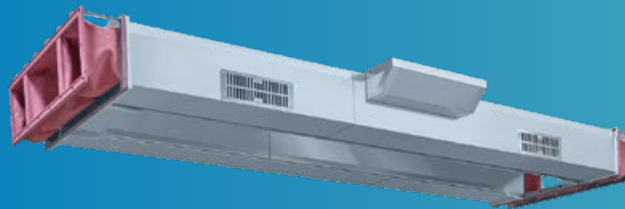
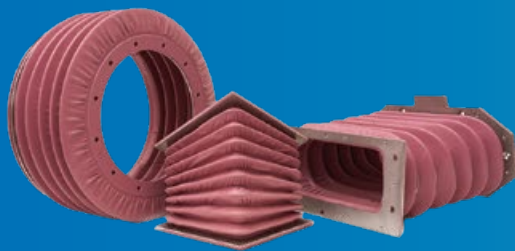


PRODUCT PORTFOLIO RAILWAY TECHNOLOGY

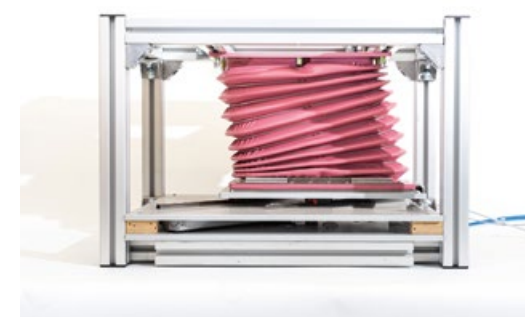
Traction Motor Boots, Fabric Expansion Joints and Air Duct Systems



Dynamic. Different. Dedicated.

PRODUCT PORTFOLIO RAILWAY TECHNOLOGY

Our product portfolio for the rail vehicle industry includes flexible components such as traction motor boots and expansion joints. We also manufacture air ducts, which in combination with MöllerWerke fabric expansion joints are used as a complete air duct system in rail vehicles. All our products are designed according to customer requirements and therefore adapt perfectly to the individual profile of the rail vehicle. MöllerWerke also offers individualized assembly systems for a wide variety of installation situations.



ABOUT MÖLLERWERKE

MöllerWerke GmbH is a long-time development partner of the railway industry and specialized in designing and manufacturing customized products for rail vehicles.





Our traction motor boots, expansion joints and air duct systems are designed in accordance with strict international fire protection standards such as EN 45545-2 and are suitable for all types of rail vehicles.

Furthermore, MöllerWerke offers its customers the opportunity to subject the ordered products to additional tests such as dynamic fatigue tests in its in-house laboratory. Our test options include, among others, leak testing, temperature cycle and vibration tests. It is also possible to perform tests on the ordered products according to customer's requirements.

For all types of vehicles, from subways to high-speed trains. Developed for millions of miles. Traction motor boots, fabric expansion joints and air duct systems – **Made by MöllerWerke**

TRACTION MOTOR BOOTS

HIGHLIGHTS

-  Optimal movement performance even at extreme deflection
-  Individual product geometry, tailored to the movement profile of the vehicle
-  Specially developed, robust silicone-aramid fabric
-  Certified according to international fire safety standards

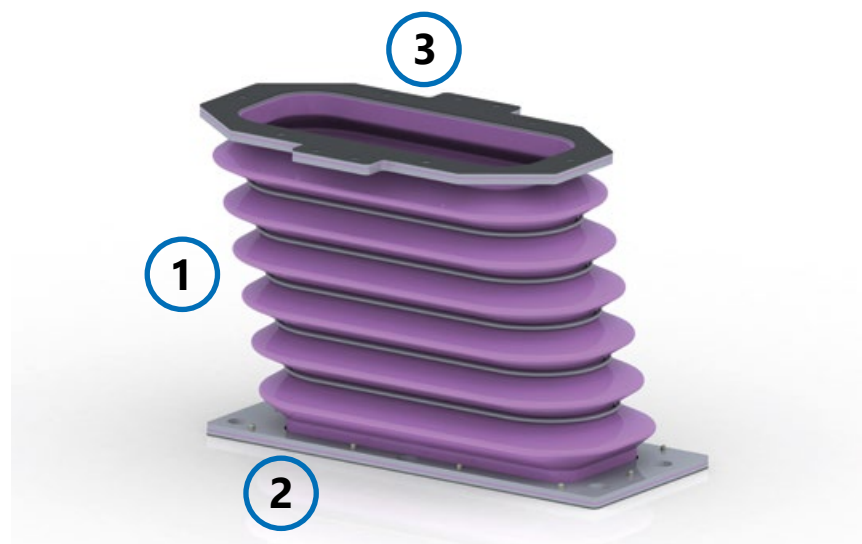


PRODUCT DESCRIPTION

Traction motor boots are customized products that adapt to the individual movement profile of the particular vehicle. The connections are designed according to the installation situation on the wagon body and the bogie. Moreover, the connections (flanges) of the bellows have circumferential sealing surfaces. Vulcanized flanges attached to the bellows ensure a self-sealing connection. The design of the traction motor boots is customized and developed based on the assembly dimensions and movement requirements.

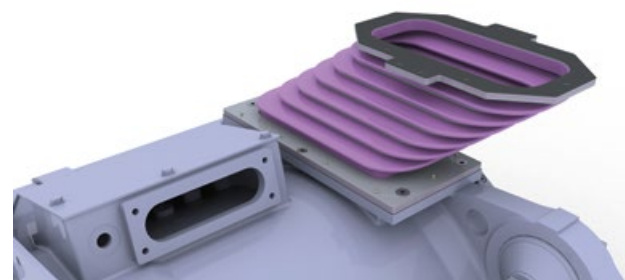
Furthermore, the required airflow and pressure loss are taken into account during the design phase of the product. The defined geometries are vulcanized on specially designed tools and tested as required. Apart from that the traction motor boots are stabilized with wire rings if necessary depending on the operating requirements.

Design and mounting systems

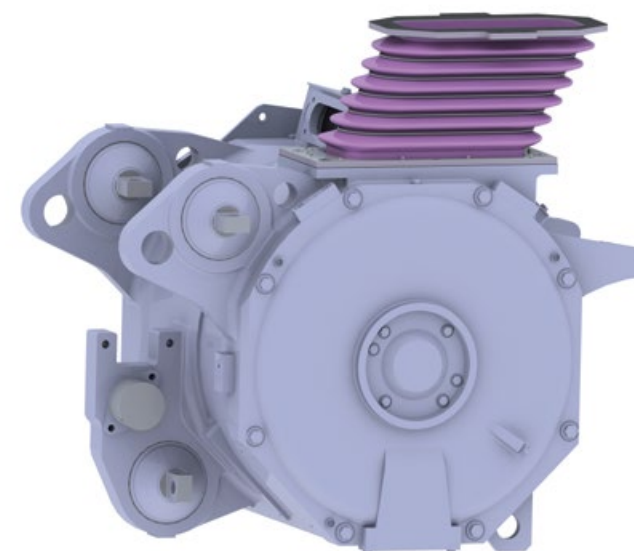


- ① Specific fold geometry, tailored to the movement profile
- ② Individual mounting and installation systems
- ③ Ultra durable and field-proven material

- Specific mounting systems for various installation requirements available
- Individual design according to customer requirements
- Specially developed, robust silicone aramid fabric
- Fire protection certification for ventilation bellows in accordance with national and international standards



Norms and parameters



The maximum stipulated movement of a bellows for a new project is simulated with testing facilities. The long-term durability of the traction motor boot can be tested before the start of serial production by calculation in testing facilities with a pre-defined movement matrix over a defined period of time. Thereby a test of the wear behaviour with various installation lengths and deformation sequences can be performed as well.

Fire protection classifications






- EN 45545-2
- NFPA 130
- Special fire protection requirements

Resistance

- Cold resistance -50°C
- Cold crack temperature -60°C
- Max. thermal stability +180°C
- Abrasion-resistant
- Airtight and waterproof

FABRIC EXPANSION JOINTS

HIGHLIGHTS

-  Customized geometry
-  Different installation systems
-  Certified according to international fire safety standards
-  Possibility of incorporating additional insulating materials to avoid thermal bridges
-  Perfect complement to MöllerWerke air ducts



PRODUCT DESCRIPTION

Fabric expansion joints are high performance, flexible connecting elements for movement and tolerance compensation in HVAC systems. MöllerWerke fabric expansion joints are used in all types of rail vehicles.

Extreme installation situations can be implemented with asymmetric geometries. The connection to the respective interface is established with self-sealing vulcanized flanges. Optionally, the flanges can be made of aluminium or stainless steel.

Installation systems

Screw Connection

- Common and standard connection
- Standardized joining element
- Robust and durable solution
- Expandable with bushes for defined tightening range (protection of the component, securing of the seal)



Quick-Release System

- System for faster assembly of the article (mounting and dismounting)
- No special tools needed
- Well-known and self-explanatory connection system
- Adjustable clamping area
- Optimized accessibility for maintenance



Plug-In System

- Individually adapted mounting system
- Used for hard-to-reach or one-sided mounting areas
- Predefined tightening torque (individually defined for application)
- Both form and force fit in one system



Norms and parameters

Fire protection classifications

- EN 45545-2
- NFPA 130
- Special fire protection requirements

Resistance






- Low temperature stability -50 °C
- Cold break temperature -60 °C
- Max. temperature +180 °C
- Resistant to abrasion and microorganisms
- Waterproof
- Can be used indoors and outdoors

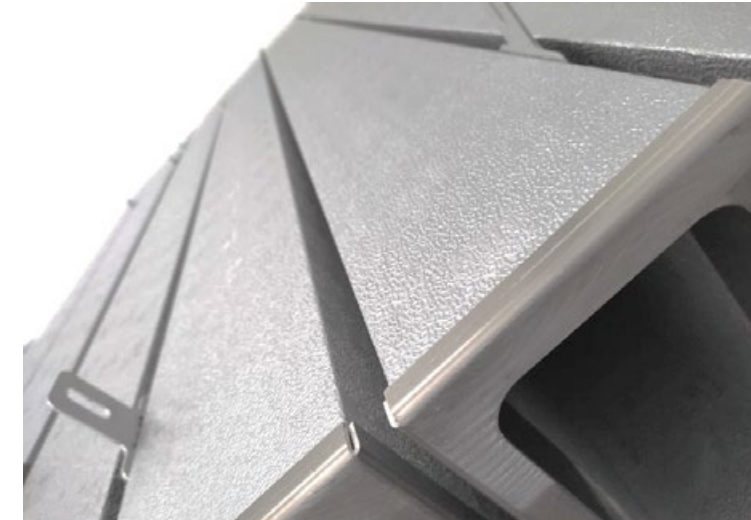
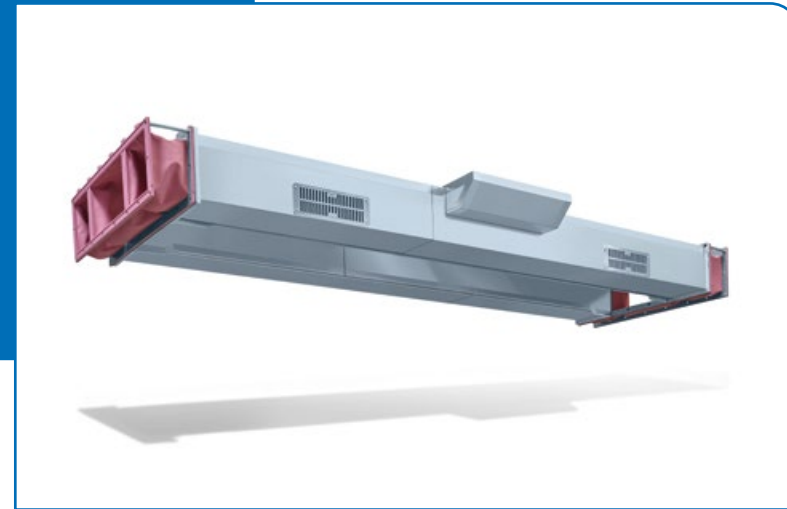


Additional insulating materials can be incorporated in the fabric expansion joints to avoid cold bridges. The materials utilized for fabric expansion joints comply with the fire protection according to railway standards.

AIR DUCT SYSTEMS

HIGHLIGHTS

-  Individually manufactured lightweight air duct systems
-  Adaptable to any vehicle geometry
-  Energy saving insulating material
-  Possibility to expand the air duct system with MöllerWerke fabric expansion joints
-  Certified according to international fire safety standards



PRODUCT DESCRIPTION

Lightweight HVAC air duct systems provide uniform air circulation in air-conditioned passenger interiors. MöllerWerke offers complete air duct systems, which are manufactured individually according to customer requirements.

The 12 mm thick sandwich material, which has an insulating core, is made of PU foam laminated with aluminium foil on both sides. The air ducts made of lightweight fire-resistant fiber composite panels, on the other hand, are available in thicknesses from 4 mm to 20 mm. Both materials meet the fire protection standard according to EN 45545-2 and are also classified to R1/HL3.

Apart from that the air duct systems have a high adaptability to temperature fluctuations, as these have been developed for operating temperatures from -40 °C to +80 °C.

Material characteristics for sandwich material



- ① Air duct made of sandwich material
- ② Flexible molded part made of VMQ-silicone aramid fabric
- ③ Individual metal flange according to the connection geometry

Material characteristics

- 12 mm sandwich material consisting of aluminium foil and PU foam
- Density of the sandwich: 60 kg/m³
- Thermal conductivity: λ 0,022 W / (mK)

Fire protection classes

- EN 45545-2
- R1 / HL3 classification

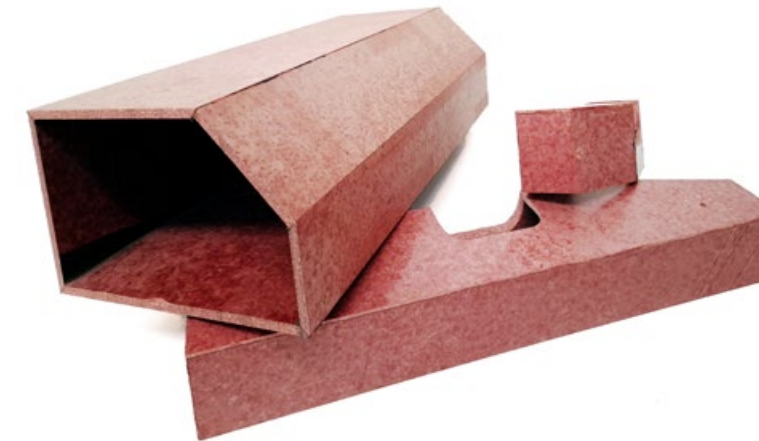
Resistance

- Resistance to cold -40 °C
- Cold-breaking temperature -50 °C
- Max. temperature +80 °C
- Resistant to microorganisms

Further standards

- DIN 6701 / EN 17460

Material characteristics for fiber composite panels



Material characteristics

- Density: 210 kg/m³
- Thermal conductivity: 0,042 W/(mK)
- Panel thickness from 4 mm to 20 mm

Fire protection classes

- EN 45545-2
- R1 / HL3 classification

Resistance

- Resistance to cold -40 °C
- Cold-breaking temperature -50 °C
- Max. temperature +80 °C
- Resistant to microorganisms

Further standards

- DIN 6701 / EN 17460

The air ducts are tested in the company's own test laboratory in accordance to EN 61373 after consultation with the customer. In addition, further tests can be organized according to international standards as well as customer-specific requirements.



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