

General technical information

Enclosure selection criteria

Enclosures are generally required to protect the installed equipment from external hazards. These hazards can be varied in nature and are of decisive significance when determining the criteria for the choice of an enclosure.

Essential for appraising whether an enclosure meets safety requirements is a precise definition of the hazards expected at an installation location. The most important conditions to consider are the following:

1. Protection against contact and penetration of foreign bodies
2. Protection against water penetration
3. Protection against internal and external radio interference
4. Chemical resistance
5. Temperature stability
6. Impact resistance
7. Corrosion resistance

Enclosure ratings

ROSE enclosures are classified in enclosure rating in accordance with the generally applicable guidelines contained in EN 60529 and IEC 144.

The enclosure rating is indicated by an abbreviation, which is always composed of the two letters IP and two digits relating to the protection level.

Protection class for contact and foreign bodies protection

First digit	Designation
0	No protection
1	Protection against large foreign bodies
2	Protection against medium-sized foreign bodies
3	Protection against small foreign bodies
4	Protection against granular foreign bodies
5	Protection against dust deposits
6	Protection against dust entry

Water protection class

Second digit	Designation
0	No protection
1	Protection against vertical falling drip water
2	Protection against obliquely falling drip water
3	Protection against water spray
4	Protection against splashing water
5	Protection against water jets
6	Protection when flooded
7	Protection when immersed
8	Protection when submerged

Note: The enclosure ratings given apply to unmodified enclosures as supplied. Wear and tear and temperature fluctuations may lead to a reduction in the enclosure rating.

Temperature stability

The definition of temperature stability for enclosures is based on the maximum continuous temperature at which the enclosure remains dimensionally stable and the enclosure rating remains guaranteed. The permissible brief peak temperatures are often considerably higher.

Corrosion resistance of aluminium enclosures

The corrosion resistance of aluminium enclosures is rated as good, even without special surface treatment. The use of special aluminium alloys with low copper content increases the corrosion resistance.

Additional treatments including

- chromating
 - lacquering (powder coating) and
 - the combination of chromating and lacquering
- further increase corrosion resistance.

We offer the following for critical external areas:

SWB version (seawater-resistant):

Purified - chromated - powder-coated

Standard colour RAL 5009, other colours on request.

For application areas with extreme UV radiation we recommend coating with a special Polyester powder.

SBG/SBGL version only for wet painting processes

SBG = Purified - alodine-primed

SBGL = Purified - alodine-primed - painted

Allgemeine technische Informationen

Chemical resistance Enclosure materials

Chemicals	Aluminium	Stainless steel	Polycarbonate	Polyester	Polystyrene	Polyamide
Acetone	+	+	-	-	-	•
Formic acid	•	+	30 %	10 %	•	-
Ammonia	+	+	-	-	+	20 %
Petrol	+	+	•	+	•	+
Benzene	+	+	-	+	-	-
Brake fluid	/	/	-	+	/	60°
Butane	+	/	+	/	-	+
Butanol	/	/	/	+	/	+
Calcium chloride	+	+	+	+	+	+
Chloral benzene	+	/	-	+	-	•
Diesel öoil	/	/	•	+	•	/
Vinegar	+	+	10 %	40 %	+ max. 50 %	-
Formaldehyde	+	+	/	30 %	+ max. 40 %	+
Freon 113	/	/	+	+	/	/
Fruit juice	/	+	+	+	/	+
Glycerine	+	+	•	+	+	+
Fuel oil	+	+	•	+	•	+
Hydraulic oil	/	/	+	+	•	+
Caustic potash solution	/	+	-	-	+ max. 50 %	-
Potassium chloride	•	+	+	+	+	+
Potassium hydroxide	-	+	/	-	+	/
Linseed oil	+	+	+	+	+	+
Methane	+	+	-	-	+	•
Methylene chloride	+	+	-	-	-	-
Lactic acid	+	+	10 %	+	+ max. 80 %	10 %
Mineral oils	/	/	+	+	+	+
Motor oils	/	/	+	+	+	+
Sodium carbonate	•	+	+	+	+	+
Sodium chloride	•	•	+	+	+	10 %
Sodium hydroxide	+	+	/	-	/	/
Soda lye	/	+	-	40 %	+ max. 50 %	10 %
Nitric acid	+	+	10 %	10 %	+ max. 25 %	-
Hydrochloric acid	/	+	20 %	+	+ max. 10 %	-
Lubricating oil	+	+	+	+	/	+
Carbon bisulphide	+	+	-	-	-	•
Sulphuric acid	•	+	50 %	70 %	+ max. 50 %	-
Suds	/	+	•	+	/	+
Cleansing agent	/	+	+	/	/	/
Terpentine oil	/	/	/	+	-	+
Carbon tetrachloride	+	/	/	+	-	•
Toluene	+	/	-	+	-	+
Trichlorethylene	+	/	/	-	-	-
Water (dest. water, river-, mains-, sea water)	/	+	+	+	+	+
Tartaric acid	/	/	10 %	+	+	+
Xylene	+	/	-	+	-	+
Zinc sulfate	•	/	+	+	+	/
Citric acid	+	/	10 %	+	+	10 %

The investigations, unless stated otherwise, were carried out at room temperature. Resistances can vary when two different materials come into contact with one another. We cannot therefore accept liability for this data.

Explanation of symbols

- + resistant to all concentrations
- % resistant against maximum % concentration
- C° resistant to maximum C°
- limited resistance
- not resistant
- / no information

General technical information

Chemical resistance Enclosure seals and accessories

Chemicals	Chloroprene	EPDM	NBR	Pocane	Polyurethane	PVC	Silicone
Acetone	+	+	-	+	-	-	•
Formic acid	+	+	-	10 %	/	< 50 %	•
Ammonia	+	+	+	10 %	/	•	+
Petrol	+	•	+	+	+	+	+
Benzene	-	-	-	+	+	-	-
Brake fluid	•	-	/	+	/	/	+
Butane	+	/	+	+	/	50 %	-
Butanol	+	/	-	+	/	•	-
Calcium chloride	/	/	/	10 %	/	+	/
Chloral benzene	-	-	-	-	-	-	-
Diesel oil	•	•	/	+	+	•	•
Vinegar	-	/	-	10 %	/	25 %	-
Formaldehyde	-	/	+	/	/	40 %	+
Freon 113	+	/	+	+	/	/	/
Fruit juice	+	+	/	+	+	+	+
Glycerine	+	+	+	+	+	+	+
Fuel oil	•	•	+	+	+	•	•
Hydraulic oil	+	/	/	+	/	/	•
Caustic potash solution	+	/	/	10 %	/	+	/
Potassium chloride	+	+	+	10 %	+	+	+
Potassium hydroxide	+	+	+	-	-	/	•
Linseed oil	+	+	+	+	+	+	•
Methane	+	/	•	+	/	/	+
Methylene chloride	-	/	-	-	-	-	-
Lactic acid	+	+	+	/	/	10 %	/
Mineral oils	•	•	+	+	+	+	+
Motor oils	•	•	+	+	+	/	+
Sodium carbonate	/	/	/	10 %	/	/	/
Sodium chloride	+	+	+	10 %	+	+	+
Sodium hydroxide	+	+	•	-	-	•	•
Soda lye	50 %	/	-	/	/	60 %	-
Nitric acid	•	+	•	10 %	-	30 %	-
Hydrochloric acid	+	+	< 65 % •	10 %	-	30 %	/
Lubricating oil	•	•	+	+	+	+	+
Carbon bisulphide	-	/	-	+	/	•	-
Sulphuric acid	50 %	/	25 %	10 %	/	80 %	25 %
Suds	+	/	+	10 %	•	•	+
Cleansing agent	+	•	/	+	•	/	+
Terpentine oil	-	/	+	+	/	+	-
Carbon tetrachloride	-	-	-	+	-	•	-
Toluene	-	-	-	•	-	-	-
Trichlorethylene	-	-	-	•	-	-	-
Water (dest. water, river-, mains-, sea water)	+	+	80 C°	+	+	40 C°	+
Tartaric acid	+	+	+	/	+	10 %	+
Xylene	-	-	-	•	-	-	-
Zinc sulfate	+	+	+	/	/	40 %	+
Citric acid	+	+	+	10 %	/	10 %	+

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EMV in der Gehäusetechnik

General

In electronic engineering, enclosures are required to fulfil two tasks:

- to protect equipment against external mechanical hazards and radio interference
- to protect the environment against mechanical and electrical hazards or radio interference caused by equipment

Electromagnetic compatibility (EMC) is becoming an increasingly important factor in the choice of enclosures due to sustained advances in the development of electronic components and increased density of components on circuit boards - this being connected with increased emission of electromagnetic radio interference into the environment.

Statutory regulations

EU directive (05.89/336/EWG), issued in May 1989 within the framework of the rationalisation of European standards, came into force in Germany in the EMC act (EMVG) on 9.11.1992.

This act applies to all devices which may cause radio interference or whose operation can be affected by this interference.

On 1.1.1996 the EMC Directive came into force Europe-wide - all new electrical and electronic devices traded within the EU must comply with these conditions.

As an outward sign of compliance with all EU-relevant laws (EMC act and other design principles) devices must display the CE conformity symbol.

Enclosure requirements

Enclosures in themselves are not covered by the EMC legislation as they are not by definition electrical or electronic devices.

Enclosures are however largely responsible for the strength of radiation emissions and/or interference (outgoing or incoming interference) of a device. The enclosure material is also a decisive factor in the screening effect, which is the combined reflection and absorption damping properties of an enclosure.

Plastics alone have no filtering effect in the case of radio interference. Screening characteristics can be achieved with additional expensive treatments (metal vaporisation or the application of a conductive coating).

Metal enclosures on the other hand offer a highly effective basic protection against radio interference without any further treatment. Large surface area contact of individual enclosure parts (cover, enclosure sections) is an important factor in this.

Where special safety requirements exist, EMC compatibility can be increased by

- conductive seals,
- contact-uninsulated ends and
- EMC-compliant cable connections.