

July 2017

Technical Rules for Hazardous Substances (TRGS)

concerning restrictions on use, substitutes and substitution of processes or technology

The Technical Rules for Hazardous Substances (TRGS) reflect the state of the art, the state of occupational health and occupational hygiene as well as other sound work-scientific knowledge relating to activities involving hazardous substances including their classification and labelling. The

Committee on Hazardous Substances (AGS)

compiles or adapts the rules, and they are announced by the Federal Ministry of Labour and Social Affairs (BMAS) in the Joint Ministerial Gazette (GMBI).

The technical rules 600 - 619 are dealing with restrictions on use, substitutes and substitution of processes or technology

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TRGS 600 (August 2008)

Substitution

An unofficial English version is available; mandatory is the current German version
<https://www.baua.de/EN/Topics/Work-design/Hazardous-substances/TRGS-600.html>.

1 Scope

(1) Under Sections 7 Subs. 1, 9 Subs. 1, 10 Subs. 1 and 19 Subs. 2 of the Hazardous Substances Ordinance (GefStoffV) the employer has the duty to determine, test and decide on substitution and to document it. The present TRGS is intended to support the employer

1. in avoiding activities involving hazardous substances,
2. to replace hazardous substances by substances, preparations or processes which are not hazardous or less so under the relevant conditions of use or
3. to replace hazardous processes by less hazardous ones.

(2) If the employer establishes within the context of the risk assessment that there is a low hazard according to the criteria of Section 7 Subs. 9 GefStoffV (see also Number 6.2 of TRGS 400 "Risk assessment for activities involving hazardous substances"), the Hazardous Substances Ordinance does not demand any substitution check or any substitution.

(3) The aim of the substitution is to eliminate or reduce to a minimum the hazard arising from all activities involving hazardous substances, including maintenance work and operating and monitoring activities. With regard to the protection of workers during activities involving hazardous substances, the primary measure to be taken by employers within the framework of information gathering and risk assessment under the Hazardous Substances Ordinance (Section 7 GefStoffV, see also TRGS 400) is to check substitution possibilities and implement them according to the criteria described in greater detail in Number 5 of this TRGS taking account of their reasonable nature.

(4) The substitution solution must as a whole reduce the hazards arising from hazardous substances at the workplace. At the same time it should not lead to any increase in other hazards at the workplace or to any increased impairment of other assets to be protected.

(5) The substitution check according to the specifications of this TRGS must also be applied if it is planned to use new substances and processes for economic or technological reasons.

(6) The TRGS does not describe the requirements set in the context of the Regulation (EC) No. 1907/2006 (REACH) regarding the assessment of substitution solutions within the framework of the authorisation and restriction procedure.

(7) Annex 1 contains a flow chart with the individual steps to be followed when determining and implementing substitution solutions. For illustration purposes Annex 1 contains in addition a simplified case example for this procedure.

TRGS 602 (May 1988)**Substitutes and restrictions on use - zinc chromates and strontium chromate as pigments for anticorrosive coatings**

Substance and use categories to be replaced	Substitutes
zinc- or strontiumchromates in wash primers	Substitute substances - Ni substitutes recommended
zinc- or strontiumchromates in primers	- basic zincphosphate-hydrate and basic zincaluminiumphoshate-hydrate - zinc dust - bariummetaborate ($\text{BaB}_2\text{O}_4 \times \text{H}_2\text{O}$) - zinc- and calciumferrites
	Substitution of process or technology - phosphating - zinc dust coatings via Coil-Coating-method - thickfilm-systems - metallic coatings - melt dipping method - diffusion metal coatings - electrolytic (galvanic) coatings

Restrictions on use

No general restrictions on use, but if the above mentioned substitutes or substitution of working methods can be adopted, zinc- and strontiumchromat should be replaced.

TRGS 608 (April 1991)**Substitutes, substitution of working methods and restrictions on use for hydrazine in water- and vapour systems**

Substance and use categories to be replaced	Substitutes
Oxygen binding agent and corrosion inhibitor in water- and vapour systems , except nuclear technical plants	Substitute substances <ul style="list-style-type: none"> - ascorbates - sulfites und hyposulfites (dithionites) - diethylhydroxylamine, hydrochinone, methylethylketoxime and tannines
oxygen-elimination in water- and vapour systems corrosion inhibitor in water- and vapour systems , except nuclear technical plants	Substitution of process or technology physical methods <ul style="list-style-type: none"> - thermal degassing with overpressure - vacuum degassing catalytic reduction pH-value increase via alkalinisation agents, such as ammonia, sodium hydroxide or trinatriumphosphate

Restrictions on use – acceptable process technology

Closed pump- and filling stations as described in detail in Statutory Insurance Informations (ZH1/109) shall be used, if the mentioned substitutes and substitution of working methods can't be adopted

TRGS 609 (June 1992)**Substitutes, substitution of working methods and restrictions on use for methyl- and ethylglykol and their acetates**

Substance and use categories to be replaced	Substitutes
solvents in the varnish- and plastic industry	Substitute substances (examples) 1-methoxy-2-propanol 1-methoxy-2-propylacetate butylglykol butylglykolacetate ethyl-3-ethoxypropionate

Restrictions on use

- for junior employee and pregnant women
- it is recommended not to use the above mentioned substances in the private sector or in comparable industrial areas

TRGS 610 (January 2011)**Substitutes, substitution of working methods for solvent based primer and adhesives for floorings**

Substance and use categories to be replaced	Substitutes
floorings, parquet and other wood floorings (GISCODE S 1 – S 6)	<p>Substitute substances</p> <ul style="list-style-type: none"> - solvent-free dispersion adhesives (GISCODE D 1), - SMP (silanemodified polymere)-adhesives (GISCODE RS 10) or - solvent-free polyurethane (PU)-adhesives (GISCODE RU 0,5 and RU 1) <p>GISCODEs are Product-Codes, see www.gisbau.de/giscodes/liste/gruppe_1.htm)</p>
	<p>Substitution of process or technology</p> <ul style="list-style-type: none"> - loose laying - floating floors (parquet and special other wood floorings) - nailing or screwing up floors

Restrictions on use (recommendations)

- use of solvent-poor or –free primer and adhesives for floorings in the industrial and non-industrial area
- in case solvent based primer and adhesives are indispensable, products with the GISCODE S 0,5 should be used.
- use of toluene-free products
- use of emission-free products

TRGS 611 (May 2007)

Restrictions on the use of water-miscible or water-mixed cooling lubricants whose use can result in the formation of N-nitrosamines

An inofficial English version is available; mandatory is the current German version
<https://www.baua.de/EN/Topics/Work-design/Hazardous-substances/TRGS-611.html>.

N-nitrosamines can be formed under certain conditions via nitrosification of secondary amines when using certain water-mixed cooling lubricants.

The following restrictions on use aim to reduce the development of N-nitrosamines by avoiding nitrosification agents and their precursors and using appropriate substitutes for secondary amines. In addition a process to monitor and control the formation of nitrosamines is described

Substance and use	restrictions on use
use of water-miscible cooling lubricant (concentrates) in the metal forming industry	<u>requirements for water-miscible cooling lubricants in the delivery form</u> <ul style="list-style-type: none"> - absence of nitrosification agents and their precursors (nitrites or nitrite-releasing substances) - concentration of secondary amines is restricted to < 0,2 mass %; in case of higher concentrations inhibitors must be added substitutes: <ul style="list-style-type: none"> - primary amines and primary alkanol amines - tertiary amines with high purity - amine-free cooling lubricants - pH-value constancy is important - use of inhibitors is recommended
use of water-mixed cooling lubricant (emulsions and solutions) in the metal forming industry	<u>required protective- and monitoring measures</u> <ul style="list-style-type: none"> - avoid skin contact - nitrate concentration in the added water < 50 mg/l - monitoring the nitrite content (replacement of the water-mixed cooling lubricants or addition of inhibitors, if the concentration is higher than 20 mg nitrite/l) - N-nitrosamine concentration (N-nitroso-diethanolamine) in the water-mixed cooling lubricant < 0,0005 % (5 mg /kg) - extended monitoring in the special case of secondary amines containing cooling lubricants (and the necessary inhibitors) - avoiding the carry-over or formation of nitrosating agents - preventing the carry-over of secondary amines - temperature in the emulsion- / solution-system as low as possible (40°C for many material-removal operations and 60°C in the case of the hot-rolling of aluminium) - monitoring and compliance with pH-value constancy

TRGS 614 (March 2001)**Restrictions on use for azodyes, which may release aromatic amines classified as carcinogens**

Azo colourants have also been regulated by Commission Directive 2003/3/EC of 6 January 2003 L 4 12 9.1.2003, which amends Directive 77/769/EEC.

Restrictions on use

azodyes may not be used when particular articles of daily use are industrially produced and handled (see Foods and Other Commodities Act (LMBG)).

Furthermore,

- azodyes which, by reductive cleavage of one or more azo groups, may release particular aromatic amines
- and their preparations of these azo.dyes
- semi-finished- and finished products, coloured with these azocolourants respectively with their preparations

may not be used.

The TRGS also applies also to coloured products and proposes substitution for azodyes, not mentioned in the Foods and Other Commodities Act (LMBG).

Exceptions (no substitutes proposed) :

Special azodyes (Solvent Red, 24 85-83-6; Solvent Red 164, 92257-31-3; Solvent Red 215, 85203-90-3) used as markers for tax-favoured mineral oils.

TRGS 615 (May 2007)

Restrictions on the use of anticorrosion agents whose use can lead to the formation of N-nitrosamines

An inofficial English version is available; mandatory is the current German version

<https://www.baua.de/EN/Topics/Work-design/Hazardous-substances/TRGS-615.html>.

This Technical Rule applies to the production and use of water-miscible, water-mixed and non-water-miscible anticorrosion agents, volatile corrosion inhibitors (VCI) and anticorrosion greases and waxes which are intended to provide temporary protection of metal objects.

Substance and use categories to be replaced	Substitutes
corrosion inhibitors containing secondary amines or nitrosification agents	Substitute substances corrosion inhibitors containing primary amines or primary amino alcohols
<p>restrictions on use</p> <p>corrosion inhibitors, containing free or disguised secondary amines and nitrosification agents or their pre-stages at the same time, may not be used (exceptions see TRGS 615).</p> <p><u>requirements for corrosion inhibitors containing free or disguised secondary amines (with exceptions):</u></p> <ul style="list-style-type: none"> - monitoring of N-nitrosamine concentration while using - threshold limit values for N-nitrosamines - in preparations or materials, the concentration limits for category 1 or 2 carcinogenic N-nitrosamines according to Technical Rule (TRGS) 905 Number 4 must be adhered to - tertiary and primary amines with high purity should be used - content of secondary amines in the finished product must not exceed <ul style="list-style-type: none"> - 0.02 % in the case of VCI packaging materials (with an active-substance content of up to 10 %), - 0.2 % in the case of all other anticorrosion agents and VCI materials; this content must not be achieved by targeted addition of secondary amines. - information about the purity of tertiary and primary amines resp. the concentration of secondary amines must be reported in the safety data sheet <p><u>requirements for corrosion inhibitors, containing nitrosification agents or their pre-stages:</u></p> <ul style="list-style-type: none"> - special monitoring measures are necessary when using VCI-materials (inclusive VCI-oils), anticorrosion greases and -waxes and water-immiscible anticorrosive liquids containing more than 1 % nitrite (measured as sodium nitrite) or more than 0,1 % of other nitrosification agents (e.g. nitrophenols, dinitrophenols or nitrosophenols) or their pre-stages - every effort should be made to reduce the nitrite content to below 0.5 %. - water-miscible and water-mixed corrosion inhibitors may not contain nitrite or other nitrosification agents or their pre-stages in the delivery form; the necessary information about the nitrite concentration must be reported in the safety data sheet 	

TRGS 617 (February 2017)**Substitutes and substitution of working methods for solvent based surface treatment agents for parquet and other wood floorings**

Substance and use categories to be replaced	Substitutes
<p>surface treatment agents for parquet and other wood floorings</p>	<p>Substitute substances</p> <ul style="list-style-type: none"> - solvent-free water seals, - water seals with less than 5 % of organic solvent, N-Methylpyrrolidone-free and N-Ethylpyrrolidone-free - water seals with isocyanate-containing hardeners and with less than 5 % of organic solvent, N-Methylpyrrolidone-free and N-Ethylpyrrolidone-free - water seals with less than 15 % of organic solvent, N-Methylpyrrolidone-free and N-Ethylpyrrolidone-free - water seals with isocyanate-containing hardeners and with less than 15 % of organic solvent, N-Methylpyrrolidone-free and N-Ethylpyrrolidone-free - solvent-free resp. solvent-reduced waxes and oils - solvent-free resp. solvent-reduced waxes and oils, butanoxime-free - solvent-reduced waxes and oils, butanoxime-free and dearomatised. <p><u>exceptions:</u></p> <p>The use of solvent based surface treatment agents for parquet and other wood floorings can be necessary in special cases, e.g. to avoid the escape of wood-ingredients when grounding wood floorings.</p>

TRGS 618 (December 1997)**Substitutes and restrictions on use for wood preservatives containing chromium (VI)**

Substance and use categories to be replaced	Substitute substances
<p>wood preservatives containing chromium (VI), esp. based on sodium-, potassium- and ammonium dichromate or chromic acid, for impregnation;</p> <p>mixtures of the following salt-combinations with water:</p> <p>CFB-salts (chromium-fluorine-boron) CK-salts (chromium-copper) CKA-salts (chromium-copper-arsenic) CKB-salts (chromium-copper-boron) CKF-salts (chromium-copper-fluorine) CKFZ-salts (chromium-copper-fluorine-zinc)</p> <p>vacuum impregnation</p>	<p>Water-based and fixating wood preservatives need a authorisation from the German Institute for construction engineering (DIBt). <u>substitutes with a DIBt-authorisation for the use-class 1 – 3 for woods:</u> chromate-free fixating wood preservatives based on</p> <ul style="list-style-type: none"> - copper /copper-HDO, - copper / quaternary ammonium salts, - copper / triazols, - quaternary ammonium salts and - triazols <p><u>substitutes with a DIBt-authorisation for the use-class 4 for woods:</u></p> <ul style="list-style-type: none"> - copper / copper-HDO, - copper / quaternary ammonium salts and - copper / triazols <p>suitable: copper-HDO, benzalkonium chloride, propiconazole and tebuconazole; The use class for woods can be reduced with constructive measures to enlarge the choice of substitutes. Furthermore it has to be examined if the use of wood preservatives can be avoided by applying resistant woods.</p>

Restrictions on use

Wood preservatives containing chromium in the use class 1 – 4 for woods may be substituted.

exception:

wood preservatives containing chromium can be used in the use class 4 for woods, if

1. they are used for vacuum impregnation and
2. no wood components are impregnated, which can come directly in skin contact with men and animals, unless the surface is well cleaned after finished treatment and fixation of the wood preservative

TRGS 619 (May 2013)

Substitute materials for aluminium silicate wool products

An unofficial English version is available; mandatory is the current German version
<https://www.baua.de/EN/Topics/Work-design/Hazardous-substances/TRGS-619.html>.

This TRGS includes criteria for determining substitutes for aluminium silicate wool products essentially used for thermal insulation in furnace and firing system construction, in heating installations and exhaust gas systems for motor vehicles, especially at application temperatures above 900°C. Substitutes for aluminium silicate wool products are already widely used in the following applications: domestic appliances, fire protection and automotive engineering.

Substance and use categories to be replaced	Substitute substances
aluminium silicate wool products	Substitutes with a lower health risk include both fibrous and fibre-free refractory products
for temperatures up to 300 °C	glass- and mineral wool
between 300 and 600 °C	mineral wool or Alkaline Earth Silicate Fibres (AES-Fibres)
between 600 and 900 °C	AES-Fibres
between 900 and 1100 °C	The possibility for using AES wool products is reduced owing to technological constraints.
above 1200 °C	AES wool products can no longer be used and the application of aluminium silicate wool products is also limited.
up to 1650 °C	Polycrystalline wool products (PCW)
between 600 and 1700 °C	Non-fibrous substitutes are refractory materials such as: <ul style="list-style-type: none"> - calcium silicate or vermiculite panels and mouldings, - thermal insulation bricks and concretes, - lightweight refractory bricks and concretes, - thermal insulation refractory compounds, - highly porous refractory materials containing e.g. aluminiumoxide, mullite and microporous calcium-hexaluminate - other non-fibrous products
	New non-fibrous refractory materials may contain quartz which can be released as respirable quartz dust during handling. When AES and aluminium silicate wools as well as microporous thermal insulation materials are used at temperatures > 900°C, quartz/cristobalite can form, which is released as silicogenic dust during maintenance and removal. Activities involving exposure to quartz/cristobalite are carcinogenic in accordance with TRGS 906. In these cases the TRGS 559 „Mineral Dust“ shall be observed.
	It is possible to determine whether a substitute for aluminium silicate wool is technically possible with the tables in Annex 1 -3 of the TRGS 619.