



## Railway Components & Application Guide



# TE Connectivity Can Help Your Next Stock To Roll & 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 signaling, including railway related telecommunication equipment, and infrastructure the same challenges are being faced throughout this complex market. For over 50-plus 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 signaling.

## Early Involvement Pays Off In Competitive Advantage

With approximately 8,000 engineers at 13 global design centres, plus manufacturing facilities in approximately 20 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 supplier 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.



| Engineering Centres     | *CIS Manufacturing North America | EMEA          | Asia Pacific    |
|-------------------------|----------------------------------|---------------|-----------------|
| 1. Bangkok              | 1. East Providence RI            | 1. Bideford   | 1. Auckland     |
| 2. Bensheim             | 2. Guaymas MX                    | 2. Collegno   | 2. Christchurch |
| 3. Greensboro NC        | 3. Hermosillo MX                 | 3. Doncaster  | 3. Kingsgrove   |
| 4. Harrisburg PA        | 4. Juarez MX                     | 4. Grenoble   | 4. Qingdao      |
| 5. Kawasaki             | 5. Lancaster PA                  | 5. Roedermark | 5. Shanghai     |
| 6. Kyungsan             | 6. Lickdale PA                   | 6. Swindon    | 6. Shenzhen     |
| 7. Menlo Park CA        | 7. Menlo Park CA                 | 7. Trutnov    | 7. Singapore    |
| 8. St. Augustin         | 8. Portland OR                   | 8. Waidhofen  | 8. DongGuan     |
| 9. Shanghai             | 9. PTP/Reidsville Rd NC          | 9. Lugano     | 9. Kunshan      |
| 10. Shenzhen            | 10. Worcester MA                 | 10. Bydgoszcz | 10. Qingdao     |
| 11. Sydney              | 11. Norwood MA                   | 11. Bangalore | 11. Zhuhai      |
| 12. Turin               | 12. Emigsville PA                |               | 12. Guangdong   |
| 13. Reno NV             | 13. Rock Hill SC                 |               | 13. Chang Ping  |
| 14. Ottawa Ontario      | 14. RH (Greenway) SC             |               | 14. Waigaogia   |
| 15. Auckland NZ (Sales) | 15. Carlisle, PA                 |               |                 |
| 16. s'-Hertogenbosch    |                                  |               |                 |
| 17. Tokyo               |                                  |               |                 |

\* CIS = Communication & Industrial Solutions

# Leading Railway Solutions Just A Simple Mouse-Click Away

## Fast Access To Information 24/7

We make it quick and easy for you to find the information you need and to order samples and production parts, as well as to obtain documentation and CAD models.

## Find Our Web Site

**te.com** is your single location for comprehensive product information, including CAD models, product and application specifications, drawings and competitive cross references. Our advanced parametric search engine allows you to find the exact part you need and all the documentation that goes with it.

## E-commerce

Authorised customers can get access to pricing, product availability, order status, sample request, shopping cart features, distributor inventories and much more.

## Visit Our Railway Portal

To make things easy, we have created an industry-specific site that focuses exclusively on the railway market. Here you can find our extensive line of products and solutions for the railway market: [te.com/railway](http://te.com/railway)

## Product Literature & Online Support

In addition to product and application specifications, TE Connectivity offers a range of detailed product catalogues and brochures which you can also benefit from. And in order to assist you even further, all documents are available online.



[te.com/railway](http://te.com/railway)

## Sales Support

Management, Engineering, Purchasing, R&D, Production, Maintenance, - whatever your job is within a company, TE Connectivity has an extensive team of customer services and sales engineers dedicated to supporting you. Sales engineers are available to visit your site to discuss the technical and commercial issues appropriate to your project or requirement. This support covers both existing products within our diverse portfolio and those which need to be tailored to your needs. Customer service can initiate new orders, change orders, request air shipments or drop shipments and generally support your business on a day-to-day basis.

## On-site Service

As experts in technology, we plan alongside our customers, provide efficient total solutions and accompany them throughout the entire production period with competent service engineers.

On-site service is provided by TE Connectivity technicians for trail fits and installation. In addition, we allow our customers to benefit from our wealth of experience by offering training programmes for servicing and repair.

## Product Information Centre

Our Product Information Centre works closely with our sales support and sales engineer teams to ensure continuity of support. Whether you need an exact part or an alternative product, if you are looking for documentation or the right technical solution to resolve a problem, our experienced specialists are waiting to assist you across new and established products. They are committed:

- To provide customers with dedicated technical support, product samples and literature across the TE Connectivity product portfolio
- To assist in identifying the right solution for the customers application
- To advise customers on the available sales channels
- To support customers using our internet based system
- To develop strong customer relationships by being professional, efficient and friendly

## Distribution Network

We manufacture over 500,000 products, backed up by nearly 100,000 employees who all have a singular commitment to bringing performance advantage to every technology, product and service we provide. We serve customers in more than 150 countries, working closely with selected wholesalers, distributors and authorised dealers in order to improve our product availability and our service. Our global coverage places us near our customers and allows us to assist them in consolidating their supply base and lowering their production costs.

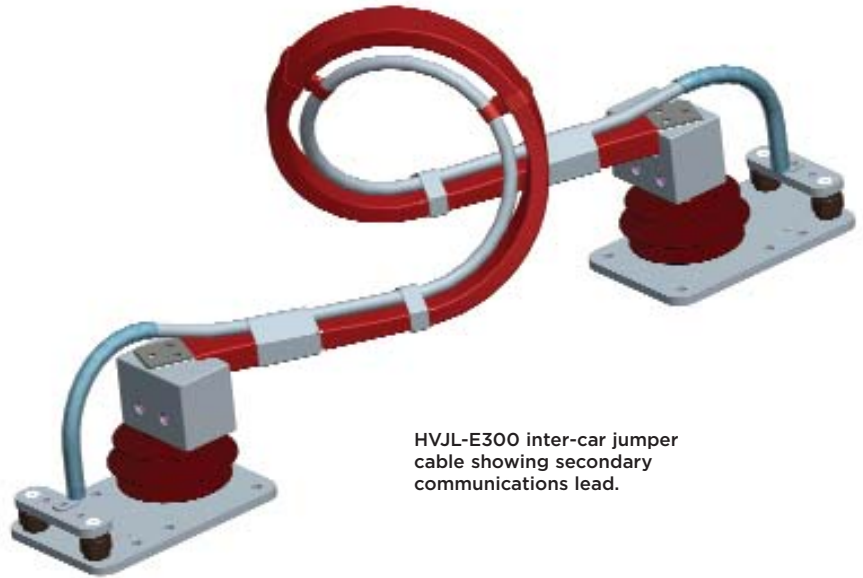
**Please see [te.com](http://te.com) for further details on the distribution network.**



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 railway supply industry gives you access to the widest selection of standard and semicustom 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-E300 inter-car jumper cable showing secondary communications lead.



HC20 single pole power connector with unique contact system.



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

## Faster Front-End Design

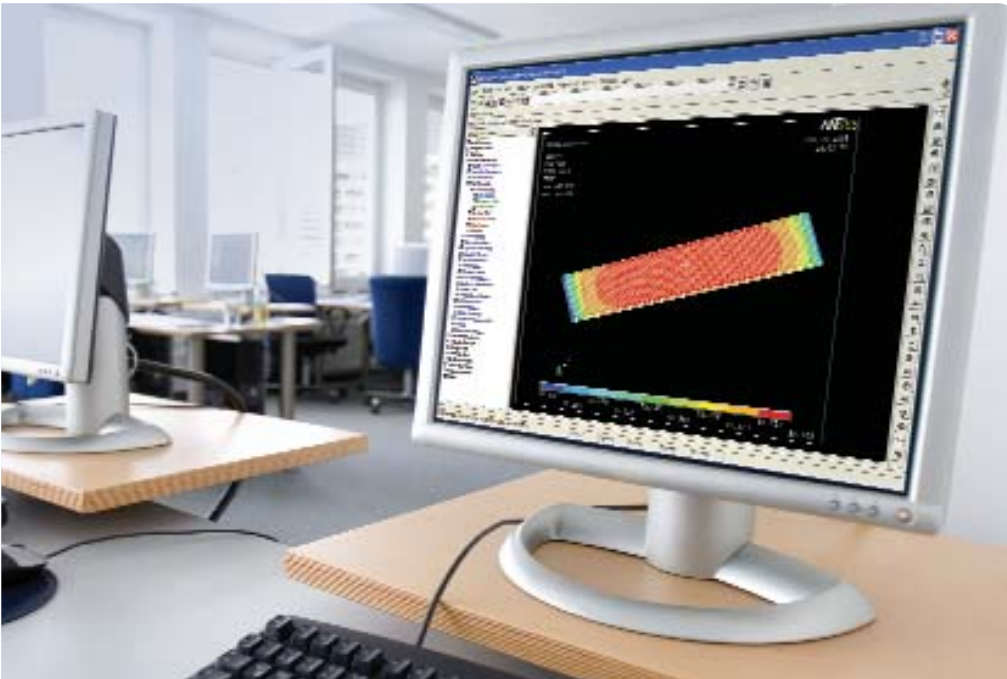
With market dynamics forcing ever-shortening design cycles, our ability to quick-turn product concepts will keep your projects on schedule and shorten the time to market. Our capabilities include:

- **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. Alternately, 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 railways supply industry. Every product we design considers the mechanical, electrical and thermal parameters - and their interactions.

Every design is subject to solid modelling, finiteelement 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 optimized for its application.



## IRIS Certification

### IRIS Certified

We want to be the premier partner for our railway customers. That means we must exceed their expectations on quality and committed to develop our Quality Systems according IRIS requirements.

Related to the new Quality System Standard IRIS TE Connectivity is dedicated to making your products successful by providing reliable solutions.

TE Connectivity certified the affected major manufacturing and remote locations in spring 2008.

### 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.

**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,

labeling and marking. We comply with standards from CENELEC, IEC, UL/CSA, BS, NFF, EN, VDE, MIL and other international agencies. We comply so you can comply.

## Communications and Industrial Solutions

Communications and Industrial Solutions (CIS) is a business segment of TE Connectivity which develops, manufactures and sells an exceptional range of products and components for around 50,000 customers around the world. Our quality products are used in the following sectors of industry:

- Appliances
- Machinery
- Instrumentation
- Railway
- Building
- Renewable energies

Regardless of which of the sectors previously mentioned we are working in, we customize our innovative products, developments and technologies with and for our customers and for the end consumers.

A comprehensive distribution network thereby complements the procurement options. We offer our customers all our expertise and our best solutions, helping them to achieve their objectives quickly both today and in the future.



### TE Telecom Networks

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.





## TE Application Tooling

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!

## TE Energy

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.



## AMP NETCONNECT

TE Connectivity develops a comprehensive range of leading-edge network connectivity and systems management infrastructure solutions as well as network management and monitoring solutions, under the AMP NETCONNECT brand, that solve complex networking infrastructure challenges companies face today. Serving customers in government, education, healthcare, finance, manufacturing, technology, commercial and residential real estate markets AMP NETCONNECT products and systems deliver integrated, customized solutions for voice, data and video networking needs. Offering the broadest line in the industry, the AMP NETCONNECT business unit of TE Connectivity is well positioned to be a single-source systems provider of products that provide optimized technology performance and increased productivity, giving customers a more immediate return on their information technology investment.



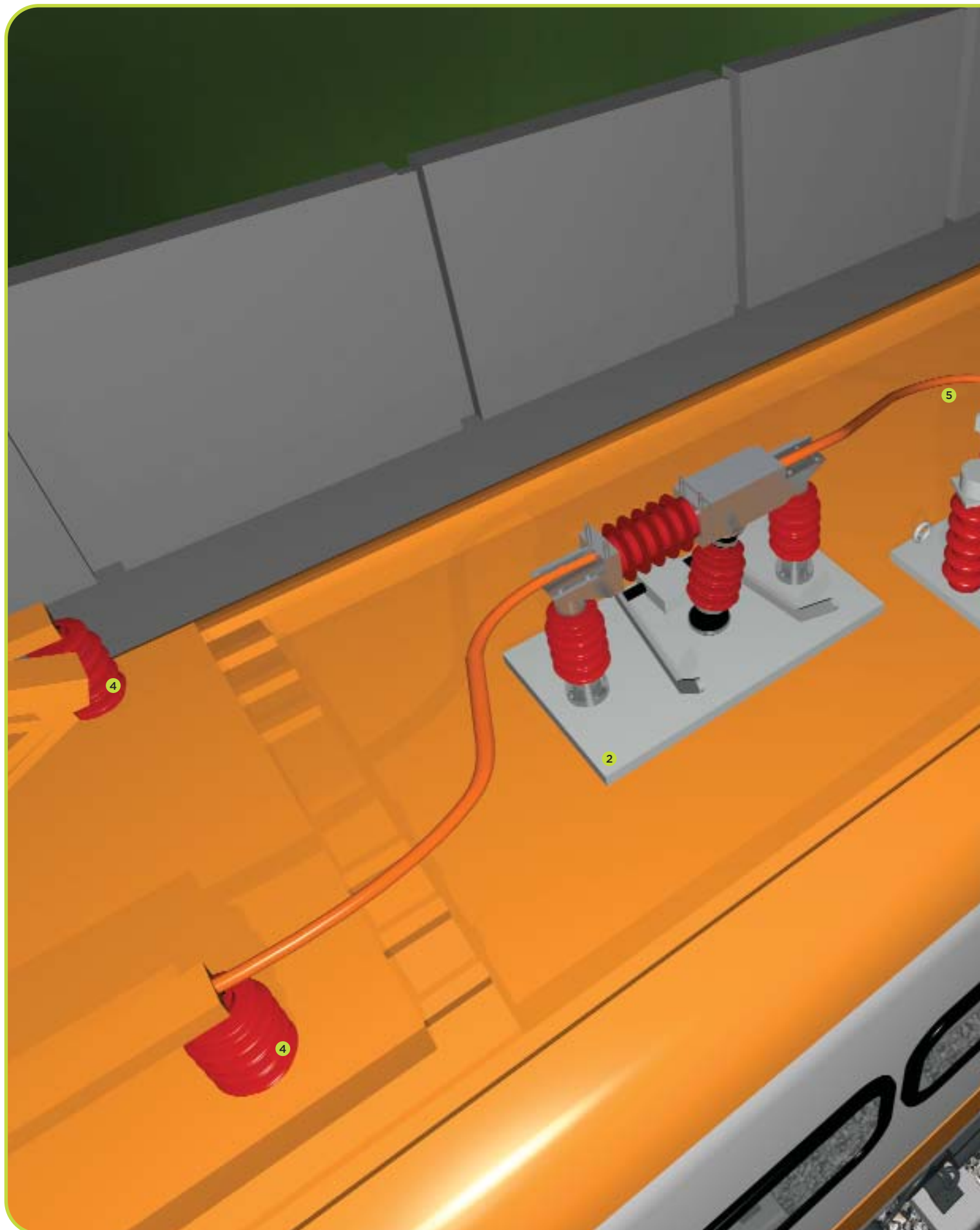


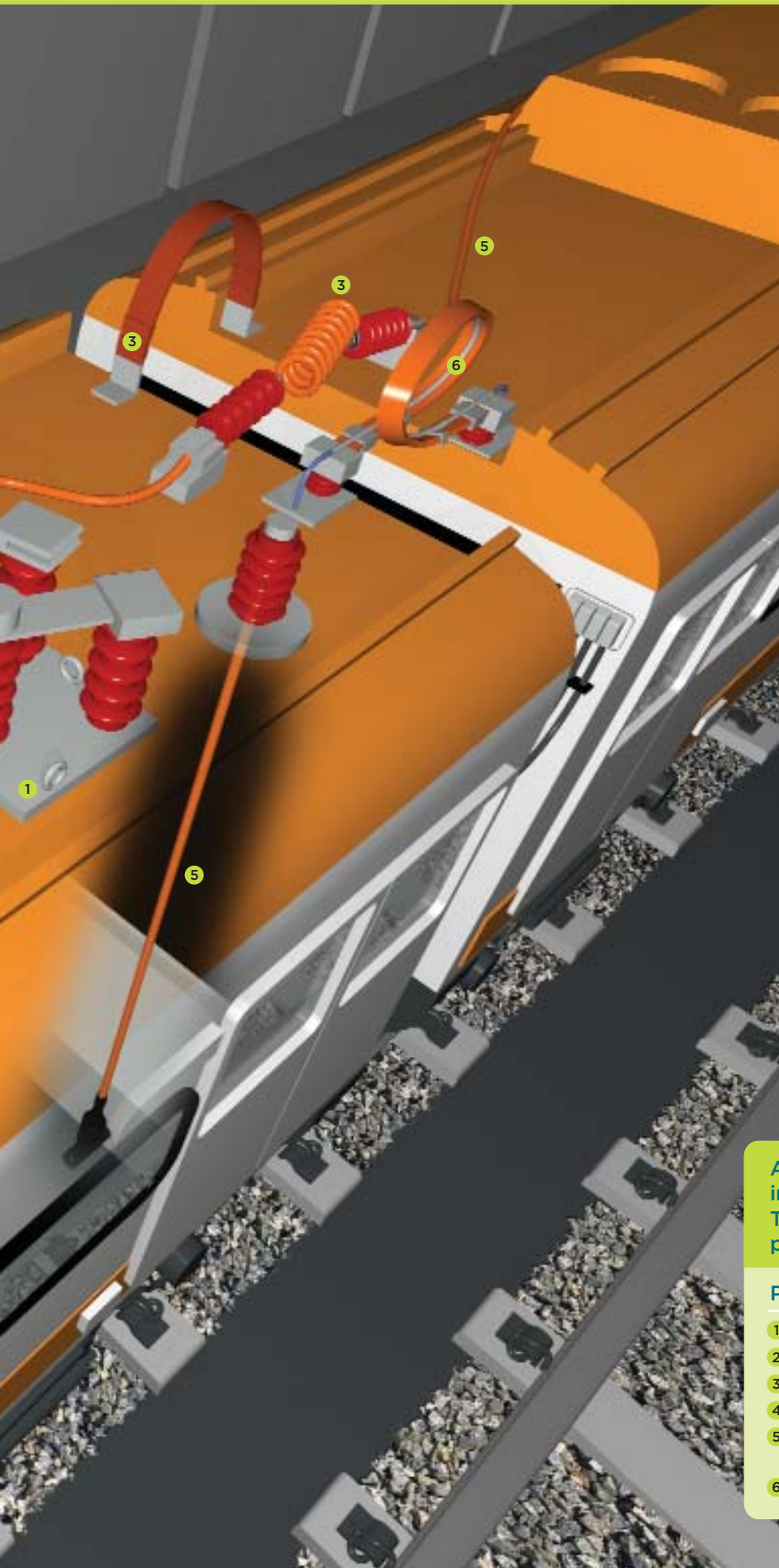
## TYPICAL APPLICATION IN RAILWAY INDUSTRY

Urbanization, 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.

Within our business segment Communications and Industrial Solutions TE Connectivity serves four major application areas ranging from High Voltage, Power distribution as well as Low Voltage Applications in rolling stock to Signaling 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 analog and computer-based signaling 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 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, from 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:**

| Product                                | Page |
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| 1 High Voltage Switch (HVCS)           | 14   |
| 2 High Voltage Circuit Breaker (HVCB)  | 14   |
| 3 Inter-Car Jumper Cables (HVJL)       | 15   |
| 4 High Voltage Insulator (HVIB)        | 15   |
| 5 HVTT, HVTE and HVEE Cable Assemblies | 15   |
| 6 DC Jumper (HVJL)                     | 15   |

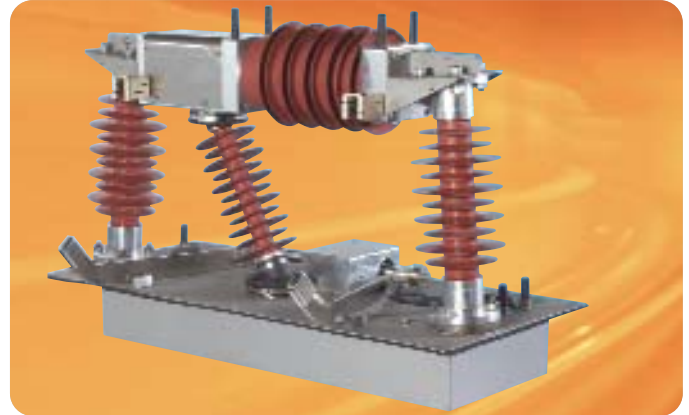


## HVCS - High Voltage Switch

TE Connectivity's HVCS switches come in three different configurations: as a voltage selector, as an earthing switch or as a disconnecter switch. Various voltage and current ratings are available, determined by the choice of insulator and busbar size used for the knife blade. The combination of industry-leading Raychem high voltage insulation materials with an electric motor drive provides a solution that is both innovative and reliable.

### Product Features

- Vehicle mounted switch optimized for use in the railway environment
- Electrically driven motor operation - no compressed air required
- Various configurations of insulators and busbars for different applications
- Fast cycle time - switching operation can be immediately reversed
- Will operate with 10mm ice coverage
- Low height and weight compared to existing technologies
- Footprint can be adapted for new-build and retrofit applications
- Can be electrically interlocked with train control systems
- High reliability and low maintenance reducing total life-cycle costs



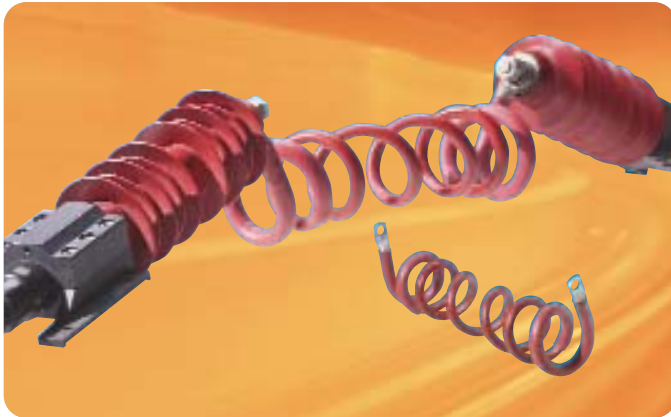
## HVCB - High Voltage Circuit Breaker

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 optimized 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 life-cycle costs





### 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 minimize wind resistance
- Coiled form allows large flexing range with minimum space
- Customisable for individual applications
- Impact resistant
- Lightweight
- Maintenance-free minimising life-cycle costs

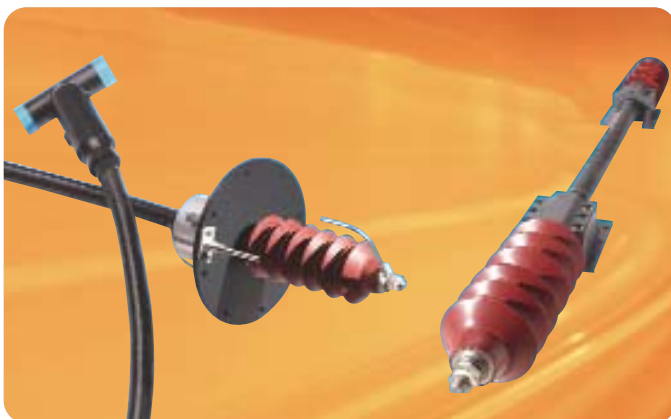


### HVJL – DC Jumper

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 life-cycle costs

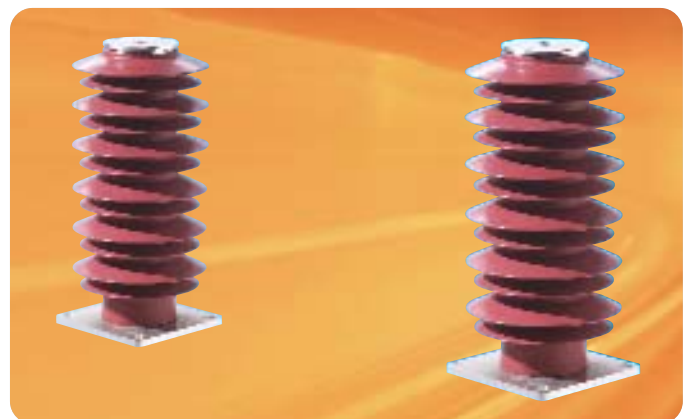


### HVTT, HVTE and HVEE Cable Assemblies

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



### HVIB High Voltage Insulators

Our 1.5 / 3kVdc, 15 / 25kVac 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 customized for specific applications
- Lightweight
- Impact resistant
- Reliable - over 20 years service history on high speed trains
- Maintenance-free







## 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:**

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| 1 Heavy Duty Connectors (HTS Series)                | 18   |
| 2 Flat Connectors                                   | 18   |
| 3 AMP Power Battery Connectors                      | 18   |
| 4 Power Wave crimp                                  | 19   |
| 5 AMPOWER Terminals and Splices                     | 19   |
| 6 High Performance Relays, Contactors and Solenoids | 19   |
| 7 Power Resistors                                   | 33   |



## HTS Power Connectors

Ranging from standard types to circular customized 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 120mm<sup>2</sup> 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

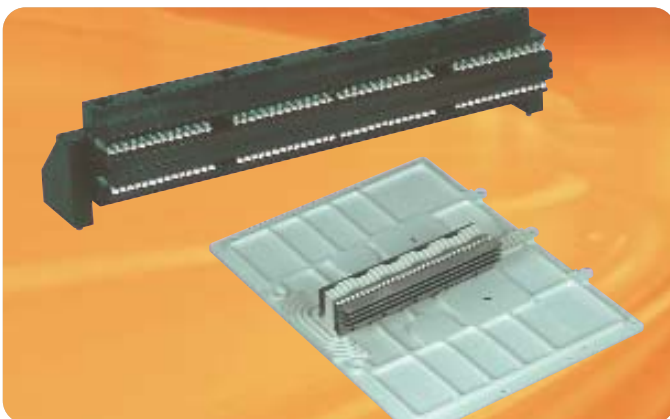


## HTS Power Connectors Series HF

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 150mm<sup>2</sup>
- 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



## Flat Connector

Converters are modular solutions with a pluggable interface from the static inverter to the drive. These series are designed as flat in/out put connectors.

### Product Features

- Customized design used in static converters
- Nominal current is <1.500A
- Knife/flat contact
- Single section convex, spherical, chamfered
- Two different generations for GTO or IGBT
- Thermal rating up to 120°C, 30 years product life cycle
- Low induction termination



## AMP Power Series Battery Connectors

AMP Power Series provides a durable, quick connect/disconnect means of transmitting 'power' levels of current and voltage. This product family includes single-pole and two-pole connector housings and crimp snap-in contacts.

### Product Features

- Single-pole and 2-pole
- Built-in interlocking features allow stacking and wire routing
- Contact range from 12 AWG to 300 MCM
- Eight series, based on approximate current-carrying capability
- Voltage rating: 600VAC/DC, current rating: 15-275A
- Colour-coded housings: UL 94V-0 and keying
- Stamped and formed, open barrel contacts



## AMPOWER 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 (6AWG to 1,000MCM [13-507mm<sup>2</sup>] for terminals and up to 1500MCM [760mm<sup>2</sup>] 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

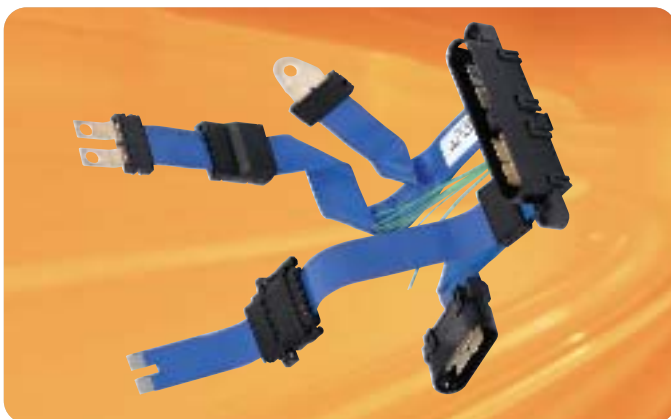


## Power Cables

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 1.5mm<sup>2</sup> to 400mm<sup>2</sup>
- Cables designed to meet customer requirements
- Jumper cables
- Approved to standards including: NF F 63 826, DIN 5510, NF F 16 101, BS 6853



## Power Wave Crimp

The AMPOWER Wave Crimp System is an innovative interconnection solution for power distribution, featuring flexible flat copper cables with multiple distribution points.

### Product Features

- Reliable, low resistance, gas tight interface
- Improved heat dissipation resulting in higher current capacity up to 110A at <30°C temperature rise
- Low inductance, high capacitance power distribution
- Separable interfaces have positive locking, polarisation and contact shrouding
- Packaging flexibility - cables can be easily routed through confined spaces
- Right-angle and vertical headers plus unique branching taps

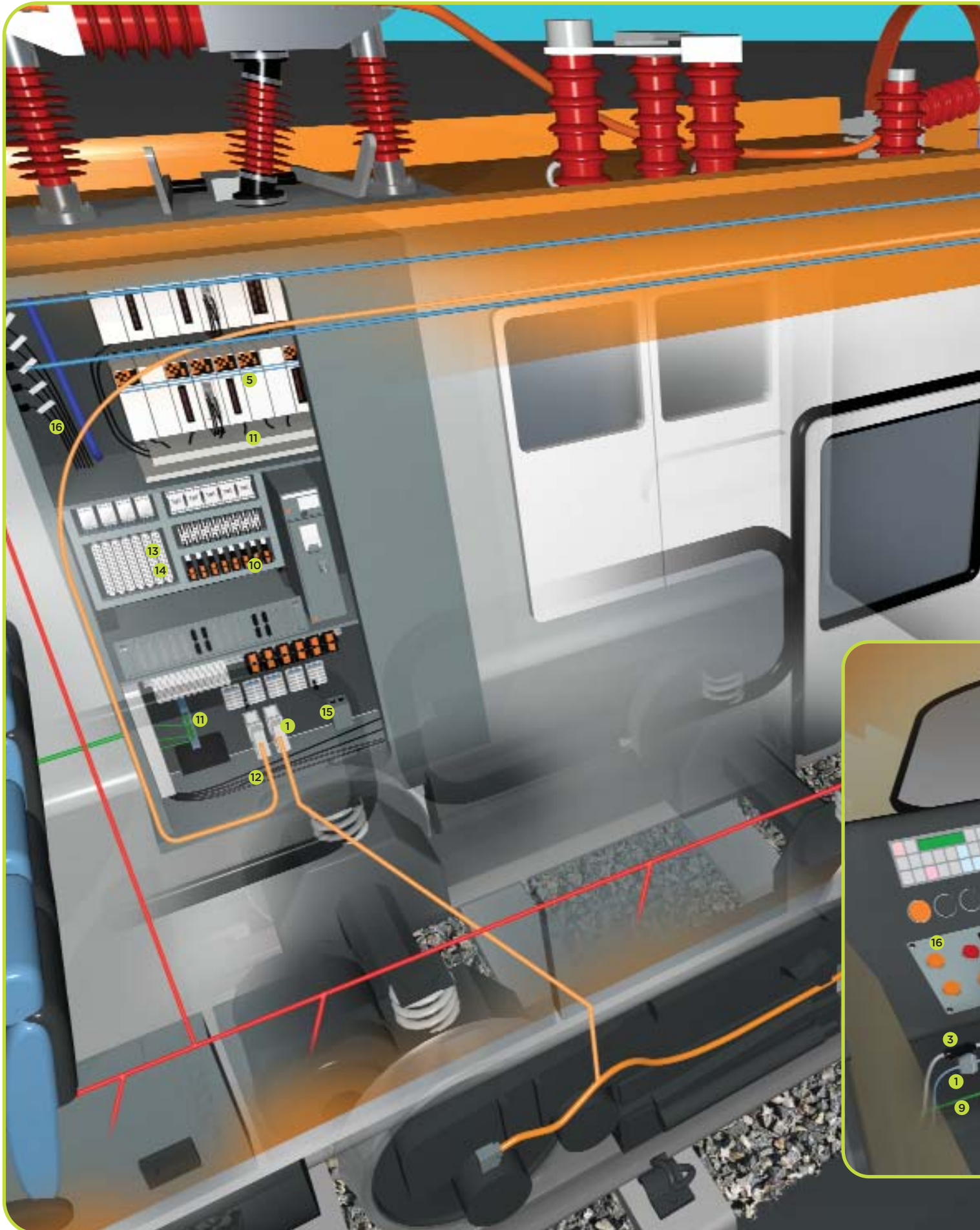


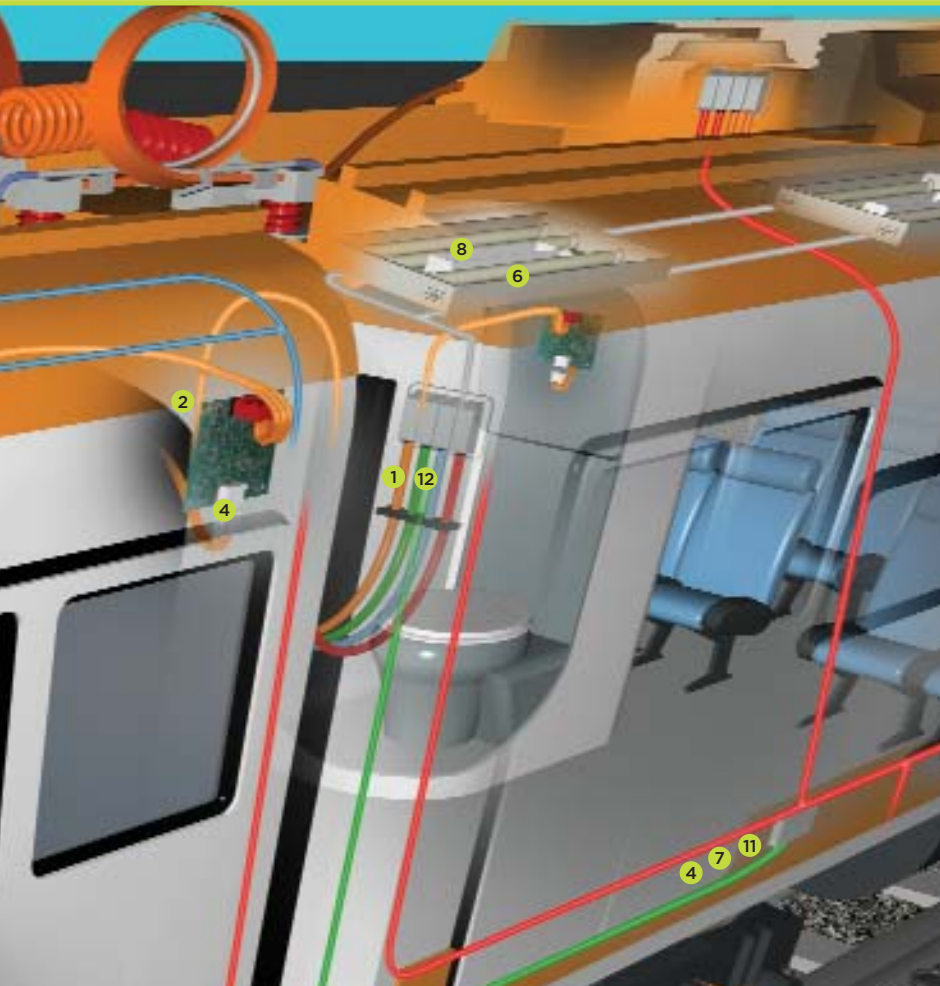
## High Performance Relays, Contactors, Solenoids and Circuit Breakers

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 & 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 APPLICATION FOR RAILWAY VEHICLES

Interoperability of control, monitoring and signaling 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.

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

| Product                              | Page |
|--------------------------------------|------|
| 1 Heavy Duty Connectors (HTS series) | 22   |
| 2 Dynamic Series Connectors          | 23   |
| 3 Circular Plastic Connectors        | 23   |
| 4 MATE-N-LOK Connectors              | 23   |
| 5 AMPLIMATE D-Sub Connectors         | 24   |
| 6 Distribution Box                   | 24   |
| 7 M8/M12 Sensor Connectors           | 24   |
| 8 Lighting Connectors                | 25   |
| 9 LED Light Pipe                     | 25   |
| 10 Relays                            | 28   |
| 11 Industrial Ethernet Products      | 29   |
| 12 Fibre Optic Solutions             | 29   |
| 13 Z-PACK Connectors                 | 32   |
| 14 Eurocard Connectors               | 32   |
| 15 EMI Filters                       | 34   |
| 16 Identification and Labeling       | 35   |



## HTS Industrial Connectors Housing

TE Connectivity offers a broad range of aluminium die casted 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 optimized cable management up to IP68
- Locking systems for highest vibration and shock protection



## 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-molded 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 70mm<sup>2</sup> 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 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 150mm<sup>2</sup> wire cross section
- Silver or gold-plated contacts with crimp or screw as well spring clamp termination
- Machine turned, stamped contacts

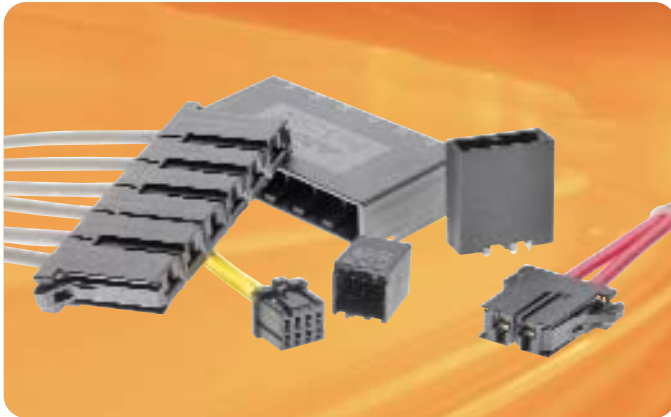


## HTS Coach to Coach (MD) Connectors

Professional molding processes enable the production 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 [.078"] thru 10.16mm [.400"] centerline spacing
- 125VAC, 3A to 630VAC, 45A power rating
- Wire range AWG 30 [0.5mm<sup>2</sup>] to AWG 8 [8mm<sup>2</sup>]
- 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

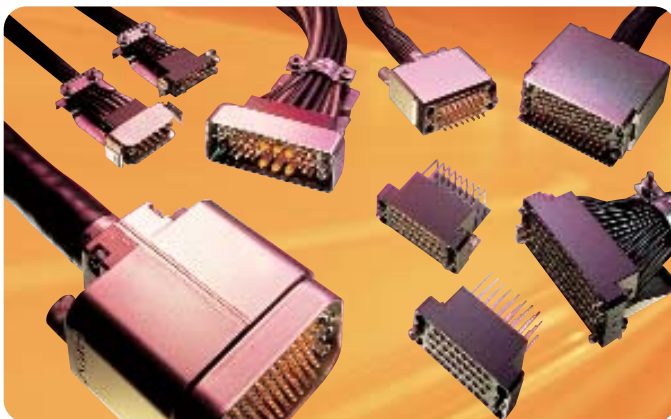


### Circular Plastic Connectors CPC

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 Signaling and Monitoring Systems and Safety Equipment to Control Systems and Distribution Boxes.

#### Product Features

- 50 and 75 way connectors meets requirements for Solid State Interlocking signaling 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



### MATE-N-LOK Connector

Universal MATE-N-LOK provides highly reliable, economical and integration 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 [0.200"] centreline
- Free hanging, panel mount and wire-to-board connections
- Ratings 19A, 250VAC
- 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 is one of the industry's most extensive and versatile connector. It has 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

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 4.0mm<sup>2</sup> available as single wires braided and jacketed multi-cores [750/1350VAC max]
- Range from 1.0mm<sup>2</sup> to 400mm<sup>2</sup> [750/1300VAC]
- Databus, Coaxial and Fibre Optic
- Jumper cables
- Compliant to various standards

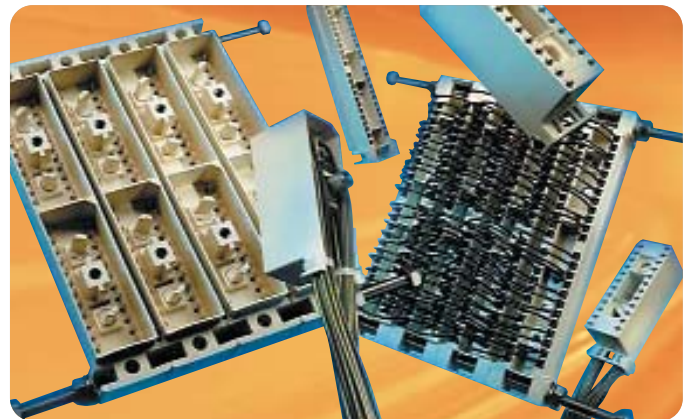


## M8/M12 Sensor Connector System

TE Connectivity offers a product line of M8/M12 Sensor connectors for use in industrial machinery and factory automation markets. This product styles include single and double terminated cable assemblies, panel mount connectors, rewirable field serviceable connectors, and adaptors.

### Product Features

- M8 connectors, 3-4 position
- M12 connectors, 3, 4, 5 and 8 position
- PVC and PUR cable materials
- PCB connectors
- Field serviceable connectors
- Y Adaptors
- Shielded and un-shielded product
- IP 67-68
- Screw and solder type
- M12 range incl. LED version



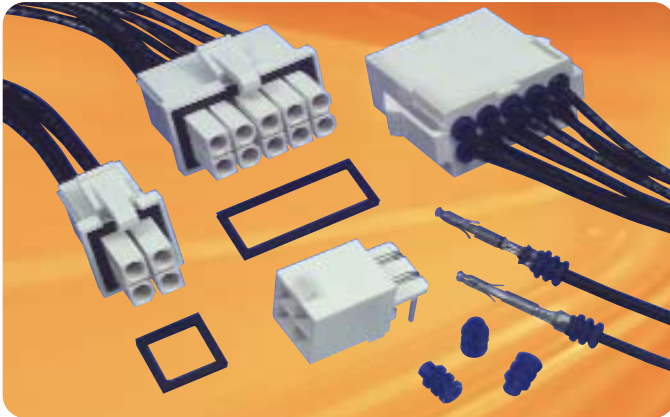
## Distribution Box (Modular Connector)

TE Connectivity provides unique solution for signal distribution and point to point application at lowest applied cost.

### Product Features

- Up to 2.5sqmm wires
- Meet NFF 16-101 fire behaviours requirement
- 24 ways pre wired panels unit to customer specification
- Modular concept



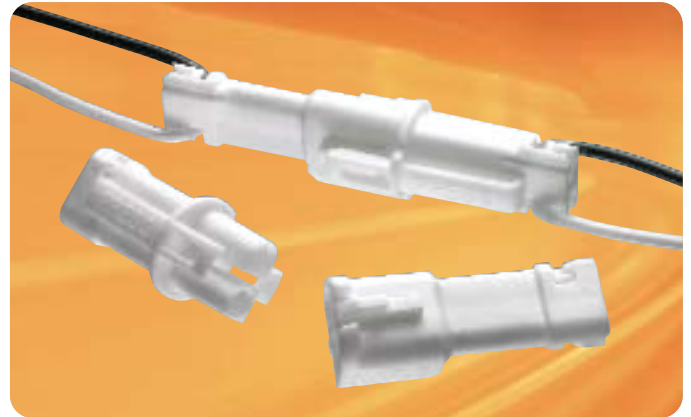


### Mini-Universal MATE-N-LOK

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 [0.163"] centreline plus 1-24 and 2-24 positions respectively
- Wire-to-wire and wire-to-board capability
- Ratings: 600VAC or VDC, 9.5A and 10.5A respectively
- Contacts are protected in the housings
- Seals available for splash protection



### LIGHT-N-LOK Connectors

A new connector for fluorescent ballast lighting applications, providing a hot-pluggable disconnect to allow safe field servicing, without exposing personnel to electrical shock hazards.

#### Product Features

- 2 and 3-position
- Poke-in termination for 18 AWG solid wire, for tool-less installation
- Integral strain relief prevents inadvertent wire twist-out or pull-out
- Designed for hot plugging
- 2-position fits through a 5/8" diameter knockout opening; 3-position fits through a 7/8" diameter knock-out opening
- Latches prevent unintentional disconnect of connector
- Rated for 5A at 600VAC



### NECTOR Connector System

The NECTOR Connection system is designed to be a pluggable electrical installation system for flexible power wiring applications, suitable for use in suspended ceilings and under raised floors.

#### Product Features

- Three possible contact styles: Spring clamp or screw for field installation, and crimped for mass production
- Keyed housing to prevent mismatches
- COSI housing plus crimp contacts available for high volumes
- Frame and shells available to allow both free-hand and panel-mount styles
- Locking devices to give improved latching between both interconnection sides

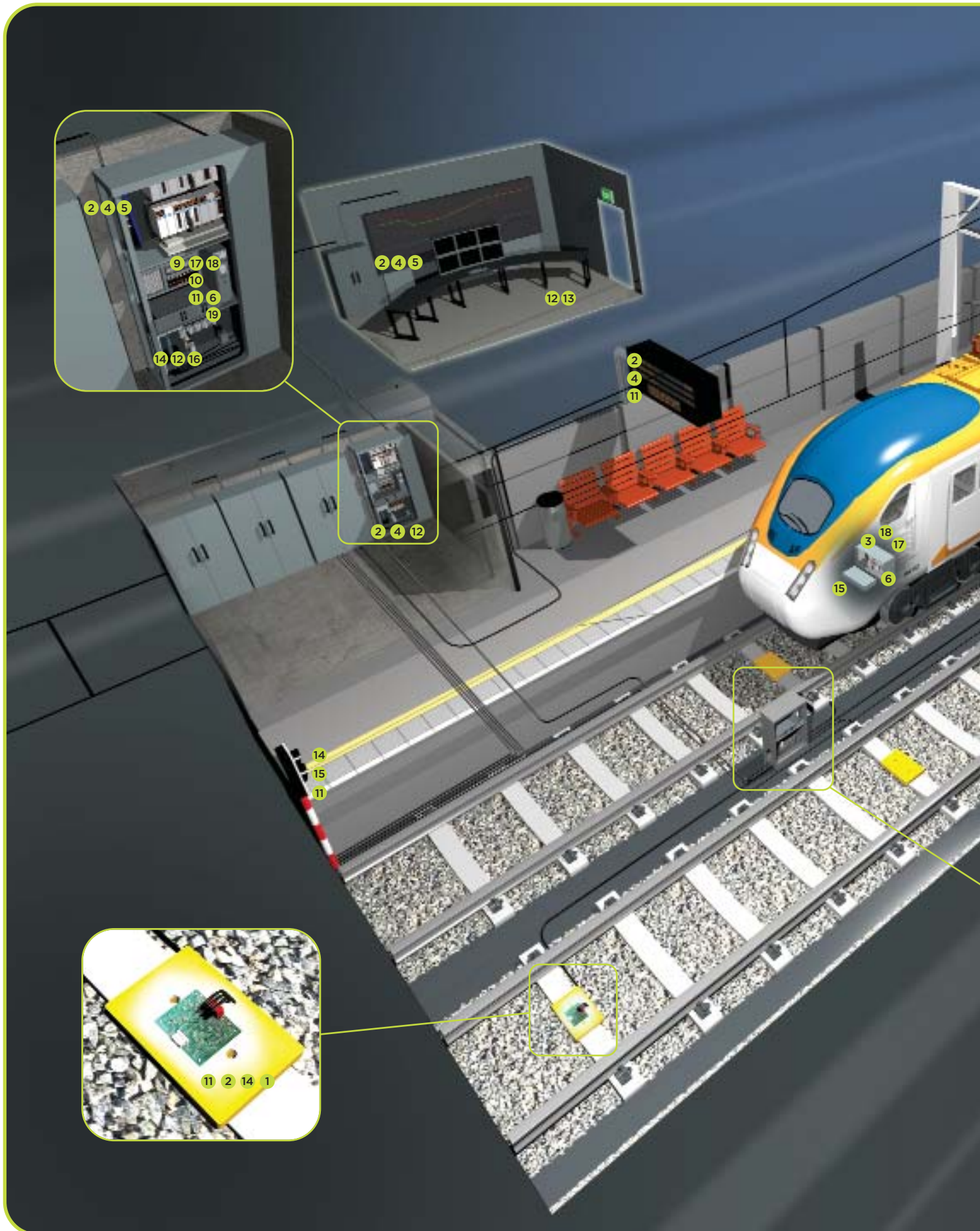


### LED Light Pipe

Linear light source using a proprietary large core optical fibre rod that projects a band of LED-driven light along the entire length of the rod.

#### Product Features

- Complete solution with LED, Light Guide, Driver, Brackets, and Cables
- High Power LEDs in a variety of colours
- Low cost
- Options for dimming control
- LED light source located on end of Light Guide Rod for remote lighting applications





## SIGNALING

Capacity and speed demands on strategic railway routes are driving a move away from analog systems and towards digital technology for signaling equipment.

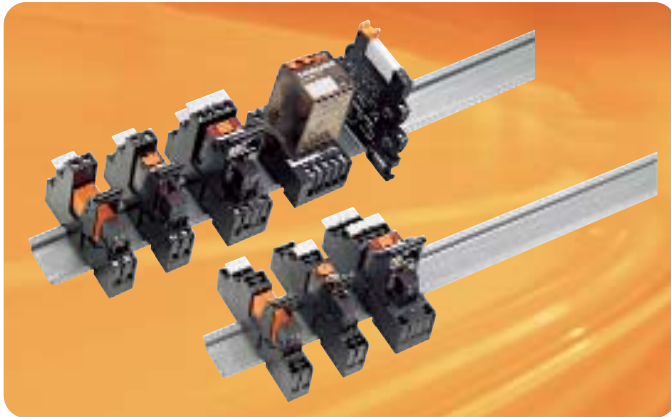
The introduction of digital transmission networks on railways brings to manufacturers the challenge of developing system concepts and equipment interfaces, which are suitable for complex data communication.

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.

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

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## General Purpose Relays

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

### 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

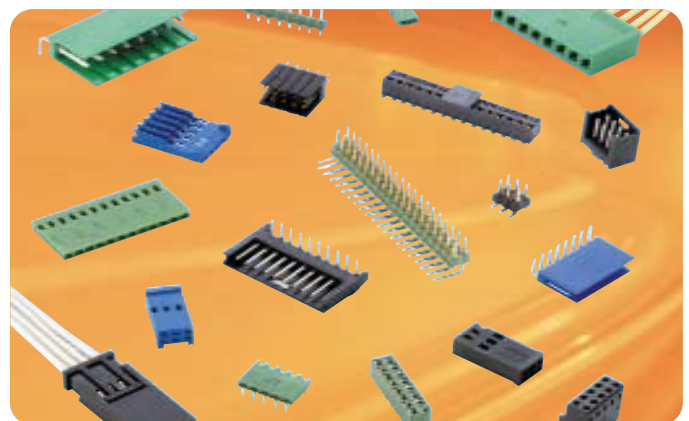


## Safety Relays

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 signaling 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 broad electronics 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

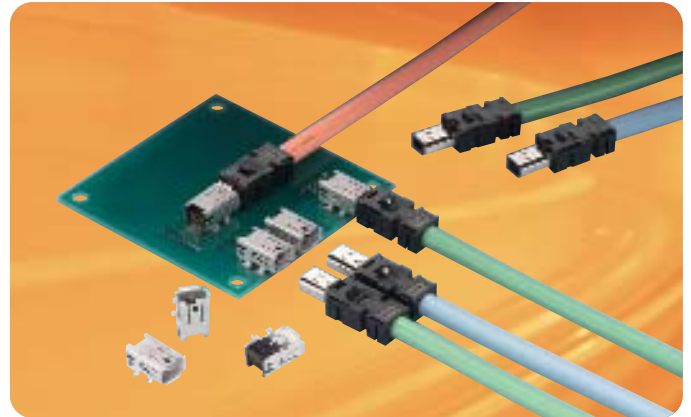


## Industrial Ethernet Products

TE Connectivity offers a variety of connectors and active products for Industrial Ethernet applications. From ruggedized 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



## Industrial Mini I/O Connector

Ethernet connectivity at 1/4 the size. TE Connectivity Industrial Mini I/O connector is 1/4 the size of standard RJ45 connectors. At 1Gbit 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



## 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
- 3000 mating cycles
- High shock and vibration resistance due to no physical contact
- Flexibility in design
- Low thermal sensitivity
- Hermaphroditic connection

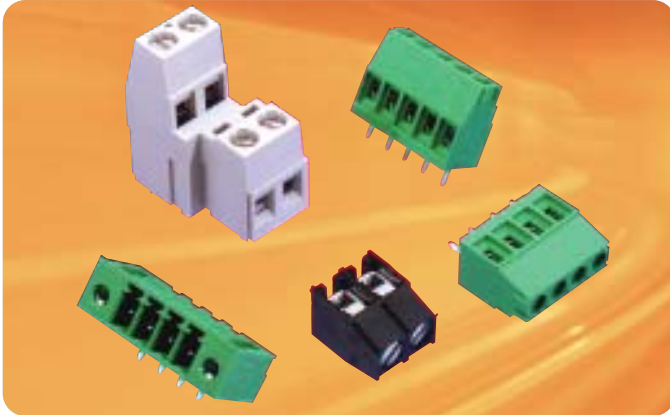


## Coax Connectors

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



## Terminals Blocks

TE Connectivity offers an extremely wide range of terminal blocks, 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



## 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



## Solder Sleeve

Solder Sleeve shield grounding termination provides an environmentally sealed, transparent, insulated and encapsulate solder connection for a variety of application.

### Product Features

- Wire-to-wire, shield, coaxial cable termination
- One piece design offers easy installation and lower installed cost
- Immersion resistant
- Prefluxe 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



## Molded 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 with 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





## 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



## 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 application 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
  - .050 [1.27] centreline; 9-100 positions
- Nanominiature Connectors per MIL-C-83513
  - .025 [0.635] centreline; 5-65 positions
- MCEM Rectangular per MIL-C-55302
  - two-row, board-to-board
  - .050 [1.27] centreline; 40-184 positions
- HDSM Rectangular per MIL-C-55302
  - Four-row, board-to-board
  - .050 [1.27] centreline; 38-400 positions





## Passive Components

Our product range covers a variety of passive components such as SMD and through hole resistors, trimmers, 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 customized 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, auxiliary equipment across the world, from control systems, or from drive cabs, passenger information, internal lighting to distribution boxes.

### 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, TCR's and Tolerances of 50ppm and 1%

### Customized Resistors

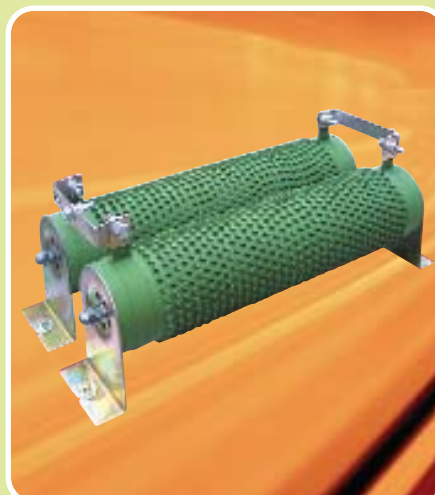
- Customization capabilities of standard products
- Supported by wide range of commodity power resistors
- Optimal thermal solutions with heat sink
- Load Banks up to 300kW
- Cyclic rated power and overload testing
- Adiabatic (single shot and frequency) testing
- Environmental, mechanical and repetitive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



Wirewound Technology



Thick Film Technology



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



Foil Technology

## Value Added Products

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

From industry standard 'point to point' cables through ruggedized 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 optimized 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 global manufacturing and supply chain infrastructure provide 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.



Engineered Solutions



Ruggedized Cable Assemblies

## 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

- Include 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
- Stand-alone 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

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

## 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



Wire and Harness Identification



Identification



Performance Labels



Thermal Transfer Printing Systems

We offer a broad selection of compatible tooling to support various applications. The tooling choice ranges from simple hand tools for lower volume production through the electric and hydraulic bench machines for higher volumes, semi-automatic stripper crimpers and finally fully automatic machines for producing of complete wire harnesses.

In addition to our flexible product portfolio, we offer tooling solutions for individual customer needs, e.g. customized hand tool kits for service and repair.

We assist customers with information for applicable technologies and a comprehensive service programme as well as pre and after sales support. This service includes maintenance contracts, service agreements, customized training courses, applicator rental requirements and spare and wear part organisation.

## AMP 3K/40 and AMP 5K/40 for Reeled Terminals

- Termination of wire sizes up to 6.0mm<sup>2</sup>
- Cycle time less than 0.4 seconds
- Easy and quick exchange of applicators
- Optional features:  
Stripping Module  
Carrier Scrap Chopper (CSC)  
Defective Crimp Cutter (DCC)  
Crimp Quality Monitoring (CQM)

## HTS Industrial Connector Hand Tool for machined Terminals

- Applicable to terminate different loose piece contacts by simply changing die and locator

## Insertion & Extraction Tools

- Inserting discreet terminals into connector housings or removing, without causing damage
- Comfortable handle and snap-in/out protective cover
- Tools can be ordered separately
- The image shows a customized Tool Kit

## Battery-Powered Hand Tools

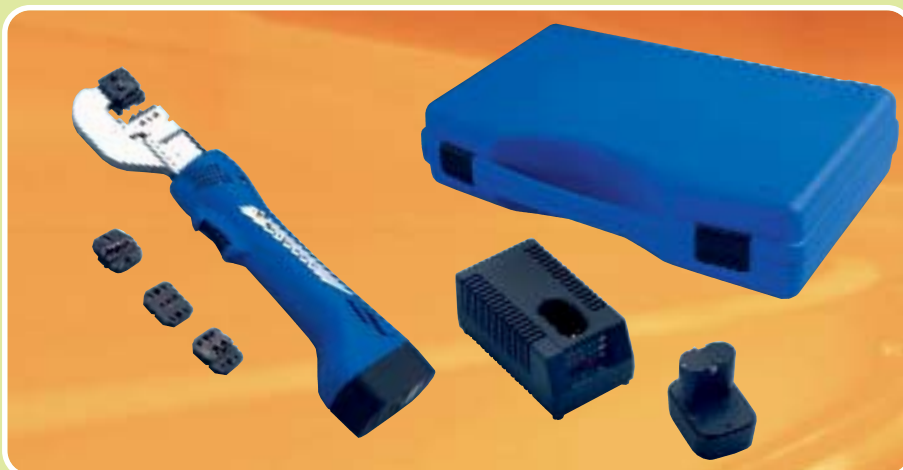
- Interchangeable tooling heads
- Ideal for use at the bench, on the line, or in the field.
- Performance of over 100 crimp cycles per charge
- Applicable wire sizes up to 6mm<sup>2</sup> (10 AWG)



AMP 3K/40 and AMP 5K/40 for reeled terminals



HTS Industrial Connector Hand Tool for machined Terminals



Battery-Powered Hand Tools



Insertion and Extraction Tools

TE Connectivity offers a comprehensive range of automatic test equipment for wiring harnesses and associated systems. Most of the test systems are built into ruggedized 19" racks. The modular build structure of the hardware allows the user to expand the system both in terms of test points and measurement function. This is achieved by simply adding switching modules and/or functional modules. Each new technical development is designed as an add-on module to the existing base system architecture.

- Test points ranging from 32 to over 200,000
- Voltages range from 500 V DC up to 10,000 V DC and above
- Typical test currents 1 A or 2 A or customized
- DC insulation resistance measurement up to 2 GOhm and higher
- 2-wire and 4-wire (Kelvin) measurement or Dual
- Hi-Pot DC test option
- Hi-Pot AC test option
- Fixed installations or mobile units
- Diode test
- External activation of active components (relays, valves, LED's, lamps etc.)
- Distance to fault measurements
- Desktop PC or Laptop
- Network able

## 19" Rack Based System



## Remote Control PocketMeg

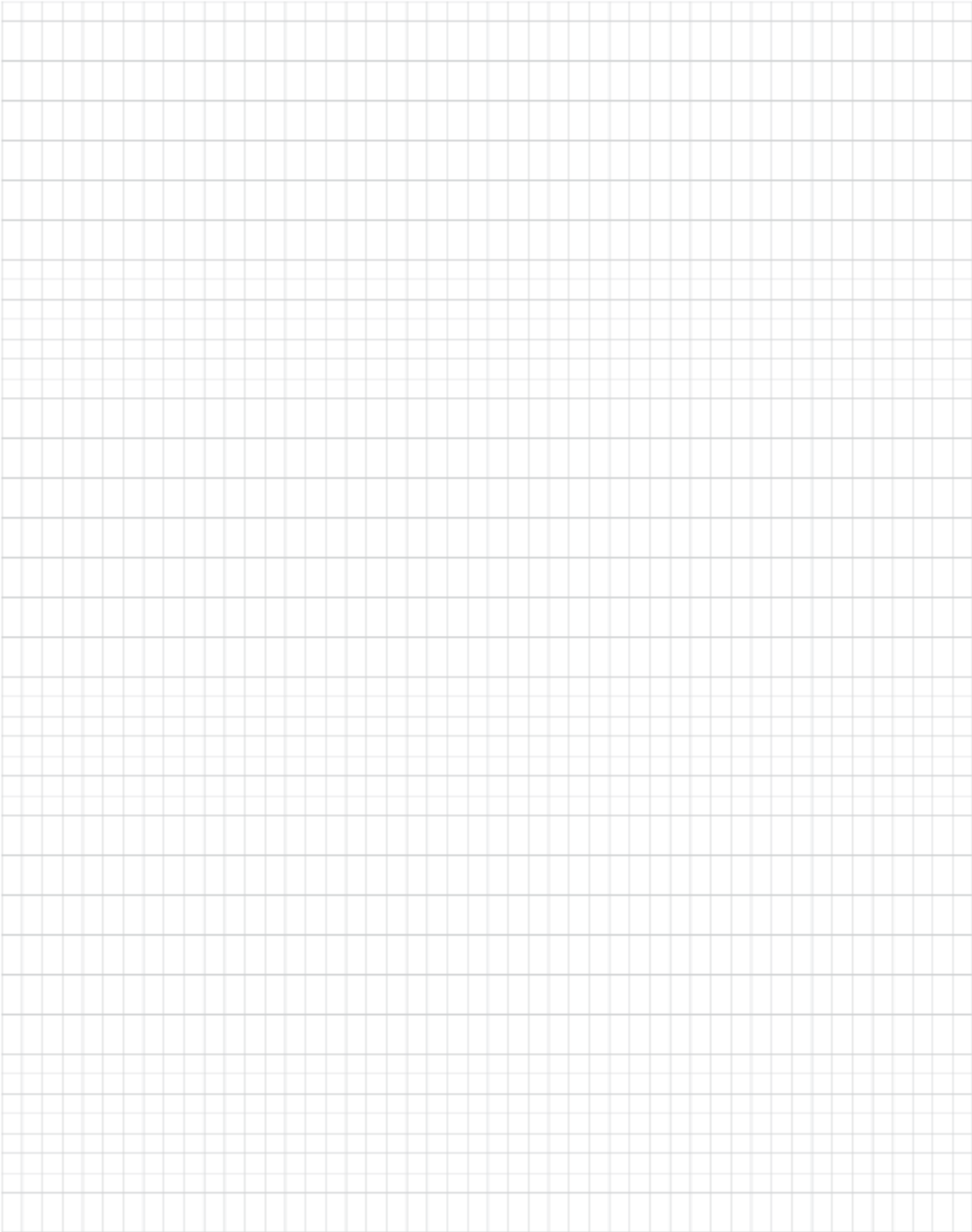
- Small handheld unit using WiFi
- Communication and data transfer protocol (11 MBps)
- Full operating software package included
- Real time measurement scanning results
- Full remote control and operator interaction with the automatic test system
- Offers operator input and pictorial guides display

## Portable Test System

- Robust case for use in harsh environments
- IP 65 protected
- Complete tester with test system, laptop computer and printer
- 2-wire and 4-wire (Kelvin) measurement or Dual
- Up to 1,024 two-wire test points (using Sub-D connectors)
- Voltages up to 500 V DC
- Continuity currents up to 10 A
- High voltage AC 25-250 V RMS/50 Hz optional
- Interface connectors can be customized



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## FOR MORE INFORMATION

[te.com/railway](http://te.com/railway)

### TE Technical Support Center

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\*as defined [www.te.com/leadfree](http://www.te.com/leadfree)

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