Description
PSENmag

Operation of the safety switch

PSENmag safety switches act in conjunction with an actuator in non-contact, magnetic operation. Each safety switch has an approved actuator. Together with an authorised evaluation device they form an approved, complete solution.

The safety switches are available with different contact combinations (N/C / N/O, N/O / N/O). If the actuator is within the response range, the magnets switch the reed contacts on the safety switch. On some safety switches this is signalled by a yellow LED.
If the actuator is outside the response range (safety gate open), the reed contacts on the safety switch will switch. On some safety switches this is signalled by a red LED.

Protection against defeat

Safety switches from the PSEN range are designed to guarantee security against manipulation through protection against defeat in accordance with VDE 0660.

Selection criteria

- Switch type: e.g. N/C / N/C combination
- Design: Compact, round (M30 or M12), square
- Type of evaluation device
- Connection to evaluation device:
  - directly to the safety switch (single connection)
  - via an interface to the safety switch (series connection of several safety switches)
- Achievable category in accordance with EN 954-1 and EN 60947-5-3
- LED to display switch status
- Type of cable connection:
  - With cable (5 or 10 m)
  - With plug-in connector (plug-in with screw connection, straight or angled)
- Safety switch with ATEX approval for use in potentially explosive atmospheres.

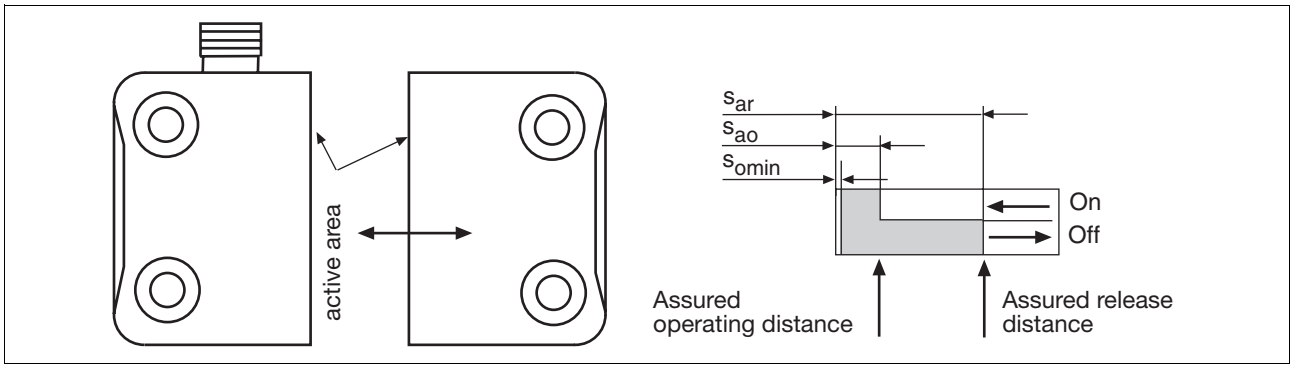
Operating distance

Safety switches with different operating distances are available for different applications, e.g. with an assured operating distance sao of 3 or 8 mm.

A high lateral and vertical offset can be achieved with long operating distances. This will provide greater tolerances for installation and even less sensitivy towards spring-back or swinging from safety gates.

Operating distances:

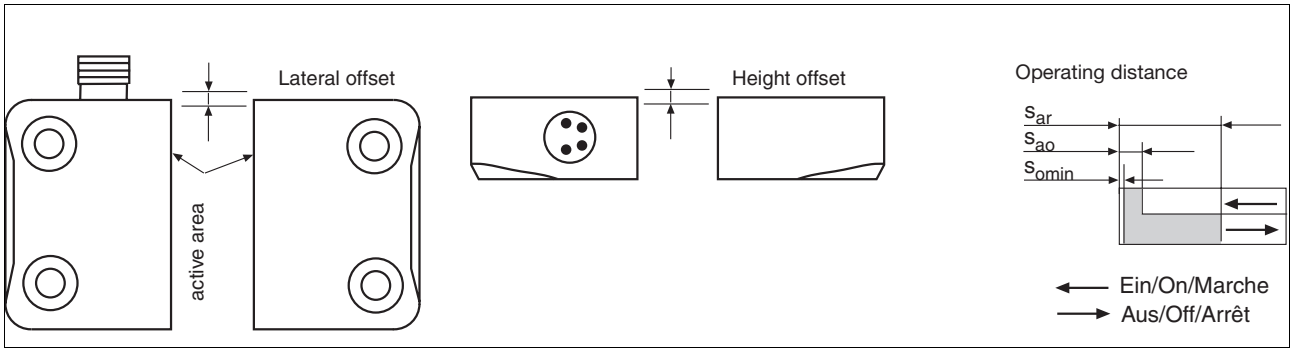
- Assured operating distance s_{ao}: This is the distance from the sensing face, within which the presence of the specified target is correctly detected under all specified environmental conditions, manufacturing tolerances and internal component faults.
- Minimum operating distance s_{omin}: This is the distance from the sensing face, within which the presence of the specified target is correctly detected under all specified environmental conditions, manufacturing tolerances and internal component faults.
- Assured release distance S_{ar}: This is the distance from the sensing face, beyond which the absence of the specified target is correctly detected under all specified environmental conditions, manufacturing tolerances and internal component faults.



Hysteresis:
The assured release distance is longer than the assured operating distance ($s_{ar} > s_{ao}$). The safety switches therefore have a hysteresis. If the actuator is within $s_{ao,}$ vibrations up to s_{ar} will not cause the safety switch to de-energise.

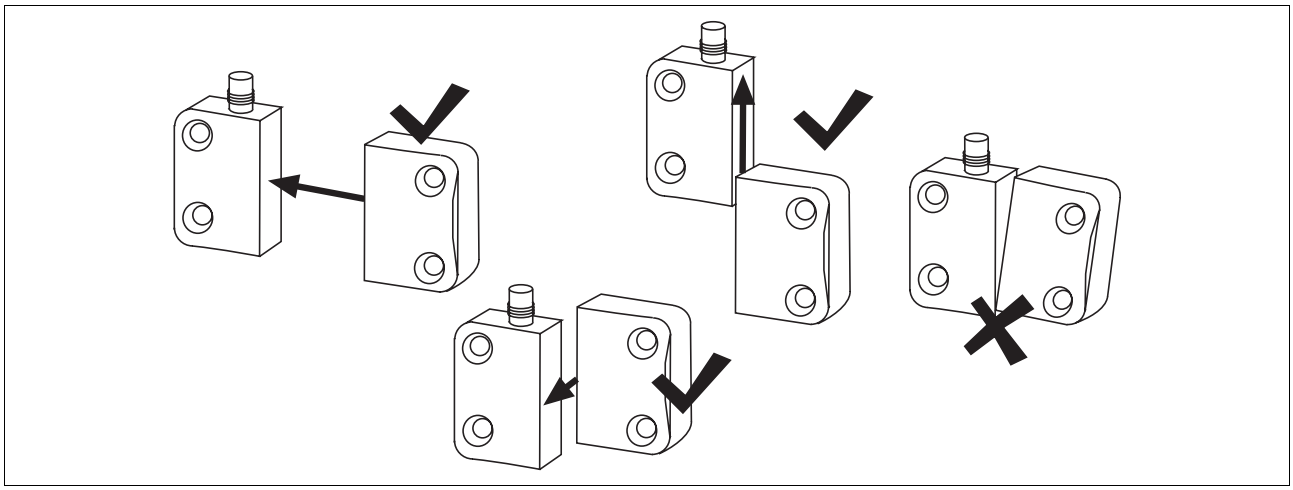
Lateral and vertical offset:
The operating distances stated in the technical datails only apply if the active areas of the sensing face and actuator are installed opposite each other in parallel. Operating distances may deviate if other arrangements are used. The maximum permitted lateral and vertical offset will depend on the safety switch you are using (see chapter entitled “Unit-specific Descriptions”, section on“Max. lateral and vertical offset in mm”).

Description
PSENmag



Actuator's direction of movement

The sensing face of the actuator is permitted to move in parallel to the sensing face on the safety switch. Movements in which the actuator is tilted in relation to the safety switch are not permitted.



Pass-by speed

If the safety switch is being used as a position switch, the maximum permitted pass-by speed of the actuator is important. This must be defined so that the evaluation device can detect the status of the safety switch. This value is device-specific.

Compact design

The safety switches are small and compact in design, enabling them to integrate perfectly into an existing working environment.

With a round or square design, the safety switches can easily be adapted to suit installation requirements.

Evaluation devices

Each safety switch has an approved evaluation device and possibly also an interface.

INFORMATION
For details of which evaluation device is approved for which safety switch, please refer to the chapter entitled “Wiring and Commissioning” or to the details in the chapter entitled “Unit-specific Descriptions”.

Connecting safety switches in series

Several safety switches are connected to an input on an evaluation device via an interface. This means, for example, that several safety gates on a plant can be monitored using a single evaluation device. The interface type and the number of safety switches that can be connected will depend on the selected evaluation device. The interface connects the safety switches in series to the evaluation device.

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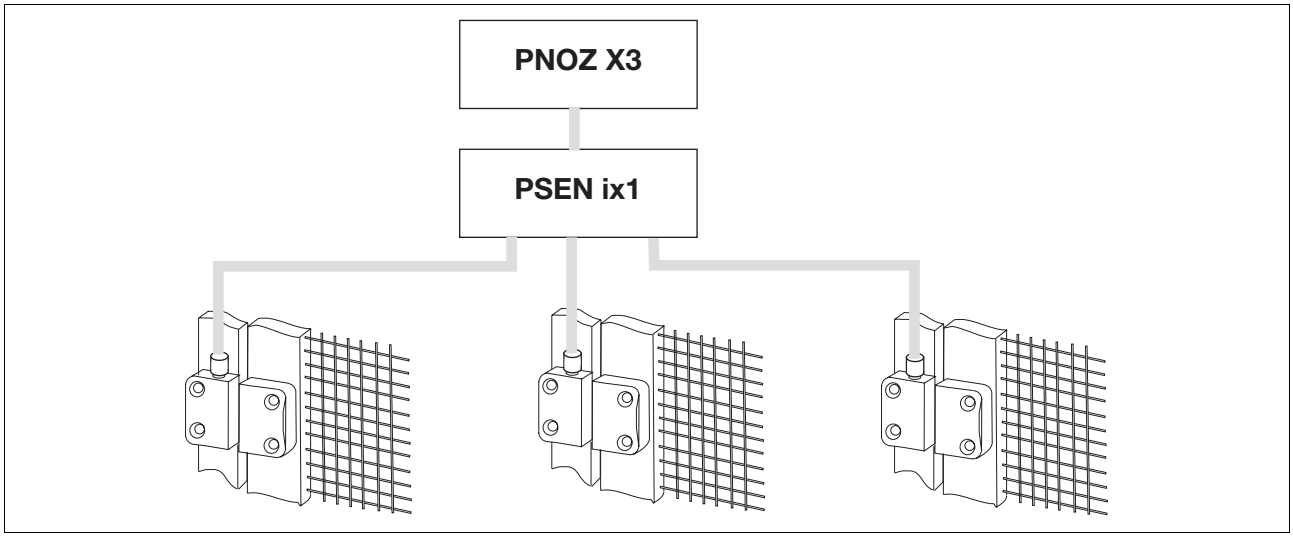
Description
PSENmag

The switch status of the individual safety switches (safety gate open or closed) is displayed through LEDs and can be evaluated via auxiliary outputs, e.g. with a PLC.



Housing material

The housing of the PSENmag safety switches is made from silicone-free PBT plastic, which is insensitive to dirt. For details of the chemical resistance of the housing material, please refer to the table in the chapter entitled “Chemical resistance”.

Connector or cable

The safety switches are available with cable or connector.
PSENmag with cable have a 4-core cable of 5 or 10 m length.
PSENmag with connectors have a 4-pin male M8 screw connector with lock. They are available straight or angled.

Category

Safety switches in the PSEN product range have two independent contacts. They are classified as PDF-M in accordance with EN 60947-5-3 and can therefore be used for applications up to category 4 in accordance with EN 954-1.
If an interface (e.g. PSEN i1) is used to connect the safety switches in series, the classification to EN 60947-5-3 is reduced to PDF-S. This means the safety switches can be used for applications up to category 3 in accordance with EN 954-1.

Application areas

Thanks to the high protection type IP65/67 on safety switches with IP69K cable, integral protection against defeat and long service life, the safety switches are suitable for use:
- In mechanical engineering.

And for safety switches with cable in particular:
- In areas with rigorous hygiene requirements, such as the food, packaging or pharmaceutical industry.

Wiring
PSENmag

When wiring and commissioning, please note the following:

- The safety switches only conform to EN 60947-5-3 in conjunction with their approved evaluation devices and actuators.
- To connect the safety switches in series, the switches must be connected to the evaluation device via an interface that has been approved for this purpose.
- Please note the colour marking on the connection cable. The colour marking for the connection lead only applies for the cable that Pilz supplies as an accessory.
- The safety switch is always shown in an unoperated condition.
- Calculation of the max. cable runs l_{max} in the input circuit:
  R_{lmax} = max. overall cable resistance (see Technical details)
  R_l / km = cable resistance/km

Permitted evaluation devices

Operation of the safety switches is only approved in conjunction with certain evaluation devices.
The permitted evaluation devices and the way in which they are connected are unit-specific and are described for each device in the chapter entitled "Units".

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Chemical resistance
Chemical resistance

Chemical resistance of the housing material
- PSENmag safety switch
- PSENmag actuator
- PSENcode safety switch

The resistance values listed here are only standard values and may be fundamentally changed by influencing factors such as filling material, changing temperatures, high load, environmental influences, reaction period etc. For this reason we cannot guarantee this information. This data was determined at room temperature and with normal to strong concentrations.

Resistance level index:
A = resistant
B = resistant under certain conditions
C = non-resistant
D = soluble

Resistance to	Resistance level	Resistance to	Resistance level
Acetaldehyde (ethanal)	A	Potassium carbonate (potash)	A
Acetic anhydride	A	Potassium nitrate (potash nitre)	A
Acetone	B	Potassium manganate 10 %	A
Ethanol (acetaldehyde)	A	Carbolic acid (phenol)	C
Ethanol (ethyl alcohol, spirit)	A	Castor oil	A
Ether (diethyl)	A	Kerosene	A
Ethyl acetate (acetic ether, acetic ester)	B	Silicic acid	A
Ethyl ether (ether, diethyl)	A	Carbonic acid (carbon dioxide)	A
Ethyl alcohol (ethanol, spirit)	A	Carbon tetrachloride (tetrachloromethane)	A
Ethyl chloride (chloroethane)	A	Nitrohydrochloric acid (HNO3/HCl)	C
Ethylene chloride (1.2 dichloroethane)	C	Copper nitrate, aqueous	A
Ethylene glycol (glycol, 1.2 ethanediol)	A	Blue vitriol (copper sulphate)	A
Ethylene glycol (cellosolve)	A	Laughing gas (nitric oxide)	A
Caustic potash (potassium hydroxide)	B	Lanolin (wool fat)	A
Caustic soda (sodium hydroxide)	B	Linseed oil	A
Allyl alcohol (2 propene 1-cl)	A	Lighting gas	A
Aluminium hydroxide	A	Magnesium carbonate	A
Aluminium nitrate	A	Magnesium nitrate	A
Formic acid	A	Magnesium sulphate (Epsom salts)	A
Aminobenzene (aniline)	A	Seawater	A
Ammonia (aqueous) (liquid ammonia)	A	Menthol	A
Ammonia 30%	A	Methanal (formaldehyde)	A
Ammonium chloride (salmiac)	A	Methane (pit gas, natural gas)	A
Ammonium hydroxide (aqueous ammonia)	A	Methanol (methane alcohol, wood spirit)	A
Ammonium bicarbonate (sal volatile)	A	Methyl acetate	A
Ammonium nitrate (fertiliser)	A	Methane alcohol	A
Ammonium phosphate (fertiliser)	A	Methyl ethyl ketone	A
Amyl alcohol (pentanol, pentyl alcohol)	A	Methylbenzoyl (toluene)	A
Anethole	A	Methylcellosolve (methyl glycol)	A
Aniline (aminobenzene)	A	Methylchloride	D
Argon	A	Methylchloroform (trichloroethylene, chlorothene)	A
Barium chloride	A	Methylene chloride (dichloromethane)	D
Barium sulphate (baryte)	A	Methyl glycol (methyl cellosolve)	A
Barium sulphide	A	Mineral oils	A
Benzaldehyde (bitter almond oil)	A	Monochloracetic acid (chlorobenzoyl)	A
Benzine, lead-free	A	Myristil alcohol (myristic alcohol)	A
Benzine, super	A	Naphtha / crude oil	A
Benzoic acid	A	Naphthalene (mineral oil)	A
Benzol	A	Sodium bicarbonate	A
Benzyl alcohol (phenylcarbinol)	A	Sodium bisulphate	A
Benzyl chloride (d-chlorotoluene)	A	Sodium borate	A
Javel water (12.5% Cl2)	A	Sodium chloride (salt)	A
Borax	A	Sodium hydroxide (caustic soda, sodium hydrate)	B
Boric acid	A	Sodium hypochlorite (javel water)	A
Brake fluid (DIN 53521)	A	Sodium carbonate	A

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Chemical resistance

Chemical resistance

Resistance to	Resistance level	Resistance to	Resistance level
Butane, liquid	A	Sodium nitrate (Chile salpetre)	A
Butanol (butyl alcohol)	B	Sodium sulphate (mirabilite)	A
Butanone-2	A	Sodium sulphide	A
Butyl acetate	A	Sodium borate (borax)	A
Butyl alcohol (butanol)	B	Caustic soda (sodium hydroxide)	B
Butyl glycol	A	Nickel sulphate	A
Butyl glycol ether	A	Nitrating acid	B
Calcium carbonate (chalk)	A	Nitrobenzoyl (mirbane)	D
Calcium chloride, aqueous	A	Octane	A
Calcium hydroxide	B	Oleic acid	A
Calcium hypochlorite (bleaching powder)	A	Oleum (fuming sulphuric acid)	C
Calcium sulphate (gypsum)	A	Ozone	A
Cellulose acetate	A	Paraffin	A
Cetylic alcohol (1 hexadecanol)	A	Pentanol (pentyl alcohol, amyl alcohol)	A
Chlorobenzoyl	A	Perchloroethylene (tetrachloroethylene)	A
Chloroform (trichloromethane)	B	Perchloric acid	A
Chlorothene (trichloroethene)	A	Petroleum, kerosene	A
Hydrochloric acid	A	Phenol (carbolic acid)	C
Chromic acid 50 %	A	Phenylcarbinol (benzyl carbinol)	A
Chromic acid anhydride (chromium trioxide)	A	Phosphoric acid	A
Citric acid	A	Polyglycol	A
Cyclohexanol (hexalin)	A	Propanol (propyl alcohol)	A
Dextrin	A	Propanone (acetone)	B
Diacetone alcohol (Pyranton, Dial, DA)	A	Propyl alcohol	A
Diethyl ether (ether)	A	Mercury	A
Dibutyl ether (butyl ether)	A	Castor oil	A
Dibutylphthalate	A	Crude oil	A
Dibutylsebacate	A	Nitric acid	A
Dichloroethane	C	Nitric acid, concentrated (aqua fortis)	B
Dichloroethylene	B	Nitric acid, fuming	B
Dichloromethane (methylene chloride)	D	Hydrochloric acid, concentrated	A
Dimethyl ether	A	Hydrochloric acid 10 %	A
Dimethylbenzoyl (xylol)	A	Oxygen	A
Dimethyl formamide DMF	B	Sulphur	A
Propanone (acetone)	B	Sulphuric ether (diethyl)	A
Dioxan	A	Sulphur chloride (disulphur dichloride)	C
Pure acetic acid (100% acetic acid)	A	Sulphurdichloride	C
Natural gas	A	Sulphur dioxide (sulphuric acid)	B
Vinegar (wine vinegar)	A	Sulphuric acid 10%	A
Acetic ester	B	Sulphuric acid 60%	B
Acetic anhydride	A	Sulphuric acid 95%	C
Acetic ether	B	Sulphuric acid, fuming (oleum)	C
Butyl acetate	A	Sulphur trioxide	C
Methyl acetate	A	Hydrogen sulphide	C
Fat (salad oil)	A	Silver nitrate	A
Fat, mineral	A	Silicone oil	A
Fatty acids above C6	A	Soda, aqueous (sodium carbonate)	A
Fluosilicic acid (hydrofluosilicic acid)	B	Salad oil/fat	A
Hydrofluoric acid	B	Spirits	A
Hydrofluoric acid	B	Stearyl alcohol (1-octadecanol)	A
Formaldehyde (formalin) (methanal)	A	Nitrogen	A
Formamide	A	Styrene (vinylbenzene, phenylethylene)	C
Freon 11 (fluorotrichloromethane)	A	Turpentine oil	A
Freon 12 (dichlorodifluoromethane)	A	Tetrachloroethylene (perchloroethylene)	A
Freon 22 (chlorodifluoromethane)	A	Carbon tetrachloride (tetrachloromethane)	A
Freon 113 (trichlorofluoroethane)	A	Tetrachloromethane (carbon tetrachloride)	A

Chemical resistance

Chemical resistance

Resistance to	Resistance level	Resistance to	Resistance level
Furfurylalcohol (furfuryl aldehyde, furfural)	A	Tetrahydrofurane (diethylene oxide, tetramethyloxide)	A
Gasoline	A	Tetrahydronaphthalene (tetralin)	A
Glucose (grape sugar)	A	Toluene (methylbenzoyl)	A
Glycerin /glycerol	A	Trichloroethylene (chlorothene)	A
Glycol (ethylene glycol)	A	Trichloroethylene (trichloroethene)	A
Heptane	A	Trichloromethane (chloroform)	B
Hexahydrobenzene (cyclohexane)	A	Perchloric acid	A
Hexalin (cyclohexanol)	A	Urine	A
Hexane	A	Vaseline oil	A
Isopropanol (persprit)	A	Vinylidene chloride (dichlorethylene)	B
Javel water (sodium hypochloride)	A	Water, spring water	A
Potassium chloride (sylvine)	A	Water, carbonated	A
Potassium hydroxide (caustic potash, caustic potash solution)	B	Hydrogen peroxide	A
Potassium hypochloride	A	Xylol (dimethylbenzoyl)	A
Potassium hypochloride	A	Citric acid	A

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Chemical resistance
Chemical resistance

Chemical resistance of the housing material:
- Actuator, PSENcode

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Resistance level index:
A = resistant
B = resistant under certain conditions
C = non-resistant
D = soluble

Resistance to	Resistance level	Resistance to	Resistance level
Acetaldehyde (ethanal)	B	Carbonic acid (carbon dioxide)	A
Acetic anhydride	A	Carbon tetrachloride (tetrachloromethane)	C
Acetone	B	Nitrohydrochloric acid (HNO3/HCl)	C
Ethanol (acetaldehyde)	A	Copper nitrate, aqueous	A
Ethanol (ethyl alcohol, spirit)	A	Blue vitriol (copper sulphate)	A
Ether (diethyl)	A	Laughing gas (nitric oxide)	A
Ethyl acetate (acetic ether, acetic ester)	B	Lanolin (wool fat)	A
Ethyl ether (ether, diethyl)	A	Linseed oil	A
Ethyl alcohol (ethanol, spirit)	A	Lighting gas	A
Ethyl chloride (chloroethane)	B	Magnesium carbonate	A
Ethylene chloride (1.2 dichloroethane)	B	Magnesium nitrate	A
Ethylene glycol (glycol, 1.2 ethanediol)	A	Magnesium sulphate (Epsom salts)	A
Ethylene glycol (cellosolve)	A	Seawater	A
Caustic potash (potassium hydroxide)	B	Menthol	A
Caustic soda (sodium hydroxide)	B	Methanal (formaldehyde)	B
Allyl alcohol (2 propene 1-cl)	A	Methane (pit gas, natural gas)	A
Aluminium hydroxide	A	Methanol (methane alcohol, wood spirit)	A
Aluminium nitrate	A	Methyl acetate	B
Formic acid	C	Methane alcohol	A
Aminobenzene (aniline)	B	Methyl ethyl ketone	B
Ammonia (aqueous) (liquid ammonia)	A	Methylbenzoyl (toluene)	B
Ammonia 30%	A	Methylcellosolve (methyl glycol)	A
Ammonium chloride (salmiac)	A	Methylchloride	C
Ammonium hydroxide (aqueous ammonia)	A	Methylchloroform (trichloroethylene, chlorothene)	C
Ammonium bicarbonate (sal volatile)	A	Methylene chloride (dichloromethane)	C
Ammonium nitrate (fertiliser)	A	Methyl glycol (methyl cellosolve)	A
Ammonium phosphate (fertiliser)	A	Mineral oils	A
Amyl alcohol (pentanol, pentyl alcohol)	A	Monochloracetic acid (chlorobenzoyl)	C
Anethole	A	Myristil alcohol (myristic alcohol)	A
Aniline (aminobenzene)	B	Naphtha / crude oil	A
Argon	A	Naphthalene (mineral oil)	A
Barium chloride	A	Sodium bicarbonate	A
Barium sulphate (baryte)	A	Sodium bisulphate	A
Barium sulphide	A	Sodium borate	A
Benzaldehyde (bitter almond oil)	B	Sodium chloride (salt)	A
Benzine, lead-free	A	Sodium hydroxide (caustic soda, sodium hydrate)	B
Benzine, super	A	Sodium hypochlorite (javel water)	A
Benzoic acid	A	Sodium carbonate	A
Benzol	B	Sodium nitrate (Chile salpetre)	A
Benzyl alcohol (phenylcarbinol)	A	Sodium sulphate (mirabilite)	A
Benzyl chloride (d-chlorotoluene)	A	Sodium sulphide	A
Javel water (12.5% Cl2)	A	Sodium borate (borax)	A
Borax	A	Caustic soda (sodium hydroxide)	B
Boric acid	A	Nickel sulphate	A
Brake fluid (DIN 53521)	A	Nitrating acid	B
Butane, liquid	A	Nitrobenzoyl (mirbane)	B

Chemical resistance

Chemical resistance

Resistance to	Resistance level	Resistance to	Resistance level
Butanol (butyl alcohol)	A	Octane	A
Butanone-2	A	Oleic acid	A
Butyl acetate	B	Oleum (fuming sulphuric acid)	C
Butyl alcohol (butanol)	A	Ozone	A
Butyl glycol	A	Paraffin	A
Butyl glycol ether	A	Pentanol (pentyl alcohol, amyl alcohol)	A
Calcium carbonate (chalk)	A	Perchloroethylene (tetrachloroethylene)	C
Calcium chloride, aqueous	A	Perchloric acid	C
Calcium hydroxide	B	Petroleum, kerosene	A
Calcium hypochlorite (bleaching powder)	A	Phenol (carbolic acid)	B
Calcium sulphate (gypsum)	A	Phenylcarbinol (benzyl carbinol)	A
Cellulose acetate	A	Phosphoric acid	C
Cetylic alcohol (1 hexadecanol)	A	Polyglycol	A
Chlorobenzoyl	C	Propanol (propyl alcohol)	A
Chloroform (trichloromethane)	C	Propanone (acetone)	B
Chlorothene (trichloroethene)	C	Propyl alcohol	A
Hydrochloric acid	B	Mercury	A
Chromic acid 50 %	B	Castor oil	A
Chromic acid anhydride (chromium trioxide)	A	Crude oil	A
Citric acid	A	Nitric acid	C
Cyclohexanol (hexalin)	A	Nitric acid, concentrated (aqua fortis)	D
Dextrin	A	Nitric acid, fuming	D
Diacetone alcohol (Pyranton, Dial, DA)	A	Hydrochloric acid, concentrated	B
Diethyl ether (ether)	A	Hydrochloric acid 10 %	B
Dibutyl ether (butyl ether)	A	Oxygen	A
Dibutylphthalate	A	Sulphur	A
Dibutylsebacate	A	Sulphuric ether (diethyl)	A
Dichloroethane	C	Sulphur chloride (disulphur dichloride)	C
Dichloroethylene	C	Sulphurdichloride	C
Dichloromethane (methylene chloride)	C	Sulphur dioxide (sulphuric acid)	B
Dimethyl ether	A	Sulphuric acid 10%	B
Dimethylbenzoyl (xylol)	B	Sulphuric acid 60%	C
Dimethyl formamide DMF	B	Sulphuric acid 95%	C
Propanone (acetone)	B	Sulphuric acid, fuming (oleum)	C
Dioxan	B	Sulphur trioxide	C
Pure acetic acid (100% acetic acid)	B	Hydrogen sulphide	C
Natural gas	A	Silver nitrate	A
Vinegar (wine vinegar)	A	Silicone oil	A
Acetic ester	B	Soda, aqueous (sodium carbonate)	A
Acetic anhydride	A	Salad oil/fat	A
Acetic ether	B	Spirits	A
Butyl acetate	B	Stearyl alcohol (1-octadecanol)	A
Methyl acetate	B	Nitrogen	A
Fat (salad oil)	A	Styrene (vinylbenzene, phenylethylene)	B
Fat, mineral	A	Turpentine oil	A
Fatty acids above C6	A	Tetrachloroethylene (perchloroethylene)	C
Fluosilicic acid (hydrofluosilicic acid)	B	Carbon tetrachloride (tetrachloromethane)	C
Hydrofluoric acid	C	Tetrachloromethane (carbon tetrachloride)	C
Hydrofluoric acid	C	Tetrahydrofurane (diethylene oxide, tetramethyloxide)	B
Formaldehyde (formalin) (methanal)	C	Tetrahydronaphthalene (tetralin)	B
Formamide	A	Toluene (methylbenzoyl)	B
Furfurylalcohol (furfuryl aldehyde, furfural)	A	Trichloroethylene (chlorothene)	C
Gasoline	A	Trichloroethylene (trichloroethene)	C
Glucose (grape sugar)	A	Trichloromethane (chloroform)	C
Glycerin /glycerol	A	Perchloric acid	C
Glycol (ethylene glycol)	A	Urine	A

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Chemical resistance

Chemical resistance

Resistance to	Resistance level	Resistance to	Resistance level
Heptane	B	Vaseline oil	A
Hexahydrobenzene (cyclohexane)	A	Vinylidene chloride (dichlorethylene)	C
Hexalin (cyclohexanol)	A	Water, spring water	A
Hexane	A	Water, carbonated	A
Isopropanol (persprit)	A	Hydrogen peroxide	A
Javel water (sodium hypochloride)	A	Xylol (dimethylbenzoyl)	B
Potassium chloride (sylvine)	A	Citric acid	A
Potassium hydroxide (caustic potash, caustic potash solution)	A		
Potassium hypochloride	A		
Potassium carbonate (potash)	A		
Potassium nitrate (potash nitre)	A		
Potassium manganate 10 %	A		
Carbolic acid (phenol)	C		
Castor oil	A		
Kerosene	B		
Silicic acid	A		