Lighting Components and Application Guide

Tyco Electronics

Our commitment. Your advantage.

Tyco Electronics Can Help Your Next Lighting Programme To Shine

The lighting industry is undergoing rapid changes in the quest for energy efficiency, longer life, and new applications. From stadium displays to residential illumination, innovation in lighting is taking advantage of broad-based technological progress. For over 60 years, Tyco Electronics has worked with leaders in the lighting industry to lower costs, increase reliability, and devise new and novel ways to create and apply lighting products. Today, as the leader in passive electronic components, and with over 500,000 part numbers, we can put our expertise to work on your development programmes.

Early Involvement Pays Off in Competitive Advantage

With over 8,000 engineers and 17 design centres, plus manufacturing facilities in 25 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.

Whether it's showing you the best existing products, offering a value-added solution or designing a new product, our commitment to advanced engineering and world-class manufacturing delivers innovation that can advance any lighting project.

Our Electronic Components division is the world's largest supplier of passive electronic components, including connectors and interconnect systems, relays, switches, circuit protection devices, touchscreens, sensors, and wire and cable.

Tyco Electronics' 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.

GIC Engineering Centres
1. Bangkok
2. Bensheim
3. Greensboro NC
4. Harrisburg PA
5. Kawasaki
6. Kyungsan
7. Menlo Park CA
8. Neunkirchen
9. Shanghai
10. Shenzhen
11. Sydney
12. Turin

GIC Manufacturing North America
1. East Providence RI
2. Guaymas MX
3. Hermosillo MX
4. Juarez MX
5. Lancaster PA
6. Lickdale PA
7. Menlo Park CA
8. Portland OR
9. PTP/Reidsville Rd NC

EMEA
1. Bideford
2. Collegno
3. Doncaster
4. Grenoble
5. L'viv
6. Roedermark
7. Swindon
8. Trutnov
9. Waidhofen

Asia Pacific
1. Auckland
2. Christchurch
3. Kingsgrove
4. Qingdao
5. Shanghai
6. Shenzhen

Within our development teams, we have the knowledge and the skills which are required to meet the needs of many different applications, ranging from fluorescents and HID lighting to solid state lighting. 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 lighting gives you access to the widest selection of standard and semi-custom products, including:

- Connectors and terminal blocks
- Wire and cable
- Relays
- Shrink tubing
- Switches

from such well-respected brands as AMP, Madison Cable, OEG, Potter & Brumfileld, Raychem and Schrack.

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:

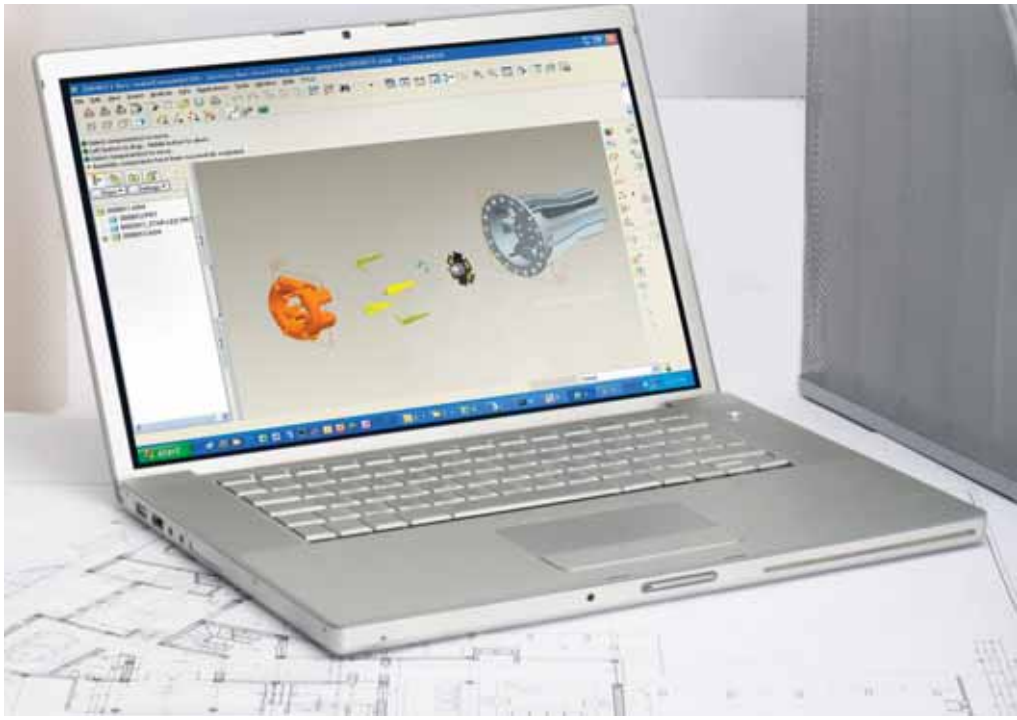
- **Computer-aided engineering -** giving some of the most sophisticated modelling and simulation capabilities in the industry to validate a design before prototyping
- **Rapid prototyping -** from stereolithography for rough 'form and fit' evaluation in minutes, to model shops that turn prototypes in 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, and 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 lighting 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.

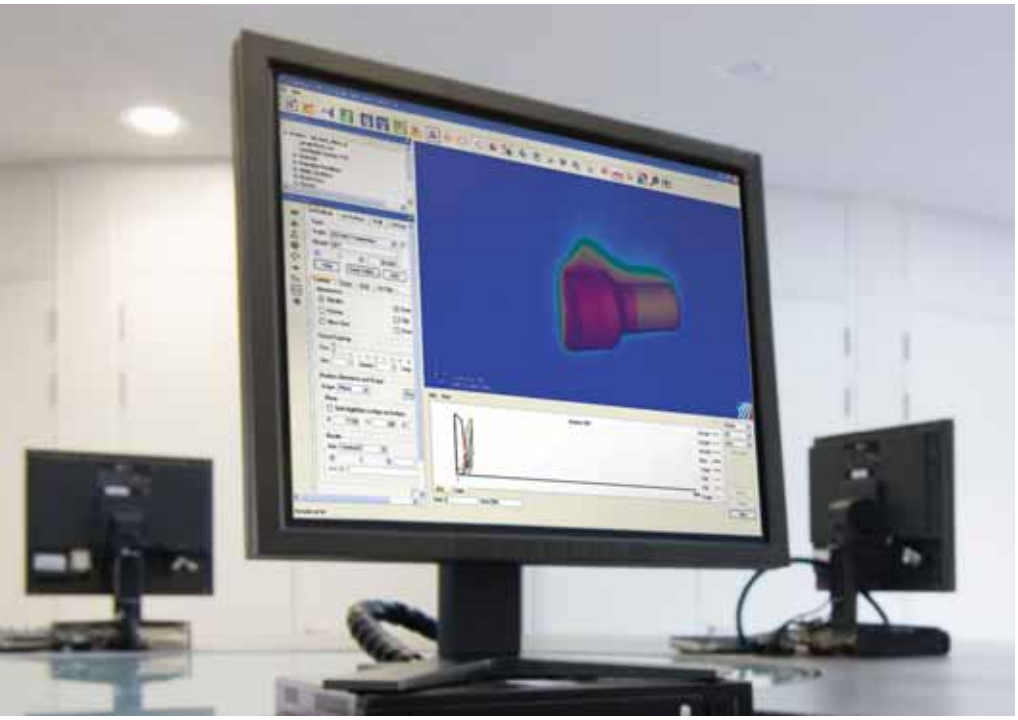
As a Six Sigma company with Lean Manufacturing, we are continually improving our processes by reducing variation and eliminating waste. Six Sigma methodologies are part of our culture, which is one that puts design excellence and product quality at the forefront of everything we do.



World-Class Test Facilities

Our in-house test capabilities include mechanical, electrical and environmental testing, to qualify and validate that our products meet your specifications. Our test labs are approved by Underwriters Laboratories for testing Tyco Electronics' 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
- **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



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 ANSI/AAMI, IEC, UL/CSA, CE, VDE and other international agencies. We comply so you can comply.

Fast Access to Information

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.

Our Web Site

tycoelectronics.com/lighting 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 gives you access to ordering, order tracking, distributor inventories, samples and much more.

Visit Our Lighting Portal for All Things Lighting

To make things easy, we have created an industry-specific site which focuses exclusively on lighting. Here you can find our extensive line of products and solutions for lighting:
tycoelectronics.com/lighting


Tyco Electronics

Street and Stadium Lighting

Street and stadium lighting is becoming increasingly more sophisticated. For example, some traffic management systems now monitor traffic flow to determine the required light output. Street and Stadium lighting systems are high voltage (120-480 V depending on location) and they must withstand outdoor environmental factors such as vibration, pollution, temperature change, salt spray and humidity. Yet they must also have a long life and be easily maintained.

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

- Transformers
- Magnetic wire terminations
- Sealed and unsealed interconnect systems
- Grounding clips and terminals
- High performance cabling

Digital Signage

Walk through any major city in the world and you'll see massive illuminated electronic signs which display advertising, branding and information. Sports stadiums and concert venues also employ large area, high definition signage to show video replays or to allow those at the back to see close-up action. Such systems must withstand all weather conditions and must also be very rugged and reliable, as advertisers won't pay if a sign goes dark! For concert venue applications they must also be very quick and easy to install and to remove.

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

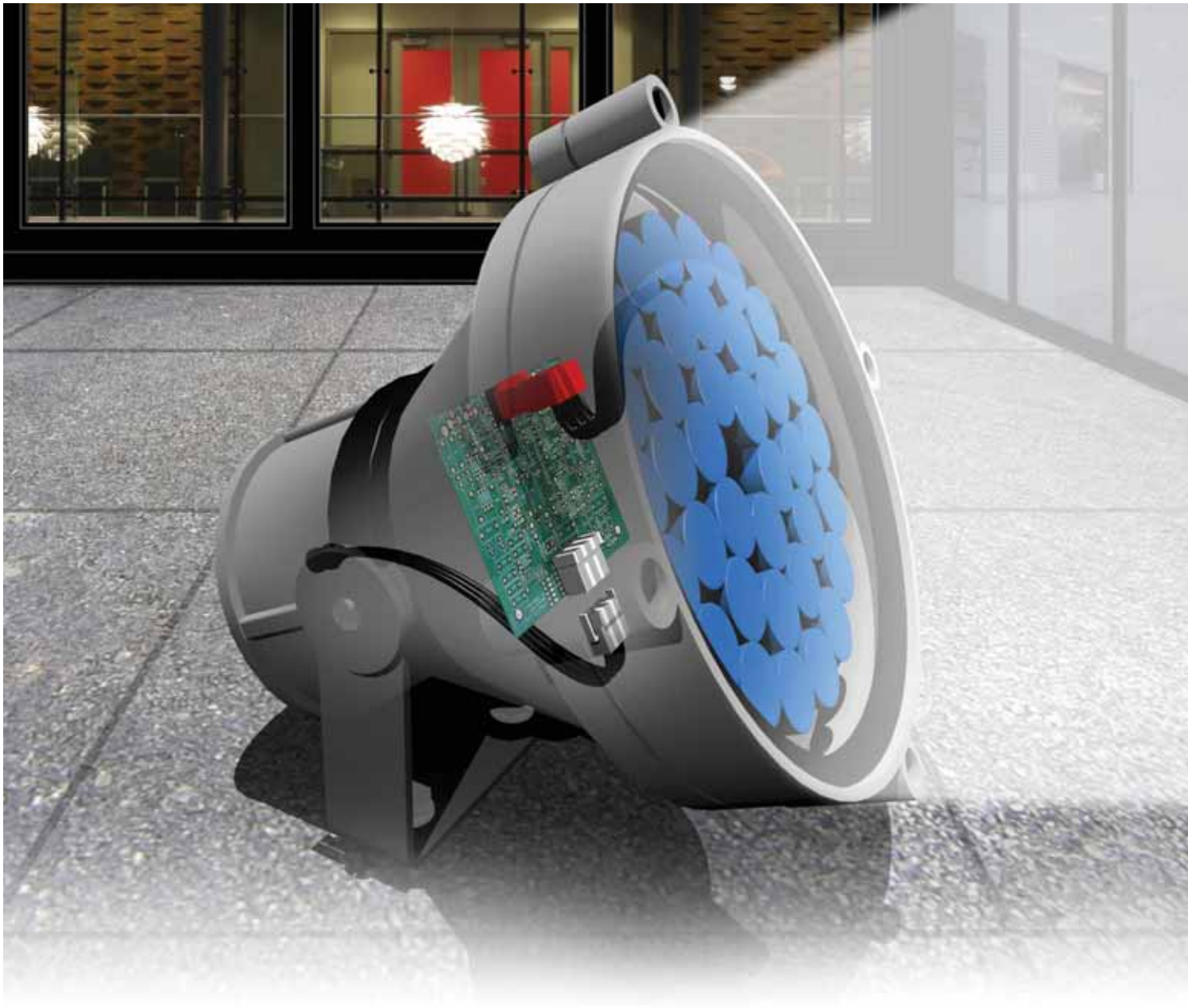
- LED interconnect packaging
- Sealed and unsealed data and power connectors
- High durability labelling products
- Fibre optic products
- Over-molded lead frames
- Cable assemblies

Indoor Lighting

There is a worldwide move away from power-hungry incandescent light bulbs, towards more energy-efficient fluorescent and LED lighting. But smaller tubes require dimmable electronic ballasts, whilst LED systems – which have very low power and long life – require a thorough understanding of solid state driver technology. Legislation aimed at reducing the amount of power we waste, just to illuminate our homes and workplaces, is being introduced in all geographic regions.

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

- Structured cabling systems
- Custom and standard cable assemblies
- Labels
- Ballast disconnects
- Wide range of standard terminals and splicers

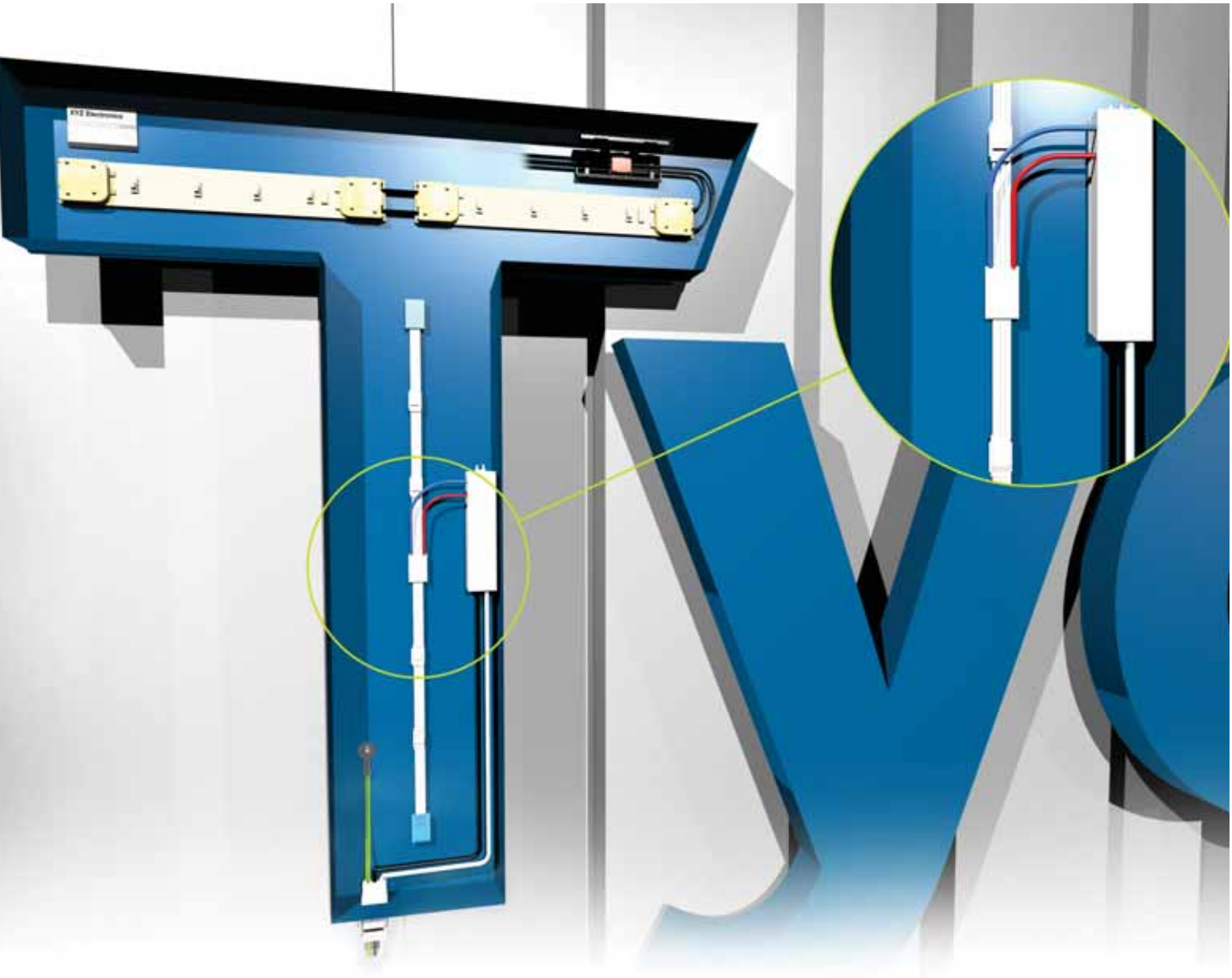


Architectural Lighting

Las Vegas wouldn't be the same without the wonderful architectural lighting which emphasises its stunning casinos and hotels. Imagine Paris without an illuminated Eiffel Tower. These systems are often used outdoors, although some buildings are illuminated from within, so they need to be able to withstand all weather conditions. They must also have a long life, which is why many systems are now based on LED technology. And power consumption is also a major consideration of course.

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

- Sealed, high reliability connectors
- Lighting controls
- Flexible and modular wiring systems
- Structural wiring systems
- Shielded interconnects
- High performance cable
- Sensors
- Small pitch connectors

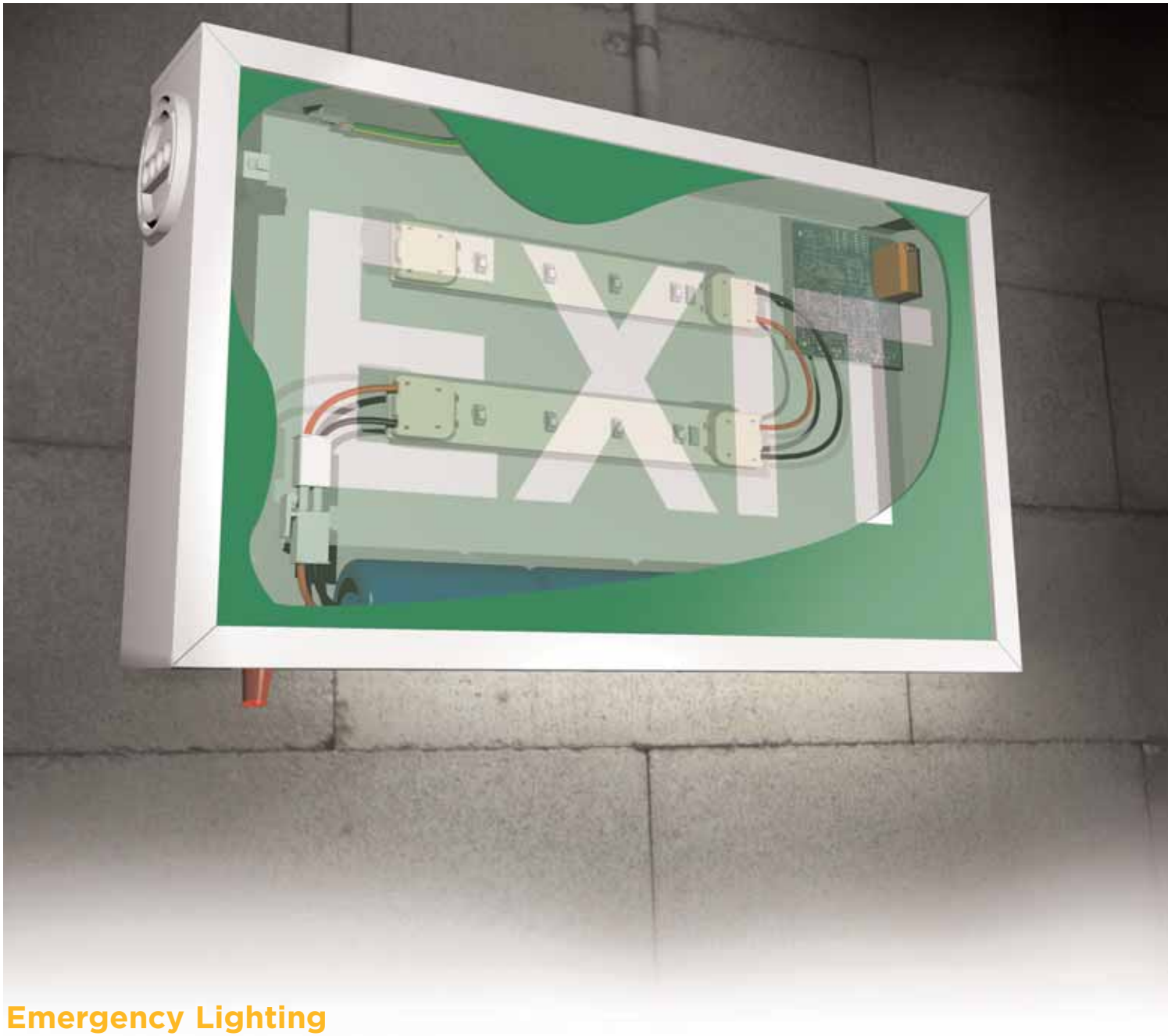


Channel/Sign Lighting

The massive illuminated company names and advertisements which sit on top of buildings and dominate city skylines are really quite simple backlit constructions. However, they must be durable enough to survive in all weather conditions, and must also be energy-efficient. Solid state (LED) light sources are very popular for this application.

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

- Sealed IDC connectors
- Power connectors
- Heat shrink tubing
- Sealing materials
- Wire management products
- Terminal blocks



Emergency Lighting

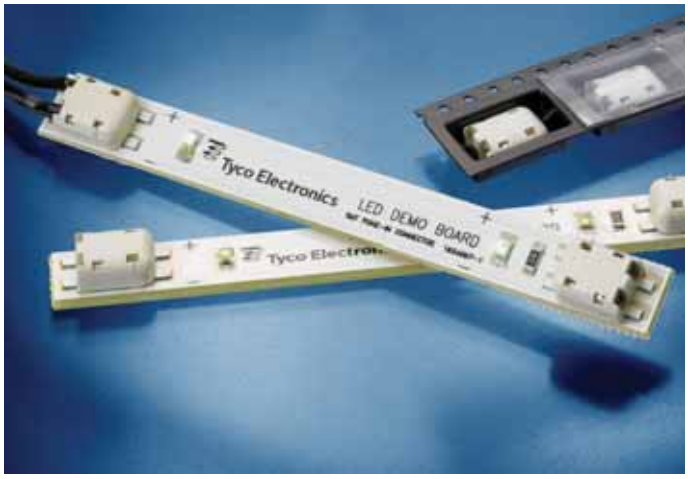
As well as providing illumination in case of emergency, illuminated emergency exit signs are now mandatory in public buildings such as stadiums, theatres or offices worldwide. More and more of these systems are moving from incandescent light sources to fluorescent and even LED products, as designers look to find longer lasting, lower power alternatives.

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

- Energy-efficient bi-stable relays
- Battery packs
- Wide range of interconnection solutions including wire-to-board and board-to-board products

Connectors

Tyco Electronics offers an almost endless range of electrical and electronic interconnection products, as shown throughout this brochure. Our continually-expanding capabilities include new copper and fibre-optic connectors, which are designed to meet the communications and computer industries' demands for higher signal speeds and high-density packaging. We strive to provide you with the right connector solution, whether it is a simple wire terminal or a highly sophisticated connector for your next-generation product.

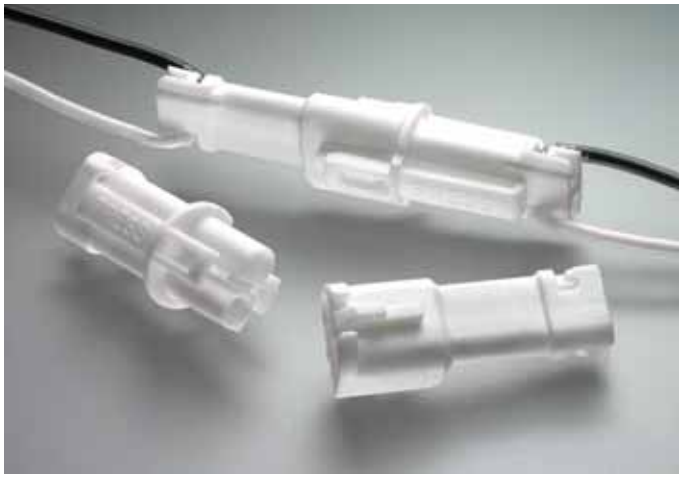


SMT Poke-in Connector

This 2-position, low profile SMT wire poke-in connector is designed for LED lighting applications. Available in surface mount tape and reel packaging, the connector is designed to accept a wide range of wire sizes and types.

Product Features

- Tape and reel packaging for high speed SMT processes
- RoHS compliant redundant SMT pads prevent peeling
- Rounded corners to minimise shadowing
- Side to side stackable, with pads on 4mm centres
- Accepts 18, 20, 22 AWG solid wire; 18, 20 AWG pre-bond stranded; 18 AWG stranded
- Cost-effective alternative to hand soldering wires
- Low profile design
- Flat top surface allows for vacuum pick up
- High temperature material for reflow processing



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

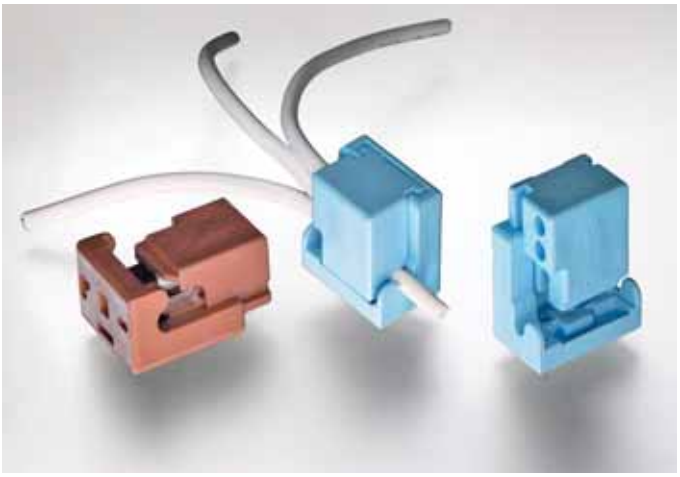
- Available in 2 and 3-position sizes
- Poke-in termination for 18 AWG solid wire, for easy tool-less field or factory installation
- Integral strain relief prevents inadvertent wire twist-out or pull-out
- Designed for hot plugging
- Snag-resistant rounded housings
- Compact connector housings: 2-position assembly fits through a 5/8" diameter knock-out opening; 3-position assembly fits through a 7/8" diameter knock-out opening
- Connector latches prevent unintentional disconnect of connector
- Standard 3/8" wire strip length
- Can be supplied as pre-assembled mated connector sets, with or without factory installed flying leads
- Product is marked (English/French) in support of CSA Luminaire labelling requirements

LED Light Pipe

Linear light source using a proprietary large core optical Fibre rod which 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
- Various colours of high power LEDs
- Low cost
- Options for dimming control
- LED light source located on end of light guide rod for remote lighting applications
- RoHS compliant

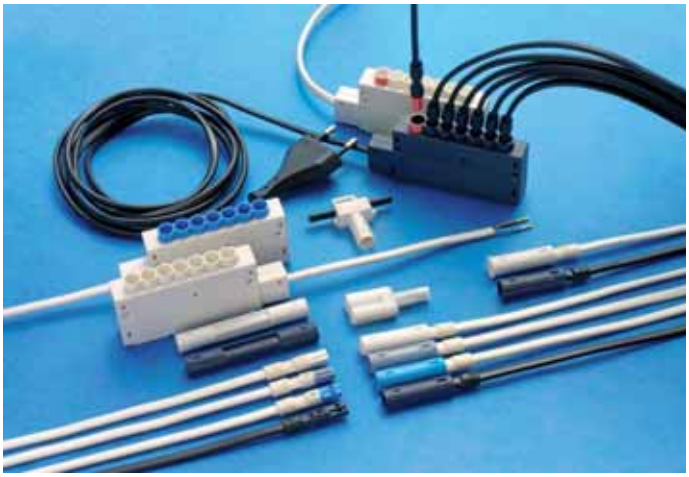


IDC Poke-in Wire Tap/Splice

Combination tap/splice design to accommodate quick termination of power wiring (tap) out to individual light fixtures (splice).

Product Features

- Tap termination allows feed-through in 12 AWG (solid or stranded) or 18 AWG THHN/THWN wire
- Splice poke-in accommodates two pre-stripped 18 AWG solid wires
- Cost-effective termination system for installation of ballast lighting systems



7.5mm Mini HVL Connector

The new Tyco Electronics 7.5mm Mini HVL connector series is designed according the IEC 60320 standard for lighting industry applications, where size and easy interconnection are key requirements. It is installable in small fixtures into furniture, ceilings, walls and floors.

Applicable in power connection and coupling between lamps such as:

- lighting wiring in offices
- kitchen, bathroom, shop and household furniture
- display cabinets and mountable lighting

Description

- Connector system available in wire-to-wire configuration
- Outlet and plug assemblies with two contact positions
- Using widely known MQS contacts
- 6 way distributor with additional switch feature

Product Features

- 7.5mm outer diameter of plug to fit into 8mm furniture holes
- Several versions available: 250 VAC, polarised 250 VAC, 125 VAC, 42 VAC and 42 VDC
- Ring clip for wire retention, to meet pull test according IEC 60320
- Coupling designed according IEC 60320
- 6 way distributor:
  - Fast one-stroke IDC termination (pre-assembled contacts)
  - Switch version available. Special coded red plug for external switch input
  - Specific red code ring to identify the 7th switch input
- Outlet bridge, splitter, panel mount outlet and bus bar. Splitter to expand interconnection

NECTOR Connector System

Description

- Connection system for flexible power wiring applications. Suitable for use in suspended ceilings and under raised floors
- Intermateable with Wieland's gesis® GST18i3 connector system

Product Features

- Pluggable electrical installation system
- 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
- Pre-assembled leads also available
- Locking devices to give improved latching between both interconnection sides according VDE
- Tool removable contact tabs according VDE

gesis is a trademark of Wieland Electric GmbH

MATE-N-LOK Bulkhead Connector

Universal MATE-N-LOK Connector for Sealed Bulkhead Applications

Bulkhead mount Universal MATE-N-LOK connector which facilitates sealed panel mounting and works with existing Universal MATE-N-LOK seals, to provide a fully-sealed interconnection system.

Product Features

- Available in 4, 6, 9 and 12 positions
- Sealed flange mount design
- Mates to standard Universal MATE-N-LOK plug housings
- Accepts standard Universal MATE-N-LOK contacts
- Works with standard Universal MATE-N-LOK connector interface and wire seals
- Anti-rotation feature aids installation

Mini-Universal MATE-N-LOK Sealed Connector System

The Mini-Universal MATE-N-LOK sealed connector system is a small wire-to-wire and wire-to-board connector system which provides all the advantages of using a proven product (Mini Universal MATE-N-LOK) but in a splash-proof environment. Conversion to a splash-proof product can be achieved with minimal changes to current Mini Universal MATE-N-LOK connectors.

Splash-proof design allows connector system to be used in areas where high humidity, intermittent liquid splashing or foam-in applications cause a requirement for a sealed connector, for improved electrical performance. Applications include appliances, vending and HVAC.

Product Features

- Dual row, 2 to 10 positions (even only)
- Mates with all standard Mini Universal MATE-N-LOK connector housings
- Positive, polarised keyed and latched orientation to ease application
- Utilises proven Mini Universal MATE-N-LOK contact interface system
- Uses existing Mini Universal MATE-N-LOK application tooling
- Product has been tested to IP Level 5/7 for 1.02-2.11 [.040-.083] insulation diameter wire

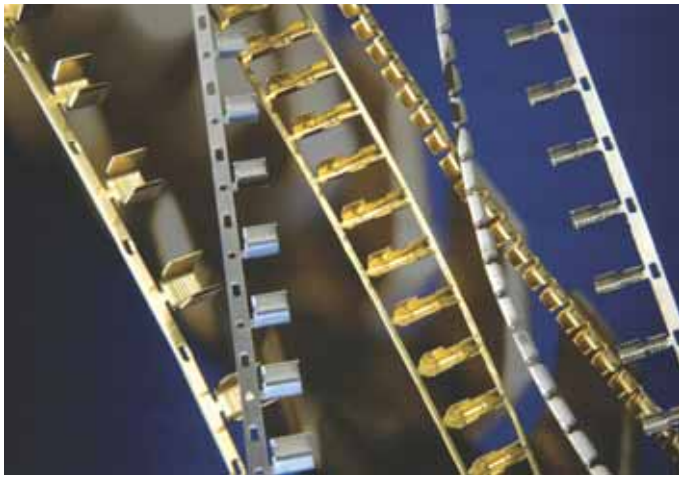
Micro MATE-N-LOK Connector

The Micro MATE-N-LOK 3mm connector system is a wire-to-wire and wire-to board connector system with contacts on a 3mm [.118] centreline. Both single-row and dual-row configurations are available. Crimp, snap-in pin and receptacle contacts are used to terminate 24-20 [0.2-0.6] and 30-26 [0.05- 0.15] AWG wire. Plug and receptacle housings allow wire-to-wire and wire-to-panel configurations. Header assemblies for wire-to-board interconnections include vertical and right angle components. These IR reflow process compatible headers are available in through-hole and surface mount configurations.

Typical uses of the Micro MATE-N-LOK 3mm connector system include the appliance, instrumentation, industrial machinery, home equipment and security system industries.

Product Features

- Wire-to-wire and wire-to-board pin and receptacle connector system
- Contacts are on 3mm [.118] centreline spacing
- 2 to 12 contact positions – single row
- 2 to 24 contact positions – dual row
- Panel mount or free-hanging wire-to-wire configurations
- Dual beam contact design for reliable interconnection
- Contacts accept 24-20 [0.2-0.6] and 30-26 [0.05-0.15] AWG wire with insulation diameter of .060 [1.52] maximum
- Contacts available in strip form or loose piece
- PCB mount pin header assemblies in both vertical and right-angle styles
- Surface mount or through hole PCB pin header attachment
- PCB headers are IR reflow process compatible
- Recognised under the Component Programme of Underwriters Laboratories Inc. to US and Canadian Standards, File No. E28476
- Passed Tests for VDE under registration number 40005280/Continuous Surveillance



AMPLIVAR Terminals and Splices

The basic design of the AMPLIVAR wire barrel encompasses two main areas - the burrs at the top of the serrations and the serrations themselves. During the crimping operation, the burrs pierce the insulation of the magnet wire and extrude the bare conductors into the serrations, creating ultimate metal-to-metal contact.

AMPLIVAR splices and terminals are specifically designed to terminate magnet wire to itself or in combination with standard solid or stranded lead wire. The AMPLIVAR product line will accommodate a wire range from 400 to 13,000 CMA.

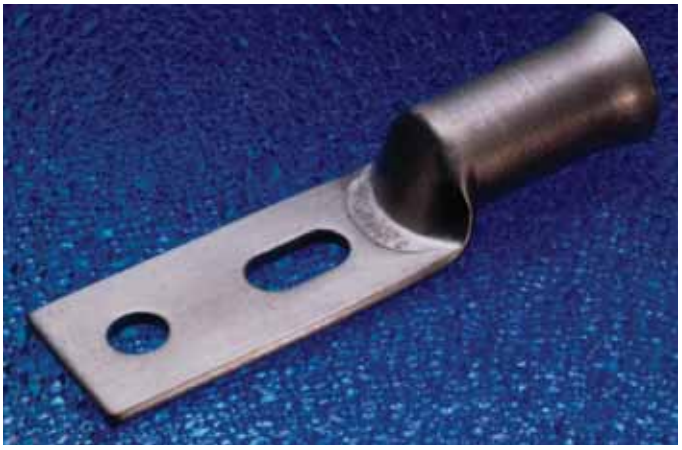
In a one-step crimping operation, the magnet wire is automatically ring-stripped of its insulation as it is forced into the wire barrel serrations. The result produces a high tensile strength, air-sealed connection that is as resistant to corrosion as the insulated conductor.

As many as three magnet wires can be terminated simultaneously in one barrel. In addition, copper or aluminum magnet wire, or a combination of both, can be terminated. When required, copper or aluminum magnet wire can be combined with pre-stripped standard solid or stranded lead wires.

Depending on your specific application, AMPLIVAR splices are available in 5, 7 and 9 serration versions as well as miniature and subminiature designs, for terminations in the 400 to 1600 CMA range.

Product Features

- Compression crimp eliminates cold solder points, weld burns or wire enbrittlement usually associated with thermal-type terminations
- Excellent tensile strength-vibration resistant
- Provides a superior electrical connection that is free of contaminants such as stripper residue and solder flux
- Precision formed, strip-fed terminals and splices terminated in Tyco Electronics automatic machines assure highest possible production rates at the lowest applied cost
- Low wire consumption and the elimination of rejects caused by solder flux or heat damage results
- Precisely controlled crimp termination helps eliminate human error for maximum reliability



AMPOWER Terminals and Splices

The AMPOWER terminal and splice product line is available in a variety of styles to suit your design requirements. AMPOWER terminals and splices are ideally suited for power generation and distribution. This makes electrical equipment such as generators, motors and welders, which are subject to continuous operation, a perfect application for AMPOWER products. In addition, other applications include interconnections of power supplies to computers and peripheral equipment.

Product Features

- Designed for large cables and leads
- Ideally suited for power generation and distribution
- Accepts a wide range of stranded copper wires (6 AWG to 1,000 MCM [13-507mm^2]--for terminals and up to 1500 MCM [760mm^2] for splices)
- Available in a variety of terminal and splice styles
- High-quality, seamless tubular copper for maximum conductivity
- Listed by Underwriters Laboratories, Inc. File No. E12388, Spec. 486
- Certified by the Canadian Standards Association File No. LR7189

AMP Pre-Insulated Closed End Splices

AMP Pre-insulated closed end splices have been designed specifically to answer the need for inexpensive, insulated electrical terminations. They can be used in almost every type of commercial application where multiple wires need to be brought together for a reliable termination - e.g. large and small appliances, and the lighting industry.

The closed end splice products accommodate wire sizes from 24 through 6 AWG [0.2 to 16mm] 509 to 42,700 CMA. The appeal of closed end splice products lies in their broad range of wire sizes, built-in pre-insulation, ease and speed of application, uniform reliability and low installed cost. As is true of all AMP terminals and splice lines, carefully engineered application tooling has been developed for the closed end splice line to provide uniformly high quality terminations.

Tool and terminal have been designed as a team to promote ease and speed of application, whilst at the same time to provide precise crimping pressure for every wire size combination. This connection provides maximum conductivity, tensile strength and high resistance to corrosion.

The quality of performance, the facility of installation and the inherent simplicity of closed end splices make them ideal for many industrial applications.

Product Features

- For single and multiple wire applications
- Nylon or vinyl or PVFC insulated
- Temperature ratings of 90°C, 105°C, 150°C
- 300V, 600V or 1,000V rated
- Crescent crimp configuration
- Covers wire ranges from 24 to 6 AWG [0.2 to 16mmC] 509 to 42,700 CMA
- Copper or steel splice material
- Plated or unplated
- Solid or stranded copper wire
- UL and CSA approved

SOLISTRAND Terminals and Splices

The proven “W” crimp, applied with precisely controlled pressure, permits the use of a shorter terminal barrel. An excellent feature for confined area termination. The SOLISTRAND terminals and splices, in combination with the “W” crimp, create terminations of optimum electrical properties and are completely reliable, giving long service in hard environments.

SOLISTRAND terminals are made of high conductivity copper, electro tinned for improved corrosion resistance. The completely closed barrel with serrations inside provides an optimum tensile strength and maximum electrical contact after crimping. The barrel has a conical entry for easy wire insertion. The “W” crimp is actually two longitudinal crimps, providing that the conductor within the barrel flows together into the serrations or dimples of the terminal barrel, creating one homogeneous mass of copper. The two indents also help to centre the conductor within the barrel for uniform crimping of the barrel around the wire.

Because Tyco Electronics matches the terminal to the tool, each termination is uniform, making quality control easy and performance consistent. SOLISTRAND products are UL listed file E 13288 and certified by CSA file LR 7189.

Product Features

- Utilise a brazed seam
- Applied with "W" crimp tooling
- Available in wire sizes 26 AWG-600 MCM [0.1-304mm^2]
- For terminating solid and stranded wires
- U.L. listed
- CSA certified
- Military approved
- Budget terminals and splices
- Utilise a butted seam
- Applied with "F" crimp tooling
- Available in wire sizes 26 - 10 AWG [0.1-6.64mm^2]
- For terminating stranded wire only

PIDG Terminals and 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. Each PIDG terminal consists of a tin plated copper body, with a specially designed copper sleeve and insulation sleeve fitted over the terminal barrel.

The carefully engineered application tooling has been designed for the PIDG programme, to ensure high quality terminations time after time. Terminal and insulation sleeve are crimped simultaneously, resulting in an excellent tensile strength and vibration resistance. During crimping dot code is applied to the insulation sleeve, to confirm the use of the correct tooling.

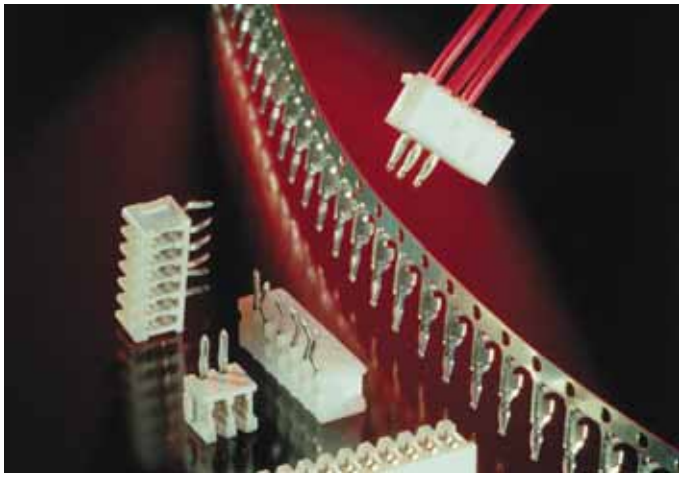
In order to obtain the best termination results it is important to select the correct tool. Each terminal is matched to a compatible tool. CERTI-CRIMP hand tools are provided with a patented ratchet device to ensure the crimp cycle is completed before releasing. There is a CERTI-CRIMP tool available for each terminal range.

Description

- Connector system available in wire-to-wire configuration
- Outlet and plug assemblies with two contact positions
- Using widely known MQS contacts
- 6 way distributor with additional switch feature

Product Features

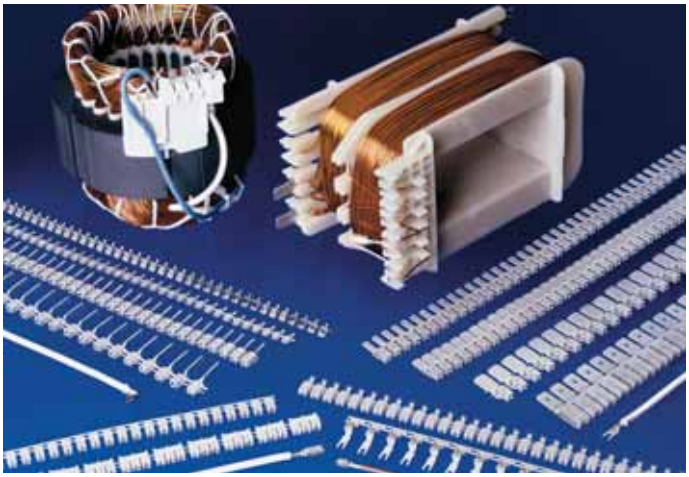
- Basic terminal is made of high conductivity copper, electro tin plated, for improved corrosion resistance
- Applicable wire size is marked on the tongue.
- Inner serrations on the wire barrel give maximum electrical contact and tensile strength with the conductor
- Copper sleeve provides circumferential insulation support to the wire and allows it to be bent in any direction without damaging the insulation or conductors
- Insulation sleeves and corresponding tooling are colour-coded by wire size for easier identification
- Tyco Electronics' PIDG terminals and splices meet the requirements of MIL-T-7928
- A variety of PIDG terminals and splices are UL listed file E 13288 and certified by CSA file LR 7189



Miniature AMP-IN Terminals

The miniature AMP-IN terminal is designed not as an electrical terminal but as a mechanical holding device, to enhance soldering of hookup wires to printed circuit boards. The combination of terminal and application tooling eliminates costly manual preparation of wires prior to soldering, and positions the wire to achieve reliable solder joints. Movement of the wire during soldering is restricted, assuring proper solder flow.

Connectors



MAG-MATE Terminals

The MAG-MATE terminal provides a durable, gas-tight electrical connection without the need to pre-strip the wire. The system uses insulation displacement technology in conjunction with a pre-determined design of plastic terminal pocket, which is moulded into the bobbin frame. This product line is used primarily within the domestic appliance and automotive industries.

High speed coiling machines utilise MAG-MATE products, to achieve very significant applied cost savings due to quick and efficient application, especially when compared with soldered assembly. AMP semi-automatic application tooling machines are available for this low cost product.

Product Features

- Terminates all magnet wire film insulations
- Eliminates need for pre-stripping conductors
- Eliminates need to post insulate termination
- Excess magnet wire is automatically trimmed during the termination process
- Simultaneously terminates two magnet wires of the same size in one terminal (for splicing or bi-filing)
- Various lead wire attachment options available
- Available in strip form, for semi-automatic or fully automatic insertions
- Available in loose piece form for hand tool insertions
- Varnish-resist tab terminals are available for special applications
- High-speed, fully automated integrated systems provide uniform terminations reliability at the lowest possible applied cost
- Clean metal-to-metal interface produces stable, gas-tight electrical terminations free of oxides and other contaminants
- Recognised under the Component Recognition Programme of Underwriters Laboratories Inc., File No. E13288

Terminal Block Connectors

Terminal Block connectors feature 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. A special version - which can be mated either 90° or 180° - completes the product line.

Terminal Block connectors offer several advantages:

- IR Reflow compatible
- Terminal Block connectors have a rising cage clamp which promotes numerous reliable connections and disconnections at field-installations
- All blocks are supplied with open screws, which shortens the time for connection
- The double captive screw system guards against lost screws
- All metal parts are non-magnetic
- The housing material used is halogen-free Polyamide 6.6 according to UL 94V-0 (self-extinguishing)
- The housing funnel entry design enables an easier product application
- The open-bottom design facilitates the PCB washing and reduces trapping of soldering fumes and dirt, with better insulation
- Test probe access is available on the board mount connectors to determine if an electrical connection has been made
- Contacts are post tin plated with nickel underplate, which allows the product to be used in especially corrosive environments

Board mount connectors, as well as PC board plugs and headers, are stackable end-to-end without loss of centreline spacing. Ease of assembly is facilitated by built-in interlocks on the housings. Pre-assembled products can be delivered upon request. Adhesive labels are available to number the cavities. Customer-specific labelling is also available upon request.

Terminal Block connectors are interchangeable with most existing products and PC board footprint is fully compatible with existing Industry Standards.

Product Features

- Certified by the VDE Testing and Certification Institute VDE file No. 6917 (Two-Piece Version) VDE file no. 6920 (One-Piece Version)
- Recognised under the Component Programme of Underwriters Laboratories Inc., file no. E60677
- Certified by Canadian Standards Association, file no. LR 703157
- Products under Quality Management System certified to ISO 9001

Sealed Circular Plastic Connectors (CPC)

Sealed CPC connectors are the latest additions to the growing family of Tyco Electronics Circular Plastic Connectors. Sealed CPC connectors were developed as part of the Series 5 and 6 product line, specifically to meet the increasing demand for an economical environmentally sealed connector.

Sealed CPC connectors are designed to meet the requirements of UL, CSA and VDE for environmentally sealed connectors used in industrial applications.

In addition, sealed CPC connectors are designed to meet the latest SAE and ASAE requirements as outlined in the standards listed here. Sealed CPC connectors incorporate the latest technology in thermoplastic design and use the Powerband precision-formed high current contact. Seen above are the Series 5 (power) and Series 6 (power/signal mix) sealed connector configurations. Other sizes are available in a Series 1 (signal/low current) configuration.

Product Features

- Economical environmentally sealed connector, designed for industrial applications
- Meets major Industrial Standards
- High strength, impact resistant thermoplastic housing, rated UL 94V-0
- Contains wire entry, peripheral and full interfacial seals
- Type III+ precision formed signal/low current contacts (Series 6)
- Other configurations in Series 1 can be made available.

Miniature Circular Plastic Connector (Mini CPC)

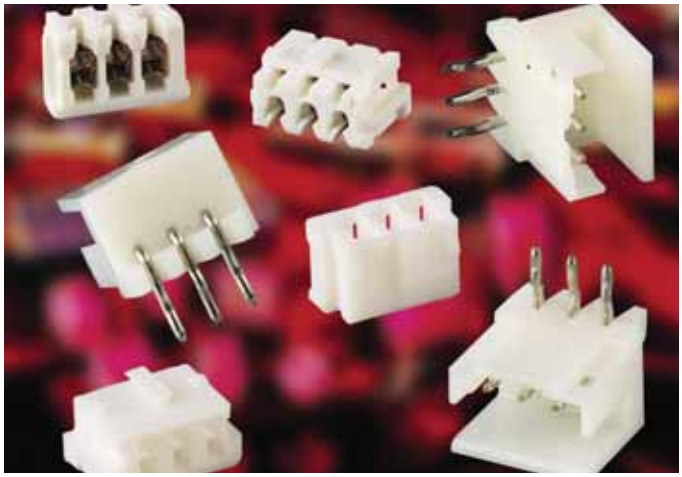
This connector system is available in wire-to-wire, wire-to-board and wire-to-panel configurations. Available in shell size 8 (1 to 4 contact positions) or size 11 (5 to 9 contact positions), this connector system utilises the existing Mini Universal MATE-N-LOK stamped and formed contacts. The contacts are designed for up to 500 mating cycles when plated with gold or up to 50 cycles with tin plating.

Industrial, Instrumentation and Transportation applications are ideal for this connector system, where contact density and environmental exposure are primary concerns.

Nylon housings offer good resistance to a wide range of chemical agents while the IP67 sealing helps prevent ingress of dirt or fluids, which could have an adverse effect on the contact interface.

Product Features

- Pre-positioned 1/4 turn coupling ring with positive lock and alignment features
- Unique contact pattern for each position size helps prevent accidental mating with other position sizes
- Sealed to IP67
- Front or rear jam nut mounting
- No assembly required
- Receptacle available in free-hanging or panel-mount versions
- Alternate keys available



CT (Common Termination) Connector System

The Tyco Electronics CT connector system is an automatic harness-making system which provides a range of harness styles by AMP high-speed automatic crimping machines, using three types of 2mm centreline connectors -- MT connectors, MT AMP-IN vertical connectors and MT AMP-IN horizontal connectors.

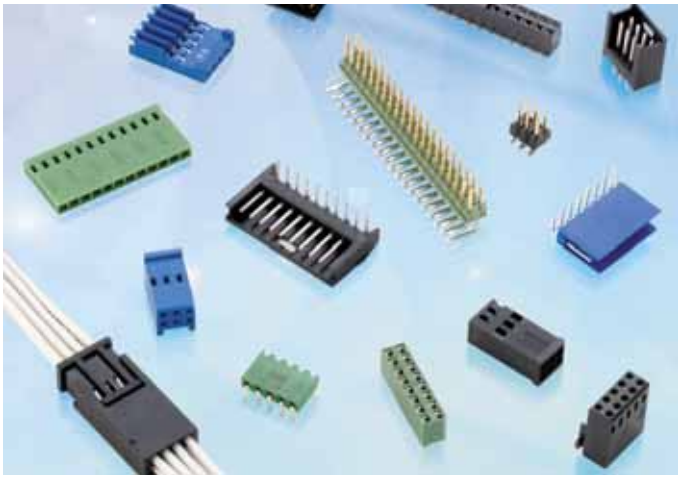
Contacts are on 2mm centreline with all connectors and the spacing between the housing end and the centreline of the contact cavity at either end is also 2mm.

Harnesses can be assembled in any of the six configurations shown in the following pages. A variety of harness-making machines are available, ranging from hand tools for low volume production to high-speed automatic crimping machines for medium to high volume productions. Both discrete wire and flat shielded cable can be used for this system, and a new generation of high-speed automatic crimping machine is now available, which allows these two types of cable to be used singly or mixed in one connector.

Tyco Electronics' high-speed automatic crimping machines are easy to operate, eliminating the need for the tedious job of changing parts inside the equipment in order to adapt to changes in harness styles.

Product Features

- 2.0mm pitch
- SMT and through-hole headers available
- Pre-loaded housings available
- Various colour options



AMPMODU Interconnection System

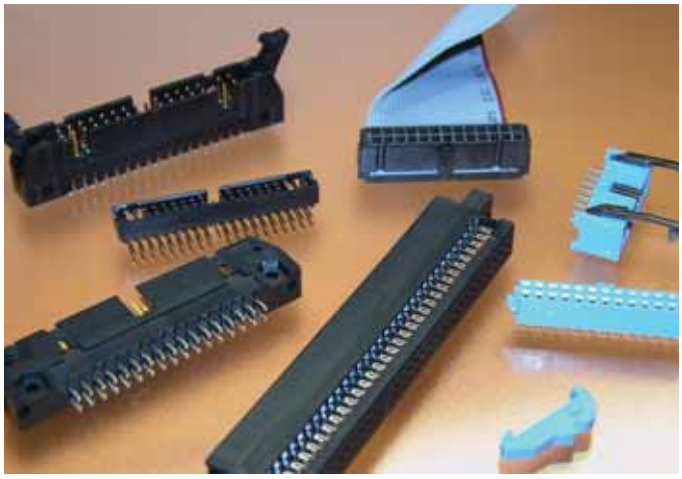
The AMPMODU interconnection system continues to be one of the most significant product families within Tyco Electronics. Widely used across all industries, these products provide core interconnect functionality, allowing our customers' designs to be reliably and efficiently realised.

Within the AMPMODU interconnection range, requirements for board-to-board, wire-to-board and wire-to-wire connection are provided through a comprehensive range of interconnect components - in a wide choice of packaging densities, mounting styles and product features. Our capability in product breadth is unrivalled.

As many of these products are mature in nature, it is all too easy to overlook their important ongoing contribution, and their continual necessity to our customers.

Product Features

- Key interconnection standard with ongoing market need
- Wide product range, offering versatile solutions



- Wide selection of sizes in all configurations
- Positive, uniform latching of contacts and housing with cover eliminates cover warpage
- Easy, visual inspection of terminations during assembly; electrical probing capability after assembly
- All polymeric parts manufactured from a UL Recognised 94V-0 rated material
- Receptacles with recessed covers provide positive locking feature for ejection style pin headers with latches
- Pinless headers with clearance-fit or press-fit onto .025 [0.64] sq. posts pre-installed in pc board
- Shielded connectors provide RFI/EMI protection

AMP-Latch Connectors

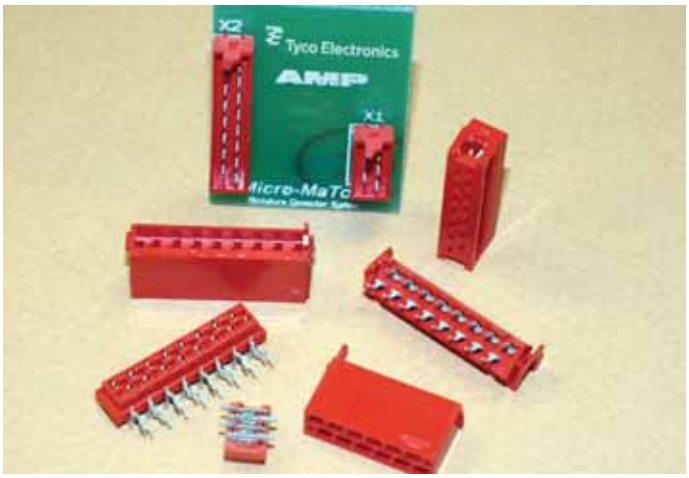
The mass termination capabilities of the AMP-LATCH connector family have helped make ribbon cable, and particularly .050 [1.27] centreline cable, popular within the electronics industry. The ability to terminate up to 64 conductors simultaneously, without stripping or otherwise preparing the cable, presents obvious labour savings.

AMP-LATCH connectors are wire-to-board devices which are used to make the transition between cable and PC board circuitry.

They are used heavily within equipment which is designed to connect one board to another, or one subsystem to another. The connectors are also used in input/output applications, to connect different pieces of equipment.

Product Features

- Connectors recognised under the Component Programme of Underwriters Laboratories Inc. File No. E28476
- Cable recognised under the Component Programme of Underwriters Laboratories Inc.
- Connectors CSA certified, file no. LR-7189
- No cable stripping; simultaneous termination of all conductors
- One-step termination with AMP application tooling
- Terminates varying thicknesses of flat, woven, shielded (properly prepared) and other ribbon cable with conductors on .050 [1.27] centres as well as discrete wires
- Self-registration of wires--compatible product and tooling designs eliminates registration problems



Micro-MaTch Miniature Connector

The demand for high-density packaging of electronic equipment is ever-increasing. For these applications Tyco Electronics has developed the Micro-MaTch connector system. The primary benefit of this system, when compared to miniature connectors, is its robust construction - with separated contact spring functions for optimum contact.

The centreline is 1.27mm, staggered. The connector system is available in an even number of positions, from 4 to 20 for wire-to-board connections with AWG 28 wires and board-to-board applications in standard or surface mount soldering technique. The tin plated contact system is fretting corrosion proof.

Product Features

- Vertical and right-angle header configurations
- Board-to-board stacking possible
- Cable of terminating discrete wire

FASTON Terminals and Connectors/FASTON Connection System

The Tyco Electronics FASTON terminals product line consists of receptacles, tabs and splices specifically designed for quick connections. The large variety of sizes and types available will enable you to select a contact to fit your needs. Receptacles are available in both straight and flag type, come in a variety of sizes and are designated numerically by a series number which corresponds to the width of the mating tab.

Straight receptacles are available with or without insulation support. Insulation diameters of 1.2mm to 6.7mm are accommodated by the insulation support receptacle. The product line offers speed application, uniform reliability and low per line cost. Speed application is achieved through the use of application tools, for which a complete line has been developed specifically for these terminals. Over forty years of history has proven the reliability of this product line.

Built-in features, also add to the reliability of FASTON products, include:

- crimping dimensions for each terminal which are precisely controlled, providing all connections with excellent performance
- low per line cost, derived from low initial product cost
- high application speeds

The combination of these features brings the user the lowest overall costs for quick connect/disconnect terminations.

Product Features

- Straight right-angle and receptacle-tab combinations available
- Receptacles available for 6.3 - 4.8 - 2.8mm tab size (.250- .187- .110 Series)
- Receptacles mate with 0.5 and 0.8mm thick tabs
- Low insertion force (LIF) receptacles available
- IEC 60335-1, Glow Wire 750° NO FLAME housings available
- RoHS compliant

Fibre Optic

With more than 30 years experience, we are a world-leading manufacturer of fibre optic connectors, backplane interconnects, cable assemblies, adapters and accessories, complemented with active and passive components and fibre management systems. We provide high-level engineered solutions with reliable, advanced-technology optical products that connect, configure, create and control light.

Connect Light

- Fibre optic connectors, cable assemblies, adapters and accessories
- High-density PARA-OPTIX cable assemblies
- Optical backplane interconnects

Create Light

- LDI fibre optic communication components
- LDI fibre optic high-power products

Control Light

- Fibre optic attenuators
- Fibre optic switches

Configure Light

- Fibre management and packaged solutions

Battery Packs

Tyco Electronics' battery systems offer customised solutions for portable electronic devices and stationary backup power applications. Our flexible volume manufacturing facilities, which are located in low cost regions, coupled with our in-house component, cell and pack qualification processes, add up to a total design, test and manufacturing solution. Our test laboratories are certified to UL1642 and UL2054 safety standards and are IEEE 1625 & 1725 compliant. With senior representation on the UL Standards Technical Panel (UL1642 & UL2054) and IEEE-P1725 Work Group, and established relationships with key supply chain vendors (especially cell suppliers and chipset providers) our dedicated development team provides quick and efficient customer support worldwide.

Industrial Ethernet - Circular Sealed RJ-45 Connectors

This new rugged connector series meets the Ethernet/IP RJ45 requirements/standards. Designed for use in harsh environments, the connector features a quick-connect bayonet coupling mechanism which meets the Open Device-Net Vendors Association (ODVA) interoperability interface specification.

Applications include industrial machinery, diagnostic equipment, communications equipment, printers and any potential applications where Ethernet is used in connectors that require a sealed, rugged interface.

Product Features

- For Category 5e Cable
- Sealing performance per IP 67
- Protective cover available for the receptacles
- Positive lock coupling ring provides reliable connections in harsh environments
- Available pass-through and field installable receptacle styles
- Bulkhead receptacle mounts to either outside or inside panel cutout
- Temperature Range is -40°C to +85°C [-40°F to +185°F]

Ultra-Fast Fully Insulated, FASTON Receptacles and Tabs

The Ultra-Fast fully insulated FASTON receptacle and tab offers the advantage of a completely protected terminal, and a wire crimp which has comparable electromechanical performance to open barrel “F” crimp FASTON terminals.

The “user-friendly” design combines easy mating with rounded corners. The .187 and .250 series receptacles incorporate a two-stage roll configuration and a cantilever mounted dimple, which provides easy insertion and multiple independent points of contact, for reduced tab interface resistance.

Ultra-Fast fully insulated FASTON receptacles, flag receptacles and tabs preclude the need for costly electrical safety interlocks or special protective shields in order to help prevent shock hazards. In addition, electrical short circuits from exposed leads are eliminated, even in equipment which requires close contact spacing.

The Ultra-Fast FASTON receptacle, flag receptacle and tab are pre-insulated assemblies, featuring a housing which is molded from type 6/6 nylon material with a +130°C UL temperature rating.

The Ultra-Fast FASTON receptacle housing completely encloses a tin plated copper alloy premier FASTON receptacle, which has been stress-relieved for increased durability and resistance to abuse. The FASTON receptacle is recessed sufficiently within the housing to allow its use in 600-volt applications. The receptacle portion of the terminal is designed for positive mating with a variety of tabs, including those with shoulders. The housing has a slotted membrane which is displaced by two tab shoulders, allowing proper engagement of tab and receptacle while maintaining the fully insulated characteristic.

Positive entry and lead-in of the tab is provided by the inner housing wall and the lead-in on the terminal rolls. This permits positive engagement, even in blind mating locations.

The Ultra-Fast FASTON tab housing completely encloses a tin plated copper alloy FASTON tab. The FASTON tab is recessed sufficiently within the housing to allow its use in 600-volt applications. The housing is designed to completely encapsulate the tab and receptacle when the two are mated.

Quality control is easily maintained. The nylon housing is translucent, allowing visual inspection of the termination. In addition, a crimp code on the platform hand tool is indented into the housing during the crimping operation, which identifies that the proper crimp dies were used. Depending on production requirements, Tyco Electronics provides a complete selection of terminating equipment, from hand tools to automatic lead makers.

Product Features

- Premier line FASTON receptacle crimp helps prevent shock and short hazards
- Designed for correct lead-in of tab
- Designed for full mating with a variety of tab styles including those with shoulders
- Funnel wire entry
- Wire stop
- Visual inspection of crimp and wire brush
- Assemblies are colour-coded by wire size
- Assemblies contain wire size and tab size designation
- Mating tab thickness marked on terminal and visible through housing (.110, .187 and .205 Series)
- Application tooling available to meet production requirements
- Tin plated copper alloy terminals
- UL rated at + 105°C
- Terminates 26-10 AWG solid, fused and stranded wire (Flags terminate stranded wire only)

Autotransformers

These 4500 series autotransformers are designed to step 480 VAC, 60 Hz. line voltage down to 277 VAC, for fluorescent lighting fixture ballasts in commercial lighting systems. Standard units available in 230 VA and 460 VA models.

Product Features

- Excellent regulation in a cost-effective, single-winding design
- Colour coded 18 AWG leads for wiring
- Welded brackets for mounting convenience
- Butt stack and weld construction with a molded bobbin
- Molded coil cover provides integral strain relief for the leads
- UL Recognised to US and Canadian standards
- Custom sizes, termination and mounting options available

Grounding Clips

Tyco Electronics' grounding clips are designed to provide a secure push-on ground. The push-on installation technique eliminates the need for drilling holes and scraping paint, as is required in a typical ground termination.

Product Features

- Terminals provide hand applied, tool-less connections to metal panels
- Designed to pierce through enamelled painted sheet metal panels
- Accepts panel thickness ranging from .020 to .041
- Available to terminate to 22-14 AWG lead wire
- Manufactured out of steel, stainless steel or tin plated phosphor bronze material

MTA 100 Connector

MTA 100 connectors accept discrete and ribbon cable wire sizes ranging from 22-28 AWG [0.4-0.08mmC], with maximum insulation outside diameter of .060[1.52] for terminating single wire and .050[1.27] for mass termination of wires. Tin plated solid, fused stranded, or stranded (7 strands) wire with PVC insulation can be used on 22-28 AWG [0.4-0.9mmC] MTA 100 connectors, and 19 stranded wire on 22-24 [0.4-0.2mmC] MTA 100 connectors. Only one wire to be terminated into an IDC contact slot.

The wire-to-post connector housing material is flame retardant thermoplastic, either UL94V-2 or UL94V-0 rated. A full line of .100[2.54] centreline headers completes the system. Headers are available with straight or right angle posts, in flat, polarised or friction lock styles. Headers are available in 2 to 28 positions. Shrouded headers are available in 2 to 14 positions.

Product Features

- Connectors and headers for 2 to 28 positions; wire sizes of 22, 24, 26, and 28 AWG [0.4-0.08] mmC
- Wire-to-post connectors pre-loaded with dual beam contacts
- Connectors and headers, except shrouded headers, are end-to-end stackable
- Connector styles include both closed end and feed through connectors with locking ramps, with and without polarising tabs
- Molded ribs on housing do not allow reverse mating
- Posted connectors for 2 to 19 positions
- Connectors pre-loaded with IDC contacts
- All contacts are slotted for insulation displacement (IDC) terminal technique
- Contacts are lubricated for fretting corrosion protection
- Benefits derived from the MTA 100 system include increased quality and ease of handling such as:
- One step assembly
- No wire stripping
- No contact damage
- Reduced wiring errors
- Simpler tooling
- Simple maintenance and repair
- Meets the material requirements of Table 23.1 of UL1410 standards for television receiver and video products (wire-to-wire post connectors only)

Wire, Harness and Protection

Tyco Electronics provides wire and cable solutions for challenging environments and demanding applications. The product range includes high performance insulated wires, coaxial and data bus cables, power cables, electronics wire and multicore cables.

Heat Shrink Tubing

With today's installation techniques, heat shrinkable products can simply not be ignored. Due to easy processing and shrinking at relatively low temperatures, these products can be used in many applications.

With a top performance at a low price, shrink products make it possible to accomplish lasting, safe mechanical and electrical protection of various parts. They also allow repairing of cables and cable connections.

For the production of prototypes or small runs, we offer kits with several different types of shrink tubing.

For other applications we also offer an extensive range of heat shrinkable tubing.

Description

- Low cost, flame retardant, standard grade polyolefin
- Thin wall heatshrink, 2:1 shrink ratio
- Available in key electrical colours
- Supplied in dispenser packs, multi packs and bulk reels

Raychem SolderSleeve Terminations

Tyco Electronics' dependable, economical wire and cable termination products provide solutions for hundreds of wire and cable interconnect requirements. All Raychem wire termination products are housed inside transparent heatshrinkable insulation sleeves, which allow for inspection and can provide various levels of environmental protection.

Most Raychem termination products incorporate a fluxed solder preform, which is essential for a highly controlled soldering process. Other products incorporate controlled crimping, or a unique process of combining a twist-on coil with controlled soldering, to provide high reliability joints on the widest variety of conductor types and platings.

SolderSleeve termination technology ensures high-quality electrical and mechanical performance time after time. Pre-measured solder and flux create repeatable, reliable terminations, reducing rejects and field failures. When the SolderSleeve termination device is heated, the tubing shrinks and the solder preform melts to make a fully insulated, strain relieved protected solder connection. Heat-shrinkable tubing provides the benefits of insulation, strain relief, and protection for our controlled crimp products.

Many Raychem interconnect products have earned UL recognition or MIL-Spec approval. Many SolderSleeve and related devices are made from polyvinylidene fluoride tubings that meet the requirements of AMS-DTL-23053/8 (formerly MIL-DTL-23053/8). Raychem interconnect devices combine high strength materials with innovative design for consistent, long-life performance. And because the insulation sleeve is transparent, operators can easily inspect the connection.

Raychem shrink-to-fit technology even helps reduce inventory, because one device size will fit a wide range of wire gauges, cable diameters and component shapes. Raychem interconnect products are designed for many applications, from simple splices to terminators for sophisticated electronic systems, either sealed or unsealed, and for high or low temperature environments.

Cable Ties, Mounts and Accessories

Today, there is an increasing demand for cable ties, to bundle and fasten wires and cables quickly and economically in various application areas. Tyco Electronics has extended the existing AMP-TY cable tie range to satisfy the present and future market requirements.

The range consists of the most commonly-used sizes, materials and colours with customer-friendly packaging. The AMP-TY range now offers an almost unlimited number of possibilities. As always, we have put great emphasis on the introduction of a quality range, attractively priced, with on-time delivery, backed up by qualified sales and technical staff.

Product Features

- Self-locking head ensures stable binding power even under extreme conditions - e.g. temperature and vibration
- Interior serrations help to hold individual wires or bundles firmly in place through friction
- Tapered tip, often with the “bent tail” facility for easy insertion, speeds up threading and reduces applied cost
- Tough, smooth polyamide may be used for indoor and outdoor applications. Black UV resistant ties are recommended for outdoor use
- The all synthetic one-piece design eliminates metal parts
- AMP-TY cable ties can be hand applied or by using application tools

Relays and Switches

Tyco Electronics

Tyco Electronics offers the broadest range of relays and contactors in the world. Switching capabilities range from dry circuit to 1,600A, up to 70kV, and as high as 6 GHz. Electromechanical, solid state and hybrid types range from SMT PC board mount devices to large panel mount units. Our broad line of Relays features expansive sets of options for enclosure, termination, input, contact arrangement and rating.

Tyco Electronics can provide virtually any type of switch you need. From miniature printed circuit board mounted DIP switches to rugged oil-tight switches for industrial controls, we provide reliable, cost-effective performance. Tyco Electronics' switch products also include knobs, boot, caps and other accessories.

High Current Inrush Relay

The RT-i Power (RT-inrush Power) relay is the new high-end member of the RT relay family. Designed for peak inrush currents up to 800Amps, and with a rated carry current of 16Amps, the RT-i Power relay is capable of switching a variety of capacitive and lighting type loads, especially incandescent and fluorescent lamps.

The RT-i Power relay has an industry standard footprint to enable product upgrade, with pinning compatibility to the Tyco Electronics Schrack 409 47/67, 429 03, RT Inrush and RP3SL relay types.

Available in either monostable (DC) or bistable/latching (with the option of a manual actuator) coils the RT-i Power relay meets the requirements of most installation applications.

Product Features

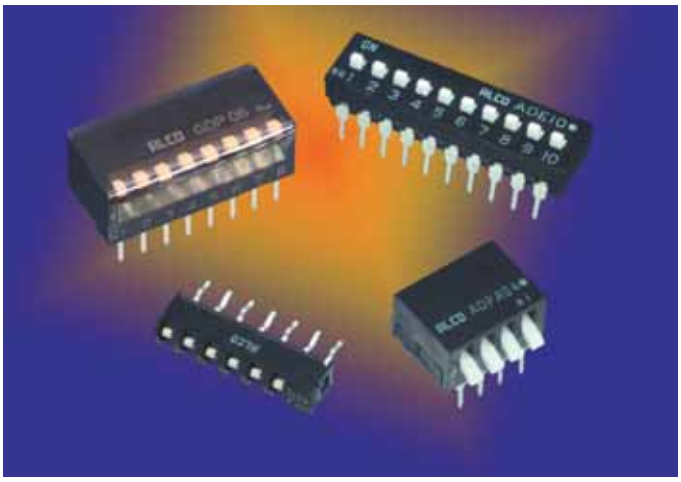
- 1 N/O contact (W pre-make contact + AgSnO)
- Rated current 16A
- Inrush peak currents: 800A/100 s; 165A/20ms
- Monostable DC coil (400 mW) or bistable coil versions
- Reinforced insulation
- Ambient temperature to 85°C
- Manual operator optional on bistable versions
- Meets RoHS and WEEE requirements (e.g. lead free, cadmium free contacts)

Pushbutton Switches

The Tyco Electronics range of pushbutton switches is designed to be cost-effective, reliable and to enhance productivity.

Product Features

- High temperature plastics – liquid crystal polymer (LCP)
- Tin-lead plated terminals
- Washable process sealed construction – internal actuator O-ring
- Silver and gold plating options
- Sealed switches available
- Through-hole or surface mount PC tails or panel mount options
- Straight or right-angle option available
- Large variety of button styles and switching functions
- Wide range of physical sizes and current ratings



DIP Switches

The Tyco Electronics range of DIP switches is designed to be cost-effective, reliable and to enhance productivity.

Product Features

- Full line of DIP switches with different profiles
- Different actuator styles available – piano, extended, rocker, flush
- Piano and slide styles that don't require sealing in order to go through wash process
- Half pitch .050" terminal spacing (GDH version)
- Variety of rotary DIP switches with different body sizes available (9mm and 7mm)
- Available in through-hole and surface mount
- Available in optional tape and reel packaging
- Variety of SIP switches available
- Multiple sizes of DIP shunts available

Identification

Identification

Tyco Electronics offers a wide range of products that 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 that support the needs of aerospace, electronics, rail, defence/marine, industrial and medical markets. In addition, we offer a complete line of laser engraved labels and markers.

Product Features

- We can design these for you, or use existing customer-specific logos, artwork and brand identification
- Colour matching
- Custom shapes
- UL and CSA certified base materials
- Equipped to hold tight tolerances
- Custom data to print: Static, sequential numbers,
- 2D data matrix and bar codes available
- High and low temperature materials
- Special adhesives
- Laminates available

Additional Identification Products

T107M Handheld printer

CWM Wire marker cards

WCD Write-on self-laminating label dispensers

CMD Cable and wire marker dispenser

EP Economy paper labels

M Metalised polyester labels

Application Tooling

Our application tooling capability includes a comprehensive portfolio of hand tools, semi-automatic bench machines and fully-automatic machine systems for processing terminal products. We provide customers with the best possible and most economical overall system solutions.

Application Tooling

- Hand tools
- Semi-automatic bench machines
- Magnet wire terminating equipment
- Advanced wire processing machines
- High-speed blockloaders
- Lead makers
- Harness makers
- Mass termination machines
- Insertion and seating machines
- Crimping machines
- IDC/Ribbon cable assembly machines
- Wire seal applicators
- Precision applicators

PC Board Assembly Equipment

- Press-fit assembly equipment
- De-panelling equipment

Finding Lighting Solutions online

Fast Access to Information

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

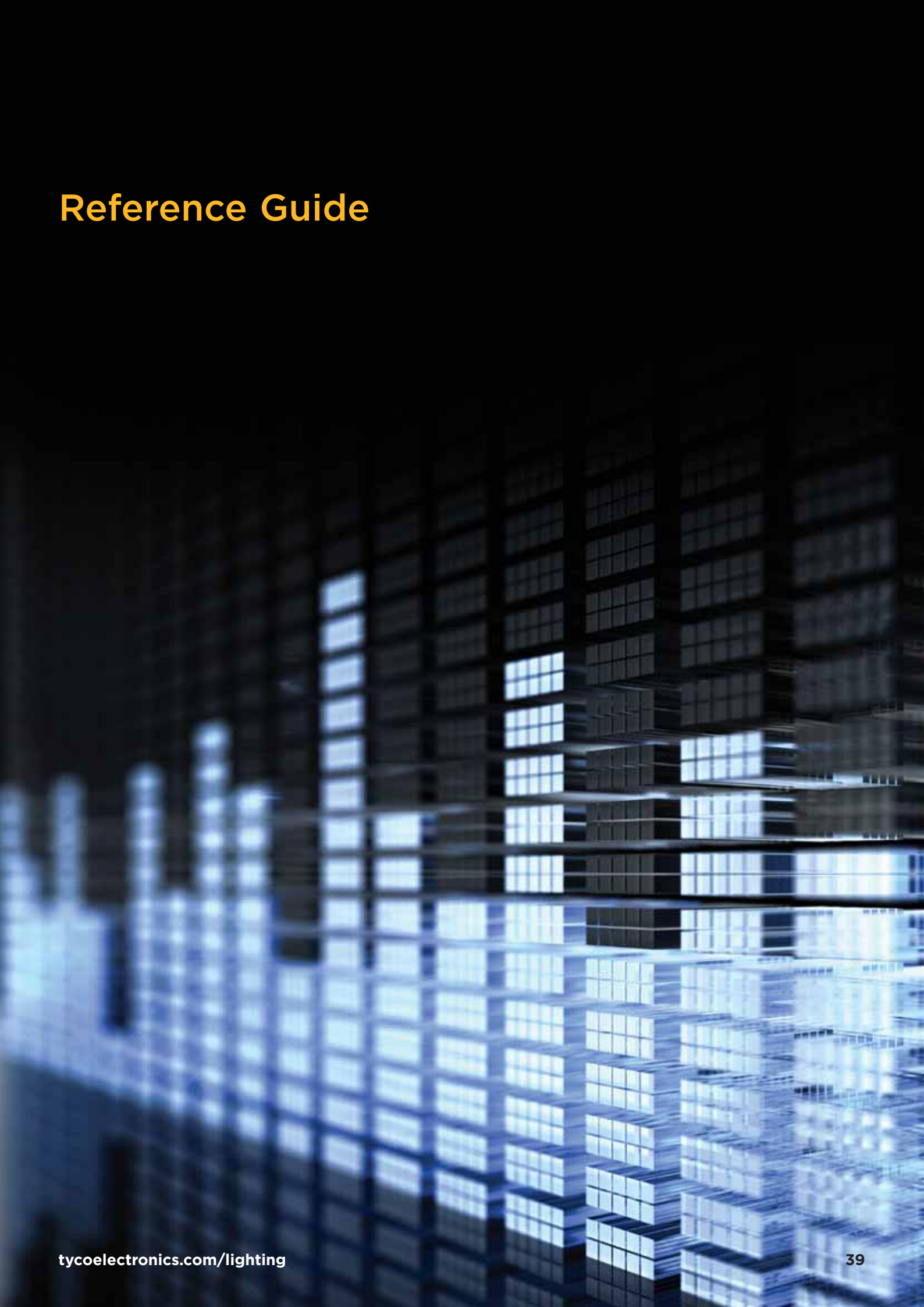
tycoelectronics.com/lighting is your single location for comprehensive product information, including CAD models, product and application specifications, drawings and competitive cross references. Our advanced parametric search engine allows you to find the exact part you need, and all the documentation that goes with it. E-commerce gives you access to ordering, order tracking, distributor inventories, samples and much more.

Visit Our Lighting Portal for All Things Lighting

To make things easy, we have created an industry-specific site that focuses exclusively on lighting. Here you can find our extensive line of products and solutions for lighting: **tycoelectronics.com/lighting**

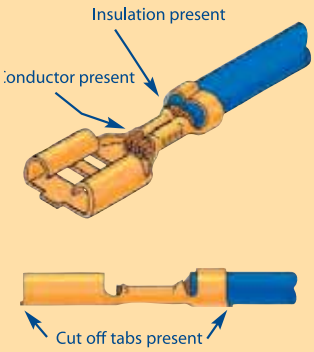
tycoelectronics.com/lighting

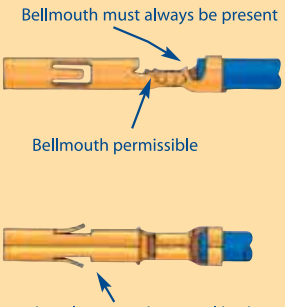
Reference Guide



Quality Guidelines

Correct





WIRE CRIMP

Correct selection of wire, terminal and applicator

Crimp barrel is closed, legs support each other

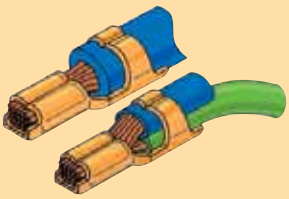
Sufficient gap between legs and bottom of crimp

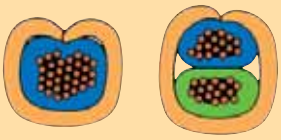
All strands are equally distributed and deformed

INSULATION CRIMP

Correct insulation diameter, applicator and terminal.

F-CRIMP





Insulation is securely held, crimp barrel closed

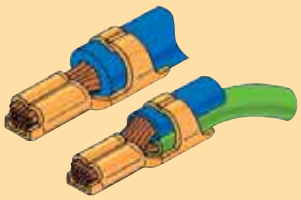
INSULATION CRIMP

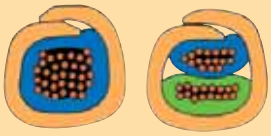
Insulation is pierced and could damage conductor

Insulation legs are not closed

For double wire applications with different size wires always place wire with smallest outer diameter in the bottom.

OVERLAP CRIMP



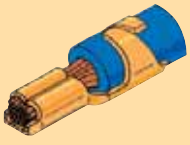


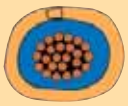
Insulation is securely held, legs overlap

Insulation material is pierced

Insulation is not securely held, legs do not overlap

WRAP OVER CRIMP



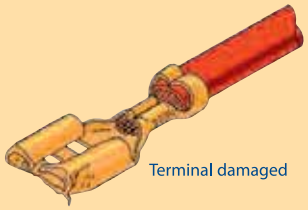


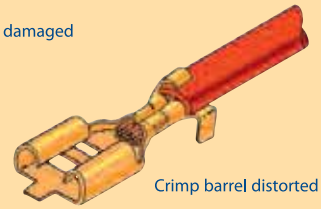
Insulation securely held, legs must pass each other

Insulation is not securely held

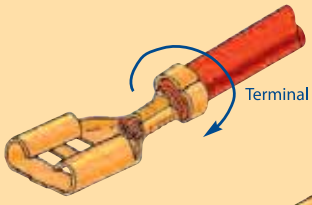
Insulation is over crimped

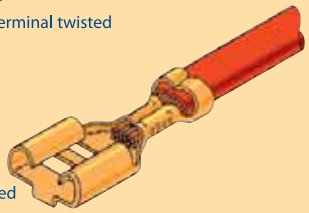
Incorrect


Terminal damaged


Cut off tab too long

Crimp barrel distorted


Terminal twisted


Cut off tab deformed

Crimp height too tight


Insulation inside the wire crimp


Conductor brush protruding into termial body

Bellmouth on wrong end



Terminal bend

Test

WIRE CRIMP

Crimp height measurement

Crimp heights and tolerances

For crimp height tolerances for any given contact, please refer to the relevant application specification.

Examples:

Contact	P/N	Wire Range	Tolerance	Application Spec.
MQS	962885 962886	0,20 - 0,50 mm²	± 0,03 mm	114-18025
JPT	927775	0,50 - 1,00 mm²	± 0,05 mm	114-18050
JPT	927773	1,50 - 2,50 mm²	± 0,05 mm	114-18050

Digital crimp height micrometer (0.001mm increments) according to DIN ISO 9001 part number 547203-1

WIRE CRIMP

Incorrect applicator adjustment

Asymmetric crimp


Terminal feed incorrectly adjusted

Unacceptable formation excessive flash and/or cracks


Anvil and crimper not aligned or worn

Incorrect terminal/wire selection

Wire size to large

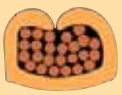

Crimp barrel does not close

Wire size to small


Legs too close to bottom of crimp. Insufficient deformation of strands, showing voids

Incorrect crimp height adjustment

Crimp height too loose

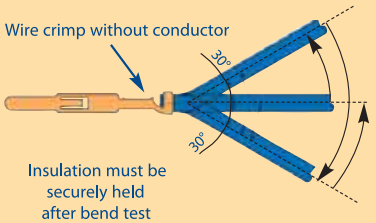

Insufficient deformation, showing voids

Crimp height too tight


Flash at under side of crimp, due to over crimping

INSULATION CRIMP

Wire crimp without conductor



Insulation must be securely held after bend test

Training

Please contact our service hotline for current training schedule.

Tel.: ++44 12 37 42 86 73

Fax: ++44 12 37 42 86 89

Wire size in AWG and mmffi to CMA

Tyco Electronics

CMA	Nominal Wire Size		Strands	Strands Diameter		Approximate Conductor Diameter	
	AWG	mm^2	Number	inch	mm	inch	mm
159	28	0.08	1	.0126	0.320	.013	0.32
175	28	0.09	7	.0050	0.127	.015	0.38
181.5	28	0.09	19	.0031	0.079	.016	0.40
198	27	0.10	51	.0020	0.050	.016	0.42
202	27	0.10	1	.0142	0.361	.014	0.36
238	26	0.12	6	.0063	0.160	.018	0.46
250	26	0.13	10	.0050	0.127	.018	0.46
250	26	0.13	26	.0031	0.079	.018	0.46
251	26	0.13	8	.0056	0.142	.018	0.46
253	26	0.13	1	.0159	0.404	.016	0.40
256	26	0.13	16	.0040	0.100	.018	0.46
278	26	0.14	7	.0063	0.160	.019	0.48
279	26	0.14	72	.0020	0.050	.022	0.56
279	26	0.14	18	.0039	0.102	.022	0.56
300	26	0.15	3	.0100	0.254	.020	0.51
304	26	0.15	19	.0040	0.100	.020	0.51
314	25	0.16	1	.0177	0.450	.018	0.45
314	25	0.16	10	.0056	0.142	.020	0.51
318	25	0.16	8	.0063	0.160	.021	0.53
320	25	0.16	1	.0179	0.455	.018	0.46
388	24	0.2	1	.0197	0.500	.020	0.50
395	24	0.2	102	.0020	0.050	.020	0.51
397	24	0.2	10	.0063	0.160	.023	0.58
400	24	0.2	16	.0050	0.127	.023	0.58
400	24	0.2	4	.0100	0.254	.023	0.58
403	24	0.2	8	.0071	0.180	.023	0.58
404	24	0.2	1	.0201	0.510	.020	0.51
408	24	0.2	13	.0056	0.142	.023	0.58
475	24	0.2	19	.0050	0.127	.023	0.58
634	22	0.3	8	.0089	0.226	.029	0.74
635	22	0.3	16	.0063	0.160	.029	0.74
640	22	0.3	10	.0080	0.203	.029	0.74
640	22	0.3	1	.0253	0.643	.025	0.64
650	22	0.3	26	.0050	0.127	.033	0.84
700	22	0.4	7	.0100	0.254	.030	0.76
754	22	0.4	19	.0063	0.160	.033	0.84
812	21	0.4	1	.0285	0.724	.029	0.72
992	20	0.5	1	.0315	0.810	.032	0.80
992	20	0.5	16	.0080	0.203	.039	1.00
992	20	0.5	256	.0020	0.050	.039	1.00
1003	20	0.5	20	.0071	0.180	.039	1.00
1000	20	0.5	10	.0100	0.254	.038	0.97
1020	20	0.5	1	.0320	0.813	.032	0.81
1025	20	0.5	41	.0050	0.127	.038	0.97
1032	20	0.5	26	.0063	0.160	.039	0.99
1111	20	0.6	7	.0126	0.320	.039	0.99
1186	20	0.6	19	.0079	0.201	.041	1.04
1289	19	0.6	1	.0359	0.912	.036	0.91
1485	18 1/2	0.75	7	.0146	0.370	.047	1.20
1488	18 1/2	0.75	24	.0080	0.200	.047	1.20
1488	18 1/2	0.75	384	.0020	0.050	.047	1.20
1504	18 1/2	0.75	30	.0071	0.180	.047	1.20
1600	18	0.8	16	.0100	0.254	.049	1.24
1608	18	0.8	19	.0092	0.234	.049	1.24
1617	18	0.8	7	.0152	0.386	.042	1.07
1624	18	0.8	1	.0403	1.024	.040	1.02
1625	18	0.8	65	.0050	0.127	.040	1.02
1627	18	0.8	41	.0063	0.160	.049	1.24
1639	18	0.8	7	.0153	0.389	.042	1.06

1792	18	0.9	7	.0159	0.404	.048	1.22
1900	18	1	19	.0100	0.254	.052	1.32
1972	17	1	1	.0445	1.130	.045	1.13
1984	17	1	32	.0080	0.203	.047	1.20
1984	17	1	512	.0020	0.050	.049	1.25
2004	17	1	7	.0169	0.430	.047	1.20
2052	17	1	1	.0453	1.151	.045	1.15
2426	16	1.2	19	.0113	0.287	.061	1.55
2510	16	1.25	50	.0071	0.180	.059	1.50
2537	16	1.25	16	.0126	0.320	.059	1.50
2580	16	1.3	65	.0063	0.160	.059	1.50
2581	16	1.3	1	.0508	1.290	.051	1.29
2600	16	1.3	26	.0100	0.254	.061	1.55
2625	16	1.3	105	.0050	0.127	.059	1.50
2800	16	1.4	7	.0200	0.508	.061	1.55
2906	15 1/2	1.5	30	.0100	0.254	.059	1.50
2934	15 1/2	1.5	7	.0205	0.520	.059	1.50
2952	15 1/2	1.5	1	.0543	1.380	.054	1.38
2974	15 1/2	1.5	392	.0028	0.070	.061	1.55
3260	15	1.6	1	.0571	1.450	.057	1.45
3831	14	2	19	.0142	0.360	.076	1.93
3902	14	2	7	.0236	0.600	.071	1.80
4079	14	2	37	.0105	0.266	.073	1.85
4099	14	2	7	.0242	0.614	.076	1.93
4100	14	2	41	.0100	0.254	.077	1.96
4106	14	2	19	.0147	0.373	.076	1.93
4109	14	2	1	.0641	1.628	.064	1.63
4123	14	2	26	.0126	0.320	.075	1.90
4167	14	2	105	.0063	0.160	.073	1.85
4234	14	2	84	.0071	0.180	.074	1.85
4844	13 1/2	2.5	50	.0098	0.25	.087	2.20
4871	13 1/2	2.5	7	.0263	0.67	.079	2.01
4935	13 1/2	2.5	1	.0701	1.78	.070	1.78
5184	13	2.6	1	.0720	1.83	.072	1.83
6088	12	3	19	.0179	0.45	.096	2.44
6475	12	3	259	.0050	0.13	.105	2.67
6500	12	3	65	.0100	0.25	.096	2.44
6501	12	3	41	.0126	0.32	.094	2.40
6503	12	3	19	.0185	0.47	.092	2.34
6512	12	3	7	.0305	0.77	.086	2.18
6529	12	3	1	.0808	2.05	.081	2.05
6545	12	3	37	.0133	0.34	.093	2.36
6549	12	3	165	.0062	0.16	.095	2.41
6654	12	3	84	.0089	0.23	.094	2.40
6939	11 1/2	3.5	7	.0315	0.80	.094	2.40
7812	11 1/2	4	56	.0012	0.03	.102	2.60
7839	11 1/2	4	7	.0335	0.85	.100	2.55
7896	11 1/2	4	1	.1004	2.55	.100	2.55
7963	11 1/2	4	19	.0205	0.52	.101	2.57
8227	11	4	1	.0907	2.30	.091	2.30
9072	10	5	7	.0360	0.91	.096	2.44
9472	10	5	37	.0160	0.41	.109	2.77
10309	10	5	65	.0126	0.32	.118	3.00
10319	10	5	37	.0167	0.42	.109	2.77
10365	10	5	41	.0159	0.40	.122	3.10
10370	10	5	7	.0385	0.98	.096	2.44
10384	10	5	1	.1019	2.59	.102	2.59
10404	10	5	19	.0234	0.59	.117	2.97
10500	10	5.5	105	.0100	0.25	.116	2.95
10842	10	5.5	7	.0394	1.00	.118	3.00
11718	10	6	84	.0118	0.30	.130	3.30
11735	10	6	7	.0409	1.04	.128	3.25
11844	10	6	1	.1087	2.76	.109	2.76

Common UL/IEC Specification for Lighting

Tyco Electronics

Stud Size		Stud Dia. Inch	Minimum Terminal Hole Diameter Inch
U.S. Cust.	Metric		
#0		.060	.064
#1		.073	.077
#2	M2	.086	.090
#3		.099	.103
#4		.112	.116
#5	M3	.125	.129
#6	M3.5	.138	.142
#8	M4	.164	.168
#10		.190	.194
#12		.216	.220
#14		.242	.247
1/4”	M6	.250	.260
5/16”	M8	.312	.323
3/8”		.375	.385
7/16”		.437	.448
1/2”	M12	.500	.510

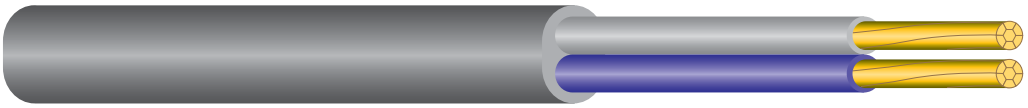
Stud Size		Stud Dia. Inch	Minimum Terminal Hole Diameter Inch
U.S. Cust.	Metric		
5/8”	M16	.625	.651
3/4”		.750	.776
7/16”	M22	.875	.901
1”		1.000	1.026
1-1/8”		1.125	1.151
1-1/4”		1.250	1.276

Solid wire

Stranded wire

Solid wire cable

Stranded cable



H03VVH2-F

SPT-1

Applicable North American Agency Requirements

Agency Specification Number	Description	Comment #1	Comment #2	Comment #3
UL 486A	Wire Connectors and Soldering Lugs for use with Copper Wire	Connectors for use with all alloys of copper conductors, for providing contacts between current-carrying parts	30 AWG to 8 AWG insulated conductors	Voltage levels above 600 V (1,000 V in a sign, lighting fixture, or luminaire)
UL 486C	Splicing Wire Connectors	Hand- or tool-applied splicing wire and cable connectors intended for use with all alloys of copper	30 AWG to 6 AWG insulated conductors	Voltages levels less than 600 V (1,000 V in a sign or luminaire)
UL 1573	Stage and Studio Luminaries, Accessories, and Connector Strips	Stage and studio luminaires rated 600 volts or less for use in theatres, studios, and similar locations		
UL 1598	Luminaries	Luminaires for use in non-hazardous locations and that are intended for installation on branch circuits of 600 V nominal or less between conductors		
UL 1977	Connectors for use in Data, Signal, Control and Power Applications – Component	Single and Multi-pole connectors	Factory Installed to copper wiring, copper alloy conductors or printed circuit boards	
UL 2108	Low Voltage Lighting Systems	Class 2 low voltage lighting systems	Low voltage exposed conductor lighting systems and luminaries incorporating exposed conductors	
UL 2459	Insulated Multi-pole Splicing Wire Connectors	Insulated Multi-pole Mating or Non Mating Wire Connectors intended for field wiring and for use in accordance with the National Electrical Code, ANSI/NFPA-70	These wire connectors are intended to facilitate the connection of devices, such as prefabricated wiring assemblies, smoke detectors and lighting products, to the branch circuit conductors of buildings. They are multi-polarity devices used to connect to two or more branch circuit conductors	
CSA C22.2 182.3	Special Use Attachment Plugs, Receptacles, and Connectors	Applies to plugs, receptacles, power inlets and outlets, connectors, and similar wiring devices intended for use in electronic and electrical applications	Voltage ratings less than 600 V	
CSA C22.2 NO. 250.0-04	Luminaries	Luminaires for use in non-hazardous locations and that are intended for installation on branch circuits of 600 V nominal or less	Similar to UL1598	

Applicable European Agency Requirements

Agency Specification Number	Description	Comment #1	Comment #2	Comment #3
IEC 61535	Installation couplers intended for permanent connection in fixed installations. It applies to two up to five wire installation couplers with or without earthing contact with a rated voltage up to and including AC 500 V	Installation couplers shall be provided with retaining means which engage automatically when the installation coupler is connected and which is capable of disengagement for disconnecting. The retaining means to be removable with the aid of a common tool only (not easily by hand) --> 80 N min retention force	Applicable for rewirable and not rewirable connectors; rated connecting capacity up to and including 10sqmm; total contact resistance wire to wire 1,0 mOhm max	Protection against electric shock ensured by IP40 minimum --> use special plastic caps or equivalent device to be removable with the aid of a common tool only (not easily by hand); Instruction sheets must be provided by manufacturer
IEC 60320	Appliance couplers for household and similar purposes; this norm is applicable to appliance couplers for AC only, with or without earthing contact, with a rated voltage not exceeding 250 V and a rated current not exceeding 16 A	It is intended for the connection of a supply cord (lead) to electrical appliances or other electrical equipment for 50 Hz or 60 Hz supply	Connectors shall be so designed that the cord cannot be subjected to excessive bending where it enters the connector: verification by 10,000 flexings for rewirable connectors and 20,000 flexings for non rewirable connectors --> requirement is no interruption of test current and no short circuit	Appliance couplers complying with this standard are suitable for use at ambient temperatures not exceeding 25 °C, but occasionally reaching 35 °C
IEC 61984	Connectors safety requirements and tests; this norm applies to connectors with rated voltage above 50 V and up to 1,000 V and rated currents up to 125 A	Suitable for fixed and free connectors (e.g. free hanging versions)	Applicable for rewirable and non rewirable connectors; connectors must have protective earth contact and (for free connectors) the cable clamp	For connectors according to this standard, voltage/current/ breaking capacity values shall be specified in compliance with mechanical and environmental conditions given in the manufacturer specification

Temperature Conversion Chart

Celsius	Fahrenheit
0 C	32.0 F
1 C	33.8 F
2 C	35.6 F
3 C	37.4 F
4 C	39.2 F
5 C	41.0 F
6 C	42.8 F
7 C	44.6 F
8 C	46.4 F
9 C	48.2 F
10 C	50.0 F
11 C	51.8 F
12 C	53.6 F
13 C	55.4 F
14 C	57.2 F
15 C	59.0 F
16 C	60.8 F
17 C	62.6 F
18 C	64.4 F
19 C	66.2 F
20 C	68.0 F
21 C	69.8 F
22 C	71.6 F
23 C	73.4 F
24 C	75.2 F
25 C	77.0 F
26 C	78.8 F
27 C	80.6 F
28 C	82.4 F
29 C	84.2 F
30 C	86.0 F

The equation for converting Fahrenheit to Celsius is:
((Deg. F) - 32) x (5/9) = Deg. C

- IEC 60320 is equivalent to VDE 625, intended for the connection of a supply cord (lead) to electrical appliances (max current rating 16 A)
- IEC 61535 is equivalent to VDE 0606-200, for power wiring devices; intended for permanent connection in fixed installations (minimum current rating 10 A)
- IEC 61984 is equivalent to VDE 627, intended for fixed and free connectors (e.g.: free hanging versions); this norm applies to connectors with rated voltage above 50 V and up to 1,000 V and rated currents up to 125 A. This is a specification for connectors general safety requirements (general application, no specific one); in addition ratings values like voltage/current/breaking capacity are specified and declared by the manufacturer (not "forced" by the norm);

Sealing and Waterproofing

Degree of protection (IEC 60529)

Degrees of protection provided by enclosures (IP Code) for electrical equipment.

Definition of degree of protection (IP Code) IEC 60529 outlines an international classification system for the sealing effectiveness of enclosures of electrical equipment against the intrusion into the equipment of foreign bodies (i.e. tools, dust, fingers) and moisture. This classification system utilises the letters IP (Ingress Protection) followed by digits.

Degrees of protection – First digit

The first digit of the IP Code indicates the degree that connection is protected against contact with moving parts and the degree that equipment is protected against solid foreign bodies intruding into an enclosure.

0 No special protection
1 Protection from a large part of the body such as hand or from solid objects greater than 50mm in diameter
2 Protection against objects not greater than 80mm in length and 12mm in diameter
3 Protection from entry by tools, wires, etc., with a diameter or thickness greater than 2.5mm
4 Protection from entry by solid objects with a diameter or thickness greater than 1.0mm
5 Protection from the amount of dust that would interfere with the operation of the equipment
6 Dust-tight

Degree of protection – Second digit

Second digit indicates the degree of protection of the equipment inside the enclosure against the harmful entry of various forms of moisture (e.g. dripping, spraying, submersions, etc.)

0 No special protection
1 Protection from vertically dripping water
2 Protection from dripping water when tilted up to 15°
3 Protection from sprayed water
4 Protection from splashed water
5 Protection from water projected from a nozzle
6 Protection against heavy seas, or powerful jets of water
7 Protection against temporary immersion
8 Protection against complete continuous submersion in water (up to 1 metre for 15 minutes)

A

abrasion-resistance A measure of the ability of a wire or wire covering to resist damage by mechanical means.

accelerated aging A test in which voltage, temperature, or other test parameters are increased above normal operating values to obtain observable deterioration in a relatively short time. The plotted results give service life within the context of the test.

adapter A device usually attached to the rear of connectors that provides for the attachment of harnessing components, such as strain-relief clamps, heat-shrinkable boots, and braid.

adhesive liner Lining that melts and flows inside a sleeve or molded part, filling any voids in between the substrate and the sleeve or molded part. DuraSeal has an adhesive liner.

ampacity See current-carrying capacity.

amplitude The magnitude of variation in a changing quantity from its zero value. The word requires modification — as with adjectives such as peak, maximum, rms, etc. — to designate the specific amplitude in question.

arc voltage Voltage that continues to pass through a surge protector during activation of GDT (approx. 20 volts).

ASTM (American Society for Testing and Materials) A nonprofit industry-wide organisation that formulates test methods and material specifications, and publishes standards, testing methods, recommended practices, definitions and other materials.

AWG (American Wire Gauge) The recognised method (in the United States) of specifying conductor size. The higher the gauge number, the smaller the conductor size.

B

back mounted A connector attached to the inside of a panel or box with its mounting flanges inside the equipment.

bare conductor A conductor not covered with insulating material.

barrel ***1.) Connector barrel:*** The section of the terminal, splice, or contact that accommodates the stripped conductor. ***2.) Insulation barrel:*** The section of the terminal, splice, or contact that accommodates the conductor insulation. ***3.) Open barrel:*** The section of a cap that accommodates the conductor.

bayonet coupling A quick-coupling device for plug and receptacle connectors. Mating is accomplished by rotation of the two parts under pressure.

bellmouth Flared at the mouth. The rear of a properly crimped wire barrel will have a slight flare (bellmouth) to relieve the strain on the wire strands as they leave the area of high compression and take their natural “lay”. A bellmouth condition may also be present in front of the wire barrel.

binder A spiral wrapping of a thread to hold together the members of a cable.

blocking The sticking together of insulated wires; usually caused by heat.

body Main or largest portion of a connector to which other portions are attached.

bonding temperature Temperature above which adhesive melts and flows sufficiently to form an adhesive bond between substrates.

braid A weave of metal fibres used as a shield covering for an insulated conductor or group of insulated conductors. When flattened it may be used as a grounding strap.

braid angle The angle between the braid strands and the axis of the cable.

breakdown voltage The voltage at which an insulator or dielectric fails to maintain the applied voltage.

breakout A region in a harness assembly where a wire or a group of wires is detached to form a separate, terminated branch. Also known as a transition.

bulkhead A term used to define a mounting style of connectors. Bulkhead connectors are designed to be inserted into a panel cutout from the rear (component side) of the panel.

bunch stranding A method of twisting individual strands to form a finished stranded conductor. Specifically, a number of strands twisted together in a common direction and with a uniform pitch (or twist) per inch.

bus A communal circuit over which data or power is transmitted.

C

cable Two or more wires in a twisted or parallel configuration. Also, a shielded wire.

cable clamp A mechanical clamp attached to the cable side of a termination assembly to support the cable or wire bundle. It provides strain relief and absorbs vibration and shock that would otherwise be transmitted by the cable terminations.

cable clamp adapter A mechanical adapter that attaches to the rear of a termination assembly to allow the attachment of a cable clamp.

cable sealing clamp A device consisting of a gland nut designed to seal around the jacket of a cable.

cabler A machine that mechanically assembles a group of insulated wires.

cabling The act of twisting together two or more insulated components to form a cable.

capacitance The property of an electrical conductor (dielectric in a capacitor) that permits the storage of energy as a result of electrical displacement. The basic unit of capacitance is the farad, however, measurement is more commonly in microfarads or picofarads.

carrier A group of strands or ends used to form a finished braid.

chemical resistance The ability of an insulation to withstand the presence of materials – such as acids, bases, water, salt water, and fuels – that can deteriorate the insulation, or that, if penetrable to the conductor, can cause dielectric loss of insulating qualities.

circuit The interconnection of a number of electrical elements or parts to accomplish a desired function.

Circular Mil Area (CMA) A unit of area equal to the area of a circle whose diameter is 1 mil (0.001 inch). Used chiefly in specifying cross-sectional areas of conductors. (See AMP Brochure No. 4402-8, Computing Circular Mil Area for AMP Terminals and Splices).

clocking The arrangement of connector inserts, jackscrews, polarising pins, sockets, keys/keyways, or housing configurations to prevent the mismating or cross-mating of connectors. See also polarisation.

closed entry contact A female contact designed to prevent the entry of a pin or probing device having a cross-sectional dimension (diameter) greater than the mating pin.

cold impact A test performed by subjecting a component to a specified impact during exposure to low temperature. It measures the brittleness of the material.

cold joint A soldered joint made with insufficient heat. (Solder hasn’t completely flowed and wet the substrate.)

colour code A means of identifying cable components using solid colours or stripes. Also, the scheme that assigns a number from 0 to 9 for each of 10 colours.

component A wire or cable that is combined with other wires or cables to make a multicomponent cable.

compound An insulating or jacketing material made by formulating polymeric materials and additives.

Compound Under Strands (CUS) A problem that occurs when loose stranding, or overheating during extrusion, allows compounds to get under individual strands of conductor.

concentric stranding A method of stranding conductor. Specifically, the final conductor is built up in layers so that the inner diameter of a succeeding layer is always equal to the outer diameter of the underlying layer.

conductivity The capability of a material to carry electrical current, usually expressed as a percentage of copper conductivity (copper being 100%). Specifically, the ratio of the current flow to the potential difference causing the flow. The reciprocal of resistance.

conductor The metallic strand or strands used to carry an electric current.

conductor resistance The resistance to flow of the electrical current along a conductor. Expressed in ohms/1,000 feet. (Usually referenced to 20°C).

conduit A tubular raceway for holding wires or cables.

configuration Arrangement of contacts in a multiple-contact connector.

connector A device used to physically and electrically connect two or more conductors.

connector classes Categories based on shape, function and smallest size contact in a series.

connector insert In connectors with metal shells, the part that holds contacts in proper arrangement while electrically insulating them from each other and from the shell.

contact The element in a connector that makes the actual electrical connection. Also the parts of a connector that actually carry the electrical current, and are touched together or separated to control the flow.

contact crimp A contact whose rear portion is a hollow cylinder that accepts the conductor. A crimping tool is applied to swage or form the contact metal firmly against the conductor. Sometimes referred to as a solderless contact.

contact durability The number of insertion and withdrawal cycles that a connector must be capable of withstanding while remaining within the performance levels of the applicable specification.

contact engaging and separating force Force required to either engage or separate contacts. Values are generally established for maximum and minimum forces.

contact inspection hole A hole, perpendicular to the cylindrical rear portion of screw machined contacts, used to check the depth to which wire has been inserted into the barrel.

contact resistance Measurement of electrical resistance of mated contacts when assembled in a connector under typical service use. Electrical resistance is determined by measuring from the rear of the electrical area of one contact to the rear of the contact area of the mating contact (excluding both crimps) while carrying a specified test current.

contact size The diameter of the engagement end of a pin contact; also related to the current-carrying capacity of a contact.

contact, two-piece A contact made of two separate parts joined by swedging, brazing or other means of fastening to form a single contact. While this provides the mechanical advantages of two metals, it also has the inherent electrical disadvantage of difference in conductivity.

continuity A continuous path for the flow of current in an electrical circuit.

continuous operating temperature Maximum temperature at which a component will maintain an acceptable lifetime performance, based on accelerated aging prediction.

core 1.) In cables, a component or assembly of components over which additional components, such as a shield or a sheath, are applied. 2.) Inner wall of dual-wall heat-shrinkable tubing.

coupling ring The portion of a plug that aids in the mating and demating of a plug and receptacle and holds the plug to the receptacle.

cover, electrical connector An item specifically designed to cover the mating end of a connector for mechanical and/or environmental protection. Also known as a dust cover.

coverage A calculated percentage that defines the completeness with which a braid or shield covers the surface of the underlying insulated conductor or conductors.

crimp The final configuration of a terminal barrel after the necessary compression forces have been applied to cause a functional union between the terminal barrel and the wire.

crimp height A top to bottom measurement of the crimped barrel, using a crimp height comparator in the prescribed manner. (Refer to AMP Instruction Sheet 7424).

crimping dies A term used to identify the shaping tools that, when moved toward each other, produce a certain desirable shape to the barrel of the terminal or contact that has been placed between them. Crimping dies are often referred to as die sets or as die inserts.

crimping head Tooling containing jaws and linkage for use in pneumatic or hydraulic powered units to crimp loose-piece contacts/terminals that may be too large for hand tool applications.

crimping tool A term commonly used to identify a hand held mechanical device that is used to crimp a contact, terminal or splice.

crosslinking The formation of bonds between molecular chains in a polymer by means of chemical catalysation or electron bombardment. The properties of the resulting thermosetting material are usually improved.

crosslinking by irradiation A method of crosslinking polymers that makes a nonflowing material. This generally improves the properties of the polymer.

CSA (Canadian Standards Association) An agency that has developed standard specifications for products with particular emphasis on safety in the end use.

current A movement or flow of electrons. Also, the measure of this flow, expressed in amperes.

current-carrying capacity The maximum current an insulated conductor is capable of carrying without exceeding its insulation- and/or jacket temperature limitations under specified ambient conditions. Also known as ampacity.

current rating The maximum continuous electrical flow of current recommended for a given situation. It is expressed in amperes.

cutout The hole, usually round or rectangular, cut into a metal panel in order to mount a connector. The cutout may also include holes for mounting screws or bolts.

cut-through resistance Resistance of solid material to penetration by an object (typically a closely controlled knife edge) under conditions of pressure, temperature, and other elements.

cycle One complete sequence of values of an alternating quantity, including a rise to maximum in one direction and return to zero; a rise to maximum in the opposite direction and return to zero. The number of cycles occurring in one second is called the frequency.

D

die closure Term used to designate a crimping area (crimping chamber) when the dies are fully closed or bottomed. Die closure is checked with go/no go plug guage to insure that the crimp produced by the tooling satisfies the crimp height specification.

dielectric A material that serves as an insulator. The amount of resistance to voltage in a given insulation.

dielectric breakdown The voltage required to cause an electrical failure or breakthrough of the insulation. Determined by a destructive test. See also breakdown voltage.

dielectric constant (also K) The ratio of the capacitance between two electrodes with a solid, liquid, or gaseous dielectric, to the capacitance with air between the electrodes. Also called permittivity and specific inductive capacity. Generally low values are desirable for insulation.

dielectric strength The maximum voltage a dielectric can withstand without rupture. Usually expressed as volts per mil.

dielectric withstanding voltage The maximum potential gradient that a dielectric material can withstand without failure.

Direct Current Resistance (DCR) The resistance offered by any circuit to the flow of direct current.

direction of lay The lateral direction in which the strands or elements of a cable run over the top of the cable as they recede from the observer. Expressed as right-hand or left-hand lay.

discontinuity Rated interconnection: a broken connection (open circuit) or the loss of a specified connection characteristic. Transient phenomena: Short term (temporary) interruption or unacceptable variation in current or voltage.

drain wire In a cable, an un-insulated conductor laid over the component, or components, in a foil-shield cable. Used as a ground connection.

dust cover See cover, electrical connector.

E

elastic memory The ability of a crosslinked polymer to be deformed to some predetermined shape, hold that shape for a period, and then return to its original shape upon the application of heat.

elastomer A material that exhibits very low or zero crystallinity and a high degree of flexibility (rubber is a synonym).

electromagnetic compatibility (EMC) The ability of an electronic device to operate in its intended environment without its performance being affected by EMI and without generating EMI that will affect other equipment.

electromagnetic interference (EMI) Unwanted electrical or electromagnetic energy that causes undesirable responses, degrading performance or complete malfunctions in electronic equipment. See also: noise.

electromotive force (emf) See voltage.

elongation The ultimate elongation, or elongation at rupture. Expressed as a percentage of original length.

EMI Abbreviation for electromagnetic interference.

encapsulant Description related to the way dual-wall tubing products and precoated molded parts melt and flow when heated, filling any void in the area being covered. Unlike an adhesive, an encapsulant does not form a mechanical bond to the substrate.

encapsulation Covering and sealing.

environmentally sealed A unit is provided with gaskets, seals, grommets, potting or other means to keep out moisture, dust, air or dirt which might reduce or impair its performance.

epoxy A family of thermosetting resins usually used as adhesives or encapsulants.

Expanded ID (EID) The specified minimum (as supplied) internal diameter of tubing.

expansion ratio An expression of how much larger the inside diameter of a tubing is before shrinking. Specifically, the relationship of the minimum (expanded) inside diameter of tubing to the maximum (recovered) inside diameter, expressed as a ratio. See also shrink ratio.

extraction tool A tool used for removing contacts from a connector body.

F

feedthrough A connector or terminal block, usually having double-ended terminals, which permits distribution and bussing of electrical circuits. Also used to describe a bushing in a wall or bulkhead, separating compartments at different pressure levels, with terminations on both sides.

ferrule A short tube used to make solderless connections to shielded or coaxial cable. Also molded into the plastic inserts of multiple contact connectors to provide strong, wear-resistant shoulders on which contact retaining springs can bear.

filler A material used in a cable construction to fill large interstices, thus providing a round construction; can be shaped, round, or in mastic forms. A nonfunctional member used in a cable to provide a more circular cross section.

flame-resistant A descriptor applied to a material that is inherently resistant to burning.

flame retardant A descriptor applied to a material that has been made or treated so as to resist burning.

flat braid A braided shield composed of flat strands.

flat cable A cable with each component in a single, flat plane.

flat conductor A conductor having a rectangular cross section, as opposed to a round or square cross section.

flex life A measure of the susceptibility of a conductor or other device to failure due to fatigue from repeated bending.

flux A liquid or solid that, when heated, exercises a cleaning and protective action upon surfaces. Used to promote or facilitate fusion during soldering or welding.

fretting corrosion A form of excellerated oxidation that appears at the interface of contacting materials undergoing slight cyclic relative motion. All non-nobel metals (tin) are susceptible to some degree of fretting corrosion and will suffer contact resistance increases.

front mounted A connector is said to be front mounted when it is attached to the outside of the mating side of a panel. A front mounted connector can only be installed or removed from the outside of the equipment.

front release contacts Connector contacts that are released from the front side of the connector and then removed from the back, wire side of the connector.

full recovery temperature, minimum See recovery temperature.

G

gauge A term used to denote the physical size of a wire. See also AWG.

ground A connection, intentional or accidental, between an electrical circuit and the earth or some conducting body (e.g. chassis) serving in place of earth.

grounding conductor A conductor that provides a current return path from an electrical device to ground.

H

hardness A general term that correlates with strength, rigidity, and resistance to abrasion or penetration. Measured on Shore or Rockwell scales. See also Shore.

harness A system providing electrical connection between two or more points.

heat aging A test that subjects components or materials to temperatures above normal operating values to evaluate changes in performance in order to predict service life. See also accelerated aging.

heat shock A test to determine the stability of a material by continuously exposing it to an extremely high temperature for a short period of time. The test was developed both to demonstrate that the material is crosslinked and to observe any problems in dripping, cracking or flowing.

heat-shrinkable A type of plastic material that has been cross-linked. A term describing tubes, sleeves, caps, boots, films or other forms of plastic which shrink to encapsulate, protect or insulate connections, splices, terminations and other configurations.

hermetic Airtight, impervious to external influence, as in a hermetic package. Often used to describe metal-to-metal solder or weld-sealed packages.

hermetic seal Hermetically sealed connectors are usually multiple contact connectors where the contacts are bonded to the connector by glass or other materials and permits maximum leakage rate of gas through the connector of 1.0 micron ft./hr. at one atmosphere pressure for special applications.

hertz (Hz) International standard term for cycles per second. Named after the German physicist Heinrich R. Hertz (e.g., 60 cycles per second is equal to 60 hertz or 60 Hz).

hookup wire and cable Wiring used to connect various points in electronic assemblies.

hot-melt adhesive An adhesive that becomes activated by heating. When heated, it melts, flows over the substrate surface, and forms an adhesive bond. Reheating causes the adhesive to remelt.

I

ID (Internal Diameter) The inside or internal diameter of a tubing.

impulse test A high voltage test designed to locate pinholes in the insulation of a wire or cable by applying a voltage while the wire or cable is being drawn through an electrode.

inductance One cause of reactance. An electromagnetic phenomenon in which the expanding and collapsing of a magnetic field surrounding a conductor or device tends to impede changes in current. The effects of inductance become greater as frequencies increase. The basic unit for inductance is the henry.

insert Meltable thermoplastic ring placed within a SolderSleeve device. Aids in encapsulation and sealing.

insert (connector) Part that holds the contacts in their proper arrangement and electrically insulates them from each other and from the shell.

insert arrangement (connector) The number, spacing and arrangement of contacts in a termination assembly.

insert cavity (connector) A defined hole in the connector insert into which the contacts are inserted.

insertion tool (connector) A tool used to insert removable contacts into a connector.

inspection hole A hole placed at one end of a contact barrel to permit visual inspection, to ensure that the conductor has been inserted to the proper depth in the barrel prior to crimping or soldering.

insulated terminal A solderless terminal with an insulated sleeve over the barrel to prevent a short circuit in certain installations.

insulation crimp The area of a terminal splice or contact that has been formed around the insulation of a wire.

insulation, electrical A nonconductive material usually surrounding or separating two conductive materials. Often called the dielectric in cables designed for high-frequency use.

insulation grip The ability of certain crimped terminals to hold firmly in place both the conductor and a small portion of insulation. This prevents the conductor from being exposed due to insulation receding away from the terminal.

insulation resistance The electrical resistance between two conductors separated by an insulating material.

insulation, thermal A nonconductive material that prevents the passage of heat.

interconnection The joining of one individual device with another.

interface The two surfaces of a multiple-contact connector that face each other when the connector is assembled.

interference An electrical or electromagnetic disturbance that causes undesirable response in electronic equipment.

interstice In a cable construction, the space or void left between or around the cabled components.

irradiation In insulations, the exposure of the material to high-energy emissions for the purpose of favorably altering the molecular structure via crosslinking.

J

jack A connecting device into which a plug can be inserted to make circuit connections. The jack may also have contacts which open or close to perform switching functions when the plug is inserted or removed. See also: receptacle.

jacket 1.) A material covering over a wire or cable assembly. 2.) Outer covering of a dual-wall heat-shrinkable tubing.

jackscrew A screw attached to one half of a two-piece, multiple-contact connector and used to draw both halves together and to separate them.

K

key (connector) A short pin or other projection that slides into a mating slot or groove to guide two parts being assembled.

keying (connector) Mechanical arrangement of guide pins and sockets, keying plugs, contacts, bosses, slots, keyways, inserts, or grooves in a connector housing, shell or insert that allows connectors of the same size and type to be lined up; used in situations where there is danger of making a wrong connection.

keyway The slot or groove in which a key slides.

kV (kilovolt) A unit equal to 1,000 volts.

L

lacing cord or twine Used for lacing and tying cable forms, hookup wires, cable ends, cable bundles and wire harness assemblies. Available in various materials and impregnants.

lanyard A device, attached to certain quick-disconnect connectors, that permits uncoupling and separation of connector halves by a pull on a wire or cable.

lay Refers to direction or sometimes the ratio of lay length to core diameter.

lay length A term used in cable manufacturing to denote the distance of advance of one member, or a group of spirally twisted members in one turn, measured axially. The lay of any helical element of a cable or conductor is the axial length of a turn of the helix of that element.

life cycle A test to determine the length of time before failure in a controlled, usually accelerated environment.

liner See core.

longitudinal change (shrink tubing) The change in length of tubing when recovered. Expressed in the percent of change from the original length.

lug A termination, usually crimped or soldered to a conductor, that allows connection to be made with a retaining screw.

M

marking A printed identification number or symbol applied to the surface of a wire or cable.

matched impedance The coupling of two circuits in such a way that the impedance of one circuit equals the impedance of the other.

mate To join two connectors in a normal engaging mode.

maximum discharge current defined as the peak current of an impulse which the device can withstand once without substantially affecting device performance.

mega (M) A prefix meaning one million (106).

melt/flow index Measurement of the flow of thermoplastic material under given conditions of temperature and pressure. Expressed as grams per unit of time.

melting point The temperature at which crystallinity disappears when crystalline material is heated.

MIL A unit equal to one one-thousandth of an inch (.001"); used in measuring the diameter of a conductor or thickness of insulation over a conductor.

minimum full recovery temperature See recovery temperature.

multiconductor More than one component within a single-cable complex.

multiple-conductor cable A combination of two or more components cabled together.

N

nick A small cut or notch in conductor strands or insulation.

noise An extraneous signal in an electrical circuit, capable of interfering with the desired signal. Classes of noise include burst of popcorn noise, intermediate frequency noise at low audio frequencies, white (thermal) noise, etc. Signals from power supply or ground line coupled into an amplifier output may be considered noise.

nominal A descriptor applied to a dimension representing the centre of the range of tolerance or a value if no tolerance is applied.

O

"O" crimp An insulation support crimp for open barrel terminals and contacts. In its crimped form it resembles an "O" and conforms to the shape of the round wire insulation. "O" crimp is also used to describe the circumferential crimps used on COAXICON ferrules.

OFT (Optional Flame Test) Canadian Standards Association's test for flame-retardance. Tubing with an OFT rating is highly flame-retardant.

operating temperature The maximum internal temperature at which a system, harness, or connector may operate in continuous service; generally expressed as a time and temperature.

operating temperature range The range between the maximum and the minimum internal temperature of insulation in a system, harness, or connector in continuous service. The lower limit is determined by low temperature flex test.

Optional Flame Test See OFT.

P

packaging The process of physically locating, connecting, and protecting devices or components.

panel The side or front (usually metal) of a piece of equipment on which connectors are mounted.

panel mount A method of fixing a connector to a board, panel or frame. The mounted connector is usually the receptacle or female connector. The plug or male connector is usually the removable portion.

peripheral seal A seal provided around the periphery of connector inserts to prevent the ingress of fluids or contaminants at the perimeter of mated connectors.

pigtail A short conductor or wire extending from an electrical or electronic device to serve as a jumper or ground connection.

pin contact An electrical terminal, usually in a connector. Normally a smaller termination than a lug.

plastic deformation Change in dimensions under a load that does not recover when the load is removed.

plating The overlaying of a thin coating of metal on metallic components to improve conductivity, facilitate soldering, or prevent corrosion.

plug The part of a connector that is normally "removable" from the other, permanently mounted part; usually that half of a two-piece connector that contains the pin contacts.

plug connector An electrical connector that is intended to be attached to the free end of a conductor, wire, cable, or bundle, and that couples or mates to a receptacle connector.

poke through A term describing stray wires in a solder joint that poke through the insulation.

polarisation (connectors) A mechanical arrangement of inserts or the shell configuration (referred to as clocking in some instances) that prohibits the mating of mismatched plugs and receptacles. See also clocking.

polyamide A polymer formed by the reaction of a diamine and a diacid. Nylons are commercial polyamides characterised by toughness, solvent resistance, and sharp melting point.

polymer A material of high molecular weight formed by the chemical union of monomers.

polyolefin A family of polymers (such as polyethylene and polypropylene) made from olefin monomers.

potting The permanent sealing of the cable end of a connector with a compound or material that thermosets into an elastomer, to exclude moisture and/or to provide strain relief.

pretinned Description of an electrical component to which solder has been applied prior to soldering.

primary insulation The inner member of a dual-wall wire insulation. The insulation applied directly on the conductor. Also referred to as the core. See also core.

printed circuit board (pcb) An insulating board serving as a base for a printed circuit. When the printing process is completed, the board may include printed components, as well as printed wiring.

PVC (Polyvinyl chloride) A polymer compound used as wire insulation.

Q

quality assurance Systematic, planned, and documented activities designed to provide confidence that a product will meet specifications.

quality control Activities that monitor, measure, and control the characteristics of a material, component, or product to documented specifications.

quick disconnect A type of connector shell that permits rapid locking and unlocking of two connector halves.

R

radiation crosslinking The act of crosslinking a material with ionising radiation. (Most Raychem products are radiation crosslinked, with an electron beam as the form of ionising radiation.) See also crosslinking by irradiation.

rated temperature The maximum temperature at which a component can operate for extended periods with acceptable changes in its basic properties.

rated voltage The maximum voltage at which an electric component can operate for extended periods without undue degradation.

receptacle Usually the fixed or stationary half of a two-piece multiple contact connector. Also the connector half usually mounted on a panel and containing socket contacts.

removable contact A contact that can be mechanically joined to or removed from an insert. Usually special tools are required to lock the contact in place or remove it for repair or replacement.

residual impulse Defined as the voltage that will pass through the device prior to activation of the GDT.

residual voltage Defined as the small amount of voltage left on the line after an impulse passes.

resistance A measure of the difficulty in moving electrical current through a conductor or insulation when a voltage is applied. It is measured in ohms.

resonance A frequency at which captive reactance and inductive reactance

ribbon cable Flat cable with conductors that have been individually insulated together. Its structure is usually characterised by individual colours of insulation for each conductor, although a single colour may be used for all conductors.

root mean square (rms) The effective value of an alternating current, corresponding to the direct current value that will produce the same heating effect.

rope lay A type of conductor lay that uses stranded conductors as components to build a larger conductor.

RT and RW specifications Specification that describes standard product properties. Qualification and acceptance inspection criteria are incorporated into RT and RW specifications. RT and RW specifications are issued and controlled by the Specifications Group.

S

sealant Soft, tacky, pliable material that seals where mechanical strength is not required.

sealed Environmentally protected by the thermoplastic inserts or core of encapsulant/adhesive that has melted down around the substrate.

sealing plug A plug that is inserted to fill an unoccupied contact aperture in a termination assembly.

semi-rigid A cable containing a flexible inner core and a relatively inflexible sheathing.

shelf life Generally, the length of time a product or material may be stored without deterioration. Specifically, the length of time during which shrink tubing will retain its expanded ID and return to its recovered ID. Usually not a concern—except for some "amnesic" materials. See amnesia.

shell (connector) The outside case, usually metallic, into which the insert (body) and contacts are assembled. Shells of mating connector halves usually provide for proper alignment and polarisation as well as for protection of projecting contacts.

shock (mechanical) (1) An abrupt impact applied to a stationary object. (2) An abrupt or nonperiodic change in position, characterised by suddenness, and by the development of substantial internal forces.

shore A scale for comparing hardness. Higher Shore values represent harder materials. The hardness of a polymer, for example, is usually represented as Shore A or Shore D, with D being harder.

shrink ratio An expression of how much the inside diameter of shrink tubing will reduce in size when recovered. The inverse of the expansion ratio. See also expansion ratio.

shrink temperature, minimum The minimum temperature at which a product begins to recover.

SHV Abbreviation for standard high voltage.

Signal cable A cable designed to carry current of less than 12 amperes per conductor.

skew Any out-of-squareness of the cut end of a piece of tubing after shrinking.

skin effect The tendency of alternating currents to flow near the surface of the conductor, thus being restricted to a small part of the total cross-sectional area. This effect increases the resistance and becomes more marked as the frequency rises.

sleeve The insulated or metallic covering over the barrel of a terminal.

solder An alloy that melts at relatively low temperatures and is used to join metals with higher melt points.

solder contact A contact or terminal having a cup, hollow cylinder, eyelet or hook to accept a wire for a conventional soldered termination.

solder cup A tubular end of a terminal into which a wire conductor is inserted prior to being soldered.

solderability The property of a metal surface that allows it to be readily wetted by molten solder. See also wetting.

soldering A process of joining metallic surfaces with solder without melting the base metal.

SolderSleeve device A device of flux-coated solder preform encapsulated in a heat-recoverable plastic sleeve. Upon the application of heat, the flux and solder will melt and flow as the sleeve recovers, forcing the solder around and onto the metallic parts being joined, thus forming an electrically insulated and strain-relieved joint.

solid conductor A conductor composed of one single strand.

solvent resistance The ability of a material to retain physical and electrical properties after being immersed in specific solvents.

SPC Silver-plated copper.

specific gravity The ratio of the density (mass per unit volume) of a material to that of water.

splice A joint connecting conductors with good mechanical strength and conductivity; a terminal that permanently joins two or more wires.

strain relief The technique for or act of removing or lessening the strain or stress on a joint, splice, or termination. SolderSleeve devices provide strain relief.

strain relief clamp See cable clamp.

strand A single unit of a conductor.

stranded conductor A conductor composed of more than one single strand. The strands in stranded conductors are usually twisted or braided together.

strip To remove insulation from a wire or cable.

stripe A continuous longitudinal or spiral colour strip applied on the surface of a wire, cable, or tubing for identification.

substrate The material – such as a wire, post, or tab – over which an interconnection device is used.

super high frequency (shf) The Federal Communications Commission designation for the band from 3,000 to 30,000 MHz in the radio spectrum.

surface resistance The ratio of the direct current applied to an insulation system to the current that passes across the surface of the system.

T

tape wrap A term denoting a spirally or longitudinally applied tape material wrapped around insulated or uninsulated wire and used as a mechanical barrier.

TC Tinned copper.

tear test A test to determine the tear strength of an insulating material. Usually includes exposure to given thermal conditions or a programmed series of conditions for prescribed periods of time.

temperature rating The maximum temperature at which the insulating material may be used in continuous operation without loss of its basic properties. Usually time dependent.

tensile The amount of axial load (longitudinal stress) required to break or pull the wire from the crimped barrel of the terminal, splice or contact.

tensile strength The greatest longitudinal stress that a substance or union can bear without tearing or pulling apart. In crimped terminations, it is the greatest longitudinal stress that a terminal can bear without the wire separating from the terminal.

thermal rating The effect of heat or cold applied at such a rate that nonuniform thermal expansion or contraction occurs within a given material or combination of materials. In electrical terminations, the effect can cause inserts and other insulation material to pull away from the metal parts.

thermal shock The effect of heat or cold applied at such a rate that nonuniform thermal expansion or contraction occurs within a given material or combination materials. The effect can cause inserts and other insulation materials to pull away from metal parts.

thermochromic indicator Special compound that changes colour when the proper wetting temperature has been reached in the solder joint.

thermoplastic A material that softens (melts and flows) when heated and becomes firm when cooled. A type of plastic that can be remelted a number of times without any important change in properties. Nylon, GE's Lexan, and PVC—examples of this type of plastic—are resilient after molding.

thermoset A material that hardens or sets when heated and, once set, cannot be resoftened by heating. This application of heat is called "curing."

thermosetting plastic A type of plastic in which an irreversible chemical reaction takes place while the plastic is being molded under heat and pressure.

thermosetting adhesive A curing adhesive that requires heat to promote curing. This type of plastic will not soften when reheated. See epoxy.

tolerance The total amount by which a quantity is allowed to vary from nominal; thus, the tolerance is half the algebraic difference between the maximum and minimum limits.

U

UL (Underwriters' Laboratories) A nonprofit independent testing organisation that operates a listing service for electrical and electronic materials and equipment.

ultraviolet degradation The degradation caused by long-time exposure of a material to sunlight or other ultraviolet rays.

V

volt (V) The unit of measurement for electromotive force (emf). It is equivalent to the force required to produce 1 ampere through a resistance of 1 ohm.

voltage (E) The term most often used to designate electrical pressure that exists between two points and is capable of producing a flow of current when a closed circuit is connected between the two points. Voltage is measured in volts, millivolts, microvolts and kilovolts. The terms electromotive force (emf), potential, potential difference and voltage drop are often referred to as voltage.

voltage breakdown The voltage necessary to cause insulation failure.

voltage drop The voltage developed across a component or conductor by the flow of current through the resistance or impedance of that component or conductor.

voltage rating The voltage that may be continuously applied to wire.

volume resistivity Reciprocal of conductivity; the resistance of a material to the flow of electrical current, usually expressed in ohm-cm.

VW-1 A rating determined by the Underwriters' Laboratories' (UL) optional Vertical Wire Flame Test – the most difficult flame test for tubing. Tubings with a VW-1 rating are highly flame-retardant.

W

wall thickness The thickness of the applied insulation or jacket.

water absorption test A method to determine the water uptake of a material. It is time and temperature dependent.

water blocking The sticking together of insulated wires; usually caused by heat.

wetting (solder) The formation of a relatively uniform, smooth, unbroken, and adherent film of solder to a base metal. Also, the free flow of solder alloy, with proper application of heat and flux, on a metallic surface to produce an adherent bond.

wicking The longitudinal flow of a liquid in a wire or cable construction due to capillary action. (This may also apply to solder.)

wire A single conductor covered with insulation.

wire dress The orderly arrangement of wires and laced harnesses.

withstanding voltage The test voltage an electrical connector can withstand for one minute without showing evidence of electrical breakdown when the voltage is applied between conductors and grounding devices of the connectors in various combinations.

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