

# Ethanol



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## IDENTIFICATION

### Ethanol

Ethyl alcohol

Alcohol

Methyl carbinol

**ZVG No:** 10420  
**CAS No:** 64-17-5  
**EC No:** 200-578-6  
**INDEX No:** 603-002-00-5

## CHARACTERISATION

### SUBSTANCE GROUP CODE

142200 Alcohols

### STATE OF AGGREGATION

The substance is liquid.

### PROPERTIES

colourless

characteristic odour

### CHEMICAL CHARACTERISATION

Highly flammable liquid.

Vapours form explosive mixtures with air.

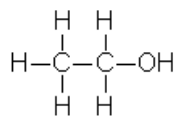
Mixable with water.

Highly volatile.

Acute or chronic health hazards result from the substance.

(see: chapter REGULATIONS).

[Substance information in Wikipedia](#)

**FORMULA**

**Molar mass:** 46,07 g/mol

**Conversion factor** (gaseous phase) at 1013 mbar and 20 °C:

1 ml/m<sup>3</sup> = 1,92 mg/m<sup>3</sup>

**PHYSICAL AND CHEMICAL PROPERTIES**

[Melting point](#) | [Boiling point](#) | [Density](#) | [Vapour pressure](#) | [Evaporation number](#) | [Flash point](#) | [Ignition temperature](#) | [Explosion data](#) | [Solubility](#) | [pH-value](#) | [Partition coefficient](#) | [Hazardous reactions](#) | [Further Information](#)

**MELTING POINT**

Melting point: -114 °C

Reference: [00440](#)

**BOILING POINT**

Boiling Point: 78 °C

Reference: [00440](#)

**DENSITY**

DENSITY

Value: 0,79 g/cm<sup>3</sup>

Temperature: 20 °C

Reference: [00440](#)

RELATIVE VAPOUR DENSITY

Ratio of the density to dry air at the same temperature and pressure

Value: 1,59

Reference: [00440](#)

RELATIVE DENSITY OF THE VAPOUR-AIR-MIXTURE

Ratio of the density to dry air at 20 °C and standard pressure

Value: 1,03

Reference: [99999](#)

**VAPOUR PRESSURE**

Vapour pressure: 58,0 hPa

Temperature: 20 °C

Reference: [00446](#)

Vapour pressure: 104 hPa

Temperature: 30 °C

Reference: [00446](#)

Vapour pressure: 178 hPa

Temperature: 40 °C

Reference: [00446](#)

Vapour pressure: 293 hPa

Temperature: 50 °C

Reference: [00446](#)

## EVAPORATION NUMBER

The evaporation number is the time required for complete evaporation of a substance, related to the time required for evaporation of diethyl ether.

Evaporation number: 8,3

Reference: [00440](#)

## FLASH POINT

Flash point: 12,0 °C

Closed cup

Reference: [00440](#)

Flash point: 16,0 °C

95 % by mass

Reference: [00440](#)

Flash point: 17,5 °C

90 % by mass

Reference: [00440](#)

Flash point: 19,5 °C

80 % by mass

Reference: [00440](#)

Flash point: 21,0 °C

70 % by mass

Reference: [00440](#)

Flash point: 22,5 °C

60 % by mass

Reference: [00440](#)

Flash point: 24,0 °C

50 % by mass

Reference: [00440](#)

Flash point: 25,5 °C

40 % by mass

Reference: [00440](#)

Flash point: 29,0 °C

30 % by mass

Reference: [00440](#)

Flash point: 35,5 °C

20 % by mass

Reference: [00440](#)

Flash point: 47,0 °C

10 % by mass

Reference: [00440](#)

Flash point: 60,0 °C

5 % by mass

Reference: [00440](#)

### IGNITION TEMPERATURE

Ignition temperature: 400 °C

Temperature class: T2

Reference: [00440](#)

### EXPLOSION DATA

Lower explosion limit:

3,1 vol. %

59 g/m<sup>3</sup>

Upper explosion limit:

27,7 vol. %

532 g/m<sup>3</sup>

Lower explosion point:

9 °C

Upper explosion point

44 °C

Max. exper. safe gap (MESG): 0,89 mm

Explosion group: IIB

Maximum explosion pressure:

8,4 bar

Reference: [00440](#)

### SOLUBILITY IN WATER

entirely mixable with water

Reference: [99999](#)

### pH-VALUE

pH-value: 7,0

Temperature: 20 °C

Concentration: 10 g/l

Reference: [01211](#)

### PARTITION COEFFICIENT (octanol/water)

log Kow: -0,3

Recommended value of LOG KOW Databank.

Reference: [02070](#)

## HAZARDOUS REACTIONS

**Decomposition temperature:**  $\geq 700\text{ }^{\circ}\text{C}$

**Hazardous chemical reactions**

Risk of explosion in contact with:

chlorine  
potassium  
sodium  
strong oxidizing agents  
nitric acid  
calcium hypochlorite  
halogene oxides  
disulfur difluoride  
acetic anhydride + salts + acids  
isocyanates  
potassium dioxide  
perchlorates  
potassium permanganate/sulfuric acid  
sodium hypochloride  
sodium peroxide  
peracids  
perchloro nitrile  
peroxodisulfuric acid  
mercury nitrate  
oxygen (liquid)  
sulfuric acid + hydrogen peroxide  
silver/nitric acid  
silver nitrate  
silver nitrate/ammonia  
silver oxide/ammonia  
nitrogen dioxide

conc.hydrogen peroxide

The substance can react dangerously with:

alkali/alkaline earth metals  
fluorine  
acids  
reducing agents  
acetylene bromide  
acetylene chloride  
barium perchlorate  
bromine trifluoride  
caesium oxide  
chromium trioxide  
chromyl chloride  
oxirane  
iodine heptafluoride  
potassium tert.-butoxide  
lithium hydride  
phosphorus trioxide  
platinum black  
nitric acid/potassium permanganate  
acid anhydrides  
uranium hexafluoride  
zirconium(IV)-chloride  
zirconium(IV)-iodide

## FURTHER INFORMATION

Conductivity:  $1,35 \cdot 10^{-7}$  S/m

Temperature: 25 °C

Reference: 08086

**TOXICOLOGICAL DATA****LD50 oral rat**

Value: 7060 mg/kg

Toxicology and Applied Pharmacology. Vol. 16, Pg. 718, 1970.

Reference: [02071](#)

**ECOTOXICOLOGICAL DATA****LC50 Fish (96 hours)**

Minimum: 42 mg/l

Maximum: 14200 mg/l

Median: 11000 mg/l

Study number: 5

Reference for median:

Bengtsson, B.E., L. Renberg, and M. Tarkpea 1984. Molecular Structure and Aquatic Toxicity - an Example with C1-C13 Aliphatic Alcohols. Chemosphere 13(5/6):613-622

**LC50 Crustaceans (48 hours)**

Minimum: 3720 mg/l

Maximum: 20700 mg/l

Median: 9280 mg/l

Study number: 20

Reference for median:

Takahashi, I.T., U.M. Cowgill, and P.G. Murphy 1987. Comparison of Ethanol Toxicity to *Daphnia magna* and *Ceriodaphnia dubia* Tested at Two Different Temperatures: Static Acute Toxicity Test Results. Bull.Environ.Contam.Toxicol. 39(2):229-236; Ziegenfuss, P.S., W.J. Renaudette, and W.J. Adams 1986. Methodology for Assessing the Acute Toxicity of Chemicals Sorbed to Sediments: Testing the Equilibrium Partitioning Theory. In: T.M.Poston and R.Purdy (Eds.), Aquatic Toxicology and Environmental Fate, 9th Volume, ASTM STP 921, Philadelphia, PA :479-493

**EC50 Crustaceans (48 hours)**

Minimum: 2 mg/l

Maximum: 17500 mg/l

Median: 9950 mg/l

Study number: 4

Reference for median:

Barera, Y., and W.J. Adams 1983. Resolving Some Practical Questions About *Daphnia* Acute Toxicity Tests. In: W.E.Bishop (Ed.), Aquatic Toxicology and Hazard Assessment, 6th Symposium, ASTM STP 802, Philadelphia, PA :509-518; Rossini, G.D.B., and A.E. Ronco 1996. Acute Toxicity Bioassay Using *Daphnia obtusa* as a Test Organism. Environ.Toxicol.Water Qual. 11(3):255-258

Reference: [02072](#)

**OCCUPATIONAL HEALTH AND FIRST AID**

[Routes of exposure](#) | [Toxic effects](#) | [First Aid](#) |  
[Occupational health check](#)

**ROUTES OF EXPOSURE****Main routes of exposure**

Under occupational conditions, the main intake pathway for ethanol (E.) proceeds via the respiratory tract.[07619]

### Respiratory tract

The kinetics of pulmonary intake were examined using various E. concentrations (80 - 10000 ppm) and ventilation rates (7 - 25 l/min).

For the usual ventilation rates, equilibrium concentrations were established within 2 hours. Then, the ethanol levels in the blood correlated in a linear manner with the E. concentration in the working atmosphere. Exposure to 80, 390 and 790 ppm E. on average led to 0.23, 0.85 and 2.18 mg E./l blood, respectively. However, the individual range of variation was relatively high (+/- 53, 20 and 26 %, respectively).

It was estimated from the whole data material that about 60 % of the amount of E. inhaled is retained in the lung.[07619]

### Skin

In experiments on cultures of human skin, a permeability constant of 3.2 µg/h was determined for E. From this data, a possible skin uptake (flux) of 0.25 mg/cm<sup>2</sup> x h was estimated undiluted E.

Consequently, if both hands and forearms are in contact with the liquid, about 500 mg E. would be dermally absorbed within 1 hour. This amount corresponds to less than 10 % of the dose which would be absorbed inhalatively if the E. concentration in the air is 500 ppm. Therefore, intake through the skin is considered to be insignificant.[07619]

### Gastrointestinal tract

E. is almost completely absorbed from the gastrointestinal tract, the main part within the first hour. However, certain factors can delay the absorption: level of stomach contents, fat content of the food. Oxidation of E. can already take place in the stomachal mucous membranes to a minor extent. [07619]

## TOXIC EFFECTS

### Main toxic effects

Acute:

Irritation to the eyes (due to liquid E.), disturbance to the general health; function disturbances of the CNS following high doses

Chronic:

Degreasing of the skin (due to liquid E.), following oral intake of high doses damage to various organ systems, in particular the liver[07619]

### Acute toxicity



Following direct contact with the eye, liquid E. causes burning/shooting pain. Splashes of 40 to 50 % E. produce reddening and superficial lesions which, however, are rapidly disappeared. To sum up, E. was estimated to be moderately irritating to the eyes.

Irritation to the skin is mainly expected as a consequence of degreasing which generally only results from repeated skin contact with liquid E. Allergic skin reactions (dermatitis, also urticaria) are possible in isolated cases (see "Chronic toxicity").

However, there is no indication of a significant sensitizing potential of E. Following acute inhalative exposure, E. was shown to be of minor toxicity.

Odor is noticeable at a level of 80 ppm, the threshold for eye irritation is significantly higher (> 10000 ppm).[07619]

High exposures can cause cough and lacrimation.[07748]

It was derived from long-term occupational experience that at concentrations up to 5000 ppm E. no local irritation and up to 1000 ppm no systemic effects appear.

In more recent tests on volunteers exposed to 1000 ppm, no exposure-relevant changes of examined performance parameters (concerning reaction time, choice reaction, short-term memory) were found and no complaints were felt. For hourly varying exposures of 100 and 1900 ppm, the high concentration caused abnormal perception (annoyance, minor irritation) which, however, were rapidly reversible. First effects to the CNS are only to be expected through far higher concentrations producing blood levels of about 200 mg E./l. Asthmatics exposed to aerosolized E. showed in isolated cases severe constriction of the airways (decrease of the FEV by 20 - 40 %), however, an allergic genesis cannot be derived from it.

The acute CNS symptoms of orally-taken E. are generally well known. The performance of the CNS can be adversely affected at blood concentration as low as 200 - 300 mg E./l (0.2 - 0.3 o/oo). From 0.6 - 0.7 o/oo upwards, the CNS function of most people is significantly influenced and from 1.0 - 1.1 o/oo upwards severe disturbances, eg. of the fitness to drive, exist in every case. Death is possible if the E. level in the blood reaches 4 o/oo but even considerably higher concentrations have been survived.[07619]

### **Chronic toxicity**

Following repeated contact, liquid E. makes the skin dry and can cause irritative inflammation. Some case reports describe contact dermatitis acquired by occupational or non-occupational contact. An allergic genesis and E. as the provoking agent were shown by means of patch tests. The skin reactions appeared in some cases even following consumption of alcoholic beverages (in addition erythema, aphthous lesions and burning sensation to the stomatic mucous membranes). Some case reports describe generalized allergic skin reactions (urticaria) which were caused by E. Cross reactions to other primary or secondary alcohols were also reported. Considering the ubiquitous possibilities of contact, allergic reactions to E. are all in all very rare, however.

No data is available on the consequences of long-term inhalative exposure to E. despite numerous working places with possibilities of exposure.

Chronic consumption of large amounts of alcoholic beverages can produce toxic effects in almost all organ systems. The liver is primarily concerned. Damage first becomes manifest as adiposis and can progress via necrotic and fibrotic stages through to hepatic cirrhosis. When E. is regularly taken in, 20 - 40 g/d for women and 60 - 80 g/d for men are assumed to be threshold doses for the initiation of toxic damage to the liver.[07619]

### **Reproductive toxicity, mutagenicity, carcinogenicity**

For classifying the reproductive toxicity and mutagenic and carcinogenic potential see list in Annex VI of the CLP regulation / TRGS 905 / List of MAK values (see section REGULATIONS).

**Reproductive toxicity:**

There is no reason to fear a risk of damage to the developing embryo or foetus when MAK and BAT values are observed.

Developmental-toxic effects (alcohol embryopathy) following oral intake of high doses has been clearly demonstrated.

The E. concentrations in the maternal blood triggering these effects, however, are in an order of magnitude which is not reached in the occupationally-relevant concentration level due to inhalative exposure. In animal experiments, concentrations through to 20000 ppm did not cause effects to the offspring in spite of toxic effects to the dams. Reduced fertility and an influence on the sex hormone level for humans and in animal experiments were also clearly detected only following oral intake of high doses.

**Mutagenicity:**

Mutagenic effects of E. were definitely determined in animal experiments, however, the corresponding dosages were already distinctly toxic. Occupationally acceptable E. concentrations do not significantly increase the general internal life time exposure (see "Carcinogenicity"). Therefore, the germ cell-mutagenic potential is considered to be negligible under these conditions.

**Carcinogenicity:**

Long-term intake of large amounts of E. in the form of alcoholic beverages can cause tumors in the oral cavity/pharynx, larynx, gullet, liver and probably also in the breast and bowels.

Occupational inhalative exposure should be kept as low as possible. It could be shown that the internal exposure to E. over a life time is still within the standard deviation of endogenous exposure if the occupational exposure concentration is 500 ppm. Therefore, it is estimated that exposure up to this limit does not significantly contribute to the cancer risk.[07619]

### **Biotransformation and excretion**

Once absorbed, E. is mainly distributed into aqueous compartments. It penetrates the blood-brain barrier and the placenta.

More than 90 % of the absorbed dose is metabolized in the liver, the remainder is eliminated unchanged via the kidneys or is exhaled. In the liver, E. is oxidized to form acetaldehyde which is further oxidized mainly to acetic acid. This is included into the intermediary metabolism or is decomposed to form water and CO<sub>2</sub>.

The reaction of E. to form acetaldehyde in the liver is mainly catalyzed by alcohol-dehydrogenase (ADH).

At high contents of E. in the blood, cytochrome-P450-2E1 significantly contributes to the decomposition of E. As opposed to ADH, 4 to 10 fold cytochrome-P450-2E1 is inducible by chronic high consumption of alcohol. Furthermore, catalase is involved in the conversion to acetaldehyde, however, to a minor extent only.

With the exception of very low and very high concentrations of E. in the blood, the velocity of the E. oxidation is independent of the concentration. Maximum elimination velocities of 175 and 228 mg/l x h were estimated from experiments on volunteers. They were independent of the gender. Very short half lives (1.7 and 6.4 min) were estimated for metabolically formed acetaldehyde and acetic acid. [07619]

### **Annotation**

This occupational health information was compiled on 04.02.2004.

It will be updated if necessary.

### **FIRST AID**

#### **Eyes**

Rinse the affected eye with widely spread lids for 10 minutes under running water whilst protecting the unimpaired eye.

Arrange medical treatment.

[07656]

#### **Skin**

Remove contaminated clothing while protecting yourself.

Cleanse the affected skin areas thoroughly with soap under running water.

Following extensive contact or if irritation persists:

Arrange for medical treatment.

[07656]

## Respiratory tract

Whilst protecting yourself remove the casualty from the hazardous area and take him to the fresh air.  
Lay the casualty down in a quiet place and protect him against hypothermia.  
In the case of breathing difficulties have the casualty inhale oxygen.  
If the casualty is unconscious but breathing lay him in a stable manner on his side.  
Arrange medical treatment.  
[07656, 99999]

## Swallowing

Following unintentional swallowing of technical grade ethanol:  
Rinse the mouth and spit the fluids out.  
If the casualty is conscious have him drink 1 glass of water (ca 200 ml).  
Arrange medical treatment.  
[07656]

## Information for physicians

The following statement takes into account only the occupationally-relevant dermal or inhalative exposure as well as the unintentional intake of technical grade ethanol.[99983]

### - Symptoms of acute poisoning:

Eyes: due to splashes of the liquid: burning/stinging sensation,[07619] foreign body type of discomfort, reddening of the conjunctiva, possible superficial lesions of the cornea with in general rapid reversibility[07748]

Skin: degreasing, dryness, later inflammation possible; allergic reactions not to be excluded; following massive skin contact possibly slight systemic effects[07619]

Inhalation: for very high vapor concentrations irritation to the eyes and upper airways (burning sensation to the mucous membranes, lacrimation, tussive irritation); possible bronchoconstriction; [07748] CNS symptoms like headache, vertigo, drowsiness, intoxication, unconsciousness

Ingestion: following swallowing in the concentrated form: strong burning sensation to the mucous membranes, possible emesis; systemically-related disturbance to the CNS in analogy to the effects due to alcoholic beverages; if denaturants are contained (eg. methanol, pyridine) incompatibility reactions probable (gastrointestinal complaints, vomiting) and more pronounced, even additional systemic effects possible.

### - Medical advice:

Thoroughly rinse eyes contaminated with the liquid. If irritation persists, consult an ophthalmologist.  
[07656]

Cleanse contaminated skin with soap and water, treat with an ointment containing lipids as needed. If irritation becomes noticeable, apply a dermatocorticoid. Further treatment will generally not become necessary. However, for massive contact (simultaneous inhalation) the casualty should be observed for signs of ethanol poisoning (restricted ability of working and fitness to drive).

Administer fresh air following massive inhalation. For signs of irritation or bronchoconstriction, application of a glucocorticoid (at least inhalatively) is indicated. Observe the casualty for systemic effects, symptomatic treatment as necessary.

Following oral intake of high doses of technical grade E., gastrolavage (with intubation) is to be considered.[99999]

Further treatment can be carried out in analogy to poisoning with alcoholic beverages. In particular, monitor the functions of the heart/circulatory system.[08013]

Hospitalize the casualty for detailed diagnoses/further observation also concerning additional noxae or medicaments taken in which could be strengthened in their action by ethanol.[07656]

## Recommendations

Provide the physician information about the substance/product and treatment already administered.

Following unintentional ingestion of E., it is important for the treatment to obtain additional information on substances possibly contained (denaturants, impurities, portions of dissolved substances) as well as on previous/simultaneous intake of medicaments.[08013]

## Annotation

This first aid information was compiled on 04.02.2004.  
It will be updated if necessary.

**Prophylaxis offer:** For activities involving this substance occupational medical prevention has to be offered.

**Deadlines:** Occupational medical prevention has to be offered to employees prior to taking up work. Deadlines for the proposal of regularly recurrent occupational medical prevention are to gather from the Occupational Health Rule (Arbeitsmedizinische Regel) "[AMR Nummer 2.1](#)".

## SAFE HANDLING

[Handling](#) | [Storage](#) | [Fire and explosion protection](#) | [Organisational measures](#) | [Personal protection](#) | [Disposal considerations](#) | [Accidental release measures](#) | [Fire fighting measures](#)

### TECHNICAL MEASURES - HANDLING

#### Workplace

Provision of very good ventilation in the working area.

Washing facility at the workplace required.

When handling excessive amounts of the substance an emergency shower is required.

Eye bath required. These locations must be signposted clearly.

#### Equipment

Use only closed apparatus.

If release of the substance cannot be prevented, then it should be suctioned off at the point of exit.

Consider emission limit values, a purification of waste gases if necessary.

Label containers and pipelines clearly.

Plastics have to be proven for their resistibility.

#### Advice on safer handling

Take care to maintain clean working place.

The substance must not be present at workplaces in quantities above that required for work to be progressed.

Do not leave container open.

Use leak-proof equipment with exhaust for refilling or transfer.

Do not transport with/using compressed air.

Avoid splashing.

Fill only into labelled container.

Use an appropriate exterior vessel when transporting in fragile containers.

#### Cleaning and maintenance

Use protective equipment while cleaning if necessary.

Only conduct maintenance and other work on or in the vessel or closed spaces after obtaining written permission.

### TECHNICAL MEASURES - STORAGE

#### Storage

Do not use any food containers - risk of mistake.

Containers have to be labelled clearly and permanently.

Store in the original container as much as possible.

Use breakable containers only up to 2 litres content.

Keep container tightly closed.

Recommended storage at room temperature.

Store in a dry place.

Keep container in a well-ventilated place.

Store apart from sources of ignition and heat.

Store smaller vessels in cabinets with collecting tubs.

Install sufficiently large collection rooms (depressions, walls, or stable freestanding walls).

Protect from overheating/heating up.

The maximum permissible stored quantities are to be found in the Technische Regel für Gefahrstoffe "Lagerung von Gefahrstoffen in ortsbeweglichen Behältern" ([TRGS 510](#)).

Storage is not permissible in hallways, thoroughfare, stairways, public hallways and corridors, on the roof, in attics, and in workrooms.

### Conditions of collocated storage

Storage class 3 (Flammable liquid substances)

Only substances of the same storage class should be stored together.

Collocated storage with the following substances is prohibited:

- Pharmaceuticals, foods, and animal feeds including additives.
- Infectious, radioactive und explosive substances.
- Gases.
- Other explosive substances of storage class 4.1A.
- Flammable solid substances or desensitized substances of storage class 4.1B.
- Pyrophoric substances.
- Substances liberating flammable gases in contact with water.
- Strongly oxidizing substances of storage class 5.1A.
- Ammonium nitrate and preparations containing ammonium nitrate.
- Organic peroxides and self reactive substances.
- Non combustible acutely toxic substances of storage class 6.1B.

Under certain conditions the collocated storage with the following sub-stances is permitted (For more details see [TRGS 510](#)):

- Oxidizing substances of storage class 5.1B.
- Noncombustible toxic or chronically acting substances of storage class 6.1D.
- Combustible solids of storage class 11.

The substance should not be stored with substances with which hazardous chemical reactions are possible.

## TECHNICAL MEASURES - FIRE AND EXPLOSION PROTECTION

### Technical, constructive measures

Substance is combustible.

Fire fighting equipment must be available.

The possibility of the formation of a hazardous explosive atmosphere must be evaluated in the risk assessment. Depending on the result of the risk assessment, measures in accordance with [TRGS 722](#) (prevention of formation), [TRGS 723](#) (prevention of ignition) and [TRGS 724](#) (constructive explosion protection) may be required.

Take precautionary measures against static discharges.

Earth all parts which can be electrically charged.

### Precaution on handling

The vapour-air-mixture is explosive.

Area with explosion risk.

Keep at a distance from sources of ignition (e.g. electrical devices, open flames, heat sources, sparks).

Observe the smoking prohibition!

Absolutely no welding in the working area.

Only work with vessels and lines after these have been thoroughly rinsed and inerting.

Work done with fire or open flame should only be carried out with written permission if the risk of fire or explosion cannot be completely eliminated.

Use caution with empty vessels; explosion is possible in case of ignition.

Do not use any tools that cause sparks.

It must be avoided that gases or vapours can escape into other rooms where sources of ignition are present.

## ORGANISATIONAL MEASURES

Instruction on the hazards and the protective measures using instruction manual ([TRGS 555](#)) are required with signature if just more than one minor hazard was detected.

Instruction must be provided before employment and then at a minimum of once per annum thereafter.

An escape and rescue plan must be prepared when the location, scale, and use of the work-site so demand.

It must be assured that the workplace limit values are being maintained. If the limit values are exceeded, additional protection measures are necessary.

The measurements must be recorded and kept on file.

Observe the restrictions on juvenile employment as defined in the "Jugendarbeitsschutzgesetz".

Only employees are permitted to enter the work areas. Signposting to this effect must be displayed.

## PERSONAL PROTECTION

### Body protection

Wear an apron or a lab coat.

Wear flameproof, antistatic protective clothing.

### Respiratory protection

In an emergency (e.g.: unintentional release of the substance, exceeding the occupational exposure limit value) respiratory protection must be worn. Consider the maximum period for wear.

Respiratory protection: Gas filter A, Colour code brown.

Use insulating device for concentrations above the usage limits for filter devices, for oxygen concentrations below 17% volume, or in circumstances which are unclear.

### Eye protection

Sufficient eye protection must be worn.

Wear glasses with side protection.

### Hand protection

The use of resistant protective gloves is recommended.

Skin protection cremes do not protect as effectively against the substance as protective gloves. Therefore suitable protective gloves should be preferred as far as possible.

The following materials are suitable for protective gloves (Permeation time  $\geq$  8 hours):

Butyl rubber - Butyl (0,5 mm)

Fluoro carbon rubber - FKM (0,4 mm)

Protective gloves of the following materials should not be worn longer than 2 hours continually (Permeation time  $\geq$  2 hours):

Polychloroprene - CR (0,5 mm)

Following materials are unsuitable for protective gloves because of degradation, severe swelling or low permeation time:

Natural rubber/Natural latex - NR

Nitrile rubber/Nitrile latex - NBR

Polyvinyl chloride - PVC

The times listed are suggested by measurements taken at 22 °C and constant contact. Temperatures raised by warmed substances, body heat, etc. and a weakening of the effective layer thickness caused by expansion can lead to a significantly shorter breakthrough time. In case of doubt contact the gloves' manufacturer. A 1.5-times increase / decrease in the layer thickness doubles / halves the breakthrough time. This data only applies to the pure substance. Transferred to mixtures of substances, these figures should only be taken as an aid to orientation.

### Occupational hygiene

Take heed of usual occupational hygiene measures when handling chemical substances, espacially wash the skin with soap and water before breaks and at the end of work and apply fatty skin-care products after washing.

Avoid contact with eyes. In case of contact rinse the affected eye(s).  
Change clothing that has become wet and do not reuse until completely dry.  
Increased risk of combustion from wicking.

## DISPOSAL CONSIDERATIONS

Hazardous waste according to Waste Catalogue Ordinance (AVV).  
If there is no way of recycling it must be disposed of in compliance with the respective national and local regulations.

Collection of small amounts of substance:

Place in a collection container for halogen-free organic solvents and solutions of halogen-free organic substances.

Collection vessels must be clearly labelled with a systematic description of their contents. Store the vessels in a well-ventilated location. Entrust them to the appropriate authorities for disposal.

## ACCIDENTAL RELEASE MEASURES

Shut off all sources of ignition.

Evacuate area. Warn affected surroundings.

Wear personal protective equipment (see chapter Personal Protection).

Absorb any spilt liquid with an absorbent (e.g. diatomite, vermiculite, sand) and dispose of according to regulations.

Use non-sparking tools.

Afterwards ventilate area and wash spill site.

Endangerment of watert:

Low hazard to waters. Inform the responsible authorities when very large quantities get into water, drainage, sewer, or the ground.

## FIRE FIGHTING MEASURES

### Classes of fires

B liquid or melting  
substances

### Suitable extinguishing media

Water (spray - not splash)

Dry extinguishing powder

Carbon dioxide

Fight large fire with alcohol resistant foam or water spray.

### Instructions

Cool surrounding containers with water spray.

If possible, take container out of dangerous zone.

Heating causes a rise in pressure, risk of bursting and explosion.

Shut off sources of ignition.

Beware of backfire.

Use only explosion proved equipment.

### Special protective equipment

In the case of a fire hazardous substances can be released.

Carbon monoxide and carbon dioxide

Wear self-contained breathing apparatus.

## REGULATIONS

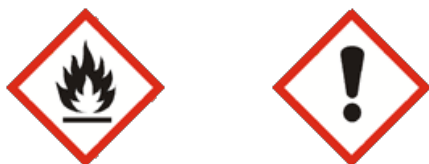


[GHS Classification/ Labelling](#) | [Workplace labelling](#) | [Water hazard class](#) | [Air quality control](#) | [Transport Regulations](#) | [Threshold limit values](#) | [MAK recommendations](#) | [SevesoIII](#) | [Restriction of use](#) | [Technical rules](#) | [Regulations of accident insurers](#) | [Occupational health check](#)

## EUROPEAN GHS CLASSIFICATION AND LABELLING

### Classification

Flammable liquids, Category 2; H225  
Eye irritation, Category 2; H319



**Signal Word** "Danger"

### Hazard Statement - H-phrases

H225: Highly flammable liquid and vapour.  
H319: Causes serious eye irritation.

### Precautionary Statement - P-phrases

P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.  
P233: Keep container tightly closed.  
P240: Ground and bond container and receiving equipment.  
P241: Use explosion-proof electrical/ventilating/lighting/... equipment.  
P242: Use non-sparking tools.  
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Manufacturer's specification by Merck

Reference: [01211](#)

State: 2023

Checked: 2023

The substance is listed in appendix VI, table 3 of CLP regulation.  
The given classification can deviate from the listed classification, since this classification is to be complemented concerning missing or divergent danger classes and categories for the respective substance.

Reference: [99999](#)

## GHS-CLASSIFICATION OF MIXTURES

### Specific Concentration Limits

Eye Irrit. 2; H319:  $\geq 50\%$

The general concentration limits from Annex 1 of the Regulation (EU) 1272/2008 are to be used for possibly unspecified concentration ranges or further available substance classifications.

Reference: [07520](#)

## WORKPLACE LABELLING ACCORDING TO GERMAN [ASR A1.3](#)

### Prohibition label





No open flame; fire, open ignition sources and smoking prohibited



No admittance for unauthorized persons

### Warning label



Caution - inflammable material

### Precept label



Use safety goggles

### GERMAN WATER HAZARD CLASS

Substance No: 96

WGK 1 - low hazard to waters

Classification according to the announcement of the list of substances hazardous to water in the Federal Register of 10.08.2017, last update 24.11.2023

### TECHNICAL INSTRUCTIONS ON AIR QUALITY CONTROL (TA LUFT)

Chapter 5.2.5 Organic Substances.

The following values, specified as overall carbon, are in all not allowed to be exceeded in exhaust gas:

Mass flow: 0,50 kg/hr

or

Mass conc.: 50 mg/m<sup>3</sup>

At old units with an annual mass flow till 1,5 Mg/a, specified as total carbon, the emissions in exhaust gas are not allowed to exceed 1,5 kg/h.

### TRANSPORT REGULATIONS

UN Number: 1170

Shipping name: Ethanol or ethanol solution

Hazard Identification Number: 33/30

Class: 3 (Flammable Liquids)

Packing Group: II/III (medium/low danger)

Danger Label: 3



Classification code: F1

Tunnel restrictions:

Transports in bulk or in tanks: passage forbidden through tunnels of category D and E.

Other transports: passage forbidden through tunnels of category E.

Reference: 07902

### TRGS 900 - GERMAN OCCUPATIONAL EXPOSURE LIMIT VALUES

200 ml/m<sup>3</sup>

380 mg/m<sup>3</sup>

Peak limitation: Excursion factor 4

Duration 15 min, mean; 4 times per shift; interval 1 hour

Category II - Substances with systemic effects

There is no reason to fear a risk of damage to the developing embryo or foetus when AGW and BGW are adhered to.

Source: DFG

### RECOMMENDATIONS OF MAK-COMMISSION

This data is recommended by scientific experience and is not established law.

200 ml/m<sup>3</sup>

380 mg/m<sup>3</sup>

Peak limitation: Excursion factor 4

Duration 15 min, mean; 4 times per shift; interval 1 hour

Category II - Substances with systemic effects

Carcinogenic: Category 5

Substances with carcinogenic and genetically toxic effects whose effect strength is judged however as so small that on adherence to the MAK-value no considerable contribution is to be expected for the cancer risk for humans.

Pregnancy: Group C

There is no reason to fear damage to the embryo or foetus when MAK and BAT values are observed.

Germ cell mutagenic: Category 5

Substances with a minimal effect. The compliance of the MAK-value should not give any genetic risk to humans.

### DIRECTIVE 2012/18/EU (Seveso III)

**The substance is subject to the hazard categories of the Hazardous Incident Ordinance:**

P5(a,b,c) Flammable liquids Category 2 or 3

### Quantity thresholds for determination of operation scopes:

Annex I Part 1 Section: P5a

Flammable liquids Category 2 or 3 (or other liquids with a flash point  $\leq 60$  °C), maintained at a temperature above their boiling point

Qualifying quantity for the application of

Lower-tier requirements: 10 t

Upper-tier requirements: 50 t

Annex I Part 1 Section: P5b

Flammable liquids Category 2 or 3 (or other liquids with a flash point  $\leq 60$  °C), where particular processing conditions, such as high pressure or high temperature, may create major-accident hazards or accident hazards

Qualifying quantity for the application of

Lower-tier requirements: 50 t

Upper-tier requirements: 200 t

Annex I Part 1 Section: P5c

Flammable liquids, Category 2 or 3 not covered by P5a and P5b

Qualifying quantity for the application of

Lower-tier requirements: 5000 t

Upper-tier requirements: 50000 t

## RESTRICTIONS OF USE / BANS OF USE

### REACH Regulation (EC) No 1907/2006 Annex XVII

Annex XVII, Point 3

1. The putting into circulation and the utilisation of the substance is not allowed in decorative objects, games and joke articles.

2. Substances labelled with H304 which can be utilised as fuels in decorative lamps and are put in circulation in amounts of 15 l or less must not contain a dye and/or a perfume.

Further information on prohibitions can be taken from the regulation.

Annex XVII, Point 40

Shall not be used, as substance or as mixtures in aerosol dispensers where these aerosol dispensers are intended for supply to the general public for entertainment and decorative purposes such as the following:

- metallic glitter intended mainly for decoration,
- artificial snow and frost,
- “whoopie” cushions,
- silly string aerosols,
- imitation excrement,
- horns for parties,
- decorative flakes and foams,
- artificial cobwebs,
- stink bombs.

Further information on prohibitions and exceptions can be taken from the regulation.

## Annex XVII, Point 75

Mixtures containing certain hazardous substances shall no longer be placed on the market for tattooing purposes. Mixtures containing such substances in specified concentrations shall no longer be used for tattooing purposes after 04.01.2022. Substances falling within one or more of the following points:

- carcinogenic or reproductive toxic substances according to Part 3 of Annex VI to CLP Regulation (excluding the classification due to effects only following exposure by inhalation),
- skin-sensitising, skin-corrosive, skin-irritant, serious eye-damaging or eye-irritant substances according to Annex VI Part 3 of the CLP Regulation,
- substances listed with specified conditions in Annex II or IV to Regulation (EC) No 1223/2009 [Cosmetics Regulation], and
- substances listed in Appendix 13 to Annex XVII (point 75) of the REACH Regulation.

In general, mixtures placed on the market for use for tattooing purposes must be labelled "Mixture for use in tattoos or permanent make-up." from 04.01.2022 on and may not be used for tattooing purposes without this labelling. Further safety information shall be provided on the packaging or in the instructions for use. Before using a mixture for tattooing purposes, the person using the mixture shall provide this information to the person undergoing the procedure.

Further information on the restrictions, concentration limits and exemptions can be taken from the Regulation.

Annex XVII to Regulation (EC) No 1907/2006, [consolidated version](#) (BAUA) (only in German)

**Consumer Goods Ordinance**

Attachment 1 to § 3, Point 5

The substance must not be utilised for the production or treatment of joke articles.

**TECHNICAL RULES FOR HAZARDOUS SUBSTANCES**[TRGS 201](#)

Einstufung und Kennzeichnung bei Tätigkeiten mit Gefahrstoffen; Ausgabe Februar 2017, zuletzt geändert und ergänzt April 2018

[TRGS 400](#)

Gefährdungsbeurteilung für Tätigkeiten mit Gefahrstoffen; Ausgabe Juli 2017

[TRGS 555](#)

Betriebsanweisung und Information der Beschäftigten; Ausgabe Februar 2017

[TRGS 600](#)

Substitution; Ausgabe Juli 2020

[TRGS 402](#)

Ermitteln und Beurteilen der Gefährdungen bei Tätigkeiten mit Gefahrstoffen: Inhalative Exposition; Ausgabe September 2023

[TRGS 500](#)

Schutzmaßnahmen; Ausgabe September 2019

[TRGS 509](#)

Lagern von flüssigen und festen Gefahrstoffen in ortsfesten Behältern sowie Füll- und Entleerstellen für ortsbewegliche Behälter; Ausgabe Juni 2022

[TRGS 510](#)

Lagerung von Gefahrstoffen in ortsbeweglichen Behältern; Ausgabe Januar Dezember 2020

[TRGS 800](#)

Brandschutzmaßnahmen; Ausgabe Dezember 2010

### [TRGS 720](#)

Gefährliche explosionsfähige Gemische - Allgemeines; Ausgabe Juli 2020, zuletzt berichtigt März 2021

### [TRGS 721](#)

Gefährliche explosionsfähige Gemische - Beurteilung der Explosionsgefährdung; Ausgabe Oktober 2020, zuletzt berichtigt Dezember 2020

### [TRGS 722](#)

Vermeidung oder Einschränkung gefährlicher explosionsfähiger Atmosphäre, Ausgabe Februar 2021

### [TRGS 723](#)

Gefährliche explosionsfähige Gemische - Vermeidung der Entzündung gefährlicher explosionsfähiger Gemische; Ausgabe Juli 2019, zuletzt geändert Oktober 2020

### [TRGS 724](#)

Gefährliche explosionsfähige Gemische - Maßnahmen des konstruktiven Explosionsschutzes, welche die Auswirkung einer Explosion auf ein unbedenkliches Maß beschränken, Ausgabe Juli 2019

## REGULATIONS OF GERMAN ACCIDENT INSURERS

### [DGUV Regel 112-190](#)

Benutzung von Atemschutzgeräten, Ausgabe November 2021  
(in German only)

## LINKS

[International Limit Values](#)

[OECD Screening Information DataSet \(SIDS\)](#)

[The MAK Collection for Occupational Health and Safety](#)

[DGUV Information 213-098: List of substances - lesson in schools \(in German only\)](#)

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Data acquisition and maintenance manual of the GESTIS substance database (non-public)

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Quelle: 01211

GHS-Sicherheitsdatenblatt, Merck

GHS Material Safety Data Sheet, Merck

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[TRGS 510](#) "Lagerung von Gefahrstoffen in ortsbeweglichen Behältern" Ausgabe Dezember 2020

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Quelle: 06002

L. Roth, U. Weller

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Liste arbeitsmedizinisch-toxikologischer Standardwerke (2)

List of standard references regarding occupational health and toxicology (2)

Quelle: 99999

Angabe des Bearbeiters

Indication of the editor

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