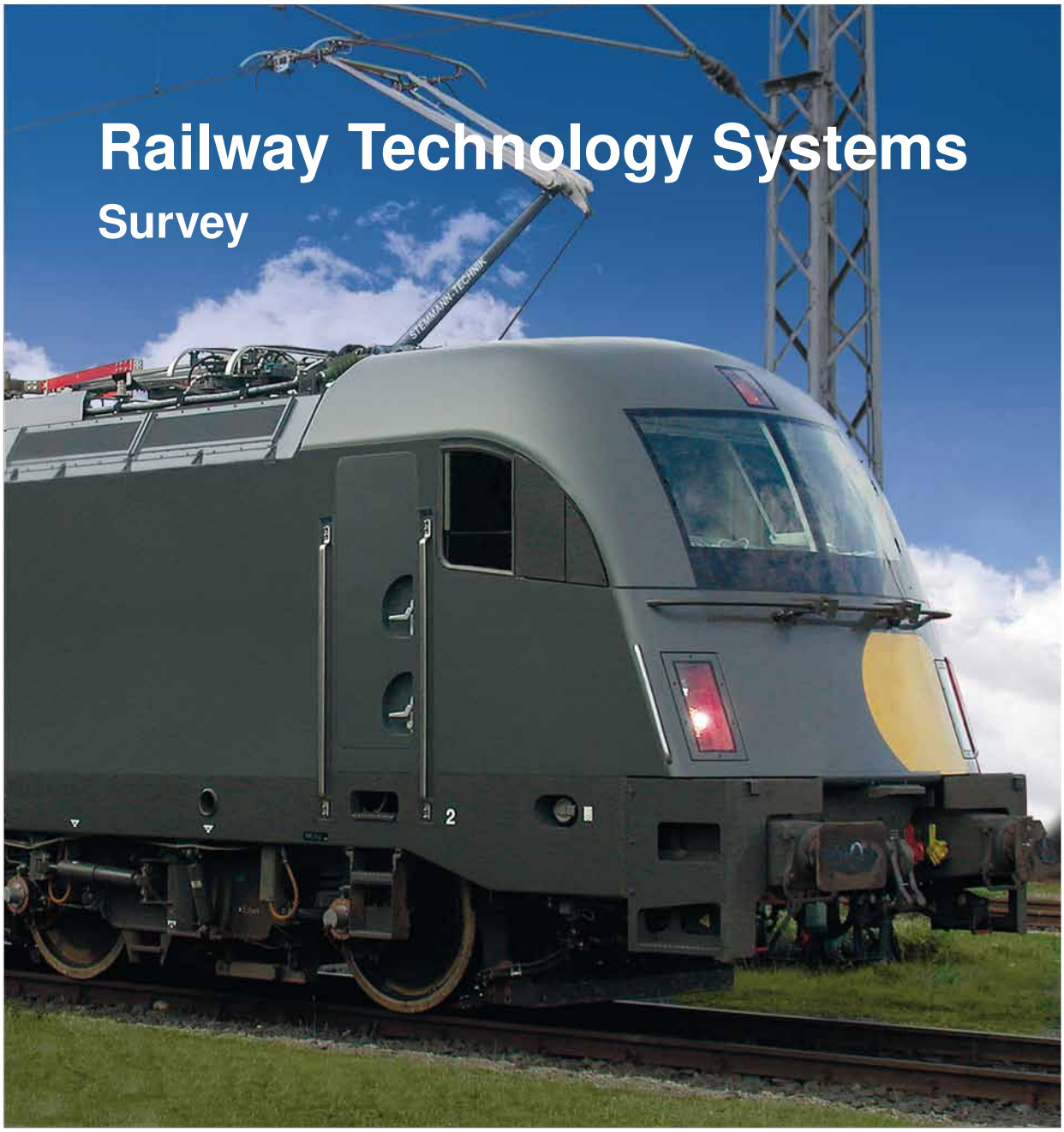
STEMMANN-TECHNIK

Fandstan Electric Group

Railway Technology Systems

Survey



STEMMANN-PRODUCTS

QUALITY MADE IN GERMANY

Index

STEMMANN PRODUCTS

QUALITY MADE IN GERMANY

From planning to production, all under one roof

Corporate headquarters and manufacturing facility in Schüttorf, Germany

STEMMANN-TECHNIK is one of the world's leading manufacturers of energy- and data transfer components and systems in industrial and transport technology.

With skills from more than 100 years of engineering and practical research, we manufacture high-quality products required all over the world, and create special, innovative, customised solutions.

A fundamental key to success is our understanding of high quality in all areas of the company, ranging from customer-oriented advice to long-term service.

The quality of the STEMMANN-TECHNIK products and services is aimed at fulfilling our customers' requests, needs and expectations.

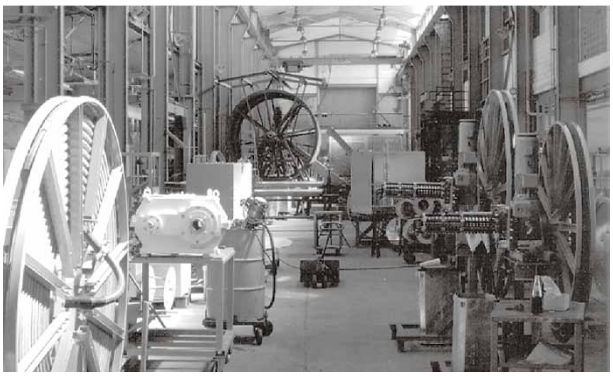
Every project and application is designed down to the finest detail, taking into account performance-related and economic aspects.

We guarantee high quality by upholding international standards and guidelines.

The quality management system is implemented based on standardised methods in conjunction with flexible structures for modelling and documenting all production and business processes.

STEMMANN-TECHNIK
DIN EN ISO 9001:2008

Global Player – Worldwide Presence



Our company was founded in Luxembourg in 1912 by engineer August Stemmann. At that time, we were already involved with producing power supplies for cranes at steel and smelting works as well as for other mobile machines.
Slip ring assemblies for rotating machines and pantograph systems for railway vehicles were added later on.

We have been part of the Fandstan Electric Group since 1984 – a private holding company with subsidiaries in Great Britain, the Netherlands, Poland, France, China, India, Taiwan, the USA and Australia.
The Fandstan Group's main business fields include the development, production, start-up and sale of innovative solutions for transmitting energy, data and fluids for rotating/mobile machines.

STEMMANN-TECHNIK RAILWAY PRODUCTS, QUALITY MADE IN GERMANY

Our factory in Schüttorf covers everything related to the production of roof-mounted pantographs, right from the research and development of innovative details to the production of all the components and their assembly into the end product. This impressive manufacturing depth and the in-house manufacturing competence that has been consolidated over the years give us flexibility in every respect.

FLEXIBILITY AND EFFICIENCY

- **Efficient production procedures**
- **Short delivery times**
- **Fast response to after-sales and service requests**
- **development of special solutions and new technologies**

Owing to the fact that we manufacture almost all structural and engineering parts, we ensure the high quality and reliability of our products. We purposefully apply the extensive know-how of our technicians and engineers in the development of new technologies, work on modified variants and new pantograph series. Our intention is to make our products technically even better, to optimize their efficiency and to extend their service life, all in line with the ever-growing customer requirements.

The focus of the design work is on robust construction elements with light weight, low moving mass, uniform contact force and good contact quality, even at very high speeds.

Third Rail Shoegears

We are specialised in customised innovative solutions in the field of third rail shoegears for suburban rail, metros and rapid transit rail.

Thanks to its large cross-section, the third rail can transmit high current densities. It is always used when an overhead wire for roof-mounted pantographs cannot or should not be installed.

The maximum vehicle speed with third rail shoegears is approximately 120 km/h. Deployment and retraction can take place manually or by remote control, i.e. through mechanical or pneumatic systems.
The contact to the conductor rail can be made from the top or the bottom or even from the side.

THIRD RAIL SHOEGEAR SYSTEMS

- **Top-Running-System**
- **Bottom-Running-System**
- **Side-Running-System**

Our third rail shoegears are in everyday use in local rail networks of the big cities regions and metropolitan areas.

STEMMANN-TECHNIK develops a perfect system for every vehicle type, for every vehicle model and railway network. We realise individual customizations for any application professionally and in time.

Systems for Third Rail Shoegears

Pneumatic systems are powered by compressed air. The deployment and retraction to the conductor rail and attachment of the current collector is controlled or initiated centrally from the driver's cabin.

Inductive or mechanical proximity switches are used for detecting the shoe position.

Pneumatic systems can also be actuated with insulated hand levers using the emergency function.

Pneumatic system

Mechanical systems are operated manually. The deployment and retraction of the current collector to the rail conductor is done individually – with the help of an insulated hand lever.

Mechanical system

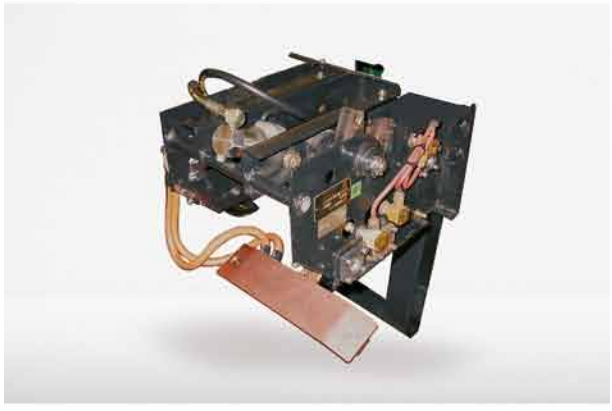
Special solutions

If maintenance vehicles or multi-system vehicles are to be supplied with energy via the third rail, there is often a requirement for new ideas and design solutions.

Our team of experts jointly develops solutions with a high degree of innovation. We have extensive project experience with the most varied vehicle types and requirements, even with limited space.

Special solution, Metro Vienna

EXAMPLES OF SPECIAL SOLUTIONS
Current collector designs in which the swinging link can be swung out of the minimum clearance outline
Current collector with electric motor drive for a hybrid tram car
Current collector with hydraulic actuation
Current collector with integrated collector shoe cover
Special solutions for maintenance vehicles



Special solution, Metro Amsterdam

Components for Third Rail Shoegears

Supplementary to our third rail shoegear, we also supply optional accessories and safety components that are required, depending on the specification.

SYSTEM COMPONENTS

- **Short-circuit terminals**
- **Fuse box**
- **Connection terminals**
- **Hand lever**
- **Protective covers**

Pneumatic **short-circuit terminals** are safety devices that are operated from the driver's cabin (remote-controlled). They can generate a short-circuit between current-carrying rails and the running rail, as a result of which the respective rail section gets cut off from the electric supply.

The short-circuit terminal is activated when there is an immediate danger, for example, if there are people on the tracks. At the same time, it serves as an additional safety device if passengers have to be evacuated, or after the operator has cut off the electric supply. By using the short-circuit terminal, the running rail can be prevented from being switched on again too early or unintentionally.

Short-circuit terminal

Fuse boxes for third rail shoegears serve to protect the electrical system of the vehicles. Selected fuses ensure safe vehicle operation in the overload range or in case of a short-circuit. We carry out the calculations and design of the fuses and supply fuse boxes in plastic or stainless steel versions, depending on the customer specifications and space conditions.

Fuse box

Components for Third Rail Shoegears

The **connection terminal** joins the cable connection of the current collector within the circuit of the vehicle. It is designed according to customer requirements and can also accommodate connections for a fuse box or short circuiter. The insulated connection to the bogie frame is provided by means of standard insulators. Covering hoods prevent direct contact with electrified parts and increase the safety of the maintenance personnel.

Connection terminal

The connection terminal can also be used as a **Stinger terminal**. In this case, a Stinger pin is fitted so that it can be connected to the counter-contact in the depot. Stinger terminals serve for providing energy to parked vehicles in the maintenance area, e.g. for charging the battery or other maintenance work that is to be carried out at the vehicle voltage.

Stinger pin

Mechanical systems are operated by means of a hand lever, while pneumatic systems are actuated by remote control. If there is a fault in the pneumatic system, these current collectors can also be deployed or retracted with hand levers. We manufacture **insulated hand levers** in close co-operation with the vehicle manufacturer. The dimensions and actuation functions are adapted to the conditions in the depot and to the route. Furthermore, we also have solutions for actuation from the vehicle (e.g. through the passenger door).

Insulated hand levers

Protective hoods for third rail shoegears are used by preference in maintenance and depot deployments. They serve as protection from electrified parts and have a pure safety function.
For example a protective hood is put on in the vehicle depot on the current collector to cover the live parts and thus protect maintenance or cleaning personnel from touching the parts accidentally.

Collecting shoe covers and other protective covers can be supplied for all third rail shoegear systems.

Protective hoods

Roof-Mounted Pantograph for Suburban Rail

To meet the specifications and wishes of our customers, we manufacture powerful suburban rail roof-mounted pantographs according to a new, efficiency-oriented design concept - fast, well priced and low maintenance. That is also a reason why the Fb product family is today among the most frequently used pantographs in suburban rail.

The rating design for DC networks can be changed on a project-specific basis and provides options for individual modification according to the prevailing usage and operation conditions.

Regarding the aspect of cost efficiency, the focus with our Fb pantographs is on lower procurement costs, higher availability in daily use and the fast supply of spare parts.

We have early recognised the contradictory trend of low procurement and maintenance costs with more stringent requirements and fundamentally revised the concept of the single-arm pantograph. The technical development target – optimised combination of stability, low total weight and small movable masses – gives our new generation of single-arm pantographs solid advantages.

Constructional Core Components of the Fb Pantographs

The Fb pantograph is supported on four **pin insulators** made of cast resin. For fastening on the base frame of the pantograph, or on the roof of the wagon, the insulators have correspondingly moulded inserted nuts on both sides.

The **base frame** consists of welded rectangular tubes and supports the suspension braces for the lower arm struts, the drive, etc.

Depending on the requirement, **the drive unit** is designed as electrical spindle drive or air raising actuator. A pre-tensioned steel spring integrated in the base frame is used to raise the pantograph.

The **lower arm** of the pantograph is made of steel tubes. It contains the bearing for the main axis and the complete bearing support for the middle joint. The bearings are mounted in an insulated way and are maintenance-free. For protecting the bearings, the current is led through bridging strands.

The **upper arm** is an aluminium welded structure in closed frame construction. Diagonal bars of stainless steel provide bracing of the upper arm and hence a reduction in the lateral deflection.

The **collector head** is supported in a way that it can be rotated, and is steered with the upper guide rod. The connection between the **contact strips** and the contract strip support is achieved by clamping, soldering or gluing.

OPTIONAL FITTINGS OF THE Fb-PANTOGRAPHS
Mechanical or compressed gas-operated Automatic Dropping Device (ADD)
Inductive proximity switch for manual actuation
Latching in lowest position
Lowest position indicator
Mating connector sets in IP65 or IP67
Foot pump for manual raising
Vibration damper in the arm construction
Damper for lowering
Additional sensors for reporting the highest or lowest position

COLLECTOR HEAD OPTIONS
Leaf spring collector head
Spring pot collector head for two contact strips
Spring pot collector head for four contact strips
Torsion spring

Fb 700 / Fb 800

Features of the Fb 700 and Fb 800 series

The **Fb 700** series has been deliberately designed with a small number of individual components and guarantees a low weight and very low maintenance costs.
The **Fb 800** unifies all the advantages of the Fb 700 and combines them with a high-strength upper arm of steel and a collector head that is movable in the direction of travel with a maintenance-free spring design.

Speed	120 km/h
Contact force	60 – 120 N (adjustable)
Drive supply	Electrical spindle drive Pneumatical drive
Overhead wire rated voltage	up to 1500 V
Rated current	up to 2700 A

Roof-Mounted Pantographs for Heavy Rail

Our DSA roof-mounted pantographs have been developed for high performance in heavy rail systems (Heavy Rail Vehicles). Their design concept, with high-strength, lightweight and innovative engineering has proven itself worldwide under the most difficult conditions.

DSA pantographs can be designed for AC and DC overhead wire networks and reach operating speeds of up to 380 km/h.

The basic type of the DSA product family is based on a modular structure concept. The core components and modules like the base frame, raising drive, the lower and upper arm as well as the collector head and the contact strip have been optimised in detail with due consideration for the performance aspects for heavy rail.

The high-strength lightweight materials are characteristic features of our DSA series for higher speeds. They minimise the movable mass of the collector head and optimise the contact quality.

Constructional Core Components of DSA Roof-Mounted Pantographs

The **base frame** is a lightweight welded construction. The raising drive inside is designed as a bellow cylinder with a wire rope. It acts on the lower arm via a wire rope and has a mechanical stopper point. The newest generation of the DSA roof-mounted pantographs is constructed with a riveted base frame.

The **lower arm** is a steel tube construction for speeds up to 200 km/h or an aluminium cast construction for with high strength speeds from 200 km/h.
The double-sealed ball bearings are lubricated for life; their insulated mounting prevents current flow through the ball bearing.

The **upper arm** is an aluminium lightweight part. Its elasticity effects an outstanding contact quality and can absorb high deformation energies. The surface is powder-coated.

The **collector head** is available in different widths. The special spring principle reduces the impact stress of the contact strips and the mechanical wear at the fastening elements. Wear parts can be replaced easily.
The elastic bearing of the entire collector head allows balancing mechanical or thermally effected tolerances on the contact strip. Collector head failure monitoring can be maintained by an ADD system.

OPTIONAL FITTINGS OF THE DSA BASE TYPES
Automatic lowering system (ADD = Automatic Dropping Device)
Raising height stop
Raising height switch
Different collector head geometries

APPLICATION- AND NETWORK-SPECIFIC MATCHING OF THE DSA BASE TYPES
Design for low and medium speeds in DC networks with high currents
Design for medium and higher speeds in AC-networks
Design for high currents and speeds in AC/DC networks

DESCRIPTION / COMPONENTS OF THE DSA-BASE TYPES
1) Contact strip
2) Collector head
3) Upper arm and collector head guide
4) Lower arm
5) Lower guide rod
6) Air bellow
7) Base frame
8) Insulators

Type Overview of the DSA Roof-Mounted Pantographs

DSA 150

Features of the DSA 150 series

Single-arm pantograph for tough daily use.
The pantographs are available in modular construction with collector head widths of 1450 mm, 1600 mm and 1950 mm for use in different countries.

Speed	160 km/h
Operating system	AC / DC
Rated currents	project-specific
Static contact force	70 − 120 N (adjustable)

DSA 200

Features of the DSA 200 series

Single-arm pantographs for general daily use.
The pantographs are available in modular construction for use in different countries.

Speed	200 km/h
Operating system	AC / DC
Rated currents	project-specific
Mass	approx. 130 kg (without insulators)

DSA 250

Features of the DSA 250 series

Because of the low mass of the collector head, the DSA 250 has good dynamic properties. As a result, it is very well suited not just for single traction and double traction, but also for multi-traction.

Speed	250 km/h
Operating system	AC / DC
Rated currents	project-specific
Static contact force	60 − 140 N (adjustable)
Mass	approx. 125 kg (without insulators)

Type Overview of the DSA Roof-Mounted Pantographs

DSA 350

Features of the DSA 350 series

The optimised joint kinematics and the good dynamics, owing to the small masses, allow problem-free use of the pantograph in overhead wire networks.

Speed	280 km/h
Operating system	AC / DC
Rated currents	project-specific
Static contact force	70 – 120 N (adjustable)
Mass	approx. 115 kg (without insulators)

DSA 380

Features of the DSA 380 series

Single-arm pantograph with small collector head masses and excellent aerodynamics for use on modern high-speed routes. They are perfectly suited for single traction, double traction or multi-traction. They can be optionally fitted with an automatic lowering device and a mechanical raising height stop.

Speed	380 km/h
Operating system	AC / DC
Rated currents	project-specific
Static contact force	70 – 120 N (adjustable)
Mass	approx. 109 kg (excluding insulators)

Open Loop System for DSA Roof-Mounted Pantographs

In order for the electrical energy to be transferred from the overhead wire to the rail vehicle without any interruption, the pantograph must touch the overhead wire with the same contact force at all speeds. Too little contact force can lead to interruptions; too much would result in increased friction – and hence increased wear.

The electro-pneumatic controller of our Open Loop System ensures an uniform contact force of the pantograph on the overhead wire at all speeds. All the pantograph types of our DSA series can be subsequently optimised by this system.

SYSTEM ADVANTAGES

- Increasing the speed on older tracks
- Improved contact quality
- Less arcing
- Less wear
- Reduction of the noise level
- Reduced measurement and optimisation cost

Electro-pneumatic controller

ADD − Automatic Dropping Device

Damaged pantographs can have seriously effects on the operation of the wagon and result in economic losses for the route operation. For example, if multiple-unit trains run with damaged contact strips over several kilometres, this will normally cause damages to the over head wires. This is why we have developed an automatic emergency lowering device (Automatic Dropping Device).

The system ensures that pantographs with damaged contact strips or collector heads are lowered automatically. In this manner, consequential damage to the overhead wire is reduced to a minimum.

A system-side sequential circuit also causes the lowering of the following pantographs so that they are also actively protected from damage. Overall, the repair and consequential damage costs on multiple-unit trains and overhead wires can be reduced significantly by this system.

As an alternative to the mechanical quick-dropping by spring unlocking, we have developed the gas pressure ADD system for LRV pantographs in suburban rail systems. The quick dropping with electric drive is based on a compressed gas unit.

The system essentially consists of two components, the actuation unit and the pneumatic cylinder.

Apart from the very short lowering time, the system has the advantage of being able to release the pantograph and deploy it at the overhead wire once again, if there has not been any serious damage to the pantograph or the overhead wire. The vehicle can then be driven to the next station or to the depot on its own power – towing costs are avoided.

Our ADD systems have increased the availability of the wagons and routes – especially after faults from damage to the pantograph.

Overhead Wire De-Icing System (Non-Icing System)

Pantograph with lubricating device

Icing of overhead wires in railway systems is a recurring problem in the winter months, since ice formation on the overhead wires impedes the transfer of electricity over the contact strips. The resulting damage can involve enormous costs.

To ensure troublefree operation even at extreme temperatures below zero and to prevent icing, we offer a highly effective system through which the overhead wires are coated with an antifrost in advance. The operating equipment costs for this preventive non icing system are very low.

The system consists of two components – the main system that is installed inside the railway coach, and an additional roof-mounted pantograph, whose collector head is replaced by a lubricating device with a felt roll.

SYSTEM ADVANTAGES

- Operational shutdowns of passenger services (overhead wire, wagons) are significantly reduced
- Damage to the electronics of the wagons owing to contact interruptions are avoided
- The carbon brush wear is reduced
- Owing to the secured contact of the contact strips with the overhead wire, the wagon is provided electrical energy continuously

Main system

Stinger Systems

Stinger systems serve to supply energy to parked vehicles in the maintenance area, e.g. for charging the battery or other maintenance work, which has to be carried out while the vehicle is electrified. Furthermore, with our Stinger systems, it is possible to move the vehicles within the depot or maintenance facility from a control panel.

STINGER SYSTEM KOMPONENTEN

- **Third rail shoegear**
- **Plug – contact spike connection**
- **Connecting cable**
- **Conductor line system**
- **Operating panel**

The connection terminals of our third rail shoegears can be used as Stinger terminals by installing a contact spike.

According to customer requirements, we manufacture and assemble complete systems, including conductor lines, plug and cable connections, controller devices and contact spikes on the railway wagon.

frost® Ground Contacts

In terms of the function principle, a ground contact is the same as a bridging circuit, consisting of the ground contact housing, the grounding cable, brush holder with contact brush and the slip assembly.

They are normally fitted on the axle box bearing housing of the pivoted bogie (axial system). Clear current paths are generated by the insulated mounting of the ground contacts.

The grounding cable carries the reverse current from the coach body pivoted bogie via a sliding contact to the wheel set shaft, from where it can flow into the rail via the wheel.
The critical point in the reverse current flow – the roller bearing or the wheel set roller bearing – is bypassed in a controlled manner.

frost® ground contacts are generally individualised solutions and as such, matched exactly to the application, the axle box bearing design, space conditions, electrical parameters and technical customer specifications.

Since the 1930s, we have successfully been involved in the planning, design and manufacture of high-quality ground contacts. Our systems are in use all over the world in the most varied vehicles.

APPLICATIONS

Heavy rail
ICE traction units, passenger coaches, trailer vehicles etc.

Suburban rail
Regional trains, metro, trams etc.

Special solutions
Low-floor vehicles, high-speed trains and special vehicles

Construction and Earthing Systems

The mechanical structure of our frost® ground contacts fulfils the applicable national and international standards and directives. The material pairings are continually optimized.

CONSTRUCTION
Robust mechanical construction
Resistant to high impact stress
MATERIAL PAIRING
Low contact resistance (to the order of milliohms)
Low wear values (1-2 mm per 100.000 km)
High operational performance
High, tested short-circuit values
SEALING FOR WHEEL SET BEARING
No entry of grease in the earth contact
No carbon dust entry in the roller bearing

frost® ground contact, type „Görlitz VIII“

In the construction or in the direction of working of the carbon brushes, a distinction is made between axial and radial operation contact systems.

Axial action frost® ground contacts are used for inner-bearing and outer bearing wheel sets. They steer the reverse current flow via the end face of the axis into the wheel set shaft, so that it flows via the wheels into the rail.
Axial frost® ground contact systems are fastened to the bearing housing or directly to the wheel, which requires a special construction with a suitable bearing and torque support.

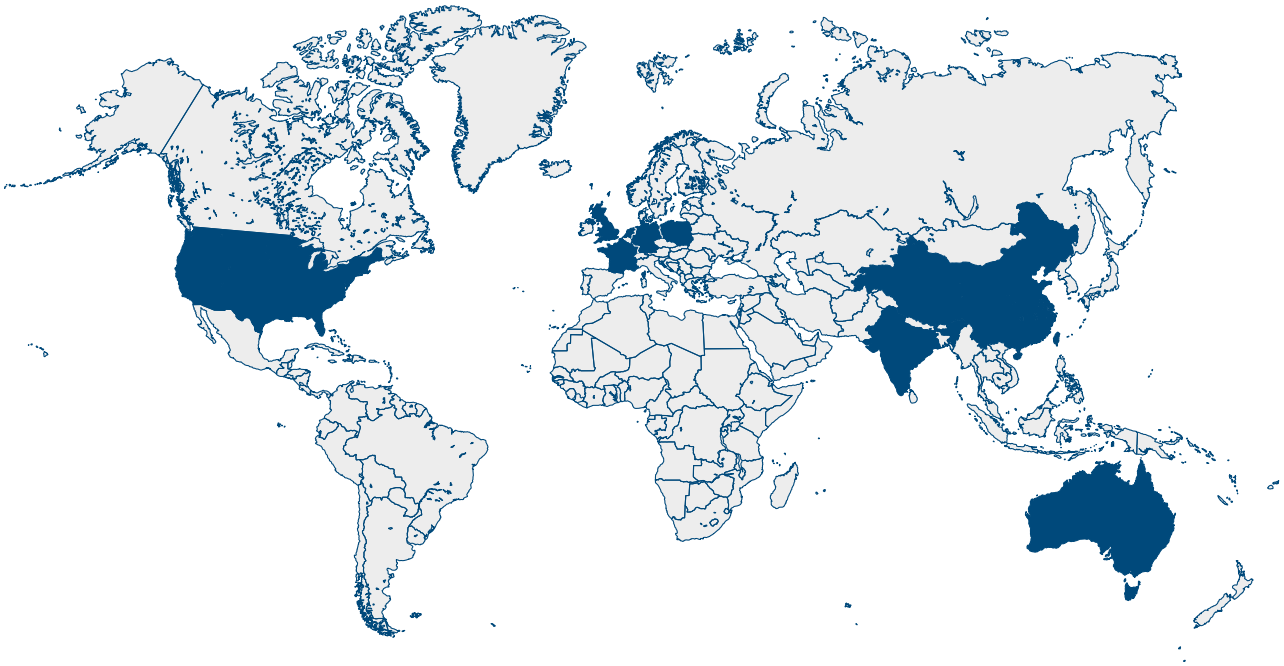
ADVANTAGES OF AXIAL SYSTEMS
Good accessibility and easy maintenance of the ground contacts
Simple encapsulation by the ground contact housing
Good protection from ambient influences
Low wear owing to smaller dimensions of the contact materials (contact diameter)

Radial action frost® ground contacts are used when the clearance outline is limited, or when pivoted bogie special constructions make this unavoidable, or when customer specification requires it. They feed the reverse current directly into the wheel set shaft, from where it can flow via the wheels into the rail.
If the space conditions allow, we recommend radial ground contact systems as a fully encapsulated version.

In the area of standard applications, the traditional round-brush constructions have been replaced by **multi-brush constructions**. The reasons for this are the higher possible current transmission and the somewhat simpler construction of the contacts.
We further developed the successful principle of the multi-brush contacts and derived the successful **frost® pressure system** from it.

Service

LOCATIONS OF THE FANDSTAN ELECTRIC GROUP

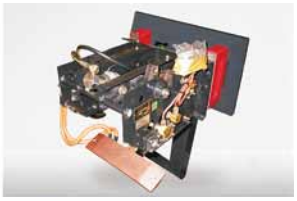


Customer satisfaction is our top priority; it is the key component to joint, long-term success.

We offer extensive services specified to customer requirements, incorporating 100 years' experience and our technical skills in design, development, production and practical application.
We attend to the needs of our customers and clients, think in a integrated, solution-oriented manner, act flexibly and offer rapid assistance within Germany and abroad.

As a manufacturer, we will provide you with original spare parts "Made in Germany" throughout our products' entire service life.

DSA pantograph revision



Third rail shoegear revision

OUR SERVICES

- Carrying out preventive maintenance work including general inspection
- Function test and inspection of the components including an acceptance log and warranty
- Revision, overhaul and modernisation

CERTIFICATES

- **DIN EN 15085-2**
  Welding of rail vehicles and rail vehicle parts
- **DIN 6701-2**
  Bonding of rail vehicles and rail vehicle parts
- **International Railway Industry Standard (IRIS)**
- **DIN EN ISO 9001:2008**

QUALITY MADE IN GERMANY

INDUSTRIAL PRODUCTS · INDUSTRIEPRODUKTE

CABLE FESTOON SYSTEMS
LEITUNGSWAGEN-SYSTEME

CABLE REELS
LEITUNGSTROMMELN

SLIP RING ASSEMBLIES
SCHLEIFRINGÜBERTRAGER

CONDUCTOR LINES
SCHLEIFLEITUNGEN

RAILWAY PRODUCTS · BAHNPRODUKTE

ROOF-MOUNTED PANTOGRAPHS
DACHSTROMABNEHMER

THIRD RAIL SHOEGEARS
DRITTE-SCHIENE-STROMABNEHMER

frost® GROUND CONTACTS
frost® ERDUNGSKONTAKTE

STINGER SYSTEMS
STINGER-SYSTEME

STEMMANN-TECHNIK GmbH
Fandstan Electric Group

Niedersachsenstr. 2
48465 Schüttorf · Germany
PO-Box · Postfach : 1460
Phone : + 49 5923 81 - 0
Fax : + 49 5923 81 - 100
sales@stemmann.de

STG · Railway Technology Systems - ENG · 08/2012 · 890243 · LD