

TracFeed®

CATENARY SYSTEMS

English



Products and Services

BRINGING PEOPLE TO THEIR DESTINATIONS SAFELY AND ON TIME – WITH HIGH-PERFORMANCE, STATE OF THE ART AND SUSTAINABLE OVERHEAD CONTACT SYSTEMS

This is a stated requirement that is fundamental to the innovative solutions provided by Rail Power Systems. Moreover, we aspire to provide you with a smooth transition to the sustainable mobility technology of the future, using our technical expertise and proven concept solutions as a basis. The name Rail Power Systems stands for high-performance railway infrastructure projects that bring ecological considerations into harmony with economic benefits. Energy efficiency, investment security, easy and fast maintenance, the ZERO HARM safety initiative and social responsibility are very important to us. And there are further benefits: a long product service life, reliable quality, German manufacturing standards and high depth of integration.

Rail Power Systems provides experienced experts from a host of specialist fields with consulting and solution concepts that are modularly structured and systematically planned out. This is in addition to tried and test product platforms that meet customer requirements through high quality standards and economical solutions.

Catenary systems – for a world undergoing change

Despite the global diversity of rail electrification systems, and as a response to increasing mobility bottlenecks, Rail Power Systems has set itself the challenge of tackling this market.

Now more than ever, we are adapting our product line and service portfolio to provide the greatest customer benefits and system profitability. Detailed statements concerning service life and life-cycle costs (LLC) of the products are just as important in this regard as information on the reliability, availability, maintenance and safety (RAMS) of the systems.

YESTERDAY, TODAY AND TOMORROW – THE BEST PERFORMANCE IN RAILWAY INFRASTRUCTURE



Renowned partner

This brochure focusses on products, systems and services for catenary systems for mass transit and mainline traffic. It also provides an overview of other products and services available from Rail Power Systems.

CATENARY ENGINEERING

As one of the world's leading providers of rail electrification and power supply systems, we strategically position ourselves in all key markets. In this regard, our decades of experience in electrification projects and the use of innovative technologies – with a constant awareness of the individual needs of our customers – are manifest in every track section. Thus we guarantee individual solutions with the highest level of efficiency.

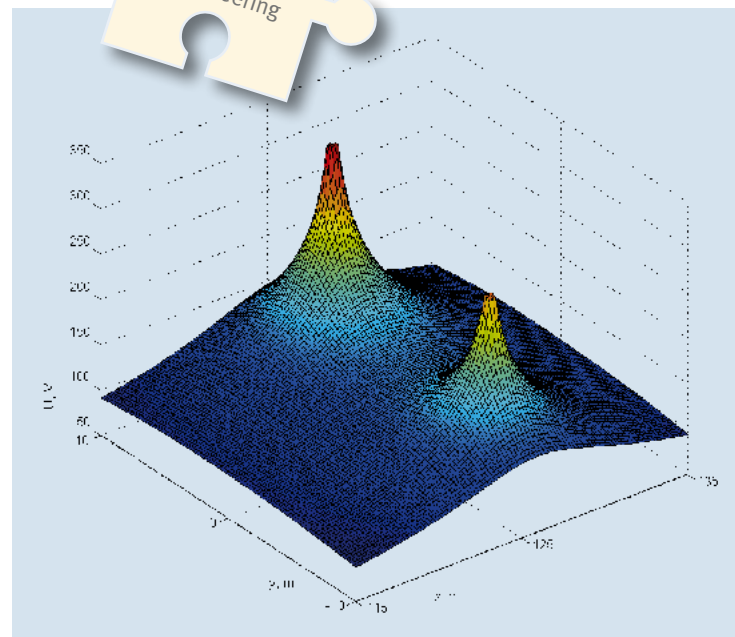
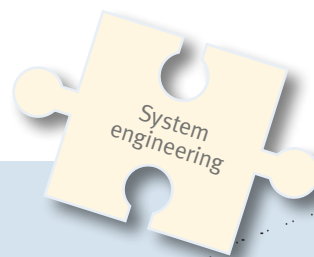
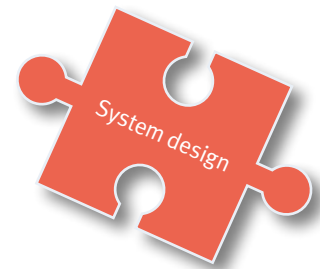
OUR ENGINEERING SERVICES INCLUDE:

System design

As a competent specialist for electrical railway infrastructure, system design plays a key role in providing infrastructure users with reliable, and above all safe, mobility. Our decades of experience gained in the world's most critical markets, added to our use of state-of-the-art technology, are the outstanding characteristics of our system design. With first-class expertise and the latest computer applications and simulations systems, our experienced, specialist engineers analyse all aspects that all aspects that are relevant to the system.

The system design department acts as an internal and external service provider for:

- Design and optimisation of traction power supply systems
- Simulation programs for AC and DC rail systems
 - for system design and planning
 - on behalf of the client
 - for sales and implementation planning
- EMC analyses
- Measurements and tests
- Feasibility studies
- Life-cycle costs/RAMS
- Test centre for the notified body for interoperability (Eisenbahn-Cert)
- TSI-compliant draft planning
- Calculation of dynamic behaviour of the pantograph/overhead contact line with CATMOS® and OSSCAT



Earth surface potential in the event of a short-circuit due to flashover of an insulator on pole



Planning competence

Thanks to its scale and diversified organisational makeup, our planning team offers consulting services with excellent availability and proximity throughout Germany. Our expertise and experience are a guarantor not only for comprehensive solutions, but also for specialised technical solutions with absolute schedule reliability and cost certainty.

Rail Power Systems is a pre-qualified supplier of Deutsche Bahn AG. We are able to provide recognised expert structural engineering inspectors and acceptance specialists for catenary systems.



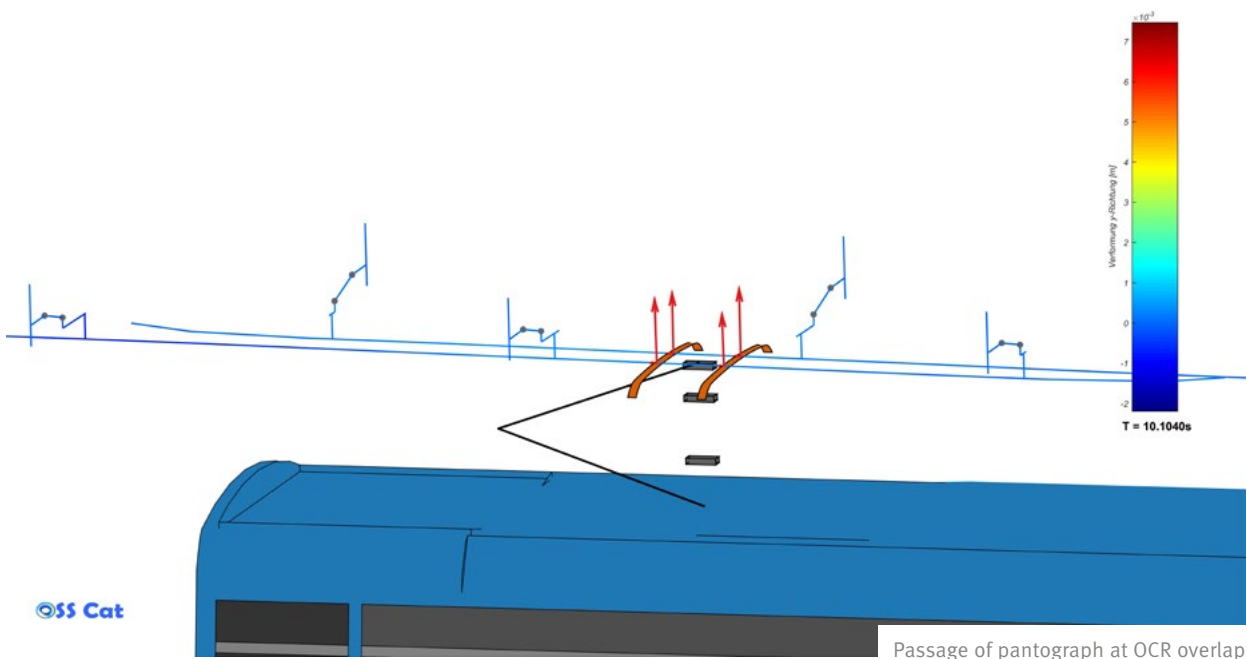
Portfolio

- Catenary planning
 - in all speed segments
 - in all voltage levels
 - for new construction, conversion and maintenance
- Overhead conductor rail
- Statics
- OSE planning
- Project management in Germany and abroad
- Design

Several of our planning references:

- Leipzig City Tunnel, Germany
- Cross-City Link Zurich, Switzerland
- Rail connection Berlin Airport BBI, Germany
- Berlin Ostkreuz conversion, Germany
- Katzenberg Tunnel, Germany
- Electrification – Erzingen-Schaffhausen, Germany
- ABS* Munich – Ingolstadt, Germany
- VDE 8.1.1 – VP Ebersfeld, Germany
- Hamburg Port Authority, Rethelbridge, Germany
- ABS Berlin – Frankfurt/Oder (EP), Germany

* ABS: Upgraded track section





System engineering – catenary

Catenaries are the counter-contact to the current collector. They must satisfy electrical as well as mechanical requirements. Fundamental mechanical and electrical parameters are considered in the development of catenary systems and their components. Technical authorisation for catenary systems rests with the system engineering organisation. At the same time, catenary components are developed, designed and further optimised. This includes assurance of availability through profiling of delivery sources and testing of components.

System Engineering handles the certification of catenaries in accordance with TSI (Technical Specification for Interoperability), the approvals of new catenary systems at EBA (German Federal Railway Authority), and the release at Deutsche Bahn (DB). The DB catenaries and the Ebs-Zeichnungswerk (Set of Standard Drawings for German Railways) are maintained and further developed by System Engineering in collaboration with DB. The structural requirements for construction are also coordinated for the German market.

Competence

- Development of catenary systems
- Development of components
- Availability of material
- Project execution in Germany and abroad
- System development for planning purposes
- Consultancy



Platforms of Rail Power Systems Germany

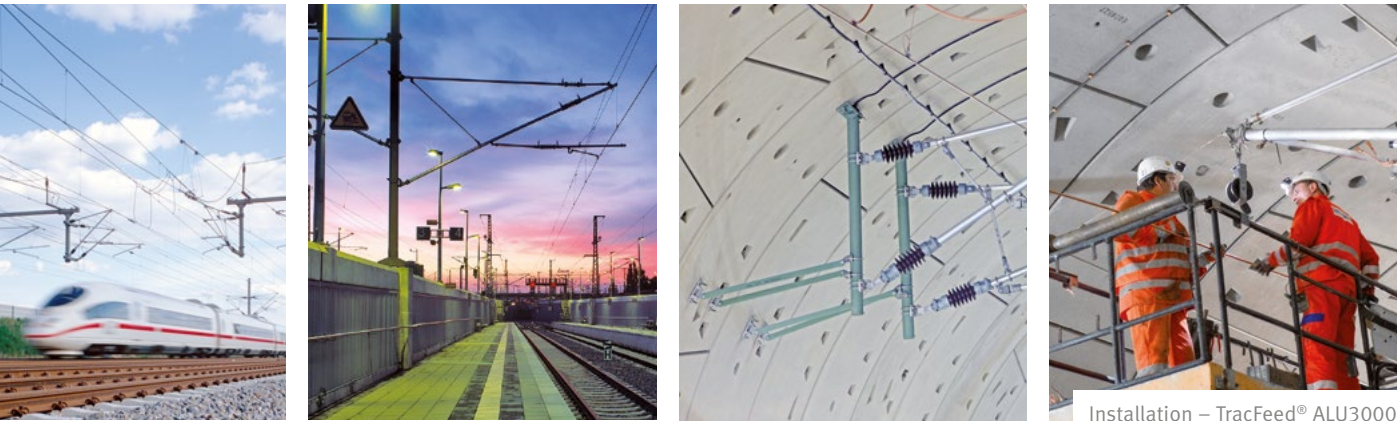
Systems	Speed	Current
TracFeed® ALU3000	> 330 km/h	AC
TracFeed® ALU2000	< 230 km/h	AC/DC
TracFeed® ALU1000	< 120 km/h	DC
TracFeed® GFK1000	< 120 km/h	DC
TracFeed® OSS	< 200 km/h	AC/DC
TracFeed® STS 3 rd rail	< 100 km/h	DC

WHY CHOOSE A SYSTEM FROM RAIL POWER SYSTEMS?

Rail Power Systems designs, develops, tests and manufactures components. Our project execution is captivated by:

- High quality standards and precision in all components
- High flexibility, based on customer requirements
- High life expectancy of the components
- Low maintenance requirements
- Qualified personnel
- In-house manufacturing in Germany





Installation – TracFeed® ALU3000

THE HIGH-SPEED CATENARY SYSTEM – TracFeed® ALU3000

The TracFeed® ALU3000 catenary system has proven itself over many years of implementation on high-speed lines. It is optimised for speeds far in excess of 330 km/h, in accordance with the latest international state of technology.

TracFeed® ALU3000 satisfies all requirements relating to high current-carrying capacity, lower elasticity and safer current collection, thanks to the large proportion of standardised components. It is notable for its high reliability and minimal maintenance requirements.

Many railway operators have opted for TracFeed® ALU3000 aluminium catenary systems, including:

Long-time references:

- Deutsche Bahn for the lines Nürnberg–Ingolstadt, Würzburg–Hannover or Hannover–Berlin
- Jernbaneverket for Norway's Oslo Airport from Gardermoen to Oslo
- The Turkish TCDD for the connection Ankara–Konya
- China Railway for the connection Wuhan–Guangzhou
- The Spanish Renfe for the connection Madrid–Seville



Messenger wire
swivel clamp



Cantilever



Contact wire clamp



Steady arm

CATENARY SYSTEMS – TracFeed® ALU2000

The TracFeed® ALU2000 catenary system has proven itself over many years of implementation on long-distance rail routes. Due to its standardised parts and components, which for the most part are made of aluminium, it is considered to be reliable, low-maintenance and maintenance-friendly.

The catenary is particularly notable for its optimisation of design, with the greatest possible distance between masts, in addition to safe, uninterrupted current collection.

The TracFeed® ALU2000 has been designed for freight lines and passenger traffic with speeds of more than 200 km/h. The catenary easily spans single-track and multi-track straight or curved sections, extending to the smallest possible passable radii. Railway stations with any type of point arrangement as well as lowered overhead contact lines under bridges are not obstructions, and neither are modern concrete tunnels, masonry tunnels or tunnels hewn out of rock.

A host of railway operators have opted for aluminium catenary systems from Rail Power Systems.

Long-time references:

- Deutsche Bahn in numerous projects
- The Malaysian KTMB in Rawang-Ipoh and Ipoh-Padang
- The American operator RT Denver
- The Chinese Railways in Harbin-Dalian
- The Hungarian GySEV
- The Finnish VR



Installation – TracFeed® ALU2000





Installation Stuttgart Zuffenhausen – TracFeed® ALU 1000

MASS TRANSIT CATENARIES – TracFeed® ALU1000 AND TracFeed® GFK1000

The TracFeed® ALU1000 and TracFeed® GFK1000 catenary systems have proven themselves over many years of implementation on commuter systems. Thanks to their aluminium or GFRP (Glass Fibre Reinforced Plastic) standardised parts and components, they are considered to be low-maintenance and reliable. The connections of these components are effortlessly integrated into the urban, suburban and rural environment of the catenary system.

These catenaries have been designed for DC-operated tramways, urban and suburban rail systems with nominal voltages between 600 V and 1500 V. They satisfy the requirements specified in the European standards for catenary systems. Their area of implementation extends from slow routes in pedestrian zones to suburban routes with speeds of up to 120 km/h.

The simple structure of the overhead contact line catenary does not obstruct the view of the sky. It merges seamlessly with the respective cityscape. In spite of its high degree of standardisation, the catenary also allows for custom solutions.

Many major cities and railway operators decided in favour of TracFeed® ALU1000 and GFK1000 catenary systems from Rail Power Systems.



Installation – TracFeed® GFK1000

Long-term references:

- Eskisehir and Adana, Turkey
- Baltimore, USA
- Sao Paulo, Brazil
- Karlsruhe, Germany
- The Rheinisch-Westfälisches Braunkohlenwerk mining operations, Germany
- Freiburg, Germany
- Dortmund, Germany
- Stuttgart, Germany
- Oslo, Kolsåsbanen & Ekebergbanen, Norway

OVERHEAD CONDUCTOR RAIL – TracFeed® OSS

Overhead conductor rails that offer significantly lower installation heights in confined spaces are used when the installation of conventional overhead contact lines is not feasible due to the limited available space – for example for new construction and the conversion of older tunnel structures. At travel speeds of up to 200 km/h, overhead conductor rails are today's alternative to existing tunnel catenaries. The system also offers an exceptional degree of safety and reliability.

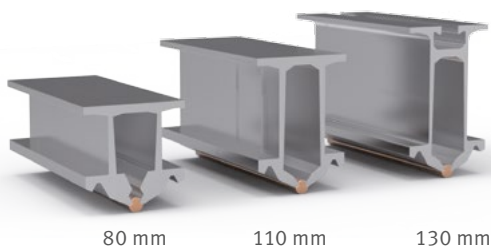
The TracFeed® OSS overhead conductor rail can also be installed as a swivel-mounted version in depots or maintenance halls to keep the area above the roof of the vehicles clear.

The minimal installation height of the Rail Power Systems overhead conductor rail TracFeed® OSS is 300 mm at 15 kV. Depending on the intended operating speed and the selected profile, the distance between supports can be extended to 14 m. The following applies in this regard: the higher the speed, the shorter the distance between supports.

Rail Power Systems offers different profiles capable of meeting the requirements placed on the overhead conductor rail for the specific project.

- The **80 mm**-high profile is used in situations where extremely limited spatial conditions require a very low installation height.
- The **110 mm**-high profile has the classic and by far the most widely used design, and is suitable for speeds of up to 200 km/h.
- The **130 mm**-high profile allows a greater standard distance between supports and, thus, higher speeds. Designed with a groove-shaped head, the profile requires only one bolt to establish the connection between conductor rail and support. This type of profile reduces costs as well as the time spent on installation and maintenance work.

Available TracFeed® OSS profiles



Technical Data – TracFeed® OSS

Cross-sectional area	2 220 mm ²
Possible contact wires	100 – 150 mm ²
Equivalent copper cross-sectional area	1 400 mm ²
Profile heights	80 mm, 110 mm, 130 mm
Supplied lengths	10 m, 12 m*
Profile mass	6.1 kg/m
Designated speed up to	200 km/h**
Support intervals up to	14 m
Maximum length of one continuous section	2 x 300 m
Nominal voltages	750–3 kV DC, 15 kV–25 kV AC
Continuous current-carrying capacity	2.9 kA***

* Standard lengths, others available upon request

** Depending on the height of the selected profile

*** Depending on temperature range



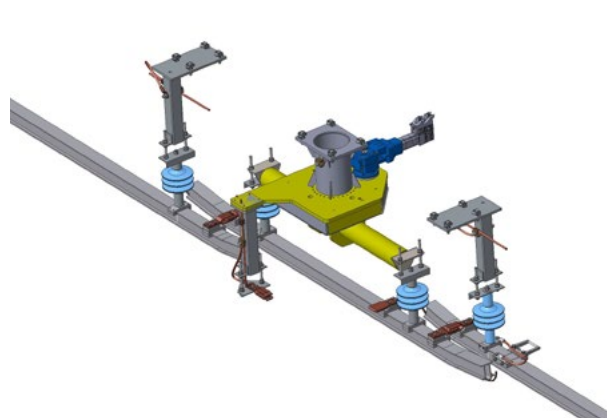


TracFeed® OSS retractable

Rail Power Systems has supplied and installed retractable models of their overhead conductor rail for various maintenance facilities (for example in Germany, Norway and Switzerland). Due to the very special requirements of the spatial conditions and the respective operator, each system is a custom solution. Implementation of these requirements poses a tremendous challenge in terms of design, planning, and the conceptual design of the corresponding controllers.

Application area

- Maintenance halls and depots for trams, commuter trains, mainline trains or high-speed trains.
- The TracFeed® OSS overhead conductor rail system enables trains to be moved into and out of the hall or depot with the usual pantographs and without additional traction engines.
- In its retracted position, TracFeed® OSS permits safe access to the train roof for maintenance tasks, thus minimizing the risk of electrical accidents.
- When retracted, working with cranes above the train is possible.
- In its extended position, vehicles can be tested using the current supplied by the overhead conductor rail, thus eliminating the use of extra traction vehicles to move vehicles to separate testing facilities.



TracFeed® OSS rotary disconnecter

The TracFeed® OSS rotary disconnecter was specifically designed for electrification of maintenance depots. It ensures a safe electrical connection and disconnection between two overhead conductor rail sections within one depot. By means of the TracFeed® OSS rotary disconnecter system, trains can be driven into the workshop on their own power.

References

- Locomotive depot Trier, Germany
- Locomotive depots Plochingen, Germany
- ARA* Cologne, Germany
- Locomotive depot Dortmund, Germany
- ARA* Dresden, Germany
- Skandinavienkai, container station, Germany
- Gemmenich Tunnel, Germany
- Locomotive depot Kassel, Germany
- Locomotive depot Würzburg, Germany
- Locomotive depot Münster, Germany
- Locomotive depot Aachen, Germany
- Tunnel City Thameslink and Canal, UK
- City Tunnel Leipzig, Germany
- IRA** Tübingen, Germany
- IRA** Heilbronn, Germany
- Skien, locomotive depot, Norway
- Locomotive depot Brebach, Germany
- ARA Laim, Munich, Germany
- Rindelflugh Tunnel, Switzerland
- Locomotive depot Steinhausen, Germany
- Boscerina Tunnel, Switzerland
- Zurich Cross-City Link, Switzerland
- Depot Herisau, Switzerland
- Depot Samstagern, Switzerland

* ARA = exterior cleaning system (Außenreinigungsanlage)

** IRA = interior cleaning system (Innenreinigungsanlage)

3rd RAIL SYSTEM – THE TracFeed® STS

3rd rail systems have been used in major cities and metropolitan areas for decades. With the TracFeed® STS system, power is routed through a steel or aluminium profile close to the running rail. With a laterally positioned current collector the vehicle can draw current.

Compared to catenary systems, the 3rd rail offers the following interesting advantages:

- Lower installation costs, no masts, foundations, etc.
- Low maintenance costs
- Low risk for installation personnel
- Minimal number of components and tools
- Easy adjustment
- Long service life, thanks to minimal wear of the contact surfaces

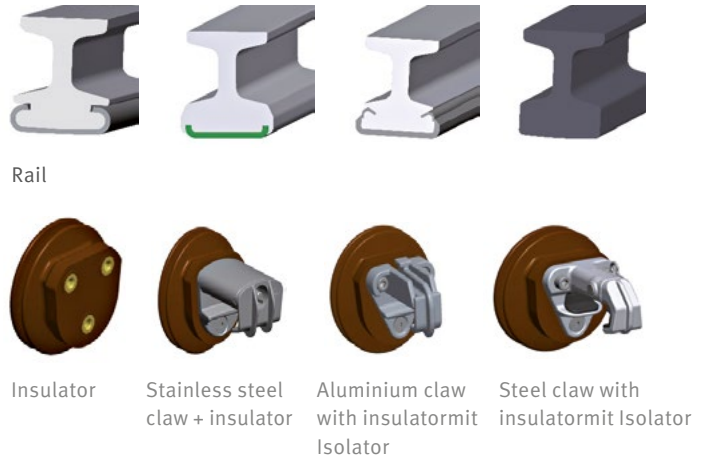
The current can be drawn on the rail from three sides:

- Current draw from above
- Current draw from below
- Current draw from the side
- The maximum speed for a 3rd rail system is 100 km/h
- The nominal voltage is 500 V to 1.5 kV DC
- The continuous current can be up to 4 700 A

References

- Nuremberg, Berlin, Hamburg, Helsinki, Oslo

Components of the TracFeed® STS



Ramps at Turnouts



GFRP Support



Installation in Nuremberg



Connection plate



Steel Support



Fixed point



Dilatation



Cover



Infeed



CATENARY COMPONENTS

Catenary components from Rail Power Systems are suitable for standard solutions as well as for tailored, customer-specific operating concepts in mass transit or mainline traffic. All Rail Power Systems elements offer a long service life, high reliability in daily operation, low life-cycle costs, outstanding quality and safe implementation under a wide variety of climatic and operating conditions.

Motor drives TracFeed® SFA

Functional description

TracFeed® SFA motor drives enable actuation of disconnectors and earthing switches installed on the mastheads of mass-transit and mainline catenary systems. Switching noise is reduced through the use of a toothed belt.

Product structure

- Housing
- Drive unit
- Electrical equipment

The housing can be opened either downwards or to the side and, depending on the version, safeguarded against unauthorised opening with a pivot lever. Additional safety measures, such as protection against inadvertent manual operation, are available on request.

The drive system consists of a drive motor and a gear housing with an integrated deflection element. A permanently energised DC motor is used as a drive. The force transmission occurs with positive locking by means of a toothed belt on a trapezoidal thread spindle. Self-locking effectively prevents a reversal of the rotational direction due to external application of force on the control lever.

The linear motion of the driven spindle nut is converted to a circular motion on the adjustment lever by a deflection element. The resulting stroke on the control lever can be selected in two stages (100 or 200 mm).

Motor protection is provided by an overcurrent relay with current-independent delay that switches off the drive in the event of an obstruction after approx. 2 seconds.



TracFeed® SFA motor drive



Technical data TracFeed® SFA

Operating current	AC or DC
Rated current	2.5 A
Drive system	450 Nm
Protection system	IP54
Dimensions (h x w x t)	600 x 380 x 210 mm
Weight	31 kg
Housing material	Stainless steel
Stroke	100 or 200 mm
Switching delay	2 to 4 seconds
Torque on the driving crank [Nm]	> 400
Switching cycles	> 20 000
Material	Stainless steel 1.4301

The motor drive can also be actuated by means of a hand crank, with which it can be moved to the home position so that a functional check can be performed. When the housing cover is opened, the voltage supply is interrupted (only with versions without local control).

**Disconnectors – TracFeed® MTS 3 kV DC,
TracFeed® MTS 15 kV to 25 kV AC,
TracFeed® MTS for OLSP 15 kV to 25 kV AC**

Functional description

Rail Power Systems has developed a modern and reliable range of switches, which offer high-level customisation possibilities due to their modular design. This also enables their combination with alternative drive concepts.

Rail Power Systems disconnector models are organised into the following basic components:

- Base plate
- Insulators
- Contact sets
- Arcing horns
- Earth contact support
- Earth contact

The following customised components can also be integrated upon request:

- Alternative drives
- Composite insulator (glass fibre reinforced plastic core/silicone sheath)

For increased power requirements:

- Contact element (measurement, silvering)

In disconnector versions with water-repellent composite insulators, these composite insulators increase increase protection against vandalism.

To facilitate installation, for many switch variants the weight has been significantly reduced by using lighter materials. The mating dimensions of all product generations were intentionally kept identical to enable easy replacement of different generations of disconnectors.



Basic electrical data

TracFeed® MTS 15 kV to 25 kV AC

Nominal voltage	15.0 to 25.0 kV AC
Rated operating current	2 300 A
Rated short-time current	50 kA
Short-time current duration	1 s

TracFeed® MTS



TracFeed® MTS inflow monitor, suitable for OLSP and AEE

Nominal voltage	25.0 kV AC
Rated insulation voltage	17.5 to 36.0 kV AC
Rated operating current	1 700 A
Rated short-time current	50 kA
Short-time current duration	1 s
Mechanical service life (switching cycles)	> 30 000
Weight	29.5 kg
Switch stroke	200 mm
Dimensions	785 x 210 x 1 353 mm

TracFeed® MTS with earth contact



TracFeed® MTS earthing switch OLSP



TracFeed® MTS 3 kV DC

Nominal voltage	3.0 kV AC
Rated operating current	3 150 A
Rated creepage distance	300 mm
Rated short-time current	50 kA
Short-time current duration	0.25 s

TracFeed® MTS 3kV DC





TracFeed® NSV wheel tensioners

Wheel tensioners connect the weights and catenary wires with constant tensile force. Changes in the length of the contact wire or supporting wire due to temperature changes that occur on a constant basis are compensated. The weight column generates a tensioning force that acts on the axle. In this process a force is exerted that is relayed over the axle. Thus the weight set generates the desired tensile force in the wires through the ratio of 1:3 in the wires.

The tensioning device has an engagement fixture. In the event of wire breakage, this fixture ensures that the re-tensioning weight is blocked. Through this measure further damage in the catenary and mast are avoided.

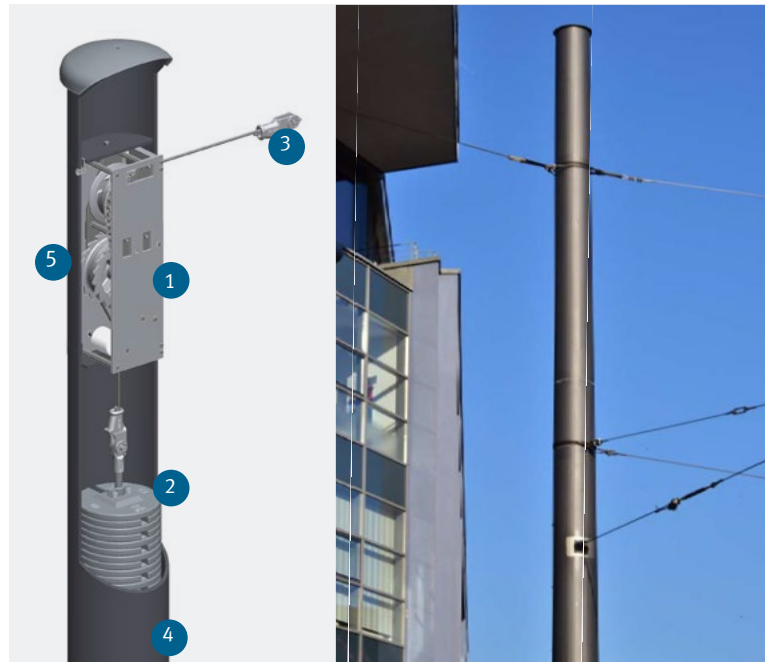
Technical data	
Transmission	1:3
Tensile force	up to 30 kN
Temperature range	-30 °C to +110 °C
Material	Aluminium alloy
Diameter – large drum	600 mm
Diameter – small drum	150 mm
Bearing	Bz



TracFeed® NSV wheel tensioner for 30 kN



TracFeed® NSV wheel tensioner for 20 kN



1. TracFeed® NSV integrated wheel tensioner
2. Weight set, max. 400 kg
3. Connection to overhead contact line
4. Special steel mast, approx. ø 360 mm
5. Upper assembly door

TracFeed® NSV integrated wheel tensioner

To optimise the exterior appearance of the catenary masts, Rail Power Systems has designed this innovative, integrated tensioning device. The benefits you gain: the TracFeed® NSV integrated tension wheel assembly can be completely integrated into the mast. It is perfectly suited for overhead contact lines and flat catenary contact systems, particularly for intra-urban and extra-urban trams, such as in Nuremberg city (VAG Nuremberg).

Technical data	
Transmission	1:3
Tensile force	up to 12 kN
Temperature range	-30 °C to +110 °C
Bearing	Needle bearing A2
Dimensions (l x w x h)	approx. 230 x 200 x 820 mm



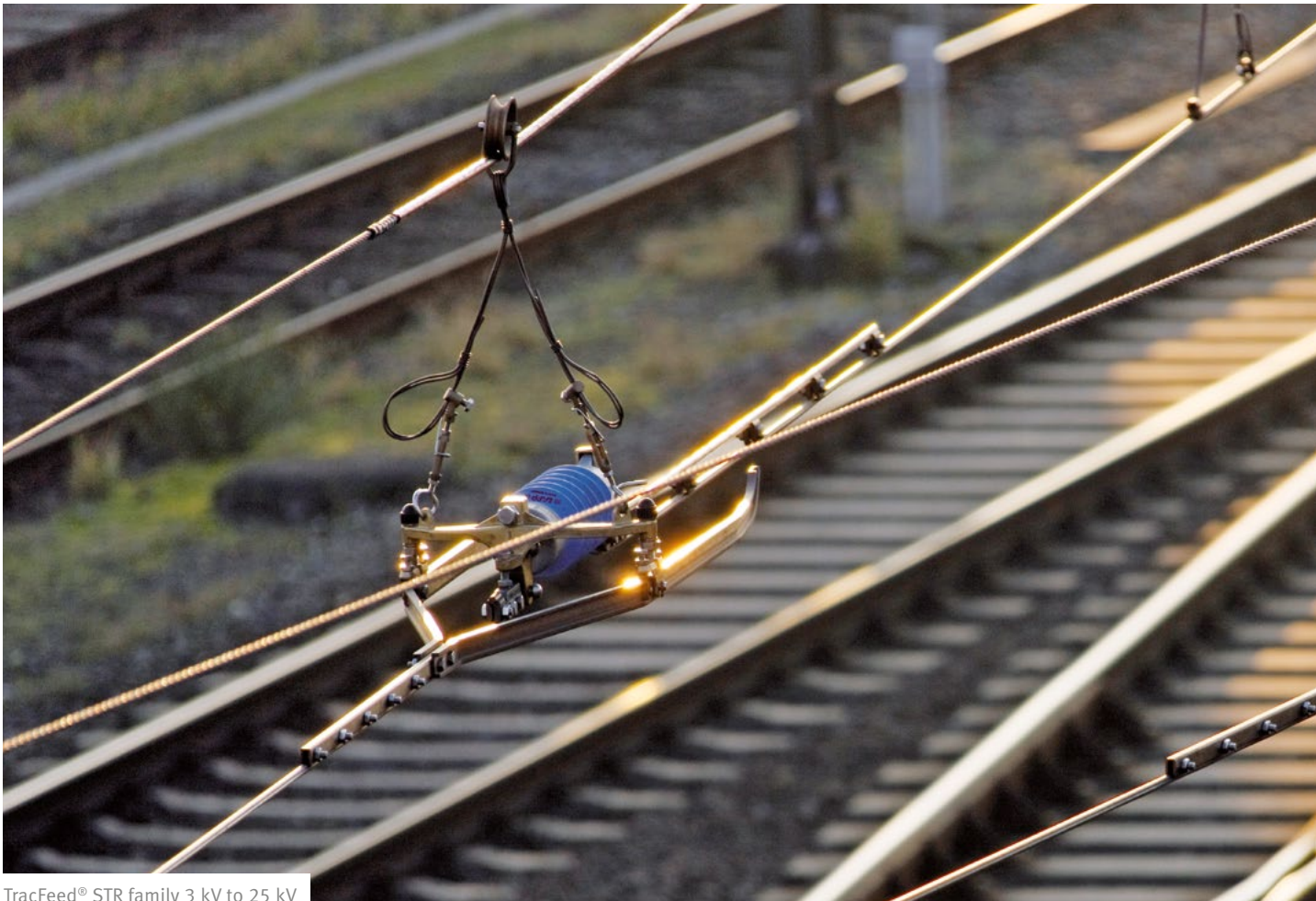
Section Insulator for AC and DC systems - TracFeed® STR

Functional description

Section insulators perform the function of separating the catenary into individual sections and electrically insulating these sections without interrupting the mechanical tension. Thus the section insulator can be used on lines travelled by electrical traction units. They are integrated into the catenary system through suspension elements.

Characteristics:

- Up to 3 kV DC
- 15 or 25 kV AC
- Main tracks and siding
- Depots and rail yards
- Suspension element pre-assembled in the plant
- Speed range 20 – 130 km/h
- With or without isolating skirts
- Corrosion-resistant and insensitive to weather influences
- Replaceable run-out skirts and spark horns
- For one or two contact wires
- Corrosion-resistant and maintenance-free
- Ceramic or composite insulators



TracFeed® STR family 3 kV to 25 kV

TRACTION POWER SUPPLY – ONE OF THE STRENGTHS OF RAIL POWER SYSTEMS

The portfolio of Rail Power Systems also includes turnkey and ultramodern traction supply systems. We support you from the planning of your individual infrastructure all the way to its installation and commissioning. Our solutions fulfil the most rigorous requirements.

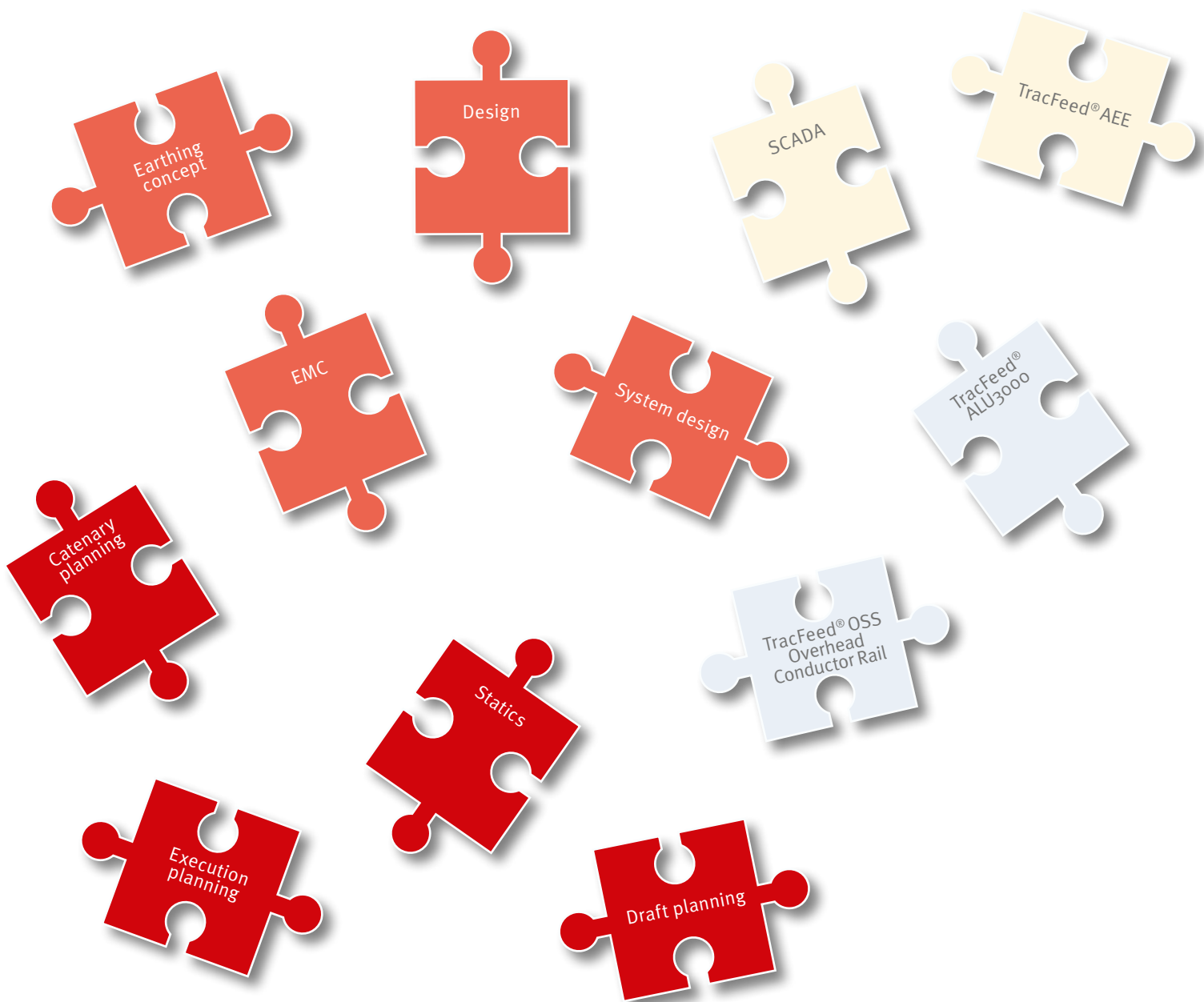
In addition to the DC and AC energy supply devices, the traction power supply systems from Rail Power Systems also include the associated matching control and protection technology, as well as remote control and power management systems.



OUR EXPERTISE – PROVEN IN CHALLENGING REFERENCE PROJECTS

Sustainable, reliable and ecologically responsible mobility represents one of the central challenges in many urban centres and large metropolitan areas. Highly efficient local transport will play a prominent role today and tomorrow in solving these tasks.

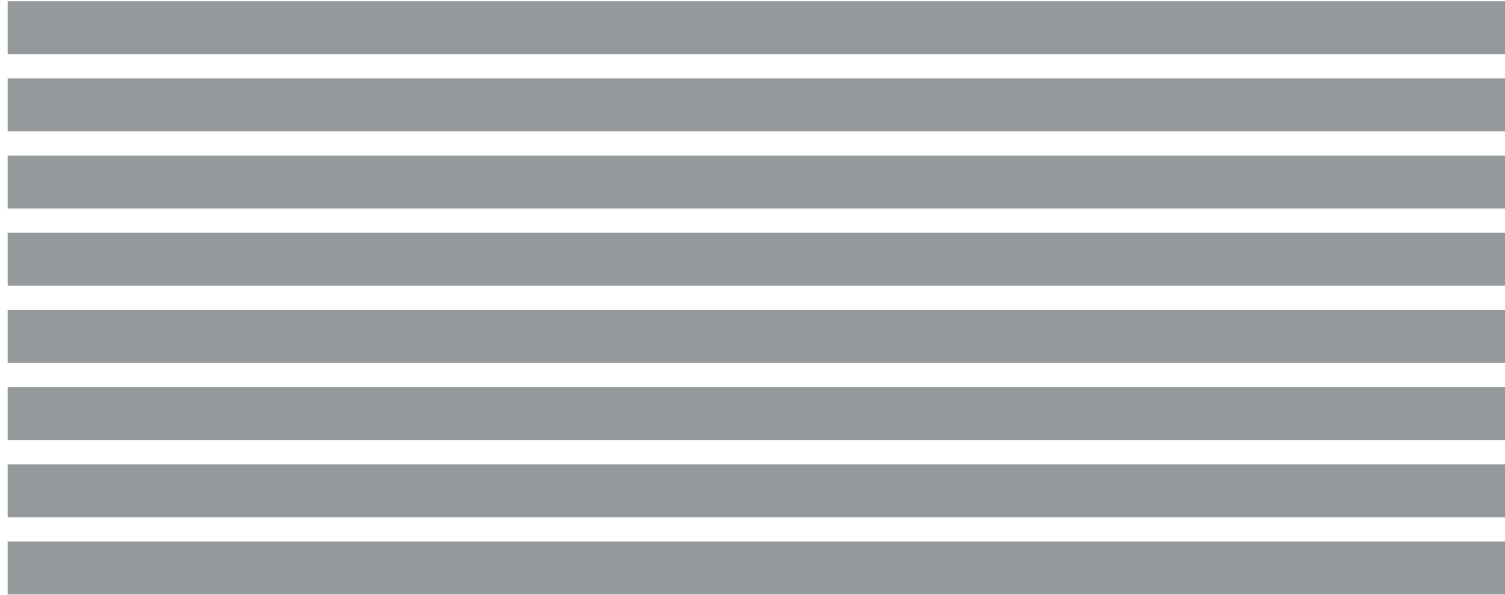
Whether you are currently planning a comprehensive, large-scale traffic project for the future, or whether you are concentrating on specific focus points, you can depend on the expertise and many years of experience of the experts at Rail Power Systems. Our competence has been proven in many challenging reference projects, both in Germany and in many other countries. Therefore, we can provide you with individual support solutions designed to achieve success.





MODULAR, COST-EFFECTIVE AND INDIVIDUAL
TO MEET YOUR SPECIFIC REQUIREMENTS:
WE PROVIDE SYSTEMATIC SOLUTIONS





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