The background of the top half of the page is a futuristic, blue-toned image. It depicts a tunnel or a road with light trails, suggesting motion and speed. Overlaid on this is a network of white dots connected by thin lines, representing data transmission or connectivity. The overall aesthetic is high-tech and modern.

Mobility in tomorrow's world
Data transmission
in rolling stock

The Quality Connection

LEONI

Mobility 4.0

The challenge of the future

In the digital age, data transmission in trains has now become indispensable and is set to play an even more important role in the future.

With a wealth of ideas, sophisticated engineering and process support services, we offer you a comprehensive portfolio of products and services designed entirely around your exact needs.

To satisfy demanding requirements concerning flexibility, functionality and service life, we use especially high-quality materials and specially developed connecting systems with corresponding plug connectors and connection components. We also have a wide variety of options for development testing and for verification of functionality and service life.

Our product portfolio for data transmission in rolling stock includes both fixed installation cables and systems as well as solutions for the mobile area between vehicles, i.e.:

- Copper data lines and fiber optic cable for installation in the vehicle – as a pre-assembled system or standard goods
- Pre-assembled data jumpers for retrofitting existing systems
- Integration of data transmission functions for development of new fixed installation cable systems and railcar jumper systems

100% inter-system compatibility

By delivering pre-assembled data lines not only for fixed installation work but also for railcar jumper applications, we are able to offer you uncompromising compatibility for the interfaces between these two subsystems.

Our systems have undergone 100% testing in terms of data transmission performance. We are happy to supply proof of interference-free data transmission at the point of transition from the fixed data line to the railcar jumper line as part of product qualification.

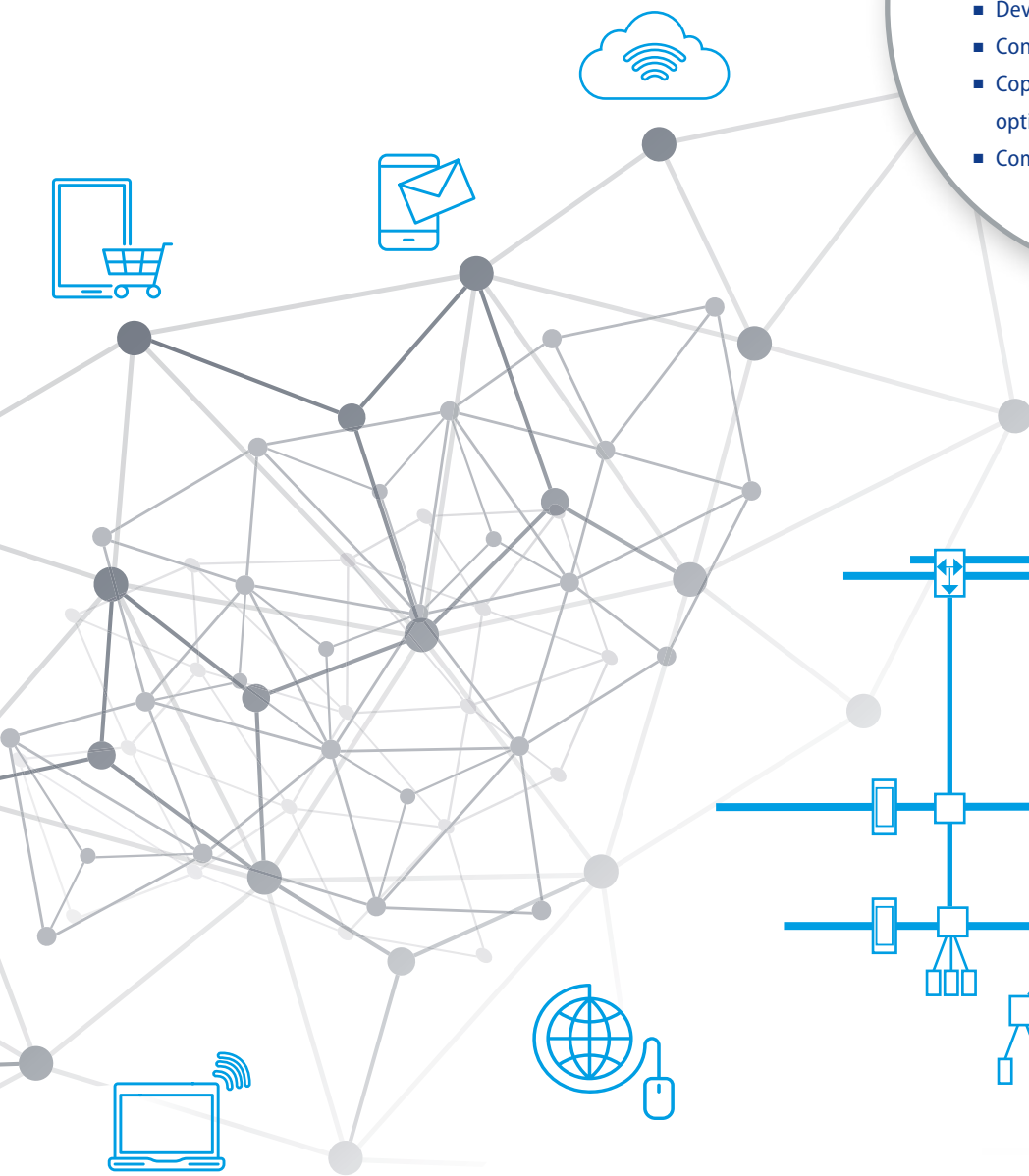


The networked passenger

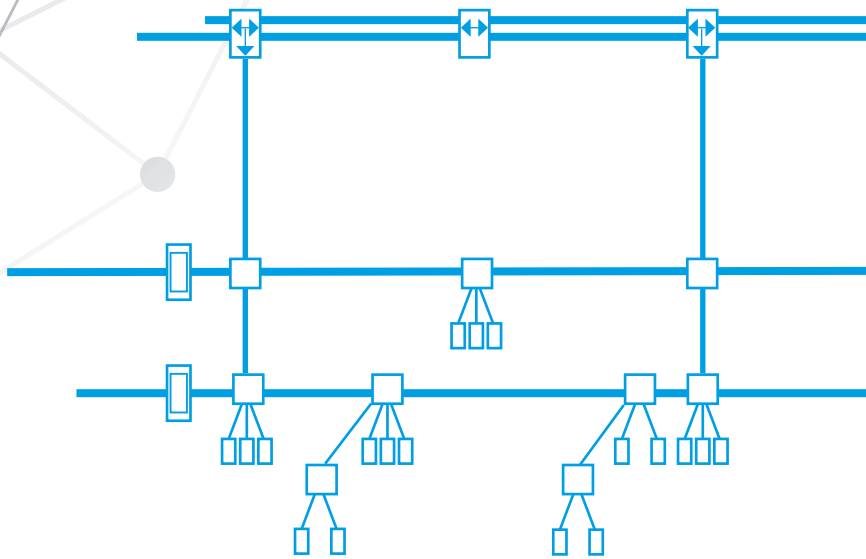


Our strengths – your benefits

- Development and qualification
- Assembly and installation of cable systems
- Development of contacting solutions
- Connector management
- Copper-based and optical fiber solutions
- Complete assemblies and solutions



The networked train



Fixed-installation applications

Our range of products and services as a full-service provider

Thanks to our broad-based portfolio of both copper and fiber optic data cables for rail applications plus our extensive system know-how, we are able to both offer and implement all-in-one solutions for internal rolling stock cabling.

Our copper and fiber optic data lines meet the highest specifications in terms of data transmission and fire safety. Our portfolio for data networks for fixed-installation applications encompasses:

- Fiber optic cables for rail applications
- Coaxial cables
- Copper data bus and video lines
- Assembly of copper data lines and fiber optic cables as individual cables or complex systems

With this portfolio, we can also offer you customer-specific data line and data line system solutions for internal cabling work that are perfectly tailored and pre-assembled to match your exact requirements. To achieve the best-possible technical solution, we can offer data lines either as pre-assembled single cables or integrated into application-specific hybrid or system cables – or as a complete, pre-assembled system.

Our assembly know-how encompasses all of the standard connectors used in rail systems, and includes both copper data lines as well as fiber optic cables. We can also offer overmoulded connector variants if required. From small lot sizes and prototype development to large-volume production and long-running projects. For product start-ups in particular, you can benefit from our comprehensive experience in relation to the change management process.

With our CAT 7A and/or OM3 multimode systems, data transmission >10 GB/s is possible without any restrictions.

When planning new projects, one option is to integrate the data lines into the newly developed cable assembly system.

Alternatively, it is of course possible to source all data lines, plus hybrid and system cables for fixed installation work as standard goods for assembly in-house.

Connector variants

- ① Fiber-optic SC connector
- ② Gigabit square connector
- ③ M12 A-coded
- ④ RF coax





Thanks to our ultramodern production facilities and the use of top-quality insulation materials, our cables offer an extremely compact form factor for in-vehicle installation – making them ideal for applications where installation space is at a premium.

Data lines for fixed-installation applications

Cable type	Properties
Fiber optic	<ul style="list-style-type: none"> ■ Complies with EN 45545-2 ■ Multimode (OM1-4) and single mode ■ Assembly optimised for long service life ■ Bend-optimised fibers ■ Data transmission rate >10 GB/s ■ High fire safety standard**
50 Ω coax cable; 75 Ω coax cable*	<ul style="list-style-type: none"> ■ Complies with EN 45545-2 ■ Compatible with all typical rail RF connectors ■ Assembly optimised for long service life ■ Optimal transmission to 3 (6) GHz ■ Attenuation-optimised ■ High fire safety standard**
BETAtans® Giga CAT Ethernet	<ul style="list-style-type: none"> ■ Complies with EN 45545-2 ■ 1200 MHz ■ Assembly optimised for long service life ■ Data transmission rate >10 GB/s ■ CAT 7A complete system ■ High fire safety standard**

* Coax cable also available in a range of other models on request

** Other fire safety certification on request

Moving applications

Railcar jumper systems

Our railcar jumper systems are designed for areas between vehicles and/or carriage bodies and bogies subjected to high mechanical stress, and are specially developed for each individual installation situation.

Railcar jumper systems can be designed as a roof or under-floor jumper system between the face ends of the carriage bodies. For the cable construction, consisting of power, control data bus, fiber optic and/or coaxial cables, as well as the design of the mechanical mounting and cable routing, LEONI can draw on its extensive experience to solve even the most complex kinds of problems.

Due to rising expectations from passengers about service quality in relation to information and availability, requirements for data communication in rolling stock will continue to grow more challenging.

As a system provider, we need to constantly improve performance by developing new products that guarantee the reliable transmission of data even between carriage bodies – a flexible, constantly moving application scenario.

LEONI system solution

- Mechanical and electrical design plus overall system architecture
- Cable construction and engineering
- Material development
- Interface design, plus connector optimisation/modification
- Service life testing for product qualification and reliability assurance (e.g. cold testing to -50 °C)
- EN45545-2 fire prevention certification for the overall system
- Lifecycle cost optimisation
- Project planning



Railcar jumper solutions for tomorrow's rolling stock requirements:

■ Development of railcar jumper systems

During the development of new railcar jumper systems, we ensure the optimal integration of data transmission requirements into the hybrid cables designed specifically for the application.

■ Development of individual data jumpers

Data jumpers are individual breakout cables that are integrated into complete railcar jumper systems or can be installed as individual jumpers. This means they can be deployed both in new vehicles and for refurbishment or retrofit projects.

■ Refurbishment and redesign

Where railcar jumper systems are already in use with existing fleets of rolling stock, we can refurbish, modernise and redesign these systems to handle the advanced requirements for data communications.

■ Retrofit

If the railcar jumper systems present are still readily usable, these can be retrofitted with data jumpers without any intervention in the existing system.



Details often make the difference in product performance and safety. Special cable solutions from LEONI are a perfect match for the functionality needed by your application – regardless of whether you need an entirely new product or only a retrofit.

Data lines in jumper cables and complete jumper systems

Cable type	Properties
Fiber optic	<ul style="list-style-type: none"> ■ Complies with EN 45545-2 ■ OM3 multimode ■ Assembly optimised for moving applications ■ Bend-optimised fibers ■ Data transmission rate >10 GB/s
50 Ω coax cable*	<ul style="list-style-type: none"> ■ Complies with EN 45545-2 ■ Compatible with all typical rail RF connectors ■ Assembly optimised for moving applications ■ Optimal transmission to 3 (6) GHz ■ Attenuation-optimised
CAT 7A	<ul style="list-style-type: none"> ■ Complies with EN 45545-2 ■ CAT 7A-ready all-in-one system for moving applications ■ Assembly optimised for moving applications ■ Long service life ■ >1000 MHz ■ Data transmission rate >10 GB/s
Hybrid data jumper	<ul style="list-style-type: none"> ■ Complies with EN 45545-2 ■ 2x CAT 7A and 2x duplex optical fiber ■ Assembly optimised for moving applications
Hybrid jumper	<ul style="list-style-type: none"> ■ Complies with EN 45545-2 ■ Assembly optimised for moving applications ■ Customer-specific engineering

* Coax cable also available in a range of other models on request

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