



**Cable expertise
to contribute to your railway network security**

High-performance trains need efficient infrastructure

The success of rail transportation around the world is not just due to faster locomotives and more comfortable wagons, but is very dependent on the quality of the infrastructure that supports the entire rail system, and that includes cables and cabling systems for telecommunications, data and energy. Today's operators are especially concerned with streamlining costs, upgrading systems, and introducing innovations that can deliver the kind of rail service that passengers, and their governments expect, especially in the face of new developments.

Modern high-speed trains in Europe and elsewhere (China) demand cables with different characteristics in terms of bandwidth, safety, electromagnetic immunity and resistance. A definite trend is interoperability, which allows trains to move easily across borders and even continents. Here, too, cables must comply with the new consolidated ERTMS/ETCS standards which are progressively integrating GSM-R radio technologies for train control, while continuing to rely on older route control systems (relay interlocking) for safety and redundancy. Indeed, safety has become a prime concern for the world's rail operators, and there is


a demand not only for more reliable operating systems, but also for materials with improved fire-performance characteristics, especially in tunnels, stations and public areas. Apart from massive upgrades and new lines around the world for both passenger and freight networks, urban mass transit systems have been experiencing substantial growth, especially in Asia. In large cities, subways, fully-automated metros, people movers, light-rail suburban lines, and now tramways are being used to solve the problems of pollution and urban gridlock. In China, alone, five to six new metro lines are being built every year. Each of these separate infrastructures has its own particular cable needs and designs.

What is expected of cable manufacturers:

- Comprehensive range of high-quality infrastructure cables from a single supplier
- Expertise in advanced WANs, MANs and LANs for the rail environment
- Full mastery of energy, data and new radio-based technologies
- Installation skills for mainline, mass transit, tunnels, streets, right-of-ways, etc.
- Familiarity with all types of rail networks to meet the needs of intermodal travel
- Fully outsourced subsystem responsibility, with customized solutions
- High interoperability and open standards for emerging ERTMS/ETCS
- Full compliance with local, national and international standards and specs
- Increased cable efficiency, compactness, lightness, and resistance
- Low costs, minimum maintenance, easy replacement and upgrades



Nexans helps you create the network you need for growth



Nexans produces a wide range of telecommunication and energy cables and components found in modern railway infrastructure: WANs, MANs and LANs for communications and train control functions, station range access cables, fiber optic trunk line and radio cables, signaling and control cables, axle counter and balise cables, and radiating cables for tunnels. Trackside energy solutions include catenaries and diverse low, medium and high-voltage feeder cables for traction and equipment, and a full range of power accessories. To protect people and equipment, all cables for public places are HFFR (halogen-free, fire-retardant), meaning that they generate low toxicity, corrosion and smoke density. Not only are they highly fire-resistant, but can maintain all vital functions for a predetermined time in the event of a fire.

In addition, Nexans provides valuable advice to operators about evolving specifications and standards, especially where new European equipment is being merged with an older infrastructure. We also provide customized engineering, turnkey installation and maintenance anywhere in the world. And we are engaged in ongoing R&D to keep all of our products competitive, compatible and environmentally-friendly.

Nexans for optimum performance

- A wide range of data/energy cables and components for all infrastructures
- Advanced cable characteristics: EM immunity, high fire-performance, resistance
- Special European-based expertise for high-speed trains worldwide
- WAN/MAN/LAN technology, using state-of-the-art copper/fiber cabling
- End-to-end turnkey systems for mainline and mass transit
- Complete signaling and train control cabling, from standard train control to ERTMS/ETCS radio-based technologies
- Modular, future-safe systems, with guaranteed inventories for tomorrow's needs
- Custom engineering to deal with country-specific problems and standards
- Technology transfer and close cooperation with local manufacturers
- Innovative installation techniques, including underground, tunnels and existing right-of-ways
- Open standards and interoperability for cost-savings and choice
- Customized logistics and fast delivery worldwide
- Maintenance support and training for installers and operators



Nexans' cable expertise...

WANs/MANs/LANs

To serve complex signaling and communications, Nexans has developed Wide, Metropolitan and Local Area Networks based on the latest multimode optical fiber technology.

The Lisbon inter-modal station (Gare do Oriente) uses a Nexans-installed LAN to manage 8 railway lines, a subway and surface mass transit.

Station range cables

For the final mile, especially in city transport systems, Nexans offers both copper and hybrid copper/optical fiber cables for xDSL transmission, which can be incorporated in a LAN or access network.

Nexans has also developed a universal cable which uses copper and a special filling mass, which means that it can be installed underground, and extended safely into buildings.

Trunk line and radio system optical fiber

To answer the needs of communications and train control, Nexans provides long-distance trunk line optical fiber solutions, and separately networked radio fiber for GSM-R technology.

Advanced right-of-way (ROW) solutions include burying cable along the track, aerial installation (optical ground wire, or self-supporting optical fiber cables), or rail-attached fiber cables protected by impact-resistant, stainless-steel sheaths.

Fiber access routing components

Nexans' splicing modules and jointing sleeves optimize fiber routing, thus guaranteeing network integrity. They are easily implemented as an end-to-end solution in distribution frames, splicing closures and access points.

Nexans provided special jointing sleeves for the optical fiber links of Deutsche Bahn AG for a part of the Cologne-Brussels TGV line. This advanced technology is used for both single circuit and single fiber management.

ODFs and closures

Our modular Optical Distribution Frames provide a complete architecture for main exchange nodes or point-of-presence applications. Splice protection closures are used along the line or at access points to the local loop.

Splicing closures come in a range of splice protection boxes and can be installed in manholes underground or fixed to poles for aerial cables.

Signaling and control cables

Copper, multipair signaling and control cables are hybrid energy/telecom cables providing low-voltage energy and two-way telecommunications for field equipment.

Nexans cables are shielded to protect them both against induction (especially important for ultra-fast TGV trains), and the natural elements.

Axle counter and balise cables

These cables carry vital information about train position, length and number of wagons collected by trackside axle counters and relayed to the driver and the train control center by transponders or balises.

National Rail of the UK chose Nexans as a preferred supplier of axle counter cables which give definite advantages in terms of cable size and performance, especially watertightness.

Radiating cables

These flexible perforated coaxial cables act like antennas in twisting or confined environments, like tunnels, where conventional antennas cannot operate. They are extremely important for ERTMS/ETCS radio-based technologies.

Nexans provided integral cabling for the 35-mile long Lötschberg railway tunnel in Switzerland, the longest in Europe. Along with energy and optical fiber links, radiating cables will assure full GSM-R operability.

Fire performance cables

for public security and emergencies in all critical railway infrastructure



Trunk line and radio system optical fiber cables

for communications and train control

Radiating cables
for data and
GSM transmissions
in tunnels or confined
environments

**WANs / MANs / LANs
(Wide, Metropolitan and
Local Area Networks)**
for signaling and
communications

Catenaries
for trains,
tramways, and
light rail systems

**Station range
cables**
for xDSL
transmissions



**Fiber access
routing components**
for fiber routing
optimization

**Axle counter
and balise cables**
to collect and carry vital
train control information

**Multipair hybrid
energy/telecom cables**
for signaling and control

ODFs and closures
used in exchange nodes
along the line or
at access points

Power accessories
for medium and
low-voltage applications

...contributes to your railway network security

LV, MV and HV energy and feeder cables

for power needs

Catenaries

Nexans produces the messenger cables, droppers and contact wires that make up a complete catenary system for trains, tramways, and light rail systems. Our continuous casting process (which eliminates soldered joints) and new alloys, like copper-silver, copper-tin, or copper-magnesium, have made it possible for high-speed trains to reach phenomenal speeds.

Nexans provided 40 kilometers of copper-tin contact wire to remodel Euston Station, one of London's busiest commuter and mainline terminals. It has also provided catenaries for Spanish, French, Korean and Chinese high-speed trains.

Energy and feeder cables

Nexans manufactures low, medium, and high-voltage cables for both mainline and mass transit. Special MV solutions include Ethylene Propylene Rubber for flexibility, and special insulations that can withstand oil, heat, stress and extreme temperatures.

Nexans supplied the power needs of two major German mass transit systems, in Berlin and Hamburg, and 1,000 km of special Long Stator Winding (LSW) cables for the new levitated Shanghai Transrapid system which uses MAGLEV technology to achieve speeds of up to 500 km/h.

Power accessories for medium and low voltage

Nexans produces medium-voltage accessories, such as joints and terminations, plug-in connectors and bushings, as well as low-voltage cabinets for aerial and underground applications.

For Italian Railways (FFSS), Nexans supplied low-voltage joints using polyepoxy resin to be installed in their many power substations.

Connectivity for medium and high voltage

Nexans produces connectors to link insulated cables with distribution and transmission equipment (transformers, switches), as well as joints and terminations.

Nexans masters heat-shrinkable, slip-on/plug-in, and cold-shrinkable technologies. The latter creates a safe and secure joint that will last over 30 years.

Fire-performance cables

For public security and emergencies, all critical Nexans railway infrastructure cables are HFFR, with improved fire-resistance characteristics. If a fire occurs, they generate low toxicity, corrosion, and smoke density, while continuing to operate over a given period as the outer sheathing is reduced to ash.

After providing nearly 600 km of HFFR cables for the Mexico City metro, Nexans won a contract for Singapore's new Circle Line.

Connectivity accessories

for medium and high-voltage applications

Nexans... service and support all along the line

To help railway operators meet the infrastructure goals of viability, interoperability and easy expansion, Nexans goes beyond cable to offer a number of important services:

Expertise

Upgrading old infrastructures and installing new ones (often from abroad) require knowledge that can only be obtained through long experience, and familiarity with the latest technologies, like high-speed lines and trackside or radio-based train control. Nexans takes an application-engineering approach, which means that when the customer is faced with a problem, or needs a customized solution, we have experts available who can suggest the right specifications in tunnels, underground, or buildings, etc. The fact that we master all cabling technologies means that we are often able to integrate systems for optimum efficiency and value.

Global presence

With our European experience and knowledge of international standards, we can act anywhere on the globe, even on major transnational projects, providing our customers with worldwide delivery logistics.

Several key products have already been fully qualified by CCC (Chinese Conformity Certificate) standards. With plants on five continents and representatives in over 65 countries, we can often count on local production opportunities, an important issue for national railway operators. The synergy between our manufacturing sites provides customers with maximum procurement flexibility, and a reliable source of supply.

Performance

This begins with giving quick and accurate answers to initial customer demands, and then providing a quality product, expertly handled, and delivered on time. Since railways are forced to upgrade under enormous cost pressures, Nexans has developed innovative turnkey products which include system engineering, project management and maintenance. Given the large investment, we are especially concerned with producing cables and systems

that will have the longest possible operational life (well beyond 20 years, in some cases) with low maintenance and high sustainability.

Partnership

Today's large-scale infrastructure projects take a "total enterprise" approach, with international groups or consortiums doing everything from civil engineering and construction, to laying railway track, installing energy, telecommunications and data cables, and designing control systems. With a century of experience in railway infrastructure, Nexans has proven its capacity to communicate and operate across countries, cultures and among various partners. Close cooperation on major projects has led to a preferred supplier status with many of our customers and service continuity, from initial tendering to execution and follow-up.



Global expert in cables and cabling systems

Nexans is the worldwide leader in the cable industry, with an industrial presence in 29 countries and commercial activities in 65. The Group employs 17,000 people. Its sales amount to 4 billion Euros. Nexans brings an extensive range of advanced copper and optical fiber cable solutions to the infrastructure, industry and building markets. Its cables and systems can be found in every area of people's lives, from telecommunications and energy networks, to aeronautics, aerospace, automobiles, railways, buildings, petrochemicals, medical applications, etc.

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