



**Global cable expertise
for rolling stock**

Rolling stock moves ahead

Railways are currently experiencing a renaissance in Europe and around the world. Trains provide fast, comfortable, and safe travel for large numbers of people and the swift delivery of freight, while ensuring environmental-friendliness, land-use efficiency, and energy conservation. Public enthusiasm has meant bulging orders for original equipment manufacturers, and a new generation of onboard equipment and cables for everything from interoperable signaling and energy systems to information and entertainment for passengers. High-speed trains, especially cross-border links are now under construction in Belgium, France, Britain, Germany, Italy, Spain and the Nordic countries. Current estimates say that high speed-rail will probably generate a 25% increase in passenger traffic by 2010, with 350 complete high-speed trains to be built and delivered worldwide by 2020! Meanwhile, freight traffic is booming in Europe, the US and the Far East; and conventional subways, fully-automated metros, and light-rail suburban vehicles are providing a solution to population density and transportation gridlock in overcrowded cities and suburbs. Today's buzzword is "sustainable mobility,"

which means the ability to move the largest number of people, in the shortest time and in the safest, most comfortable way. Experts believe that in the next two decades, twice the number of passengers and triple the volume of freight will be carried by the world's railways. However, a number of challenges must be met, including streamlined costs, necessary upgrades, system integration, better customer service, and innovation to make rail more competitive against road and air travel. As a global expert in cables and cabling systems, Nexans can help you attain these important goals.

What is expected of cable manufacturers

- a complete range of high-quality rolling stock cables from one supplier
- innovative materials and production procedures, including preassembly
- short product development cycles and fast time-to-market for lower costs
- full outsource subsystem responsibility, with customized solutions where necessary
- high interoperability to meet the challenge of European Rail Traffic Management (ERTMS) and the European Train Control System (ETCS)
- industry-wide cooperation and information-sharing
- increased energy-efficiency, compactness, lightness, and resistance
- non-pollution guarantees and high safety levels for public and equipment
- durability, easy retrofitting, and low maintenance



Nexans helps you achieve sustainable mobility and profitability

The rolling stock industry is at a crucial point in its development. Due to concentration, a few large suppliers now account for over 50% of the worldwide market share for rail products. The attractiveness of rail over other modes of travel gives rise to "cautious optimism": trains are far safer than cars, consume 3 times less energy per passenger, and use minimum space, while reducing congestion, pollution and noise. However, economic uncertainties, an overlong innovation cycle, and a traditional lack of uniformity in components raise many questions and uncertainties. In today's cars, 60% of components are common to all makes, a distinct manufacturing advantage. Rolling stock manufacturers urgently need global cable products that are designed to make railways more competitive, safe and cost-effective.

In answer to this challenge, Nexans produces a full range of data and energy cables and components found in modern rolling stock, from low-voltage and data cables with thin-wall technique to energy cables up to 45 kV. Our catalogue includes both standard and thin-wall control cables with or without shielding; silicon-insulated motor connection wires; databus cables; optical fiber cables; special power cables; sheathed singlecore and multicore cables; high-voltage cables and systems; complete harnesses with their connections and sealing ends; robust jumper cables for carrying control and power functions between cars. Virtually all of our cables are halogen-free, meeting the highest standards of safety.

Nexans for on-track safety and efficiency

- World supplier of all data/energy cables and components for rolling stock
- Longstanding expertise in train harnesses for locos, drives and wagons
- Close cooperation with leading OEMs, sub-system suppliers and operators
- Specialists in easy-to-install, pre-engineered solutions for end-assembly
- Integrators of cable systems for important cost savings
- Co-developer of integrated ERTMS/ETCS solutions
- Custom engineering for country-specific problems and standards
- Fast delivery times, flexibility, and automated assembly logistics for harnesses
- Quick time-to-market in product development
- Maintenance support and training for installers and operators
- Developers of fire-safe solutions to safeguard the public, personnel and equipment
- R&D pioneers for new safer materials and lighter, more efficient designs
- Conformity to national, international and new European standards



Nexans provides a wide range of rolling stock cables...

Rolling stock power cables

Nexans manufactures a wide range of flexible, Class 5, tinned copper single and multicore rubber cables to meet the power needs of today's locomotives and drives. This includes cables that can handle 3-phase drives, with variable frequency.

To assure protection in the special operating environments of both electric and diesel locomotives, Nexans has developed a special polyolefin coating against mineral oil in electric motors.

Low and high-temperature power cables for locomotives and drives

To deal with extreme temperatures and weight constraints (especially for ultra high-speed trains), Nexans has developed a new generation of light, compact silicon cables which can operate in temperatures from - 45° C to +140° C (tested to 180° C).

Used on French and German high-speed trains, these cables achieve 10% to 20% weight reduction for the 2 tons of cabling which are standard for this type of locomotive.

Silicone motor connection cables

For high-voltage transformers, motors and generators, where high-temperatures prevail and flexibility is required, Nexans developed silicone cables with good anti-friction properties and abrasion resistance.

Used in Bombardier's BR 185 freight locomotive, these cables have proven flexibility (far beyond rubber), while making important weight and space gains.

HV connection cables, bushings, connectors

To carry electricity from the roof-mounted pantograph to the locomotive's transformer, Nexans manufactures flexible high-voltage cables (up to 45 kV) which are sold as a pre-mounted, pre-tested set, with bushings and connectors. For years now, these sets have been highly rated by both Bombardier and Siemens.

Nexans connectors and terminations are being used both on DSB locomotives in freezing winter conditions between Denmark and Sweden, and also in Swiss Railways' red Loco 200 locomotives in inter-valley and valley runs in the Alps. Increasingly our "dead front" connections have been replacing "live front" ones for greater worker safety.

Winding wires for traction transformers

Continuously Transposed Cables (CTC) are made of multiple enameled copper conductors or impregnated glass fiber yarn/glass polyester-blended yarn copper conductors. In addition, the cable (including single copper conductors) can be insulated with stabilized cellulose paper and polyaramide aromatic paper.



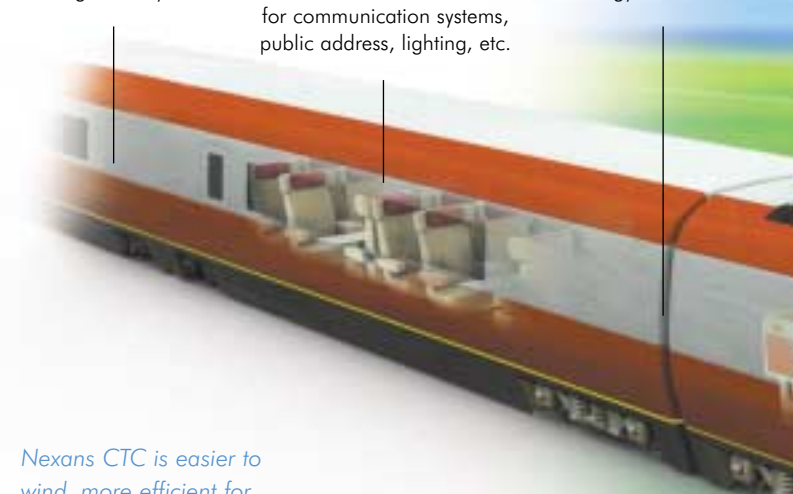
Harnesses
for all train management systems



Standard and thin-wall LV control cables
for communication systems, public address, lighting, etc.



Jumper cables
to carry information and energy between cars



Nexans CTC is easier to wind, more efficient for medium and high-voltage, and extremely durable, with a lifespan of up to 25 years and more.

Winding wires for traction motors

Copper conductors insulated with polyamide foil (temperature class 240), or impregnated glass fiber yarn/glass polyester-blended yarn (temperature class 155 to 200), and enameled (temperature class 180 to 240).

Nexans delivered approximately 1,000 km of 20 kV motor winding wires (long stator) to ThyssenKrupp for the Shanghai Transrapid magnetic levitation railway, capable of attaining speeds up to 500 kmh.

Harnesses

Rolling stock harnesses consolidate wires, connectors and identification systems not only in the locomotive, but in drives and black boxes throughout the train. Nexans designs, manufactures, pre-mounts and end-tests a complete family of harnesses.

For the high-speed Talgo between Barcelona and Madrid, Nexans developed with Bombardier EMC-tested harnesses for faster lead times and easier assembly. With Siemens, a locomotive-length cable tray was designed to accommodate all train management functions.



HV connection cables and connectors
to carry electricity from the pantograph to the transformer



Winding wires
for traction motors



Rolling stock power cables
for power needs of locomotives and drives



Coaxial cables
for multimedia and GSM radio transmissions



Optical fiber cables
to carry vital onboard data



Winding wires
for transformers



Silicone motor connection cables
for HV transformers, motors and generators



Low and high-temperature power cables
to provide energy and deal with extreme temperatures and weight constraints



Databus cables
to assure surveillance and video liaisons

...covering diverse railway standards

Jumper cables

As links between cars and/or bogie cars, short jumper cables carry information and energy in an open, moving environment. Nexans jumpers use a special construction and materials for high flexibility, strength and durability (over one million cycles).

Nexans jumper cables are used on many types of rolling stock worldwide, including light trains, and regional and ultra-high-speed trains in France, Korea, Spain, etc.

Standard and thin-wall, low-voltage (up to 750 V) control cables

Nexans' wide range of control cables (with or without shielding) provide energy and low frequency control for communications, public address, automatic doors, lighting, etc. Where space is limited, our thin-wall designs have a tough but flexible high-tech coating.

Our clients are the who's who of the rolling stock business, including major constructors like Bombardier, Alstom and Siemens, in addition to numerous cable manufacturers serving the railroad industry.

Databus cables

To assure surveillance and a video liaison between both extremities of a train, Nexans has developed a whole series of copper, twisted-pair data cables with different impedances and layups (twins, quads, and special constructions, including hybrid). These databus cables meet the main data standards protocol used in rolling stock, like Profibus, MVB, etc.

Polyethylene foam insulation guarantees low attenuation, while precise manufacturing keeps impedance at constant levels. With Alstom, Nexans developed all onboard cables for the ERTMS and ETCS programs.

Coaxial cables

For multimedia and GSM radio transmissions, as well as rail traffic management and train control, Nexans has developed a series of coaxial cables, meeting all railway requirements.

Nexans coaxial cables come in various sizes and scopes of attenuation, and have special sheathings for safety, flexibility and crush resistance, making them both easy-to-install and durable. They respect RG and KX standards (same connectivity).

Optical fiber cables

Instead of a twisted-pair bus cable, rolling-stock manufacturers can use our high-performance multimode optical fiber cable to carry vital onboard data.

Nexans provided special jointing sleeves to be used in an optical fiber link of Deutsche Bahn AG, a part of the Cologne-Brussels TGV line.

All our cables are halogen-free

To protect people and equipment, Nexans rolling-stock cables are halogen-free, meaning that they are fire-retardant, while providing low toxicity, low corrosivity, and low smoke density.

With Cenelec (the European Electrical Board/working group 12) which specifies new standards for rolling stock cables and their properties, Nexans has been deeply involved in developing and testing new materials and designs to optimize safety at every level.

Nexans... your junction for service and support

To help the railway industry achieve its goals of viability, interoperability and expansion, Nexans goes beyond cable to offer a number of important services:

Expertise

Because of concentration in the industry, rolling stock manufacturers need the kind of technical support and independent problem-solving capability that only a preferred supplier can provide. The fact that cables are Nexans' core business means that we not only have the broad skills needed to supply nearly every cable, harness, and accessory found onboard, we also have a deep understanding of system requirements. That includes a wide range of skills in R&D, standards and legislation, automated assembly practices, logistics, maintenance, etc. We don't just discuss products; we develop systems together with our customers.

Global presence

With our European experience and knowledge of international standards, we can follow our customers wherever they want to go, providing them with worldwide delivery logistics. For example, our products are 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

Nexans heavily reinvests in R&D to constantly develop new products for rolling stock manufacturers in areas like polymers, plastic optical fiber, safe and non-polluting materials, etc. We pioneered a whole range of halogen-free, low smoke cables for onboard safety, which are now an industry benchmark in terms of fire-performance and survival. Because producers are moving towards fully-synchronized production (including sub-component assembly), we provide full support from initial design to delivery, testing and maintenance.

Partnership

During our 40-year involvement in the rail industry, Nexans has acquired invaluable experience by working with engineers, rolling stock designers, construction yards, repairers and especially major manufacturers. By developing products together, we are able to keep prices competitive through more efficient designs and volume sales. Often partnership means finding a standard, interchangeable product, but it can also mean proposing above-standard, customized solutions. Long-term cooperation leads to continuous improvement and "a best of everything" approach among independent companies who pool their strengths in today's global railway market.





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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