

Rail Systems for Railway Signaling and Communication



**Be certain.
Belden.**

BELDEN



HIRSCHMANN

A BELDEN BRAND



lumbergautomation

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Competitive Advantage

Belden® offers tried and tested solutions to meet the key challenges of today's rail industry.

Reliability

Wired and wireless Ethernet systems designed to operate in the harshest environments with maximum reliability.

Cost Saving

A Belden IP-based infrastructure delivers better service – saving on maintenance costs.

**Passengers rely on
their Transport Company.
Who does the Transport
Company rely on?**

Be certain. Belden.



Railway Signaling and Communication

The Belden portfolio of networking, connectivity and cabling products incorporates the latest innovations and is based on proven technology.

Belden works closely with all the leading players in the railway transportation market. This experience enables us to deliver maximum network availability, wherever safety and reliability are absolutely crucial, from the control room to the actual railway line.

Whether you are an operator, a manufacturer or a system integrator, you can be certain that Belden will deliver a complete solution to meet your most critical needs, every time.

Competitive Advantage

In order to make rail transportation more attractive to both passengers and businesses, rail operators have to overcome the challenges of capacity, reliability and life cycle costs. A Belden dedicated Ethernet-based infrastructure not only meets the requirements of critical assets such as signaling and modern train stations, it also helps to increase capacity, reliability and safety. Thanks to Belden's innovative product portfolio, railway operators can improve system efficiency, while driving down costs with industry-leading reliability.



Reliability

Railway networks need to operate in harsh environments. This requires special performance and a high degree of resilience. Among the many challenges that need to be overcome are humidity and temperature, small spaces, the need for redundancy, reliability, data security and long distances. Belden is able to meet these conditions head-on, using its range of specially designed industrial products.

A network comprising devices designed for the harsh industrial rail environment will, on average, be 10 times more effective than one implemented with commercial devices. This resolves the various issues of designing the data transmission network, and ensures the overall reliability and efficiency of systems serving critical infrastructure.

Our portfolio makes Belden the ideal solutions partner to ensure you overcome system challenges.



Cost Saving

Modern IP technology and devices offer improved reliability and performance. With the help of ever increasing bandwidths, both wired and wireless, railway operators can control and monitor an increasing number of systems from remote control centers. As a world leader in this technology, Belden designs and implements new systems that reduce maintenance and intervention costs, thus increasing the efficiency of rail network.

The Key Objective is Safety

With the latest innovations, Belden's rail approved networking, connectivity and cabling products are ideally suited to meet the requirements of the Rail Industry.

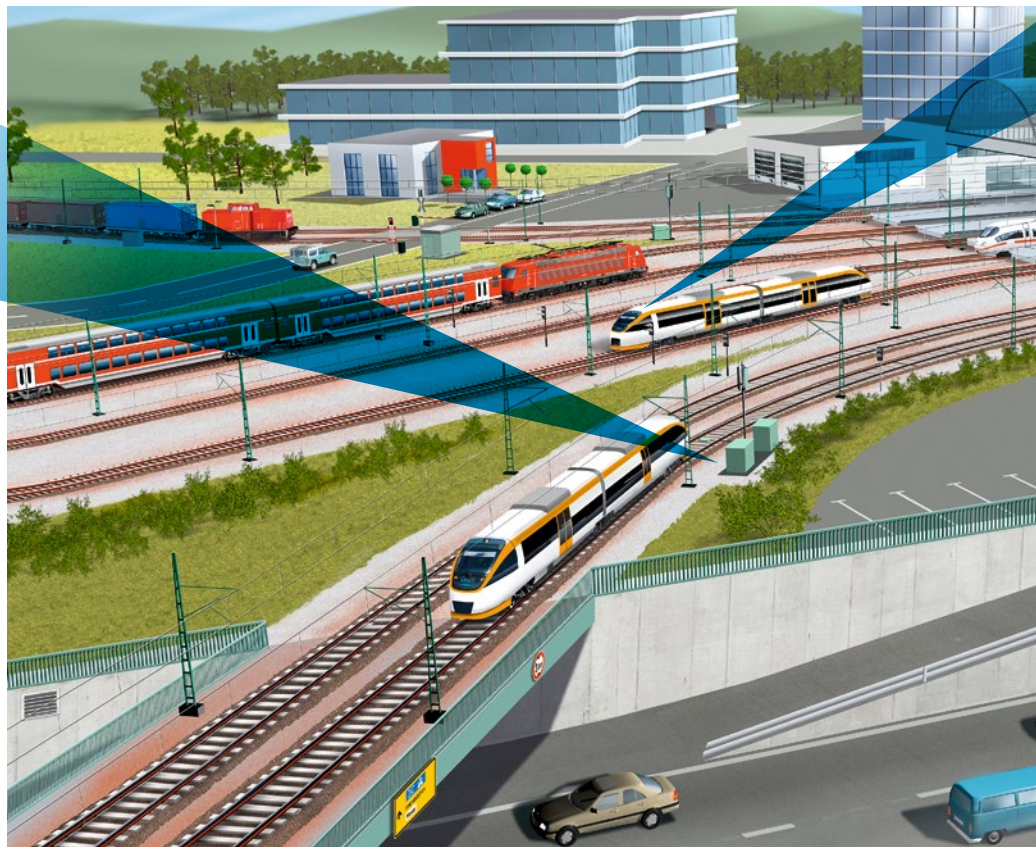
Meeting Tomorrow's Needs Today

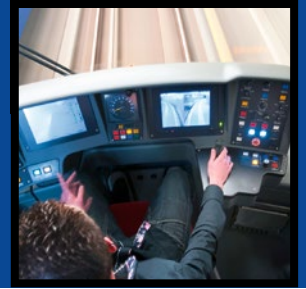
Whatever the application, the function of railway signaling is to guarantee the safe and fluid transportation of passengers and/or goods, while maximizing the capacity and efficiency of the railway network. To do this effectively, you need a communication network infrastructure that uses the most advanced technologies, both on the ground and on-board.

In the future we will see the introduction of ever greater dynamic signaling systems such as CBTC, ERTMS and PTC. These will require increasingly faster responses, real-time communication and a growing availability of wireless and wired technologies. To increase the operational efficiency of the infrastructure, the communications network needs to develop more capacity and systems need to become faster, embracing an Ethernet and IP architecture able to replace old networking technologies.

Wayside Signaling and Communication Systems

Along the railway track, Belden provides the backbone network infrastructure serving the equipment for the railway signaling system, for example the switches for the GSM-R base stations or the fiber optic cables. This network must meet the requirements of reliability, bandwidth capacity, resistance to harsh environments and extreme temperatures. It can also be used for the operation of systems related to signaling such as SCADA controls, security and maintenance systems.





Onboard Signaling System Communication

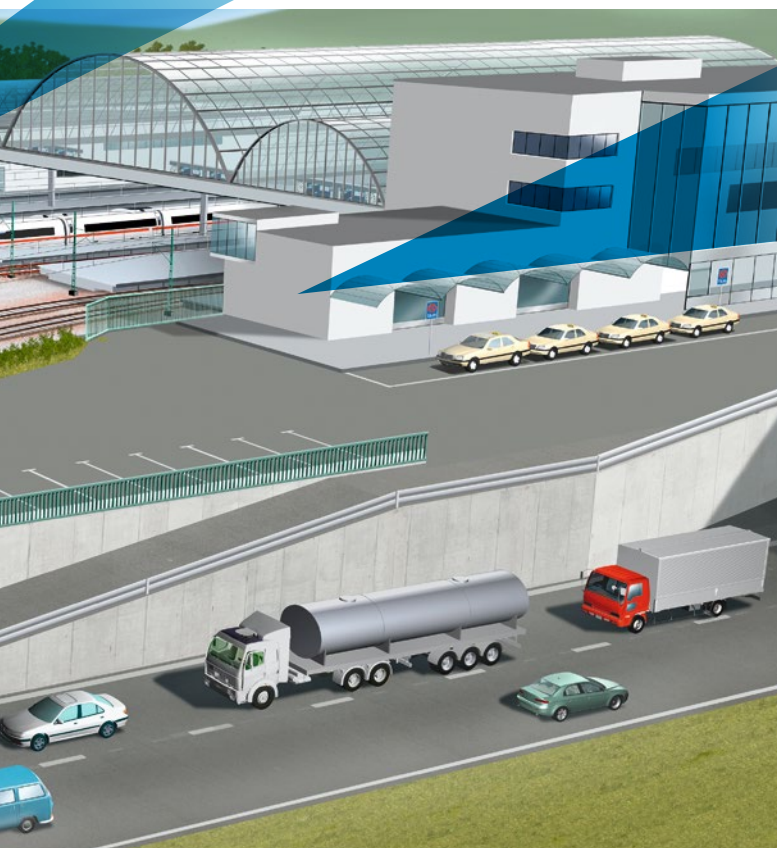
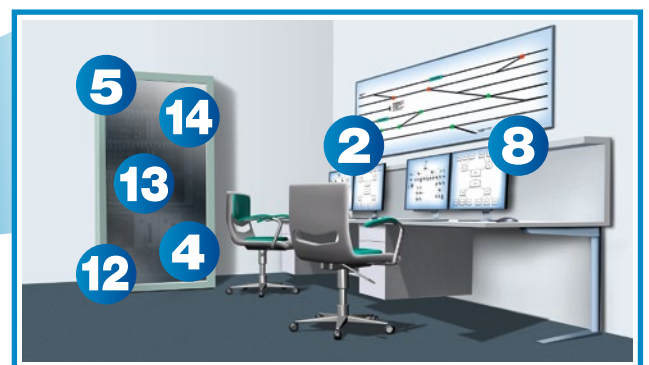
The train transmits its exact position and direction to the control center and receives movement authority, together with permissible speed and route data, processed by the onboard computer and transferred to the driver's HMI screen. The onboard network

provides the connection for all the signaling equipment on the train. Belden offers innovative rail approved copper cables and switches, compliant with the EN 50155 and EN 45545 standards, which are fundamental requirements for on-board devices.



Control Center Communication

The control center is the point where all field data is collected and managed. Operators at the center are given information relating to the situation on the track and can control train traffic adherence to schedules, routes and speeds – all in real time. Other data is monitored, such as electric traction substation information, SCADA, passenger information system (PIS) and security systems. Belden provides network equipment with the greatest number of ports and bandwidth capacity.



Belden Product Solution

The UN predicts that by 2020, over 80% of the World's population will live in cities. This trend towards urbanization drives the need for greater urban mobility. With the added pressure of climate change and environmental concerns, the demands on railway signaling and communication network systems have never been greater. These and other macro trends, such as deregulation and energy scarcity, are driving the need to expand rail networks for increased capacity. This is achieved by replacing and upgrading existing signaling and communication networks, while at the same time installing new networks that allow the deployment of new rolling stock fitted with increasingly sophisticated CBTC systems.

Railway signaling and communication networks have to be capable of handling increasing bandwidth requirements while meeting uncompromising safety and reliability standards. Belden offers a portfolio of rail approved networking, connectivity and cabling products that incorporate the latest technology innovations. Based on proven technology our innovations are ideally suited to meet the high standards of the Rail Industry. Moreover, Belden has been active in the railway industry for many years, gaining in-depth knowledge, while being involved in the drafting of future rail technical standards. This experience and expertise makes Belden the ideal solutions partner to help you meet the system challenges for today and tomorrow.

Industrial Connectivity

1

Belden Multi Loose Tube Cables

Multi loose tube cables are the best proven solution for harsh outdoor environments, designed for direct burial, duct, outside tray and aerial applications.

- Designed for direct burial, duct, outside tray and aerial applications
- Available with rodent protection
- Combine the water tightness characteristics and LSZH-FR sheath

2

Belden DataTuff® Industrial Ethernet Cabling Solutions

Belden's comprehensive DataTuff® Industrial Ethernet cable and connectivity range ensures the highest level of reliability, quality and performance.

- Widest choice for best fit
- Robust enough to guarantee the highest levels of reliability and performance

3

Belden Industrial Ethernet RailTuff™ Rail Cables

For reliable communications and enhanced system performance, supporting data rates of up to 10 Gb/s whilst still meeting the stringent requirements of EN 50155 TX and EN 45545. Available with silver plated or tinned copper conductors.

- Low toxicity, low smoke emissions and flame retardant
- Compliant with international railway standards
- Small bend radius cable

Industrial Connectivity

4

Belden 10GX®, CAT6+ and CAT5E Bonded-Pair Modular Cords

The 10GX, CAT6+ and CAT5E series of Bonded-Pair Modular Cords are made with Belden's patented robust design Bonded-Pair cables.

- Bonded-Pair cable technology
- Exceptional structural stability and electrical performance
- Improved attenuation

5

Belden KeyConnect™ Patch Panels

The KeyConnect Patch Panel series is a comprehensive line of robust all-metal, preloaded and modular patch panels.

- Available in a wide variety of preloaded and modular configurations
- Large front labeling space
- Compatibility with standard 19"

6

Lumberg Automation™ Train Approved M12 Connectors

Providing fast and inexpensive installation due to molded and field attachable connector types and ready to install pre terminated M12 patch cables.

- Easy mounting spring type clamp
- EN 50155 approval
- Innovative shielding concept

Industrial Infrastructure

7

Hirschmann™ Managed DIN Rail Mount Switches

A comprehensive range of switches that provides customized communications solutions with design features that adapt to any application without compromising quality or system performance.

- Gigabit Ethernet ports availability
- Designed for use in harsh environment
- Ring redundancy using MRP (IEC 62439)

8

Hirschmann Industrial HiVision

Industrial HiVision is designed to meet the needs for maximum network visibility. It is ideal for configuring and supervising all Hirschmann managed networking products, as well as third-party devices.

- Auto-Topology Discovery
- MultiConfig™ facilitates configuration
- Integration of third-party devices

Industrial Infrastructure

9

Hirschmann MACH1000 Family

Ruggedized substation (IEC 61850) switches for Gigabit/ Fast-Ethernet applications deliver excellent performance, high port density, excellent RFI/EMI shielding and great flexibility in a compact form.

- Extensive layer 2 and layer 3 software
- Fanless cooling system
- Operating temperatures from -40 up to +80°C

10

Hirschmann OpenRail – Modular Industrial Switches

Used centrally in the control cabinet, or in a decentralized manner in the distribution cabinet, MICE Switches and media modules are capable of handling every requirement in the Industrial Ethernet network.

- Redundancy protocols PRP, HSR, MRP, Fast MRP and RSTP supported
- Versions for 12, 20 or 28 ports
- High shock and vibration resistance



Industrial Infrastructure

11



Hirschmann OCTOPUS Family

Train approved Octopus managed and unmanaged switches are maintenance-free and have exceptional reliability as well as a variety of redundancy mechanisms. Optimum fail-safety thanks to extremely robust hardware, comprehensive redundancy methods and security functions.

- Rail-specific EMC and fire safety approvals
- Vibration-proof construction
- Redundant power supply

12



Hirschmann EAGLE20-0400 and EAGLE30-0402

These Multi-port Firewalls offer absolute flexibility for physical deployment combined with state-of-the-art security functionality tailored to the unique requirements of Industrial Ethernet Networks.

- High levels of access protection
- Operating temperatures: -40°C to +85°C
- Static routing

Industrial Infrastructure

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Hirschmann MACH4000 Family

The MACH4000 backbone switch is a real all-rounder (layer 2 or layer 3 switch) and suits all applications – especially large networks, with a large number of media modules, high port density and the extendable routing functionality.

- Extensive Layer 2 and Layer 3 software
- Up to 48 GE ports and 3 x 10 GE
- Power supply redundancy

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Hirschmann MACH100 Family

The comprehensive switching and routing functions, as well as the kettle lead power plug for the power supply make the MACH100 series workgroup switches a cost-effective alternative for Layer 2/Layer 3 applications with high data rates.

- 16 Gigabit TX ports for PoE/PoE Plus
- 2 XFP uplinks for 10 Gigabit speeds
- Fanless design with external power supply unit

The Belden Brand Promise

The world is growing more and more connected with an explosion of links from human to human, human to machine, and machine to machine. And, as more connections are created, the networks they form become increasingly vital to our daily lives and our long-term goals.

But, with more connectivity comes more complexity. As the machines, processors and systems that power our world become more sophisticated, the people who design, build and maintain them need a partner with perspective that spans technology platforms, geographies, and industries.

That's why Belden is on a path to assemble a portfolio of best-in-class communication technology brands. As a part of Belden, our brands benefit from over a century of excellence in manufacturing to the highest standards, and they're able to share innovations and thought leadership across the organization to stay ahead of the competition.

Our customers across all our brands can rely on what we build to outperform and outlast in the most demanding conditions, and they know that we'll support them with uncompromising and responsive service.

We are greater than the sum of our parts. We prove it by adding expertise and resourcefulness that goes above and beyond product performance. We prove it through our focus on the applications and markets that are most in-demand from industrial IT, to industrial connectivity, to enterprise connectivity, and broadcast. We prove it through continually optimizing our portfolio of technologies, capabilities and brands to create the strongest connections possible.



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GLOBAL LOCATIONS

More information can be found at
www.beldensolutions.com



**Be certain
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