "specially designed" and developed as MWD (Measurement While Drilling) sensors for use in down-hole well services operations.

Note 2: 7A103.a does not control inertial or other equipment using accelerometers or gyros controlled by 7A001 or 7A002 that are only NS controlled.

Note 3: 7A103.a. includes Attitude and Heading Reference Systems (AHRSs), gyrocompasses, Inertial Measurement Units (IMUs), Inertial Navigations Systems (INSs), Inertial Reference Systems (IRSs), and Inertial Reference Units (IRUs).

b. Integrated flight instrument systems, which include gyrostabilizers or automatic pilots, designed or modified for use in rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km, and "specially designed" "parts" and "components" therefor.

c. Integrated Navigation Systems, designed or modified for use in rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km and capable of providing a navigational accuracy of 200m Circular Error Probable (CEP) or less.

Technical Note: An ' integrated navigation system' typically incorporates the following "parts" and "components":
1. An inertial measurement device (e.g., an attitude and heading reference system, inertial reference unit, or inertial navigation system);

2. One or more external sensors used to update the position and/or velocity, either periodically or continuously throughout the flight (e.g., satellite navigation receiver, radar altimeter, and/or Doppler radar); and

3. Integration hardware and software.

7A104 Gyro-astro compasses and other devices, other than those controlled by 7A004, which derive position or orientation by means of automatically tracking celestial bodies or satellites and “specially designed” “parts” and “components” therefor.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See USML Categories IV and XV for certain 'star trackers' that are “subject to the ITAR” (see 22 CFR parts 120 through 130). (2) This entry controls “specially designed” “parts” and “components” for gyro-astro compasses and other devices controlled by 7A004.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

7A105 Receiving equipment for 'navigation satellite systems', having any of the following characteristics (see List of Items Controlled), and “specially designed” “parts” and “components” therefor.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1

Control(s)	Country chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See also 7A005, 7A611 and 7A994. (2) See USML Category XII(d) for GNSS receiving equipment subject to the ITAR and USML Category XI(c)(10) for antennae that are subject to the ITAR. (3) Items that otherwise would be covered by ECCN 7A105.b.2 are “subject to the ITAR” (see 22 CFR parts 120 through 130). (4) See USML Category XII(d) for GPS receiving equipment in 7A105.a, b.1 and b.3 that are subject to the ITAR.

Related Definitions: 'Navigation satellite systems' include Global Navigation Satellite Systems (GNSS; e.g. GPS, GLONASS, Galileo or BeiDou) and Regional Navigation Satellite Systems (RNSS; e.g. NavIC, QZSS).

Items: a. Designed or modified for use in “missiles”; or

b. Designed or modified for airborne applications and having any of the following:

b.1. Capable of providing navigation information at speeds in excess of 600 m/s;

b.2. Employing decryption, designed or modified for military or governmental services, to gain access to a 'navigation satellite system' secure signal/data; or

b.3. Being “specially designed” to employ anti-jam features (e.g., null steering antenna or electronically steerable antenna) to function in an environment of active or passive countermeasures.

> *Note: 7A105.b.2 and 7A105.b.3 do not control equipment designed for commercial, civil or Safety of Life (e.g., data integrity, flight safety) 'navigation satellite system' services.*

7A106 Altimeters, other than those controlled by 7A006, of radar or laser radar type, designed or modified for use in “missiles”. (These items are “subject to the ITAR.” See 22 CFR parts 120 through 130.)

7A107 Three axis magnetic heading sensors having all of the following characteristics (see List of Items Controlled), and “specially designed” “parts” and “components” therefor.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Internal tilt compensation in pitch (±90 degrees) and roll (±180 degrees) axes;

b. Azimuthal accuracy better (less) than 0.5 degrees rms at latitudes of ±80 degrees, referenced to local magnetic field; *and*

c. Designed or modified to be integrated with flight control and navigation systems.

> *Note: Flight control and navigation systems in 7A107 include gyrostabilizers, automatic pilots and inertial navigation systems.*

7A115 Passive sensors for determining bearing to specific electromagnetic sources (direction finding equipment) or terrain characteristics, designed or modified for use in "missiles". (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

7A116 Flight control systems and "parts" and "components", as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See 9A610.r. and 9A610.s. for items designed or modified for military UAVs. (2) See USML Category IV for items "specially designed" for use in rockets or missiles that are "subject to the ITAR."

Related Definitions: N/A

Items: a. Pneumatic, hydraulic, mechanical, electro-optical, or electromechanical flight control systems (including fly-by-wire and fly-by-light systems) designed or modified for UAVs capable of delivering at least 500 kilograms of payload to a range of at least 300 km, other than those controlled by either USML paragraph VIII(a) or ECCN 9A610.a;

b. Attitude control equipment designed or modified for UAVs capable of delivering at least 500 kilograms of payload to a range of at least 300 km, other than those controlled by either USML paragraph VIII(a) or ECCN 9A610.a;

c. Flight control servo valves designed of modified for the systems in 7A116.a. or 7A116.b, and designed or modified to operate in a vibration environment greater than 10 g rms over the entire range between 20Hz and 2 kHz.

> *Note: This entry includes the systems, equipment and valves designed or modified to enable operation of manned aircraft as unmanned aerial vehicles.*

7A117 "Guidance sets" capable of achieving system accuracy of 3.33% or less of the range (e.g., a "CEP" of 10 km or less at a "range" of 300 km). (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

7A611 Military fire control, laser, imaging, and guidance equipment, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, MT, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 7A611.y	NS Column 1.
MT applies to commodities in 7A611.a that meet or exceed the parameters in 7A103.b or .c	MT Column 1.
RS applies to entire entry except 7A611.y	RS Column 1.
RS applies to 7A611.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry except 7A611.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $1500

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 7A611.

List of Items Controlled

Related Controls: (1) Military fire control, laser, imaging, and guidance equipment that are enumerated in USML Category XII, and technical data (including software) directly related thereto, are subject to the ITAR. (2) See Related Controls in ECCNs 0A504, 2A984, 6A002, 6A003, 6A004, 6A005, 6A007, 6A008, 6A107, 7A001, 7A002, 7A003, 7A005, 7A101, 7A102, and 7A103. (3) See ECCN 3A611 and USML Category XI for controls on countermeasure equipment. (4) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S. origin "600 series" controlled content.

Related Definitions: N/A

Items:

a. Guidance or navigation systems, not elsewhere specified on the USML, that are "specially designed" for a defense article on the USML or for a 600 series item.

b. to w. [Reserved]

x. "Parts," "components," "accessories," and "attachments," including accelerometers, gyros, angular rate sensors, gravity meters (gravimeters), and inertial measurement units (IMUs), that are "specially designed" for defense articles controlled by USML Category XII or items controlled by 7A611, and that are NOT:

x.1. Enumerated or controlled in the USML or elsewhere within ECCN 7A611;

x.2. Described in ECCNs 6A007, 6A107, 7A001, 7A002, 7A003, 7A101, 7A102 or 7A103; or

x.3. Elsewhere specified in ECCN 7A611.y or 3A611.y.

y. Specific "parts," "components," "accessories," and "attachments" "specially designed" for a commodity subject to control in this ECCN or a defense article in Category XII and not elsewhere specified on the USML or in the CCL, as follows, and "parts," "components," "accessories," and "attachments" "specially designed" therefor:

y.1 [Reserved]

7A994 Other navigation direction finding equipment, airborne communication equipment, all aircraft inertial navigation systems not controlled under 7A003 or 7A103, and other avionic equipment, including "parts" and "components," n.e.s.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country chart (see supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

License Requirement Notes: Typically commercially available GPS do not employ decryption or adaptive antenna and are classified as 7A994.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See 7A005 and 7A105.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

B. “Test”, “Inspection” and “Production Equipment”

7B001 Test, calibration or alignment equipment, “specially designed” for equipment controlled by 7A (except 7A994).

License Requirements

Reason for Control: NS, MT, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See also 7B101, 7B102 and 7B994. (2) This entry does not control test, calibration or alignment equipment for 'Maintenance level I' or 'Maintenance Level II'.

Related Definition: For the purposes of 7B001: (1) 'Maintenance Level I': The failure of an inertial navigation unit is detected on the “aircraft” by indications from the Control and Display Unit (CDU) or by the status message from the corresponding sub-system. By following the manufacturer's manual, the cause of the failure may be localized at the level of the malfunctioning Line Replaceable Unit (LRU). The operator then removes the LRU and replaces it with a spare. (2) 'Maintenance Level II': The defective LRU is sent to the maintenance workshop (the manufacturer's or that of the operator responsible for level II maintenance). At the maintenance workshop, the malfunctioning LRU is tested by various appropriate means to verify and localize the defective Shop Replaceable Assembly (SRA) module responsible for the failure. This SRA is removed and replaced by an operative spare. The defective SRA (or possibly the complete LRU) is then shipped to the manufacturer. 'Maintenance Level II' does not include the disassembly or repair of controlled accelerometers or gyro sensors.

Items:

The list of items controlled is contained in the ECCN heading.

7B002 Equipment "specially designed" to characterize mirrors for ring "laser" gyros, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 7B102 and 7B994

Related Definitions: N/A

Items: a. Scatterometers having a measurement "accuracy" of 10 ppm or less (better);

b. Profilometers having a measurement "accuracy" of 0.5 nm (5 angstrom) or less (better).

7B003 Equipment "specially designed" for the "production" of equipment controlled by 7A (except 7A994).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to entire entry	MT Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See also 7B103, (this entry is "subject to the ITAR" (see 22 CFR parts 120 through 130)) and 7B994. (2) This entry includes: Inertial Measurement Unit (IMU module) tester; IMU platform tester; IMU stable element handling fixture; IMU platform balance fixture; gyro tuning test station; gyro dynamic balance station; gyro run-in/motor test station; gyro evacuation and fill station; centrifuge fixtures for gyro bearings; accelerometer axis align stations; accelerometer test station; and fiber optic gyro coil winding machines.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

7B101 "Production equipment", and other test, calibration, and alignment equipment, other than that described in 2B119 to 2B122, 7B003, and 7B102, designed or modified to be used with equipment controlled by 7A001 to 7A004 or 7A101 to 7A104.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) *See also* 2B119 to 2B122, 7B003, 7B102, and 7B994.

(2) This entry includes: inertial measurement unit (IMU module) tester; IMU platform tester; IMU stable element handling fixture; IMU platform balance fixture; gyro tuning test station; gyro dynamic balance stations; gyro run-in/motor test stations; gyro evacuation and filling stations; centrifuge fixtures for gyro bearings; accelerometer axis align stations; and accelerometer test stations.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

7B102 Equipment, other than those controlled by 7B002, designed or modified to characterize mirrors, for laser gyro equipment, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Scatterometers having a threshold accuracy of 10 ppm or less (better).

b. Reflectometers having a threshold accuracy of 50 ppm or less (better).

c. Prolifometers having a threshold accuracy of 0.5nm (5 angstrom) or less (better).

7B103 "Specially designed" "production facilities" for equipment controlled by 7A117. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

7B611 Test, inspection, and production commodities "specially designed" for military fire control, laser, imaging, and guidance equipment, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, AT, UN

Control(s)	Country chart (see supp. no. 1 to part 738)
NS applies to entire entry	NS Column 1.
MT applies to 7B611.a commodities "specially designed" for 7A611.a commodities controlled for MT reasons	MT Column 1.
RS applies to entire entry	RS Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 7B611.

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Test, inspection, and production end items and equipment "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities controlled in ECCN 7A611 (except 7A611.y) or commodities in USML Category XII that are not enumerated in USML Category XII or controlled by another "600 series" ECCN.

b. Environmental test facilities "specially designed" for the certification, qualification, or testing of commodities controlled in ECCN 7A611 (except 7A611.y) or guidance equipment in USML Category XII that are not enumerated in USML Category XII or controlled by another "600 series" ECCN.

c. Field test equipment “specially designed” to evaluate or calibrate the operation of systems described in USML Category XII(a), (b), or (c).

d. to w. [Reserved]

x. “Parts,” “components,” “accessories,” and “attachments” that are “specially designed” for a commodity listed in this entry and that are not enumerated on the USML or controlled by another “600 series” ECCN.

7B994 Other equipment for the test, inspection, or “production” of navigation and avionics equipment.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

C. “Materials” [Reserved]

D. “Software”

7D001 “Software” “specially designed” or modified for the “development” or “production” of equipment controlled by 7A (except 7A994) or 7B (except 7B994).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to "software" for equipment controlled by 7A001 to 7A004, 7A006, 7A008, 7B001, 7B002 or 7B003	NS Column 1.
MT applies to "software" for equipment controlled for MT reasons. MT does not apply to "software" for equipment controlled by 7A008	MT Column 1.
RS applies to "software" for inertial navigation systems and inertial equipment, and "components" therefor, for "9A991.b aircraft"	RS Column 1
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See also 7D101 and 7D994. (2) The "software" related to 7A003.b, 7A005, 7A103.b, 7A105, 7A106, 7A115, 7A116, 7A117, or 7B103 is "subject to the ITAR" (see 22 CFR parts 120 through 130). (3) "Software" for inertial navigation systems and inertial equipment and "parts" or "components" "specially designed" therefor that are directly related to defense articles and not "specially designed" for use on civil aircraft is "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

7D002 "Source code" for the operation or maintenance of any inertial navigation equipment, including inertial equipment not controlled by 7A003 or 7A004, or Attitude and Heading Reference Systems ('AHRS').

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to entire entry	MT Column 1

Control(s)	Country chart (see supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1.) See also 7D102 and 7D994. (2.) This entry does not control “source code” for the operation or maintenance of gimballed 'AHRS'.

Related Definition: For the purposes of 7D002, 'AHRS' generally differ from Inertial Navigation Systems (INS) in that an 'AHRS' provides attitude and heading information and normally does not provide the acceleration, velocity and position information associated with an INS.

Items:

The list of items controlled is contained in the ECCN heading.

7D003 Other “software” as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
MT applies to “software” for equipment controlled for MT reasons. MT does not apply to “software” for equipment controlled by 7A008	MT Column 1.

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit software in 7D003.a or .b to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: See also 7D103 and 7D994.

Related Definitions: 'Data-Based Referenced Navigation' ('DBRN') systems are systems which use various sources of previously measured geo-mapping data integrated to provide accurate navigation information under dynamic conditions. Data sources include bathymetric maps, stellar maps, gravity maps, magnetic maps or 3-D digital terrain maps.

Items:

a. “Software” “specially designed” or modified to improve the operational performance or reduce the navigational error of systems to the levels controlled by 7A003, 7A004 or 7A008;

b. “Source code” for hybrid integrated systems which improves the operational performance or reduces the navigational error of systems to the level controlled by 7A003 or 7A008 by continuously combining heading data with any of the following:

b.1. Doppler radar or sonar velocity data;

b.2. “Satellite navigation system” reference data; *or*

b.3. Data from 'Data-Based Referenced Navigation' ('DBRN”) systems;

c. [Reserved]

d. [Reserved]

N.B. For flight control "source code," see 7D004.

e. Computer-Aided-Design (CAD) "software" "specially designed" for the "development" of "active flight control systems", helicopter multi-axis fly-by-wire or fly-by-light controllers or helicopter "circulation-controlled anti-torque or circulation-controlled direction control systems", whose "technology" is controlled by 7E004.b.1, 7E004.b.3 to b.5, 7E004.b.7 to b.8, 7E004.c.1 or 7E004.c.2.

7D004 "Source code" incorporating "development" "technology" specified by 7E004.a.2, a.3, a.5, a.6 or 7E004.b, for any of the following: (see List of Items Controlled).

License Requirements

Reason for Control: NS, AT

Control(s)	Country chart (See Supp. No.1 to part 738)
NS applies to entire entry	NS Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: License Exception STA may not be used to ship or transmit "software" in 7D004.a to .d and .g to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

List of Items Controlled

Related Controls: See 7D103 and 7D994

Related Definitions: N/A

Items: a. Digital flight management systems for "total control of flight";

b. Integrated propulsion and flight control systems;

c. “Fly-by-wire systems” or “fly-by-light systems“;

d. Fault-tolerant or self-reconfiguring “active flight control systems”;

e. [Reserved];

f. Air data systems based on surface static data; *or*

g. Three dimensional displays.

> *Note: 7D004 does not apply to “source code” associated with common computer elements and utilities (e.g., input signal acquisition, output signal transmission, computer “program” and data loading, built-in test, task scheduling mechanisms) not providing a specific flight control system function.*

7D005 “Software” “Specially Designed” To Decrypt “Satellite Navigation System” Ranging Signals Designed for Government Use.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

7D101 "Software" "specially designed" or modified for the "use" of equipment controlled for missile technology (MT) reasons by 7A001 to 7A006, 7A101 to 7A107, 7A115, 7A116, 7A117, 7B001, 7B002, 7B003, 7B101, 7B102, or 7B103.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) The "software" related to 7A003.b, 7A005, 7A103.b, 7A105, 7A106, 7A115, 7A116, 7A117, or 7B103 is "subject to the ITAR" (see 22 CFR parts 120 through 130). (2) "Software" for inertial navigation systems and inertial equipment and "parts" and "components" "specially designed" therefor that are directly related to a defense article is "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

7D102 Integration "software", as follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: The "software" related to 7A003.b or 7A103.b is "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items: a. Integration "software" for the equipment controlled by 7A103.b.

b. Integration "software" "specially designed" for the equipment controlled by 7A003 or 7A103.a.

7D103 "Software" "specially designed" for modelling or simulation of the "guidance sets" controlled by 7A117 or for their design integration with "missiles". (This entry is "subject to the ITAR." See 22 CFR parts 120 through 130.)

7D611 "Software" "specially designed" for commodities controlled by 7A611 or equipment controlled by 7B611, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 7D611.y	NS Column 1.
MT applies to 7D611.a "software" "specially designed" for 7A611.a commodities controlled for MT reasons	MT Column 1.
RS applies to entire entry except 7D611.y	RS Column 1.
RS applies to 7D611.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry except 7D611.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any software in 7D611.

LIST OF ITEMS CONTROLLED

Related Controls: "Software" directly related to articles enumerated in USML Category XII is subject of USML paragraph XII(f).

Related Definitions: N/A

Items:

a. "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCNs 7A611 (except 7A611.y) or 7B611.

b. to .x [Reserved]

y. Specific "software" "specially designed" for the "development," "production," operation, or maintenance of commodities described in 7A611.y.

7D994 "Software", n.e.s., for the "development", "production", or "use" of navigation, airborne communication and other avionics.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

E. "Technology"

7E001 "Technology" according to the General Technology Note for the "development" of equipment or "software," specified by 7A. (except 7A994), 7B. (except 7B994), 7D001, 7D002, 7D003 or 7D005.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, AT

Control(s)	Country chart (See Supp. No.1 to part 738)
NS applies to "technology" for items controlled by 7A001 to 7A004, 7A006, 7A008, 7B001 to 7B003, 7D001 to 7D005	NS Column 1
MT applies to technology for equipment controlled for MT reasons. MT *does not* apply to "technology" for equipment controlled by 7A008. MT *does* apply to "technology" for equipment specified in 7A001, 7A002 or 7A003.d that meets or exceeds parameters of 7A101, 7A102 or 7A103	MT Column 1
RS applies to "technology" for inertial navigation systems or inertial equipment, and "components" therefor, for 9A991.b aircraft	RS Column 1
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit any technology in this entry to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) See also 7E101 and 7E994. (2) The "technology" related to 7A003.b, 7A005, 7A103.b, 7A105, 7A106, 7A115, 7A116, 7A117, 7B103, software in 7D101 specified in the Related Controls paragraph of ECCN 7D101, 7D102.a, or 7D103 is "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

Note: 7E001 includes key management "technology" exclusively for equipment specified in 7A005.a.

7E002 "Technology" according to the General Technology Note for the "production" of equipment controlled by 7A (except 7A994) or 7B (except 7B994).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to "technology" for equipment controlled by 7A001 to 7A004, 7A006, 7A008 or 7B001 to 7B003	NS Column 1.
MT applies to technology for equipment controlled for MT reasons. MT *does not* apply to "technology" for equipment controlled by 7A008. MT *does* apply to "technology" for equipment specified in 7A001, 7A002 or 7A003.d that meets or exceeds parameters of 7A101, 7A102 or 7A103	MT Column 1.
RS applies to "technology" for inertial navigation systems or inertial equipment, and "components" therefor, for 9A991.b aircraft	RS Column 1
AT applies to entire entry	AT Column 1.

REPORTING REQUIREMENTS See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit any technology in this entry to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) See also 7E102 and 7E994. (2) The "technology" related to 7A003.b, 7A005, 7A103.b, 7A105, 7A106, 7A115, 7A116, 7A117, or 7B103 is "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

7E003 "Technology" according to the General Technology Note for the repair, refurbishing or overhaul of equipment controlled by 7A001 to 7A004.

License Requirements

Reason for Control: NS, MT, AT

Control(s)	Country chart (See Supp. No.1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

List of Items Controlled

Related Controls: See also 7E994. This entry does not control "technology" for maintenance directly associated with calibration, removal or replacement of damaged or unserviceable LRUs and SRAs of a "civil aircraft" as described in 'Maintenance Level I' or 'Maintenance Level II'.

Related Definition: Refer to the Related Definitions for 7B001 for 'Maintenance Level I' or 'Maintenance Level II'.

Items: The list of items controlled is contained in the ECCN heading.

7E004 Other "technology" as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, MT, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to "technology" for equipment or systems controlled for MT reasons	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: (1) Paragraph (c)(1) of License Exception STA (§ 740.20(c)(1) of the EAR) may not be used for 7E004, except for 7E004.a.7. (2) Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for 7E004, except for 7E004.a.7.

List of Items Controlled

Related Controls: (1) See also 7E001, 7E002, 7E101, and 7E994. (2) In addition to the Related Controls in 7E001, 7E002, and 7E101 that include MT controls, also see the MT controls in 7E104 for design "technology" for the integration of the flight control, guidance, and propulsion data into a flight management system, designed or modified for rockets or missiles capable of achieving a "range" equal to or greater than 300 km, for optimization of rocket system trajectory; and also see 9E101 for design "technology" for integration of air vehicle fuselage, propulsion system and lifting control surfaces, designed or modified for unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km, to optimize aerodynamic performance throughout the flight regime of an unmanned aerial vehicle.

Related Definitions: N/A.

Items:

a. "Technology" for the "development" or "production" of any of the following:

a.1. [Reserved]

a.2. Air data systems based on surface static data only, *i.e.,* which dispense with conventional air data probes;

a.3. Three dimensional displays for "aircraft";

a.4. [Reserved]

a.5. Electric actuators (*i.e.,* electromechanical, electrohydrostatic and integrated actuator package) “specially designed” for 'primary flight control';

> *Technical Note: For the purposes of 7E004.a.5, 'primary flight control' is “aircraft” stability or maneuvering control using force/moment generators, i.e., aerodynamic control surfaces or propulsive thrust vectoring.*

a.6. 'Flight control optical sensor array' “specially designed” for implementing “active flight control systems”; *or*

> *Technical Note: For the purposes of 7E004.a.6, a 'flight control optical sensor array' is a network of distributed optical sensors, using “laser” beams, to provide real-time flight control data for on-board processing.*

a.7. “DBRN” systems designed to navigate underwater, using sonar or gravity databases, that provide a positioning “accuracy” equal to or less (better) than 0.4 nautical miles;

b. “Development” “technology”, as follows, for “active flight control systems” (including “fly-by-wire systems” or “fly-by-light systems”):

b.1. Photonic-based “technology” for sensing “aircraft” or flight control component state, transferring flight control data, or commanding actuator movement, “required” for “fly-by-light systems” “active flight control systems”;

b.2. [Reserved]

b.3. Real-time algorithms to analyze component sensor information to predict and preemptively mitigate impending degradation and failures of components within an “active flight control system”;

> *Note: 7E004.b.3 does not include algorithms for purpose of off-line maintenance.*

b.4. Real-time algorithms to identify component failures and reconfigure force and moment controls to mitigate “active flight control system” degradations and failures;

> *Note: 7E004.b.4 does not include algorithms for the elimination of fault effects through comparison of redundant data sources, or off-line pre-planned responses to anticipated failures.*

b.5. Integration of digital flight control, navigation and propulsion control data, into a digital flight management system for “total control of flight”;

> *Note: 7E004.b.5 does not apply to:*

1. "Technology" for integration of digital flight control, navigation and propulsion control data, into a digital flight management system for 'flight path optimization';

2. "Technology" for "aircraft" flight instrument systems integrated solely for VOR, DME, ILS or MLS navigation or approaches.

Technical Note: 'Flight path optimization' is a procedure that minimizes deviations from a four-dimensional (space and time) desired trajectory based on maximizing performance or effectiveness for mission tasks.

b.6. [Reserved]

b.7. "Technology" "required" for deriving the functional requirements for "fly-by-wire systems" having all of the following:

b.7.a. 'Inner-loop' airframe stability controls requiring loop closure rates of 40 Hz or greater; *and*

Technical Note: For the purposes of 7E004.b.7.a, 'inner-loop' refers to functions of "active flight control systems" that automate airframe stability controls.

b.7.b. Having any of the following:

b.7.b.1. Corrects an aerodynamically unstable airframe, measured at any point in the design flight envelope, that would lose recoverable control if not corrected within 0.5 seconds;

b.7.b.2. Couples controls in two or more axes while compensating for 'abnormal changes in aircraft state';

Technical Note: For the purposes of 7E004.b.7.b.2, 'abnormal changes in aircraft state' include in-flight structural damage, loss of engine thrust, disabled control surface, or destabilizing shifts in cargo load.

b.7.b.3. Performs the functions specified in 7E004.b.5; *or*

Note: 7E004.b.7.b.3 does not apply to autopilots.

b.7.b.4. Enables "aircraft" to have stable controlled flight, other than during take-off or landing, at greater than 18 degrees angle of attack, 15 degrees side slip, 15 degrees/second pitch or yaw rate, or 90 degrees/second roll rate;

b.8. "Technology" "required" for deriving the functional requirements of "fly-by-wire systems" to achieve all of the following:

b.8.a. No loss of control of the ”aircraft” in the event of a consecutive sequence of any two individual faults within the “fly-by-wire system”; *and*

b.8.b. Probability of loss of control of the ”aircraft” being less (better) than 1×10^{-9} failures per flight hour;

> *Note: 7E004.b does not apply to “technology” associated with common computer elements and utilities (e.g., input signal acquisition, output signal transmission, computer “program” and data loading, built-in test, task scheduling mechanisms) not providing a specific flight control system function.*

c. “Technology” for the “development” of helicopter systems, as follows:

c.1. Multi-axis fly-by-wire or fly-by-light controllers, which combine the functions of at least two of the following into one controlling element:

c.1.a. Collective controls;

c.1.b. Cyclic controls;

c.1.c. Yaw controls;

c.2. “Circulation-controlled anti-torque or circulation-controlled direction control systems”;

c.3. Rotor blades incorporating 'variable geometry airfoils', for use in systems using individual blade control.

> *Technical Note: For the purposes of 7E004.c.3, 'variable geometry airfoils' use trailing edge flaps or tabs, or leading edge slats or pivoted nose droop, the position of which can be controlled in flight.*

7E101 “Technology,” according to the General Technology Note for the “use” of equipment controlled by 7A001 to 7A006, 7A101 to 7A107, 7A115 to 7A117, 7B001, 7B002, 7B003, 7B101, 7B102, 7B103, or 7D101 to 7D103 for MT reasons.

License Requirements

Reason for Control: MT, RS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
RS applies to “technology” required for the use of inertial navigation systems, or	RS Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
inertial equipment, or "specially designed" "parts" and "components" therefor, "specially designed" for 9A991.b aircraft	
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: The "technology" related to 7A003.b, 7A005, 7A103.b, 7A105, 7A106, 7A115, 7A116, 7A117, 7B103, software specified in the Related Controls paragraph of ECCN 7D101, 7D102.a, or 7D103 is "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

7E102 "Technology" for protection of avionics and electrical subsystems against electromagnetic pulse (EMP) and electromagnetic interference (EMI) hazards, from external sources, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Design “technology” for shielding systems;

b. Design “technology” for the configuration of hardened electrical circuits and subsystems;

c. Design “technology” for the determination of hardening criteria of .a and .b of this entry.

7E104 Design “Technology” for the integration of the flight control, guidance, and propulsion data into a flight management system, designed or modified for rockets or missiles capable of achieving a “range” equal to or greater than 300 km, for optimization of rocket system trajectory. (This entry is “subject to the ITAR.” See 22 CFR parts 120 through 130.)

7E611 “Technology” “required” for the “development,” “production,” operation, installation, maintenance, repair, overhaul or refurbishing of commodities controlled by 7A611, commodities controlled by 7B611, or software controlled by 7D611, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 7E611.y	NS Column 1.
MT applies to “technology” in 7E611.a if “required” for items controlled for MT reasons in 7A611.a, 7B611.a, or 7D611.a	MT Column 1.
RS applies to entire entry except 7E611.y	RS Column 1.
RS applies to 7E611.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry except 7E611.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any technology in 7E611.

LIST OF ITEMS CONTROLLED

Related Controls: Technical data directly related to articles enumerated in USML Category XII are subject to the control of USML Category XII(f).

Related Definitions: N/A

Items:

a. "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities or "software" controlled by ECCN 7A611 (except 7A611.y), 7B611, or 7D611 (except 7D611.y).

b. through .x [Reserved]

y. Specific "technology" "required" for the "production," "development," operation, installation, maintenance, repair, or overhaul of commodities or software controlled by ECCNs 7A611.y or 7D611.y.

7E994 "Technology", n.e.s., for the "development", "production", or "use" of navigation, airborne communication, and other avionics equipment.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

EAR99 Items subject to the EAR that are not elsewhere specified in this CCL Category or in any other category in the CCL are designated by the number EAR99.

Category 8—Marine

A. “End Items”, “Equipment”, “Accessories”, “Attachments”, “Parts”, “Components” and “Systems”

8A001 Submersible vehicles and surface vessels, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

Reporting Requirements

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $5000; N/A for 8A001.b and .c.1

GBS: N/A

Special Conditions for STA

STA: License Exception STA may not be used to ship any commodity in 8A001.b, 8A001.c or 8A001.d to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

List of Items Controlled

Related Controls: For the control status of equipment for submersible vehicles, see: Category 6 for sensors; Categories 7 and 8 for navigation equipment; Category 8A for underwater equipment.

Related Definitions: N/A

Items:

a. Manned, tethered submersible vehicles designed to operate at depths exceeding 1,000 m;

b. Manned, untethered submersible vehicles having any of the following:

b.1. Designed to 'operate autonomously' and having a lifting capacity of all the following:

b.1.a. 10% or more of their weight in air; *and*

b.1.b. 15 kN or more;

b.2. Designed to operate at depths exceeding 1,000 m; *or*

b.3. Having all of the following:

b.3.a. Designed to continuously 'operate autonomously' for 10 hours or more; *and*

b.3.b. 'Range' of 25 nautical miles or more;

Technical Notes: 1. For the purposes of 8A001.b, 'operate autonomously' means fully submerged, without snorkel, all systems working and cruising at minimum speed at which the submersible can safely control its depth dynamically by using its depth planes only, with no need for a support vessel or support base on the surface, sea-bed or shore, and containing a propulsion system for submerged or surface use.
2. For the purposes of 8A001.b, 'range' means half the maximum distance a submersible vehicle can 'operate autonomously'.

c. Unmanned submersible vehicles as follows:

c.1. Unmanned submersible vehicles having any of the following:

c.1.a. Designed for deciding a course relative to any geographical reference without real-time human assistance;

c.1.b. Acoustic data or command link; or

c.1.c. Wireless optical data or command link exceeding 1,000 m;

c.2. Unmanned, submersible vehicles, not specified in 8A001.c.1, having all of the following:

c.2.a. Designed to operate with a tether;

c.2.b. Designed to operate at depths exceeding 1,000 m; and

c.2.c. Having any of the following:

c.2.c.1. Designed for self-propelled maneuver using propulsion motors or thrusters specified by 8A002.a.2; or

c.2.c.2. Fiber optic data link;

d. [Reserved]

e. Ocean salvage systems with a lifting capacity exceeding 5 MN for salvaging objects from depths exceeding 250 m and having any of the following:

e.1. Dynamic positioning systems capable of position keeping within 20 m of a given point provided by the navigation system; *or*

e.2. Seafloor navigation and navigation integration systems, for depths exceeding 1,000 m and with positioning "accuracies" to within 10 m of a predetermined point.

8A002 Marine systems, equipment, "parts" and "components," as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

Reporting Requirements

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $5000; N/A for 8A002.o.3.b

GBS: Yes for manipulators for civil end uses (*e.g.,* underwater oil, gas or mining operations) controlled by 8A002.i.2 and having 5 degrees of freedom of movement; and 8A002.r.

Special Conditions for STA

STA: License Exception STA may not be used to ship any commodity in 8A002.b, h, j, o.3, or p to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) See also 8A992 and for underwater communications systems, see Category 5, Part I—Telecommunications. (2) See also 8A992 for self-contained underwater breathing apparatus that is not controlled by 8A002 or released for control by the 8A002.q Note. (3) For electronic imaging systems "specially designed" or modified for underwater use incorporating image intensifier tubes specified by 6A002.a.2.a or 6A002.a.2.b, see 6A003.b.3. (4) For electronic imaging systems "specially designed" or modified for underwater use incorporating "focal plane arrays" specified by 6A002.a.3.g, see 6A003.b.4.c. (5) Section 744.9 imposes a license requirement on commodities described in 8A002.d if being exported, reexported, or transferred (in-country) for use by a military end-user or for incorporation into an item controlled by ECCN 0A919.

Related Definitions: N/A

Items:

a. Systems, equipment, "parts" and "components," "specially designed" or modified for submersible vehicles and designed to operate at depths exceeding 1,000 m, as follows:

a.1. Pressure housings or pressure hulls with a maximum inside chamber diameter exceeding 1.5 m;

a.2. Direct current propulsion motors or thrusters;

a.3. Umbilical cables, and connectors therefor, using optical fiber and having synthetic strength members;

a.4. "Parts" and "components" manufactured from material specified by ECCN 8C001;

> *Technical Note: For the purposes of 8A002.a.4, this entry should not be defeated by the export of 'syntactic foam' controlled by 8C001 when an intermediate stage of manufacture has been performed and it is not yet in its final component form.*

b. Systems "specially designed" or modified for the automated control of the motion of submersible vehicles controlled by 8A001, using navigation data, having closed loop servo-controls and having any of the following:

b.1. Enabling a vehicle to move within 10 m of a predetermined point in the water column;

b.2. Maintaining the position of the vehicle within 10 m of a predetermined point in the water column; *or*

b.3. Maintaining the position of the vehicle within 10 m while following a cable on or under the seabed;

c. Fiber optic pressure hull penetrators;

d. Underwater vision systems having all of the following:

d.1. "Specially designed" or modified for remote operation with an underwater vehicle; and

d.2. Employing any of the following techniques to minimize the effects of back scatter:

d.2.a. Range-gated illuminators; or

d.2.b. Range-gated “laser” systems;

e. [Reserved]

f. [Reserved]

g. Light systems “specially designed” or modified for underwater use, as follows:

g.1. Stroboscopic light systems capable of a light output energy of more than 300 J per flash and a flash rate of more than 5 flashes per second;

g.2. Argon arc light systems “specially designed” for use below 1,000 m;

h. “Robots” “specially designed” for underwater use, controlled by using a dedicated computer and having any of the following:

h.1. Systems that control the “robot” using information from sensors which measure force or torque applied to an external object, distance to an external object, or tactile sense between the “robot” and an external object; *or*

h.2. The ability to exert a force of 250 N or more or a torque of 250 Nm or more and using titanium based alloys or “composite” “fibrous or filamentary materials” in their structural members;

i. Remotely controlled articulated manipulators “specially designed” or modified for use with submersible vehicles and having any of the following:

i.1. Systems which control the manipulator using information from sensors which measure any of the following:

i.1.a. Torque or force applied to an external object; *or*

i.1.b. Tactile sense between the manipulator and an external object; *or*

i.2. Controlled by proportional master-slave techniques and having 5 degrees of 'freedom of movement' or more;

> *Technical Note: For the purposes of 8A002.i.2, only functions having proportionally related motion control using positional feedback are counted when determining the number of degrees of 'freedom of movement'.*

j. Air independent power systems “specially designed” for underwater use, as follows:

j.1. Brayton or Rankine cycle engine air independent power systems having any of the following:

j.1.a. Chemical scrubber or absorber systems, “specially designed” to remove carbon dioxide, carbon monoxide and particulates from recirculated engine exhaust;

j.1.b. Systems “specially designed” to use a monoatomic gas;

j.1.c. Devices or enclosures, “specially designed” for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; *or*

j.1.d. Systems having all of the following:

j.1.d.1. “Specially designed” to pressurize the products of reaction or for fuel reformation;

j.1.d.2. “Specially designed” to store the products of the reaction; *and*

j.1.d.3. “Specially designed” to discharge the products of the reaction against a pressure of 100 kPa or more;

j.2. Diesel cycle engine air independent systems having all of the following:

j.2.a. Chemical scrubber or absorber systems, “specially designed” to remove carbon dioxide, carbon monoxide and particulates from recirculated engine exhaust;

j.2.b. Systems “specially designed” to use a monoatomic gas;

j.2.c. Devices or enclosures, “specially designed” for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; *and*

j.2.d. “Specially designed” exhaust systems that do not exhaust continuously the products of combustion;

j.3. “Fuel cell” air independent power systems with an output exceeding 2 kW and having any of the following:

j.3.a. Devices or enclosures, “specially designed” for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; *or*

j.3.b. Systems having all of the following:

j.3.b.1. “Specially designed” to pressurize the products of reaction or for fuel reformation;

j.3.b.2. “Specially designed” to store the products of the reaction; *and*

j.3.b.3. “Specially designed” to discharge the products of the reaction against a pressure of 100 kPa or more;

j.4. Stirling cycle engine air independent power systems having all of the following:

j.4.a. Devices or enclosures, “specially designed” for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; *and*

j.4.b. “Specially designed” exhaust systems which discharge the products of combustion against a pressure of 100 kPa or more;

k. [Reserved]

l. [Reserved]

m. [Reserved]

n. [Reserved]

o. Propellers, power transmission systems, power generation systems and noise reduction systems, as follows:

o.1. [Reserved]

o.2. Water-screw propeller, power generation systems or transmission systems, designed for use on vessels, as follows:

o.2.a. Controllable-pitch propellers and hub assemblies, rated at more than 30 MW;

o.2.b. Internally liquid-cooled electric propulsion motors with a power output exceeding 2.5 MW;

o.2.c. “Superconductive” propulsion motors with a power output exceeding 0.1 MW;

o.2.d. Power transmission shaft systems incorporating “composite” material “parts” or “components” and capable of transmitting more than 2 MW;

o.2.e. Ventilated or base-ventilated propeller systems, rated at more than 2.5 MW;

o.3. Noise reduction systems designed for use on vessels of 1,000 tonnes displacement or more, as follows:

o.3.a. Systems that attenuate underwater noise at frequencies below 500 Hz and consist of compound acoustic mounts for the acoustic isolation of diesel engines, diesel generator sets, gas turbines, gas turbine generator sets, propulsion motors or propulsion reduction gears, “specially designed” for sound or vibration isolation and having an intermediate mass exceeding 30% of the equipment to be mounted;

o.3.b. 'Active noise reduction or cancellation systems' or magnetic bearings, “specially designed” for power transmission systems;

> *Technical Note: For the purposes of 8A002.o.3.b, 'active noise reduction or cancellation systems' incorporate electronic control systems capable of actively reducing equipment vibration by the generation of anti-noise or anti-vibration signals directly to the source.*

o.4. Permanent magnet electric propulsion motors “specially designed” for submersible vehicles, having a power output exceeding 0.1 MW.

> *Note: 8A002.o.4. includes rim-driven propulsion systems.*

p. Pumpjet propulsion systems having all of the following:

p.1. Power output exceeding 2.5 MW; *and*

p.2. Using divergent nozzle and flow conditioning vane techniques to improve propulsive efficiency or reduce propulsion-generated underwater-radiated noise;

q. Underwater swimming and diving equipment as follows;

q.1. Closed circuit rebreathers;

q.2. Semi-closed circuit rebreathers;

> *Note: 8A002.q does not control individual rebreathers for personal use when accompanying their users.*

> *N.B. For equipment and devices "specially designed" for military use see ECCN 8A620.f.*

r. Diver deterrent acoustic systems "specially designed" or modified to disrupt divers and having a sound pressure level equal to or exceeding 190 dB (reference 1 μPa at 1 m) at frequencies of 200 Hz and below.

> *Note 1: 8A002.r does not apply to diver deterrent systems based on under-water-explosive devices, air guns or combustible sources.*

> *Note 2: 8A002.r includes diver deterrent acoustic systems that use spark gap sources, also known as plasma sound sources.*

8A018 Items on the Wassenaar Arrangement Munitions List.

No items currently are in this ECCN. See ECCN 8A609 for engines and propulsion systems and "specially designed" "components" therefor that, immediately prior to January 6, 2014, were classified under ECCN 8A018.b.3. See ECCN 8A620 for closed and semi-closed circuit (rebreathing) apparatus, engines and propulsion systems for submersible vessels (diesel engines of 1,500 hp and over with rotary speed of 700 rpm or over "specially designed" for submarines), submarine and torpedo nets, and "specially designed" "components" therefor that, immediately prior to January 6, 2014, were classified under ECCN 8A018.a, .b.1, or .b.4, respectively. See ECCNs 8A001, 8A002 and 8A992 for controls on non-military submersible vehicles, oceanographic and associated equipment. See USML Category XX (22 CFR part 121) for electric motors "specially designed" for submarines that, immediately prior to January 6, 2014, were classified under ECCN 8A018.b.2.

8A609 Surface vessels of war and related commodities (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry, except 8A609.y	NS Column 1.
RS applies to entire entry, except 8A609.y	RS Column 1.
RS applies to 8A609.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry, except 8A609.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1,500

GBS: N/A

Special Conditions for STA

STA: (1) Paragraph (c)(1) of License Exception STA (§ 740.20(c)(1) of the EAR) may not be used for any item in 8A609.a, unless determined by BIS to be eligible for License Exception STA in accordance with § 740.20(g) (License Exception STA eligibility requests for 9x515 and "600 series" items). (2) Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 8A609.

List of Items Controlled

Related Controls: (1) Surface vessels of war and special naval equipment, and technical data (including software), and services directly related thereto, described in 22 CFR part 121, Category VI, Surface Vessels of War and Special Naval Equipment, are subject to the jurisdiction of the International Traffic in Arms Regulations. (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a de minimis amount of U.S.- origin "600 series" controlled content. (3) For controls on diesel engines and electric motors that are "subject to the EAR" for surface vessels of war "subject to the EAR" or "subject to the ITAR," see ECCN 8A992.g. For diesel engines and electric motors for surface vessels of war "subject to the ITAR," see 22 CFR part 121, Category VI(c) for parts, components, accessories, and attachments, "specially designed" for developmental vessels funded by the Department of Defense via contract or other funding authorization. (4) For controls on military gas turbine engines and related items for vessels of war, see ECCN 9A619. (4) For controls on military gas turbine engines and related items for vessels of war, see ECCN 9A619.

Related Definitions: N/A

Items:

a. Surface vessels of war "specially designed" for a military use and not enumerated or otherwise described in the USML.

Note 1: 8A609.a includes: (i) Underway replenishment ships; (ii) surface vessel and submarine tender and repair ships, except vessels that are "specially designed" to support naval nuclear propulsion plants; (iii) non-submersible submarine rescue ships; (iv) other auxiliaries (e.g., AGDS, AGF, AGM, AGOR, AGOS, AH, AP, ARL, AVB, AVM, and AVT); (v) amphibious warfare craft, except those that are armed; and (vi) unarmored and unarmed coastal, patrol, roadstead, and Coast Guard and other patrol craft with mounts or hard points for firearms of .50 caliber or less.

Note 2: For purposes of paragraph .a, surface vessels of war includes vessels "specially designed" for military use that are not identified in paragraph (a) of ITAR § 121.15, including any demilitarized vessels, regardless of origin or designation, manufactured prior to 1950 and that have not been modified since 1949. For purposes of this note, the term modified does not include incorporation of safety features required by law, cosmetic changes (e.g., different paint), or the addition of "parts" or "components" available prior to 1950.

b. Non-magnetic diesel engines with a power output of 50 hp or more and either of the following:

b.1. Non-magnetic content exceeding 25% of total weight; or

b.2. Non-magnetic parts other than crankcase, block, head, pistons, covers, end plates, valve facings, gaskets, and fuel, lubrication and other supply lines.

c. through w. [Reserved]

x. "Parts," "components," "accessories" and "attachments" that are "specially designed" for a commodity enumerated or otherwise described in ECCN 8A609 (except for 8A609.y) or a defense article enumerated or otherwise described in USML Category VI and not specified elsewhere on the USML, in 8A609.y or 3A611.y.

Note 1: Forgings, castings, and other unfinished products, such as extrusions and machined bodies, that have reached a stage in manufacturing where they are clearly identifiable by mechanical properties, material composition, geometry, or function as commodities controlled by ECCN 8A609.x are controlled by ECCN 8A609.x.

Note 2: "Parts," "components," "accessories" and "attachments" specified in USML subcategory VI(f) are subject to the controls of that paragraph. "Parts," "components," "accessories," and "attachments" specified in ECCN 8A609.y are subject to the controls of that paragraph.

y. Specific "parts," "components," "accessories" and "attachments" "specially designed" for a commodity subject to control in this ECCN or for a defense article in USML Category VI and not elsewhere specified in the USML, as follows, and "parts," "components," "accessories," and "attachments" "specially designed" therefor:

y.1. Public address (PA) systems;

y.2. Filters and filter assemblies, hoses, lines, fittings, couplings, and brackets for pneumatic, hydraulic, oil and fuel systems;

y.3. Galleys;

y.4. Lavatories;

y.5. Magnetic compass, magnetic azimuth detector;

y.6. Medical facilities;

y.7. Potable water tanks, filters, valves, hoses, lines, fittings, couplings, and brackets;

y.8. Panel knobs, indicators, switches, buttons, and dials whether unfiltered or filtered for use with night vision imaging systems;

y.9. Emergency lighting;

y.10. Gauges and indicators;

y.11. Audio selector panels.

8A620 Submersible vessels, oceanographic and associated commodities (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry, except 8A620. b and .y	NS Column 1.
RS applies to entire entry, except 8A620.y	RS Column 1.
RS applies to 8A620.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry, except 8A620.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1,500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: (1) Paragraph (c)(1) of License Exception STA (§ 740.20(c)(1) of the EAR) may not be used for any item in 8A620.a or .b, unless determined by BIS to be eligible for License Exception STA in accordance with § 740.20(g) (License Exception STA eligibility requests for "600 series" end items). (2) Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 8A620.

LIST OF ITEMS CONTROLLED

Related Controls: (1) Submersible vessels, oceanographic and associated equipment, and technical data (including software), and services directly related thereto, described in 22 CFR part 121, Category XX, Submersible Vessels, Oceanographic and Associated Equipment, are subject to the jurisdiction of the International Traffic in Arms Regulations (ITAR). "Parts," "components," "accessories," and "attachments" "specially designed" for defense articles in USML Category XX are controlled under USML sub-category XX(c). (2) See ECCN 0A919 for foreign made "military commodities" that incorporate more than a de minimis amount of U.S.-origin "600 series" controlled content. (3) For controls on nonmilitary submersible vehicles, oceanographic and associated equipment, see ECCNs 8A001, 8A002, and 8A992. (4) See ECCN 8A609 for controls on nonmagnetic diesel engines with a power output of 50 hp or more and either: (i) Nonmagnetic content exceeding 25% of total weight; or (ii) non-magnetic parts other than crankcase, block, head, pistons, covers, end plates, valve facings, gaskets, and fuel, lubrication and other supply lines.

Related Definitions: N/A

Items:

a. Submersible and semi-submersible vessels "specially designed" for a military use and not enumerated or otherwise described in the USML.

> *Note: 8A620.a includes submarine rescue vehicles and Deep Submergence Vehicles (DSV).*

b. Submersible and semi-submersible vessels "specially designed" for cargo transport and "parts," "components," "accessories," and "attachments" "specially designed" therefor.

c. Harbor entrance detection devices (magnetic, pressure, and acoustic) and controls therefor, not elsewhere specified on the USML or the CCL.

d. Diesel engines of 1,500 hp and over with rotary speed of 700 rpm or over "specially designed" for submarines.

> *Note: Propulsion systems not specified in ECCN 8A620.d that are "specially designed" for an article controlled by USML Category XX are controlled by USML XX(b) or (c).*

e. Submarine nets and torpedo nets.

f. Diving and underwater swimming apparatus specially designed or modified for military use, as follows:

f.1. Self-contained diving rebreathers, closed or semi-closed circuit;

f.2. Underwater swimming apparatus specially designed for use with the diving apparatus specified in subparagraph f.1;

N.B.: See also 8A002.q.

g. through w. [Reserved]

x. "Parts," "components," "accessories" and "attachments" that are "specially designed" for a commodity enumerated or otherwise described in ECCN 8A620 (except for 8A620.b or 8A620.y) and not elsewhere specified on the USML, in 8A620.y or 3A611.y.

Note 1: Forgings, castings, and other unfinished products, such as extrusions and machined bodies, that have reached a stage in manufacturing where they are clearly identifiable by mechanical properties, material composition, geometry, or function as commodities controlled by ECCN 8A620.x are controlled by ECCN 8A620.x.

Note 2: "Parts," "components," "accessories" and "attachments" specified in ECCN 8A620.y are subject to the controls of that paragraph.

y. Specific "parts," "components," "accessories," and "attachments" "specially designed" for a commodity subject to control in this ECCN, as follows, and "parts," "components," "accessories," and "attachments" "specially designed" therefor:

y.1. Public address (PA) systems;

y.2. Filters and filter assemblies, hoses, lines, fittings, couplings, and brackets for pneumatic, hydraulic, oil and fuel systems;

y.3. Galleys;

y.4. Lavatories;

y.5. Magnetic compass, magnetic azimuth detector;

y.6. Medical facilities;

y.7. Potable water tanks, filters, valves, hoses, lines, fittings, couplings, and brackets;

y.8. Panel knobs, indicators, switches, buttons, and dials whether unfiltered or filtered for use with night vision imaging systems;

y.9. Emergency lighting;

y.10. Gauges and indicators;

y.11. Audio selector panels.

8A992 Vessels, marine systems or equipment, not controlled by 8A001 or 8A002, and "specially designed" "parts" and "components" therefor, and marine boilers and "parts," "components," "accessories," and "attachments" therefor (see List of Items Controlled).

License Requirements

Reason for Control: AT, Foreign policy

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.
Russian industry sector sanctions apply to entire entry	See § 746.8 for specific license requirements and license review policy.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: 1. See also 8A002. 2. Marine gas turbine engines are not controlled in paragraph .g of this entry. See ECCN 9A619 for possible controls on marine gas turbine engines specially designed for a military use. See ECCN 9A002 for possible controls on marine gas turbine engines not specially designed for a military use. Marine gas turbine engines subject to the EAR that are not controlled in ECCNs 9A002 or 9A619 are designated EAR99.

Related Definitions: N/A

Items:

a. Underwater vision systems, as follows:

a.1. Television systems (comprising camera, lights, monitoring and signal transmission equipment) having a limiting resolution when measured in air of more than 500 lines and "specially designed" or modified for remote operation with a submersible vehicle; *or*

a.2. Underwater television cameras having a limiting resolution when measured in air of more than 700 lines;

Technical Note: Limiting resolution in television is a measure of horizontal resolution usually expressed in terms of the maximum number of lines per picture height discriminated on a test chart, using IEEE Standard 208/1960 or any equivalent standard.

b. Photographic still cameras “specially designed” or modified for underwater use, having a film format of 35 mm or larger, and having autofocusing or remote focusing “specially designed” for underwater use;

c. Stroboscopic light systems, “specially designed” or modified for underwater use, capable of a light output energy of more than 300 J per flash;

d. Other underwater camera equipment, n.e.s.;

e. Other submersible systems, n.e.s.;

f. Vessels, n.e.s., including inflatable boats, and “specially designed” “parts” and “components” therefor, n.e.s.;

g. Marine engines (both inboard and outboard) and submarine engines, n.e.s.; and “specially designed” “parts” and “components” therefor, n.e.s.;

h. Other self-contained underwater breathing apparatus (scuba gear) and related equipment, n.e.s.;

i. Life jackets, inflation cartridges, compasses, wetsuits, masks, fins, weight belts, and dive computers;

j. Underwater lights and propulsion equipment;

k. Air compressors and filtration systems “specially designed” for filling air cylinders.

l. Marine boilers designed to have any of the following characteristics:

l.1. Heat release rate (at maximum rating) equal to or in excess of 190,000 BTU per hour per cubic foot of furnace volume; *or*

l.2. Ratio of steam generated in pounds per hour (at maximum rating) to the dry weight of the boiler in pounds equal to or in excess of 0.83.

m. Major “components,” “accessories,” and “attachments” for marine boilers described in 8A992.l.

B. “Test”, “Inspection” and “Production Equipment”

8B001 Water Tunnels Designed to Have a Background Noise of Less Than 100 dB (Reference 1 μPa, 1 Hz) Within the Frequency Range Exceeding 0 Hz But Not Exceeding to 500 Hz and Designed for Measuring Acoustic Fields Generated by a Hydro-Flow Around Propulsion System Models.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of All license exceptions)

LVS: $3,000

GBS: N/A

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

8B609 Test, inspection, and production "equipment" and related commodities "specially designed" for the "development," "production," repair, overhaul or refurbishing of commodities enumerated or otherwise described in ECCN 8A609 or USML Category VI (except for Cat VI(f)(7)), as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $1500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 8B609.

LIST OF ITEMS CONTROLLED

Related Controls: See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. Test, inspection, and production "equipment" "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities enumerated or otherwise described in ECCN 8A609 (except for 8A609.y) or in USML Category VI (except for USML Cat VI(f)(7)), and "parts," "components," "accessories," and "attachments" "specially designed" therefor.

b. [Reserved]

8B620 Test, inspection, and production "equipment" and related commodities "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities enumerated or otherwise described in ECCN 8A620 (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry, except 8B620.b	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $1500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 8B620.

LIST OF ITEMS CONTROLLED

Related Controls: See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. Test, inspection and production "equipment" "specially designed" for the "development," "production," repair, overhaul or refurbishing of commodities enumerated or otherwise described in ECCN 8A620 (except for 8A620.b and .y) and "parts," "components," "accessories," and "attachments" "specially designed" therefor.

b. Test, inspection, and production "equipment" "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities enumerated or otherwise described in ECCN 8A620.b and "parts," "components," "accessories," and "attachments" "specially designed" therefor.

C. "Materials"

8C001 'Syntactic foam' designed for underwater use and having all of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 8A002.a.4.

Related Definition: For the purposes of 8C001, 'Syntactic foam' consists of hollow spheres of plastic or glass embedded in a resin "matrix."

Items:

a. Designed for marine depths exceeding 1,000 m; *and*

b. A density less than 561 kg/m^3.

8C609 Materials "specially designed" for the "development" or "production" of commodities controlled by 8A609 not elsewhere specified in the USML (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $1500

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 8C609.

List of Items Controlled

Related Controls: (1) See USML Categories VI and XIII(f) for controls on materials "specially designed" for vessels of war enumerated or otherwise described in USML Category VI. (2) See ECCN 0A919 for foreign made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. Materials, not enumerated on the USML, that are "specially designed" for commodities enumerated in ECCN 8A609 (except for 8A609.y).

b. [Reserved]

D. "Software"

8D001 "Software" "Specially Designed" or Modified for the "Development," "Production" or "use" of Equipment or Materials, Controlled by 8A (Except 8A992), 8B or 8C.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except for exports or reexports to destinations outside of those countries listed in Country Group A:5 (See Supplement No. 1 to part 740 of the EAR) of "software" "specially designed" for the "development" or "production" of equipment controlled by 8A001.b, 8A001.c.1, or 8A002.o.3.b.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit "software" "specially designed" for the "development" or "production" of equipment in 8A001.b, 8A001.c, 8A002.b, 8A002.h, 8A002.j, 8A002.o.3 or 8A002.p to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

8D002 Specific "software" "specially designed" or modified for the "development", "production", repair, overhaul or refurbishing (re-machining) of propellers "specially designed" for underwater noise reduction.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: Yes

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit any software in this entry to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: See also 8D992

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

8D609 "Software" "specially designed" for the "development," "production," operation or maintenance of commodities controlled by 8A609, 8B609, or 8C609 (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry, except 8D609.y	NS Column 1.
RS applies to entire entry, except 8D609.y	RS Column 1.
RS applies to 8D609.y	China, Russia, or Venezuela (see § 742.6(a)(7)).

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.
UN applies to entire entry, except 8D609.y	See § 746.1(b) for UN controls.

LIST BASED LICENSE EXCEPTIONS (SEE PART 740 FOR A DESCRIPTION OF ALL LICENSE EXCEPTIONS)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any "software" in 8D609.

LIST OF ITEMS CONTROLLED

Related Controls: (1) "Software" directly related to articles enumerated in USML Category VI is controlled under USML Category VI(g). (2) See ECCN 0A919 for foreign made "military commodities" that incorporate more than a de minimis amount of U.S.-origin "600 series" controlled content.

Related Definitions: N/A

Items:

a. "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCN 8A609, ECCN 8B609, or ECCN 8C609 (except for commodities controlled by ECCN 8A609.y).

b. through .x [Reserved]

y. Specific "software" "specially designed" for the "development," "production," operation, or maintenance of commodities in ECCN 8A609.y.

8D620 "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by 8A620 or 8B620 (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry, except 8D620.b and .y	NS Column 1.
RS applies to entire entry, except 8D620.y	RS Column 1.
RS applies to 8D620.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry, except 8D620.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any "software" in 8D620.

List of Items Controlled

Related Controls: (1) "Software" directly related to articles enumerated or otherwise described in USML Category XX is controlled under USML Category XX(d). (2) See ECCN 0A919 for foreign made "military commodities" that incorporate more than a de minimis amount of U.S.-origin "600 series" controlled content.

Related Definitions: N/A

Items:

a. "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCN 8A620 or ECCN 8B620 (except for commodities controlled by ECCN 8A620.b or .y or ECCN 8B620.b).

b. "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCN 8A620.b or ECCN 8B620.b.

c. through .x [Reserved]

y. Specific "software" "specially designed" for the "development," "production," operation, or maintenance of commodities in ECCN 8A620.y.

8D992 "Software" "specially designed" or modified for the "development", "production" or "use" of equipment controlled by 8A992.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

8D999 "Software" "specially designed" for the operation of unmanned submersible vehicles used in the oil and gas industry.

LICENSE REQUIREMENTS

Reason for Control: Foreign policy

Control(s)	Country chart (see Supp. No. 1 to part 738)
Russian industry sector sanctions apply to entire entry	See § 746.8 for specific license requirements and license review policy.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

E. "Technology"

8E001 "Technology" According to the General Technology Note for the "Development" or "Production" of Equipment or Materials, Controlled by 8A (Except 8A992), 8B or 8C.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: Yes, except for exports or reexport to destinations outside of those countries listed in Country Group A:5 (Supplement No. 1 to part 740 of the EAR) of "technology" for items controlled by 8A001.b, 8A001.c.1 or 8A002.o.3.b.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit "technology" according to the General Technology Note for the "development" or "production" of equipment specified by 8A001.b, 8A001.c, 8A002.b, 8A002.h, 8A002.j, 8A002.o.3 or 8A002.p to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

8E002 Other "technology" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

License Exceptions Note: License Exception TSU is not applicable for the repair "technology" controlled by 8E002.a or .b, see Supplement No. 2 to part 774.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit technology in 8E002.a to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: See also 8E992.

Related Definitions: N/A

Items:

a. "Technology" for the "development", "production", repair, overhaul or refurbishing (re-machining) of propellers "specially designed" for underwater noise reduction;

b. “Technology” for the overhaul or refurbishing of equipment controlled by 8A001, 8A002.b, 8A002.j, 8A002.o or 8A002.p.

c. “Technology” according to the General Technology Note for the “development” or “production” of any of the following:

c.1. Surface-effect vehicles (fully skirted variety) having all of the following:

c.1.a. Maximum design speed, fully loaded, exceeding 30 knots in a significant wave height of 1.25 m or more;

c.1.b. Cushion pressure exceeding 3,830 Pa; *and*

c.1.c. Light-ship-to-full-load displacement ratio of less than 0.70;

c.2. Surface-effect vehicles (rigid sidewalls) with a maximum design speed, fully loaded, exceeding 40 knots in a significant wave height of 3.25 m or more;

c.3. Hydrofoil vessels with active systems for automatically controlling foil systems, with a maximum design speed, fully loaded, of 40 knots or more in a significant wave height of 3.25 m or more; *or*

c.4. 'Small waterplane area vessels' having any of the following:

c.4.a. Full load displacement exceeding 500 tonnes with a maximum design speed, fully loaded, exceeding 35 knots in a significant wave height of 3.25 m or more; *or*

c.4.b. Full load displacement exceeding 1,500 tonnes with a maximum design speed, fully loaded, exceeding 25 knots in a significant wave height of 4 m or more.

> *Technical Note: For the purposes of 8E002.c.4, a 'small waterplane area vessel' is defined by the following formula: waterplane area at an operational design draft less than 2x (displaced volume at the operational design draft)$^{2/3}$.*

8E609 “Technology” “required” for the “development,” “production,” operation, installation, maintenance, repair, overhaul, or refurbishing of commodities controlled by 8A609, 8B609, or 8C609, or “software” controlled by 8D609 (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry, except 8E609.y	NS Column 1.
RS applies to entire entry, except 8E609.y	RS Column 1.
RS applies to 8E609.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry, except 8E609.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any "technology" in 8E609.

List of Items Controlled

Related Controls: Technical data directly related to articles enumerated or otherwise described in USML Category VI are controlled under USML Category VI(g).

Related Definitions: N/A

Items:

a. "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities controlled by ECCN 8A609, 8B609, or 8C609 (except for commodities controlled by ECCN 8A609.y), or "software" controlled by ECCN 8D609.

b. through .x [Reserved]

y. Specific "technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities or software in ECCN 8A609.y or 8D609.y.

8E620 "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities controlled by 8A620 or 8B620, or "software" controlled by 8D620 (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart see Supp. No. 1 to part 738)
NS applies to entire entry, except 8E620.b and .y	NS Column 1.
RS applies to entire entry, except 8E620.y	RS Column 1.
RS applies to 8E620.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry, except 8E620.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any "technology" in 8E620.

List of Items Controlled

Related Controls: Technical data directly related to articles enumerated or otherwise described in USML Category XX are controlled under USML Category XX(d).

Related Definitions: N/A

Items:

a. "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities controlled by ECCN 8A620 or 8B620 or "software" controlled by ECCN 8D620 (except for commodities controlled by ECCN 8A620.b or .y or ECCN 8B620.b or "software" controlled by 8D620.b or .y).

b. "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities controlled by ECCN 8A620.b or 8B620.b or "software" controlled by ECCN 8D620.b.

c. through .x [Reserved]

y. Specific "technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul or refurbishing of commodities or software in ECCN 8A620.y or 8D620.y.

8E992 "Technology" for the "development", "production" or "use" of equipment controlled by 8A992.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

EAR99 Items subject to the EAR that are not elsewhere specified in this CCL Category or in any other category in the CCL are designated by the number EAR99.

Category 9—Aerospace and Propulsion

A. "End Items", "Equipment", "Accessories", "Attachments", "Parts", "Components" and "Systems"

> *N.B.: For propulsion systems designed or rated against neutron or transient ionizing radiation, see the U.S. Munitions List, 22 CFR part 121.*

9A001 Aero gas turbine engines having any of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to only to those engines that meet the characteristics listed in 9A101	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See also 9A101 and 9A991.

Related Definitions: N/A

Items:

a. Incorporating any of the “technologies” controlled by 9E003.a, 9E003.h, or 9E003.i;

Note 1: 9A001 does not control aero gas turbine engines which meet all of the following:
a. Certified by the civil aviation authority in a country listed in Supplement No. 1 to Part 743; and

b. Intended to power non-military manned “aircraft” for which any of the following has been issued by a Wassenaar Arrangement Participating State listed in Supplement No. 1 to Part 743 for the “aircraft” with this specific engine type:

b.1. A civil type certificate; or

b.2. An equivalent document recognized by the International Civil Aviation Organization (ICAO).

Note 2: 9A001 does not apply to aero gas turbine engines designed for Auxiliary Power Units (APUs) approved by the civil aviation authority in a Wassenaar Arrangement Participating State (see

Supplement No. 1 to part 743 of the EAR).

b. [Reserved]

9A002 'Marine gas turbine engines' designed to use liquid fuel and having all of the following (see List of Items Controlled), and "specially designed" assemblies and "components" therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $5,000

GBS: N/A

LIST OF ITEMS CONTROLLED:

Related Controls: N/A

Related Definition: N/A

Items: a. Maximum continuous power when operating in "steady state mode" at standard reference conditions specified by ISO 3977-2:1997 (or national equivalent) of 24,245 kW or more; *and*

b. 'Corrected specific fuel consumption' not exceeding 0.219 kg/kWh at 35% of the maximum continuous power when using liquid fuel.

Note: The term 'marine gas turbine engines' includes those industrial, or aero-derivative, gas turbine engines adapted for a ship's electric power generation or propulsion.

Technical Note: For the purposes of 9A002, 'corrected specific fuel consumption' is the specific fuel consumption of the engine corrected to a marine distillate liquid fuel having a net specific energy (i.e.,

net heating value) of 42 MJ/kg (ISO 3977-2:1997).

9A003 "Specially designed" assemblies or "components", incorporating any of the "technologies" controlled by 9E003.a, 9E003.h, 9E003.i, or 9E003.k, for any of the following aero gas turbine engines (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $5000

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definition: N/A

Items:

a. Controlled by 9A001; *or*

b. Whose design or production origins are either not from a Wassenaar Participating State (see Supplement No. 1 to part 743 of the EAR) or unknown to the manufacturer.

9A004 Space launch vehicles and "spacecraft," "spacecraft buses," "spacecraft payloads," "spacecraft" on-board systems or equipment, terrestrial equipment, and air-launch platforms, and "sub-orbital craft," as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to 9A004 .g, .r, .u, and .w	NS Column 1.
NS applies to 9A004.s, .v, and .x	NS Column 2.
RS applies to 9A004.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to 9A004.g, .s, .u, .v, .w, .x, and .y	AT Column 1.

LICENSE REQUIREMENT NOTE: *ECCN 9A004.a through .f apply to certain space launch vehicles, spacecraft, spacecraft buses, spacecraft payloads, on-board systems or equipment, and terrestrial equipment. They are described in ECCN 9A004.a through .f in order to harmonize 9A004 with the Wassenaar Arrangement Dual-Use List, even though the controls for these items are found under ECCN 9A515 and direct exporters, reexporters, and transferors to see USML Category IV for 9A004.a. See UMSL Category IV for 9A004.a. See ECCN 9A515 for 9A004.b through .f, and .h. See this ECCN 9A004 for .g, .h, .r, and .u through .y.*

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See also 9A104, 9A515, and 9B515. (2) See ECCNs 9E001 (“development”) and 9E002 (“production”) for technology for items controlled by this entry. (3) See USML Categories IV for the space launch vehicles and XV for other spacecraft that are “subject to the ITAR.”

Related Definition: N/A

Items:

a. Space launch vehicles.

b. “Spacecraft.”

c. “Spacecraft buses.”

d. “Spacecraft payloads” incorporating items specified by 3A001.b.1.a.4 or z (if also described in 3A001.b.1.a.4), 3A002.g, 5A001.a.1, .b.3, 5A002.c, z.3 or z.8, .e, z.5, 6A002.a.1, a.2, .b, .d, 6A003.b, 6A004.c, .e, 6A008.d, .e, .k, .l or 9A010.c.

e. On-board systems or equipment, “specially designed” for “spacecraft” and having any of the following functions:

e.1. 'Command and telemetry data handling;'

Note 1 to 9A004.e.1: For the purpose of 9A004.e.1, 'command and telemetry data handling' includes bus data management, storage, and processing.

e.2. 'Payload data handling;' *or*

Note 2 to 9A004.e.2: For the purpose of 9A004.e.2, 'payload data handling' includes payload data management, storage, and processing.

e.3. 'Attitude and orbit control;'

Note 3 to 9A004.e.3: For the purpose of 9A004.e.3, 'attitude and orbit control' includes sensing and actuation to determine and control the position and orientation of a "spacecraft."

f. Terrestrial equipment specially designed for "spacecraft," as follows:

f.1. Telemetry and telecommand equipment "specially designed" for any of the following data processing functions:

f.1.a. Telemetry data processing of frame synchronization and error corrections, for monitoring of operational status (also known as health and safe status) of the "spacecraft bus;" *or*

f.1.b. Command data processing for formatting command data being sent to the "spacecraft" to control the "spacecraft bus;"

f.2. Simulators "specially designed" for 'verification of operational procedures' of "spacecraft".

Technical Note: For the purposes of 9A004.f.2, 'verification of operational procedures' is any of the following:
1. Command sequence confirmation;

2. Operational training;

3. Operational rehearsals; or

4. Operational analysis.

g. "Aircraft" "specially designed" or modified to be air-launch platforms for space launch vehicles or "sub-orbital craft."

h. "Sub-orbital craft."

i. through q. [Reserved]

r. In-space habitats, other than the International Space Station (ISS).

> *Note 4 to 9A004.r: In-space habitats are considered the commercial equivalent of a space station because it is used for persons conducting experiments or space tourism activities.*

s. “Parts,” “components,” “accessories,” and “attachments” that are “specially designed” for in-space habitats in 9A004.r and that are NOT:

s.1. Described on the USML;

s.2. Described in ECCN 7A004 or 7A104;

s.3. Described in an ECCN containing “space-qualified” as a control criterion (refer to 9A515.x.4); or

s.4 Described in 9A001, 9A002, 9A003, 9A515, or 9A991.

t. [Reserved]

u. The James Webb Space Telescope (JWST) being operated under the supervision of the U.S. National Aeronautics and Space Administration (NASA).

v. “Parts,” “components,” “accessories,” and “attachments” that are “specially designed” for the James Webb Space Telescope and that are NOT:

v.1. Described on the USML;

v.2. Microelectronic circuits;

v.3. Described in ECCN 7A004 or 7A104; *or*

v.4. Described in an ECCN containing “space-qualified” as a control criterion (refer to 9A515.x.4).

w. The International Space Station being operated under the supervision of the U.S. National Aeronautics and Space Administration.

x. “Parts,” “components,” “accessories,” and “attachments” that are “specially designed” for the International Space Station.

y. Items that would otherwise be within the scope of ECCN 9A004.s or .x but that have been identified in an interagency-cleared commodity classification (CCATS) pursuant to § 748.3(e) as warranting control in 9A004.y.

y.1. Discrete electronic components not specified in 9A515.e;

y.2. Thermistors for spacecraft applications;

y.3. RF microwave bandpass ceramic filters (*e.g.,* Dielectric Resonator Bandpass Filters);

y.4. Hall effect sensors for spacecraft applications;

y.5. Subminiature (SMA and SMP) plugs and connectors, TNC plugs and cable and connector assemblies with SMA plugs and connectors for spacecraft applications;

y.6. Flight cable assemblies for spacecraft applications;

y.7. Public address (PA) systems;

y.8. Audio selector panels;

y.9. Spacecraft crew, passenger, or participant lavatories and body waste management systems;

y.10. Spacecraft crew, passenger, or participant hygiene facilities and systems;

y.11. Spacecraft crew, passenger, or participant crew rest equipment or sleeping quarters;

y.12. Spacecraft crew, passenger, or participant galleys or food preparation or serving systems;

y.13. Spacecraft crew, passenger, or participant entertainment systems;

y.14. Spacecraft crew, passenger, or participant exercise systems;

y.15. Spacecraft crew, passenger, or participant laundry systems;

y.16. Spacecraft crew, passenger, or participant safety systems not including launch abort systems/launch escape systems, ejector seats, spacesuits, flight suits, helmets, or parts and components therefor;

y.17. Spacecraft crew, passenger, or participant storage units, facilities, or systems (for items related to human safety, welfare, and health);

y.18. Spacecraft crew, passenger, or participant medical facilities or health-related systems for monitoring, evaluating, or assessing, or for providing treatments;

y.19. Spacecraft crew, passenger, or participant information systems (*e.g.,* personal laptops and phones);

y.20. Name plates, identification plates, and identification systems;

y.21. Internal, external, and emergency lighting systems;

y.22. Humidity and CO_2 removal systems;

y.23. Potable water storage systems;

y.24. Water regeneration systems;

y.25. Air filters, filter networks, or air quality systems;

y.26. Space heaters, temperature sensors, or thermostats for human habitation;

y.27. Environmental control systems for human habitation;

y.28. Spacecraft environmental control systems (*e.g.,* air conditioner, air distribution, air filtration and sanitation, CO_2 removal, cabin pressure control, dehumidifier, fire suppression system, nitrogen oxygen recharge system, heater systems, thermostats);

y.29. Plant growth systems;

y.30. Fire extinguishers;

y.31. Flame, smoke, or CO_2 detectors;

y.32. Fire suppression systems;

y.33. Spacecraft crew, passenger, or participant seats and parts and components;

y.34. Spaceflight crew, passenger, or participant ejection seat mounted survival aids;

y.35. Spaceflight crew, passenger, or participant life rafts;

y.36. Spacecraft crew, passenger, or participant locator beacons;

y.37. Spacecraft crew, passenger, or participant mirrors;

y.38. Spacecraft crew, passenger, or participant windows;

y.39. Spacecraft locator beacons;

y.40. Viewing windows on non-crewed spacecraft;

y.41. Hydraulic, pneumatic, oil, fuel, gas, propellant, fluid, and thermal control fluid reservoirs, filters, filter assemblies, tubing, lines, hoses, check valves, and quick disconnects, and associated fittings, couplings, clamps, brackets, adapters, valves, gaskets, and shims;

y.42. Gauges and indicators;

y.43. Filtered and unfiltered panel knobs, indicators, annunciator panels, switches, buttons and dials;

y.44. Energy dissipating pads for cargo or crew;

y.45. Bracket adapters for bus and payload structures;

y.46. Latches and hinges;

y.47. Boom assemblies;

y.48. Multiplexor and Demultiplexors (MUX & DEMUX);

y.49. Switches, switch bank assemblies, beam select switches, transfer switch assemblies, switch matrices, thermal switches;

y.50. Magnetic torque bars;

y.51. Filters, filter networks;

y.52. Network switches;

y.53. Antenna feed horns;

y.54. Diplexers, modulators, demodulators;

y.55. Backshells, pins, and contacts;

y.56. Measurement devices;

y.57. Non Propulsive landing systems (*e.g.,* skids, inflatable);

y.58. Electrical connectors;

y.59. Electric fans;

y.60. Microphones;

y.61. Speakers;

y.62. Circuit breakers; *and*

y.63. Printed circuit boards.

Note 5 to 9A004: An item operating on any celestial body other than Earth is treated as if it is on Earth for classification purposes on the CCL.

9A005 Liquid rocket propulsion systems containing any of the systems or "components," controlled by 9A006. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9A006 Systems, "components," "specially designed" for liquid rocket propulsion systems. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9A007 Solid rocket propulsion systems. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9A008 "Components" "specially designed" for solid rocket propulsion systems. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9A009 Hybrid rocket propulsion systems. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9A010 "Specially Designed" "Parts," "Components," Systems and Structures, for Launch Vehicles, Launch Vehicle Propulsion Systems or "Spacecraft". (See Related Controls Paragraph.)

LIST OF ITEMS CONTROLLED

Related Controls: (1) See USML Category IV of the International Traffic in Arms Regulations (ITAR) (22 CFR parts 120 through 130) and ECCN 9A604 for paragraphs 9A010.a, .b and .d. (2) See USML Category XV of the ITAR and ECCN 9A515 for paragraph 9A010.c. (3) See Supplement No. 4 to part 774, Order of Review for guidance on the process for determining classification of items.

Related Definitions: N/A

Items:

a. "Parts", "components" and structures, each exceeding 10 kg and "specially designed" for launch vehicles manufactured using any of the following:

a.1. "Composite" materials consisting of "fibrous or filamentary materials" specified by 1C010.e and resins specified by 1C008 or 1C009.b;

a.2. Metal "matrix" "composites" reinforced by any of the following:

a.2.a. Materials specified by 1C007;

a.2.b. "Fibrous or filamentary materials" specified by 1C010; *or*

a.2.c. Aluminides specified by 1C002.a; *or*

a.3. Ceramic "matrix" "composite" materials specified by 1C007;

> *Note: The weight cut-off is not relevant for nose cones.*

b. "Parts", "components" and structures, "specially designed" for launch vehicle propulsion systems specified by 9A005 to 9A009, manufactured using any of the following:

b.1. "Fibrous or filamentary materials" specified by 1C010.e and resins specified by 1C008 or 1C009.b;

b.2. Metal "Matrix "composites" reinforced by any of the following:

b.2.a. Materials specified by 1C007;

b.2.b. “Fibrous or filamentary materials” specified by 1C010; *or*

b.2.c. Aluminides specified by 1C002.a; *or*

b.3. Ceramic “matrix” “composite” materials specified by 1C007;

c. Structural components and isolation systems, specially designed to control actively the dynamic response or distortion of “spacecraft” structures;

d. Pulsed liquid rocket engines with thrust-to-weight ratios equal to or more than 1 kN/kg and a 'response time' of less than 30 ms.

Technical Note: For the purposes of 9A010.d, 'response time' means the time required to achieve 90% of total rated thrust from start-up.

9A011 Ramjet, scramjet or 'combined cycle engines', and “specially designed” “parts” and “components” therefor. (These items are “subject to the ITAR.” See 22 CFR parts 120 through 130.)

Technical Note: For the purposes of 9A011, 'combined cycle engines' combine two or more of the following types of engines:
—Gas turbine engine (turbojet, turboprop and turbofan);

—Ramjet or scramjet;

—Rocket motor or engine (liquid/gel/solid-propellant and hybrid).

9A012 Non-military “Unmanned Aerial Vehicles,” (“UAVs”), unmanned “airships”, related equipment and “components”, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart (See supp. no. 1 to part 738)
NS applies to entire entry	NS

Control(s)	Country chart (See supp. no. 1 to part 738)
MT applies to non-military Unmanned Aerial Vehicles (UAVs) and Remotely Piloted Vehicles (RPVs) that are capable of a maximum range of at least 300 kilometers (km), regardless of payload, and UAVs that meet the requirements of 9A120 AT applies to entire entry	Column 1. MT Column 1. AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See the U.S. Munitions List Category VIII (22 CFR part 121). (2) Also see ECCN 9A610 and § 744.3 of the EAR. (3) For “UAVs” that are “sub-orbital craft,” see ECCNs 9A004.h and 9A515.a.

Related Definitions: N/A

Items:

a. “UAVs” or unmanned “airships”, designed to have controlled flight out of the direct 'natural vision' of the 'operator' and having any of the following:

a.1. Having all of the following:

a.1.a. A maximum 'endurance' greater than or equal to 30 minutes but less than 1 hour; and

a.1.b. Designed to take-off and have stable controlled flight in wind gusts equal to or exceeding 46.3 km/h (25 knots); *or*

a.2. A maximum 'endurance' of 1 hour or greater;

Technical Notes:

1. For the purposes of 9A012.a, 'operator' is a person who initiates or commands the "UAV" or unmanned "airship" flight.

2. For the purposes of 9A012.a, 'endurance' is to be calculated for ISA conditions (ISO 2533:1975) at sea level in zero wind.

3. For the purposes of 9A012.a, 'natural vision' means unaided human sight, with or without corrective lenses.

b. Related equipment and "components", as follows:

b.1 [Reserved]

b.2. [Reserved]

b.3. Equipment or "components" "specially designed" to convert a manned "aircraft" or a manned "airship" to a "UAV" or unmanned "airship", controlled by 9A012.a;

b.4. Air breathing reciprocating or rotary internal combustion type engines, "specially designed" or modified to propel "UAVs" or unmanned "airships", at altitudes above 15,240 meters (50,000 feet).

9A018 Equipment on the Wassenaar Arrangement Munitions List.

(a) See ECCN 9A610 for the aircraft, refuelers, ground equipment, parachutes, harnesses, and instrument flight trainers, as well as "parts", "accessories," and "attachments" for the forgoing that, immediately prior to October 15, 2013, were classified under 9A018.a.1, .a.3, .c, .d, .e, or .f.

(b) See ECCN 9A619 for military trainer aircraft turbo prop engines and "parts" and "components" therefor that, immediately prior to October 15, 2013, were classified under ECCN 9A018.a.2 or .a.3.

(c) See ECCN 0A606.b for certain armored ground transport vehicles that prior to January 6, 2014 were classified under ECCN 9A018.b.

9A101 Turbojet and turbofan engines, other than those controlled by 9A001, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.

Control(s)	Country chart (see Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: 9A101.b controls only engines for non-military unmanned aerial vehicles [UAVs] or remotely piloted vehicles [RPVs], and does not control other engines designed or modified for use in “missiles”, which are “subject to the ITAR” (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items:

a. Engines having all of the following characteristics:

a.1. 'Maximum thrust value' greater than 400 N (achieved un-installed) excluding civil certified engines with a maximum thrust value greater than 8,890 N (achieved un-installed);

a.2. Specific fuel consumption of 0.15 kg N^{-1} h^{-1} or less;

a.3. 'Dry weight' less than 750 kg; *and*

a.4. 'First-stage rotor diameter' less than 1 m; *or*

Technical Notes: 1. 'Maximum thrust value' in 9A101.a.1 is the manufacturer's demonstrated maximum thrust for the engine type un-installed at sea level static conditions using the ICAO standard atmosphere. The civil type certified thrust value will be equal to or less than the manufacturer's demonstrated maximum thrust for the engine type.
2. Specific fuel consumption is determined at maximum continuous thrust for engine type un-installed at sea level static conditions using the ICAO standard atmosphere.

3. 'Dry weight' is the weight of the engine without fluids (fuel, hydraulic fluid, oil, etc.) and does not include the nacelle (housing).

4. 'First-stage rotor diameter' is the diameter of the first rotating stage of the engine, whether a fan or compressor, measured at the leading edge of the blade tips.

b. Engines designed or modified for use in “missiles” or UAVs with a range equal to or greater than 300 km, regardless of thrust, specific fuel consumption, 'dry weight' or 'first-stage rotor diameter'.

9A102 'Turboprop engine systems' “specially designed” for items controlled in 9A012 for MT reasons, and “specially designed” “parts” and “components” therefor, having a maximum power greater than 10 kW (achieved uninstalled at sea level static conditions using the ICAO standard atmosphere), excluding civil certified engines.

License Requirements

Reason for Control: MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738).
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See also 9A001 and 9A101.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

Technical Note to 9A102: For the purposes of 9A102 a 'turboprop engine system' incorporates all of the following:
a. Turboshaft engine; and

b. Power transmission system to transfer the power to a propeller.

9A103 Liquid propellant tanks "specially designed" for the propellants controlled in ECCNs 1C011, 1C111 or other liquid propellants used in "missiles." (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9A104 Sounding rockets, capable of a range of at least 300 km. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9A105 Liquid propellant rocket engines. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9A106 Systems, "parts" or "components," other than those controlled by 9A006, usable in "missiles," and "specially designed" for liquid rocket propulsion systems, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: Items described in 9A106.a, .b, and .c are "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items: a. Ablative liners for thrust or combustion chambers;

b. Rocket nozzles;

c. Thrust vector control sub-systems;

Technical Note: Examples of methods of achieving thrust vector control controlled by 9A106.c includes:
1. Flexible nozzle;

2. Fluid or secondary gas injection;

3. Movable engine or nozzle;

4. Deflection of exhaust gas steam (jet vanes or probes); or

5. Thrust tabs.

d. Liquid, slurry and gel propellant (including oxidizers) control systems, and "specially designed" "parts" and "components" therefor, designed or modified to operate in vibration environments greater than 10 g rms between 20 Hz and 2000 Hz.

Note: The only servo valves, pumps and gas turbines controlled by 9A106.d, are the following:
a. Servo valves designed for flow rates equal to or greater than 24 liters per minute, at an absolute pressure equal to or greater than 7 MPa, that have an actuator response time of less than 100 ms;

b. Pumps, for liquid propellants, with shaft speeds equal to or greater than 8,000 rpm at the maximum operating mode or with discharge pressures equal to or greater than 7 Mpa; or

c. Gas turbines, for liquid propellant turbopumps, with shaft speeds equal to or greater than 8,000 rpm at the maximum operating mode.

e. Flight control servo valves designed or modified for use in "missiles" and designed or modified to operate in a vibration environment greater than 10g rms over the entire range between 20Hz and 2 kHz.

9A107 Solid propellant rocket motors, usable in rockets with a range capability of 300 km or greater, other than those controlled by 9A007, having total impulse capacity equal to or greater than 8.41×10^5 Ns, but less than 1.1×10^6 Ns. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9A108 Solid rocket propulsion "parts" and "components," other than those controlled by 9A008, usable in rockets with a range capability of 300 km or greater. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9A109 Hybrid rocket motors, usable in rockets with a range capability of 300 km or greater, other than those controlled by 9A009, and "specially designed" "parts" and "components" therefor. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9A110 Composite structures, laminates and manufactures thereof "specially designed" for 9A012 items that are controlled for MT reasons.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 1A002.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9A111 Pulse jet engines, usable in rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km, and "specially designed" "parts" and "components" therefor. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9A115 Apparatus, devices and vehicles, designed or modified for the transport, handling, control, activation and launching of rockets, missiles, and unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: See the U.S. Munitions List (22 CFR part 121). Also see ECCN 9A610.u.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9A116 Reentry vehicles, usable in "missiles," and equipment designed or modified therefor. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9A117 Staging mechanisms, separation mechanisms, and interstages therefor, usable in "missiles". (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9A118 Devices to regulate combustion usable in engines which are usable in rockets, missiles, and unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km, controlled by 9A011 or 9A111. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9A119 Individual rocket stages, usable in rockets with a range capability greater than 300 km or greater, other than those controlled by 9A005, 9A007, 9A009, 9A105, 9A107 and 9A109. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9A120 Complete unmanned aerial vehicles, not specified in 9A012, having all of the following characteristics (see List of Items Controlled).

License Requirements

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCN 9A012 or the U.S. Munitions List Category VIII (22 CFR part 121). Also see ECCN 2B352.i for controls on certain spraying or fogging systems, and "parts" and "components" therefor, "specially designed" or modified for fitting to aircraft, "lighter than air vehicles," or "UAVs."

Related Definitions: N/A

Items: a. Having any of the following:

a.1. An autonomous flight control and navigation capability; *or*

a.2. Capability of controlled-flight out of the direct vision range involving a human operator; *and*

b. Having any of the following:

b.1. Incorporating an aerosol dispensing system/mechanism with a capacity greater than 20 liters; *or*

b.2. Designed or modified to incorporate an aerosol dispensing system/mechanism with a capacity of greater than 20 liters.

> *Note: 9A120 does not control model aircraft, "specially designed" for recreational or competition purposes.*

> *Technical Notes: 1. An aerosol consists of particulate or liquids other than fuel components, by—products or additives, as part of the "payload" to be dispersed in the atmosphere. Examples of aerosols include pesticides for crop dusting and dry chemicals for cloud seeding.*
> *2. An aerosol dispensing system/mechanism contains all above devices (mechanical, electrical, hydraulic, etc.), which are necessary for storage and dispersion of an aerosol into the atmosphere. This includes the possibility of aerosol injection into the combustion exhaust vapor and into the propeller slip stream.*

9A515 "Spacecraft" and related commodities, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry, except .e, .x, and .y	NS Column 1.
RS applies to entire entry, except .e, .x, and .y	RS Column 1.
MT applies to microcircuits in 9A515.d and 9A515.e.2 when "usable in" "missiles" for protecting "missiles" against nuclear effects (*e.g.,* Electromagnetic Pulse (EMP), X-rays, combined blast and thermal effects). MT also applies to 9A515.h when the total impulse capacity is equal to or greater than 8.41×10^5 newton seconds	MT Column 1.
NS applies to 9A515.x	NS Column 2.
RS applies to 9A515.e and .x	RS Column 2.
RS applies to 9A515.y	China, Russia or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.

License Requirement Notes: (1) The Commerce Country Chart is not used for determining license requirements for commodities classified in ECCN 9A515.a.1, .a.2, .a.3, .a.4, and .g. See § 742.6(a)(9), which specifies that such commodities are subject to a worldwide license requirement, except to Australia, Canada, and the United Kingdom.
(2) ECCN 9A004.a through .f apply to certain space launch vehicles, spacecraft, spacecraft buses, spacecraft payloads, on-board systems or equipment, and terrestrial equipment. They are listed in ECCN 9A004.a through .f in order to harmonize 9A004 with the Wassenaar Arrangement Dual-Use List, even though the controls for these items are found under ECCN 9A515 and to direct exporters, reexporters, and transferors to see USML Category IV for 9A004.a. See UMSL Category IV for 9A004.a. See ECCN 9A515 for 9A004.b through .f, and .h. See this ECCN 9A004 for .g, .h, .r, .s, and .u through .y.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: (1) Paragraph (c)(1) of License Exception STA (§ 740.20(c)(1) of the EAR) may not be used for "spacecraft" in ECCNs 9A515.a.1, a.2, a.3, or a.4, "sub-orbital craft," or items in 9A515.g, unless determined by BIS to be eligible for License Exception STA in accordance with § 740.20(g) (License Exception STA eligibility requests for certain 9x515 and "600 series" items). (2) License Exception STA may not be used if the "spacecraft" controlled in ECCN 9A515.a.1, a.2, a.3, or a.4 contains a separable or removable propulsion system described in USML Category IV(d)(2) or USML Category XV(e)(12) and designated MT. (3) Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 9A515.

LIST OF ITEMS CONTROLLED

Related Controls: Spacecraft, launch vehicles and related articles that are described on the USML, and technical data (including "software") directly related thereto, and all services (including training) directly related to the integration of any satellite or spacecraft to a launch vehicle, including both planning and onsite support, or furnishing any assistance (including training) in the launch failure analysis or investigation for items in ECCN 9A515.a, are "subject to the ITAR." All other "spacecraft," as enumerated below and defined in § 772.1, are subject to the controls of this ECCN. See also ECCNs 3A001, 3A002, 3A991, 3A992, 6A002, 6A004, 6A008, and 6A998 for specific "space-qualified" items, 7A004 and 7A104 for star trackers, and 9A004 for the International Space Station (ISS), the James Webb Space Telescope (JWST), and "specially designed" "parts" and "components" therefor. See USML Category XI(c) for controls on certain "Monolithic Microwave Integrated Circuit" ("MMIC") amplifiers. See ECCN 9A610.g for pressure suits used for high altitude aircraft.

Related Definitions: 'Microcircuit' means a device in which a number of passive or active elements are considered as indivisibly associated on or within a continuous structure to perform the function of a circuit.

Items:

"Spacecraft" and other items described in ECCN 9A515 remain subject to the EAR even if exported, reexported, or transferred (in-country) with defense articles "subject to the ITAR" integrated into and included therein as integral parts of the item. In all other cases, such defense articles are subject to the ITAR. For example, a 9A515.a "spacecraft" remains "subject to the EAR" even when it is exported, reexported, or transferred (in-country) with a "hosted payload" described in USML Category XV(e)(17) incorporated therein. In all other cases, a "hosted payload" performing a function described in USML Category XV(a) always remains a USML item. The removal of the defense article subject to the ITAR from the spacecraft is a retransfer under the ITAR and would require an ITAR authorization, regardless of the CCL authorization the spacecraft is exported under. Additionally, transfer of technical data regarding the defense article subject to the ITAR integrated into the spacecraft would require an ITAR authorization.

a. "Spacecraft," including satellites, and space vehicles and "sub-orbital craft," whether designated developmental, experimental, research or scientific, not described in USML Category XV or described in ECCN 9A004.r, .u, or .w, that:

a.1. Have electro-optical remote sensing capabilities and having a clear aperture greater than 0.35 meters, but less than or equal to 0.50 meters;

a.2. Have remote sensing capabilities beyond NIR (*i.e.,* SWIR, MWIR, or LWIR);

a.3. Have radar remote sensing capabilities (*e.g.,* AESA, SAR, or ISAR) having a center frequency equal to or greater than 1.0 GHz, but less than 10.0 GHz and having a bandwidth equal to or greater than 100 MHz, but less than 300 MHz;

a.4. Provide space-based logistics, assembly, or servicing of another “spacecraft”; *or*

a.5. Are not described in ECCN 9A515.a.1, .a.2, .a.3 or .a.4.

Note 1 to 9A515: ECCN 9A515.a includes commercial communications satellites, remote sensing satellites, “sub-orbital craft,” and planetary and interplanetary probes, not identified in ECCN 9A004 or USML Category XV(a).

b. Equipment for telemetry, tracking, and control, as follows:

b.1. Ground control systems and training simulators “specially designed” for telemetry, tracking, and control of the “spacecraft” controlled in paragraphs 9A004.u or 9A515.a;

b.2. Terrestrial equipment “specially designed” for “spacecraft,” as follows:

b.2.a. Telemetry and telecommand equipment “specially designed” for any of the following data processing functions:

b.2.a.1. Telemetry data processing of frame synchronization and error corrections, for monitoring of operational status (also known as health and safe status) of the “spacecraft bus;” *or*

b.2.a.2. Command data processing for formatting command data being sent to the “spacecraft” to control the “spacecraft bus;”

b.2.b. [Reserved]

b.3. Simulators “specially designed” for 'verification of operational procedures' of “spacecraft.”

Technical Note: For the purposes of 9A515.b.3, 'verification of operational procedures' is any of the following:
1. Command sequence confirmation;

2. Operational training;

3. Operational rehearsals; or

4. Operational analysis.

c. [Reserved]

d. Microelectronic circuits (*e.g.,* integrated circuits, microcircuits, or MOSFETs) and discrete electronic components rated, certified, or otherwise specified or described as meeting or exceeding all the following characteristics and that are "specially designed" for defense articles, "600 series" items, or items controlled by ECCNs 9A004.v or 9A515:

d.1. A total dose of 5×10^5 Rads (Si) (5×10^3 Gy (Si));

d.2. A dose rate upset threshold of 5×10^8 Rads (Si)/sec (5×10^6 Gy (Si)/sec);

d.3. A neutron dose of 1×10^{14} n/cm^2 (1 MeV equivalent);

d.4. An uncorrected single event upset sensitivity of 1×10^{-10} errors/bit/day or less, for the CRÈME-MC geosynchronous orbit, Solar Minimum Environment for heavy ion flux; and

d.5. An uncorrected single event upset sensitivity of 1×10^{-10} errors/part or less for a fluence of 1×10^7 protons/cm^2 for proton energy greater than 50 MeV.

e. Microelectronic circuits (*e.g.,* integrated circuits, microcircuits, or MOSFETs) and discrete electronic components that are rated, certified, or otherwise specified or described as meeting or exceeding the characteristics in either paragraph e.1 or e.2, AND "specially designed" for defense articles described in USML Category XV or items controlled by ECCNs 9A004.u or 9A515:

e.1. A total dose ≥1×10^5 Rads (Si) (1×10^3 Gy(Si)) and <5×10^5 Rads (Si) (5×10^3 Gy(Si)); and a single event effect (SEE) (*i.e.,* single event latchup (SEL), single event burnout (SEB), or single event gate rupture (SEGR)) immunity to a linear energy transfer (LET) ≥80 MeV-cm^2/mg; *or*

e.2. A total dose ≥5×10^5 Rads (Si) (5×10^3 Gy (Si)) and not described in 9A515.d.

Note 2 to 9A515.d and .e: See USML Category XI for military electronics. See 3A611.f for PLDs and ASICs programmed for 600 series items.

Note 3 to 9A515.d and .e: See 3A001.a and .z for controls on radiation-hardened microelectronic circuits "subject to the EAR" that are not controlled by 9A515.d or .e.

f. Pressure suits (*i.e.,* space suits) capable of operating at altitudes greater than or equal to 55,000 feet above sea level.

g. Remote sensing components "specially designed" for "spacecraft" described in ECCNs 9A515.a.1 through .a.4 as follows:

g.1. Space-qualified optics (*i.e.,* lens, mirror, membrane having active properties (*e.g.,* adaptive, deformable)) with the largest lateral clear aperture dimension equal to or less than 0.35 meters; or with the largest clear aperture dimension greater than 0.35 meters but less than or equal to 0.50 meters;

g.2. Optical bench assemblies "specially designed" for ECCN 9A515.a.1, a.2, a.3, or a.4 "spacecraft;" *or*

g.3. Primary, secondary, or hosted payloads that perform a function of ECCN 9A515.a.1, a.2, a.3, or a.4 "spacecraft."

h. Spacecraft thrusters using bi-propellants or mono-propellants that provide thrust equal to or less than 150 lbf (*i.e.,* 667.23 N) vacuum thrust.

i. through w. [RESERVED]

w. "Parts," "components," "accessories," and "attachments" that would otherwise be within the scope of ECCN 9A515.x but that have been identified by the interagency as warranting control in 9A515.w, as follows:

w.1. [Reserved]

x. "Parts," "components," "accessories" and "attachments" that are "specially designed" for defense articles described in USML Category XV or items controlled by 9A515, and that are NOT:

x.1. Described on the USML or elsewhere within ECCNs 9A515 or 9A004;

x.2. Microelectronic circuits and discrete electronic components;

x.3. Described in ECCNs 7A004 or 7A104;

x.4. Described in an ECCN containing "space-qualified" as a control criterion (*i.e.,* 3A001.b.1, .e.4 or .z, 3A002.g.1, 3A991.o, 3A992.b.3, 6A002.a.1, .b.2, .d.1, 6A004.c and .d, 6A008.j.1, 6A998.b, or 7A003.d.2);

x.5. Microwave solid state amplifiers and microwave assemblies (refer to ECCN 3A001.b.4 and .z for controls on these items);

x.6. Travelling wave tube amplifiers (refer to ECCN 3A001.b.8 and .z for controls on these items); *or*

x.7. Elsewhere specified in ECCN 9A515.y.

Note 4 to 9A515.x: "Parts," "components," "accessories," and "attachments" described on the USML, either in Category XV(e) or elsewhere, are subject to the ITAR.

Note 5 to 9A515.b and .x: This note clarifies the scope of controls over baseband units (BBU). For

purposes of 9A515.b and .x, a BBU means a device that interprets the original frequency range of a transmission signal. These devices are not controlled under 9A515.b or .x when they do not perform telemetry, track, and control.

y. Items that would otherwise be within the scope of ECCN 9A515.x but that have been identified in an interagency-cleared commodity classification (CCATS) pursuant to § 748.3(e) as warranting control in 9A515.y.

y.1. Discrete electronic components not specified in 9A515.e;

y.2. Thermistors for spacecraft applications;

y.3. RF microwave bandpass ceramic filters (*e.g.,* Dielectric Resonator Bandpass Filters);

y.4. Hall effect sensors for spacecraft applications;

y.5. Subminiature (SMA and SMP) plugs and connectors, TNC plugs and cable and connector assemblies with SMA plugs and connectors for spacecraft applications;

y.6. Flight cable assemblies for spacecraft applications;

y.7. Public address (PA) systems;

y.8. Audio selector panels;

y.9. Spacecraft crew, passenger, or participant lavatories and body waste management systems;

y.10. Spacecraft crew, passenger, or participant hygiene facilities and systems;

y.11. Spacecraft crew, passenger, or participant crew rest equipment or sleeping quarters;

y.12. Spacecraft crew, passenger, or participant galleys or food preparation or serving systems;

y.13. Spacecraft crew, passenger, or participant entertainment systems;

y.14. Spacecraft crew, passenger, or participant exercise systems;

y.15. Spacecraft crew, passenger, or participant laundry systems;

y.16. Spacecraft crew, passenger, or participant safety systems, not including launch abort systems/launch escape systems, ejector seats, spacesuits, flight suits, helmets, or “parts” and “components” therefor;

y.17. Spacecraft crew, passenger, or participant storage units, facilities, or systems (for items related to human safety, welfare, and health);

y.18. Spacecraft crew, passenger, or participant medical facilities or health-related systems for monitoring, evaluating, or assessing, or for providing treatments;

y.19. Spacecraft crew, passenger, or participant information systems (*e.g.,* personal laptops and phones);

y.20. Name plates, identification plates, and identification systems;

y.21. Internal, external, and emergency lighting systems;

y.22. Humidity and CO_2 removal systems;

y.23. Potable water storage systems;

y.24. Water regeneration systems;

y.25. Air filters, filter networks, or air quality systems;

y.26. Space heaters, temperature sensors, or thermostats for human habitation;

y.27. Environmental control systems for human habitation;

y.28. Spacecraft environmental control systems (*e.g.,* air conditioner, air distribution, air filtration and sanitation, CO_2 removal, cabin pressure control, dehumidifier, fire suppression system, nitrogen oxygen recharge system, heater systems, thermostats);

y.29. Plant growth systems;

y.30. Fire extinguishers;

y.31. Flame, smoke, or CO_2 detectors;

y.32. Fire suppression systems;

y.33. Spacecraft crew, passenger, or participant seats, other than ejection seats, and “parts” and “components;”

y.34. Spaceflight crew, passenger, or participant ejection seat mounted survival aids;

y.35. Spaceflight crew, passenger, or participant life rafts;

y.36. Spacecraft crew, passenger, or participant locator beacons;

y.37. Spacecraft crew, passenger, or participant mirrors;

y.38. Spacecraft crew, passenger, or participant windows;

y.39. Spacecraft locator beacons;

y.40. Viewing windows on non-crewed spacecraft;

y.41. Temperature sensors and pressure transducers;

y.42. Thermal control pumps, accumulators, fluid filters and filter assemblies, control valves, heat exchangers, and radiators;

y.43. Hydraulic, pneumatic, oil, fuel, gas, propellant, fluid, and thermal control fluid reservoirs, filters, filter assemblies, tubing, lines, hoses, check valves, and quick disconnects, and associated fittings, couplings, clamps, brackets, adapters, valves, gaskets, shims, and o-rings;

y.44. Gauges and indicators;

y.45. Filtered and unfiltered panel knobs, indicators, annunciator panels, switches, buttons and dials;

y.46. Spacecraft tires and brake systems (does not include sintered mix or carbon/carbon materials);

y.47. Bearings (*e.g.,* Ball, roller, wheel);

y.48. Energy dissipating pads for cargo or crew;

y.49. Spacecraft bus structures;

y.50. Bracket adapters for bus and payload structures;

y.51. Latches and hinges;

y.52. Boom assemblies;

y.53. Cables, cable assemblies, and connectors;

y.54. Batteries and associated battery management circuitry;

y.55. Germanium coated polyimide tapes (*e.g.,* Kapton tape);

y.56. Multiplexors and Demultiplexors (MUX & DEMUX);

y.57. Switches, switch bank assemblies, beam select switches, transfer switch assemblies, switch matrices, thermal switches;

y.58. Magnetic torque bars;

y.59. Filters, filter networks;

y.60. Network switches;

y.61. Reflectors, antennas;

y.62. Antenna feed horns;

y.63. Diplexers, modulators, demodulators;

y.64. Second surface mirrors;

y.65. Backshells, pins and contacts;

y.66. Measurement devices;

y.67. Electrical power distribution and control units;

y.68. Electrical connectors;

y.69. Non-propulsive landing systems (*e.g.,* skids, inflatable);

y.70. Electric fans;

y.71. Microphones;

y.72. Speakers;

y.73. Circuit breakers; *and*

y.74. Printed circuit boards "specially designed" for items classified under 9A515.y

> *Note 6 to 9A515: An item operating on any celestial body other than Earth is treated as if it is on Earth for classification purposes on the CCL.*

9A604 Commodities related to launch vehicles, missiles, and rockets (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, MT, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
RS applies to entire entry	RS Column 1.
MT applies to 9A604.c, .d, and .f	MT Column 1.
RS applies to 9A604.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.

Control(s)	Country chart (see Supp. No. 1 to part 738)
UN applies to entire entry	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in this ECCN 9A604.

List of Items Controlled

Related Controls: (1) Launch vehicles, missiles, and rockets are subject to the ITAR (see USML Category IV). (2) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" controlled content. (3) Thermal batteries for USML Category IV items are subject to the ITAR (see USML Category XIII).

Related Definitions: N/A

Items:

a. through b. [Reserved]

c. "Components" "specially designed" for ramjet, scramjet, pulse jet, or combined cycle engines described in USML Category IV, including devices to regulate combustion in such commodities.

d. "Components" "specially designed" for hybrid rocket motors described in USML Category IV usable in rockets, missiles, or unmanned aerial vehicles capable of a range equal to or greater than 300 km.

e. "Components" "specially designed" for pressure gain combustion-based propulsion systems described in USML Category IV.

f. Composite structures, laminates and manufactures thereof "specially designed" for the following items described in USML Category IV:

f.1. Systems capable of a range equal to or greater than 300 km;

f.2. Individual rocket stages usable in 9A604.f.1. systems;

f.3. Solid propellant rocket motors or hybrid rocket motors having a total impulse capacity equal to or greater than 8.41×10^5 Ns; or

f.4. Liquid propellant rocket engines integrated, or designed or modified to be integrated, into a liquid propellant propulsion system which has a total impulse capacity equal to or greater than 8.41×10^5 Ns.

f.5. Thrust vector control systems usable in rockets, space launch vehicles (SLVs), and missiles capable of delivering at least a 500 kg payload to a range of at least 300 km.

f.6. Re-entry vehicles or warhead heat shields usable in rockets, SLVs, and missiles capable of delivering at least a 500 kg payload to a range of at least 300 km.

f.7. Safing, arming, fuzing, and firing components usable in rockets, SLVs, and missiles capable of delivering at least a 500 kg payload to a range of at least 300 km.

g. through w. [Reserved]

x. "Parts," "components," "accessories," and "attachments" that are "specially designed" for a commodity subject to control in paragraphs .a through .d of this ECCN, or a defense article described in USML Category IV, and not specified elsewhere on the USML or in 9A604.y.

> *Note to 9A604.x: "Parts," "components," "accessories," and "attachments" specified in USML Category IV(h) are subject to the controls of that paragraph.*

y. Specific "parts," "components," "accessories," and "attachments" "specially designed" for a commodity subject to control in this entry, ECCN 9A604, or for a defense article in USML Category IV and not elsewhere specified on the USML or on the CCL, and other commodities, as follows, and "parts," "components," "accessories," and "attachments" "specially designed" therefor:

y.1. "Parts" and minor "components" for landing leg assemblies; *and*

y.2. [RESERVED]

9A610 Military Aircraft and Related Commodities, Other Than Those Enumerated in 9A991.a (See List of Items Controlled).

License Requirements

Reason for Control: NS, RS, MT, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except: 9A610.b; parts and components controlled in 9A610.x if being exported or reexported for use in an aircraft controlled in 9A610.b; and 9A610.y	NS Column 1
RS applies to entire entry except: 9A610.b; parts and components controlled in 9A610.x if being exported or reexported for use in an aircraft controlled in 9A610.b; and 9A610.y	RS Column 1
RS applies to 9A610.y	China, Russia, or Venezuela (see § 742.6(a)(7))
MT applies to 9A610.t, .u, .v, and .w	MT Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry except 9A610.y	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1,500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: (1) Paragraph (c)(1) of License Exception STA (§ 740.20(c)(1) of the EAR) may not be used for any item in 9A610.a (*i.e.,* "end item" military aircraft), unless determined by BIS to be eligible for License Exception STA in accordance with § 740.20(g) (License Exception STA eligibility requests for 9x515 and "600 series" items). (2) Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 9A610.

LIST OF ITEMS CONTROLLED

Related Controls: (1) Military aircraft and related articles that are enumerated in USML Category VIII, and technical data (including software) directly related thereto, are subject to the ITAR. (2) See ECCN 0A919 for controls on foreign-made "military commodities" that incorporate more than a de minimis amount of U.S.-origin "600 series" controlled content. (3) See USML Category XIX and ECCN 9A619 for controls on military aircraft gas turbine engines and related items.

Related Definitions: In paragraph .y of this entry, the term 'fluid' includes liquids and gases.

Items:

a. 'Military Aircraft' “specially designed” for a military use that are not enumerated in USML paragraph VIII(a).

Note 1: For purposes of paragraph .a the term 'military aircraft' means the LM-100J aircraft and any aircraft “specially designed” for a military use that are not enumerated in USML paragraph VIII(a). The term includes: Trainer aircraft; cargo aircraft; utility fixed wing aircraft; military helicopters; observation aircraft; military non-expansive balloons and other lighter-than-air aircraft; and unarmed military aircraft, regardless of origin or designation. Aircraft with modifications made to incorporate safety of flight features or other FAA or NTSB modifications such as transponders and air data recorders are “unmodified” for the purposes of this paragraph .a.

Note 2: 9A610.a does not control 'military aircraft' or “lighter-than-air vehicles” that:
a. Were first manufactured before 1946;

b. Do not incorporate defense articles enumerated or otherwise described on the U.S. Munitions List, unless the items are required to meet safety or airworthiness standards of civil aviation authorities of a Wassenaar Arrangement Participating State; and

c. Do not incorporate weapons enumerated or otherwise described on the U.S. Munitions List, unless inoperable and incapable of being returned to operation.

b. L-100 aircraft manufactured prior to 2013.

c.-d. [Reserved]

e. Mobile aircraft arresting and engagement runway systems for aircraft controlled by either USML Category VIII(a) or ECCN 9A610.a.

f. Pressure refueling equipment and equipment that facilitates operations in confined areas, “specially designed” for aircraft controlled by either USML paragraph VIII(a) or ECCN 9A610.a.

g. Aircrew life support equipment, aircrew safety equipment and other devices for emergency escape from aircraft controlled by either USML paragraph VIII(a) or ECCN 9A610.a.

h. Parachutes, paragliders, complete parachute canopies, harnesses, platforms, electronic release mechanisms, “specially designed” for use with aircraft controlled by either USML paragraph VIII(a) or ECCN 9A610.a, and “equipment” “specially designed” for military high altitude parachutists, such as suits, special helmets, breathing systems, and navigation equipment.

i. Controlled opening equipment or automatic piloting systems, designed for parachuted loads.

j. Ground effect machines (GEMS), including surface effect machines and air cushion vehicles, “specially designed” for use by a military.

k. through s. [Reserved]

t. Composite structures, laminates, and manufactures thereof “specially designed” for unmanned aerial vehicles controlled under USML Category VIII(a) with a range equal to or greater than 300 km.

Note to paragraph .t: Composite structures, laminates, and manufactures thereof “specially designed” for unmanned aerial vehicles controlled under USML Category VIII(a) with a maximum range less than 300 km are controlled in paragraph .x of this entry.

u. Apparatus and devices “specially designed” for the handling, control, activation and non-ship-based launching of UAVs controlled by either USML paragraph VIII(a) or ECCN 9A610.a, and capable of a range equal to or greater than 300 km.

Note to paragraph .u: Apparatus and devices “specially designed” for the handling, control, activation and non-ship-based launching of UAVs controlled by either USML paragraph VIII(a) or ECCN 9A610.a with a maximum range less than 300 km are controlled in paragraph .x of this entry.

v. Radar altimeters designed or modified for use in UAVs controlled by either USML paragraph VIII(a) or ECCN 9A610.a., and capable of delivering at least 500 kilograms payload to a range of at least 300 km.

Note to paragraph .v: Radar altimeters designed or modified for use in UAVs controlled by either USML paragraph VIII(a) or ECCN 9A610.a. that are not capable of delivering at least 500 kilograms payload to a range of at least 300 km are controlled in paragraph .x of this entry.

w.1. Pneumatic hydraulic, mechanical, electro-optical, or electromechanical flight control systems (including fly-by-wire and fly-by-light systems) and attitude control equipment designed or modified for UAVs controlled by either USML paragraph VIII(a) or ECCN 9A610.a., and capable of delivering at least 500 kilograms payload to a range of at least 300 km.

Note to paragraph .w.1: Pneumatic, hydraulic, mechanical, electro-optical, or electromechanical flight control systems (including fly-by-wire and fly-by-light systems) and attitude control equipment designed or modified for UAVs controlled by either USML paragraph VIII(a) or ECCN 9A610.a., not capable of delivering at least 500 kilograms payload to a range of at least 300 km are controlled in paragraph .x of this entry.

w.2. Flight control servo valves designed or modified for the systems in 9A610.w.1. and designed or modified to operate in a vibration environment greater than 10g rms over the entire range between 20Hz and 2 kHz.

Note to paragraph .w: Paragraphs 9A610.w.1. and 9A610.w.2. include the systems, equipment and valves designed or modified to enable operation of manned aircraft as unmanned aerial vehicles.

x. “Parts,” “components,” “accessories,” and “attachments” that are “specially designed” for a commodity enumerated or otherwise described in ECCN 9A610 (except for 9A610.y) or a defense article enumerated or otherwise described in USML Category VIII and not elsewhere specified on the USML or in 9A610.y, 9A619.y, or 3A611.y.

y. Specific “parts,” “components,” “accessories,” and “attachments” “specially designed” for a commodity subject to control in this entry, ECCN 9A619, or for a defense article in USML Categories VIII or XIX and not elsewhere specified in the USML or the CCL, and other aircraft commodities “specially designed” for a military use, as follows, and “parts,” “components,” “accessories,” and “attachments” “specially designed” therefor:

y.1. Aircraft tires;

y.2. Analog gauges and indicators;

y.3. Audio selector panels;

y.4. Check valves for hydraulic and pneumatic systems;

y.5. Crew rest equipment;

y.6. Ejection seat mounted survival aids;

y.7. Energy dissipating pads for cargo (for pads made from paper or cardboard);

y.8. Fluid filters and filter assemblies;

y.9. Galleys;

y.10. Fluid hoses, straight and unbent lines (for a commodity subject to control in this entry or defense article in USML Category VIII), and fittings, couplings, clamps (for a commodity subject to control in this entry or defense article in USML Category VIII) and brackets therefor;

y.11. Lavatories;

y.12. Life rafts;

y.13. Magnetic compass, magnetic azimuth detector;

y.14. Medical litter provisions;

y.15. Cockpit or cabin mirrors;

y.16. Passenger seats including palletized seats;

y.17. Potable water storage systems;

y.18. Public address (PA) systems;

y.19. Steel brake wear pads (does not include sintered mix or carbon/carbon materials);

y.20. Underwater locator beacons;

y.21. Urine collection bags/pads/cups/pumps;

y.22. Windshield washer and wiper systems;

y.23. Filtered and unfiltered panel knobs, indicators, switches, buttons, and dials;

y.24. Lead-acid and Nickel-Cadmium batteries;

y.25. Propellers, propeller systems, and propeller blades used with reciprocating engines;

y.26. Fire extinguishers;

y.27. Flame and smoke/CO_2 detectors;

y.28. Map cases;

y.29. 'Military Aircraft' that were first manufactured from 1946 to 1955 that do not incorporate defense articles enumerated or otherwise described on the U.S. Munitions List, unless the items are required to meet safety or airworthiness standards of a Wassenaar Arrangement Participating State; and do not incorporate weapons enumerated or otherwise described on the U.S. Munitions List, unless inoperable and incapable of being returned to operation;

y.30. “Parts,” “components,” “accessories,” and “attachments,” other than electronic items or navigation equipment, for use in or with a commodity controlled by ECCN 9A610.h;

y.31. Identification plates and nameplates; *and*

y.32. Fluid manifolds.

9A619 Military gas turbine engines and related commodities (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 9A619.y	NS Column 1.
RS applies to entire entry except 9A619.y	RS Column 1.

Control(s)	Country chart (see Supp. No. 1 to part 738)
RS applies to 9A619.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry except 9A619.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1,500

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in ECCN 9A619.

List of Items Controlled

Related Controls: (1) Military gas turbine engines and related articles that are enumerated or otherwise described in USML Category XIX, and technical data (including software) directly related thereto, are subject to the jurisdiction of the International Traffic in Arms Regulations (ITAR). (2) Gas turbine engines designated 501-D22 are controlled in ECCN 9A991.d regardless of the aircraft type into which they will be installed. (3) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a de minimis amount of U.S.-origin "600 series" controlled content. (4) "Parts," "components," "accessories," and "attachments" specified in USML Category XIX(f) are subject to the controls of that paragraph. (5) "Parts," "components," "accessories," and "attachments" specified in ECCN 9A619.y are subject to the controls of that paragraph.

Related Definitions: In paragraph .y of this entry, the term 'fluid' includes liquids and gases.

Items:

a. "Military Gas Turbine Engines" "specially designed" for a military use that are not controlled in USML Category XIX(a), (b), (c), or (d).

> *Note: For purposes of ECCN 9A619.a, the term "military gas turbine engines" means gas turbine engines "specially designed" for "end items" enumerated in USML Categories VI, VII or VIII or on the CCL under ECCNs 0A606, 8A609 or 9A610.*

b. Digital engine controls (*e.g.,* Full Authority Digital Engine Controls (FADEC) and Digital Electronic Engine Controls (DEEC)) "specially designed" for gas turbine engines controlled in this ECCN 9A619.

c. If "specially designed" for gas turbine engines controlled in 9A619.a, hot section components (*i.e.,* combustion chambers and liners; high pressure turbine blades, vanes, disks and related cooled structure; cooled low pressure turbine blades, vanes, disks and related cooled structure; cooled augmenters; and cooled nozzles);

d. If "specially designed" for gas turbine engines controlled in 9A619.a, uncooled turbine blades, vanes, disks, and tip shrouds;

e. If "specially designed" for gas turbine engines controlled in 9A619.a, combustor cowls, diffusers, domes, and shells;

f. Engine monitoring systems (*i.e.,* those that conduct prognostics, diagnostics, and monitor health) "specially designed" for gas turbine engines and components controlled in this ECCN 9A619.

g. through w. [Reserved]

x. Parts," "components," "accessories," and "attachments" that are "specially designed" for a commodity controlled by this ECCN 9A619 (other than ECCN 9A619.c) or for a defense article enumerated in USML Category XIX and not specified elsewhere on the USML or in ECCN 3A611.y, 9A610.y or 9A619.y.

Note to paragraph .x: "Parts," "components," "accessories," and "attachments" specified in USML subcategory XIX(f) are subject to the controls of that paragraph. "Parts," "components," "accessories," and "attachments" specified in ECCN 3A611.y, 9A610.y or 9A619.y are subject to the controls of that paragraph.

y. Specific "parts," "components," "accessories," and "attachments" "specially designed" for a commodity subject to control in this entry, ECCN 9A610, or for a defense article in USML Category VIII or Category XIX and not elsewhere specified on the USML or in the CCL, and other commodities, as follows, and "parts," "components," "accessories," and "attachments" "specially designed" therefor:

y.1. Oil tank and reservoirs;

y.2. Oil lines and tubes;

y.3. Fluid hoses, and lines (for a commodity subject to control in this entry or a defense article in USML Category XIX), fittings, couplings, and brackets therefor;

y.4. Fluid filters and filter assemblies;

y.5. Clamps (for a commodity subject to control in this entry or a defense article in USML Category XIX);

y.6. Shims;

y.7. Identification plates and nameplates;

y.8. Fluid manifolds; and

y.9. Check valves for fluid systems.

9A620 Cryogenic and "superconductive" equipment, as follows (see list of items controlled).

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (see Part 740 for a description of all license exceptions)

LVS: $1500.

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 9A620.

LIST OF ITEMS CONTROLLED

Related Controls: Electronic items that are enumerated in USML Category XI or other USML categories, and technical data (including software) directly related thereto, are subject to the ITAR.

Related Definitions: N/A

Items: a. Equipment "specially designed" to be installed in a vehicle for military ground, marine, airborne, or space applications, and capable of operating while in motion and of producing or maintaining temperatures below 103 K (−170 °C).

> *Note to 9A620.a: ECCN 9A620.a includes mobile systems incorporating or employing "accessories" or "components" manufactured from non-metallic or non-electrical conductive materials such as plastics or epoxy-impregnated materials.*

b. "Superconductive" electrical equipment (rotating machinery and transformers) "specially designed" to be installed in a vehicle for military ground, marine, airborne, or space applications, and capable of operating while in motion.

Note to 9A620.b: ECCN 9A620.b. does not control direct-current hybrid homopolar generators that have single-pole normal metal armatures which rotate in a magnetic field produced by superconducting windings, provided those windings are the only superconducting components in the generator.

c. through w. [Reserved].

x. "Parts," "components," "accessories" and "attachments" that are "specially designed" for a commodity controlled by ECCN 9A620.

9A980 Nonmilitary mobile crime science laboratories; and accessories, n.e.s.

Heading Note: In order for a vehicle to be classified as a nonmilitary mobile crime scene laboratory under ECCN 9A980, the vehicle must contain one or more analytical or laboratory items controlled for Crime Control (CC) reasons on the CCL, such as ECCNs 3A980 and 3A981.

LICENSE REQUIREMENTS

Reason for Control: CC

Control(s)	Country Chart (See Supp. No. 1 to part 738)
CC applies to entire entry	CC Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9A990 Diesel engines, n.e.s., and tractors and "specially designed" "parts" and "components" therefor, n.e.s. (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry except 9A990.a	AT Column 1.
AT applies to 9A990.a only	AT Column 2.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items: a. Diesel engines, n.e.s., for trucks, tractors, and automotive applications of continuous brake horsepower of 400 BHP (298 kW) or greater (performance based on SAE J1349 standard conditions of 100 Kpa and 25°)

b. Off highway wheel tractors of carriage capacity 9 mt (20,000 lbs) or more; and major “components” and accessories, n.e.s.

c. On-Highway tractors, with single or tandem rear axles rated for 9 mt per axel (20,000 lbs.) or greater and “specially designed” major “components”.

9A991 “Aircraft,” n.e.s., and gas turbine engines not controlled by 9A001 or 9A101 and “parts” and “components,” n.e.s. (see List of Items Controlled).

License Requirements

Reason for Control: AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.
UN applies to 9A991.a	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Military aircraft, demilitarized (not specifically equipped or modified for military operation), as follows:

a.1 Cargo aircraft bearing "C" designations and numbered C-45 through C-118 inclusive, C-121 through C-125 inclusive, and C-131, using reciprocating engines only.

a.2 Trainer aircraft bearing "T" designations and using reciprocating engines or turboprop engines with less than 600 horsepower (s.h.p.).

a.3 Utility aircraft bearing "U" designations and using reciprocating engines only.

a.4 All liaison aircraft bearing an "L" designation.

a.5 All observation aircraft bearing "O" designations and using reciprocating engines.

b. Aircraft n.e.s.;

c. Aero gas turbine engines, and "parts" and "components" "specially designed" therefor.

> *Note: 9A991.c does not control aero gas turbine engines that are destined for use in civil "aircraft" and that have been in use in bona fide civil "aircraft" for more than eight years. If they have been in use in bona fide civil "aircraft" for more than eight years, such engines are controlled under 9A991.d.*

d. "Parts" and "components," "specially designed" for "aircraft," n.e.s.

e. Pressurized aircraft breathing equipment, n.e.s.; *and* "parts" and "components" "specially designed" therefor, n.e.s.

9A992 Complete canopies, harnesses, and platforms and electronic release mechanisms therefor, except such types as are in normal sporting use.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

B. "Test", "Inspection" and "Production Equipment"

9B001 Manufacturing equipment, tooling or fixtures, as follows (See List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
MT applies to equipment for engines controlled under 9A001 for MT reasons and for engines controlled under 9A101	MT Column 1.
AT applies to entire entry	AT Column 1.

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $5000, except N/A for MT

GBS: Yes, except N/A for MT

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship commodities in 9B001 to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: For "specially designed" production equipment of systems, sub-systems, "parts" and "components" controlled by *9A005* to *9A009, 9A011, 9A101, 9A105* to *9A109, 9A111,* and *9A116* to *9A119* usable in "missiles" see *9B115.* See also *9B991*.

Related Definitions: N/A

Items:

a. Directional solidification or single crystal casting equipment designed for "superalloys";

b. Casting tooling, "specially designed" for manufacturing gas turbine engine blades, vanes or "tip shrouds", manufactured from refractory metals or ceramics, as follows:

b.1. Cores;

b.2. Shells (moulds);

b.3. Combined core and shell (mould) units;

c. Directional-solidification or single-crystal additive-manufacturing equipment designed for "superalloys".

9B002 On-line (real time) control systems, instrumentation (including sensors) or automated data acquisition and processing equipment, having all of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to equipment for engines controlled under 9A001 for MT reasons and for engines controlled under 9A101	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $3,000, except N/A for MT

GBS: Yes, except N/A for MT

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items: a. "Specially designed" for the "development" of gas turbine engines, assemblies, "parts" or "components"; *and*

b. Incorporating any of the "technologies" controlled by 9E003.h or 9E003.i.

9B003 Equipment "specially designed" for the "production" or test of gas turbine brush seals designed to operate at tip speeds exceeding 335 m/s, and temperatures in excess of 773 K (500 °C), and "specially designed" "components" or "accessories" therefor.

License Requirements

Reason for Control: NS, MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to equipment for engines controlled under 9A001 for MT reasons and for engines controlled under 9A101	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $5000, except N/A for MT

GBS: Yes, except N/A for MT

LIST OF ITEMS CONTROLLED

Related Controls: See also 9B115

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9B004 Tools, dies or fixtures, for the solid state joining of "superalloy", titanium or intermetallic airfoil-to-disk combinations described in 9E003.a.3 or 9E003.a.6 for gas turbines.

Reason for Control: NS, MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to equipment for engines controlled under 9A001 for MT reasons and for engines controlled under 9A101	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $3000, except N/A for MT

GBS: Yes, except N/A for MT

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9B005 On-line (real time) control systems, instrumentation (including sensors) or automated data acquisition and processing equipment, "specially designed" for use with any of the following (see List of Items Controlled).

Reason for Control: NS, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 9B105.

Related Definitions: N/A

Items:

a. Wind tunnels designed for speeds of Mach 1.2 or more;

> *Note: 9B005.a does not control wind tunnels "specially designed" for educational purposes and having a 'test section size' (measured laterally) of less than 250 mm.*

> *Technical Note: For the purposes of 9B005.a Note, 'test section size' means the diameter of the circle, or the side of the square, or the longest side of the rectangle, at the largest test section location.*

b. Devices for simulating flow-environments at speeds exceeding Mach 5, including hot-shot tunnels, plasma arc tunnels, shock tubes, shock tunnels, gas tunnels and light gas guns; *or*

c. Wind tunnels or devices, other than two-dimensional sections, capable of simulating Reynolds number flows exceeding 25×10^6.

9B006 Acoustic vibration test equipment capable of producing sound pressure levels of 160 Db or more (referenced to 20 uPa) with a rated output of 4 kW or more at a test cell temperature exceeding 1,273 K (1,000 °C), and "specially designed" quartz heaters therefor.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $3000

GBS: Yes

LIST OF ITEMS CONTROLLED

Related Controls: See also 9B106. Note that some items in 9B006 may also be controlled under 9B106

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9B007 Equipment "specially designed" for inspecting the integrity of rocket motors and using Non-Destructive Test (NDT) techniques other than planar x-ray or basic physical or chemical analysis.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9B008 Direct measurement wall skin friction transducers "specially designed" to operate at a test flow total (stagnation) temperature exceeding 833 K (560 °C)).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $5000

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9B009 Tooling "specially designed" for producing gas turbine engine powder metallurgy rotor "parts" or "components" having all of the following (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 2
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $5,000

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See 9B002.

Related Definitions: N/A

Items: a. Designed to operate at stress levels of 60% of Ultimate Tensile Strength (UTS) or more measured at a temperature of 873 K (600 °C); *and*

b. Designed to operate at a temperature of 873 K (600 °C) or more.

> *Note: 9B009 does not specify tooling for the production of powder.*

9B010 Equipment "Specially Designed" for the Production of Items Specified by 9A012.

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9B104 'Aerothermodynamic test facilities', usable for rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km and their subsystems, and having an electrical power supply equal to or greater than 5 MW or a gas supply total pressure equal to or greater than 3 MPa.

LICENSE REQUIREMENTS

Reasons for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See ECCNs 9D101, 9E001 and 9E002.

Related Definitions: 'Aerothermodynamic test facilities' include plasma arc jet facilities and plasma wind tunnels for the study of thermal and mechanical effects of airflow on objects.

Items: The list of items controlled is contained in the ECCN heading.

9B105 'Aerodynamic test facilities' for speeds of Mach 0.9 or more, usable for rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km and their subsystems.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 9B005

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

Note: 9B105 does not control wind tunnels for speeds of Mach 3 or less with the dimension of the 'test cross section size' equal to or less than 250 mm.

Technical Notes: 1. 'Aerodynamic test facilities' includes wind tunnels and shock tunnels for the study of airflow over objects.

2. 'Test cross section size' means the diameter of the circle, or the side of the square, or the longest side of the rectangle, or the major axis of the ellipse at the largest 'test cross section' location. 'Test cross section' is the section perpendicular to the flow direction.

9B106 Environmental chambers usable for rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km and their subsystems, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Environmental chambers having all of the following characteristics:

a.1. Capable of simulating any of the following flight conditions:

a.1.a. Altitude equal to or greater than 15,000 m; or

a.1.b. Temperature range from below −50 °C to above 125 °C; and

a.2. Incorporating, or designed or modified to incorporate, a shaker unit or other vibration test equipment to produce vibration environments equal to or greater than 10 g rms, measured 'bare table,' between 20 Hz and 2 kHz while imparting forces equal to or greater than 5 kN;

Technical Notes: 1. Item 9B106.a.2 describes systems that are capable of generating a vibration

environment with a single wave (e.g., a sine wave) and systems capable of generating a broad band random vibration (i.e., power spectrum).
2. The term 'bare table' means a flat table, or surface, with no fixture or fittings.

3. In Item 9B106.a.2, designed or modified means the environmental chamber provides appropriate interfaces (e.g., sealing devices) to incorporate a shaker unit or other vibration test equipment as specified in this Item.

b. Environmental chambers capable of simulating all of the following flight conditions:

b.1. Acoustic environments at an overall sound pressure level of 140 dB or greater (referenced to 2×10^{-5} N/m^2) or with a total rated acoustic power output of 4kW or greater; and

b.2. Any of the following:

b.2.a. Altitude equal to or greater than 15,000 m; or

b.2.b. Temperature range of at least −50 °C to + 125 °C.

9B115 "Specially designed" production "equipment" for systems, sub-systems and "components" controlled by ECCN 9A101 or by USML Category IV(d)(2), (d)(3), (d)(4), or (h)(17).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) Although items described in USML Category IV(d)(2), (d)(3), (d)(4), or (h)(17) are "subject to the ITAR" (see 22 CFR parts 120 through 130), the production "equipment" controlled in this entry that is related to these items is subject to the export licensing authority of BIS. (2) "Specially designed" production "equipment" for

systems, sub-systems, and "components" described in USML Category IV(d)(1), (d)(7), (h)(1), (h)(4), (h)(6), (h)(7), (h)(8), (h)(9), (h)(11), (h)(20), (h)(21), (h)(26), or (h)(28) are controlled by ECCN 9B604. (3) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of US-origin "600 series" controlled content.

Related Definitions: NA

Items: The list of items controlled is contained in the ECCN heading.

9B116 "Specially designed" "production facilities" for systems, sub-systems, and "components" controlled by ECCN 9A012 (applies to MT-controlled items only) or 9A101 or by USML Category IV(d)(2), (d)(3), (d)(4), or (h)(17).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) Although items described in USML Category IV(d)(2), (d)(3), (d)(4), or (h)(17) are "subject to the ITAR" (see 22 CFR parts 120 through 130), the "production facilities" controlled in this entry that are related to these items are subject to the export licensing authority of BIS. (2) "Specially designed" "production facilities" for systems, sub-systems, and "components" described in USML Category IV(d)(1), (d)(7), (h)(1), (h)(4), (h)(6), (h)(7), (h)(8), (h)(9), (h)(11), (h)(20), (h)(21), (h)(26), or (h)(28) are controlled by ECCN 9B604. (3) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of US-origin "600 series" controlled content.

Related Definitions: NA

Items: The list of items controlled is contained in the ECCN heading.

9B117 Test Benches and Test Stands for Solid or Liquid Propellant Rockets, Motors or Rocket Engines, Having Either of the Following Characteristics (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: See also 9B990

Related Definitions: N/A

Items: a. The capacity to handle solid or liquid propellant rocket motors or rocket engines having a thrust greater than 68 kN; or

b. Capable of simultaneously measuring the three axial thrust components.

9B515 Test, inspection, and production "equipment" "specially designed" for "spacecraft" and related commodities, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, RS, AT

Control(s)	Country chart (see supp. no. 1 to part 738)
NS applies to entire entry	NS Column 1.
MT applies to equipment in 9B515.a for the "development" or "production" of commodities in USML Category XV(e)(12) and XV(e)(19) that are MT controlled	MT Column 1.
RS applies to entire entry	RS Column 1.

Control(s)	Country chart (see supp. no. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $1500; $5000 for 9B515.b

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 9B515.

List of Items Controlled

Related Controls: N/A

Related Definitions: N/A

Items: a. Test, inspection, and production "equipment" "specially designed" for the "production" or "development" of commodities enumerated in ECCNs 9A004.u, 9A515.a, or USML Category XV(a) or XV(e).

> *Note: ECCN 9B515.a includes equipment, cells, and stands "specially designed" for the analysis or isolation of faults in commodities enumerated in ECCNs 9A004.u or 9A515.a, or USML Category XV(a) or XV(e).*

b. Environmental test chambers capable of pressures below (10^{-4}) Torr, and "specially designed" for commodities enumerated in 9A515.a or USML Category XV(a).

9B604 Test, inspection, and production "equipment" and related commodities "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities in ECCN 9A604 or related defense articles in USML Category IV (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, MT, AT, UN

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
MT applies to 9B604.a and .b and to 9B604.d "specially designed" "production facilities" or production "equipment" for defense articles identified as MTCR Annex items in USML Category IV(d)(1), (h)(1), (h)(4), (h)(6), (h)(7), (h)(8), (h)(9), (h)(11), (h)(20), (h)(21), or (h)(26)	MT Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a Description of all License Exceptions)

LVS: $1,500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in this ECCN 9B604.

LIST OF ITEMS CONTROLLED

Related Controls: (1) "Production facilities" for the "production" or "development" of commodities enumerated or otherwise described in ECCN 9A012 or 9A101 or in USML Category IV(d)(2), (d)(3), (d)(4), or (h)(17) are controlled by ECCN 9B116. (2) Test, inspection, and other production "equipment" "specially designed" for the "production" or

"development" of commodities enumerated or otherwise described in ECCN 9A101 or in USML Category IV(d)(2), (d)(3), (d)(4), or (h)(17) are controlled by ECCN 9B115. (3) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of US-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. "Production facilities" "specially designed" for items that are controlled by USML Category IV(a)(1) or (a)(2).

b. Test, calibration, and alignment equipment "specially designed" for items that are controlled by USML Category IV(h)(28).

c. Test, inspection, and other production "equipment" that is "specially designed" for the "development," "production," repair, overhaul, or refurbishing of commodities described in ECCN 9A604, or defense articles controlled under USML Category IV, and not specified in ECCN 0B604.a or in ECCN 9B604.a, .b, or .d.

d. "Specially designed" "production facilities" or production "equipment" for systems, sub-systems, and "components" controlled by USML Category IV(d)(1), (d)(7), (h)(1), (h)(4), (h)(6), (h)(7), (h)(8), (h)(9), (h)(11), (h)(20), (h)(21), (h)(26), or (h)(28).

e. through w. [Reserved]

x. "Parts," "components," "accessories," and "attachments" that are "specially designed" for a commodity subject to control in paragraph .a or .b of this ECCN.

9B610 Test, inspection, and production "equipment" and related commodities "specially designed" for the "development" or "production" of commodities enumerated or otherwise described in ECCN 9A610 or USML Category VIII (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, MT, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry except 9B610.c	NS Column 1
RS applies to entire entry	RS Column 1
MT applies to 9B610.c	MT Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $1500

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 9B610.

List of Items Controlled

Related Controls: USML Category VIII(h)(1) controls "parts," "components," "accessories," and "attachments" "specially designed" for the aircraft enumerated or otherwise described in Category VIII(h)(1), but does not control the commodities enumerated or otherwise described in ECCN 9B610. USML Category VIII(h)(2)-(28) controls other aircraft "parts," "components," "accessories," "attachments," and "systems."

Related Definitions: N/A

Items: a. Test, inspection, and production "equipment" "specially designed" for the "production," "development," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities enumerated or otherwise described in ECCN 9A610 (except 9A610.y) or USML Category VIII, and "parts," "components," "accessories," and "attachments" "specially designed" therefor.

b. Environmental test facilities "specially designed" for the certification, qualification, or testing of commodities enumerated or otherwise described in ECCN 9A610 (except for 9A610.y) or USML Category VIII and "parts," "components," "accessories," and "attachments" "specially designed" therefor.

c. "Production facilities" designed or modified for UAVs or drones that are (i) controlled by either USML paragraph VIII(a) or ECCN 9A610.a and (ii) capable of a range equal to or greater than 300 km.

9B619 Test, inspection, and production "equipment" and related commodities "specially designed" for the "development" or "production" of commodities enumerated or otherwise described in ECCN 9A619 or USML Category XIX (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 9B619.y	NS Column 1.
RS applies to entire entry except 9B619.y	RS Column 1.
RS applies to 9B619.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.

Control(s)	Country chart (see Supp. No. 1 to part 738)
UN applies to entire entry except 9B619.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

LVS: $1,500

GBS: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in ECCN 9B619.

List of Items Controlled

Related Controls: USML Category XIX(f)(1) controls "parts," "components," "accessories," and "attachments" "specially designed" for the engines described in Category XIX(f)(1), but does not control the commodities enumerated or otherwise described in ECCN 9B619. USML Category XIX(f)(2)-(11) controls other engine "parts," "components," "accessories," "attachments," and "systems."

Related Definitions: N/A

Items:

a. Test, inspection, and production "equipment" "specially designed" for the "production," "development," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities enumerated or otherwise described in ECCN 9A619 (except for 9A619.y) or in USML Category XIX, and "parts," "components," "accessories," and "attachments" "specially designed" therefor.

b. Equipment, cells, or stands "specially designed" for testing, analysis and fault isolation of engines, "systems," "components," "parts," "accessories," and "attachments" enumerated or otherwise described in ECCN 9A619 (except for 9A619.y) on the CCL or in Category XIX on the USML.

c. through x. [Reserved]

y. Bearing pullers "specially designed" for the "production" or "development" of commodities enumerated or otherwise described in ECCN 9A619 (except for 9A619.y) or USML Category XIX and "parts," "components," "accessories," and "attachments" "specially designed" therefor.

9B620 Test, inspection, and production commodities for cryogenic and "superconductive" equipment (see List of Items controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (see Part 740 for a description of all license exceptions)

LVS: $1500.

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 9B620.

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Test, inspection, and production end items and equipment "specially designed" for the "development," "production," repair, overhaul or refurbishing of items controlled in ECCN 9A620.

b. [Reserved]

9B990 Vibration test equipment and "specially designed" "parts" and "components," n.e.s.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9B991 "Specially designed" "equipment," tooling or fixtures, not controlled by 9B001, for manufacturing or measuring gas turbine blades, vanes or tip shroud castings, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Automated equipment using non-mechanical methods for measuring airfoil wall thickness;

b. Tooling, fixtures or measuring equipment for the “laser”, water jet or ECM/EDM hole drilling processes controlled by 9E003.c;

c. Ceramic core leaching equipment;

d. Ceramic core manufacturing equipment or tools;

e. Ceramic shell wax pattern preparation equipment;

f. Ceramic shell burn out or firing equipment.

C. “Materials”

9C110 Resin impregnated fiber prepregs and metal coated fiber preforms therefor, for composite structures, laminates and manufactures specified in 9A110, made either with organic matrix or metal matrix utilizing fibrous or filamentary reinforcements having a “specific tensile strength” greater than 7.62×10^4 m and a “specific modulus” greater than 3.18×10^6 m.

License Requirements

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: N/A

GBS: N/A

List of Items Controlled

Related Controls: (1) See also 1C010 and 1C210.c.

(2) The only resin impregnated fiber prepregs controlled by entry 9C110 are those using resins with a glass transition temperature (T_g), after cure, exceeding 418 K (145 °C) as determined by ASTM D4065 or national equivalents.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9C610 Materials "specially designed" for commodities controlled by USML Category VIII or ECCN 9A610 and not elsewhere specified in the CCL or the USML (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $1500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in 9C610.

LIST OF ITEMS CONTROLLED a. Materials not elsewhere specified in the USML or the CCL and "specially designed" for commodities enumerated or otherwise described in USML Category VIII or ECCN 9A610 (except 9A610.y).

> *Note 1: Materials enumerated elsewhere in the CCL, such as in a CCL Category 1 ECCN, are controlled pursuant to controls of the applicable ECCN.*

> *Note 2: Materials "specially designed" for both aircraft enumerated in USML Category VIII and aircraft enumerated in ECCN 9A610 are subject to the controls of this ECCN.*

b. [Reserved]

9C619 Materials "specially designed" for commodities controlled by USML Category XIX or ECCN 9A619 and not elsewhere specified in the CCL or on the USML (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, AT, UN

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a description of all license exceptions)

LVS: $1,500

GBS: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in ECCN 9C619.

LIST OF ITEMS CONTROLLED

Related Controls: (1) See USML subcategory XIII(f) for controls on structural materials specifically designed, developed, configured, modified, or adapted for defense articles, such as USML Category XIX engines. (2) See ECCN 0A919 for foreign made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" controlled content.

Related Definitions: N/A

Items: a. Materials not controlled by paragraph .b of this entry and not elsewhere specified in the CCL or on the USML, and "specially designed" for commodities enumerated or otherwise described in USML Category XIX or ECCN 9A619 (except 9A619.y).

b. Materials "specially designed" for use in certain gas turbine engines, as follows:

b.1. Powders "specially designed" for thermal or environmental barrier coating of defense articles enumerated or described in USML Category XIX paragraphs (f)(1)-(f)(4) for engines listed in (f)(1);

b.2. Superalloys (*i.e.,* nickel, cobalt or iron based), used in directionally solidified or single crystal casting, "specially designed" for defense articles enumerated or described in USML Category XIX paragraphs (f)(1)-(f)(4) for engines listed in paragraph (f)(1); or

b.3. Imide matrix, metal matrix, or ceramic matrix composite material (*i.e.,* reinforcing fiber combined with a matrix) "specially designed" for defense articles enumerated or described in USML Category XIX paragraphs (f)(1)-(f)(4) for engines listed in paragraph (f)(1).

Note 1: Materials enumerated elsewhere in the CCL, such as in a CCL Category 1 ECCN, are controlled pursuant to the controls of the applicable ECCN.

Note 2: Materials described in paragraph .a of this entry that are "specially designed" for both an engine enumerated in USML Category XIX and an engine enumerated in ECCN 9A619 are subject to the controls of this ECCN 9C619.

Note 3: Materials described in this entry that are or have been used in gas turbine engines in production (i.e., not in development) that are not enumerated or otherwise described on the USML or ECCN 9A619 are not controlled by this entry.

D. "Software"

9D001 "Software", not specified in 9D003 or 9D004, "specially designed" or modified for the "development" of equipment or "technology" controlled by ECCN 9A001 to 9A004, 9A012, 9A101 (except for items in 9A101.b that are "subject to the ITAR", see 22 CFR part 121), 9A106.d. or .e, 9A110, or 9A120, 9B (except for ECCNs 9B604, 9B610, 9B619, 9B990, and 9B991), or ECCN 9E003.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to "software" for equipment controlled by 9A001 to 9A004, 9A012, 9B001 to 9B010, and technology controlled by 9E003	NS Column 1
MT applies to "software" for equipment controlled by 9B116 for MT reasons	MT Column 1
AT applies to entire entry	AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
	Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit "software" "specially designed" or modified for the "development" of equipment or "technology", specified by ECCNs 9B001.b. or 9E003.a.1, 9E003.a.2 to a.5, 9E003.a.8, or 9E003.h to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: "Software" that is "required" for the "development" of items specified in ECCNs 9A005 to 9A011, 9A101.b (except for items that are subject to the EAR), 9A103 to 9A105, 9A106.a, .b, and .c, 9A107 to 9A109, 9A110 (for items that are "specially designed" for use in missile systems and subsystems), and 9A111 to 9A119 is "subject to the ITAR".

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9D002 "Software", not specified in 9D003 or 9D004, "specially designed" or modified for the "production" of equipment controlled by ECCN 9A001 to 9A004, 9A012, 9A101 (except for items in 9A101.b that are "subject to the ITAR", see 22 CFR part 121), 9A106.d or .e, 9A110, or 9A120, 9B (except for ECCNs 9B604, 9B610, 9B619, 9B990, and 9B991).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to "software" for equipment controlled by 9A001 to 9A004, 9A012, 9B001 to 9B010	NS Column 1
MT applies to "software" for equipment controlled by 9B116 for MT reasons	MT Column 1
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit "software" "specially designed" or modified for the "production" of equipment specified by 9B001.b to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: "Software" that is "required" for the "production" of items specified in ECCNs 9A005 to 9A011, 9A101.b (except for items that are subject to the EAR), 9A103 to 9A105, 9A106.a, .b, and .c, 9A107 to 9A109, 9A110 (for items that are "specially designed" for use in missile systems and subsystems), and 9A111 to 9A119 is "subject to the ITAR".

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9D003 "Software" Incorporating "Technology" Specified by ECCN 9E003.h and Used in "FADEC Systems" for Systems Controlled by ECCN 9A001 to 9A003, 9A101 (Except for Items in 9A101.b That Are "Subject to the ITAR", See 22 CFR Part 121), 9A106.d or .e, or 9B (Except for ECCNs 9B604, 9B610, 9B619, 9B990, and 9B991).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
NS applies to "software" for "use" of "FADEC systems" for equipment controlled by 9A001 to 9A003	NS Column 1.
MT applies to "software" required for the "use" of "FADEC systems" for gas turbine engines controlled by 9A101, or 9A106.	MT Column 1.
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: Yes, except N/A for MT

LIST OF ITEMS CONTROLLED

Related Controls: (1) See also 9D103. (2) "Software" "required" for the "use" of equipment specified in ECCNs 9A004 (except for items that are subject to the EAR), 9A005 to 9A011, 9A101.b (except for items that are subject to the EAR), 9A103 to 9A105, 9A106.a, .b, and .c, 9A107 to 9A109, 9A110 (for items that are "specially designed" for use in missile systems and subsystems), and 9A111 to 9A119 is "subject to the ITAR" (see 22 CFR parts 120 through 130). (3) "Software" directly related to defense articles that are "subject to the ITAR" (see 22 CFR parts 120 through 130) is also "subject to the ITAR" (see 22 CRR parts 120 through 130).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9D004 Other "software" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A.

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit software in 9D004.a and 9D004.c to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR)

LIST OF ITEMS CONTROLLED

Related Controls: See also 9D104.

Related Definitions: N/A

Items: a. 2D or 3D viscous "software", validated with wind tunnel or flight test data required for detailed engine flow modelling;

b. "Software" for testing aero gas turbine engines, assemblies, "parts" or "components", having all of the following:

b.1. "Specially designed" for testing any of the following:

b.1.a. Aero gas turbine engines, assemblies or components, incorporating "technology" specified by 9E003.a, 9E003.h or 9E003.i; *or*

b.1.b. Multi-stage compressors providing either bypass or core flow, specially designed for aero gas turbine engines incorporating "technology" specified by 9E003.a or 9E003.h; *and*

b.2. "Specially designed" for all of the following:

b.2.a. Acquisition and processing of data, in real time; *and*

b.2.b. Feedback control of the test article or test conditions (*e.g.,* temperature, pressure, flow rate) while the test is in progress;

> *Note: 9D004.b does not specify software for operation of the test facility or operator safety (e.g., overspeed shutdown, fire detection and suppression), or production, repair or maintenance acceptance-testing limited to determining if the item has been properly assembled or repaired.*

c. "Software" "specially designed" to control directional solidification or single crystal material growth in equipment specified by 9B001.a or 9B001.c;

d. [Reserved]

e. "Software" "specially designed" or modified for the operation of items specified by 9A012;

f. "Software" "specially designed" to design the internal cooling passages of aero gas turbine engine blades, vanes and "tip shrouds";

g. "Software" having all of the following:

g.1. "Specially designed" to predict aero thermal, aeromechanical and combustion conditions in aero gas turbine engines; *and*

g.2. Theoretical modeling predictions of the aero thermal, aeromechanical and combustion conditions, which have been validated with actual turbine engine (experimental or production) performance data.

9D005 "Software" Specially Designed or Modified for the Operation of Items Specified by 9A004.e or 9A004.f. (This "Software" Is Controlled by ECCN 9D515.)

9D018 "Software" for the "use" of equipment controlled by 9A018.

(a) See ECCN 9D610 for "software" related to aircraft, refuelers, ground equipment, parachutes, harnesses, instrument flight trainers and "parts", "accessories," and "attachments" for the forgoing that, immediately prior to October 15, 2013, were classified under 9A018.a.1, .a.3, .c, .d, .e, or .f.

(b) See ECCN 9D619 for "software" related to military trainer aircraft turbo prop engines and "parts" and "components" therefor that, immediately prior to October 15, 2013, were classified under ECCN 9A018.a.2 or .a.3.

(c) Software related to certain armored ground transport vehicles that prior to January 6, 2014 were classified under ECCN 9A018.b is EAR99 (See 0D606).

9D101 "Software" "specially designed" or modified for the "use" of commodities controlled by 9B104, 9B105, 9B106, 9B116, or 9B117.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) See ECCN 9D610 for "software" related to aircraft, refuelers, ground equipment, parachutes, harnesses, instrument flight trainers and "parts," "accessories," and "attachments" for the forgoing that, immediately prior to October 15, 2013, were classified under 9A018.a.1, .a.3, .c, .d, .e, or .f. (2) See ECCN 9D619 for "software" related to military trainer aircraft turbo prop engines and "parts" and "components" therefor that, immediately prior to October 15, 2013, were classified under ECCN 9A018.a.2 or .a.3.

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9D103 "Software" "specially designed" for modelling, simulation or design integration of "missiles," or the subsystems controlled by 9A005, 9A007, 9A009, 9A105, 9A106, 9A107, 9A108, 9A109, 9A116 or 9A119. (This entry is "subject to the ITAR." See 22 CFR parts 120 through 130.)

9D104 "Software" specially designed or modified for the "use" of equipment controlled by ECCN 9A001, 9A012 (for MT controlled items only), 9A101 (except for items in 9A101.b that are "subject to the ITAR", see 22 CFR part 121), or 9A106.d.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: "Software" for commodities specified in ECCNs 9A005 to 9A011, 9A103 to 9A105, 9A101.b (except for items that are subject to the EAR), 9A106.a, .b, and .c, 9A107 to 9A109, 9A111, 9A115 to 9A118 is "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

> *Note: For a manned aircraft converted to operate as an unmanned aerial vehicle specified in 9A012 and controlled for MT reasons, 9D104 includes "software", as follows:*

a. "Software" "specially designed" or modified to integrate the conversion equipment with the aircraft system functions;

b. "Software" "specially designed" or modified to operate the aircraft as an unmanned aerial vehicle.

9D105 "Software" that coordinates the function of more than one subsystem, "specially designed" or modified for "use" in rockets, missiles, or unmanned aerial vehicles capable of achieving a "range" equal to or greater than 300 km. (These items are "subject to the ITAR." See 22 CFR parts 120 through 130.)

9D515 "Software" "specially designed" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of "spacecraft" and related commodities, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 9D515.x and y	NS Column 1.
RS applies to entire entry except 9D515.x and y	RS Column 1.
NS applies to 9D515.x	NS Column 2.
RS applies to 9D515.x	RS Column 2.
RS applies to 9D515.y, except to Russia for use in, with, or for the International Space Station (ISS), including launch to the ISS	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: (1) Paragraph (c)(1) of License Exception STA (§ 740.20(c)(1) of the EAR) may not be used for 9D515.b, .d, or .e. (2) Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any "software" in 9D515.

List of Items Controlled

Related Controls: (1) "Software" directly related to articles described in USML Category XV is subject to the ITAR. (2) See also ECCNs 3D001, 6D001, 6D002, and 6D991 for controls of specific "software" "specially designed" for certain "space-qualified" items. (3) For "software" for items listed in 9A004.d that are incorporated into "spacecraft payloads", see the appropriate "software" ECCN within those Categories.

Related Definitions: N/A

Items:

a. "Software" (other than "software" controlled in paragraphs .b, .d, or .e of this entry) "specially designed" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities controlled by ECCN 9A515 (except 9A515.d, .e, or .x) or 9B515.

b. "Source code" that:

b.1. Contains the algorithms or control principles (*e.g.,* for clock management), precise orbit determination (*e.g.,* for ephemeris or pseudo range analysis), signal construct (*e.g.,* pseudo-random noise (PRN) anti-spoofing) "specially designed" for items controlled by ECCN 9A515;

b.2. Is "specially designed" for the integration, operation, or control of items controlled by ECCN 9A515;

b.3. Contains algorithms or modules "specially designed" for system, subsystem, component, part, or accessory calibration, manipulation, or control of items controlled by ECCN 9A515;

b.4. Is "specially designed" for data assemblage, extrapolation, or manipulation of items controlled by ECCN 9A515;

b.5. Contains the algorithms or control laws "specially designed" for attitude, position, or flight control of items controlled in ECCN 9A515; or

b.6. Is "specially designed "for built-in test and diagnostics for items controlled by ECCN 9A515.

c. [Reserved]

d. "Software" "specially designed" for the "development," "production," operation, failure analysis or anomaly resolution of commodities controlled by ECCN 9A515.d.

e. "Software" "specially designed" for the "development," "production," operation, failure analysis or anomaly resolution of commodities controlled by ECCN 9A515.e.

f. through w. [Reserved]

x. "Software" "specially designed" for the "development," "production," operation, failure analysis or anomaly resolution of commodities controlled by ECCN 9A515.x.

y. Specific "software" "specially designed" for the "development," "production," operation, or maintenance of commodities enumerated in ECCN 9A515.y.

9D604 "Software" "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCN 9A604 or 9B604 (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, MT, AT, UN

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
MT applies to "software," as described in paragraph .a of this entry, for commodities controlled for MT reasons in ECCN 9A604.c or .d, or ECCN 9B604	MT Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in this ECCN 9D604.

LIST OF ITEMS CONTROLLED

Related Controls: (1) Software directly related to articles enumerated or otherwise described in USML Category IV is controlled under USML Category IV(i). (2) See also ECCNs 9D101 and 9D104 for controls on "software" for the "use" of missiles and related commodities. (3) See ECCN 0A919 for foreign-made "military commodities" that incorporate more than a *de minimis* amount of U.S.-origin "600 series" controlled content.

Related Definitions: N/A

Items a. "Software" "specially designed" for the "development," "production," operation or maintenance of commodities controlled by ECCN 9A604 or ECCN 9B604.

b. [Reserved]

9D610 Software "specially designed" for the "development," "production," operation, or maintenance of military aircraft and related commodities controlled by 9A610, equipment controlled by 9B610, or materials controlled by 9C610 (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, MT, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 9D610.y	NS Column 1.
MT applies to software "specially designed" for the operation, installation, maintenance, repair, overhaul, or refurbishing of commodities controlled for MT reasons in 9A610 or 9B610	MT Column 1.
RS applies to entire entry except 9D610.y	RS Column 1.
RS applies to 9D610.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry except 9D610.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: (1) Paragraph (c)(1) of License Exception STA (§ 740.20(c)(1) of the EAR) may not be used for 9D610.b. (2) Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any software in 9D610.

LIST OF ITEMS CONTROLLED

Related Controls: Software directly related to articles enumerated or otherwise described in USML Category VIII is subject to the control of USML paragraph VIII(i).

Related Definitions: N/A

Items:

a. "Software" (other than software controlled in paragraphs .b or .y of this entry) "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCN 9A610, ECCN 9B610, or ECCN 9C610.

b. "Software" "specially designed" for the "development" or "production" of any of the following:

b.1. Static structural members;

b.2. Exterior skins, removable fairings, non-removable fairings, radomes, access doors and panels, and in-flight opening doors;

b.3. Control surfaces, leading edges, trailing edges, and leading edge flap seals;

b.4. Leading edge flap actuation system commodities (*i.e.,* power drive units, rotary geared actuators, torque tubes, asymmetry brakes, position sensors, and angle gearboxes) "specially designed" for fighter, attack, or bomber aircraft controlled in USML Category VIII;

b.5. Engine inlets and ducting;

b.6. Fatigue life monitoring systems "specially designed" to relate actual usage to the analytical or design spectrum and to compute amount of fatigue life "specially designed" for aircraft controlled by either USML subcategory VIII(a) or ECCN 9A610.a, except for Military Commercial Derivative Aircraft;

b.7. Landing gear, and "parts" and "components" "specially designed" therefor, "specially designed" for use in aircraft weighing more than 21,000 pounds controlled by either USML subcategory VIII(a) or ECCN 9A610.a, except for Military Commercial Derivative Aircraft;

b.8. Conformal fuel tanks and "parts" and "components" "specially designed" therefor;

b.9. Electrical "equipment," "parts," and "components" "specially designed" for electro-magnetic interference (EMI)—*i.e.,* conducted emissions, radiated emissions, conducted susceptibility and radiated susceptibility—protection of aircraft that conform to the requirements of MIL-STD-461;

b.10. HOTAS (Hand-on Throttle and Stick) controls, HOCAS (Hands on Collective and Stick), Active Inceptor Systems (*i.e.,* a combination of Active Side Stick Control Assembly, Active Throttle Quadrant Assembly, and Inceptor Control Unit), rudder pedal assemblies for digital flight control systems, and parts and components "specially designed" therefor;

b.11. Integrated Vehicle Health Management Systems (IVHMS), Condition Based Maintenance (CBM) Systems, and Flight Data Monitoring (FDM) systems;

b.12. Equipment "specially designed" for system prognostic and health management of aircraft;

b.13. Active Vibration Control Systems; or

b.14. Self-sealing fuel bladders "specially designed" to pass a .50 caliber or larger gunfire test (MIL-DTL-5578, MIL-DTL-27422).

c. to x. [Reserved]

y. Specific "software" "specially designed" for the "development," "production," operation, or maintenance of commodities enumerated in ECCN 9A610.y.

9D619 Software "specially designed" for the "development," "production," operation or maintenance of military gas turbine engines and related commodities controlled by 9A619, equipment controlled by 9B619, or materials controlled by 9C619 (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 9D619.y	NS Column 1.
RS applies to entire entry except 9D619.y	RS Column 1.
RS applies to 9D619.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry except 9D619.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: (1) Paragraph (c)(1) of License Exception STA (§ 740.20(c)(1) of the EAR) may not be used for 9D619.b. (2) Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any software in ECCN 9D619.

List of Items Controlled

Related Controls: Software directly related to articles enumerated or otherwise described in USML Category XIX is subject to the control of USML paragraph XIX(g).

Related Definitions: N/A

Items:

a. "Software" (other than software controlled in paragraph .b of this entry) "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCN 9A619 (except 9A619.y), ECCN 9B619 (except 9B619.y), or ECCN 9C619.

b. "Software" "specially designed" for the "development" or "production" of any of the following:

b.1. Front, turbine center, and exhaust frames;

b.2. Low pressure compressor (*i.e.,* fan) "components" and "parts" as follows: nose cones, casings, blades, vanes, spools, shrouds, blisks, shafts and disks;

b.3. High pressure compressor "components" and "parts" as follows: casings, blades, vanes, spools, shrouds, blisks, shafts, disks, and impellers;

b.4. Combustor "components" and "parts" as follows: casings, fuel nozzles, swirlers, swirler cups, deswirlers, valve injectors, igniters, diffusers, liners, chambers, cowlings, domes and shells;

b.5. High pressure turbine "components" and "parts" as follows: casings, shafts, disks, blades, vanes, nozzles, and tip shrouds;

b.6. Low pressure turbine "components" and "parts" as follows: casings, shafts, disks, blades, vanes, nozzles, and tip shrouds;

b.7. Augmentor "components" and "parts" as follows: casings, flame holders, spray bars, pilot burners, augmentor fuel controls, flaps (external, convergent, and divergent), guide and syncronization rings, and flame detectors and sensors;

b.8. Mechanical "components" and "parts" as follows: fuel metering units and fuel pump metering units, valves (fuel throttle, main metering, oil flow management), heat exchangers (air/air, fuel/air, fuel/oil), debris monitoring (inlet and exhaust), seals (carbon, labyrinth, brush, balance piston, and knife-edge), permanent magnetic alternator and generator, eddy current sensors;

b.9. Torquemeter assembly (*i.e.,* housing, shaft, reference shaft, and sleeve);

b.10. Digital engine control systems (*e.g.,* Full Authority Digital Engine Controls (FADEC) and Digital Electronic Engine Controls (DEEC)) "specially designed" for gas turbine engines controlled in this ECCN; or

b.11. Engine monitoring systems (*i.e.,* prognostics, diagnostics, and health) "specially designed" for gas turbine engines and components controlled in this ECCN.

c. to x. [Reserved]

y. Specific "software" "specially designed" for the "development," "production," operation, or maintenance of commodities enumerated in ECCN 9A619.y or 9B619.y.

9D620 "Software" "specially designed" for cryogenic and "superconductive" equipment, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reasons for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (see Part 740 for a description of all license exceptions)

TSR: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any "software" in 9D620.

List of Items Controlled

Related Controls: "Software" directly related to articles enumerated on USML are subject to the control of that USML category.

Related Definitions: N/A

Items: Software "specially designed" for the "development," "production," operation, or maintenance of commodities controlled by ECCNs 9A620 or 9B620.

9D990 "Software", n.e.s., for the "development" or "production" of equipment controlled by 9A990 or 9B990.

License Requirements

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to "software" for equipment under 9A990 except 9A990.a	AT Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to "software" for equipment under 9A990.a only	AT Column 2

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9D991 "Software", for the "development" or "production" of equipment controlled by 9A991 or 9B991.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

E. "Technology"

Note 1: "Development" or "production" "technology" controlled by 9E001 to 9E003 for gas turbine engines remains controlled when used for repair or overhaul. Excluded from 9E001 to 9E003 control are: technical data, drawings or documentation for maintenance activities directly associated with calibration, removal or replacement of damaged or unserviceable line replaceable units, including replacement of whole engines or engine modules.

Note 2: USML Category XV(f) and ECCNs 9E001, 9E002 and 9E515 do not control the data transmitted to or from a satellite or "spacecraft," whether real or simulated, when limited to information about the health, operational status, or measurements or function of, or raw sensor output from, the "spacecraft," "spacecraft" payload(s), or its associated subsystems or components. Such information is not within the scope of information captured within the definition of "technology" in the EAR for purposes of Category 9 Product Group E. Examples of such information, which are commonly referred to as "housekeeping data," include (i) system, hardware, component configuration, and operation status information pertaining to temperatures, pressures, power, currents, voltages, and battery charges; (ii) "spacecraft" or payload orientation or position information, such as state vector or ephemeris information; (iii) payload raw mission or science output, such as images, spectra, particle measurements, or field measurements; (iv) command responses; (v) accurate timing information; and (vi) link budget data. The act of processing such telemetry data—i.e., converting raw data into engineering units or readable products—or encrypting it does not, in and of itself, cause the telemetry data to become subject to the ITAR or to ECCN 9E515 for purposes of 9A515, or to ECCNs 9E001 or 9E002 for purposes of 9A004. All classified technical data directly related to items controlled in USML Category XV or ECCNs 9A515, and defense services using the classified technical data remains subject to the ITAR. This note does not affect controls in USML XV(f), ECCN 9D515, or ECCN 9E515 on software source code or commands that control a "spacecraft," payload, or associated subsystems for purposes of 9A515. This note also does not affect controls in ECCNs 9D001, 9D002, 9E001, or 9E002 on software source code or commands that control a "spacecraft," payload, or associated subsystems for purposes of 9A004.

9E001 "Technology" according to the General Technology Note for the "development" of equipment or "software", controlled by 9A004, 9A012, 9B (except for ECCNs 9B604, 9B610, 9B619, 9B990 and 9B991), or ECCN 9D001 to 9D004, 9D101, or 9D104.

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to "technology" for items controlled by 9A004, 9A012, 9B001 to 9B010, 9D001 to 9D004 for NS reasons	NS Column 1
MT applies to "technology" for items controlled by 9A012, 9B001, 9B002, 9B003, 9B004, 9B005, 9B007, 9B104, 9B105, 9B106, 9B115, 9B116, 9B117, 9D001, 9D002, 9D003, or 9D004 for MT reasons	MT Column 1
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit any technology in this entry to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR)

LIST OF ITEMS CONTROLLED

Related Controls: (1) See also 9E101 and 1E002.f (for controls on "technology" for the repair of controlled structures, laminates or materials). (2) "Technology" required for the "development" of equipment described in ECCNs 9A005 to 9A011 or "software" described in ECCNs 9D103 and 9D105 is "subject to the ITAR."

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

9E002 "Technology" according to the General Technology Note for the "production" of "equipment" controlled by ECCN 9A004 or 9B (except for ECCNs 9B117, 9B604, 9B610, 9B619, 9B990, and 9B991).

LICENSE REQUIREMENTS

Reason for Control: NS, MT, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
MT applies to "technology" for equipment controlled by 9B001, 9B002, 9B003, 9B004, 9B005, 9B007, 9B104, 9B105, 9B106, 9B115 or 9B116 for MT reasons	MT Column 1
AT applies to entire entry	AT Column 1

REPORTING REQUIREMENTS

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: License Exception STA may not be used to ship or transmit any technology in this entry to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

LIST OF ITEMS CONTROLLED

Related Controls: (1) See also 9E102. (2) See also 1E002.f for 'technology" for the repair of controlled structures, laminates, or materials. (3) "Technology" that is required for the "production" of equipment described in ECCNs 9A005 to 9A011 is "subject to the ITAR."

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

9E003 Other "technology" as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, SI, AT

Control(s)	Country chart (see supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
SI applies to 9E003.a.1 through a.8, .h, .i, and .l	See § 742.14 of the EAR for additional information.
AT applies to entire entry	AT Column 1

Reporting Requirements

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: License Exception STA may not be used to ship or transmit any technology in 9E003.a.1 to a.5, 9E003.c., 9E003.h, or 9E003.i (other than technology for fan or power turbines) to any of the destinations listed in Country Group A:5 or A:6 (See Supplement No.1 to part 740 of the EAR).

License Exception STA may not be used to ship or transmit any technology in 9E003.k to any of the destinations listed in Country Group A:6 (See Supplement No.1 to part 740 of the EAR).

List of Items Controlled

Related Controls: (1) Hot section "technology" specifically designed, modified, or equipped for military uses or purposes, or developed principally with U.S. Department of Defense funding, is "subject to the ITAR" (see 22 CFR parts 120 through 130). (2) "Technology" is subject to the EAR when actually applied to a commercial "aircraft" engine program. Exporters may seek to establish commercial application either on a case-by-case basis through submission of documentation demonstrating application to a commercial program in requesting an export license from the Department of Commerce in respect to a specific export, or in the case of use for broad categories of "aircraft," engines, "parts" or "components," a commodity jurisdiction determination from the Department of State.

Related Definitions: N/A

Items:

a. "Technology" "required" for the "development" or "production" of any of the following gas turbine engine "parts," "components" or systems:

a.1. Gas turbine blades, vanes or “tip shrouds”, made from Directionally Solidified (DS) or Single Crystal (SC) alloys and having (in the 001 Miller Index Direction) a stress-rupture life exceeding 400 hours at 1,273 K (1,000 °C) at a stress of 200 MPa, based on the average property values;

Technical Note: For the purposes of 9E003.a.1, stress-rupture life testing is typically conducted on a test specimen.

a.2. Combustors having any of the following:

a.2.a. 'Thermally decoupled liners' designed to operate at 'combustor exit temperature' exceeding 1,883 K (1,610 °C);

a.2.b. Non-metallic liners;

a.2.c. Non-metallic shells; *or*

a.2.d. Liners designed to operate at 'combustor exit temperature' exceeding 1,883 K (1,610 °C) and having holes that meet the parameters specified by 9E003.c;

a.2.e. Utilizing 'pressure gain combustion';

Technical Note: For the purposes of 9E003.a.2.e, in 'pressure gain combustion' the bulk average stagnation pressure at the combustor outlet is greater than the bulk average stagnation pressure at the combustor inlet due primarily to the combustion process, when the engine is running in a “steady state mode” of operation.

Note: The “required” “technology” for holes in 9E003.a.2 is limited to the derivation of the geometry and location of the holes.

Technical Notes: 1. For the purposes of 9E003.a.2.a, 'thermally decoupled liners' are liners that feature at least a support structure designed to carry mechanical loads and a combustion facing structure designed to protect the support structure from the heat of combustion. The combustion facing structure and support structure have independent thermal displacement (mechanical displacement due to thermal load) with respect to one another, i.e., they are thermally decoupled.
2. For the purposes of 9E003.a.2.d, 'combustor exit temperature' is the bulk average gas path total (stagnation) temperature between the combustor exit plane and the leading edge of the turbine inlet guide vane (i.e., measured at engine station T40 as defined in SAE ARP 755A) when the engine is running in a “steady state mode” of operation at the certificated maximum continuous operating temperature.

N.B.: See 9E003.c for “technology” “required” for manufacturing cooling holes.

a.3. “Parts” or “components,” that are any of the following:

a.3.a. Manufactured from organic “composite” materials designed to operate above 588 K (315 °C);

a.3.b. Manufactured from any of the following:

a.3.b.1. Metal “matrix” “composites” reinforced by any of the following:

a.3.b.1.a. Materials controlled by 1C007;

a.3.b.1.b. “Fibrous or filamentary materials” specified by 1C010; *or*

a.3.b.1.c. Aluminides specified by 1C002.a; *or*

a.3.b.2. Ceramic “matrix” “composites” specified by 1C007; *or*

a.3.c. Stators, vanes, blades, tip seals (shrouds), rotating blings, rotating blisks or 'splitter ducts', that are all of the following:

a.3.c.1. Not specified in 9E003.a.3.a;

a.3.c.2. Designed for compressors or fans; *and*

a.3.c.3. Manufactured from material controlled by 1C010.e with resins controlled by 1C008;

Technical Note: For the purposes of 9E003.a.3.c, a 'splitter duct' performs the initial separation of the air-mass flow between the bypass and core sections of the engine.

a.4. Uncooled turbine blades, vanes or “tip shrouds” designed to operate at a 'gas path temperature' of 1,373 K (1,100 °C) or more;

a.5. Cooled turbine blades, vanes or “tip shrouds”, other than those described in 9E003.a.1, designed to operate at a 'gas path temperature' of 1,693 K (1,420 °C) or more;

Technical Note: For the purposes of 9E003.a.5, 'gas path temperature' is the bulk average gas path total (stagnation) temperature at the leading-edge plane of the turbine component when the engine is running in a “steady state mode” of operation at the certificated or specified maximum continuous operating temperature.

a.6. Airfoil-to-disk blade combinations using solid state joining;

a.7. [Reserved]

a.8. 'Damage tolerant' gas turbine engine rotor “parts” or “components” using powder metallurgy materials controlled by 1C002.b; *or*

> *Technical Note: For the purposes of 9E003.a.8, 'damage tolerant' “parts” and “components” are designed using methodology and substantiation to predict and limit crack growth.*

a.9. [Reserved]

> *N.B.: For “FADEC systems”, see 9E003.h.*

a.10. [Reserved]

> *N.B.: For adjustable flow path geometry, see 9E003.i.*

a.11. 'Fan blades' having all of the following:

a.11.a. 20% or more of the total volume being one or more closed cavities containing vacuum or gas only; *and*

a.11.b. One or more closed cavities having a volume of 5 cm^3 or larger;

> *Technical Note: For the purposes of 9E003.a.11, a 'fan blade' is the aerofoil portion of the rotating stage or stages, which provide both compressor and bypass flow in a gas turbine engine.*

b. “Technology” “required” for the “development” or “production” of any of the following:

b.1. Wind tunnel aero-models equipped with non-intrusive sensors capable of transmitting data from the sensors to the data acquisition system; *or*

b.2. “Composite” propeller blades or prop-fans, capable of absorbing more than 2,000 kW at flight speeds exceeding Mach 0.55;

c. “Technology” “required” for manufacturing cooling holes in gas turbine engine “parts” or “components” incorporating any of the “technologies” specified by 9E003.a.1, 9E003.a.2, or 9E003.a.5, and having any of the following:

c.1. Having all of the following:

c.1.a. Minimum 'cross-sectional area' less than 0.45 mm^2;

c.1.b. 'Hole shape ratio' greater than 4.52; *and*

c.1.c. 'Incidence angle' equal to or less than 25°; *or*

c.2. Having all of the following:

c.2.a. Minimum 'cross-sectional area' less than 0.12 mm^2;

c.2.b. 'Hole shape ratio' greater than 5.65; *and*

c.2.c. 'Incidence angle' more than 25°;

Note: 9E003.c does not apply to "technology" for manufacturing constant radius cylindrical holes that are straight through and enter and exit on the external surfaces of the component.

Technical Notes: 1. For the purposes of 9E003.c, the 'cross-sectional area' is the area of the hole in the plane perpendicular to the hole axis.
2. For the purposes of 9E003.c, 'hole shape ratio' is the nominal length of the axis of the hole divided by the square root of its minimum 'cross-sectional area'.

3. For the purposes of 9E003.c, 'incidence angle' is the acute angle measured between the plane tangential to the airfoil surface and the hole axis at the point where the hole axis enters the airfoil surface.

4. For the purposes of 9E003.c, methods for manufacturing holes include "laser" beam machining, water jet machining, Electro-Chemical Machining (ECM) or Electrical Discharge Machining (EDM).

d. "Technology" "required" for the "development" or "production" of helicopter power transfer systems or tilt rotor or tilt wing "aircraft" power transfer systems;

e. "Technology" for the "development" or "production" of reciprocating diesel engine ground vehicle propulsion systems having all of the following:

e.1. 'Box volume' of 1.2 m^3 or less;

e.2. An overall power output of more than 750 kW based on 80/1269/EEC, ISO 2534 or national equivalents; *and*

e.3. Power density of more than 700 kW/m^3 of 'box volume';

Technical Note: For the purposes of 9E003.e.1., 'box volume' is the product of three perpendicular dimensions measured in the following way:
Length: The length of the crankshaft from front flange to flywheel face;

Width: The widest of any of the following:

a. The outside dimension from valve cover to valve cover;

b. The dimensions of the outside edges of the cylinder heads; or

c. The diameter of the flywheel housing;

Height: The largest of any of the following:

a. The dimension of the crankshaft center-line to the top plane of the valve cover (or cylinder head) plus twice the stroke; or

b. The diameter of the flywheel housing.

f. “Technology” “required” for the “production” of “specially designed” “parts” or “components” for high output diesel engines, as follows:

f.1. “Technology” “required” for the “production” of engine systems having all of the following “parts” and “components” employing ceramics materials controlled by 1C007:

f.1.a Cylinder liners;

f.1.b. Pistons;

f.1.c. Cylinder heads; *and*

f.1.d. One or more other “part” or “component” (including exhaust ports, turbochargers, valve guides, valve assemblies or insulated fuel injectors);

f.2. “Technology” “required” for the “production” of turbocharger systems with single-stage compressors and having all of the following:

f.2.a. Operating at pressure ratios of 4:1 or higher;

f.2.b. Mass flow in the range from 30 to 130 kg per minute; *and*

f.2.c. Variable flow area capability within the compressor or turbine sections;

f.3. “Technology” “required” for the “production” of fuel injection systems with a “specially designed” multifuel (*e.g.,* diesel or jet fuel) capability covering a viscosity range from diesel fuel (2.5 cSt at 310.8 K (37.8 °C)) down to gasoline fuel (0.5 cSt at 310.8 K (37.8 °C)) and having all of the following:

f.3.a. Injection amount in excess of 230 mm^3 per injection per cylinder; *and*

f.3.b. Electronic control features “specially designed” for switching governor characteristics automatically depending on fuel property to provide the same torque characteristics by using the appropriate sensors;

g. “Technology” “required” for the “development” or “production” of 'high output diesel engines' for solid, gas phase or liquid film (or combinations thereof) cylinder wall lubrication and permitting operation to temperatures exceeding 723 K (450 °C), measured on the cylinder wall at the top limit of travel of the top ring of the piston;

Technical Note: For the purposes of 9E003.g, 'high output diesel engines' are diesel engines with a specified brake mean effective pressure of 1.8 MPa or more at a speed of 2,300 r.p.m., provided the rated speed is 2,300 r.p.m. or more.

h. “Technology” for gas turbine engine “FADEC systems” as follows:

h.1. “Development” “technology” for deriving the functional requirements for the “parts” or “components” necessary for the “FADEC system” to regulate engine thrust or shaft power (*e.g.,* feedback sensor time constants and accuracies, fuel valve slew rate);

h.2. “Development” or “production” “technology” for control and diagnostic “parts” or “components” unique to the “FADEC system” and used to regulate engine thrust or shaft power;

h.3. “Development” “technology” for the control law algorithms, including “source code”, unique to the “FADEC system” and used to regulate engine thrust or shaft power;

Note: 9E003.h does not apply to technology related to engine-“aircraft” integration required by civil aviation authorities of one or more Wassenaar Arrangement Participating States (See Supplement No. 1 to part 743 of the EAR) to be published for general airline use (e.g., installation manuals, operating instructions, instructions for continued airworthiness) or interface functions (e.g., input/ output processing, airframe thrust or shaft power demand).

i. “Technology” for adjustable flow path systems designed to maintain engine stability for gas generator turbines, fan or power turbines, or propelling nozzles, as follows:

i.1. “Development” “technology” for deriving the functional requirements for the “parts” or “components” that maintain engine stability;

i.2. “Development” or “production” “technology” for “parts” or “components” unique to the adjustable flow path system and that maintain engine stability;

i.3. “Development” “technology” for the control law algorithms, including “source code”, unique to the adjustable flow path system and that maintain engine stability;

Note: 9E003.i does not apply to “technology” for any of the following:

a. Inlet guide vanes;

b. Variable pitch fans or prop-fans;

c. Variable compressor vanes;

d. Compressor bleed valves; or

e. Adjustable flow path geometry for reverse thrust.

j. “Technology” “required” for the “development” of wing-folding systems designed for fixed-wing “aircraft” powered by gas turbine engines.

N.B.: For “technology” “required” for the “development” of wing-folding systems designed for fixed-wing “aircraft” specified in USML Category VIII (a), see USML Category VIII (i).

k. “Technology”, not specified in 9E003.a, 9E003.h, or 9E003.i, “required” for the “development” of any of the following components or systems, “specially designed” for aero gas turbine engines to enable “aircraft” to cruise at Mach 1 or greater for more than 30 minutes:

k.1. Propulsion inlet systems;

k.2. Propulsion exhaust systems;

k.3. 'Reheat systems';

k.4. 'Active thermal management systems' to condition fluids used to lubricate or cool 'engine rotor supports';

k.5. Oil-free 'engine rotor supports'; or

k.6. Systems to remove heat from 'compression system' core gas path flow.

Technical Notes: For the purposes of 9E003.k:
1. Propulsion inlet systems include core flow pre-coolers.

2. 'Reheat systems' provide additional thrust by combusting fuel in exhaust and/or bypass flow downstream of the last turbomachinery stage. 'Reheat systems' are also referred to as afterburners.

3. 'Active thermal management systems' employ methods other than passive oil-to-air cooling or oil-to-fuel cooling, such as vapor cycle systems.

4. 'Compression system' is any stage or combination of stages between the engine inlet face and the combustor that increases gas path pressure through mechanical work.

5. An 'engine rotor support' is the bearing supporting the main engine shaft that drives the compression system or turbine rotors.

N.B. 1 See 9E003.h, for engine control technology.

N.B. 2 See 9E003.i, for adjustable flow path systems technology.

l. "Technology" not otherwise controlled in 9E003.a.1 through a.8, a.10, and .h and used in the "development", "production", or overhaul of hot section "parts" or "components" of civil derivatives of military engines controlled on the U.S. Munitions List.

9E018 "Technology" for the "development," "production," or "use" of equipment controlled by 9A018.

(a) See ECCN 9E610 for "technology" related to aircraft, refuelers, ground equipment, parachutes, harnesses, instrument flight trainers and "parts", "accessories" and "attachments" for the forgoing that, immediately prior to October 15, 2013, were classified under 9A018.a.1, .a.3, .c, .d, .e, or .f.

(b) See ECCN 9E619 for "technology" related to military trainer aircraft turbo prop engines and "parts" and "components" therefor that, immediately prior to October 15, 2013, were classified under ECCN 9A018.a.2 or .a.3.

(c) Technology related to certain armored ground transport vehicles that prior to January 6, 2014 were classified under ECCN 9A018.b is EAR99 (See 0E606).

9E101 "Technology" according to the General Technology Note for the "development" or "production" of commodities or "software" controlled by ECCN 9A012 (applies only to "production" "technology" for MT-controlled items in 9A012), 9A101 (except for items in 9A101.b that are "subject to the ITAR," see 22 CFR part 121), 9A106.d or .e, 9A110 (for items that are "specially designed" for non-military unmanned aerial vehicles controlled by 9A012), 9C110, 9D101, or 9D104.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: "Technology" that is required for items specified in ECCNs 9A101.b (except for items that are subject to the EAR), 9A104, 9A105, 9A106.a, .b, and .c, 9A107 to 9A109, 9A110 (for items that are "specially designed" for use in missile systems and subsystems), 9A111, 9A115 to 9A119, 9D103, and 9D105 is "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9E102 "Technology" according to the General Technology Note for the "use" of commodities or "software" controlled by ECCN 9A004 (except for items in 9A004 that are "subject to the ITAR," see 22 CFR part 121), 9A012, 9A101 (except for items in 9A101.b that are "subject to the ITAR," see 22 CFR part 121), 9A106.d or .e, 9A110 (for items that are "specially designed" for non-military unmanned aerial vehicles controlled by 9A012), 9B105, 9B106, 9B115, 9B116, 9D101, or 9D104.

LICENSE REQUIREMENTS

Reason for Control: MT, AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: (1) For the purpose of this entry, "use" "technology" is limited to items controlled for MT and their subsystems. (2) "Technology" for items specified in ECCNs 9A004 (except for items that are subject to the EAR), 9A005 to 9A011, 9A101.b (except for items that are subject to the EAR), 9A104, 9A105, 9A106.a, .b and .c, 9A107 to 9A109, 9A110 (for items that are "specially designed" for use in missile systems and subsystems), 9A111, 9A115 to 9A119, 9D103, and 9D105 is "subject to the ITAR" (see 22 CFR part 121).

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9E515 "Technology" "required" for the "development," "production," operation, installation, repair, overhaul, or refurbishing of "spacecraft" and related commodities, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, MT, RS, AT

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 9E515.x and .y	NS Column 1.
RS applies to entire entry except 9E515.x and .y	RS Column 1.
MT applies to technology for items in 9A515.d, .e.2, .h, and 9B515.a controlled for MT reasons	MT Column 1.
NS applies to 9E515.x	NS Column 2.
RS applies to 9E515.x	RS Column 2.
RS applies to 9E515.y, except to Russia for use in, with, or for the International Space Station (ISS), including launch to the ISS	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.

License Requirement Note: The Commerce Country Chart is not used for determining license requirements for "technology" classified ECCN 9E515.f. See § 742.6(a)(9), which specifies that such "technology" is subject to a worldwide license requirement, except to Australia, Canada, and the United Kingdom.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: (1) Paragraph (c)(1) of License Exception STA (§ 740.20(c)(1) of the EAR) may not be used for ECCN 9E515.b, .d, .e, or .f unless determined by BIS to be eligible for License Exception STA in accordance with § 740.20(g) (License Exception STA eligibility requests for certain 9x515 and "600 series" items). (2) Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any "technology" in 9E515.

LIST OF ITEMS CONTROLLED

Related Controls: Technical data directly related to articles described in USML Category XV are subject to the ITAR. See also ECCNs 3E001, 3E003, 6E001, and 6E002 for specific "space-qualified" items. See ECCNs 9E001 and 9E002 for technology for the International Space Station, the James Webb Space Telescope (JWST) and "parts," "components," "accessories," and "attachments" "specially designed" therefor. See USML Category XV for controls on technical data and defense services related to launch vehicle integration.

Related Definitions: N/A

Items:

a. "Technology" "required" for the "development," "production," installation, repair (including on-orbit anomaly resolution and analysis beyond established procedures), overhaul, or refurbishing of commodities controlled by ECCN 9A515 (except 9A515.a.1, a.2, a.3, a.4, .b, .d, .e, or .g), ECCN 9B515, or "software" controlled by ECCN 9D515.a.

b. "Technology" "required" for the "development," "production," failure analysis or anomaly resolution of software controlled by ECCN 9D515.b.

c. [Reserved]

d. "Technology" "required" for the "development," "production," operation, failure analysis or anomaly resolution of commodities controlled by ECCN 9A515.d.

e. "Technology" "required" for the "development," "production," failure analysis or anomaly resolution of commodities controlled by ECCN 9A515.e.

f. "Technology" "required" for the "development," "production," installation, repair (including on-orbit anomaly resolution and analysis beyond established procedures), overhaul, or refurbishing of commodities controlled by ECCN 9A515.a.1, a.2, a.3, a.4, or .g.

g. through w. [Reserved]

x. "Technology" "required" for the "development," "production," operation, failure analysis or anomaly resolution of commodities controlled by ECCN 9A515.x.

y. Specific "technology" "required" for the "production," "development," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities or software enumerated in ECCN 9A515.y or 9D515.y.

Note 1: [Reserved]

Note 2: Activities and technology/technical data directly related to or required for the spaceflight (e.g., sub-orbital, orbital, lunar, interplanetary, or otherwise beyond Earth orbit) passenger or participant experience, regardless of whether the passenger or participant experience is for space tourism, scientific or commercial research, commercial manufacturing/production activities, educational, media, or commercial transportation purposes, are not subject to the ITAR or the EAR. Such activities and technology/technical data include those directly related to or required for:
(i) "Spacecraft" access, ingress, and egress, including the operation of all "spacecraft" doors, hatches, and airlocks;

(ii) Physiological training (e.g., human-rated centrifuge training or parabolic flights, pressure suit or spacesuit training/operation);

(iii) Medical evaluation or assessment of the spaceflight passenger or participant;

(iv) Training for and operation by the passenger or participant of health and safety related hardware (e.g., seating, environmental control and life support, hygiene facilities, food preparation, exercise equipment, fire suppression, communications equipment, safety-related clothing or headgear) or emergency procedures;

(v) Viewing of the interior and exterior of the spacecraft or terrestrial mock-ups;

(vi) Observing "spacecraft" operations (e.g., pre-flight checks, landing, in-flight status);

(vii) Training in "spacecraft" or terrestrial mock-ups for connecting to or operating passenger or participant equipment used for purposes other than operating the "spacecraft"; or

(viii) Donning, wearing or utilizing the passenger's or participant's flight suit, pressure suit or spacesuit, and personal equipment.

9E604 "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities controlled by ECCN 9A604 or 9B604, or "software" controlled by ECCN 9D604 (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, MT, AT, UN

Control(s)	Country chart (See Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
MT applies to "technology," as described in paragraph .a of this entry, for commodities and "software" controlled for MT reasons in ECCN 9A604, 9B604 or 9D604	MT Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any item in this ECCN 9E604.

List of Items Controlled

Related Controls: (1) Technical data directly related to articles enumerated or otherwise described in USML Category IV is controlled under USML Category IV(i). (2) See also ECCNs 9E002, 9E101, and 9E102 for controls on "technology" for the "development," "production," and "use" of missiles and related items controlled on the CCL.

Related Definitions: N/A

Items: a. "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities controlled by ECCN 9A604 or 9B604, or "software" controlled by ECCN 9D604.

b. [Reserved]

9E610 Technology "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of military aircraft and related commodities controlled by 9A610, equipment controlled by 9B610, materials controlled by 9C610, or software controlled by 9D610 (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: NS, RS, MT, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 9E610.y	NS Column 1.
RS applies to entire entry except 9E610.y	RS Column 1.
RS applies to 9E610.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
MT applies to "technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities or software controlled for MT reasons in 9A610, 9B610, or 9D610 for MT reasons	MT Column 1.
AT applies to entire entry	AT Column 1.
UN applies to entire entry except 9E610.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: (1) Paragraph (c)(1) of License Exception STA (§ 740.20(c)(1) of the EAR) may not be used for 9E610.b. (2) Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any technology in 9E610.

LIST OF ITEMS CONTROLLED

Related Controls: Technical data directly related to articles enumerated or otherwise described in USML Category VIII are subject to the control of USML paragraph VIII(i).

Related Definitions: N/A

Items:

a. "Technology" (other than technology controlled by paragraphs .b or .y of this entry) "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities or software controlled by ECCN 9A610, 9B610, 9C610, or 9D610.

> *Note: "Build-to-print technology" "required" for the "production" of items described in paragraphs b.1 through b.15 of this entry is classified under 9E610.a.*

b. "Technology" (other than "build-to-print technology") "required" for the "development" or "production" of any of the following:

b.1. Static structural members;

b.2. Exterior skins, removable fairings, non-removable fairings, radomes, access doors and panels, and in-flight opening doors;

b.3. Control surfaces, leading edges, trailing edges, and leading edge flap seals;

b.4. Leading edge flap actuation system commodities (*i.e.,* power drive units, rotary geared actuators, torque tubes, asymmetry brakes, position sensors, and angle gearboxes) "specially designed" for fighter, attack, or bomber aircraft controlled in USML Category VIII;

b.5. Engine inlets and ducting;

b.6. Fatigue life monitoring systems "specially designed" to relate actual usage to the analytical or design spectrum and to compute amount of fatigue life "specially designed" for aircraft controlled by either USML subcategory VIII(a) or ECCN 9A610.a, except for Military Commercial Derivative Aircraft;

b.7. Landing gear, and "parts" and "components" "specially designed" therefor, "specially designed" for use in aircraft weighing more than 21,000 pounds controlled by either USML subcategory VIII(a) or ECCN 9A610.a, except for Military Commercial Derivative Aircraft;

b.8. Conformal fuel tanks and "parts" and "components" "specially designed" therefor;

b.9. Electrical "equipment," "parts," and "components" "specially designed" for electro-magnetic interference (EMI)—*i.e.,* conducted emissions, radiated emissions, conducted susceptibility and radiated susceptibility—protection of aircraft that conform to the requirements of MIL-STD-461;

b.10. HOTAS (Hand-on Throttle and Stick) controls, HOCAS (Hands on Collective and Stick), Active Inceptor Systems (*i.e.,* a combination of Active Side Stick Control Assembly, Active Throttle Quadrant Assembly, and Inceptor Control Unit), rudder pedal assemblies for digital flight control systems, and parts and components "specially designed" therefor;

b.11. Integrated Vehicle Health Management Systems (IVHMS), Condition Based Maintenance (CBM) Systems, and Flight Data Monitoring (FDM) systems;

b.12. Equipment "specially designed" for system prognostic and health management of aircraft;

b.13. Active Vibration Control Systems;

b.14. Self-sealing fuel bladders "specially designed" to pass a .50 caliber or larger gunfire test (MIL-DTL-5578, MIL-DTL-27422); or

b.15. Technology "required" for the "development" or "production" of "parts" or "components" controlled in 9A610.x and "specially designed" for damage or failure-adaptive flight control systems controlled in Category VIII(h)(7) of the USML.

c. through x. [Reserved]

y. Specific "technology" "required" for the "production," "development," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities or software enumerated in ECCN 9A610.y or 9D610.y.

9E619 "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of military gas turbine engines and related commodities controlled by 9A619, equipment controlled by 9B619, materials controlled by 9C619, or software controlled by 9D619 (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry except 9E619.y	NS Column 1.
RS applies to entire entry except 9E619.y	RS Column 1.
RS applies to 9E619.y	China, Russia, or Venezuela (see § 742.6(a)(7)).
AT applies to entire entry	AT Column 1.
UN applies to entire entry except 9E619.y	See § 746.1(b) for UN controls.

List Based License Exceptions (See Part 740 for a Description of All License Exceptions)

TSR: N/A

Special Conditions for STA

STA: (1) Paragraph (c)(1) of License Exception STA (§ 740.20(c)(1) of the EAR) may not be used for 9E619.b. or .c. (2) Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any technology in ECCN 9E619.

List of Items Controlled

Related Controls: Technical data directly related to articles enumerated or otherwise described in USML Category XIX are subject to the control of USML Category XIX(g).

Related Definitions: N/A

Items:

a. "Technology" (other than "technology" controlled by paragraphs .b and .c of this entry) "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishment of items controlled by ECCN 9A619 (except 9A619.y), ECCN 9B619 (except 9B619.y), ECCN 9C619, or ECCN 9D619 (except 9D619.y).

> *Note: "Build-to-print technology" "required" for the "production" of items described in paragraphs b.1 through b.10 of this entry is classified under 9E619.a.*

b. "Technology" (other than "build-to-print technology") "required" for the "development" or "production" of any of the following:

b.1. Front, turbine center, and exhaust frames;

b.2. Low pressure compressor (*i.e.,* fan) "components" and "parts" as follows: Nose cones and casings;

b.3. High pressure compressor "components" and "parts" as follows: Casings;

b.4. Combustor "components" and "parts" as follows: Casings, fuel nozzles, swirlers, swirler cups, deswirlers, valve injectors, and igniters;

b.5. High pressure turbine "components" and "parts" as follows: Casings

b.6. Low pressure turbine "components" and "parts" as follows: Casings;

b.7. Augmentor "components" and "parts" as follows: Casings, flame holders, spray bars, pilot burners, augmentor fuel controls, flaps (external, convergent, and divergent), guide and syncronization rings, and flame detectors and sensors;

b.8. Mechanical "components" and "parts" as follows: Fuel metering units and fuel pump metering units, valves (fuel throttle, main metering, oil flow management), heat exchangers (air/air, fuel/air, fuel/oil), debris monitoring (inlet and exhaust), seals (carbon, labyrinth, brush, balance piston, and "knife-edge"), permanent magnetic alternator and generator, eddy current sensors;

b.9. Torquemeter assembly (*i.e.,* housing, shaft, reference shaft, and sleeve); or

b.10. Materials controlled by ECCN 9C619.b.

c. "Technology" "required" for the "development" or "production" of any of the following:

c.1. Low pressure compressor (*i.e.,* fan) “components” and “parts” as follows: blades, vanes, spools, shrouds, blisks, shafts and disks;

c.2. High pressure compressor “components” and “parts” as follows: blades, vanes, spools, shrouds, blisks, shafts, disks, and impellers;

c.3. Combustor “components” and “parts” as follows: diffusers, liners, chambers, cowlings, domes and shells;

c.4. High pressure turbine “components” and “parts” as follows: shafts and disks, blades, vanes, nozzles, tip shrouds;

c.5. Low pressure turbine “components” and “parts” as follows: shafts and disks, blades, vanes, nozzles, tip shrouds;

c.6. Digital engine control systems (*e.g.,* Full Authority Digital Engine Controls (FADEC) and Digital Electronic Engine Controls (DEEC)) “specially designed” for gas turbine engines controlled in this ECCN; or

c.7. Engine monitoring systems (*i.e.,* prognostics, diagnostics, and health) “specially designed” for gas turbine engines and components controlled in this ECCN.

d. through x. [Reserved]

y. Specific “technology” “required” for the “development,” “production,” operation, installation, maintenance, repair, overhaul, or refurbishment of commodities controlled by 9A619.y or 9B619.y, or “software” controlled by ECCN 9D619.y.

9E620 Technology “required” for cryogenic and “superconductive” equipment, as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, RS, AT, UN

Control(s)	Country chart (see Supp. No. 1 to part 738)
NS applies to entire entry	NS Column 1
RS applies to entire entry	RS Column 1
AT applies to entire entry	AT Column 1
UN applies to entire entry	See § 746.1(b) for UN controls

List Based License Exceptions (see Part 740 for a description of all license exceptions)

TSR: N/A

SPECIAL CONDITIONS FOR STA

STA: Paragraph (c)(2) of License Exception STA (§ 740.20(c)(2) of the EAR) may not be used for any technology in 9E620.

LIST OF ITEMS CONTROLLED

Related Controls: Technical data directly related to articles enumerated on USML are subject to the control of that USML category.

Related Definitions: N/A

Items: "Technology" "required" for the "development," "production," operation, installation, maintenance, repair, overhaul, or refurbishing of commodities or software controlled by ECCN 9A620, 9B620 or 9D620.

9E990 "Technology", n.e.s., for the "development" or "production" or "use" of equipment controlled by 9A990 or 9B990.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to "technology" for equipment under 9A990 and 9B990 except 9A990.a	AT Column 1
AT applies to "technology" for equipment under 9A990.a only	AT Column 2

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9E991 "Technology", for the "development", "production" or "use" of equipment controlled by 9A991 or 9B991.

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: The list of items controlled is contained in the ECCN heading.

9E993 Other "technology", not described by 9E003, as follows (see List of Items Controlled).

LICENSE REQUIREMENTS

Reason for Control: AT

Control(s)	Country Chart (See Supp. No. 1 to part 738)
AT applies to entire entry	AT Column 1.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

LIST OF ITEMS CONTROLLED

Related Controls: N/A

Related Definitions: N/A

Items: a. Rotor blade tip clearance control systems employing active compensating casing "technology" limited to a design and development data base; *or*

b. Gas bearing for turbine engine rotor assemblies.

EAR99 Items subject to the EAR that are not elsewhere specified in this CCL Category or in any other category in the CCL are designated by the number EAR99.

[63 FR 2459, Jan. 15, 1998]

Editorial Notes: 1. For FEDERAL REGISTER citations affecting supplement no. 1 to part 774, see the List of CFR Sections Affected, which appears in the Finding Aids section of the printed volume and at *www.govinfo.gov*.

Editorial Notes: 2. At 88 FR 71936, Oct. 18, 2023, § supplement no. 1 to part 774 was amended by revising 9A005; however, the amendment could not be incorporated due to missing text.

Supplement No. 2 to Part 774—General Technology and Software Notes

1. ***General Technology Note.*** The export of "technology" that is "required" for the "development", "production", or "use" of items on the Commerce Control List is controlled according to the provisions in each Category.

"Technology" "required" for the "development", "production", or "use" of a controlled product remains controlled even when applicable to a product controlled at a lower level.

License Exception TSU is available for "technology" that is the minimum necessary for the installation, operation, maintenance (checking), or repair of those products that are eligible for License Exceptions or that are exported under a license.

N.B.: This does not allow release under a License Exception of the repair "technology" controlled by 1E002.e, 1E002.f, 8E002.a, or 8E002.b.

N.B.: The "minimum necessary" excludes "development" or "production" technology and permits "use" technology only to the extent "required" to ensure safe and efficient use of the product. Individual ECCNs may further restrict export of "minimum necessary" information.

2. ***General Software Note.*** License Exception TSU (mass market software) (see § 740.13 of the EAR) is available to all destinations, except countries in Country Group E:1 of Supplement No. 1 to part 740 of the EAR, for release of "software" which is any of the following:

1. Generally available to the public by being:
    a. Sold from stock at retail selling points, without restriction, by means of:
        1. Over the counter transactions;
        2. Mail order transactions;
        3. Electronic transactions; *or*
        4. Telephone call transactions; *and*
    b. Designed for installation by the user without further substantial support by the supplier.
2. [Reserved] See § 734.3(b)(3) for "publicly available technology and software."

3. The minimum necessary "object code" for the installation, operation, maintenance (checking) or repair of those items whose export has been authorized.

3. ***General "Information Security"*** Note. "Information security" items or functions should be considered against the provisions in Category 5-Part 2, even if they are components, "software" or functions of other items.

Note: Minimum necessary "object code" does not enhance or improve the performance of an item or provide new features or functionality.

Note: The General Software Note does not apply to "software" controlled by Category 5, part 2 "Information Security"). For "software" controlled by Category 5, part 2, see Supplement No. 1 to part 774, Category 5, part 2, Note 3—Cryptography Note.

[69 FR 46087, July 30, 2004, as amended at 78 FR 37394, June 20, 2013; 79 FR 45307, Aug. 4, 2014; 81 FR 64691, Sept. 20, 2016]

Supplement No. 3 to Part 774—Statements of Understanding

(a) ***Statement of Understanding—medical equipment.*** Commodities that are ""specially designed" for medical end-use" that "incorporate" commodities or software on the Commerce Control List (Supplement No. 1 to part 774 of the EAR) that do not have a reason for control of Nuclear Nonproliferation (NP), Missile Technology (MT), or Chemical & Biological Weapons (CB) are designated by the number EAR99 (*i.e.,* are not elsewhere specified on the Commerce Control List).

Notes to paragraph (a): (1) "Specially designed for medical end-use" means designed for medical treatment or the practice of medicine (does not include medical research).
(2) Commodities or software are considered "incorporated" if the commodity or software is: Essential to the functioning of the medical equipment; customarily included in the sale of the medical equipment; and exported or reexported with the medical equipment.

(3) Except for such software that is made publicly available consistent with § 734.3(b)(3) of the EAR, commodities and software "specially designed for medical end-use" remain subject to the EAR.

(4) *See also* § 770.2(b) interpretation 2, for other types of equipment that incorporate items on the Commerce Control List that are subject to the EAR.

(5) For computers used with medical equipment, *see also* ECCN 4A003 note 2 regarding the "principal element" rule.

(6) For commodities and software "specially designed" for medical end-use that incorporate an encryption or other "information security" item subject to the EAR, see also section 3 (General "Information Security" Note (GISN)) to Supplement No. 2 to this part.

(b) ***Statement of Understanding—Source Code.*** For the purpose of national security controlled items, "source code" items are controlled either by "software" or by "software" and "technology" controls, except when such "source code" items are explicitly decontrolled.

(c) ***Category 5—Part 2—Note 4 Statement of Understanding.*** All items previously described by Notes (b), (c) and (h) to 5A002 are now described by Note 4 to Category 5—Part 2. Note (h) to 5A002 prior to June 25, 2010 stated that the following was not controlled by 5A002:

Equipment "specially designed" for the servicing of portable or mobile radiotelephones and similar client wireless devices that meet all the provisions of the Cryptography Note (Note 3 in Category 5, Part 2), where the servicing equipment meets all of the following:

(1) The cryptographic functionality of the servicing equipment cannot easily be changed by the user of the equipment;

(2) The servicing equipment is designed for installation without further substantial support by the supplier; *and*

(3) The servicing equipment cannot change the cryptographic functionality of the device being serviced.

(d) ***Statement of Understanding—Used Goods.*** The specifications in the Commerce Control List apply equally to new or used goods. In the case of used goods, an evaluation by the Bureau of Industry and Security may be carried out in order to assess whether the goods are capable of meeting the relevant specifications.

[75 FR 36502, June 25, 2010, as amended at 76 FR 29632, May 20, 2011; 82 FR 27110, June 14, 2017]

Supplement No. 4 to Part 774—Commerce Control List Order of Review

(a) As described in EAR § 734.3, the EAR govern only items "subject to the EAR," e.g., items not subject to the exclusive jurisdiction of another agency. Thus, for example, if an item is described in the U.S. Munitions List (USML) (22 CFR Part 121) of the International Traffic in Arms Regulations (ITAR) (22 CFR Parts 120-130), including one of its catch-all paragraphs, then the item is a "defense article" subject to the ITAR and there is no need to review the CCL with respect to whether it describes the item. See 22 CFR § 120.6 ("Defense article means any item or technical data designated in § 121.1 of the ITAR. The policy described in § 120.3 is applicable to designations of additional items"). If an item is not described on the USML and is otherwise "subject to the EAR," then work through each of the following steps to determine where the item is covered by the CCL or, if it is not covered by the CCL, and is therefore designated as EAR99.

(1) Step 1. To classify an item "subject to the EAR" against the CCL, review the general characteristics of the item. This will usually guide you to the appropriate category (0 through 9) on the CCL.

(2) Step 2. Once the potentially applicable CCL categories are identified, determine which product group within the CCL category or categories—i.e., A, B, C, D, or E—is applicable to the item.

(3) Step 3. The "600 series" describes military items that were once subject to the ITAR. The 9x515 ECCNs describe "spacecraft," related items, and some radiation-hardened microelectronic circuits that were once subject to the ITAR under USML Category XV. Just as the ITAR effectively trumps the EAR, items described in a 9x515 ECCN or "600 series" ECCN trump other ECCNs on the CCL. Thus, the next step in conducting a classification analysis of an item "subject to the EAR" is to determine whether it is described in a 9x515 ECCN or "600 series" ECCN paragraph other than a "catch-all"

paragraph such as a ".x" paragraph that controls unspecified "parts" and "components" "specially designed" for items in that ECCN or the corresponding USML paragraph. If so, the item is classified under that 9x515 ECCN or "600 series" ECCN paragraph even if it would also be described in another ECCN.

(4) Step 4. If the item is not described in a 9x515 ECCN or "600 series" ECCN, then determine whether the item is classified under a 9x515 ECCN or "600 series" catch-all paragraph, i.e., one that controls non-specific "parts," "components," "accessories," and "attachments" "specially designed" for items in that ECCN or the corresponding USML paragraph. Such items are generally in the ".x" paragraph of ECCN 9A515 or a "600 series" ECCN.

(i) Step 4.a. Determine whether the item would meet the criteria of either paragraphs (a)(1) or (a)(2) of the "specially designed" definition in § 772.1 of the EAR. (These are informally known as the "catch" paragraphs.) If not applicable, then the item is not within the scope of the ECCN paragraph that contains a "specially designed" control parameter. Skip to Step 5.

(ii) Step 4.b. If the item meets the criteria of either paragraph (a)(1) or (a)(2) of the "specially designed" definition, then determine whether any of the provisions of paragraph (b) of the "specially designed" definition would apply. (These are informally known as the "release" provisions.) If so, then the item is not within the scope of the ECCN paragraph that contains a "specially designed" control parameter.

Note to paragraph (a)(4): The emphasis on the word "control" in Steps 4.a and 4.b is deliberate. Some ECCNs use "specially designed" as a de-control parameter. If an item would *not* be classified under a particular ECCN because it falls within the scope of either subparagraph (a)(1) or (a)(2) of the "specially designed" definition, then there is no need to analyze whether any element of paragraph (b) of the definition would apply to the item. One needs only review the "release" provisions in paragraph (b) of the "specially designed" definition if paragraph (a) of the "specially designed" definition applies to the item in a "control" paragraph of an ECCN that uses the term "specially designed."

(5) Step 5. If an item is not classified by a "600 series" or in a 9x515 ECCN, then starting from the beginning of the product group analyze each ECCN to determine whether any other ECCN in that product group describes the item. If any ECCN uses the term "specially designed," see Steps 4.a and 4.b above in paragraphs (a)(4)(i) and (a)(4)(ii) respectively. If the item is described in one of these ECCNs, then the item is classified under that ECCN.

(6) Step 6. If the item is not described under any ECCN of any category of the CCL, then the item is designated as EAR99. EAR99 items may require a license if destined for a prohibited or restricted end user, end use or destination. See paragraphs (g) through (n) of § 732.3 "Steps Regarding the Ten General Prohibitions," or General Prohibitions Four through Ten of part 736 of the EAR for license requirements other than those imposed by the CCL.

(b) [Reserved]

[78 FR 22735, Apr. 16, 2013, as amended at 79 FR 27443, May 13, 2014; 79 FR 32632, June 5, 2014]

Supplement No. 5 to Part 774—Items Classified Under ECCNS 0A521, 0B521, 0C521, 0D521 and 0E521

The following table lists items subject to the EAR that are not listed elsewhere in the CCL, but which the Department of Commerce, with the concurrence of the Departments of Defense and State, has identified warrant control for export or reexport because the items provide at least a significant military or intelligence advantage to the United States or for foreign policy reasons.

Item descriptor. ***Note:*** **The description must match by model number or a broader descriptor that does not necessarily need to be company specific**	**Date of initial or subsequent BIS classification (ID = initial date; SD = subsequent date)**	**Date when the item will be designated EAR99, unless reclassified in another ECCN or the 0Y521 classification is reissued**	**Item-specific license exception eligibility**
0A521. Systems, Equipment and Components			
No. 1 [Reserved]	[Reserved]	[Reserved]	[Reserved]
0B521. Test, Inspection and Production Equipment			
[Reserved]			
0C521. Materials			
No. 1 XBS Epoxy system designed to obfuscate critical technology components against x-ray and terahertz microscopy imaging attempts	November 16, 2015 (ID)	November 16, 2016	License Exception GOV under § 740.11(b)(2)(ii) only
No. 2 [Reserved]	[Reserved]	[Reserved]	[Reserved]
0D521. Software			
No. 1 Geospatial imagery "software" "specially designed" for training a Deep Convolutional Neural Network to automate the analysis of geospatial imagery and point clouds, and having all of the following: 1. Provides a graphical user interface that enables the user to identify objects (*e.g.,* vehicles, houses, etc.) from within geospatial imagery and point clouds in order to extract positive and negative samples of an object of interest; 2. Reduces pixel variation by performing scale, color, and rotational normalization	January 6, 2020 (ID)	January 6, 2023	License Exception GOV under § 740.11(b)(2)(ii) only.

Item descriptor. *Note:* The description must match by model number or a broader descriptor that does not necessarily need to be company specific	Date of initial or subsequent BIS classification (ID = initial date; SD = subsequent date)	Date when the item will be designated EAR99, unless reclassified in another ECCN or the 0Y521 classification is reissued	Item-specific license exception eligibility
on the positive samples; 3. Trains a Deep Convolutional Neural Network to detect the object of interest from the positive and negative samples; and 4. Identifies objects in geospatial imagery using the trained Deep Convolutional Neural Network by matching the rotational pattern from the positive samples with the rotational pattern of objects in the geospatial imagery. *Technical Note:* A point cloud is a collection of data points defined by a given coordinate system. A point cloud is also known as a digital surface model.			
0E521. TECHNOLOGY			
No. 1 [Reserved]	[Reserved]	[Reserved]	[Reserved]

[80 FR 70678, Nov. 16, 2015, as amended at 81 FR 52328, Aug. 8, 2016; 83 FR 14583, Apr. 5, 2018; 85 FR 461, Jan. 6, 2020; 86 FR 462, Jan. 6, 2021; 87 FR 730, Jan. 6, 2022]

Supplement No. 6 to Part 774—Sensitive List

Note to Supplement No. 6: *While the items on this list are identified by ECCN rather than by Wassenaar Arrangement numbering, the item descriptions are drawn directly from the Wassenaar Arrangement's Sensitive List. If text accompanies an ECCN below, then the Sensitive List is limited to a subset of items classified under the specific ECCN or has differing parameters.*

(1) Category 1

(i) 1A002.a.1—“Composite” structures or laminates made from an organic “matrix” and “fibrous or filamentary materials” specified by 1C010.c or 1C010.d.

(ii) 1C001.

(iii) 1C007.c.

(iv) 1C010.c and .d.

(v) 1C012.

(vi) 1D002—"Software" for the "development" of organic "matrix", metal "matrix", or carbon "matrix" laminates or composites controlled under 1A002.a.1, 1C001, 1C007.c, 1C010.c, 1C010.d, or 1C012.

(vii) 1E001—"Technology" according to the General Technology Note for the "development" or "production" of equipment and materials controlled under 1A002, 1C001, 1C007.c, 1C010.c, 1C010.d, or 1C012.

(viii) 1E002.e and .f.

(2) Category 2

(i) 2D001—"Software", other than that controlled by 2D002, "specially designed" for the "development" or "production" of equipment as follows:

(A) Specified by 2B001.a, 2B001.b.1, or 2B001.b.2, and having a "unidirectional positioning repeatability" equal to or less (better) than 0.9 μm along one or more linear axis;

(B) Specified by 2B001.b.3, 2B001.d, 2B001.f or 2B003.

(ii) 2E001—"Technology" according to the General Technology Note for the "development" of equipment or "software", as follows:

(A) Equipment specified by 2B001.a, 2B001.b.1 or 2B001.b.2, and having a "unidirectional positioning repeatability" equal to or less (better) than 0.9 μm along one or more linear axis;

(B) Equipment specified by 2B001.b.3, 2B001.d, 2B001.f or 2B003.

(C) ***"Software"*** specified by 2D001 of this Supplement;

(iii) 2E002—"Technology" according to the General Technology Note for the "production" of equipment as follows:

(A) Specified by 2B001.a, 2B001.b.1, or 2B001.b.2, and having a "unidirectional positioning repeatability" equal to or less (better) than 0.9 μm along one or more linear axis;

(B) Specified by 2B001.b.3, 2B001.d, 2B001.f or 2B003.

(3) Category 3

(i) 3A001.b.2 (including those described under 3A001.b.2 that are controlled by 3A001.z)—"Monolithic Microwave Integrated Circuit" ("MMIC") amplifiers that are any of the following:

(A) Rated for operation at frequencies exceeding 2.7 GHz up to and including 6.8 GHz with a "fractional bandwidth" greater than 15%, and having any of the following:

(A.1.) A peak saturated power output greater than *300 W (54.8 dBm)* at any frequency exceeding 2.7 GHz up to and including 2.9 GHz;

(A.2.) A peak saturated power output greater than *300 W (54.8 dBm)* at any frequency exceeding 2.9 GHz up to and including 3.2 GHz;

(A.3.) A peak saturated power output greater than *300 W (54.8 dBm)* at any frequency exceeding 3.2 GHz up to and including 3.7 GHz; or

(A.4.) A peak saturated power output greater than *120 W (50.8 dBm)* at any frequency exceeding 3.7 GHz up to and including 6.8 GHz;

(B) Rated for operation at frequencies exceeding 6.8 GHz up to and including *12 GHz* with a "fractional bandwidth" greater than 10%, and having any of the following:

(B.1) A peak saturated power output greater than *25 W (44 dBm)* at any frequency exceeding 6.8 GHz up to and including 8.5 GHz; or

(B.2.) A peak saturated power output greater than *25 W (44 dBm)* at any frequency exceeding 8.5 GHz up to and including *12 GHz*.

(ii) 3A001.b.3 (including those described under 3A001.b.3 that are controlled by 3A001.z)—Discrete microwave transistors that are any of the following:

(A) Rated for operation at frequencies exceeding 2.7 GHz up to and including 6.8 GHz and having any of the following:

(A.1.) A peak saturated power output greater than *600 W (57.8 dBm)* at any frequency exceeding 2.7 GHz up to and including 2.9 GHz;

(A.2.) A peak saturated power output greater than *600 W (57.8 dBm)* at any frequency exceeding 2.9 GHz up to and including 3.2 GHz;

(A.3.) A peak saturated power output greater than *600 W (57.8 dBm)* at any frequency exceeding 3.2 GHz up to and including 3.7 GHz; or

(A.4.) A peak saturated power output greater than *130 W (51.2 dBm)* at any frequency exceeding 3.7 GHz up to and including 6.8 GHz;

(B) Rated for operation at frequencies exceeding 6.8 GHz up to and including *12 GHz* and having any of the following:

(B.1.) A peak saturated power output greater than *130 W (51.2 dBm)* at any frequency exceeding 6.8 GHz up to and including 8.5 GHz;

(B.2.) A peak saturated power output greater than *60 W (47.8 dBm)* at any frequency exceeding 8.5 GHz up to and including 12 GHz.

(iii) 3A002.g.1.

(iv) 3D001—"Software" "specially designed" for the "development" or "production" of equipment controlled under 3A001.b.2, 3A001.b.3, equipment described under 3A001.b.2 or 3A001.b.3 that are controlled under 3A001.z, and 3A002.g.1.

(v) 3E001—"Technology" according to the General Technology Note for the "development" or "production" of equipment controlled under 3A001.b.2, 3A001.b.3, equipment described under 3A001.b.2 or 3A001.b.3 that are controlled under 3A001.z, and 3A002.g.1.

(4) Category 4

(i) 4A001.a.2.

(ii) [Reserved]

(5) Category 5—Part 1

(i) 5A001.b.3, .b.5, and .h.

(ii) 5B001.a—Equipment and “specially designed” components or “accessories” therefor, “specially designed” for the “development” or “production” of equipment, functions or features controlled under 5A001.b.3, b.5, or .h.

(iii) 5D001.a—“Software” “specially designed” for the “development” or “production” of equipment, functions or features controlled under 5A001.b.3, b.5, or .h.

(iv) [Reserved]

(v) 5E001.a—“Technology” according to the General Technology Note for the “development” or “production” of equipment, functions or features controlled under 5A001.b.3, b.5, or .h or “software” described in this Supplement's description of 5D001.a.

(6) Category 6

(i) 6A001.a.1.b—Systems or transmitting and receiving arrays, designed for object detection or location, having any of the following:

(A) A transmitting frequency below 5 kHz or a sound pressure level exceeding 224 dB (reference 1 μPa at 1 m) for equipment with an operating frequency in the band from 5 kHz to 10 kHz inclusive;

(B) Sound pressure level exceeding 224 dB (reference 1 μPa at 1 m) for equipment with an operating frequency in the band from 10 kHz to 24 kHz inclusive;

(C) Sound pressure level exceeding 235 dB (reference 1 μPa at 1 m) for equipment with an operating frequency in the band between 24 kHz and 30 kHz;

(D) Forming beams of less than 1° on any axis and having an operating frequency of less than 100 kHz;

(E) Designed to operate with an unambiguous display range exceeding 5,120 m; *or*

(F) Designed to withstand pressure during normal operation at depths exceeding 1,000 m and having transducers with any of the following:

(1) Dynamic compensation for pressure; or

(2) Incorporating other than lead zirconate titanate as the transduction element;

(ii) 6A001.a.1.e.

(iii) 6A001.a.2.a.1, a.2.a.2, a.2.a.3, a.2.a.5, and a.2.a.6.

(iv) 6A001.a.2.b.

(v) 6A001.a.2.c—Processing equipment, “specially designed” for real time application with towed acoustic hydrophone arrays, having “user-accessible programmability” and time or frequency domain processing and correlation, including spectral analysis, digital filtering and beamforming using Fast Fourier or other transforms or processes.

(vi) 6A001.a.2.d.

(vii) 6A001.a.2.e.

(viii) 6A001.a.2.f—Processing equipment, "specially designed" for real time application with bottom or bay cable systems, having "user-accessible programmability" and time or frequency domain processing and correlation, including spectral analysis, digital filtering and beamforming using Fast Fourier or other transforms or processes.

(ix) 6A002.a.1.a, a.1.b, and a.1.c.

(x) 6A002.a.1.d.

(xi) 6A002.a.2.a—Image intensifier tubes having all of the following:

(A) A peak response in the wavelength range exceeding 400 nm but not exceeding 1,050 nm;

(B) Electron image amplification using any of the following:

(1) A microchannel plate for electron image amplification with a hole pitch (center-to-center spacing) of 12 μm or less; or

(2) An electron sensing device with a non-binned pixel pitch of 500 μm or less, "specially designed" or modified to achieve ' charge multiplication' other than by a microchannel plate; and

(C) Any of the following photocathodes:

(1) Multialkali photocathodes (e.g., S-20 and S-25) having a luminous sensitivity exceeding 700 μA/lm;

(2) GaAs or GaInAs photocathodes; *or*

(3) Other "III-V compound" semiconductor photocathodes having a maximum "radiant sensitivity" exceeding 10 mA/W.

(xii) 6A002.a.2.b.

(xiii) 6A002.a.3—Subject to the following additional notes:

Note 1: 6A002.a.3 does not apply to the following "focal plane arrays" in this Supplement:
a. Platinum Silicide (PtSi) "focal plane arrays" having less than 10,000 elements;

b. Iridium Silicide (IrSi) "focal plane arrays".

Note 2: 6A002.a.3 does not apply to the following "focal plane arrays" in this Supplement:
a. Indium Antimonide (InSb) or Lead Selenide (PbSe) "focal plane arrays" having less than 256 elements;

b. Indium Arsenide (InAs) "focal plane arrays";

c. Lead Sulphide (PbS) "focal plane arrays";

d. Indium Gallium Arsenide (InGaAs) "focal plane arrays".

Note 3: 6A002.a.3 does not apply to Mercury Cadmium Telluride (HgCdTe) "focal plane arrays" as follows in this Supplement:
a. 'Scanning Arrays' having any of the following:

1. 30 elements or less; or

2. Incorporating time delay-and-integration within the element and having 2 elements or less;

b. 'Staring Arrays' having less than 256 elements.

Technical Notes: a. 'Scanning Arrays' are defined as "focal plane arrays" designed for use with a scanning optical system that images a scene in a sequential manner to produce an image;
b. 'Staring Arrays' are defined as "focal plane arrays" designed for use with a nonscanning optical system that images a scene.

Note 6: 6A002.a.3 does not apply to the following "focal plane arrays" in this List:

a. Gallium Arsenide (GaAs) or Gallium Aluminum Arsenide (GaAlAs) quantum well "focal plane arrays"
having less than 256 elements;

b. Microbolometer "focal plane arrays" having less than 8,000 elements.

Note 7: 6A002.a.3.g does not apply to "focal plane arrays", "specially designed" or modified to achieve 'charge multiplication', as follows:
a. Linear (1-dimensional) arrays having 4,096 elements or less.

b. Non-linear (2-dimensional) arrays having all of the following;

b.1. A total of 250,000 elements or less; and

b.2. A maximum of 4,096 elements in each dimension.

(xiv) 6A002.b.

(xv) 6A002.c—‘ Direct view’ imaging equipment incorporating any of the following:

(A) Image intensifier tubes having the characteristics listed in this Supplement's description of 6A002.a.2.a or 6A002.a.2.b;

(B) ***“Focal plane arrays”*** having the characteristics listed in this Supplement's description of 6A002.a.3; or

(C) Solid-state detectors having the characteristics listed in 6A002.a.1.

(xvi) 6A003.b.3—Imaging cameras incorporating image intensifier tubes having the characteristics listed in this Supplement's description of 6A002.a.2.a or 6A002.a.2.b

Note: 6A003.b.3 does not apply to imaging cameras “specially designed” or modified for underwater use.

(xvii) 6A003.b.4—Imaging cameras incorporating “focal plane arrays” having any of the following:

(A) Incorporating “focal plane arrays” specified by this Supplement's description of 6A002.a.3.a to 6A002.a.3.e;

(B) Incorporating “focal plane arrays” specified by this Supplement's description of 6A002.a.3.f; or

(C) Incorporating “focal plane arrays” specified by this Supplement's description of 6A002.a.3.g.

Note 1: ‘ Imaging cameras’ described in 6A003.b.4 include “focal plane arrays” combined with sufficient “signal processing” electronics, beyond the read out integrated circuit, to enable as a minimum the output of an analog or digital signal once power is supplied.

Note 2: 6A003.b.4.a does not control imaging cameras incorporating linear “focal plane arrays” with twelve 12 elements or fewer, not employing time-delay-and-integration within the element, and designed for any of the following:
a. Industrial or civilian intrusion alarm, traffic or industrial movement control or counting systems;

b. Industrial equipment used for inspection or monitoring of heat flows in buildings, equipment or industrial processes;

c. Industrial equipment used for inspection, sorting or analysis of the properties of materials;

d. Equipment “specially designed” for laboratory use; or

e. Medical equipment.

Note 3: 6A003.b.4.b does not control imaging cameras having any of the following characteristics:
a. A maximum frame rate equal to or less than 9 Hz;

b. Having all of the following:

1. Having a minimum horizontal or vertical ‘ Instantaneous-Field-of-View (IFOV)’ of at least 10 mrad/pixel (milliradians/pixel);

2. Incorporating a fixed focal-length lens that is not designed to be removed;

3. Not incorporating a ‘ direct view’ display; and

Technical Note: ‘ Direct view’ refers to an imaging camera operating in the infrared spectrum that presents a visual image to a human observer using a near-to-eye micro display incorporating any light-security mechanism.
4. Having any of the following:

a. No facility to obtain a viewable image of the detected field-of-view; or

b. The camera is designed for a single kind of application and designed not to be user modified; or

Technical Note: ‘ Instantaneous Field of View (IFOV)’ specified in Note 3.b is the lesser figure of the ‘ Horizontal FOV’ or the ‘ Vertical FOV’.
‘ Horizontal IFOV’ = horizontal Field of View (FOV)/number of horizontal detector elements

‘ Vertical IFOV’= vertical Field of View (FOV)/number of vertical detector elements.

c. Where the camera is “specially designed” for installation into a civilian passenger land vehicle of less than 3 tonnes three tons (gross vehicle weight) and having all of the following:

1. Is operable only when installed in any of the following:

a. The civilian passenger land vehicle for which it was intended; or

b. A “specially designed”, authorized maintenance test facility; and

2. Incorporates an active mechanism that forces the camera not to function when it is removed from the vehicle for which it was intended.

Note: When necessary, details of the items will be provided, upon request, to the Bureau of Industry and Security in order to ascertain compliance with the conditions described in Note 3.b.4 and Note 3.c in this Note to 6A003.b.4.b.

Note 4: 6A003.b.4.c does not apply to ' imaging cameras' having any of the following characteristics:

a. Having all of the following:

1. Where the camera is "specially designed" for installation as an integrated component into indoor and wall-plug-operated systems or equipment, limited by design for a single kind of application, as follows:

a. Industrial process monitoring, quality control, or analysis of the properties of materials;

b. Laboratory equipment "specially designed" for scientific research;

c. Medical equipment;

d. Financial fraud detection equipment; and

2. Is only operable when installed in any of the following:

a. The system(s) or equipment for which it was intended; or

b. A "specially designed", authorized maintenance facility; and

3. Incorporates an active mechanism that forces the camera not to function when it is removed from the system(s) or equipment for which it was intended;

b. Where the camera is "specially designed" for installation into a civilian passenger land vehicle of less than 3 tonnes (gross vehicle weight), or passenger and vehicle ferries having a length overall (LOA) 65 m or greater, and having all of the following:

1. Is only operable when installed in any of the following:

a. The civilian passenger land vehicle or passenger and vehicle ferry for which it was intended; or

b. A "specially designed", authorized maintenance test facility; and

2. Incorporates an active mechanism that forces the camera not to function when it is removed from the vehicle for which it was intended;

c. Limited by design to have a maximum "radiant sensitivity" of 10 mA/W or less for wavelengths exceeding 760 nm, having all of the following:

1. Incorporating a response limiting mechanism designed not to be removed or modified; and

2. Incorporates an active mechanism that forces the camera not to function when the response limiting mechanism is removed; and

3. Not “specially designed” or modified for underwater use; or

d. Having all of the following:

1. Not incorporating a ‘ direct view’ or electronic image display;

2. Has no facility to output a viewable image of the detected field of view;

3. The “focal plane array” is only operable when installed in the camera for which it was intended; and

4. The “focal plane array” incorporates an active mechanism that forces it to be permanently inoperable when removed from the camera for which it was intended.

Note: When necessary, details of the item will be provided, upon request, to the Bureau of Industry and Security in order to ascertain compliance with the conditions described in Note 4 above.

Note 5: 6A003.b.4.c does not apply to imaging cameras “specially designed” or modified for underwater use.

(xviii) 6A003.b.5.

(xix) 6A004.c.

(xx) 6A004.d.

(xxi) 6A006.a.1.

(xxii) 6A006.a.2—“Magnetometers” using optically pumped or nuclear precession (proton/Overhauser) “technology” having a ‘ sensitivity’ lower (better) than 2 pT (rms) per square root Hz.

(xxiii) 6A006.c.1—“Magnetic gradiometers” using multiple “magnetometers” specified by 6A006.a.1 or this Supplement's description of 6A006.a.2.

(xxiv) 6A006.d—“Compensation systems” for the following:

(A) Magnetic sensors specified by 6A006.a.2 and using optically pumped or nuclear precession (proton/Overhauser) “technology” that will permit these sensors to realize a ‘ sensitivity’ lower (better) than 2 pT rms per square root Hz.

(B) Underwater electric field sensors specified by 6A006.b.

(C) ***“Magnetic gradiometers”*** specified by 6A006.c. that will permit these sensors to realize a ‘ sensitivity’ lower (better) than 3 pT/m rms per square root Hz.

(xxv) 6A006.e—Underwater electromagnetic receivers incorporating “magnetometers” specified by 6A006.a.1 or this Supplement's description of 6A006.a.2.

(xxvi) 6A008.d, .h, and .k.

(xxvii) 6B008.

(xxviii) 6D001—"Software" "specially designed" for the "development" or "production" of equipment specified by 6A004.c, 6A004.d, 6A008.d, 6A008.h, 6A008.k, or 6B008.

(xxix) 6D003.a.

(xxx) 6E001.

(xxxi) 6E002—"Technology" according to the General Technology Note for the "production" of equipment specified by the 6A or 6B provisions described in this Supplement.

(7) Category 7

(i) 7D002.

(ii) 7D003.a.

(iii) 7D003.b.

(iv) [Reserved]

(v) 7D004.a to .d and .g.

(vi) 7E001.

(vii) 7E002.

(8) Category 8

(i) 8A001.b to .c.

(ii) 8A002.b—Systems specially designed or modified for the automated control of the motion of submersible vehicles specified by 8A001.b through .c using navigation data having closed loop servo-controls and having any of the following:

(A) Enabling a vehicle to move within 10 m of a predetermined point in the water column;

(B) Maintaining the position of the vehicle within 10 m of a predetermined point in the water column; or

(C) Maintaining the position of the vehicle within 10 m while following a cable on or under the seabed.

(iii) 8A002.h and .j.

(iv) 8A002.o.3.

(v) 8A002.p.

(vi) 8D001—"Software" specially designed for the "development" or "production" of equipment in 8A001.b to .c, 8A002.b (as described in this Supplement), 8A002.h, 8A002.j, 8A002.o.3, or 8A002.p.

(vii) 8D002.

(viii) 8E001—"Technology" according to the General Technology Note for the "development" or "production" of equipment specified by 8A001.b to .c, 8A002.b (as described in this Supplement), 8A002.h, 8A002.j, 8A002.o.3, or 8A002.p.

(ix) 8E002.a.

(9) Category 9

(i) 9A011.

(ii) 9B001.

(iii) 9D001—"Software" "specially designed" or modified for the "development" of equipment or "technology," specified by 9A011, 9B001.b. 9E003.a.1, 9E003.a.2 to a.5 or 9E003.a.8 or 9E003.h.

(iv) 9D002—"Software" "specially designed" or modified for the "production" of equipment specified by 9A011 or 9B001.b.

(v) 9D004.a and .c.

(vi) 9E001.

(vii) 9E002.

(viii) [Reserved]

(ix) 9E003.a.1 to a.5, a.8.

(x) 9E003.h.

[78 FR 22736, Apr. 16, 2013, as amended at 79 FR 45307, Aug. 4, 2014; 80 FR 29455, May 21, 2015; 81 FR 64691, Sept. 20, 2016; 82 FR 38819, Aug. 15, 2017; 83 FR 53793, Oct. 24, 2018; 85 FR 56334, Sept. 11, 2020; 86 FR 16506, Mar. 29, 2021; 88 FR 71985, Oct. 18, 2023; 88 FR 73517, Oct. 25, 2023; 89 FR 23905, Apr. 4, 2024]

Supplement No. 7 to Part 774—Very Sensitive List

Note to Supplement No. 7: *While the items on this list are identified by ECCN rather than by Wassenaar Arrangement numbering, the item descriptions are drawn directly from the Wassenaar Arrangement's Very Sensitive List, which is a subset of the Wassenaar Arrangement's Sensitive List. If text accompanies an ECCN below, then the Very Sensitive List is limited to a subset of items classified under the specific ECCN or has differing parameters.*

(1) Category 1

(i) 1A002.a.1.

(ii) 1C001.

(iii) 1C012.

(iv) 1E001—"Technology" according to the General Technology Note for the "development" or "production" of equipment and materials specified by 1A002.a, 1C001, or 1C012.

(2) Category 5—Part 1

(i) 5A001.b.5.

(ii) 5A001.h.

(iii) 5D001.a—"Software" "specially designed" for the "development" or "production" of equipment, functions or features specified by 5A001.b.5 or 5A001.h.

(iv) 5E001.a—"Technology" according to the General Technology Note for the "development" or "production" of equipment, functions, features or "software" specified by 5A001.b.5, 5A001.h, or 5D001.a.

(3) Category 6

(i) 6A001.a.1.b.1—Systems or transmitting and receiving arrays, designed for object detection or location, having a sound pressure level exceeding 210 dB (reference 1 μPa at 1 m) and an operating frequency in the band from 30 Hz to 2 kHz.

(ii) 6A001.a.2.a.1 to a.2.a.3, a.2.a.5, or a.2.a.6.

(iii) 6A001.a.2.b.

(iv) 6A001.a.2.c—Processing equipment, "specially designed" for real time application with towed acoustic hydrophone arrays, having "user-accessible programmability" and time or frequency domain processing and correlation, including spectral analysis, digital filtering and beamforming using Fast Fourier or other transforms or processes.

(v) 6A001.a.2.e.

(vi) 6A001.a.2.f—Processing equipment, "specially designed" for real time application with bottom or bay cable systems, having "user-accessible programmability" and time or frequency domain processing and correlation, including spectral analysis, digital filtering and beamforming using Fast Fourier or other transforms or processes.

(vii) 6A002.a.1.c.

(viii) 6B008.

(ix) 6D001—"Software" "specially designed" for the "development" or "production" of equipment specified by 6B008.

(x) 6D003.a.

(xi) 6E001—"Technology" according to the General Technology Note for the "development" of equipment or "software" specified by the 6A, 6B, or 6D provisions described in this Supplement.

(xii) 6E002—"Technology" according to the General Technology Note for the "production" of equipment specified by the 6A or 6B provisions described in this Supplement.

(4) Category 7

(i) 7D003.a.

(ii) 7D003.b.

(5) Category 8

(i) 8A001.b.

(ii) 8A001.c.1.

(iii) 8A002.o.3.b.

(iv) 8D001—"Software" specially designed for the "development" or "production" of equipment specified by 8A001.b, 8A001.c.1, or 8A002.o.3.b.

(v) 8E001—"Technology" according to the General Technology Note for the "development" or "production" of equipment specified by 8A001.b, 8A001.c.1, or 8A002.o.3.b.

(6) Category 9

(i) 9A011.

(ii) 9D001—"Software" "specially designed" or modified for the "development" of equipment or "technology" specified by 9A011, 9E003.a.1, or 9E003.a.3.a.

(iii) 9D002—"Software" "specially designed" or modified for the "production" of equipment specified by 9A011.

(iv) 9E001—"Technology" according to the General Technology note for the "development" of equipment or "software" specified by 9A011 or this Supplement's description of 9D001 or 9D002.

(v) 9E002—"Technology" according to the General Technology Note for the "production" of equipment specified by 9A011.

(vi) 9E003.a.1.

(vii) 9E003.a.3.a.

[78 FR 22736, Apr. 16, 2013, as amended at 83 FR 53793, Oct. 24, 2018; 85 FR 56334, Sept. 11, 2020]