

Concise know-how ***- Gasketing -***



Materials sold by EMKA differentiating between properties, areas of application and chemical resistance:

- EPDM
- NBR
- CR
- PVC
- TPE
- PUR foam
- Silicone

Specialities:

- Foam rubber
- Economy compounds
- UL certified rubber compounds
- Fire protection compound according to DIN EN 45545
- Hygiene compounds
- Finishing of profiles
- Frames and rings

(ethylene propylene diene monomer rubber)

Area of application of EPDM rubber compounds:

- The EPDM rubber compound is one of the most versatile compounds standing out due to its excellent outdoor behaviour. Even under aggressive outer conditions EPDM is very stable.
- The EPDM rubber compound retains its properties even at very big differences in temperatures. This is why it is used in various industrial applications worldwide: Automotive and construction industry as well as shipbuilding and switchboard cabinet making.

Properties:

- Temperature range: - 40° C to + 100° C
- With special grades a temperature of up to + 140° C can be achieved.
- Excellent resistance against ageing, weather conditions and ozone also at high temperatures.
- The sealing behaviour of EPDM in case of hot water and high-pressure steam is better than for dry heat.

Chemical resistance:

- Good resistance to many chemicals and non-hydrocarbon solvents.
- No resistance to oil.

Examples for rubber profiles of EPDM



(nitrile butadiene rubber)

Area of application of NBR rubber compounds:

- The NBR rubber compound is used due to its resistance to oil and greases.
- Nitrile rubber compounds are specifically made to withstand the contact with industrial oils, hydrocarbons, kerosene or high temperatures. The main application is the production of industry-strength gaskets and other components.

Properties:

- Temperature range: - 30° C to + 100° C. Also tolerates up to - 40° C.
- Using special grades (e. g. HNBR) a temperature of up to + 150° C can be achieved.
- Good mechanical properties such as tensile strength as well as flexibility.
- Limited ageing properties

Chemical resistance:

- Good resistance to inorganic chemical products except antioxidant agents and chlorine.
- Satisfactory resistance to aliphatic hydrocarbons.
- Limited resistance to aromatics.

Examples for rubber profiles of NBR



(Polychloroprene compounds)

Area of application of polychloroprene rubber compounds:

- CR or polychloroprene is also known under the brand name Neoprene®. This compound is known for its balanced combination of properties making it a multi-functional rubber par excellence.
- The rubber compound is used for making insulation joints and protective coatings. The coatings are used to protect against contact with oils and other chemicals. The CR compound is also used outdoors as it is resistant to variations in temperature, ozone and adverse weather conditions.
- This compound is used in industrial maintenance (oil), operational safety (fire), food industry and plant engineering.

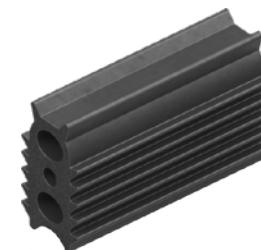
Properties:

- Temperature range: - 25° C to + 100° C
- Good mechanical and abrasion properties.
- Good temperature and ozone resistance.

Chemical resistance:

- Good resistance to mineral oils.
- Resistance to inorganic chemicals, except oxidising acids and halogens.
- Light resistance to aliphatic hydrocarbons.
- No resistance to most organic compounds, except alcohol.

Examples for rubber profiles of CR



(polyvinyl chloride)

Area of application of PVC rubber compounds:

- PVC is used in all fields of technology (window production, electrical and construction industry).
- Preferred areas of application: Bellows, boots, moulded parts for ventilation, covers as well as insulating material for cables and sockets.

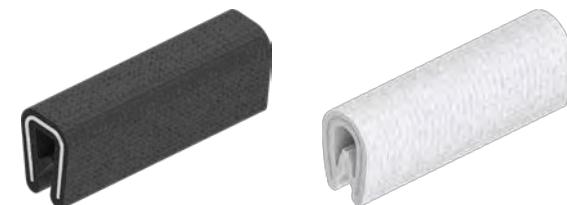
Properties:

- Temperature range: - 40° C to + 70° C
- Slow burning and self-extinguishing due to a high chlorine content.
- Weather-resistant
- Can be dyed in many RAL colours.

Chemical resistance:

- Good resistance to acids, bases, oils, ethanol and hydrocarbons.
- No resistance to acetone, chloroform, oxidising mineral acids and concentrated hydrochloric acid.

Examples for a profile of PVC



(thermoplastic elastomer)

Area of application of TPE rubber compounds:

- TPE is between the elastomer and plastics regarding its properties.
- It is used for firmly-bonded hard/soft connections and mostly serves the purpose of upgrading a product. At EMKA this is realised in the form of gaskets on plastic parts. For housings of plastic a TPE gasket is ejection-moulded for example. This is called a 2K part (2 components).

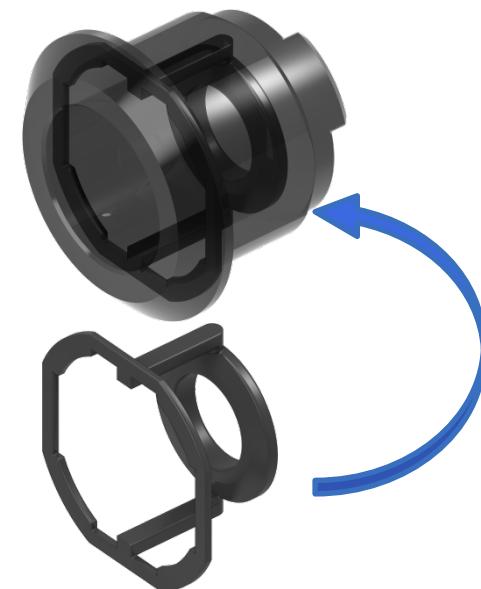
Properties:

- Temperature range: - 40° C to + 90° C
- As elastic as rubber
- Can be dyed in many RAL colours.

Chemical resistance:

- Good resistance to many chemicals
- No resistance to oil.

Application example TPE gasket



Area of application of PUR foam gaskets:

- PUR foam gaskets are formed by two chemicals that react when exposed to air. The chemicals are mixed during the application and react when exposed to air. Due to this simple handling the area of application is very wide and it is used on electrical switch cabinets, filters, packaging lids and in the automotive industry.

Properties:

- Temperature range: - 40° C to + 80° C (only if the optimum installation space specifications)
- Simple handling.
- Properties depend a lot on the installation space.

Chemical resistance:

- Good resistance to many chemicals
- No resistance to acids.

Application example PU foam gasketing



Area of application of silicone rubber compounds:

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- Almost stable properties in extreme environments enable steady operational properties across a wide range of temperatures; this is why silicone is so versatile like almost no other elastomer, for instance in the industrial applications of the automotive, electronic, lighting and food industry.

Properties:

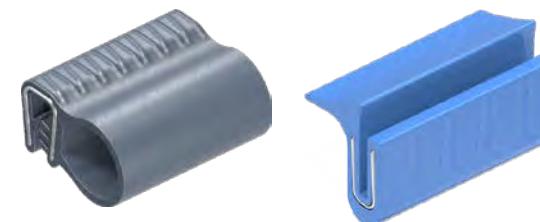
- Optimum temperature range for application: - 60° C to + 180° C (short-term up to - 230° C).
- Natural resistance to weather conditions, like ozone and UV radiation.
- Electrical insulator.
- The impact of thermal influences on the mechanical properties of the silicone is very low in a very wide temperature range.
- Not suitable for sealing in case of vapour pressure.

Chemical resistance:

- Diluted bases and acids have little impact on the silicone independent of the temperature.
- Highly concentrated bases and acids (especially strongly oxidising ones) as well as concentrated cleaning agents have a stronger effect on the silicone.
- Little swelling in polar liquids, such as alcohols and ketones.
- More swelling in nonpolar media, such as hydrocarbons, (mineral) oils and greases.

Rule of thumb: approx. 2 x as expensive as EPDM

Examples for rubber profiles of CR



What is foam rubber?

The basic material for foam rubber consists of EPDM or CR compounds. For the production the compounds are frothed up by a foaming agent and formed. Foam rubber is also called sponge rubber or cellular rubber.

Self-adhesive foam rubber at EMKA:

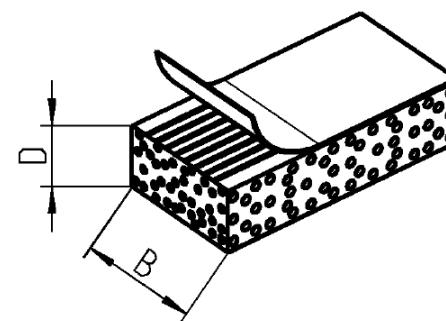
The foam rubber is available in various dimensions (width and thickness). On the bottom side a high-quality, double-face adhesive tape is applied for quick and simple mounting. Depending on the strip thickness the foam rubbers are coiled on reels in different lengths.

Note:

The adhesive tape does not have the same resistance properties as the foam rubber.

Standard lengths:

Profile thickness	Reel length
3 – 7 mm	10 m
8 – 10 mm	5 m
From 11 mm	1 m



Examples for rubber profiles of CR

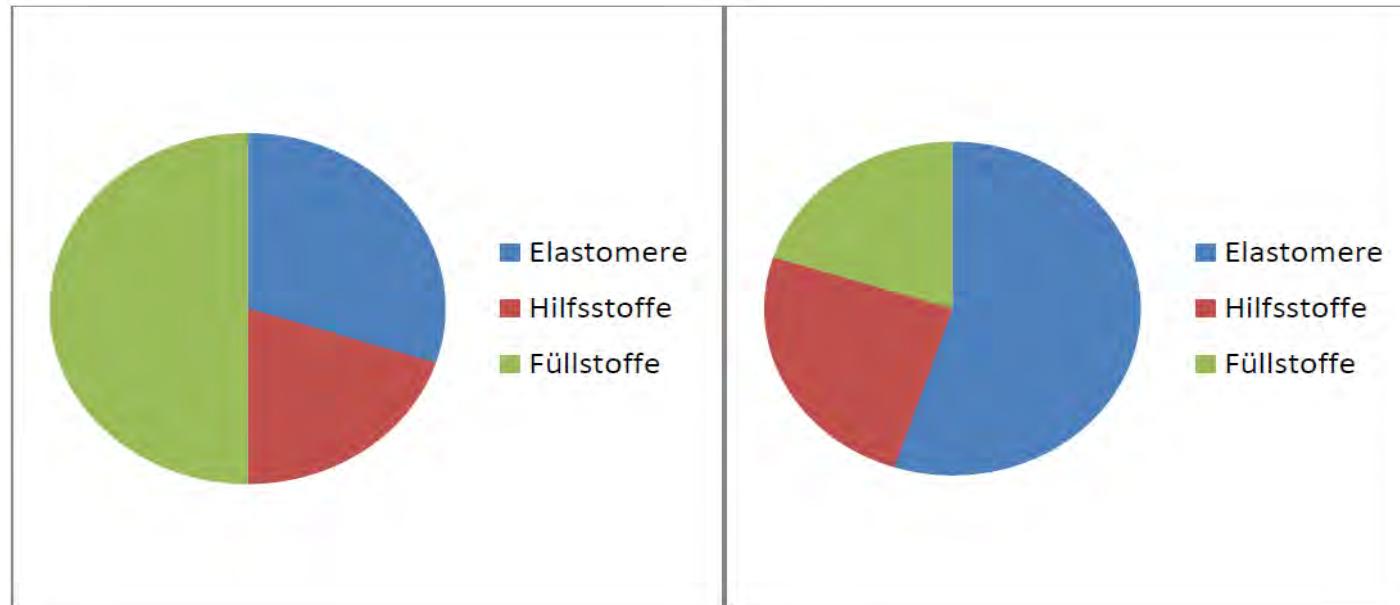


Properties of Economy rubber compounds:

- Economy rubber compounds have a higher portion of filler material and are made of chemically reprocessed used materials (reclaimed material).
- The cost saving in comparison to certified standard gaskets.
- Manufacturing process the same as for standard compounds.

Economy compound EPDM

Standard compound EPDM



Available are (status 01/2016):

- 4 EPDM profiles
- 2 PVC profiles

Economy compound PVC

Standard compound PVC

Ingredients:	Regained material *	Typified goods (of new materials)
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* Product gained by chemical reprocessing of used materials

What is UL?

UL is an independent company operating worldwide in the field of safety science. The UL mark stands for the compliance of the American standards for electrical and electronic products. No other mark of conformity has a comparable significance. The UL mark is used as proof that a representative number of a products was tested by UL.

What products come into consideration for the UL mark?

- Products linked with electrical and electronic products.
- Products that passed the tests carried out in UL-certified test labs according to the UL specifications.
- The components have to be certified according to American standards (with the relevant documentation).

Does the UL mark replace the CE mark?

- The UL mark does not replace the compulsory CE mark (European conformity). But the UL program data test can be used for supporting the statements of the CE mark.
- Components complying with the UL standard and bearing the UL mark stand for highest quality and functionality.
- UL is a significant quality feature in North America.

How long is the UL mark valid?

- The certification remains valid for an indefinite period as long as the product remains unmodified.
- Manufacturing sites have to pass unannounced audits by UL.

Tests that the rubber compounds with UL characteristics have to pass:

- Inflammability
- Short-term physical properties.
- Long-term physical properties.
- And many more.

Example for UL mark:

- Inflammability



Fire tests and their classification:

The most common fire test according to UL in the field of gasketing is UL 94. This differentiates according to horizontal (HB, HB40 and HB75) and vertical (V0, V1 and V2) reaction to fire.

Protection classes

Direction	Class	Reaction to fire
Horizontal	HB	self-extinguishing
	HB40	Material thickness ≥ 3 mm, burn-off behaviour < 40 mm/min
	HB75	Material thickness < 3 mm, burn-off behaviour < 75 mm/min
Vertical	V0	No flaming droplets allowed, Extinguishing of the flame < 10 s
	V1	No flaming droplets allowed, Afterglowing < 60 s
	V2	Flaming droplets allowed, extinguishing within 30 s

Dimensions of a UL compliant test object



What is DIN EN 45545-2

The DIN EN 45545-2 is a European standard for the rail industry specifying the requirements regarding the reaction to fire of materials and components.

What is tested?

- Reaction to fire
- Smoke gas generation
- Toxicity



Protection classes:

Utilisation category	Class of construction			
	N Standard	A Automatic	D Double deck	S Sleeper
Above ground vehicles	HL1	HL1	HL1	HL2
Tunnel max. 5 km	HL2	HL2	HL2	HL2
Tunnel > 5 km	HL2	HL2	HL2	HL3
Tunnel, evacuation from the side not possible	HL3	HL3	HL3	HL3

- EMKA uses EPDM fire protection compounds to meet the protection classes HL1 and HL2.
- The protection class HL3 is only achieved with soft rubber.

Application area:

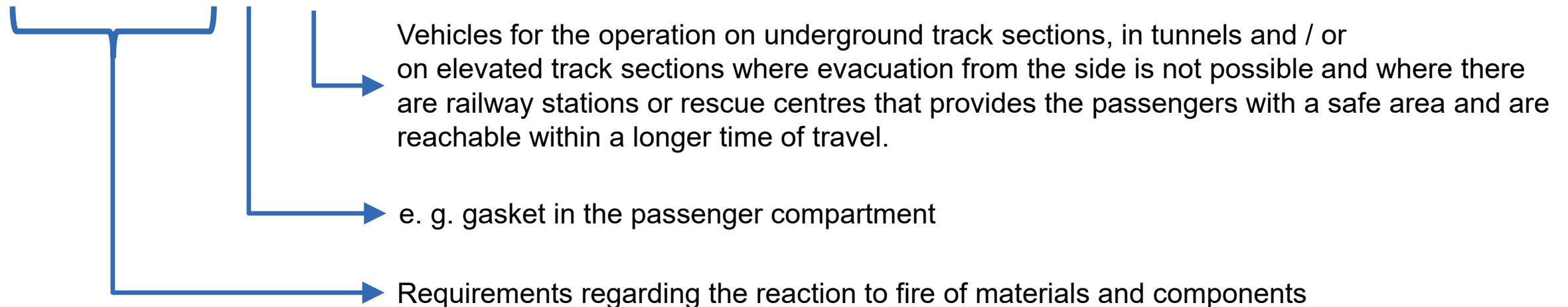
Depending on the application area (e. g. passenger compartment, outdoor area, ceilings etc.) the components have to meet different requirements. For every requirement type test methods, test conditions and requirements regarding reaction to fire of materials and components are determined depending on the hazard level. The components are categories and graded according to numbers.

- Relevant component nos. at EMKA are mostly R22 and R23.



Example of the standard name:

- DIN EN 45545-2 R22 HL2



Hygiene compounds according to VDI 6022 (EPDM):

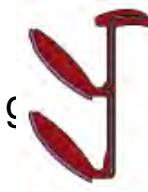
- Compounds tested and certified according to VDI 6022 contain an anti-bacterial substance.
- The guideline 6022 of VDI (Verein Deutscher Ingenieure - Association of German Engineers) of the specialist division Civil Engineering and Building Services is state-of-the-art concerning the hygiene requirements for air handling units.
- EPDM compounds according to VDI 6022 contain additives preventing the spreading of bacteria, spores, fungi, mould and viruses in addition to the normal properties.

Hygiene compounds for the food industry (silicone):

- Compounds used in the food industry have to be certified, e. g. according to FDA or by EHEDG (European Hygienic Engineering & Design Group).
- These compounds have to be resistant to sterilising agents, vapour and concentrated cleaning agents.
- The area of application depends on the possibilities of cleaning, sterilising, and the wear and tear of the compound.

Flock coating:

- The application of flock coating ensures a scratch-free and smooth gliding of e. g. window c



- EPDM Shore A:70^{±5}
- eingelegter Metallträger
- Beflockung

Painting:

- By applying a lubricant varnish (siliconising), you achieve a reduction in wear and tear and noise



- EPDM Shore A:60^{±5}
- Moosgummi
- eingelegter Stahlfederkern
- Silikonbeschichtung

Coating:

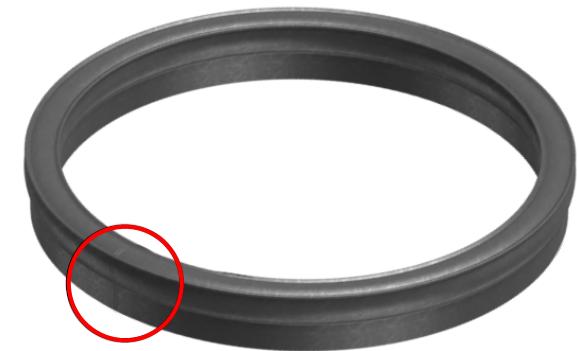
- By coating a gasket, e. g. by an EMC film (electromagnetic compatibility) the gasket gains electrically conducting properties.



Pre-fabricated frames and rings increase the tightness on the cabinets, specially in the corners and facilitate the mounting. There are three types of joining at the disposal:

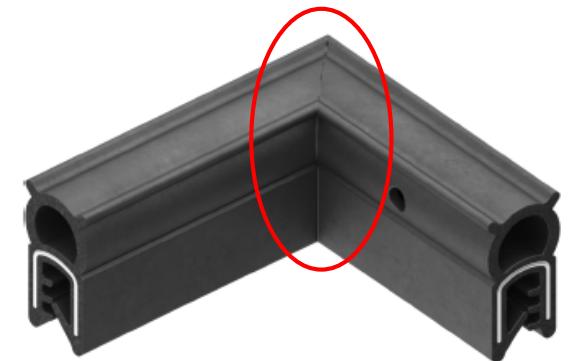
Glueing:

- Glueing is the most simple process. In this process the profile ends are glued with a special glue.



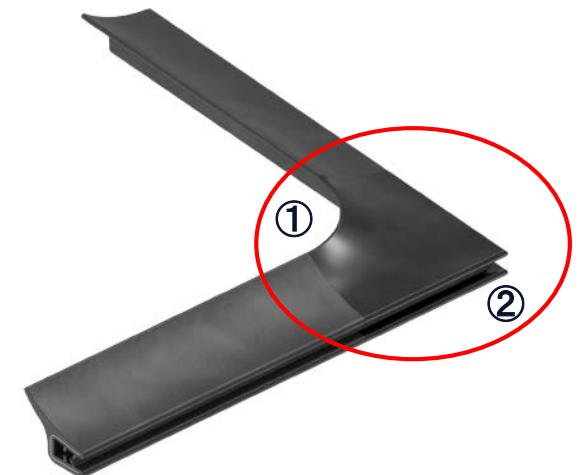
Film vulcanising:

- In case of film vulcanising a foil of the same material is put between the profile ends. This results in a stable and lasting joint.



Injection Moulding:

- Injection Moulding stands for moulded corners and end gating. In this process special corners for a frame can be injection moulded, for instance a lip profile in the corners can be formed in a round shape. While the clamping area ② of the profile can be executed in a right angle.



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