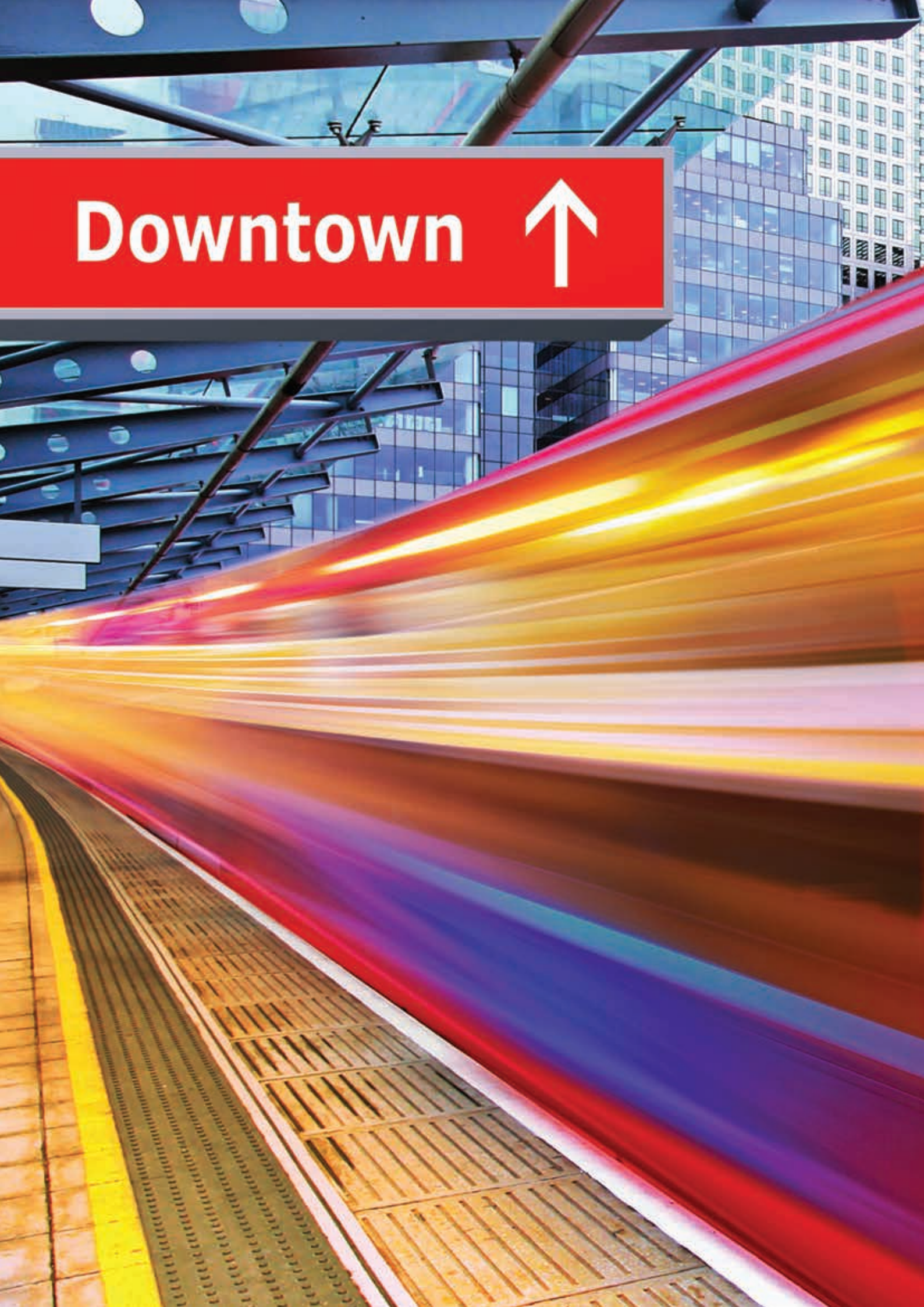




RAIL COMPONENTS AND APPLICATION GUIDE

Downtown ↑



TE CONNECTIVITY CAN HELP YOUR NEXT STOCK TO ROLL AND YOUR COMMUNICATION TO RUN

The railway industry is undergoing rapid changes in the quest for energy efficiency, increase of economies, reliability, effectiveness and quality of railway transport. Urbanization, growing populations and increasing environmental concerns are all factors leading to an increased demand for railway public transportation. Today's railroads evolve into an evermore high-tech industry. Whether it is rolling stock, services, system and signalling, including railway related telecommunication equipment, and infrastructure the same challenges are being faced throughout this complex market. For over 50 years, TE Connectivity has helped make it easier and more productive to increase capabilities, ensure reliability and control maintenance costs for on-board railway applications and signalling.

Early Involvement Pays Off In Competitive Advantage

With approximately 7,000 engineers at 21 global design centres, plus 100 manufacturing facilities and operations in over 50 countries globally, we put a premium on innovation when it comes to helping companies solve tough design problems. Talking to us early on in your design cycle will give you the full benefit of our expertise, to help you:

- Shorten the design cycle
- Reduce costs
- Increase reliability
- Design for manufacturability

In short, we can help you achieve a sustainable competitive advantage.

Our commitment to advanced engineering and world-class manufacturing delivers innovation that can advance any project - from

showing you the best existing products to offering a value-added solution, or even designing a new product.

TE Connectivity is one of the world's largest suppliers of passive electronic components, including connectors and interconnect systems, relays, switches, touchscreens, sensors, filters and wire and cable.

TE Connectivity's ability to serve your present and future requirements is realised through the synergies of a strong R&D programme and our expertise in materials science, product design and process engineering, all supported by our network of knowledgeable application engineers, sales representatives and customer service personnel.



EVERY CONNECTION COUNTS



7,000 engineers



100 manufacturing sites



21 design centres

EXPERTISE IN RAILWAY INDUSTRY

Within our development teams, we have the knowledge and the skills which are required to meet all of your needs. Our global presence means we operate wherever you do, and we can support you worldwide through a single account management programme, to simplify design and sourcing. Our focus on the railway supply industry gives you access to the widest selection of standard and semi-custom products, including:

- High voltage products
- Connectors and terminal blocks
- Wire and cables
- Identification
- Value added harnessing
- Resistors and passives
- Sensors and relays
- Tooling

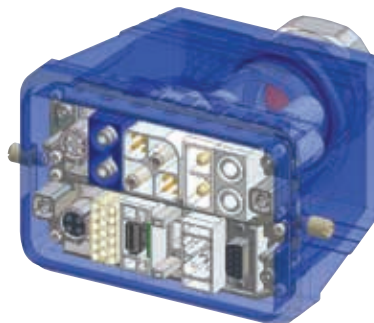
and many others from such well respected brands as Raychem®, HTS, AMP, SCHRACK, Bowthorpe EMP, CII, Potter & Brumfield, EMP & Device, HARTMAN and KILOVAC.



HVJL inter-car jumper cable showing secondary communications lead.



FXP Connector



Heavy duty connector with modular inserts for pneumatic, power, signal and communication.

Faster Front-End Design

With market dynamics forcing ever-shortening design cycles, our ability to quick-turn product concepts will keep your projects on schedule and shorten the time to market. Our capabilities include:

- Computer-aided engineering
 - giving some of the most sophisticated modelling and simulation capabilities in the industry to validate a design before prototyping
- Rapid prototyping - from stereolithography for rough 'form and fit' evaluation in minutes, to model shops that turn prototypes in days, providing you with product samples quickly and conveniently
- CAD model interchange - allowing us to import your CAD files into our system for custom application development. Alternatively, we provide our CAD files in a wide range of formats for maximum compatibility, to ease integration of our products into yours. Sharing files is simple, fast and seamless.

Innovative Engineering For Mechanical, Electrical & Thermal Performance

From extensive research in materials, contact physics and signal transmission - to advanced tools which can model, simulate and validate a design, we understand the requirements of the railway supply industry. Every product we design considers the mechanical, electrical and thermal parameters - and their interactions.

Every design is subject to solid modelling, finite element analysis (FEA), root-cause failure analysis (RCFA) and failure-mode and effects analysis (FMEA) - all supported by extensive design reviews and documentation, so that the design is optimised for its application.

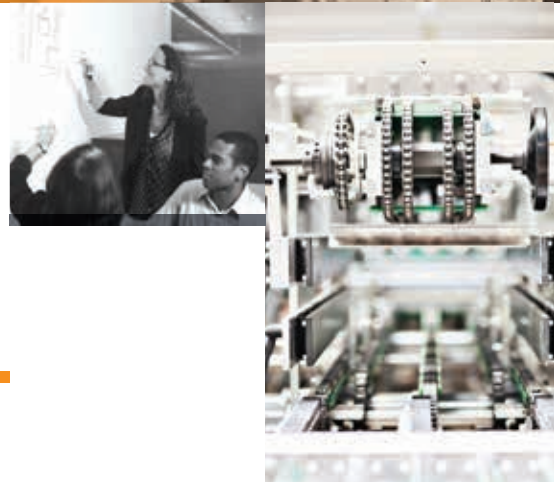
ENGINEERING CENTRE & QUALITY STANDARDS

Our in-house test capabilities include mechanical, electrical, environmental testing and ANSYS analysis to qualify and validate that our products meet your specifications. Our test labs are approved by Underwriters Laboratories for testing TE Connectivity's passive components, which is your sign that they meet stringent requirements for rigorous and reliable analysis. Routine capabilities include:

- Environmental Testing
 - Temperature and humidity
 - Temperature cycling
 - Thermal shock
 - Heat aging
 - Ice Covering
- Electrical
 - Contact resistance
 - Dielectric withstanding voltage
 - Temperature rise versus current
 - EMI
- Mechanical
 - Vibration
 - Shock
 - Tension/compression
 - Mating cycles
 - Mating/unmating forces
 - Normal force
 - Flex life
 - Crush resistance
- Product Simulation

Your Standards Are Our Standards

Our engineering teams have a thorough knowledge of agency standards and regulations. We design and test our products to allow you to satisfy these requirements, through qualification testing, periodic retesting, labelling and marking. We comply with standards from CENELEC, IEC, UL/CSA, BS, NFF, EN, VDE, MIL, DIN and other international agencies. We comply so you can comply.



Customer Confidentiality

All customer and project-related information will be handled securely and with extreme care. In order to guarantee complete confidentiality and peace of mind, TE Connectivity provides secure data exchange services for all documentation and CAD models via IFX (Internet File Exchange) and Odette servers.

Product & Application Specifications

TE Connectivity provides a full range of documentation which contains all of the product specifications you may require. Application Specifications are also available, in order to ensure that all components and products are professionally implemented.

CONNECTING RAILWAY INFRASTRUCTURE AND ROLLING STOCK

Population increases, rising congestion and environmental concerns are driving resurgence in the rail industry. Optimising existing rail networks for increased capacity and improved passenger experiences means modernising both the infrastructure and rolling stock like never before.

TE Connectivity relies on its unique combination of deep Rail industry experience and rigorous testing to answer the challenges of today, and to power the innovations of the future. We provide high quality products that are easy to install, offer superior reliability and are designed to thrive in harsh environments, with no maintenance.

Capabilities

TE's line of reliable, high-performance products - including well-known brands like Raychem®, Simel and Bowthorpe EMP - enable continuous power flow, to optimise networks and improve passenger comfort. Applications include:

- Substations
- High voltage power distribution
- Catenary
- Overhead line and third rails
- Signalling and rail control
- Rolling stock
- Traction, interior power and signal distribution
- Data and information
- Cable identification





Energy Solution

TE Energy develops, manufactures and markets products and systems for the electrical power industry. Our products are extensively employed by power utilities and equipment manufacturers, in railway transport systems and in industry around the world. We are a leading global supplier of Cable Accessories, Connectors and Fittings, Insulators, Insulation Systems, Surge Arresters, Switching & Protection, Street Lighting and Power Measurement and Control products



Data System Solution

Telecom-Outside Plant business unit offers a broad product portfolio for communication service providers. They install and maintain the millions of miles of copper and fibre optic cables - and the associated switching and routing infrastructure - that bring telephone, data and cable television service to commercial buildings and residences. Build-out of "Last-Mile" Fibre-to-the-Home installations has increased significantly, supporting broadband requirements driven by Internet traffic and high-definition television. Our products include connectivity, passive devices, above-and below-ground enclosures, wall mountable boxes, heat shrink sleeves, street cabinets and distribution frames for copper and fibre networks.



Tooling Solution

TE Application Tooling is dedicated to providing high quality equipment options to meet all levels of our connector products specifications. We are also able to provide a broad range of equipment for other manufacturer's products.

Our equipment range is vast and unmatched by others operating in the same industry segments, as is our global presence and support network in the form of field service engineers and product managers. You will see from browsing this catalogue; we supply everything from simple hand tools to the most complex automated systems - you name it, we supply it!

RAILWAY INDUSTRIES





TYPICAL APPLICATION IN RAILWAY INDUSTRY

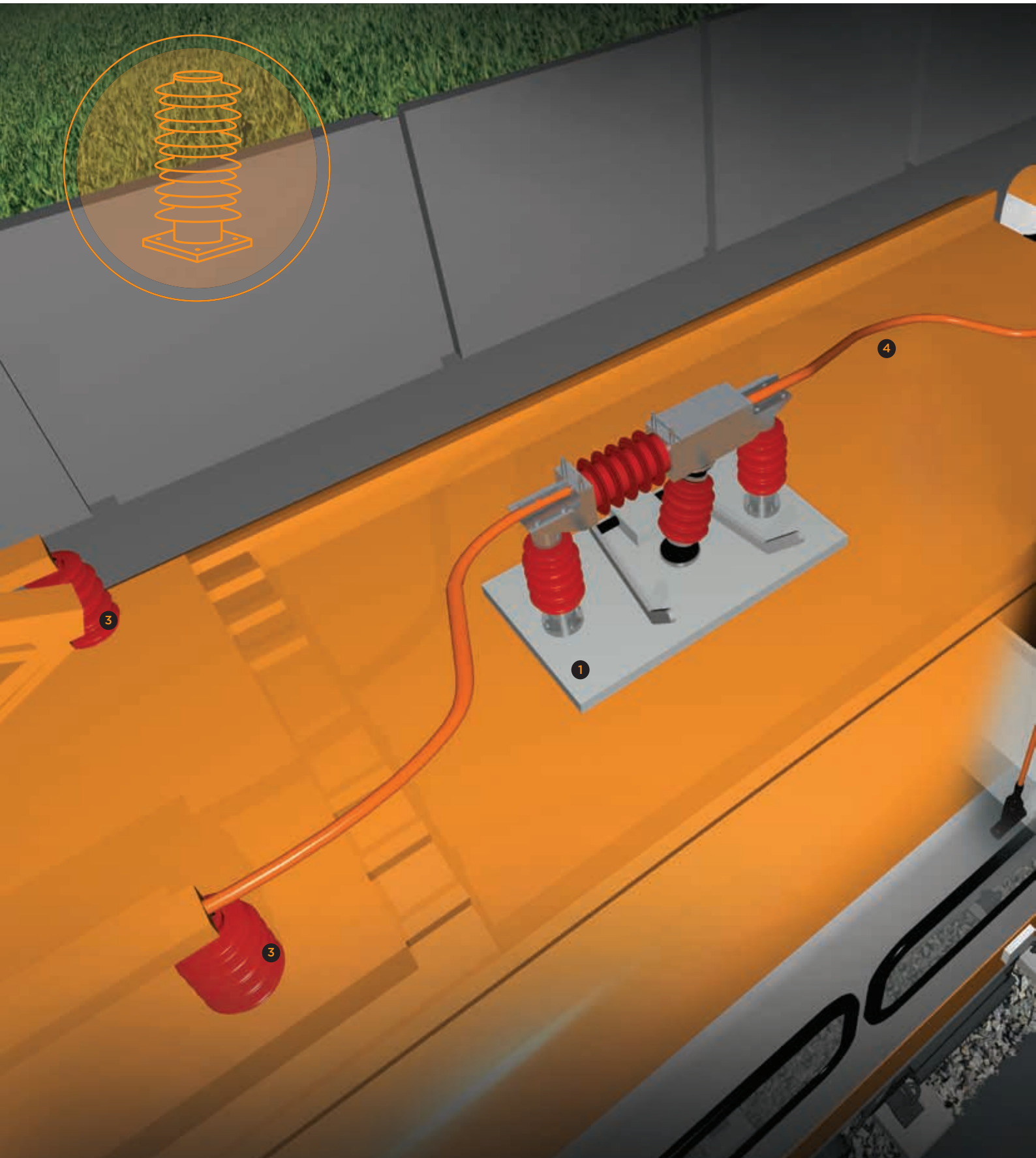
Urbanisation, growing populations and environmental concerns are all factors leading to an increased demand for railway public transportation. Industry competition is leading to greater innovation and efficiency, reduced cost and delivery lead-times, higher performance and product standardisation.

TE Connectivity serves four major application areas ranging from High Voltage, Power Distribution as well as Low Voltage Applications in rolling stock to Signalling applications. The product portfolio covers the needs for all train types and major sub systems from urban to very high-speed applications, including diesel propulsion, refurbishment activities as well as analogue and computer-based signalling equipment.

Manufacturers are seeking further efficiency savings in the full range electrical components that meet low life-cycle costs. Our passive electronic components, including connectors and interconnect systems, relays, switches, sensors and wire and cable enable increased productivity and capabilities. This will improve operational availability and control of maintenance costs.



HIGH VOLTAGE





HIGH VOLTAGE POWER DISTRIBUTION FOR RAILWAY VEHICLES

High Voltage Power Distribution is facing many changes. Locomotive manufacturers are increasingly looking at efficiency savings in all areas of design, such as minimising the top weight of the car, maximising maintenance intervals, reducing aerodynamic noise and raising withstand temperatures.

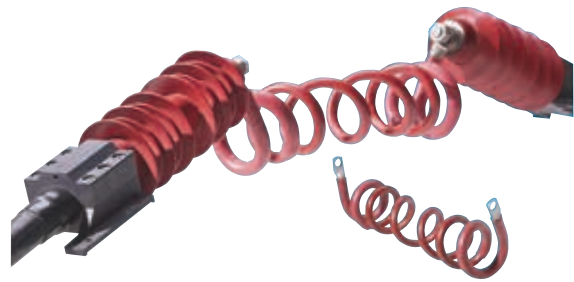
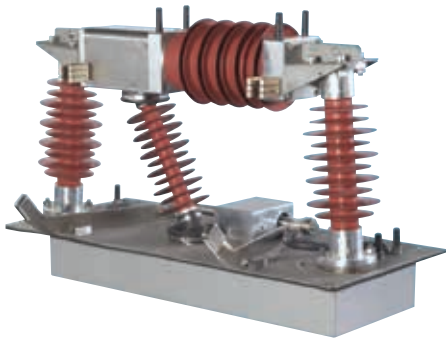
Our engineers are developing the next high-tech component and assembly solutions for tomorrow's railway technologies. We offer customers the complete High Voltage system, from pantograph to main transformer for 50/25/15kV AC applications. Products are also available for 3/1.5/0.75kV DC applications.

Our comprehensive range of inter-connection, insulation, protection and switching equipment comes pre-tested and ready for installation. Raychem® polymeric insulation delivers high impact resistance, lightweight, small size and aerodynamic profile. Plug and Play capability ensures quick integration to help companies get their rolling stock fleet to a high operational level. Robust materials and long creepage paths ensure that our products require no cleaning under most service conditions. Application of High Voltage, electrical and mechanical engineering expertise means that all products can be custom-designed to individual vehicle requirements for new build and retrofit purposes.

Amongst a wide range of general interconnection and passive components, TE Connectivity also offers the following products which address this market:

- ❶ High Voltage Circuit Breaker (HVCB)
- ❷ Inter-Car Jumper Cables (HVJL)
- ❸ High Voltage Insulator (HVIB)
- ❹ HVTT, HVTE and HVEE
- ❺ Cable Assemblies
DC Jumper (HVJL)

HIGH VOLTAGE



VESA HVCB – High Voltage Circuit Breaker

TE Connectivity HVCB vacuum circuit breakers provide main circuit switching as part of the train's high voltage power control system. The combination of industry-leading Raychem® high voltage insulation materials, the latest vacuum interrupter designs and well-proven electromagnetic actuator technology provides a solution that is both innovative and reliable.

Product Features

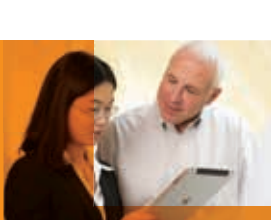
- 25kV vehicle mounted circuit breaker optimised for use in the railway environment
- Electro-magnetic operation - no compressed air required
- Solid insulation with no internal creepage paths to eliminate internal flashovers
- Low height and weight compared to existing technologies
- Fits industry standard footprint making it suitable for new-build and retrofit applications
- Available with integral earthing switch, saving space and expense
- Can be interlocked with train safety/control systems
- High reliability and low maintenance reducing total lifecycle costs

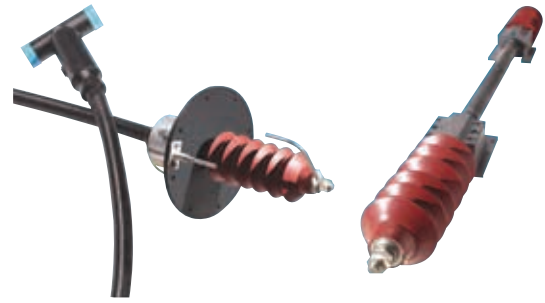
VESA HVJL – Inter-Car Jumper Cables

TE Connectivity 15/25kV jumper cables provide a low profile and maintenance-free inter-car jumper solution that is robust and reliable in the harsh railway environment. Industry-leading Raychem® insulation and a plastic strength member gives high flexibility over a wide temperature range.

Product Features

- Insulated against flashover
- Low profile to improve clearances and minimise wind resistance
- Coiled form allows large flexing range with minimum space
- Customisable for individual applications
- Impact resistant
- Lightweight
- Maintenance-free minimising lifecycle costs





VESA HVJL – DC Jumper

Our 750v DC and 25kV AC jumpers are used where flexibility is needed in all three axes. Raychem® insulation materials and a glass-fibre strength member gives a design that works over a wide temperature range and is reliable in the railway environment. Conductor sizes available up to 2000A. Below 3kV DC, a secondary low power or communication cable can be included. A U-shaped jumper is also available for situations where space is at a premium. It can be installed either horizontally or vertically and can accommodate large inter-carriage movements in two planes.

Product Features

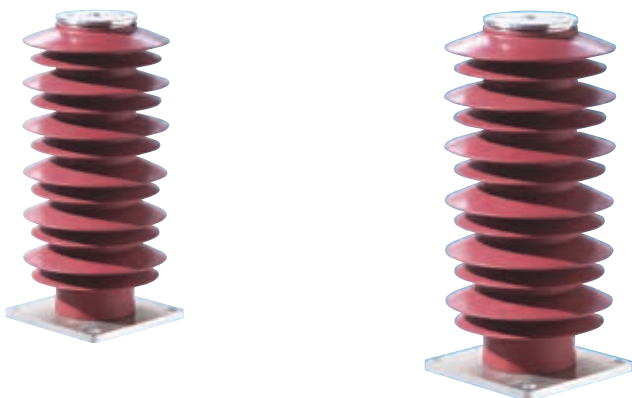
- Flexible across a wide temperature range
- Insulated against flashover
- Customisable
- Impact resistant
- Maintenance free minimising total lifecycle costs

VESA HVTT, HVTE and HVEE Cable Assemblies

Our 15/25kV roof-line and equipment connection cables for use between the pantograph and main transformer come pre-tested and ready to install. Industry-leading Raychem® insulation and stress control materials with flexible EPR insulation make our assemblies easy to install and reliable in the harsh railway environment.

Product Features

- Customisable for individual applications
- Over 20 years' service history on high speed trains
- Lightweight terminations compared to conventional ceramic alternatives
- Made from impact resistant polymeric materials
- Maintenance-free



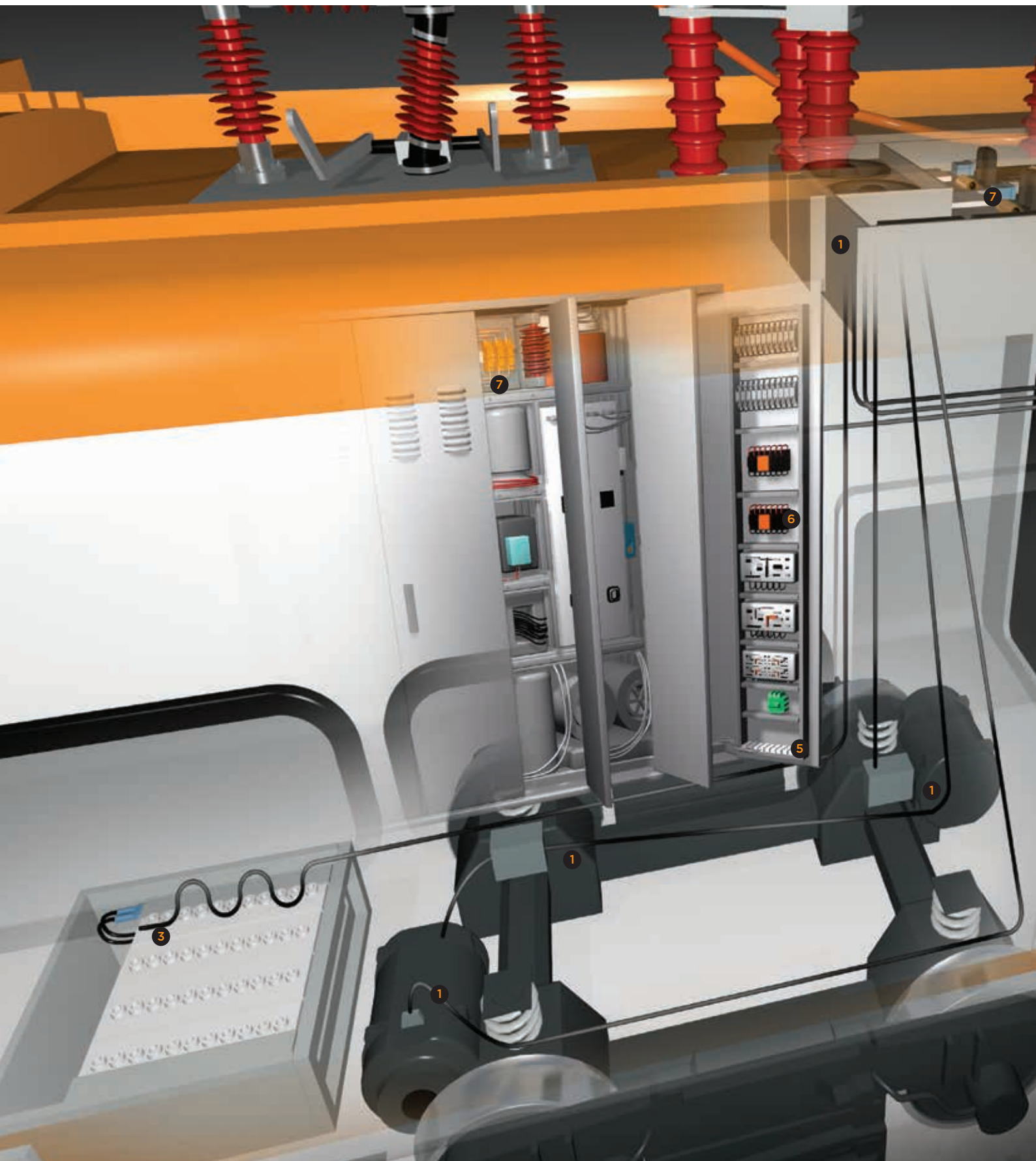
VESA HVIB High Voltage Insulators

Our 1.5/3kV DC, 15/25kV AC polymeric insulators provide robust, lightweight designs for pantograph and equipment supports. Raychem® insulation materials and polymer or glass fibre cores make these insulators easy to install and reliable in the harsh railway environment. HVAF Airfeed insulators include an integral airfeed line for pantograph operation.

Product Features

- Standard designs available but can be customised for specific applications
- Lightweight
- Impact resistant
- Reliable - over 20 years' service history on high speed trains
- Maintenance-free

POWER APPLICATIONS





POWER APPLICATION FOR RAILWAY VEHICLES

Today's rolling stock generation for public transport fulfils a variety of the power supply and distribution requirements, to meet the demands of comfort for passengers and profitability for operators. Power applications are allocated throughout the train roof and underfloor, including power converters/inverters as well as power storage and miscellaneous distributed sub systems.

Quick replacement and low maintenance of widely distributed equipment, whilst reducing space, weight and energy consumption to increase passenger comfort, requires sophisticated solutions. Operators throughout the world are demanding more productivity, efficiency and availability from their modern rolling stock fleet. It is critical to monitor, integrate into control systems and control motor performance.

Our modular concept is a solution to the standardisation of sub systems while fulfilling individual requirements. Due to the wide range of operating environments, IP65 – IP69 protection class components can be crucial for a robust and reliable system. Our wide range of power applications and onboard equipment working on several power levels include couplers, batteries, pantographs, converters/inverters and “coach to coach” solutions.

Amongst a wide range of general interconnection and passive components, TE Connectivity also offers the following products which address this market:

- ① Heavy Duty Rectangular Connectors
- ② Heavy Duty Circular Connectors
- ③ AMP Power Battery Connectors
- ④ Power Wave crimp
- ⑤ AMPOWER Terminals and Splices
- ⑥ High Performance Relays, Contactors and Solenoids
- ⑦ Power Resistors

POWER APPLICATIONS



EKO Series

Rectangular monobloc power connector in composite. Locked by 2 stainless steel screws and available in 5 sizes with 1, 3, 4 or 5 contacts. Crimp contact with cross sections from 25mm² to 240mm².

Product Features

- Nominal current - up to 800A (with 240mm² cable)
- Nominal voltage - 1500v or 3000v
- Protection index - IP66 or IP67 according to EN 60 529
- Salt spray resistance - 96 hours (more on request)
- Temperature range - from -40°C to +100°C
- Fire behaviour - requirement 2 following NF F 16-101 & NF F 16-102 and UL94V0

Standards & Quality Approvals

- ALSTOM approval
- SIEMENS approval
- SNCF approval

Technology/Coupling System

- High power
- Screw thread



FXP Series

Product Features

- Test voltage - > 12000v
- Temperature range - from -40°C to +100°C
- Service voltage - 3000v (OV2-PD3 and OV3PD2 according to EN50-124) or 4000v (OV2-PD2 according to EN50-124)
- Salt spray resistance - 500 hours
- Endurance - 500 mating cycles
- Keying system - 6 positions
- Fluid resistance - gasoil, mineral oil, base and acid
- Protection Index - IP68
- Fire and smoke - compliant to EN45545
- Cross Section - contact caliber 7mm (50mm²) up to 175A and 12mm (120mm²) up to 400A
- Shell - aluminium shell with chemical oxidation plating and black varnish
- Insert - thermoplastic (Group I)
- RoHS compliance

WYE Series

A single pole power derivation in composite. Includes a locking system with captive screws and crimp contact for cross sections from 35mm² to 120mm².

Product Features

- Nominal current - up to 400 A (with 120mm² cable)
- Nominal voltage - 3000v (OV2-PD2 following EN 50-124) or 1500v (OV2-PD3 following EN 50-124)
- Test voltage - 5750v
- Insulation strength - > 5000 MOhm
- Protection index - IP66 according to EN 60 529
- Temperature range - from -40°C/+100°C
- Keying system - 6 positions
- Endurance - 500 mating cycles
- Fire behaviour - requirement 2 following NF F 16-101, NF F 16-102 and UL94V0
- RoHS compliance

Standards & Quality Approvals

- BOMBARDIER approval
- RATP approval

Technology/Coupling System

- High power
- Screw thread



CAM Series

Circular connector in aluminium with handle locking system, suitable for very harsh environments. Designed for intervehicle jumpers (dynamic applications). From 4 to 61 poles, with straight or angled plugs.

Product Features

- Nominal current - 10 to 500A
- Service voltage - up to 750v
- Temperature range - from -40°C to +100°C
- Endurance - > 500 mating cycles
- Salt spray resistance - 96 hours (more on request)
- Many robust configurations available for signal and power use
- Suitable for harsh environments
- Safe and easy locking system

Technology/Coupling System

- Environmentally sealed



CPP Series

Screw coupling aluminium connector for power connections. Suitable for intervehicle or underframe location. 4 shell sizes with 7 arrangements, from 1 to 11 poles. Removable hard insert, and silver plated crimp contacts.

Product Features

- Nominal current - from 50A to 500A
- Service voltage - from 400v AC to 1500v DC
- Test voltage - 3250v and 5750v
- Protection index - IP66 mated with suitable backshell according to EN 60529
- Salt spray resistance - 96 hours or 500 hours depending on the shell plating
- Temperature range - from -40°C to +100°C
- Endurance - 500 coupling cycles
- Fire behaviour - requirement 2 following NF F 16-101 & NF F 16-102
- RoHS compliance

Standards & Quality Approvals

- NF-F 16-101 standard compliance
- NF-F 16-102 standard compliance
- NF-F 61-030 standard compliance

Technology/Coupling System

- High power
- Screw thread
- Environmentally sealed



CMC Series

Screw coupling aluminium connector for signal and control. Suitable for intervehicle or underframe location. 6 shell sizes with 24 arrangements, from 4 to 61 poles. Removable hard insert, silver or gold plated crimp contacts with metallic clip.

Product Features

- Nominal current - from 15 to 250 A
- Service voltage - up to 400v AC according to NF F 61-030
- Test voltage - 2550v or 3250v according to NF F 61-030
- Protection index - IP66 mated with suitable backshell according to EN 60529
- Salt spray resistance - 96 hours or 500 hours depending on the shell plating
- Temperature range - from -40°C to +100°C
- Endurance - 500 coupling cycles
- Fire behaviour - requirement 2 following NF F 16-101 & NF F 16-102
- RoHS compliance

Standards & Quality Approvals

- ALSTOM approval
- SNCF approval
- NF F 61-030 standard compliance

Technology/Coupling System

- Environmentally sealed
- Screw thread

POWER APPLICATIONS



HTS Power Connectors

Ranging from standard types to circular customised solutions, these enable specific constructions for large dimensions, weight optimisation or electrical and mechanical improvements.

Product Features

- **AM1P Drive Motors**
Single pole for current rates <300A with crimps and terminations for cable lugs; or
- **Quick disconnect**
Combining up to 4 x 370A, ground contact for 120mm² and 3.5kV nominal voltage, impact and corrosion resistance for usage in bogie-wiring; or
- **Power connectors**
Current ratings up to 500A, strain reliefs, ground connection and corrosion resistance



HTS Power Connectors Series HF

HF series combines housings with outstanding corrosion protection and EMI features with the unique coil spring contact system.

Product Features

- Wire cross sections of up to 150mm²
- Nominal voltage up to 3000v; current up to 420A
- Weight-reducing aluminium die-cast
- Excellent EMI features; outstanding protection against corrosion due to hard coating
- IP68 rating for permanent protection
- Cable thread up to size M63
- Highest vibration and shock protection





AMPOWER Terminal and Splice AWG

AMPOWER terminals and splices are ideally suited for power generation and distribution, including interconnections of power supplies to peripheral equipment.

Product Features

- Designed for large cables and leads
- Accepts a wide range of stranded copper wires (6AWG to 1,000MCM for terminals and up to 1500MCM for splices)
- High quality, seamless tubular copper for maximum conductivity
- Listed by Underwriters Laboratories, Inc. File No. E12388, Spec. 486
- Certified by Canadian Standards Association File No. LR7189
- Available in a variety of terminal and splice styles



Power Cables

High performance power cables meeting the demanding requirements of EN 50264. These cables are extremely flexible, tough and fluid resistant. Available in two different voltage ratings. The insulation is halogen-free and meets LFH requirements. Insulation materials are strong whilst being smaller in size and weight.

Product Features

- Zero halogen, high temperature, lightweight cables
- Medium Voltage power cables from 1.5mm² to 400mm²
- Cables designed to meet customer requirements
- Jumper cables
- Approved to standards including: NF F 63 826, DIN 5510, NF F 16 101, BS 6853



AMPOWER Metric Terminal and Splice

AMPOWER terminals and splices are ideally suited for power generation and distribution, including interconnections of power supplies to peripheral equipment.

Product Features

- Designed for large cables and leads
- Accepts a wide range of stranded copper wires (13-507mm² for terminals and up to 760mm² for splices)
- High quality, seamless tubular copper for maximum conductivity
- BS4G 178 Part 2 1986 and RSE/STD 024 Part 8 - Issue A (London Underground Approval).
- NFF 00363*
- Available in a variety of terminal and splice styles

* Especific clause see DataSheet



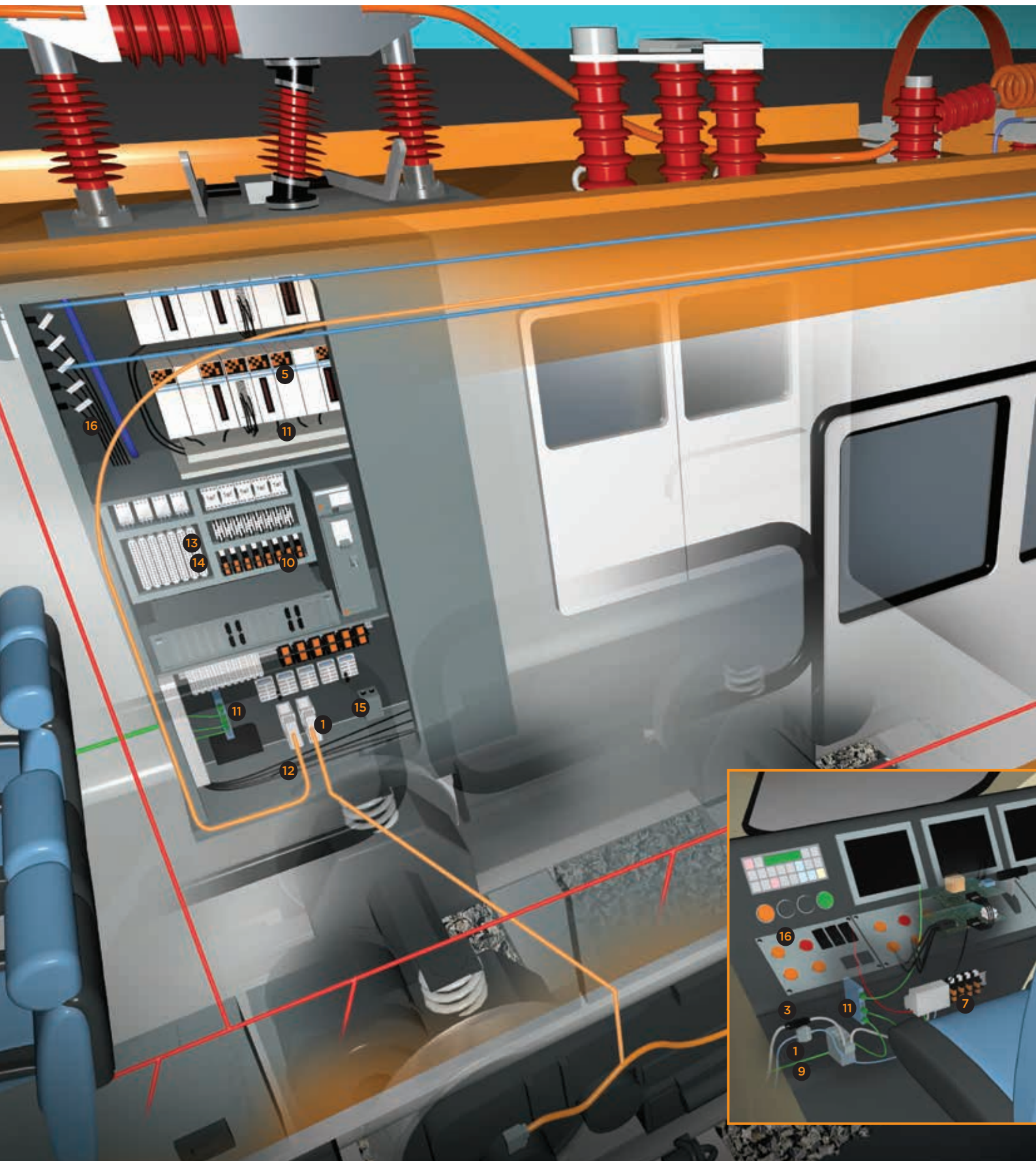
High Performance Relays, Contactors, Solenoids and Circuit Breakers

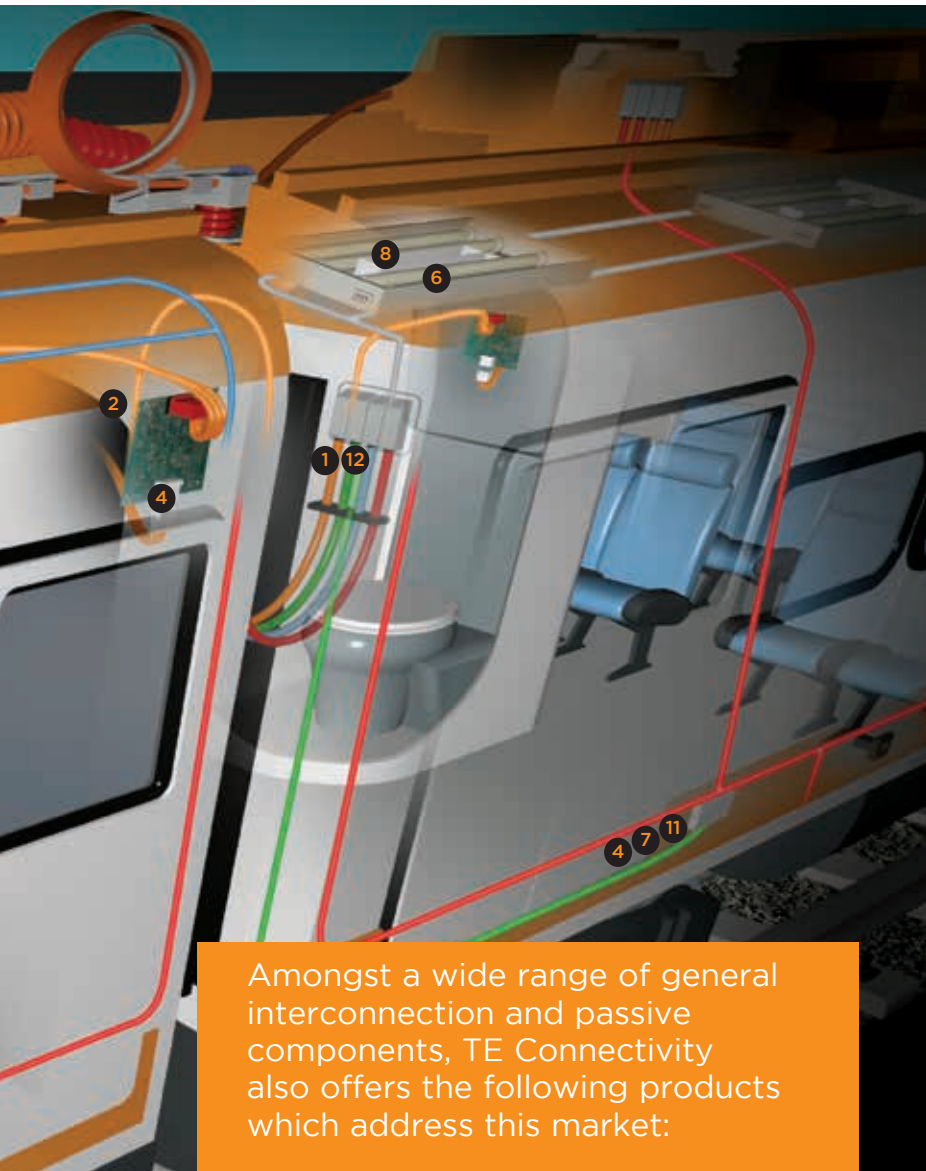
TE Connectivity offers a range of high performance switching for demanding applications. Ranging from commercial off-the-shelf products to highly specialised, custom-designed products, our AGASTAT, CII, HARTMAN and KILOVAC product lines include products from low signal level up to 2000A and 70kV.

Product Features

- Signal level high performance/mid-range relays
- High Voltage relays and contactors
- Solid state relays, timers and sensors
- Electromechanical relays and contactors
- Circuit breakers • Custom solenoids
- Power distribution panels and assemblies
- Electrical control panels and assemblies

LOW VOLTAGE





Amongst a wide range of general interconnection and passive components, TE Connectivity also offers the following products which address this market:

- 1 Heavy Duty Connectors (HTS series)
- 2 Dynamic Series Connectors
- 3 Circular Plastic Connectors
- 4 MATE-N-LOK Connectors
- 5 AMPLIMATE D-Sub Connectors
- 6 Distribution Box
- 7 M8/M12 Sensor Connectors
- 8 Lighting Connectors
- 9 LED Light Pipe
- 10 Relays
- 11 Industrial Ethernet Products
- 12 Fibre Optic Solutions
- 13 Z-PACK Connectors
- 14 Eurocard Connectors
- 15 EMI Filters
- 16 Identification and Labelling

LOW VOLTAGE APPLICATION FOR RAILWAY VEHICLES

Interoperability of control, monitoring and signalling systems, safety and security, passenger information and public communication are factors which lead to an increased demand for low voltage application for railway vehicles. Next generation trains provide operators with the ability to meet requirements for increased efficiency savings and new consumer loads including first class office equipment, entertainment and passenger information.

Ever increasing data rates and miniaturisation are driving new developments towards compact, robust high-speed communication solutions. The ability to easily upgrade system components and transfer or collect data is necessary to maintain technology leadership. On-board intelligence is networked together to provide a high degree of interoperability while maintaining consistent predictability and safety standards.

We offer solutions for a variety of applications ranging from tough environmental conditions, extended runs due to industry regulations through to intelligent wireless systems. Our products are safe and reliable with the added benefit of low power consumption and leading optical performance.

LOW VOLTAGE



NGC Series

The NGC series is a new compact and cost effective solution for rolling stock applications, eg. air conditioning or lighting systems. This composite connector equipped with a safe locking system fulfils the railway fire & smoke requirement standards and is watertight according to IP66.

Product Features

- Withstanding voltage - 2550v according NF F 61-030 or 3500v according to EN 50124-1/A2 (OV3-PD2)
- Temperature range - from -40°C to +100°C
- Nominal current - up to 20 A
- Service voltage - 220v AC or DC according to NF F 61-030 or 500v AC or DC according EN 50124-1/A2 (OV3-PD2)
- Salt spray resistance - 250 hours
- Endurance - 500 mating cycles
- Fluid resistance - gasoil, mineral oil, acid, base and cutting fluid
- Protection Index - IP66 mated according to EN60529
- Fire behaviour - requirement 2 according to NF F 16-101 and NF F 16-102UL94V0
- RoHS compliance



SRC Series

Circular signal connector for main outside equipment connections. Has an aluminium housing with a reverse bayonet locking system, derived from MIL DTL 5015 and VG 95234 standard. Available in 9 shell sizes with 11 arrangements from 6 to 60 crimp contacts - which are AWG16, 12 and 8 silver or gold plated. Removable and interchangeable inserts, plug and receptacle can be male or female. Accessories and backshells are also available.

Product Features

- Nominal current - up to 45A (with 6mm² cable)
- Service voltage - 700v or 1250v according to VG95234
- Service voltage - 220v or 500v according to NF F 61-030
- Test voltage - 2800v or 3600v according to VG95234
- Test voltage - 2550v or 3250v according to NF F 61-030
- Protection index - IP66 mated with suitable backshell according to EN 60 529
- Salt spray resistance - 250 or 500 hours depending on the shell plating
- Temperature range - from -40°C to +100°C
- RoHS compliance
- Fire behaviour - requirement 2 following NF F 16-101 & NF F 16-102 and UL94V0
- Hard thermoplastic insert - self extinguishing, halogen and phosphorous free
- Can be supplied fully assembled or in spare parts

Standards & Quality Approvals

- RATP and SNCF approval
- NF F 61-030 standard compliance

Technology/Coupling System

- Environmentally sealed
- Bayonet locking



UIC 552 Series

High power single pole connector with automatic cover locking. Includes one each of:

- plug with crimp contact for UIC 552 cable 185mm²
- distribution box with lateral or back cable outlets
- junction box with automatic cover, safety lock, lateral or back cable outlets
- intermediate derivation box
- dummy socket with cover

Product Features

- Nominal current - up to 800A (with 185mm² cable)
- Nominal voltage - 1500v or 3000v DC or AC
- Protection index - IP56 according to EN 60 529
- Temperature range - from -50°C to +120°C
- Salt spray resistance - 96 hours (more on request)
- Endurance - > 500 coupling cycles
- Fire behaviour - following NF F 16-101 & NF F 16-102
- Connection of the main line on railway rolling stock (UIC)

Standards & Quality Approvals

- DB approval
- SNCF approval
- UIC 552 standard compliance
- SNCB/NMBS approval
- TRENITALIA approval

Technology/Coupling System

- High power



UIC 568 Series

Pull apart circular connector with painted aluminium socket, plus automatic cover and composite plug. Audio coupler connection for rolling stock. Includes one receptacle shell with removable insert, equipped with 13 or 18 crimp contacts for UIC 568 or UIC 558 cables. Also includes one plug with removable insert and one dummy socket.

Product Features

- Nominal current - 5A
- Service voltage - 110v
- Test voltage - 2000v
- Salt spray resistance - 96 hours (more on request)
- Temperature range - from -40°C to +120°C
- Protection Index - IP67 according to EN 60 529
- Endurance - > 500 coupling cycles
- Pull apart connector
- Fire behaviour - following NF F 16-101 & NF F 16-102
- RoHS compliance

Standards & Quality Approvals

- DB approval
- SNCF approval
- UIC 568 and UIC 558 standard compliance
- SNCB/NMBS approval
- TRENITALIA approval

UIC541 Series

Product Features

- Test voltage - 1500v
- Temperature range - from -40°C to +100°C
- Service voltage - 72v
- Salt spray resistance - 96 hours (more on request)
- Endurance - 500 mating cycles
- Fire behaviour - requirement 2 following NF F 16-101 and NF F 16-102
- RoHS compliance

Standards & Quality Approvals

- DB approval
- SNCF approval
- UIC 541-5 standard compliance
- SNCB/NMBS approval
- TRENITALIA approval

Technology/Coupling System

- Environmentally Sealed



LOW VOLTAGE



CLN Series

Circular water tight connector in nickel plated brass. Different keyways available, with screw locking. 11 arrangements from 5 to 49 contacts, with crimp contacts for cable cross sections from 0.6mm² to 70mm².

Product Features

- Temperature range - from -40°C to +80°C
- Nominal current - from 5A to 50A
- Nominal voltage - up to 380v
- Endurance - 500 mating cycles
- Robust - suitable for harsh environment use

Standards & Quality Approvals

- ALSTOM approval
- RATP approval

Technology/Coupling System

- Environmentally sealed
- Screw thread



DTX Series

High power single pole connector with 100% shielding continuity, and aluminium housing for outside locations. Available in two sizes, for cable cross sections from 50mm² to 240mm².

Product Features

- Nominal current - up to 800A (with 240mm² cable)
- Nominal voltage - 3000v (OV2-PD2 following EN 50-124) or 1500v (OV2-PD3 following EN 50-124)
- Test voltage - 9500v
- Temperature range - from -40°C to +100°C
- Salt spray resistance - 96 hours (more on request)
- Protection index - IP66 according to EN 60 529
- Keying system - 11 positions
- Endurance - 500 mating cycles
- Locking system by 2 screws or 2 forks
- Fire behaviour - requirement 2 following NF F 16-101 & NF F 16-102 and UL94V0
- RoHS compliance

Standards & Quality Approvals

- BOMBARDIER approval
- SNCF approval

Technology/Coupling System

- High power
- Screw thread



CSR 31000 Series

Rectangular connector with 2 poles and 7 pilots that has been specially designed for battery racks. Rackable type with one floating part and one fixed part.

Product Features

- Nominal current for main contacts - 350A and 500A
- Nominal current for pilots - 30A
- Service voltage - 700v
- Test voltage - 3500v
- Temperature range - from -40°C to +100°C
- Fire behaviour - requirement 2 following NF F 16-101 & NF F 16-102 and UL94V0
- RoHS compliance

Standards & Quality Approvals

- NF-F 16-101 standard compliance
- NF-F 16-102 standard compliance
- UL94V0 standard compliance

Technology/Coupling System

- High power
- Rack and panel



MCM Series

Composite rectangular connector for inside installation, including locking system with clip or handle. Available in six shell sizes, from 14 to 90 contacts. Has silver or gold plated contacts (AWG16, AWG12 and AWG8) and a Din panel cut out.

Product Features

- Nominal current - up to 32A (with 6mm² cable)
- Service voltage - up to 1000v (OV2 PD2 according to EN 50-124)
- Protection index - IP55 (with watertight hood) and IP43 (with grommet)
- Salt spray resistance - 240 hours
- Temperature range - from -40°C to +100°C
- Fire behaviour - requirement 2 following NF F 16-101 & NF F 16-102 and UL94V0
- RoHS compliance
- High density of contacts
- Monobloc and evolutive arrangements



LOW VOLTAGE

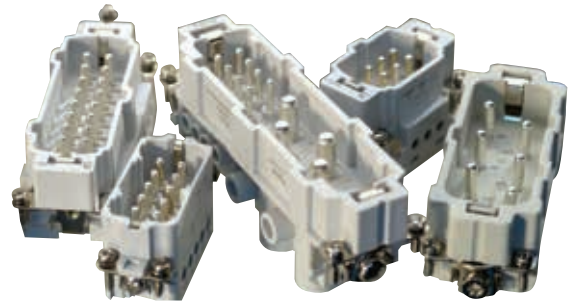


HTS Industrial Connector Housing

TE Connectivity offers a broad range of aluminium die cast housings with a high variety of sizes and shapes, various locking systems and specific surface treatments.

Product Features

- Extremely impact-resistant due to powder coating
- EMI protected housing
- Excellent corrosion protection due to hard coating
- Cable thread up to size M63
- Angled cable entry for optimised cable management up to IP68
- Locking systems for highest vibration and shock protection



HTS Industrial Connector Inserts

TE Connectivity offers a broad range of standard inserts for power and signal applications as well as combination inserts.

Product Features

- Laser-printed inserts for a permanent and a clear marking
- VDE, UL and CSA
- Flame-retardant materials according to UL94-V0
- Combination inserts for signal and power contacts in one insert
- Inserts for up to 3000V; 420A; 216 contacts or up to 150mm² wire cross section
- Silver or gold-plated contacts with crimp or screw as well as spring clamp termination
- Machine turned, stamped contacts



HTS Industrial Connector Modular

With HVS and MDL, two modular systems are available to create unrestricted combinations of different inserts to build application specific connectors.

Product Features

- Single piece zinc die-cast frames with in-moulded ground contacts
- Laser printing, twist locking on frames and on inserts
- Up to 6 single module inserts per frame
- Up to 150 contacts; 5000V; 250A or 70mm² wire cross section
- RJ45, USB, Fire Wire, fibre, D-Sub, coax, 4 and 8-way twisted pair, power, signal and pneumatic
- Quadrax up to 1GHz
- Tool-less handling



HTS Coach to Coach (MD) Connectors

Professional moulding processes enable the production of aluminium casting for ambitious products with great dimensions. This range of connectors has been developed by the requirements of the railway market.

Product Features

- Corrosion protected aluminum die-cast housing for 8 inserts of size 8 [LxWxH 350mm x 230mm x 160mm]
- Central locking screw for improved protection (IP67) and to support mating process
- Safe earth connection via housing
- Corrosion protected with cable gland up to M63 or conduit adaptors



Dynamic Series Connectors

The Dynamic Series offers solutions for both signal and power. Wire-to-wire, wire-to-board, and board-to-board options are available for tough, industrial environments.

Product Features

- 2mm through to 10.16mm centreline spacing
- 125v AC, 3A to 630v AC, 45A power rating
- Wire range AWG 30 [0,5mm²] to AWG 8 [8mm²]
- Polarised and Latching housings
- Audible click during mate cycle
- "Lance-less" contact design prevents back-out issues
- Markings identify housing cavities and contact size
- PCB connectors in 90° and 180° configurations

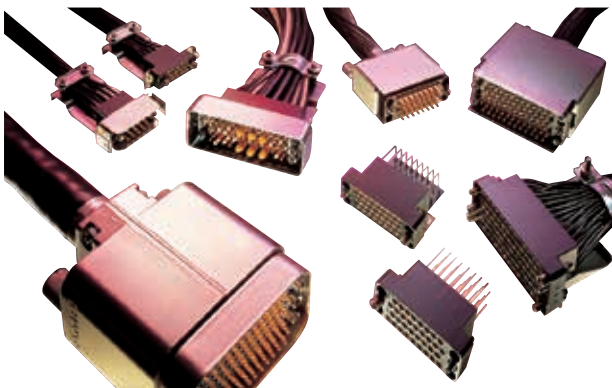


Circular Plastic Connectors CPC

The CPC family consists of four sizes of pin and socket connectors arranged in six different series for flexibility of different contact types. These connectors are used as a rugged power input/output connector solution. Rapid connect and disconnect is achieved with the use of a coupling ring.

Product Features

- Lightweight, all-plastic circular connectors
- Comprises signal, power and combination signal/power configurations
- Overall position range of 3 to 63 and current capacity up to 50A
- Operating temperature -55 to +125°C
- Some versions sealable to IEC IP65 or IP67



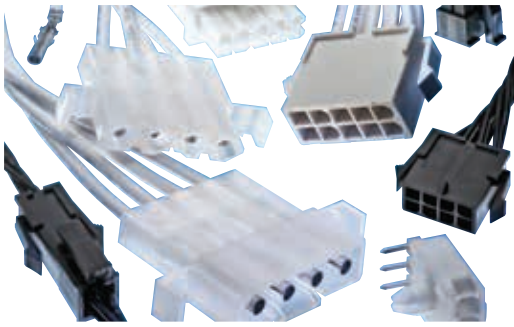
M-Series Connectors

The AMP M-Series connector is one of the most versatile pin and socket connector lines. A connector can be built with a wide choice of contacts and hardware to serve in applications ranging from Signalling and Monitoring Systems and Safety Equipment to Control Systems and Distribution Boxes.

Product Features

- 50 and 75 way connectors meet requirements for Solid State Interlocking signalling installations
- Intermateable with connectors made to MIL-C-28748
- Accessory hardware for fastening, protecting, guiding, shielding, strain relief and keying
- Variety of contacts: signal, power, coaxial, posted

LOW VOLTAGE

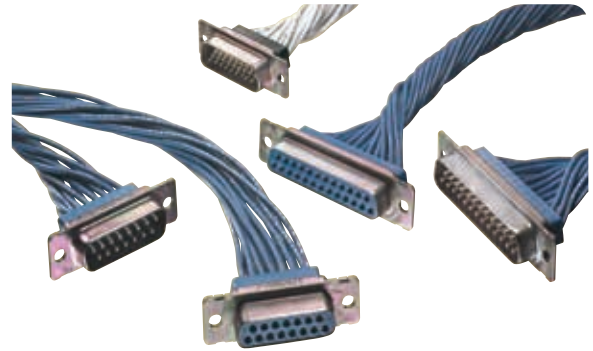


MATE-N-LOK Connector

Universal MATE-N-LOK provides a highly reliable, economical and integrated system for multiple connections in subsystems, lighting and passenger information. The connector system with crimp poke contacts is available in strip or loose piece.

Product Features

- Standard density, wire-to-wire and wire-to-board connectors
- 1-16 positions with 5.08mm centreline
- Free hanging, panel mount and wire-to-board connections
- Ratings 19A, 250v AC
- Fully polarised nylon housings
- Hosing materials halogen free UL94V-0, UL94V-2 and GWT 750°C No Flame
- Univ. MNL-T connector and Bulkhead mount Univ. MNL available



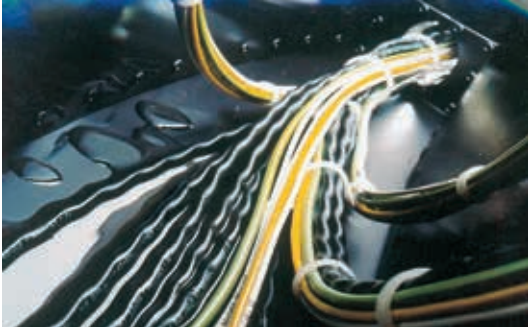
AMPLIMITE D-Subminiature Connectors

The AMPLIMITE family of Subminiature D connectors are one of the industry's most extensive and versatile connectors. They have become the most popular type of input/output (I/O) connectors in use today. Established and proven, they are rugged and easily used.

Product Features

- Qualified to MIL-DTL-24308
- Standard density (9-50 positions) and high density (15-104) positions
- Blindmate shell for improved alignment solutions
- Combination power/RF insert arrangements
- Sealed versions available
- Space qualified versions
- ULTRA-LITE non-magnetic connectors provide 15-20% weight savings and enhanced EMI/RFI performance



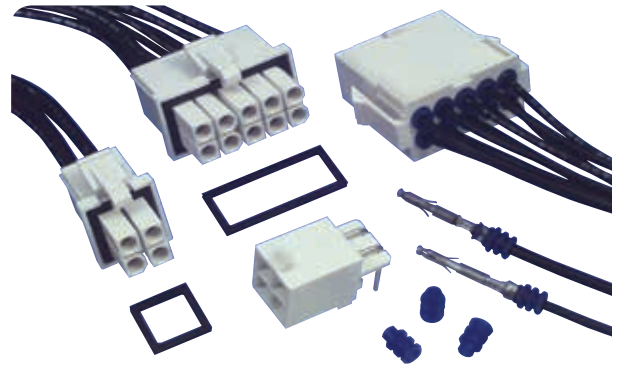


Signal Wire & Cables

A range of high performance signal cables that meet the demanding requirements of various standards including EN50306. Extremely flexible, tough and resistant to a variety of fluids, meeting the limited fire hazard requirements. Insulation materials are mechanically strong and durable whilst being smaller and lighter.

Product Features

- Zero halogen, thin wall, high temperature
- From 0.15 to 4.0mm² available as single wires braided and jacketed multi-cores [750/1350v AC max]
- Range from 1.0mm² to 400mm² [750/1300v AC]
- Databus, Coaxial and Fibre Optic
- Jumper cables
- Compliant to various standards



Mini-Universal MATE-N-LOK

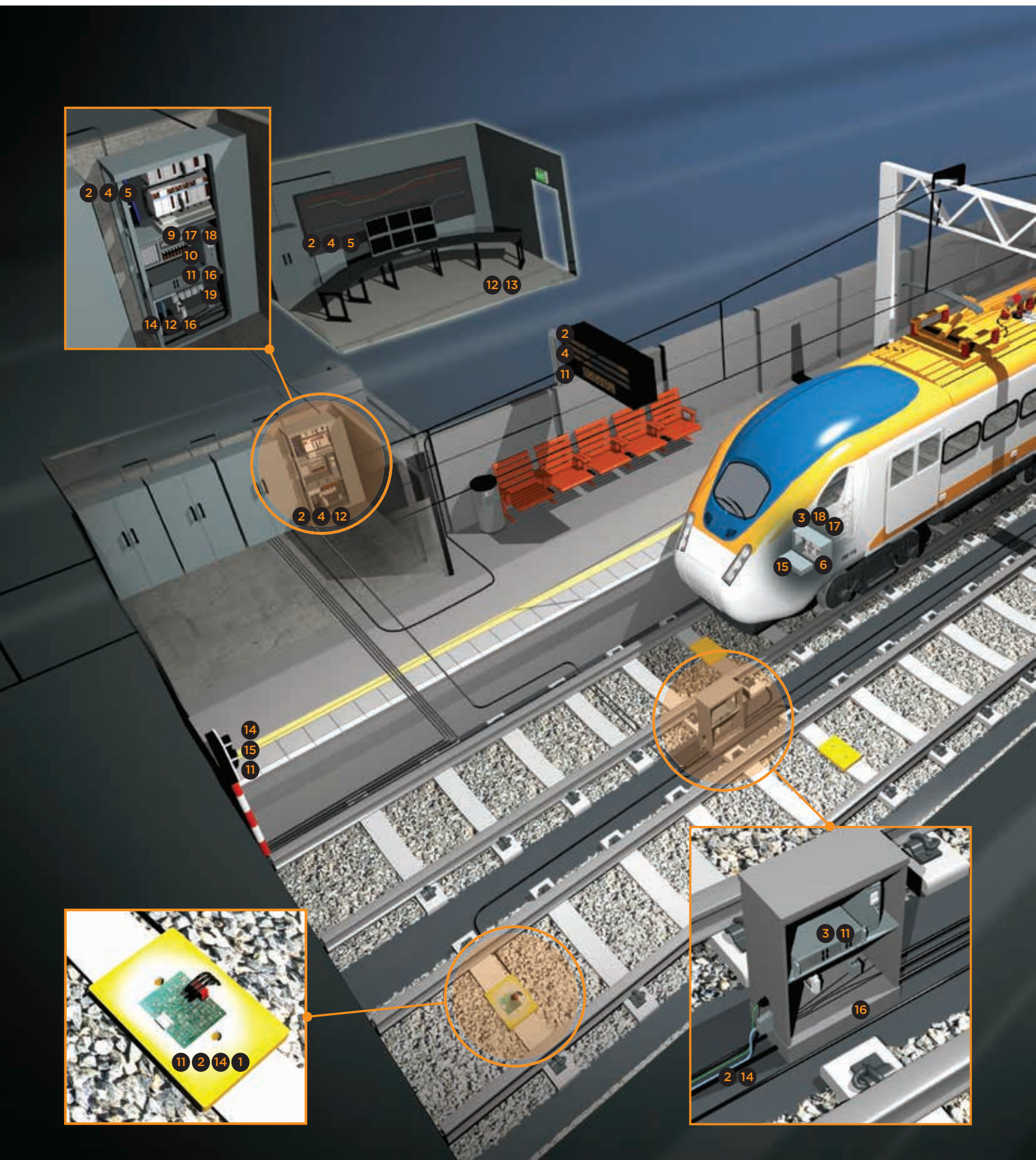
The Mini-Universal MATE-N-LOK connector was developed for low voltage halogen lamp termination, offering ease of use and low assembly cost with high operating reliability. The compact design can be easily used for installation in narrow spaces. Integrated strain relief assures a reliable connection.

Product Features

- High density, 4.14mm centreline plus 1-24 and 2-24 positions respectively
- Wire-to-wire and wire-to-board capability
- Ratings: 600v AC or v DC, 9.5A and 10.5A respectively
- Contacts are protected in the housings
- Seals available for splash protection
- Markings identify housing cavities and contact size
- PCB connectors in 90° and 180° configurations



SIGNALLING





Amongst a wide range of general interconnection and passive components, TE Connectivity also offers the following products which address this market:

- 1 AMPOWER Terminals and Splices
- 2 HTS Industrial Connectors
- 3 Dynamic Series Connectors
- 4 Circular Plastic Connectors (CPC)
- 5 M-Series Connectors
- 6 Amplitude D-Subminiature Connectors
- 7 Light-N-LOK Connectors
- 8 LED Light Pipe
- 9 General Purpose Relays
- 10 Safety Relays
- 11 AMPMODU Connectors
- 12 Industrial Ethernet Products
- 13 Industrial Mini I/O Connectors
- 14 Rugged Fibre Optic Solutions
- 15 Coax Connectors
- 16 Terminal Blocks
- 17 Eurocard Connectors
- 18 Z-PACK Connectors
- 19 EMI Filters

SIGNALLING

Capacity and speed demands on strategic railway routes are driving a move away from analogue systems and towards digital technology for signalling equipment. The introduction of digital transmission networks on railways brings to manufacturers the challenge of developing system concepts and equipment interfaces, which are suitable for complex data communication.

The European Railway Traffic Management System (ERTMS) is the newly agreed EU standard for train control systems. The liberation of the European railway system creates new basic conditions for railway operational traffic management. System integrators must adapt existing control systems to meet these new requirements. This includes connecting new interlockings to the control system through the development of innovative interface systems.

TE Connectivity is committed to providing innovative solutions that are compliant with the latest market requirements. Products include Industrial Ethernet systems, single and multimode fibre optics and other ERTMS-compliant products.

SIGNALLING

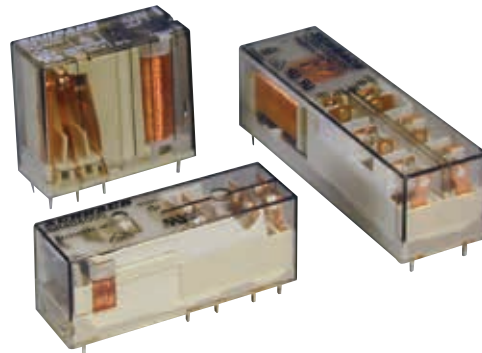


General Purpose Relays

A wide range, and ongoing development of innovative products, has made TE Connectivity a leading relays supplier. Internationally renowned products such as RT, MSR and SNR have set the standard.

Product Features

- Panel mount, plug-in and PC mount relays for sub system and control equipment
- Compact design
- Relays for high ambient temperature and high inrush currents
- PCB relays for control applications and high power relays suited to heavy current switching up to 30 Amps
- DIN railway sockets with screwless terminals for PT, XT and RT series

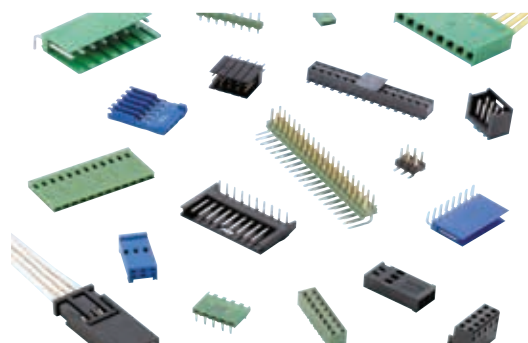
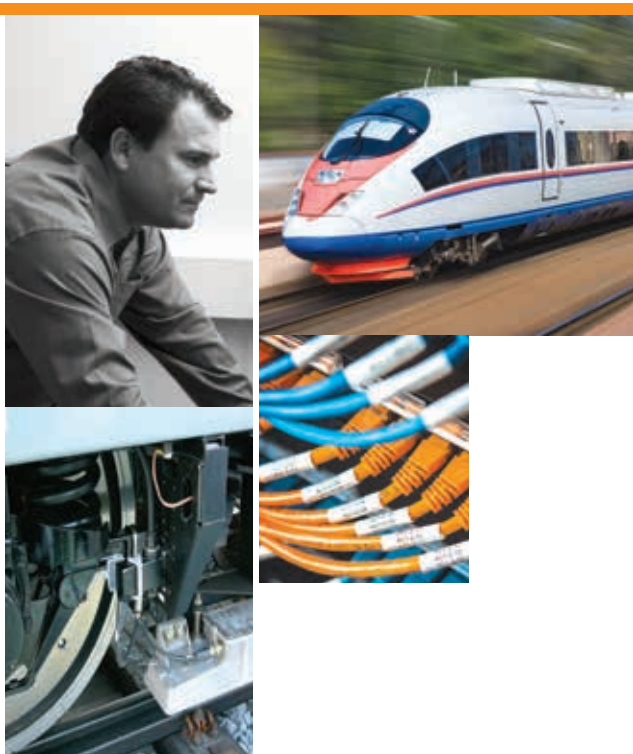


Safety Relays

Safety Relays with forcibly guided contacts play a decisive role in avoiding accidents in systems. Safety control circuits ensure switching into a fail-safe condition. Forcibly guided contacts monitor the function of the safety control circuits.

Product Features

- A range of safety relays to EN50205
- Includes the innovative SR6 low profile 6 pole safety relay
- Suitable for signalling where safety is paramount
- Mechanically-linked contacts prevent normally open and closed contacts from being closed simultaneously,
- PC board and DIN mount models
- 2, 4 and 6-pole configurations



AMPMODU Connectors

From fine pitch signal to rugged power connection, the AMPMODU system provides innovative solutions for the railway industry. Board-to-board, wire-to-board and wire-to-wire applications are reliably facilitated through a comprehensive family of interconnect components in a choice of packaging densities, to suit your application.

Product Features

- Signal or power connection
- Centrelines from 1.27mm to 3.96mm
- Gold or tin plated contacts
- Through hold solder, press fit and surface mount termination
- Product styles and functionality to suit all applications



Industrial Ethernet Products

TE Connectivity offers a variety of connectors and active products for Industrial Ethernet applications. From ruggedised RJ45 connectors to Ethernet switches, media converters and device servers, solutions for both IP20 and IP67 applications are available.

Product Features

- Tool-less, field terminable, IP20 RJ45 plug - 4 and 8 position
- Field-installable IP67 plug and receptacle kits
- Industrial Ethernet cable and cable assemblies
- IP67 connectors meet the Ethernet/IP and Open DeviceNet specification
- 10/100MB Ethernet switches
- 10/100/1000MB Ethernet switch
- Media converter • Device Server

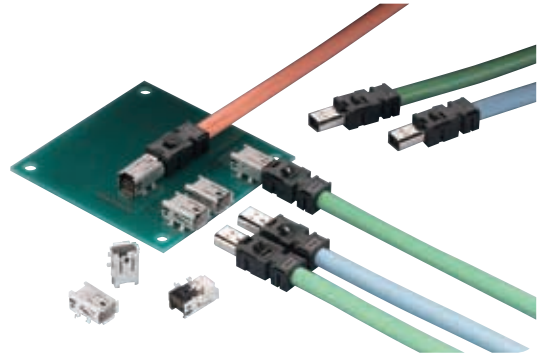


Rugged Fibre Optic Solutions for Harsh Environments

Built to survive - TE Connectivity offers a broad range of fibre optic products, that meet the demanding requirements of the rugged environment. TE Connectivity also offers fibre management systems, packaged solutions, subsystems and sealed connectors and cable assemblies for less demanding applications.

Product Features

- Protection against contamination
- Easy to clean
- Low thermal sensitivity
- 3000 mating cycles
- Hermaphroditic connection
- High shock and vibration resistance due to no physical contact
- Flexibility in design

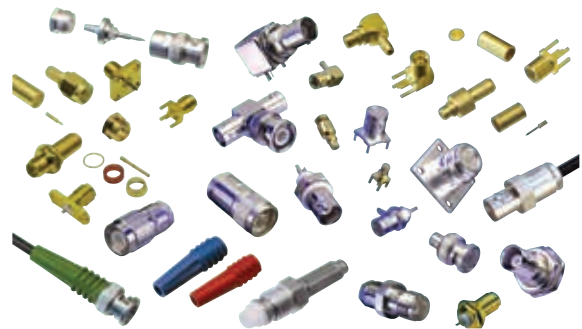


Industrial Mini I/O Connector

Ethernet connectivity at a quarter of the size. TE Connectivity Industrial Mini I/O connector is 1/4 the size of standard RJ45 connectors. At 1GB per second speed, it can be used in a variety of applications. Two points of contact and a metallic latch make this ideal for high vibration industrial applications.

Product Features

- Two points of contact
- 0.5A per contact
- Latching
- Utilises standard Cat 5e industrial cable
- Two keying options prevent mis-mating
- Cable assemblies available upon request



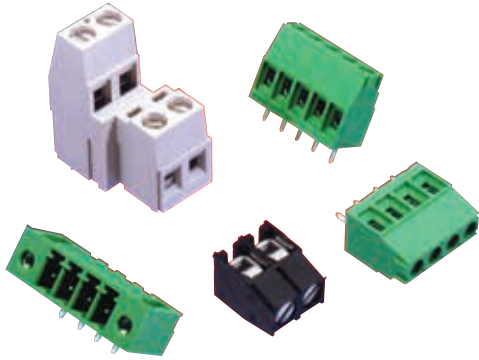
Coax Connectors

The RF coax connectors range comprises a variety of styles and configurations. The combination of connectors and associated tooling ensures trouble free termination at the lowest applied cost.

Product Features

- Available in 50 and 75 Ohm impedance
- Connectors to suit from DC to high frequency operation
- Mounting style of PCB, panel and bulkhead available
- Multiple plating options
- Wide selection of connector types and interfaces including:
 - MIL-C-39012, MIL-C-55339, MIL-A-83517
 - BNC, TNC, UHF, SMB, SMC, MCX, MMCX
 - FME, ISA, N Series, SMA, SSMA

MULTIPLE APPLICATION PRODUCTS

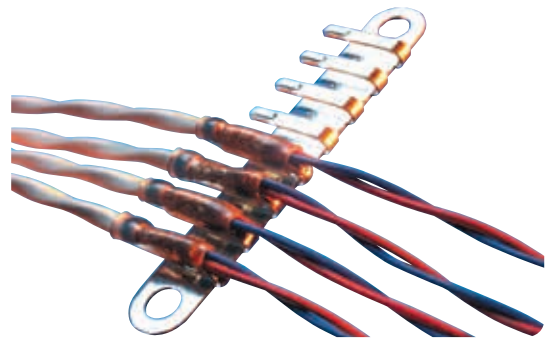


Terminal Blocks

TE Connectivity offers an extremely wide range of terminal blocks, and also features the special rising cage clamp design. The modular design of terminal block connectors consists of one-piece board-mount terminal blocks and plug connectors, with mating straight and right angle shrouded headers.

Product Features

- IR reflow compatible
- Rising cage clamp with open screws which minimizes installation effort
- Captive screws
- Non-magnetic metal parts
- Halogen-free Polyamide 6.6 housings according to UL 94V-0
- Operating temperature -40°C to +105°C
- End-to-end stackable without loss of centreline space



SolderSleeve

SolderSleeve shield grounding termination provides an environmentally sealed, transparent, insulated and encapsulated solder connection for a variety of applications.

Product Features

- Wire-to-wire, shield, coaxial cable termination
- One piece design offers easy installation and lower installed cost
- Immersion resistant
- Prefluxed solder preform provides a controlled soldering process
- Some parts meet MIL-S-83519 or NAS 1744
- Bus Bar Devices suitable for cable screen termination
- Multiple coax terminations



PIDG Terminals & Splices

PIDG pre-insulated diamond grip terminals and splices are designed for complete and uniform reliability. The pre-insulated termination ensures a vibration-safe connection with maximum conductivity, and its tensile strength approaches that of the wire itself.

Product Features

- Made of high conductivity copper
- Electro tin-plated for improved corrosion resistance
- LSF halogen free insulation providing high dielectric strength
- STRATO-THERM high-temperature terminal available
- A variety of PIDG terminals and splices are UL listed file E13288 and certified by CSA file LR7189
- Meets requirements of London Underground and SNCF



Moulded Parts

Raychem® heat-shrinkable molded parts, with adhesive coating, form a watertight seal, protecting cables and equipment from corrosion and mechanical abuse while providing excellent electrical insulating properties. Meets requirements for most mass transit applications.

Product Features

- Heat-shrinkable, flexible, fluid-resistant modified fluoro-elastomer
- Excellent resistance to long-term fuel immersion
- Optimum waterproofing and environmental protection
- Highly resistant to moisture, fungus, and weathering
- Heat-shrinkable boots and transitions
- Meet numerous specifications



Heat Shrinkable Tubing

With a top performance and a low total installed cost, shrink products make it possible to accomplish lasting, safe mechanical and electrical protection and sealing of various parts.

Product Features

- Low recovery temperature
- Highly Flame retardant, Halogen free
- Shrink ratios from 2:1 to 4:1
- High operating temperatures: (-70° to +120°C)
- Flexibility and improved resistance to abrasion and mechanical damage
- Resists most oils, fuels, and other fluids commonly found in mil-aero applications
- Meets SAE-AMS-DTL-23053/ 1 class 1 & 2



MiniSeal Crimp Splices

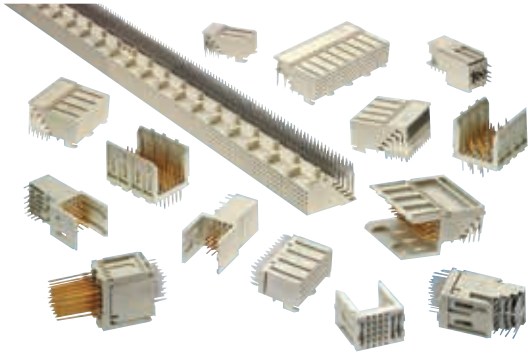
MIL-S-81824/1 qualified MiniSeal crimp splices are environment-resistant and provide excellent reliability, long-term performance at a low installed cost. MiniSeal crimp splices consist of a tin plated crimp barrel and a separate, heat-shrinkable, transparent sealing sleeve.

Product Features

- Qualified to MIL-S-81824/1
- Immersion-resistant splice with heat-shrinkable sealing sleeve
- Insulation and strain relief
- Small and lightweight



MULTIPLE APPLICATIONS PRODUCTS



Z-PACK Connectors

Z-PACK HM is a two piece 2mm pitch connector family, meeting IEC 1076-4-101/CPCI.

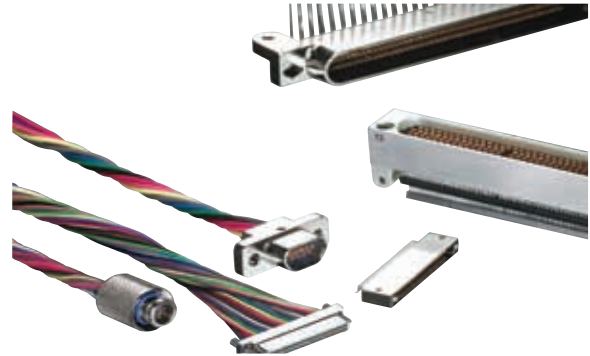
Product Features

- Standard and reverse configurations
- Redundant contact design
- Modular design
- 4, 5, 5+2, 8, 8+2, 12 row versions
- Full family offering - Coax, Fibre, Power, Keying, Cable and Shielding

TE Connectivity Z-PACK 2mm FB is a two-piece connector system.

Product Features

- Four-row, five-row, 2mm x 2mm circuit grid
- Modular design for signal and power connections
- Module assemblies are end-to-end stackable
- Solder leads or compliant press-fit leads
- Flat rock receptacle tooling
- Press peg receptacle retention for low applied cost



Microminiature, Nanominiature & Rectangular Connectors

Suited for applications where high density, reliability and reduced size and weight are serious design parameters. Available in wire-to-wire, wire-to-board and board-to-board.

Product Features

- Microminiature D Connectors per MIL-PRF-83513
 - .050mm centreline; 9-100 positions
- Nanominiature Connectors per MIL-C-83513
 - .025mm centreline; 5-65 positions
- MCEM Rectangular per MIL-C-55302
 - two-row, board-to-board
 - .050mm centreline; 40-184 positions
- HDSM Rectangular per MIL-C-55302
 - Four-row, board-to-board
 - .050mm centreline; 38-400 positions



Eurocard Connectors

Eurocard Connectors provide high reliability and economy in packages compatible with the industry standard for printed circuit board computer backplane bus system application.

Product Features

- Meet Din 41612 and IEC 603-2
- Available in Type B, C, D, F, G, M, R
- ACTION PIN post for reliability and economical assembly

PASSIVE COMPONENTS

Our product range covers a variety of passive components such as SMD and through hole resistors, timers, potentiometers, PTC and NTC surface mount thermistors and a range of inductive products. Our core markets for resistors are industrial machinery, railway industry and transportation. Here we serve with standard and customised solutions and key technologies from thick film, through thin film, wire-wound to foil technology.

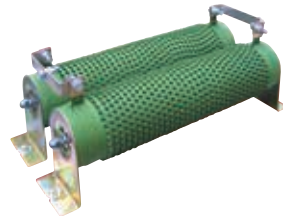
Found in a wide range of applications, they are useful when converting electric power from one frequency to another, and are especially advantageous when a high degree of control over the output is required. TE Connectivity resistors can be found in drives, converters, power supply, and auxiliary equipment across the world, from control systems, or from drive cabs, passenger information, internal lighting to distribution boxes.



Wirewound Technology



Thick Film Technology



Customised resistor solution with heat sink up to approx. 25kW



Foil Technology

Precision Resistors

- SMD and leaded high reliability and stability products
- Thin Film and Wirewound technologies
- SMD range of products is a market leader
- Flexibility in MOQ and pack size
- Quick Turnaround
- Accuracy to +/- 0.01% and 5ppm

Power Resistors

- Power ratings from 1W to > 1KW
- Range of technologies including – Wirewound, Thick and Thin Film, Foil, Carbon and Ceramic Composition
- In house Design and Test facilities for development of specification driven products
- Capabilities for current Sensing across a wide range of products/ technologies
- Current Sense resistors from 0.5 milliohm, TCRs and Tolerances of 50ppm and 1%

Customised Resistors

- Customisation capabilities of standard products
- Supported by wide range of commodity power resistors
- Optimal thermal solutions with heat sink
- Load Banks up to 300kW
- Cyclic rated power and overload testing
- Adiabatic (single shot and frequency) testing
- Environmental, mechanical and repetitive pulse testing

VALUE ADDED PRODUCTS AND FILTERS

Value Added Products

TE Connectivity produces a comprehensive range of cable assemblies, harnesses and value added solutions designed to meet the demanding application requirements within the railway industry.

From industry standard 'point to point' cables through ruggedised systems for harsh environmental applications to complex application specific solutions, TE Connectivity has the capability to support your project.

Combining our ability to develop and manufacture components and integrate them into a complete system allows us to create optimised lowest installed cost solutions.

Our technical support teams are regionally deployed providing 'face to face' on site application support at the critical design and development stage - saving both time and cost.

Strong project management methodology is applied to each project ensuring that we deliver all of your quality, cost and timescale objectives.

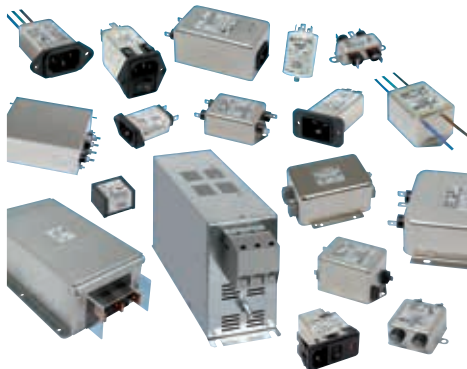
Component and final assembly test specification validation is also assured through our in house world class NAMAS approved laboratories and test facilities.

TE Connectivity's global manufacturing and supply chain infrastructure provides low cost manufacture combined with the benefit of localised component sourcing, reducing both lead-time and cost.

The benefits of choosing TE Connectivity as your partner for value added products do not stop there. Our aim is to create sustainable lowest cost solutions by utilising proven cost reduction techniques. Our business development team can create comprehensive cost reduction programmes that provide a structured and systematic approach to achieving long term cost targets.

Filters

Our range of market leading EMC filter technologies and solutions serves a worldwide market from industry to medical clients. A large selection of off-the-shelf filters and already-proven special filters are available, in order to provide an optimal solution for noise reduction problems. TE Connectivity also offers the possibility of developing a custom-designed filter specially tailored to customers' requirements.



IEC Plug Filters - Power Entry Modules

- Broad range current and performance capabilities
- For the most severe environmental applications
- High frequency filters
- For Tempest applications to protect confidential information
- IEC connectors, wires leads, and .250 (6.35) or stud terminals available

Single-Phase Filters

- Includes a wide range of connection and attenuation properties
- Consumer electronics, motors, drives, inverters and switching power supplies

Three-Phase Filters

- Typical application areas are control cabinet, plus all types of power converter applications
- 3 and 4-wire filters for a range of 3 to 900A

Heavy Power Line Filters

- 100 dB of attenuation from 12 kHz -10 GHz
- Standalone and NEMA I style facility filters
- Designed in accordance with MIL-F-15733
- UL listed in accordance with UL 1283
- High Altitude Electromagnetic Pulse (HEMP) products available

IDENTIFICATION

At TE Connectivity we provide a wide range of label products, high quality materials, as well as software and printers to offer you innovative solutions for all your identification needs. From barcode identification for high-volume printed circuit board production to high-performance, flame-resistant identification solutions for electrical installations in the railway industry, TE Connectivity offers you a total solution.

Our wide range of products will last and perform in the most extreme indoor/outdoor conditions. Our focus is on supplying high quality materials and adhesives that meet or exceed industry standards. We specialise in custom and pre-print adhesive-backed labels and nameplates for parts identification, as well as laser engraved labels and markers.

Wire & Harness Identification

- Low fire hazard, low toxicity and low smoke HX-SCE product format available
- Heat-shrinkable sleeves provide permanent wire identification, strain relief and insulation
- Available in a multitude of sizes and materials for diverse applications
- Tie-on markers provide identification solutions for large cable and wire bundles
- Outstanding print quality and mark permanence
- Meets industry and customer-specific standards
- Products will perform in harsh environments and are abrasion resistant and fluid-resistant (oils, greases and fuels) as well as being suitable for high or low temperature applications

Identification

- Complete range of standard labels available to meet or exceed your identification requirements
- Custom labels available according to specific logos, artwork and brand identification
- Colour matching capability such as Pantone, RAL, BSI etc.
- Custom shapes
- UL and CSA certified base materials
- Equipped to hold tight tolerances
- Custom data to print: Static and/or sequential numbers
- 2D data matrix and bar codes available
- High and low temperature materials
- Specific materials to suit: UL, cUL, MIL Std 202F- fluids, LUL C3349, Fed Std 228 - flammability



LABELLING

Performance Labels

- Printer, ribbon, material solutions available to UL, cUL, MIL Std 202F - fluids, LUL C3349, Fed Std 228 - flammability
- Self-laminating labels compatible with thermal transfer or laser printers
- Labels available for temporary or permanent applications

Fascias & Membranes

- Fascias in various sizes for control panels, signage, graphics
- Membrane keyboards for control panels, conductor's cabin etc.
- Anti-graffiti and scratch resistant over-laminating technology
- UL Certification, low toxicity and smoke technology available

Thermal Transfer Printing Systems

- Wide range of thermal transfer printers for printing identification products
- Printing systems for both high and low volume applications
- Simultaneous, double-sided printer designed for demanding applications
- Approved ribbon combinations for various materials to maximize print performance
- Software includes built-in templates and printing schemes and is easy to navigate
- Integrated print-and-apply label systems also available
- Handheld printer



HX-SCE

- Low Fire Hazard
- Heat shrinkable sleeve
- Zero Halogen
- Low smoke, toxicity, flammability
- 2:1 shrink ratio



D-SCE

- Fluid Resistant
- Heat shrinkable sleeve
- Strain relief
- Insulation & Protection
- 3:1 shrink ratio



CM-SCE-TP

- Military Grade
- Cable Marker
- Applied using cable ties
- Highly flame retardant
- Large cable bundles

ENGINEERING NOTES



ENGINEERING NOTES

A large rectangular area filled with a light gray grid, resembling graph paper, intended for taking engineering notes.



About TE Connectivity

TE Connectivity (NYSE: TEL) is a \$14 billion global technology leader. Our connectivity and sensor solutions are essential in today's increasingly connected world. We collaborate with engineers to transform their concepts into creations – redefining what's possible using intelligent, efficient and high-performing TE products and solutions proven in harsh environments. Our 80,000 people, including 7,500 design engineers, partner with customers in over 150 countries across a wide range of industries. We believe EVERY CONNECTION COUNTS - **te.com**.

About TTI, Inc.

TTI, Inc., a Berkshire Hathaway company, is the world's leading specialist distributor of passive, connector, electromechanical and discrete components. TTI's philosophy is "Lead by Design", and the company differentiates itself by focusing on people, parts and process. TTI in Europe strives to be the distributor of choice for customers and suppliers alike by introducing new product technologies and by stocking broad and deep inventory across its franchise base. TTI's sophisticated inventory management system ensures the ability to service changes in demand due to fluctuating markets and supply chains. For more information about TTI, please visit: **ttieurope.com**.

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