High-tech cables & systems for rolling stock applications Rolling Stock

The Quality Connection





LEONI

Content



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High-tech cables & system solutions

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LEONI is one of world's leading providers of standardised and customised special cables as well as assembled cable systems. With our Business Unit Traffic, Business Field Rolling Stock, we provide our customers with all the expertise of a global enterprise, focused on the needs of the rolling stock industry.

With our extensive portfolio of products and services for internal and external wiring of rolling stock we will assist you across the entire lifecycle of your vehicles – worldwide.

As a strong partner, we offer you application-specific cable and cable system solutions meeting national and international standards. You can trust in our well-founded sector and product knowledge as well as our many years of experience.

Quality - Reliability - Safety

Our areas of expertise

- High-speed trains
- Regional trains
- Locomotives
- Trams
- Metros
- Freight cars
- Passenger coaches
- Diesel and electrical multiple units
- Trolley buses
- Buses



Solutions for complex requirements



The LEONI value chain



Having the ability to produce cable for rolling stock means being at home in many technical disciplines and having a broad product range. The requirements are not only technically demanding but also exceptionally complex. On the one hand this field requires numerous products that are sometimes very different; on the other hand extreme operating conditions and tricky installation problems will frequently have to be tackled. LEONI is one of the few cable manufacturer and system provider able to fulfil all these requirements.

What makes this possible is LEONI's unique value chain, which stretches from thin copper wire to multi-core special cables and through to the ready-to-install cable system. All cable components and products are developed and produced in house, which guarantees optimally harmonised solutions. We offer you earth straps, standard cables made to national and international standards, application-specific special cables, ready-to-connect assembled cables, sub-systems as well as complete system solutions for rolling stock applications such as high-speed trains, locomotives, trams, Metros, diesel and electrical multiple units and freight cars. LEONI offers you an extensive product range, which meets the multifaceted requirements of this market not only in its breadth, but also in its depth.

Our product portfolio

- Electron-beam crosslinked wires and cables
- Halogen free cables
- Cables with insulation integrity
- Weight and volume-optimised cables
- Heat and cold resistant cables
- Fiber optic cables
- Power and supply cables
- Control cables
- Bus cables (Ethernet, MVB and WTB)
- UIC train cable and train bus cables
- Data and coaxial cables
- Hybrid cables and special designs
- Earth-straps, earth connection wires
- Coiled cables
- Cable harnesses
- Railcar jumper systems

Areas of application

- Communication links
- Infotainment
- Seat wiring
- Driver's control panel wiring
- Coiled radio cables
- Drive systems
- Motor connection cable
- Switch cabinet and control panel wiring
- Air conditioning, ventilation and heating systems
- Sensor and component connections
- Brake systems
- Door and footboard controls
- Electric railcar jumper
- High-voltage roof-mounted jumpers
- Train safety systems
- Train radar



Test + Simulation

Comprehensive expertise relating to your core business

Product development

Design + Development

Being resolutely focused on your core business means finding better solutions faster and moreefficiently.

Do benefit to the best possible extent from our support services and technologies, and thus focus on your core business.

Process-related support

Design + Development

- On-site consulting
- One-stop shop for customised and standardised solutions
- Development of new materials for cables intended for special operating conditions
- Development of system solutions based on prescribed interfaces
- Layout and design of tailor-made cable solutions
- Development of concepts for railcar jumper solutions through the early stages of new vehicle platform designs
- Design of mechanical connections for railcar jumper systems
- Precise layout of lengths into the moving part of the cables according to the specific relative movements of the car ends
- Costing of maintenance and operation across the entire lifecycle (lifecycle costs) of railcar jumper systems (LCC/RAM analysis)
- Design to cost

Test + Simulation

- Prototype building under near mass-production conditions
- Planning and execution of separate and integration tests
- assessing of optimisation potential
- Design and building of special testing facilities for system fatigue tests to demonstrate the required durability
- In-house equipment to test the layout of moving cable systems
- Engineering science-based calculations of durability using stress modelling
- Finite element calculations for cable carrier and guide systems
- Climate and lifecycle tests for cables, system components and cable systems; own fire test lab in house

Implementation



Production

- State-of-the-art technology to produce prototypes through to customer-specific series production
- Production application and marketspecific standard and special cables
- Cutting, insulation stripping, attaching (using assembly robots)
- Soldering
- Crimping (with assembly machines)
- IDC (insulation displacement connectors)
- EMC-compliant assembly
- Fitting of electronic and mechanical components
- Fitting of complete components/systems including metal and plastic parts
- Making of plastic injection moulding parts
- Cable extrusion (connectors, sockets)
- Global production and service presence as required by your value creation concept

Installation + Logistics

- Customer-specific logistics solutions (just in time)
- Installation outsourcing

 g. technical support during installation of the jumper systems and training of the assembling as well as the maintenance staff

Aftersales

- Management of spare parts for components and systems up to 20 years
- Retrofit service provider for updating systems in existing rolling stock

Process-related support



Project management

... for efficient solutions, worldwide

Complex projects require clear structures and processes. We define the project objectives together with our customer, taking into account the set time and cost parameters as well as the available resources.

The key especially to international projects is to harmonise widely varying technical, commercial, cultural, legal and political input. This is where we can bring the experience we have gained from numerous international projects effectively into play. Once determined, we ensure that the individual stages are adhered to and that the overall project is realised.

... with an eye for the big picture

Highly qualified, internationally experienced project managers with inter-disciplinary and inter-cultural capabilities plan and coordinate all the jobs related to electrical connection technology within your overall project with respect to quality, costs and time, worldwide. In doing so we use the latest communication and project management tools that also correspond with the IT set-up of our customers.

Our project management incorporates all the phases of development, production and installation of cable systems for rolling stock

- Particularly the planning and execution of development work through to all the review and verification stages
- Prototype building and first sample testing with the customer.





Technologically leading

LEONI has attained a leading position worldwide with its products. Particularly in the rolling stock engineering sector, LEONI pools all its know-how into a perfect whole and to an extent that virtually no other cable manufacturer is able to offer. In addition there is the fact that LEONI continually invests in new technologies, systems and processes and, if required, also itself develops machinery and processes to produce and test cable as well as cable system solutions.

An outstanding example of this is electron-beam crosslinking of plastics (BETA technology). This technology involves highly accelerated electrons penetrating the insulation material of cables and interlinking the plastic's polymer chains on three dimensions. The insulation and therefore the whole cable consequently becomes much more durable thermally and its resistance to chemicals is also improved.











Earth-straps and earth connection leads



Areas of application

- Switch and control cabinets
- Cable channels
- Roof superstructures
- Underfloor components

If required, we can also fit our earth-straps and earth connection leads with special insulation or with strain relief.

We produce flexible and highly flexible earth-straps and earth connection leads both for protective earthing inside the rolling stock and also for the underfloor area or vehicle exterior. We offer a wide choice of standardised or tailor-made solutions – flexible or highly flexible, as bulk cable or assembled ready to connect.

Our product range also encompasses round copper flexibles, round and rectangular braided conductors as well as flat woven cables made of a wide variety of different materials with and without surface refinement in conductor cross sections from 0.5 to 1000 mm² in accordance with the relevant standards.



Round, stranded copper flexibles in accordance with DIN 46438

Materials E-Cu/OF-Cu as well as Cu alloys; plain, tinned, nickel-plated or silver-plated

Braided copper tapes, flat rolled, flexible in accordance with DIN 46444

Materials E-Cu, plain, tinned, nickel-plated or silver-plated

Practical cable solutions made to international standards



2º ai Marconcia

With each new vehicle generation there are requirement increases in terms of system uptime as well as the extent to which electrical and electronic components for power distribution, data transmission and control are fitted. The absolute safety and reliability of the connection technology is meanwhile taken for granted.

LEONI railway cables are used in protected and unprotected installations inside and outside of rolling stock, busses and other modes of transport vehicles. They are used especially where optimum processability and ease of installation are called for and where the cable volume and weight plays a crucial role.

The LEONI **BETAtrans**[®] **GKW**, **BETAtherm**[®] **ENgine** and **BETAflam**[®] **ENgine** product groups encompass a comprehensive portfolio that fulfils the highest requirements of rolling stock manufacturers. LEONI provides both single and multi-core control cables, power cables as well as data bus and coaxial cables.

Areas of application

- Cable systems
- Switch panels and units
- Control panels
- Cable ducts and bundles
- Control consoles
- Braking resistors and brake units
- Power and signal cables for AC and DC
- Inverters
- Mains power and battery cables
- Communication systems (ORMR, PIS)
- Monitoring and recording systems (CCTV)



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Product properties that stand for safety, cost advantages and high user benefit



All railway cables are flame retardant, low smoke and halogen free. No corrosive gases are released in the event of a fire, and our railway cables boast a low toxicity index. The low fire load reduces combustion heat to a minimum.

LEONI railway cables withstand even extreme ambient and operating conditions because of their strong resistance to aggressive media (oils, fuels, acids and alkaline solutions), UV and ozone resistance as well as strong resistance to abrasion.

Depending on the cable type and standard, temperature resistance ranges from -40 °C to +120 °C; in the case of **BETAtrans**° **GKW** from -55 °C to +120 °C. Another key property is the corona and partial discharge resistance under heavy electrical load during operation.

Just as in car manufacturing, the space available for installing and laying cables is becoming increasingly tight due to the increasing number of electrical and electronic systems. LEONI's weight-optimised cables contribute to solving this problem.

They boast, due particularly to the electron-beam crosslinked insulation materials, very good dielectric properties despite thin insulation wall thickness and reduced outer diameter and without compromising safety or reliability.

An ever increasing number of communication systems and electrical signals in trains and locomotives raise the threat of reciprocal electromagnetic interference. The use of various shielding technologies and special materials gives our cable solutions optimum EMC properties. LEONI's signal, control and power cables can thus be laid even in the tightest of spaces without the threat of reciprocal interference.



BETAtrans[®] GKW

Product portfolio

Performance in case of fire

Standard	Level of pro- tection inside vehicle	Level of protection outside vehicle
BS 6853	la, lb, ll	la, lb, ll
DIN 5510	1, 2, 3, 4	1, 2, 3, 4
NF F 16-101 Classification C/FO	A1, A2, B	A1, A2, B

Overview product range	
BETAtrans®	600/1000 V thin wall, single core,
GKW R	cross sections 0.5 - 2.5 mm ²
BETAtrans®	600/1000 V thin wall, multi-core
GKW flex R	
BETAtrans®	600/1000 V thin wall, multi-core,
GKW C-flex R	with optimized EMC screening
BETAtrans®	600/1000 V single core,
3 GKW	cross sections 0.5 - 400 mm ²
BETAtrans®	600/1000 V multi-core
3 GKW flex	
BETAtrans®	600/1000 V multi-core,
3 GKW C-flex	with optimized EMC screening
BETAtrans®	1.8/3 kV single core,
4 GKW-AXplus	cross sections 1-400 mm ²
BETAtrans®	1.8/3 kV multi-core
4 GKW-AXplus flex	
BETAtrans®	1.8/3 kV single- and multi-core,
4 GKW-AXplus C-flex	with optimized EMC screening
BETAtrans®	3.6/6 kV single core,
9 GKW-AXplus	cross sections 1.5 - 400 mm ²
BETAtrans®	3.6/6 kV multi-core
9 GKW-AXplus flex	
BETAtrans®	3.6/6 kV single- and multi-core,
9 GKW-AXplus C-flex	with optimized EMC screening

BENEFITS for OEMs and operators

- Temperature index +120 °C (20,000 hrs at 50 % elongation) permits ≥25 % higher current carrying capacity and increases the longevity to three to four times that of conventional cables
- Temperature resistance down to -55 °C guarantees a longer useful life under cold ambient temperatures because conventional cables already show embrittlement and other material damage below -10 °C
- Excellent corona resistance where there are high-frequency spikes, giving best performance in critical applications such as in converters, reducing fatigue in the cable insulation
- Provides consistently high partial discharge resistance thanks to highly developed materials and SRC technology
- Weight-optimised railway cable reduces energy costs during the whole operating phase of the rolling stock
- The smallest insulation and cable diameters thanks to BETA irradiation process – thereby reducing need for space and consuming less installation materials such as cable glands and ducts

- As it is a physical process, the BETA technology does not requires any chemical crosslinking agents are exposed to accelerated aging at higher temperatures)
- **Resistant to pressure** at extremely high temperatures
- Short circuit proof during electrical faults (e.g. extended period of overcurrent)
- The most minute diameter tolerances and consistent insulation wall thicknesses enable interference-free stripping and thus fast assembly and waste reduction

BETAtrans® GKW FE 180

Product portfolio



BENEFITS for OEMs and operators

- 180-minute fire resistance pursuant to BS 6387 and guaranteed insulation integrity at full voltage rating
- Compliant with the IEC and EN fire resistance standards

Of course the FE 180 series also provides all the benefits of the BETAtrans-GKW standard cable (see page 14).

Performance in case of fire		
Standard	Level of protection inside vehicle	Level of protection outside vehicle
BS 6853	la, lb, ll	la, lb, ll
DIN 5510	1, 2, 3, 4	1, 2, 3, 4
NF F 16-101 Classification C/FO	A1, A2, B	A1, A2, B
BS 6387	Intrinsic resistance to fire for 180 minutes CAT A	
	Intrinsic resistance to fire with mechanical shock for 15 minutes CAT X	
IEC 60331-11/21	IEC 60331-11/21 Intrinsic resistance to fire for 180 minutes	
EN 50200	EN 50200 Intrinsic resistance to fire with mechanical shock for unprotected cables with small diameters for 120 minutes	

BETAtherm[®] ENgine and BETAflam[®] ENgine

Product portfolio



Overview product range		
BETAtherm [®] ENgine EN 50306-2	300/500 V thin wall, single-core, cross sections 0.5 - 2.5 mm ²	
BETAflam [®] ENgine EN 50306-4	300/500 V thin wall, multi-core, unscreened or with optimized EMC screening	
BETAtherm® ENgine EN 50264-3-1	600/1000 V single-core, cross sections 0.5-400 mm ²	
BETAflam [®] ENgine EN 50264-3-2	600/1000 V multi-core, unscreened or with optimized EMC screening	
BETAtherm [®] ENgine EN 50264-3-1	1.8/3 kV single-core, cross sections 1-400 mm ²	
BETAtherm® ENgine EN 50264-3-1	3.6/6 kV single-core, cross sections 1.5-400 mm ²	
600/1000 V possible although not required by the standard, available on request		

BENEFITS for OEMs and operators

- Temperature index +120 °C (20,000 hrs at 50 % elongation) permits ≥25 % higher current carrying capacity and increases the longevity to three to four times that of chemically crosslinked cables
- Temperature resistant down to -40 °C
- Excellent corona resistance where there are high-frequency spikes, giving best performance in critical applications such as in converters, reducing fatigue in the cable insulation
- As it is a physical process, the BETA technology does not requires any chemical crosslinking agents are exposed to accelerated aging at higher temperatures)
- Longer uptime and fewer defects as well as environmentally compatible production
- Better material homogenity and purity; the extrusion process is much easier with no need of chemical crosslinking agents. So pre-crosslinked parts can be avoided.
- Outstanding flame retardance with high LOI readings

Classification

EN 50306-2 300V M	EN 50306-4 5P 300V MM 105
EN 50306-4 1E 300V MM 105	EN 50264-3-1 600V M
EN 50306-4 1P300V MM 105	EN 50264-3-2 600V MM
EN 50306-4 3E300V MM 105	EN 50264-3-2 600V MM S
EN 50306-4 3P300V MM 105	EN 50264-3-1 1800V M
EN 50306-4 5E 300V MM 105	EN 50264-3-1 3600V MM

600/1000 V possible although not required by the standard, available on request

- Reduced flame spreading
- Consistently high partial discharge resistance, thanks to the use of advanced materials

UIC train cable and train bus cables

Product portfolio



Overview product range		
UIC-Junction Cable	18 core	
UIC-Transit Circuit Cable	16 core	
UIC-Transit Circuit	16 core	with functional integrity
UIC-Branch Quad Cabler	4 core	
UIC-Bus Cable (WTB)	2 core	120 Ω
EP-Control Cable	9 core	
EP-Control Cable	10 core	
UIC-Junction Cable	12 core	
MVB Train Bus Cable	2 core	120 Ω
MVB Train Bus Cable	3 core	120 Ω
MVB Train Bus Cable	8 core	120Ω

BENEFITS for OEMs and operators

- Halogenfree and flame retardant
- Low smoke density and corrosiveness of fumes
- UV and ozone resistance
- Heat pressure resistant and abrasion proof
- Resistant to oil, acids and alkaline solutions
- Flexible when cold

LEONI UIC cables are developed and produced to UIC specifications. They provide the ideal conditions for use as connection cables between the cars and as either through connections or supply cords inside the cars.

They transmit both analogue and digital signals, e.g.

- For train crew voice communication
- Remote control of train components (e.g. doors)
- For power supply and controlling the electro-pneumatic brake

Particular attention was paid to the tough ambient conditions of railway operations when designing these cables. Especially in the coupling area only high quality, special materials will provide a safe solution.

Customised special cable for rolling stock engineering



Design features include

- Use of highly flexible class 5 and 6 Cu strands in compliance with DIN EN 60228 / VDE 0295
- High tensile strength due to integrated Kevlar[®] supporting braid
- Thin-wall versions
- Halogen free complying with DIN VDE 0472-815 / EN 50267-2-1
- Flame retardand, DIN 50265-2-1 / IEC 60332-1, DIN 50266-2 / IEC 60332-3
- Ozone resistant pursuant to EN 50305 Section 7.42
- Temperature range from –30 °C to +100 °C
- Low smoke
- Low fire-load density
- Low toxicity
- Weatherproof
- Easy to strip both installation and jacketing
- Acid and alkali resistant
- Oil and fuel resistant

Details will frequently determine the performance and safety of a cable. Special cable solutions by LEONI are matched precisely to their intended purpose in a function-optimised way, no matter whether that involves a flexible or fixed-installed application.

Such individual cable design as well as the use of specially developed sheath and insulation materials provide strong durability under thermal and mechanical strain. LEONI special cable solutions are developed and produced to national and international standards for the railway industry.

Our additional services

- Production of short lengths (starting at 100 m of cable)
- Prototype cables
- Implementation of cable design
- Through to finished cable within a few weeks
- Patented solutions for power cables operating with high currents at higher frequencies through to rectangular current flow (optimised for skin effect and EMC)

Application-specific cable solutions

Highly flexible power and supply cables

- Cross-section range up to 400 mm²
- Single or multi-core
- With/without CU braided shield
- Designed for all common voltage classes (300/500 V · 0.6/1 kV · 1.8/3 kV · 3.6/6 kV)
- Applications under high mechanical strain; e.g. railcar jumper

Highly flexible hybrid cables

- Application-specific combination of power and signal transmission as well as data and bus cables in a single cable (WTB, MVB, coaxial cables, ethernet)
- Hybrid cables that consist of a combination of metallic conductors and single fiber optic conductors or also complete fiber optic cables (e.g. application-specific jumper cables).
- Applications under high mechanical strain; e.g. railcar jumper

Fiber optic cables (POF & glass fiber)

Glass or polymer-based fiber optics (POF = Polymer Optical Fiber) provide secure and interference-free transmission of signals and therefore of data, images and, where required, also of light for illumination.

Fiber optic (FO) cables boast

- High rates of transmission with extensive reserves
- EMC security electromagnetic interference has no effect on the transmission properties
- Galvanic separation no need for potential equalisation
- Low weight with the smallest dimensions

Because of their special properties, fiber optic cables are used in rolling stock projects especially where rapid and disruptionfree communication is required, such as in operator and control panel connection.

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LEONI provides two types of FO cable:

- Pure FO cables that contain nothing but either glass or polymer fibers (halogen free and flame retardant pursuant to IEC 60332-1 and IEC 60332-3)
- Fibre optic cables also available as customised hybrid cables

Engineering services



Areas of application

- Feasibility and concept studies
- Carriage bridging systems / Inter-car jumper systems
- High tension roof bridging systems
- Build to Print
- Refurbishment

As your development service provider, we will supply you with application-specific system solutions. In particular, these include intercar jumpers and high voltage, roof-mounted jumpers, cable harnesses for device wiring as well as cable harnesses for economical and reliably working wiring harnesses for switch cabinets, panels, terminals and complete railcars.

We are able to profit from our extensive experience and expertise in the following areas:

- Mechanical and electrical design, together with the layout of the overall system
- Cable design and engineering
- Materials development
- Interface design, including optimisation / adaptation of connectors
- Computer-aided simulation and full scale product and service life tests
- Life cycle cost-optimisation

Under continuous movements our system solutions have a lifecycle of more than 8 years.



Feasibility and design studies



Our OEM customers commission us to provide feasibility and design studies, so that when they receive an order they are able to rapidly offer technically feasible interface solutions.

This can result in the design solutions which have very different requirements, because train operators transfer the responsibility for the availability of rolling stock to our customers, according to country-specific specifications. This resulted, for example, in the creation of completely new inter-car jumper systems concept for high-speed trains. Based on frame conditions given by the customer, several options were developed and discussed, evaluated in terms of profitability and incorporated into the specifications by the customer.

The requirements for inter-car jumper systems range from the electrical characteristics to the resistance to severe environmental conditions and the mechanical strength of the systems themselves.



In this feasibility study, the end users requested, amongst other things, a very high capacity to absorb vertical forces. To meet this design specification, our engineers developed a special strain relief system that can be tailored to the particular mounting interface and be validated as a complete system.

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Carriage bridging systems Inter-car systems

LEONI's carriage bridging / jumper systems are for the mechanically highly stressed region between carriages and/or the carriage body or bogies and are specifically matched to each individual installation.

In general, they are designed to be a breakout cable between the end walls of the carriage bodies or as a roof or under floor jumper system.

Years of experience means that LEONI is able to solve the most complex tasks, whether in terms of the cable construction – consisting of power, data bus, fiber optic or coaxial cable – or in relation to the mechanical design of the cable fixings and guides.

In order to meet the high requirements for flexibility, functionality and durability, we use top-quality materials and specially developed connection systems with suitable connectors and wiring components.

We also have a wide range of testing capabilities for development, functionality, reliability and service life testing.





BENEFITS for OEMs and operators

- A development and system partner provides improved technical solutions to reduce interface costs
- Optimally matched components
- Thanks to the LEONI value chain, a customized solution and the most rapid availability is possible, even at component level
- Product qualification and validation through service life testing
- Simple, safe and fast installation, reduced process costs



LEONI

High-voltage roof jumpers

High-voltage roof jumpers for power transmission from car to car.



LEONI manufactures roof jumpers as a double helix, which thanks to the sophisticated cable design and the use of specially developed jacketing and insulation materials ensures excellent bending strength and flexibility even when subject to the highest mechanical, physical and chemical strains. The highly flexible cable system compensates for permanently occurring oscillations and changes in length of up to \pm 1000 mm. A high hydrolytic stability, good rebound properties at temperatures from -30 °C to +80 °C are also achieved, as is high UV resistance. The cable meets the requirements of IEC 60332-1.

BENEFITS for OEMs and operators

- Full compensation of the three-dimensional relative movements at the fixing points
- High operational reliability through redundant design (double helix), electrically or mechanically
- Available in different cross sections depending on power supply
- Thanks to its intrinsic performance, fail-safe insulation distance to gangway bellow underneath, even in the event of one or both spirals is ruptured
- Mounting on insulators or terminals
- Customer-/ application specific connection
- Product qualification and validation through life testing
- Engineering at LEONI (analysis, design)

Build-to-Print

Refurbishment



The cable systems are manufactured or assembled in our factory, based on the 2D illustration taken from the design-to-build process. The term Build-to-Print describes the cable assembly (Build) with the help of the Print on the cable boards.

- Cutting
- Marking
- Assembling
- Retention Test (test for proper engagement of the crimp contact inside the connector)
- Electrical Continuity Test (network test), insulation, dielectric strength, four-terminal measurement where required by the customer
- Examination (visual inspection for obvious defects)

In addition to supplying made-up cable systems, we also offer system engineering. We take over the wiring of equipment at our works or develop mechanical and electrical component assemblies all the way from prototype to a marketable product.

Modernization, general overhaul, upgrading

When managing refurbishment projects, project managers and system engineers cooperate closely with the experts from manufacturing and production. As part of this cooperation, we analyse the specific needs of the installation situation, looking for solutions that meet the existing conditions and then implementing the optimal solution.



Global presence

We are represented in all the key industrial regions.

References



Local presence is a key to success for us. Our worldwide presence makes it easy for our partners to use all our services quickly and straightforwardly.

- Global production and service network
- Assurance of high product availability
- Local process monitoring as well as process and product optimisation
- Customised logistics solutions
- On site installation
- Spare parts management



Our customers include a large number of companies

- Alstom Transportation
- Bombardier Transportation
- BVG (Berliner Verkehrsbetriebe)
- CAF
- CMKS
- CNR Changchun Railway Vehicles Ltd.
- CNR Tangshan Railway Vehicles Ltd.
- CSR Zhuzhou E.L.W.
- Deutsche Bahn
- Gmeinder Lokomotivenfabrik GmbH
- Graz-Köflacher Eisenbahn
- HYUNDAI Rotem
- Matisa Materiel

- MVG (Münchner Verkehrsgesellschaft GmbH)
- Österreichische Bundesbahnen
- RhB Rhätische Bahnen
- Schweizerische Bundesbahnen
- Siemens Mobility
- Skoda
- Stadler Rail
- Vossloh Kiepe GmbH
- Windhoff Bahn- und Anlagentechnik GmbH
- ZOS Trnava

LEONI – The Quality Connection



LEONI is a worldwide system and development provider for wire, cable and wiring systems. Employing over 50,000 people in 36 countries, the Group achieves excellent results on the basis of solid financial management and offers quality of the highest technical standard in all areas. We implement our "Quality Connection" motto by always developing the best quality solution for our customers and by seeking to provide the best possible service in every project we work on. We supply products and solutions to leading German industrial businesses and many market leaders in their respective areas.

Market leader and leading system provider

The Wiring Systems Division is one of the two business areas of the worldwide LEONI Group. LEONI is the market leader in the wiring systems sector in Europe and is ranked number 4 in the global league. We aim to lead our competitors in terms of cost and are one of the few providers with a global network of production and development locations.

Success in a variety of markets

As well as products for the automotive, commercial vehicle and supplier industries, LEONI's services in the "Wire & Cable Solutions" division include copper wires and strands, cables and special cables, as well as cable systems and services in line with customer specifications.

End users are companies in the automotive, communication and infrastructure, industry and health, domestic appliances as well as wires and strands markets.

LEONI is actually the world market leader for vehicle cables. Our wire products have made us a leading system provider for the special cable and component industry. The particular strength of LEONI within the cable business is its ability to manufacture both standardised cables and customer-specific special cables and assembled systems. We work with different processes used in all technologies. This is your opportunity to make use of these unique synergy effects and to tap into the enormous potential available within the LEONI Group.

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