

**FLAMEX®**

TO SUPPORT YOUR ROLLING STOCK  
PERFORMANCE AND SAFETY ONBOARD:  
COMPLETE RANGE OF CABLE SOLUTIONS  
AND SERVICES





# THE GROWTH OF WORLD RAIL TRANSPORT

**Rail provides an answer to sustainable mobility and the land movement of people and goods. It ensures energy-efficient mass urban/suburban commuting in “smart cities,” regular and high-speed travel between cities, and economical freight transport across continents.**

Population size, urbanization, congestion and economic development have stimulated rolling stock orders, including high-speed trains, electrical multiple units (EMUs), locomotives, trams and metros. Growth is averaging 3.5% annually, and total market volume is expected to reach over 46 billion Euros per annum by 2019.

The regional markets with the highest growth rates are Latin America, Asia/Pacific and NAFTA, with major rail projects in Brazil, China, India and the US. In France, Germany, Russia and South Africa railways are being upgraded (especially regional lines). China is targeting railways to boost the economy and facilitate travel, while India has approved hundreds of rail projects for the same reason. Meanwhile, 150 cities with populations of over a million persons are looking to rail to solve urban problems and create new opportunities.

Driven by customer-demand for cheaper, safer, more comfortable and efficient rail travel, and national policy objectives for carbon reduction and transportation efficiency, rolling stock manufacturers are undergoing significant changes, many of which require advanced cabling solutions. In addition, they are increasingly asking for services from partner-suppliers: from inventory management to customer tailored packaging, recycling, the resolution of technical and installation problems, and design-to-cost.

## What you expect from a cable producer:

- Comprehensive range of high-quality rolling stock cables
- Common products that meet railway standards worldwide
- Integrated systems and harnesses to simplify installation
- Longer lifetime for cost savings and lower maintenance
- Increased energy-efficiency, compactness and lightness
- Services to lower cost-of-ownership and increase competitiveness





# REQUIRES **FLAMEX®** CABLE SOLUTIONS FOR SAFETY, PERFORMANCE, AND COMFORT

**Nexans is a highly-experienced, vertical market supplier who can manufacture the hundreds of specialty products necessary to fit out a complete trainset. We have supplied over 80% of the cables used for major projects like Bombardier's Intercity AGC and the high-altitude Tibet Line, Alstom's two-level RGV2N TGV, and Siemens VAL 208 driverless metro, often consolidating supply and subsystems in order to eliminate the need for multiple sub-contractors.**

Our FLAMEX® cable solutions include power cables for locos, EMUs, and self-propelled bogies, like the Alstom AGV which offers speeds up to 360 km/h. We developed high-temperature solutions for locomotives, high-voltage connectivity between pantograph and transformers, and low-voltage power for cars. Control cables assure operational performance and safety, while data cables provide surveillance, video and internet. Cable harnesses and jumper cables include optical fiber in hybrid cable systems.

We assure compliance to standards, with rigorous testing done in our research laboratories. Growing safety demands have driven us to find better ways to assure electrical circuit integrity and improve fire performance. Energy concerns of operators have inspired us to develop smaller, lighter products; and a pressing need for train management has led to significant advances in data cable designs.

By responding to your operational requirements, Nexans' Service Program combines just the right cables with a tailored service package to generate immediate and lasting value for your investment.

## **FLAMEX® for on-track safety and train performance**

- Complete data/energy cables and components for rolling stock
- Full conformity with national and international standards
- Integrated harnesses and subsystems, and ERTMS/ETCS solutions
- Fire-performance cables to protect the public, personnel and equipment
- Rugged, long-lasting cables tested for 20,000 hours of operation
- High-performance data cables, including fiber for multimedia
- Aluminum conductors; reduced cross-sections for high-temperature cables
- Services throughout trainset life cycle, from conception to replacement/recycling

# FLAMEX® ROLLING STOCK CABLE SOLUTIONS



## Control cables



FLAMEX® control cables are particularly recommended for the wiring of electronic equipment in low voltage applications. Designed to conform to EN 50306, the control cables are intended

for rolling stock applications where weight and space is an issue. A 125°C conductor temperature is allowed for a 20,000 hours cumulative working time.

## Power cables with reduced insulation thickness



Nexans FLAMEX® power cables are designed to comply with EN 50264 requirements. They are installed in switching station and control panels through cable ducts, pipes and

tubes in line with EN 50343. A 120°C conductor temperature is allowed for a 20,000 hours cumulative working time.

## High temperature flexible power cables



FLAMEX® SI power cables are particularly recommended where high temperature is required to save cable weight. Designed to conform to EN 50382, they can withstand

extreme temperature (from -50°C to 150°C) while offering significant weight savings compared to regular power cables. A 140°C conductor temperature is allowed for a 20,000 hours cumulative working time for 120°C types. Thanks to their high flexibility these cables are easy to install in narrow space.

## Communication cables



This range of Multimedia and Data transmission cables meets the current needs of the market especially regarding the interoperability of trains



and railway equipment throughout Europe (ERTMS). These cables are adapted for data transmission up to 600 MHz, with performance close to that of Category 7 cables. Nexans' experience in the design of shielding technology enables us to propose all constructions with high EMC protection: Databus cables for passenger video services/surveillance and vital equipment, coaxial cables for rail traffic management and train control, optical fiber cables to bring high bandwidth for onboard services.

### Fire resistant cables

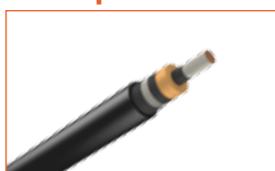


In the event of fire, rolling stock equipment should remain functional to help in the evacuation process. Nexans has been at the forefront of technological progress in fire

resistant cables, designing control and power cables to be used in safety systems (emergency lighting, fire detection, warning systems, door opening, etc.) for control or power

feeding. These cables ensure the integrity of electrical circuits for a certain time after the fire started. FLAMEX® fire resistant cables are surviving more than 90 minutes when tested according to EN 45545-2.

### HV loops and accessories



Nexans offers a wide range of products and services for high voltage applications in traction power supply systems:

- Flexible HV FLAMEX® (N)TMCGCHXOE or PANTO cables
- Separable connectors and terminations for inside or outside use
- End-to-end customized HV loop solutions including mounting of each single component and electrical testing.

### Hybrid, jumper and high-temperature cables



Nexans produces a complete range of standard or customized jumper cables for power and data transmission outside trains, subways and tramways.

Nexans manufactures 2 jumper cable types:

- to supply power in each coach,
- to transmit information between coaches and between chassis and bogie inside a coach.

# SERVICES TO MAKE YOU MORE COMPETITIVE



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↑↓  
♿

← 博多博多  
全席喫煙 Non-Smoking Seat  
1 2  
3 4 5 6 7 8 9 10  
4 8 3  
• かけ込み乗車は急なためおやめください。  
• 喫煙席はマナーシートなどに切り替えください。  
• 手荷物や持ち物の忘れ物等は、速やかに乗務員までご連絡ください。  
\* Full view ability of seat back for each train.  
\* Please observe the safety rules at all times.  
\* Please notify the staff immediately if you find any suspicious goods or substances.  
テーブルの重量制限 Load limit : 10kg

### **Inventory management**

Nexans uses high-performance analysis tools to carry out diagnostics and propose personalized solutions to speed up supply chain flows to reduce costs, cash flow and free up warehouse space, and to simplify project management. It gives strong leverage to our customers in reducing the Total Cost of Ownership of their cable needs.

### **Custom-tailored packaging**

Cables are delivered on special reels, custom packaged with added protection (protective film wrap, lagging, hooping) and cross-docking to consolidate deliveries. This facilitates rollout of new projects and reduces waste.

### **Recycling**

For 30 years, Nexans has collected and recovered cable waste from production plants and from cables at end-of-life. Recycable (35%-owned by Nexans) recycles cable cores to produce new wires, while polymers are transformed into useful items.

### **Innovation**

For OEMs, Nexans makes available R&D tools like numerical modeling, electron microscopy, laboratory testing and engineering expertise. Innovation accelerates time-to-market, optimizes performance, and lowers development costs.

### **Technological consulting**

Nexans optimizes electrical, thermal and mechanical designs for rolling stock, and conducts life-cycle analysis to assess environmental impact. For major projects, a resident engineer oversees the project and provides maximum onsite support.

### **Design to cost**

On-site experts identify solutions and technical alternatives to make cable purchases leaner and reduce Total Cost of Ownership. Bills of materials are optimized, both in terms of process and performance.



### **"My Nexans" dedicated space**

Through personalized access, you can track orders and deliveries, create pre-selected catalogues, consult inventory and product availability.

A dedicated space provides a secure electronic library of all technical, administrative and commercial documentation over a project's lifetime.

## SERVICES ON THE HORIZON

### GLOBAL EXPERTISE

Nexans' complete, safe, high quality solutions incorporate customized products, new materials and advanced techniques, and are delivered via integrated logistics everywhere.

### LOCAL PRESENCE

Our international manufacturing resources and dedicated sales teams support your rolling stock activities worldwide, including upgrades and provisioning of complete trainsets.

### INNOVATION

Nexans co-developed solutions for ERTMS/ETCS, pioneered high and very low-temperature cables, achieved weight/space gains, and enhanced manufacturing through modular subsystems.

### SERVICES

To boost competitiveness and performance, Nexans proposes high value-added services which are a response to your overall procurement, production and marketing needs.

Nexans brings energy to life through an extensive range of cables and cabling solutions that deliver increased performance for our customers worldwide. Nexans' teams are committed to a partnership approach that supports customers in four main business areas: Power transmission and distribution (submarine and land), Energy resources (Oil & Gas, Mining and Renewables), Transportation (Road, Rail, Air, Sea) and Building (Commercial, Residential and Data Centers). Nexans' strategy is founded on continuous innovation in products, solutions and services, employee development, customer training and the introduction of safe, low-environmental-impact industrial processes. In 2013, Nexans became the first cable player to create a Foundation to introduce sustained initiatives for access to energy for disadvantaged communities worldwide. Nexans is an active member of Europacable, the European Association of Wire & Cable Manufacturers, and a signatory of the Europacable Industry Charter. The Charter expresses its members' commitment to the principles and objectives of developing ethical, sustainable and high-quality cables. We have an industrial presence in 40 countries and commercial activities worldwide, employing close to 26,000 people and generating sales in 2015 of 6.2 billion euros. Nexans is listed on NYSE Euronext Paris, compartment A.

### Nexans

8, rue du Général Foy - 75008 Paris - France  
Tel. : +33 (0)1 73 23 84 00 - Fax : +33 (0)1 73 23 86 38  
[www.nexans.com/flammex](http://www.nexans.com/flammex)  
[marcom.info@nexans.com](mailto:marcom.info@nexans.com)