

## Hydrochloric acid solution



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### IDENTIFICATION

#### Hydrochloric acid solution

E 507

**ZVG No:** 520030

**INDEX No:** 017-002-01-X

#### Related

**CAS No:** 7647-01-0

Hydrogen chloride, anhydrous

**EC No:** 231-595-7

### CHARACTERISATION

#### SUBSTANCE GROUP CODE

120510 Acids, inorganic

133200 Chlorine compounds, inorganic

#### STATE OF AGGREGATION

The substance is liquid.

#### PROPERTIES

colourless to yellowish

pungent odour

#### CHEMICAL CHARACTERISATION

Mixable with water.

Characteristics of a 36% hydrochloric acid solution:

Strongly caustic. Reacts with air under formation of caustic acid fumes which are heavier than air.

Strong acid which reacts vigorously with bases.

Non-noble metals are dissolved under hydrogen formation. Oxides are also dissolved. Carbonates are converted under formation of carbon dioxide. With oxidizing agents chlorine is formed.

Acute or chronic health hazards result from the substance.

(see: chapter REGULATIONS).

## FORMULA

HCl  
ClH  
H—Cl

**Molar mass:** 36,46 g/mol

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

1 ml/m<sup>3</sup> = 1,52 mg/m<sup>3</sup>

## PHYSICAL AND CHEMICAL PROPERTIES

[Melting point](#) | [Density](#) | [Vapour pressure](#) |  
[Hazardous reactions](#)

### MELTING POINT

Melting point: -30 °C

solution 37 %

Reference: [01211](#)

### DENSITY

DENSITY

Value: ca. 1,19 g/cm<sup>3</sup>

Temperature: 20 °C

solution 37 %

Reference: [01211](#)

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: 190 hPa

Temperature: 20 °C

solution 37 %

Reference: [01211](#)

### HAZARDOUS REACTIONS

**Hazardous chemical reactions**

Risk of explosion in contact with:  
potassium  
sodium  
potassium permanganate (seldom)  
conc. sulfuric acid

The substance can react dangerously with:  
aluminium  
amines  
fluorine  
concentrated lye  
oxidizing agents  
caesium carbides; calcium carbide; calcium hydride; formaldehyde; copper sulfide; lithium silicide;  
metals; sodium hydride;  
sodium hypochlorite and its solutions; natron bleaching solution; rubidium carbide; silanes; silicon  
dioxide; vinyl methyl ether; zinc

## TOXICOLOGY / ECOTOXICOLOGY

### ECOTOXICOLOGICAL DATA

#### LC50 Crustaceans (48 hours)

Minimum: 240 mg/l  
Maximum: 260 mg/l  
Median: 250 mg/l  
Study number: 2

Reference for median:

Portmann, J.E., and K.W. Wilson 1971. The Toxicity of 140 Substances to the Brown Shrimp and Other Marine Animals. Shellfish Information Leaflet No.22 (2nd Ed.), Ministry of Agric.Fish.Food, Fish.Lab.Burnham-on-Crouch, Essex, and Fish Exp.Station Conway, North Wales :12 p.

Reference: [02072](#)

## OCCUPATIONAL HEALTH AND FIRST AID

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

### ROUTES OF EXPOSURE

#### Main routes of exposure

Exposure to hydrochloric acid (also named muriatic acid, HCl) is possible during occupational handling due to contact with the skin and inhalation of vapors. [454]  
The main intake pathway is considered to be via the respiratory tract. [7619]

#### Respiratory tract

From concentrated (38%) hydrochloric acid (fuming hydrochloric acid), mist is released even at room temperature, which is composed of an aerosol of the acid.

When concentrated hydrochloric acid is heated, the vapors initially contain significantly more hydrogen chloride than water vapor. With decreasing content of HCl in the liquid phase, the proportion of water in the vapor phase increases. At the end, when 20% hydrochloric acid is present, an azeotrope of 20% HCl and 80% H<sub>2</sub>O is transferred into the vapor phase. [7942]

Inhaled aerosol of hydrochloric acid is mainly retained on the mucous membranes of the upper airways and partially neutralized there. Nevertheless, a proportion reaches even lower regions of the respiratory tract, in particular at higher frequencies of breathing. [435, 7619]

No specific studies on the absorption behavior are available. [99983]

In principle, absorption is considered possible but because of the severe local effects is at most of secondary importance. [7619]

### **Skin**

The dermal uptake has not been examined. [99983]

It is assumed that dermal exposure does not lead to uptake of systemically relevant doses. [419, 7748, 7619]

### **Gastrointestinal tract**

Specific kinetic studies are not available. [99983]

They are considered not necessary because gastric juice already contains a high concentration of hydrochloric acid which is physiologically conditioned. Following ingestion, local effects are therefore of priority. [7619]

## **TOXIC EFFECTS**

### **Main toxic effects**

Acute:

Irritation and corrosion to the eyes, airways and skin,  
danger of severe damage to the eyes and lungs, [7619, 419]  
following ingestion, concentration-dependent damage to the gastrointestinal tract [419]

Chronic:

Airway diseases, damage to the teeth, gastrointestinal disorders [7619]

### **Acute toxicity**

The acute action of hydrochloric acid is based on the locally damaging effects on contacted tissues which are primarily dependent on the concentration. [7619]

Following the widespread use of the acid for decades, damage to the eyes was frequently caused of liquid splashes. The severity of damage varied depending on the concentration, amount and the contact time until rinsing the eyes from reddening and swelling through to complete opacity of the cornea and (more rarely) loss of the eye. Most frequently, whitish coagulations on the conjunctiva and cornea were reported to have been caused following impact of small droplets of the acid which healed in the course of 1 - 2 days when rinsing was immediately started. [7979, 7836]

In tests on rabbits' eyes, aqueous 3.3% HCl (0.1 ml) caused slight irritation, 5% HCl (0.03 ml) is severely irritating and corrosive and 10% HCl (0.1 ml) caused corneal damage which is expected to cause permanent visual disorders.

On the skin of test persons, aqueous 4% HCl was slightly irritating, 10% HCl was characterized to be irritating. Tests on the skin of rabbits revealed corrosion for 17% HCl (0.5 ml, 4 h) and for 37% HCl already after contact for 1 h severe corrosive damage.

From occupational handling, there is no indication of a sensitization of the skin. Also a test on volunteers and 2 animal experiments (maximization test on guinea pigs and mouse ear swelling test) were negative. [435]

Following exposure to acid vapors, irritation to the upper airways is of the greatest concern. The effects correspond to those of hydrogen chloride gas because this immediately reacts with moist air to form mist of hydrochloric acid. Considering the concentration of HCl in the room air, analogous dose-effect relationships are to be assumed:

2 - 3 ppm: still no irritation to the mucous membranes but initially slight disturbing sensations possible; 5 - 7 ppm (7.6 - 10.6 mg/m<sup>3</sup>): slight irritation to the mucous membranes; 17 - 22 ppm (approx. 26.5 - 33.5 mg/m<sup>3</sup>): unbearable, difficulties in breathing, even at short-term exposure. [7619]

Based on experience of older reports at workplaces, an IDLH (immediately dangerous to life or health) value of 50 ppm was derived. [7930]

At this concentration range and upwards, acute damage in the respiratory tract is expected.

Symptoms which directly occurred following accidents were: irritation to the eyes, lacrimation, burning sensation in the throat, hoarseness, headache, tightness in chest, shortness of breath, influenza-like symptoms.

As sequelae following high exposures, degenerated lung functions, frequent airway diseases and neurobiological conspicuousness (e.g. concerning the equilibrium and visual reaction tests) were reported. [7619] In isolated cases (in particular for asthmatics) an unspecific hypersensitivity of the airways resulted ("reactive airways dysfunction syndrome").

At high concentrations, nasal mucous membranes, paranasal sinus, bronchi, bronchioles and alveoles can be seriously damaged. There is a danger of life threatening irritation reactions (laryngospasm, glottic edema, bronchospasms, bronchoconstriction) or serious lung damage (alveolar emphysema, atelectasis, pulmonary edema). [7619, 419] If pulmonary capillaries are damaged, thrombogenesis can follow and as sequelae in the lungs, kidneys, liver and heart infarcts and lethal functional disturbances can be triggered.

Systemic effects following inhalation of HCl vapors are not relevant.

However, reflex cardiovascular and respiratory responses which were attributed to the irritating effects are possible (e.g. drop in pulse rate during inhalation, changes of rhythm and depth of breathing). [7619]

LC50 values found in tests on rodents following inhalation of hydrochloric acid vapors were at 8.3 mg/L for 30 minutes for rats; 16.5 mg/L for 5 min and 3.2 mg/L for 30 min for mice. [435] However, for humans it was reported that even short-term inhalation of 500 - 1000 ppm hydrogen chloride gas can cause glottic cramps or reflex respiratory and cardiac arrest. [7978]

Following oral intake, hydrochloric acid often causes long lasting vomiting. The damaging effect is mainly determined by the concentration. Concentrated acid can very rapidly cause life threatening damage (glottic edema, perforation/strictures in the esophagus/stomach) and additional reflex cardiovascular and respiratory disorders. When 33% hydrochloric acid is swallowed, as little as 5 - 20 ml can be lethal. [7836, 8088]

For the very diluted acid, the risk is reduced. For the 3.3% HCl, 238 - 277 mg/kg bw was determined to be an oral LD50 for rats. [435]

## Chronic toxicity

Following repeated contact with the skin, even diluted hydrochloric acid can cause skin damage (reddening, drying, fissures, dermatitis). [419, 7748]

The critical effect following repeated inhalative exposure is irritation to the respiratory tract.

It can be derived from occupational experience that long-term exposure to distinctly increased concentrations of HCl in inhaled air can lead to an increased incidence of airway diseases (chronic bronchitis).

In older reports, chronic (but apparently still tolerable) exposure was found to lead to not only airway irritations but also to gastrointestinal diseases at abnormal levels of stomach acid and to typical acid-related damage of the teeth. The teeth lost their gleam and became yellow discolored, soft, rough as well as mottled and eventually fell out.

Only little data is available on dose-effect relationships.

From the available occupationally-medicinal experience it can be derived that at concentrations of up to approx. 5 ppm HCl in workplaces, no sensoric irritative effects are expected, not even after prolonged exposure.

At hourly average concentrations of 3 - 5 ppm (4.5 - 7.6 mg/m<sup>3</sup>), chronic diseases of the airways have not been found.

Following exposure to 20 ppm (30 mg/m<sup>3</sup>) for years "chronic bronchitis" resulted (no detailed data reported). [7619]

In a group of 63 workers who were exposed at their workplaces to varying concentrations of approx. 18 - 43 ppm HCl and approx. 0.5 - 2 ppm of sulfuric acid aerosol, influences on the immune system were demonstrated (changes of the IgA and IgG levels in the saliva, changes of the enzyme activities in the unspecific immune system). The relevance of these effects is unclear. [7619, 419]

Based on the insufficient data from workplace studies, animal experiments were included in order to derive a tolerable concentration for workplaces.

In a 2-year study on rats, 10 ppm HCl led to hyperplasia in the larynx and trachea. From the findings in this study, it was estimated by means of extrapolation that at exposures of up to 2 ppm (even under unfavorable conditions) no effects are expected. It has been estimated for this concentration that even at 100% absorption of HCl the amounts of chloride ions and H-ions taken up are insufficient either to disturb the chloride balance or to cause acidosis and that systemic effects can also be ruled out. [7619]

### **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.

If the maximum workplace value is observed, neither disturbances of the chloride balance nor acidosis are expected, so that damage to developing embryo or fetes can be ruled out, although no valid studies are available on this. [7619]

According to an analogous estimation, an influence on fertility is not to be expected either. [435]

Mutagenicity:

In in-vitro tests with HCl, both negative and positive results have been shown which were, however, attributed to the decreased pH value in the test medium. Because the pH value is physiologically regulated in vivo, these findings were considered non-relevant. [435]

Carcinogenicity:

For humans, no causal relationship between an inhalative exposure to HCl and increased tumor incidence was found.

In a 128-week inhalation study on rats, which inhaled 10 ppm HCl, no exposure-related increase of neoplasia or preneoplasia in the respiratory tract was demonstrable. [435]

### **Biotransformation and excretion**

Hydrochloric acid is completely dissociated. Therefore, following absorption, only chloride ions and hydrogen ions are available in the organism and there is no accumulation of HCl. [435]

Chloride ions and hydrogen ions are integrated in the organism into the well-known physiological metabolic processes.

It is expected that following inhalatively tolerable exposure to HCl the hydrogen ions taken up are buffered, so that no acidosis will result. [7619] The amount of chloride can be considered insignificant in comparison with the amount which is usually taken in with the diet. The elimination of chloride mainly proceeds with the urine and is regulated via homeostatic mechanisms because of its physiologic importance as an electrolyte. [435]

### **Annotation**

This occupational health information was compiled on 17.01.2012.  
It will be updated if necessary.

## **FIRST AID**

### **Eyes**

As soon as possible:

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

Point the mild water jet directly into the eye in order to remove the acid residues as soon and as completely as possible.

Then, immediately transport the casualty to an eye doctor / to hospital.

[454, 160]

### **Skin**

Remove contaminated clothing while protecting yourself.

Rinse the affected skin areas for at least 10 to 20 minutes under running water.

Arrange for medical treatment.

After extensive contamination:

Immediately use a (deluge) shower and avoid inhalation of acid mists!

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

In the meantime, call a physician to the site of the accident. [419, 99999]

### **Respiratory tract**

Following release of acid vapors/ acid aerosols:

Whilst protecting yourself remove the casualty from the hazardous area and take him to the fresh air.

The casualty should be carried or driven (horizontal position; for dyspnea half-upright position).

Avoid physical effort.

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

As soon as possible repeatedly have the casualty deeply breath a glucocorticoid inhalation spray in.

In the case of breathing difficulties have the casualty inhale oxygen.

Immediately call a physician.

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

For respiratory arrest, carry out artificial ventilation, if possible with breathing apparatus (e.g. bag valve mask); the first aider must pay attention to protect him or herself.

In case of cardiac arrest (no response and no normal breathing), immediately perform chest compressions and ventilation. If available, use Automated External Defibrillator (AED). The protection of the vital functions (respiration and circulation) takes priority over all other measures.

Poisoning symptoms can appear after a period of delay.

[419, 22, 8088]

### **Swallowing**

If the casualty is conscious: have the casualty rinse his or her mouth and spit out the liquid.

Immediately have the casualty drink a glass of water in sips. [419, 7978]

Do not make the casualty vomit.

Do not try to neutralize the acid with alkaline and do not use charcoal! [160, 454]

During spontaneous vomiting hold the head of the casualty low with the body in a prone position in order to avoid aspiration. [7638]

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

In the meantime, call a physician to the site of the accident. [419]

### **Information for physicians**

The damaging effect of the acid is mainly dependent on the concentration, the contact duration and the amount. [435]

- Symptoms of acute poisoning:

Eyes: pain, blepharospasm, eyelid swelling, (whitish) coagulation on the conjunctiva/ cornea, chemosis through to (irreversible) opacity/necrosis of the cornea (danger of blindness!); after exposure to vapors mostly only lacrimation, conjunctivitis [7836, 7979]

Skin: severe irritation; due to > 10% acid chemical burns of first to third degree (whitish to grey eschars); following extensive corrosion, possible shock and consequences from defunctionalization of the skin. [160, 435, 7836, 8088]

Inhalation: stinging/ burning sensation in the nose and throat, cough, headache, pressure/stinging in the chest, shortness of breath, asthmoid complaints, flu-like symptoms, reflex cardiovascular and respiratory responses (changes in pulse rate, in rhythm and depth of breathing); at higher concentrations feeling of suffocation, danger of (rapidly occur) glottic edema, laryngospasm, bronchospasm, bronchoconstriction or (after a latency period) atelectasis, pulmonary edema and/ or pneumonia; due to thrombogenesis possible damage to heart, lungs, kidneys or liver as sequelae; at very high concentrations possibly immediate reflex respiratory or cardiac arrest [7619, 435, 419, 7978]

Ingestion: burning sensation, pain and swelling in the mouth/ throat/ esophagus/ stomach, dysphagia, mostly prolonged vomiting (containing blood), cardiovascular affection; after swallowing of concentrated acid loss of mucous membranes on contact site (possible whitish-grey eschars), danger of reflex respiratory/cardiac arrest, glottic edema, perforation of esophagus/stomach; gastrointestinal bleeding, shock, acidosis, microthrombosis, disseminated intravascular coagulation, renal failure, hemolysis; possible sequelae: mediastinitis, peritonitis, strictures. [7836, 8088, 160]

- Medical advice:

Following contact with the eyes, continue rinsing (with water, better with RINGER-lactate solution or physiological saline solution or still better with balanced salt solution), alleviation of pain, then ensure immediate ophthalmological treatment. [8088, 99996]

Rinse contaminated skin repeatedly with water. Then, apply a dermatocorticoid foam spray to irritated areas and apply a sterile cover to chemical burns. Treatment for shock could become necessary (see below). [8088]

Following inhalation of acid mists - independent of whether there are symptoms or not - administer glucocorticoids (inhalatively and i.v.), administer oxygen and carry out all further measures for pulmonary edema prophylaxis. Avoid physical effort.

Treat cough with codeine. For bronchial spasm administer bronchodilators.

Support cardiovascular functions. In serious cases, intubation, artificial ventilation and further measures for cardiopulmonary cerebral resuscitation can become necessary. Hospitalize the casualty as soon as possible for further monitoring and treatment. [419, 7978, 8088]

After swallowing of small amounts of the acid, immediate administration of liquid is recommended in order to achieve a rinsing effect in the esophagus. [7906, 8088]

After intake of larger amounts of the acid, there are differing views on the advisability of administration of liquids (minor influence on the pH value but with possible simultaneous strong development of heat and increased probability of vomiting -> possibly leading to even greater adverse effect on the tissues). [7978] In such cases, consideration should be given to drawing off the stomach contents via a thin, flexible tube (by an expert under endoscopic visual control). The decision should be made depending on the poisoning situation/findings (watch for a danger of perforation). [160, 8088]

After ingestion also early prophylaxis for glottic edema with glucocorticoids and nasal intubation as needed. [7906, 160]

In all cases, safeguard vital functions. For hypotension early infusion of electrolyte solutions and laying the casualty in a flat position are recommended. [8088, 7978]

In hospital, inspection and treatment of chemical burns, prophylaxis for pulmonary edema and pneumonia and monitoring of cardiovascular and respiratory functions are of priority. Soon also check/ correct the acid base balance, observe kidney and liver functions and carry out analysis of blood gases and hemogram as well as coagulation status. [8088]

## Recommendations



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

[99999]

It is important to know whether contact was with very diluted or concentrated acid. [99999]

In single literature sources, the inhalation of an aerosol from 0,5 - 2% sodium hydrogen carbonate solution in an early phase of poisoning is recommended. This treatment was successful in some poisoning cases after inhalation of chlorine gas, [99996] but reports on clinical experience regarding the inhalation of hydrochloric acid vapors are not available. [99983]

Following high inhalative exposure to hydrochloric acid vapors prolonged monitoring of the lung functions is recommended because of possible persisting disorders. [7619]

### **Annotation**

This first aid information was compiled on 17.01.2012.

It will be updated if necessary.

## **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 good ventilation in the working area.

Washing facility at the workplace required.

Eye bath required. These locations must be signposted clearly.

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

#### **Equipment**

Use closed apparatus if possible.

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

Label containers and pipelines clearly.

Suitable materials:

Glass

Stoneware, porcelain

Polyvinyl chloride

Polyethylene PE

Polypropylene

Polytetrafluoro ethylene PTFE (Teflon)

Iron-silicon-molybdenum-alloys

Except copper and the noble metals, almost all metals are not appropriate, including the most of the stainless steel

#### **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.

Avoid splashing.

Fill only into labelled container.

Avoid any contact when handling the substance.

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.

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

## **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.

Do not use any metal containers.

Preferably use unbreakable containers rather than glass containers.

Place fragile vessels in break-proof outer vessels.

Keep container tightly closed.

Recommended storage at room temperature.

### **Conditions of collocated storage**

Storage class 8 B (Non-combustible corrosive 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.
- Strongly oxidizing substances of storage class 5.1A.
- Organic peroxides and self reactive substances.

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

- Other explosive substances of storage class 4.1A.
- Pyrophoric substances.
- Substances liberating flammable gases in contact with water.
- Ammonium nitrate and preparations containing ammonium nitrate.

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 non-combustible. Select fire and explosion prevention measures according to the other used substances.

Inspect the electrical fittings regularly against the higher risk of corrosion.

## **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.

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".

## **PERSONAL PROTECTION**

### **Body protection**

Depending on the risk, wear a sufficiently long apron and boots or a suitable chemical protection suit.

### **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 E, colour code yellow.

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 chemical safety goggles.

If the face is at risk a protective shield must also be worn.

If vapours or aerosols that may injure the eyes arise, then safety of the eyes can best be guaranteed by wearing a full mask.

### **Hand protection**

Use protective gloves. The glove material must be sufficiently impermeable and resistant to the substance. Check the tightness before wear. Gloves should be well cleaned before being removed, then stored in a well ventilated location. Pay attention to skin care.

Skin protection cremes do not protect sufficiently against the substance.

Textile or leather gloves are completely unsuitable.

Following data refers to chloric acid solutions (10% and 20%) :

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

Natural rubber/Natural latex - NR (0,5 mm) (use non-powdered and allergen free products)

Polychloroprene - CR (0,5 mm)

Nitrile rubber/Nitrile latex - NBR (0,35 mm)

Butyl rubber - Butyl (0,5 mm)

Fluoro carbon rubber - FKM (0,4 mm)

Polyvinyl chloride - PVC (0,5 mm)

Following data refers to chloric acid (32%) :

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

Polychloroprene - CR (0,5 mm)

Nitrile rubber/Nitrile latex - NBR (0,35 mm)

Butyl rubber - Butyl (0,5 mm)

Fluoro carbon rubber - FKM (0,4 mm)

Polyvinyl chloride - PVC (0,5 mm)

Protective gloves of the following materials should not be worn longer than 4 hours continually (Permeation time  $\geq$  4 hours):

Natural rubber/Natural latex - NR (0,5 mm) (use non-powdered and allergen free products)

Following data refers to chloric acid (37%) :

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

Polychloroprene - CR (0,5 mm)

Nitrile rubber/Nitrile latex - NBR (0,35 mm)

Butyl rubber - Butyl (0,5 mm)

Fluoro carbon rubber - FKM (0,4 mm)

Polyvinyl chloride - PVC (0,5 mm)

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

Natural rubber/Natural latex - NR (0,5 mm) (use non-powdered and allergen free products)

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**

Foods, beverages and other articles of consumption must not be consumed at the work areas.

Suitable areas are to be designated for these purposes.

Avoid contact with skin. In case of contact wash skin.

Avoid contact with eyes. In case of contact rinse the affected eye(s).

Avoid inhalation of vapour or mist.

Avoid contact with clothing. Contaminated clothes must be exchanged and cleaned carefully.

Provide washrooms with showers and if possible rooms with separate storage for street clothing and work clothing.

The skin must be washed with soap and water before breaks and at the end of work. Apply fatty skin-care products after washing.

### **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:

Inorganic acids and their anhydrides are, if necessary, first dilute or hydrolised by stirring cautiously in ice water. Then are neutralised with caustic lye; check pH value.

Place in collecting containers for salt solutions, adjust for a pH value of 6 - 8.

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**

Evacuate area. Warn affected surroundings.

The hazardous area may only be entered once suitable protective measures are implemented. Only then can the hazardous situation be removed (see chapter Personal Protection).

Take up with an absorbent (absorbent and neutralizer for spilled acids) and dispose of according to regulations.

Afterwards ventilate area and wash spill site.

Endangerment of water:

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

### **FIRE FIGHTING MEASURES**

#### **Instructions**

Substance is incombustible. Select fire fighting measures according to the surrounding conditions.

In case of ambient fire:

Cool surrounding containers with water spray.

If possible, take container out of dangerous zone.

Rise in pressure and risk of bursting when heating.

Contain vapours with water spray.

#### **Special protective equipment**

In the case of inclusion in an ambient fire hazardous substances can be released.

Hydrogen chloride

Wear self-contained breathing apparatus and special tightly sealed suit.

## REGULATIONS

[GHS Classification/Labelling](#) | [Workplace labelling](#) | [Water hazard class](#) | [Transport Regulations](#) | [Threshold limit values](#) | [EC-Threshold limit values](#) | [MAK recommendations](#) | [Restriction of use](#) | [Technical rules](#) | [Regulations of accident insurers](#)

### EUROPEAN GHS CLASSIFICATION AND LABELLING

#### Classification

Corrosive to metals, Category 1; H290  
 Skin corrosion, Category 1B; H314  
 Serious eye damage, Category 1; H318  
 Specific Target Organ Toxicity (single exposure), Category 3; H335



**Signal Word** "Danger"

#### Hazard Statement - H-phrases

H290: May be corrosive to metals.  
 H314: Causes severe skin burns and eye damage.  
 H335: May cause respiratory irritation.

#### Precautionary Statement - P-phrases

P280: Wear protective gloves/protective clothing/eye protection/face protection.  
 P303+P361+P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water or shower.  
 P305+P351+P338+P310: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.

Manufacturer's specification by Sigma-Aldrich

Reference: [01221](#)

State: 2020

Checked: 2020

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

Skin Corr. 1B; H314:  $C \geq 25 \%$   
 Skin Irrit. 2; H315:  $10 \% \leq C < 25 \%$   
 Eye Irrit. 2; H319:  $10 \% \leq C < 25 \%$   
 STOT SE 3; H335:  $C \geq 10 \%$   
 Met. Corr. 1:  $C \geq 0.1 \%$

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: [07500 07520](#)

## WORKPLACE LABELLING ACCORDING TO GERMAN ASR A1.3

### Warning label



Caution - corrosive material

### Precept label



Use safety goggles



Wear safety gloves

## GERMAN WATER HAZARD CLASS

Substance No: 238

WGK 1 - low hazard to waters

Scope:hydrogen chloride

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

## TRANSPORT REGULATIONS

UN Number: 1789

Shipping name: Hydrochloric acid, solution

Hazard Identification Number: 80

Class: 8 (Corrosive Substances)

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

Danger Label: 8



Classification code: C1

Tunnel restrictions:

Passage forbidden through tunnels of category E.

Reference: [07902](#)

## TRGS 900 - GERMAN OCCUPATIONAL EXPOSURE LIMIT VALUES

2 ml/m<sup>3</sup>

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

Peak limitation: Excursion factor 2

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

Category I - Substances for which local irritant effects determine the exposure limit value, also respiratory allergens

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

Scope:

Hydrogen chloride

## EC OCCUPATIONAL EXPOSURE LIMIT VALUES

Directive 2000/39/EC

**Recommended indicative occupational exposure limit value** for the European Union

A national occupational exposure limit value has to be set.

8 hours limit value: 8 mg/m<sup>3</sup> (5 ppm)

Short term limit value: 15 mg/m<sup>3</sup> (10 ppm)

## RECOMMENDATIONS OF MAK-COMMISSION

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

2 ml/m<sup>3</sup>

3,0 mg/m<sup>3</sup>

Peak limitation: Excursion factor 2

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

Category I - Substances for which local irritant effects determine the exposure limit value, also respiratory allergens

Pregnancy: Group C

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

## 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 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 401](#)

Gefährdung durch Hautkontakt, Ermittlung - Beurteilung - Maßnahmen; Ausgabe Oktober 2022

##### [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

#### 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 Data Set \(SIDS\)](#)

[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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G. Hommel

"Handbuch der gefährlichen Güter" Loseblattsammlung mit Ergänzungslieferungen

"Handbook of dangerous goods " loose-leaf collection with supplement deliveries

Springer-Verlag, Heidelberg

Quelle: 00160

Bundesinstitut für gesundheitlichen Verbraucherschutz und Veterinärmedizin (BgVV):

Informationskartei für die Erkennung und Behandlung von Vergiftungen

(Federal Institute for Health Protection of Consumers and Veterinary Medicine: Information index for the detection and treatment of poisoning)

Quelle: 00419

CHEMINFO - Chemical Profiles Created by CCOHS

Quelle: 00435

Organisation for Economic Cooperation and Development (OECD) "Screening Information Data Set for High Production Volume Chemicals (SIDS)", <http://www.inchem.org/pages/sids.html>

Quelle: 00454

Hazardous Substances Data Bank (HSDB)

Quelle: 01211

GHS-Sicherheitsdatenblatt, Merck

GHS Material Safety Data Sheet, Merck

Quelle: 01221

GHS-Sicherheitsdatenblatt, Sigma-Aldrich

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Quelle: 02072

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Quelle: 05108

Kühn-Birett-Merkblätter: 108. Ergänzungslieferung; 06/98

Quelle: 05300

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

Quelle: 05350

[TRGS 900](#) "Arbeitsplatzgrenzwerte" Ausgabe Januar 2006, zuletzt geändert und ergänzt Juni 2023

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"Gefährliche Chemische Reaktionen" Loseblattsammlung mit Ergänzungslieferungen, ecomed-Verlag

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Quelle: 07500

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European Chemicals Agency ECHA: Information on registered substances

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Quelle: 07638

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DFG Deutsche Forschungsgemeinschaft: MAK- und BAT-Werte-Liste 2023, Senatskommission zur Prüfung gesundheitsschädlicher Arbeitsstoffe, Mitteilung 59; GMS PUBLISSO

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Quelle: 99999

Angabe des Bearbeiters

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