

Isobutane



IDENTIFICATION

Isobutane
iso-Butane
i-Butane
i-Methyl ethyl methane
2-Methyl propane
Trimethyl methane

ZVG No: 25040
CAS No: 75-28-5
EC No: 200-857-2
INDEX No: 601-004-00-0

CHARACTERISATION

SUBSTANCE GROUP CODE

140110 Hydrocarbons, aliphatic, saturated
162000 Organic gases

STATE OF AGGREGATION

The substance is gaseous.

PROPERTIES

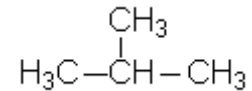
colourless
sweetish odour
usually odorized

CHEMICAL CHARACTERISATION

Extremely flammable gas. Forms explosive mixtures with air.
Practically insoluble in water.
Gas is heavier than air.
Evaporation of very cold liquid or expansion of the gas causes formation of cold mist spreading on the ground.

FORMULA

C₄H₁₀



Molar mass: 58,12 g/mol

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

1 ml/m³ = 2,42 mg/m³

PHYSICAL AND CHEMICAL PROPERTIES

TRIPLE POINT

Temperature: -159,6 °C

Pressure: 0,195 mikrobar

MELTING POINT

Melting point: -159,42 °C

BOILING POINT

Boiling Point: -11,7 °C

CRITICAL DATA

Crit. temperature: 135,0 °C

Crit. pressure: 36,5 bar

Crit. density: 0,221 g/cm³

DENSITY

VAPOUR DENSITY

under standard conditions (0 °C, 1013 mbar)

Value: 2,6956 kg/m³

DENSITY OF LIQUID PHASE AT BOILING POINT

Value: 0,5937 kg/l

RELATIVE VAPOUR DENSITY

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

Value: 2,07

VAPOUR DENSITY

Value: 2,5060 kg/m³

Temperature: 15 °C

at 1 bar

VAPOUR PRESSURE

Vapour pressure: 3,019 bar

Temperature: 20 °C

Vapour pressure: 4,1 bar

Temperature: 30 °C

Vapour pressure: 6,778 bar

Temperature: 50 °C

FLASH POINT

Flash point: -83 °C

IGNITION TEMPERATURE

Ignition temperature: 460 °C

Temperature class: T1

EXPLOSION LIMITS

Lower explosion limit:

1,5 mol% (Ideal gas: mol% = vol.%)

Upper explosion limit:

9,4 mol% (Ideal gas: mol% = vol.%)

SOLUBILITY IN WATER

Concentration: 49 mg/l

Temperature: 20 °C

PARTITION COEFFICIENT (octanol/water)

log Kow: 2,76

Recommended value of LOG KOW Databank.

HAZARDOUS REACTIONS

Hazardous chemical reactions:

Risk of explosion in contact with:

oxidizing agents

oxidizing gases

The substance can react dangerously with:

nitric oxides

halogens

acetylene

FURTHER INFORMATION

global warming potential : 3

ozone depletion potential : 0

OCCUPATIONAL HEALTH AND FIRST AID

ROUTES OF EXPOSURE

Main Routes of exposure:

The main intake pathway for isobutane is via the respiratory tract. [7619]

Respiratory tract:

Because of the low boiling point, occupational and also non-occupational exposure is expected to be nearly exclusively to isobutene in gas form. [7619]

Pulmonary absorption takes place to only a low degree for short-chained and branched aliphatic hydrocarbons.

For volunteers who inhaled 100 ppm isobutane for 20 minutes, an absorption rate of 14% was found.

At higher concentrations and more prolonged exposure, the proportion absorbed can possibly be even smaller. For rats exposed to 5000 ppm isobutane for 80 - 100 min, the absorbed proportion was approx. only 5.4%. [99997]

Skin:

Because isobutane is a gas under normal conditions and skin contact with liquefied gas or an aerosol released from compressed gas cylinders can only take place short-term, no significant penetration of the skin is expected. [7619, 99999]

Gastrointestinal tract:

As a result of its physicochemical properties, oral intake of significant amounts of isobutane can be excluded. The question of absorption rate is therefore irrelevant. [419]

TOXIC EFFECTS

Main toxic effects:

Acute:

Cold damage to the eyes and skin following contact with the liquefied gas, [7619]
disturbances of the central nervous system and heart function due to very high

concentrations of the gas; suffocating effect due to displacement of oxygen [99997, 7619]

Chronic:

Insufficient data available [99983]

Acute toxicity:

Isobutane gas does not irritate the eyes and skin. [7619]

Liquefied isobutane can cause a sensation of cold and even frostbite on the eyes and skin or other contacted tissues due to the strong cold resulting from evaporation. [7619, 99997]

Despite long-term occupational and non-occupational experience (also used as a propellant for spray cans) there are no indications of a sensitizing effect. [7877, 99983] No test results are available for dermal toxicity. [99983] All available information and gathered experience for this substance do not indicate any systemic effects when skin contact alone take place. [7619]

Following inhalation, irritation to the airways has not been reported. Such an effect could also not be demonstrated in animal experiments, not even at very high concentrations.

Systemic effects were first shown to be possible at very high concentrations.

Exposure of 8 volunteers to concentrations of isobutane between 250 and 1000 ppm lasting up to 8 h did not lead to any subjective or clinical symptoms. No effects to the heart and lung functions, no neurologic disturbances or derivations of hematological or biochemical parameters were noticeable either. [99997]

First narcotic effects can be observed starting at 10000 ppm (1%) with symptoms such as weakness, headache, nausea, vomiting, dazed feeling and sleepiness. [7877]

Apparently, isobutane also has an euphoriant effect. This is according to case reports of the abusive sniffing (mostly by children and juveniles). [99996]

Very high concentrations cause narcosis through to coma. Effects to the CNS at very high concentrations are overlapped and intensified through a hypoxic effect due to displacement of oxygen from the breathable air. [419] Besides this, high concentrations can produce disturbances to the cardiac functions (arrhythmogenic effect) due to a sensitization of the heart to adrenaline.

The following indications are available regarding a dose-effect-relationship from animal experiments. A 2h LC50 of 520 000 ppm was found for mice, a 15min LC50 of 570 000 ppm was found for rats. The animals showed CNS depression, rapid and shallow respiration and apnea. For dogs, the potential to cause anesthesia was lesser than that of n-butane. Complete anesthesia within 10 minutes was only produced at 450 000 ppm, a concentration which was near the lethal concentration (550 000 ppm).

Sensitization of the heart muscle to adrenaline was found for dogs already at distinctly lower concentrations. At an exposure of 5 minutes, the mean effective concentration (EC50) was 70 000 ppm. In the same concentration range this effect was shown by monkeys as well. [7619, 99997]

Despite the low toxicity of isobutane, some sudden deaths have taken place among humans in recent years resulting from abusive inhalation. As the cause of death, acute rhythm disturbances and/or hypoxia were assumed.

In further cases, life-threatening cardiac reactions (ventricular fibrillation) following abusive or also accidental inhalation (accidental spraying of a deodorant into the

nostrils) were reported. The persons recovered rapidly following reanimation and did not show any sequelae. [99996]

Chronic toxicity:

The only field report available from the occupational sector concerns the handling of liquefied propane and butane. Persons working in bottling liquid gases suffered from symptoms of the airways (dry cough, dry throat), restlessness and dizziness. Cardiac disturbances were noticeable (tachycardia, arrhythmia). In 2 random test samples, the maximum gas concentrations were found to be 8000 ppm; there is a lack of further data on the exposure. [220, 7877]

Results of experimental studies with isobutane indicate low toxicity.

In tests on skin tolerability, volunteers who received a deodorizer containing approx. 70% of a mixture of isobutane and propane, 20% methylene chloride and 10% other components sprayed onto their skin twice daily for 12 weeks. The result was only slight temporary reddening of the skin. [99997]

Daily inhalative exposure of volunteers to 500 ppm for 8 h carried out on 5 days/week for 2 weeks did not lead to clinical symptoms, nor were there any disturbances of the functions of the heart and lungs or changes of hematologic or biochemical parameters. A minor deviation while examining the nervous conduction velocity (reduction of the visually evoked response) is considered not significant. [99997, 220]

Results from inhalative animal experiments with repeated exposure to pure grade isobutane are not available.

The inhalation of a mixture of 50% isobutane and 50% isopentane in concentrations of 1000 or 4500 ppm (6 h/d, 5 d/w) in a 13-week study on rats only caused temporary symptoms of slight disturbances of the CNS but no macroscopically hematologically or biochemically demonstrable effects. At the end of exposure, no significant findings on the kidneys (in the sense of a male rat hydrocarbon nephropathy) were histologically demonstrable either, although these effects were especially tested for. [220, 7619]

From the study, a NOAEC for organ damage of 2250 ppm could be derived for isobutane. [7619]

Reproductive toxicity, Mutagenicity, Carcinogenicity:

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

Reproductive toxicity:

The available information was considered to be insufficient for evaluation and hence for classification.

In individual cases, for women who suffered from butane gas poisoning during their pregnancy, brain organic damage was found in the offspring. However, this damage was attributed to intrauterine hypoxia and not to a specific reproductive toxic effect of butane. [7619]

Animal experiments are not available for either isobutane or butane. [99983]

Mutagenicity:

In microbiological tests done up til now (Ames tests with or without metabolic activation), isobutane and also butane were shown to be not genotoxic.

Irrespective of this, there is a potential hazard when isobutane contains $\geq 0.1\%$ 1,3-butadiene (see ZVG number 531421). [7510]

Carcinogenicity:

No studies on carcinogenic effects are available. [99983]

Irrespective of this, there is a potential hazard when isobutane contains $\geq 0.1\%$ 1,3-butadiene (see ZVG number 531421). [7510]

Biotransformation and Excretion:

Determining the isobutane contents in selected tissues following poisoning cases showed a favored distribution into the fatty tissue, brain, heart and liver. [99996]

Elimination mainly occurs through exhalation in unchanged form. A relatively low proportion is metabolized, almost exclusively by oxidation on the tertiary carbon atom. 2-Methyl-2-propanol (tert-butanol) was proved as a metabolite in both animal experiments and poisoning cases. [99996, 7619] A further oxidative transformation of this metabolite does not take place because tert-butanol is not a predominant substrate of the alcohol dehydrogenase. [7619]

Annotation:

This occupational health information was compiled on 13.11.2012.

It will be updated if necessary.

FIRST AID

Eyes:

Following contact with the liquefied or expanded cold gas, rinse eyes only briefly with flowing (lukewarm) water. Do not spread the eyelids, leave contact lenses in place. No warmth. Sterile covering.

Arrange medical treatment.

[419]

Skin:

Whilst protecting yourself, relocate the casualty away from the source of danger.

Remove contaminated clothing while protecting yourself.

Following contact with liquefied isobutane / expanded gas, initially thaw clothing which has frozen onto the body with a lot of cold or lukewarm water and then remove it carefully.

Rinse any skin areas suspected of being frozen caused by contact with subcooled isobutane with cold/lukewarm water. Do not rub affected skin areas or subject them to dry warmth, instead cover them with a sterile covering.

Lay the casualty down in a quiet place to rest and protect him against hypothermia.

Arrange for medical treatment.

[419]

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.

Arrange medical treatment.

Following massive inhalation, the following can be necessary:

If the casualty is unconscious but breathing lay him in a stable manner on his side.

In the case of cardiac arrest (lack of heart beat or pulse) immediately apply heart lung resuscitation. The protection of the vital functions (heartbeat and respiration without assistance) takes priority over every other activity.

If the casualty has stopped breathing give mouth to nose resuscitation. If this is not possible use mouth to mouth resuscitation. Keep his respiratory tract clear.

[419]

Swallowing:

Swallowing of the subcooled liquid is hardly conceivable. [419]

If this has nevertheless occurred, have the casualty slowly drink 1 - 2 glasses of water.

For further treatment, see under "Respiratory tract".

Call a physician to the site of the accident. [99999]

Information for physicians:

Gaseous isobutane does not cause irritation but following expansion from gas bottles it could cause frostbite. Systemic effects are expected at very high concentrations.

- Symptoms of acute poisoning:

Eyes: frostbite caused by the liquefied or expanded gas

Skin: frostbite caused by the liquefied or expanded gas (numbness, tingling feeling in the skin, itching, burning, stiffness of the affected areas)

Inhalation: at very high concentrations (from approx. 10 000 ppm) systemic effects (see below), at concentrations above 140 000 ppm hypoxic effects due to reduction of the amount of oxygen in the air breathed in; [419]

following direct inhalation of aerosols from pressure vessels, possible reflex cardiac arrest caused by the effect of cold on the vagus nerve [99996]

Ingestion: following intake of the subcooled liquid probable frost damage in the mouth or acute heart-circulatory system reactions (see above) [99999]

Absorption: following massive inhalation, dizziness, state of excitement/euphoria, blurred vision, weak speech, general weakness, headache, nausea, vomiting, state of intoxication with hallucinations, ataxia, disturbances to the heart functions (tachycardia, arrhythmia, ventricular fibrillation), dazed state up to loss of consciousness/cramps, symptoms of strong hypoxia/anoxia; danger of cardiac and respiratory arrest; if the poisoning is survived, complications resulting from having suffered hypoxia. [99996]

- Medical advice:

Following eye contact with the liquefied/expanded gas, rinsing of the eyes and consultation of an ophthalmologist is indicated.

Local frostbite on the skin or undercooling resulting from impact over a large area can be treated in the usual way.

Following massive inhalation, liberally apply fresh air and as soon as possible have the casualty inhale oxygen. Place the patient in a quiet place. Carry out further treatment symptomatically. [419]

Following extremely high exposure, cardiac-pulmonary and cerebral resuscitation measures could rapidly become necessary. In this situation exercise care in the use of cardiovascular drugs containing adrenaline/ephedrine and derivatives (at very high concentrations the heart is sensitized to the effect of catecholamines). Use of an anti-arrhythmic medicament is recommended. [99996]

Even if there are no poisoning symptoms, following massive exposure, hospitalization is recommended to carry out further diagnosis of the heart, circulatory and lung function, the acid-base metabolism and the kidney function. [419, 99996]

Recommendations:

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

[99999]

Isobutane can contain small quantities of 1,3-butadiene (see ZVG number 531421).

[7510] The exposure of the casualty to this can be estimated by determining the amount of mercapturic acid derivatives of the 1,3-butadiene metabolites and by the determination of hemoglobin adducts. The determination of 1,3-butadiene-DNA adducts seems to be suitable for effect monitoring. [7620]

Annotation:

This first aid information was compiled on 13.11.2012.

It will be updated if necessary.

SAFE HANDLING

TECHNICAL MEASURES - HANDLING

Workplace:

Provision of very good ventilation in the working area.

The gas is heavier than air. Adequate ventilation of the floor area must be ensured as well.

Devices for detecting and reporting the presence of hazardous gases should be present.

Protect ducts and sewers against penetration by the gas.

Equipment:

Use only closed apparatus.

If dangerous pressure can arise from contact with heat, suitable safety measures and equipment should be provided.

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.

There should be a shutoff for the lines at a safe distance.

Suitable materials:

For cylinders and valves:

All usual materials.

For seals:

Polytetrafluoro ethylene PTFE (Teflon)

Polychloro trifluoro ethylene PCTFE

Polyvinylidene fluoride

Polyamide PA

Polypropylene PP

Acrylonitrile butadiene rubber NBR
Polychloroprene rubber CR
Fluoro rubber FKM

Advice on safer handling:

Do not store cylinders at the working area.

Do not force open valve.

When changing bottles, always inspect the leak-proof closure of the filled and empty bottles.

Refilling or transfer in storage rooms is prohibited.

Prevent cylinders from falling over.

Suck back of water into the container must be prevented. Do not allow backfeed into the container.

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

Purge air from equipment before introducing the gas.

When handling large amounts or during refilling define a large safety zone and remove all sources of ignition in that area.

Usually transport occurs in containers with high pressure. Use suitable equipment for the transport.

Tightly screw on the protective caps and blind nuts when transporting. Secure cylinders against falling over, do not throw.

Cleaning and maintenance:

Regular inspection of leak test required!

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

TECHNICAL MEASURES - STORAGE

Storage:

Containers have to be labelled clearly and permanently.

Store in a cool place.

Keep container in a well-ventilated place.

Keep upright, protect against falling over.

Protect from exposure to sunlight.

Prevent the generation of heat or inadmissible pressure.

Do not store in escape routes, work rooms, or in direct proximity to them.

For transporting, storing, preparing, emptying, and maintaining pressurized gas bottles, the detailed rules in TRG 280 must be absolutely adhered to. For pressurised gas packaging, observe the applicable TRG 300.

Conditions of collocated storage:

Storage class 2 A (Gases)

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 materials.
- Flammable liquids of storage class 3.
- 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.
- Oxidizing substances of storage class 5.1B.
- Organic peroxides and self reactive substances.
- Combustible and non combustible acutely toxic substances of storage classes 6.1A and 6.1B.
- Combustible toxic or chronically acting substances of storage class 6.1C.
- Noncombustible toxic or chronically acting substances of storage class 6.1D.
- Combustible liquids of storage class 10.

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

- Aerosols (spray bottles).
- Ammonium nitrate and preparations containing ammonium nitrate.
- Combustible corrosive substances of storage class 8A.
- Combustible solids of storage class 11.

Consider the regulations of TRG 280 at collocated storage of different compressed gases.

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.

Measures required by the "Explosionsschutz-Richtlinie":

- Preventing the formation of an explosive atmosphere (limiting and monitoring the concentration, making inert, sealing, ventilation, warning systems, etc.)
- Preventing the ignition of an explosive atmosphere (separation into zones, removal of sources of ignition, explosion-proof electrical installation, explosion-protected electrical operating systems, pumps, controls, and valves, grounding, etc.)
- Architectural measures to limit the effects of an explosion (explosive-force-proof construction, release of explosive pressure, explosion suppression, etc.)

Take precautionary measures against static discharges.

Earth all parts which can be electrically charged.

Protect parts of the system from any warming; if necessary, provide cooling with sprayed water.

Suitable measures must be applied to seal off waste-water systems, cable and pipe access ways, etc. (e.g.: immersing and sand beds).

Precaution on handling:

The gas-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.

Displacement with air is only permissible under strict observance of special protective measures.

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.

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.

Creeping gases from afar may cause ignition.

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 flameproof, antistatic protective clothing.

Use protective boots while handling gas cylinders.

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.

This is a low-boiling-point substance of group 2 of the DGUV Regel 112-190.

Respiratory protection: Gas filter AX, colour code brown.

Max. concentration for use:

1000 ml/m³ for max. 60 min.

5000 ml/m³ for max. 20 min.

Filters may only be used in their original condition. Repeated use is permissible for the appropriate maximum period within a single shift (max. 8 hours). Do not use AX filters against mixtures of low-boiling-point substances and other organic compounds.

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 should be worn.

When handling compressed gas, at least glasses with side protection should be worn.

When handling liquid gas, chemical safety goggles must be used as well as a protective shield.

Hand protection:

Wear leather gloves to prevent frostbite injuries from rapidly expanding gas when handling pressurised gas bottles.

Occupational hygiene:

Avoid skin contact with the liquid phase: risk of frostbite.

Avoid inhalation of gas.

Change clothing that has been in contact with or taken up any of the gas and air the clothing far from any sources of ignition.

DISPOSAL CONSIDERATIONS

Hazardous waste according to Waste Catalogue Ordinance (AVV).

Compressed gas cylinders can normally be returned to the supplier. Pressurised cans are non-returnable and must be disposed of.

Do not empty pressure vessels to the point of pressure compensation. Mark empty vessels to avoid confusion with full ones.

ACCIDENTAL RELEASE MEASURES

Shut off all sources of ignition.

Provide adequate ventilation.

Evacuate area. Warn affected surroundings.

Wear respiratory protection (see chapter Personal Protection).

Attempt to stop the gas from escaping. Otherwise place leaky bottles under a suctioning device or put them outdoors.

Gas is moving on the ground.

Use non-sparking tools.

Afterwards ventilate area.

Endangerment of watert:

No hazards to sources of water are to be feared if released into water, drainage, sewer, or the ground.

FIRE FIGHTING MEASURES

Classes of fires:

C gaseous, also compressed substances

Suitable extinguishing media:

Dry extinguishing powder

Carbon dioxide extinguisher with gas nozzle

Instructions:

In the case of fire advise fire fighters on the presence of gas cylinders.

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.
Only put out fire if the gas flow can be interrupted.
Risk of explosion from gas accumulation and backfire.
Be watchful for frostbite in case of contact with fluid.
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

Classification:

Flammable gases, Category 1; H220
Gases under pressure, liquefied gas; H280



Signal Word: "Danger"

Hazard Statement - H-phrases:

H220: Extremely flammable gas.
H280: Contains gas under pressure; may explode if heated.

Precautionary Statement - P-phrases:

P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381: Eliminate all ignition sources if safe to do so.
P403: Store in a well-ventilated place.

Manufacturer's specification by Air Liquide

Reference: [01401](#)

State: 2016

Checked: 2016

The substance is listed in appendix VI, table 3.1 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

COLOUR CODING OF GAS CYLINDERS



Shoulder colour: Red
(flammable gases)

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 - gas cylinder



Caution - explosive atmosphere

Precept label:



Use safety goggles



Wear safety shoes



Wear safety gloves

GERMAN WATER HAZARD CLASS

Substance No: 562

non-hazardous to waters

Classification according to the Administrative Regulation of Substances Hazardous to Water (VwVwS)

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/m³

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: 1969

Shipping name: Isobutane

Hazard Identification Number: 23

Class: 2.1 (Flammable Gases)

Packing Group: -

Danger Label: 2.1



Tunnel restrictions:

Transports in tanks: passage forbidden through tunnels of category B, C, D and E.

Other transports: passage forbidden through tunnels of category D and E.

TRGS 900 - GERMAN OCCUPATIONAL EXPOSURE LIMIT VALUES

1000 ml/m³
2400 mg/m³

Peak limitation: Excursion factor 4

Duration 15 min, mean; 4 times per shift; interval 1 hour
Category II - Substances with systemic effects

Source: DFG

RECOMMENDATIONS OF MAK-COMMISSION

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

1000 ml/m³
2400 mg/m³

Peak limitation: Excursion factor 4

Duration 15 min, mean; 4 times per shift; interval 1 hour
Category II - Substances with systemic effects

Pregnancy: Group D

A classification according to groups A-C is not possible, because either there is no data available or the available data is insufficient for a final evaluation.

SEVESO III - Directive

Annex I Part 2 Number: 18

Liquefied flammable gases, Category 1 or 2

Qualifying Quantity 50 t

Column 2:

Qualifying Quantity 200 t

Column 3:

FURTHER REGULATIONS

TRGS 200

Einstufung und Kennzeichnung von Stoffen, Zubereitungen und Erzeugnissen; Ausgabe Oktober 2011

TRGS 201

Einstufung und Kennzeichnung bei Tätigkeiten mit Gefahrstoffen; Ausgabe Oktober 2011

TRGS 400

Gefährdungsbeurteilung für Tätigkeiten mit Gefahrstoffen; Ausgabe Dezember 2010; geändert und ergänzt September 2012

TRGS 555

Betriebsanweisung und Information der Beschäftigten; Ausgabe Januar 2013

TRGS 600

Substitution; Ausgabe August 2008

[TRGS 402](#)

Ermitteln und Beurteilen der Gefährdungen bei Tätigkeiten mit Gefahrstoffen: Inhalative Exposition; Ausgabe Januar 2010, zuletzt geändert und ergänzt Oktober 2016

[TRGS 407](#)

Tätigkeiten mit Gasen - Gefährdungsbeurteilung; Ausgabe Februar 2016, geändert und ergänzt Oktober 2016

[TRGS 745/TRBS 3145](#)

Ortsbewegliche Druckgasbehälter - Füllen, Bereithalten, innerbetriebliche Beförderung, Entleeren; Ausgabe Februar 2016

[TRGS 746/TRBS 3146](#)

Ortsfeste Druckanlagen für Gase; Ausgabe September 2016

[TRGS 510](#)

Lagerung von Gefahrstoffen in ortsbeweglichen Behältern; Ausgabe Januar 2013, zuletzt berichtigt November 2015

[TRGS 500](#)

Schutzmaßnahmen; Ausgabe Januar 2008, ergänzt Mai 2008

[TRGS 800](#)

Brandschutzmaßnahmen; Ausgabe Dezember 2010

DGUV Vorschrift 79 (BGV D34): Verwendung von Flüssiggas

LINKS

[International Limit Values](#)

[Publications of EIGA \(European Industrial Gases Association\) Documents Download](#)

[Publications of the IG V \(Industriegaseverband e.V.\) \(in german only\)](#)

REFERENCES

Reference: 00001
IFA: Erfassungs- und Pflegehandbuch der GESTIS-Stoffdatenbank (nicht öffentlich)
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