TURCK
Network Media Products

TURCK Standards

One or more of the following standards may apply to products or components of products in this catalog. This section is intended to provide a reference to the applicable standards only. Original or facsimiles of the original standards documents should be used for interpretation. It is the responsibility of the user to determine the suitability of use of the products represented in this catalog.

ANSI/B93.55M

Generally defines the geometry and connection scheme of “mini” type connectors used in fluid power (valve) applications. It defines the numerical marking of the pins and the conductor size and colors for 3 and 5 pin versions. This specification was the basis for the so-called “automotive” standard conductor colors that are widely used on sensors.

CENELEC EN 50 044

Identifies connections for inductive proximity switches. The specification defines conductor colors for proximity switches with 2, 3, or 4 conductors. It also defines numerical marking of the terminals, whether quick disconnect, or not. TURCK sensors and recommended cordsets that apply within the scope of the standard comply with CENELEC EN 50 044. The conventions defined in this standard have been widely adopted in industry to include photoelectric controls and other related sensing devices.

CSA

The Canadian equivalent of UL in Canada. It is a government-run organization that tests and certifies that products conform to their own set of safety-related specifications.

DIN 43650

Defines the geometry and other characteristics of the “square” connectors most frequently used on hydraulic and pneumatic solenoid valves and other devices in the fluid power industry.

MSHA

The Mine Safety and Health Administration - a US Government agency that ensures and regulates safety for mines and mine workers. The MSHA approval is required for products used in underground mines, including electrical equipment, power cords, and instrumentation components.

The MSHA standards require special fire-resistant properties and characteristics that prevent the propagation of flames.

NRTL

Nationally Recognized Test Laboratory - An independent laboratory authorized by the US Government to perform product safety evaluations. Test laboratories must meet government laboratory standards, and are audited annually by OSHA to maintain this credential. UL standards are adopted by the US government and OSHA as being “Safety Standards”, and these accredited labs then use the UL standards to perform product evaluations.

The Canadian Standards Association, (CSA) is authorized as a NRTL to perform product evaluations and tests to the UL Standards. The certification mark “CSA NRTL/C” is then applied to products that satisfy all construction and performance criteria for both US and Canada. This certification mark is generally accepted by local building, safety, and quality agencies as meeting safety, construction, and performance criteria in both the US and Canada.
Whenever wire is used to transmit electrical data, it is possible for the wire to absorb external noise, possibly changing the characteristics of the electrical signal, or to give off noise that could cause changes in other electrical components that are near. Shielding is the act of placing conductive material between the potential noise emitters and receivers.

Electrical noise is usually classified as electro-magnetic interference (EMI) or radio frequency interference (RFI). TURCK offers a number of shielding options:

- Foil shield with drain, drain not connected
- Foil and braid shield with shield tied to coupling nut
- Foil shield with drain, drain connected to a pin
- Aluminum armored cable with armor tied to coupling nut
- Foil and braid shield with shield tied to coupling nut

For a shield to be effective, it must be tied to a ground at some point. It is usually preferred to not tie the shield to ground at more than one point to avoid ground loops. A shield not tied to a ground will reflect some noise and be better than no shield at all, but will be much more effective if tied to a ground.

High frequency noise, RFI, is handled well with a foil shield. The wavelength of RFI is usually small and can pass through the 'holes' in a braided shield. EMI is usually larger wavelengths and needs a braided shield to increase the mass of shielding material to be effective.

Aluminum armored cables provide the ultimate in noise immunity as they are basically flexible conduit.

Select the shielded cordset that best meets your needs. If it is easier to tie the shield to ground inside the panel, the foil/drain with the drain not connected inside the cordset is a good choice. If you can connect the drain via a pin inside the device being connected, the foil/drain with the drain connected to a pin is a good choice. Any environments with EMI noise from things like large motors or welding equipment will benefit from a braided shield tied to the coupling nut. TURCK shielded cordsets with the shield tied to the coupling nut offer complete shielding for the entire length of the cordset. A metal sleeve inside the molded body connects the braid/foil shield of the cable to the metal coupling nut with no loss of shielding potential.

TURCK armored cordsets are the ultimate in shielded connectors. A TURCK patented process allows the interlocked aluminum armor to be connected directly to the coupling nut offering the same protection as running conductors inside metal conduit.
# IP Protection Class

<table>
<thead>
<tr>
<th>IP Protection</th>
<th>Dust Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>0. Unprotected</td>
<td>00 10 20 30 40 50 60</td>
</tr>
<tr>
<td>1. Dripping water</td>
<td>11 21 31 41 51 61</td>
</tr>
<tr>
<td>2. Dripping water on 15° slant</td>
<td>12 22 32 42 52 62</td>
</tr>
<tr>
<td>3. Spraying water</td>
<td>23 33 43 53 63</td>
</tr>
<tr>
<td>4. Splashing water</td>
<td>34 44 54 64</td>
</tr>
<tr>
<td>4K Splashing water high pressure</td>
<td>34K 44K 54K 64K</td>
</tr>
<tr>
<td>5. Jet water</td>
<td>55 65</td>
</tr>
<tr>
<td>6. Intense jet water</td>
<td>56 66</td>
</tr>
<tr>
<td>6K Intense jet water high pressure</td>
<td>56K 66K</td>
</tr>
<tr>
<td>7. Temporary immersion</td>
<td>67</td>
</tr>
<tr>
<td>8. Continuous immersion as specified by manufacturer</td>
<td>68</td>
</tr>
<tr>
<td>9K Water at high pressure/Steam jet cleaning</td>
<td>69K</td>
</tr>
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</table>
# IP 67 Protection

<table>
<thead>
<tr>
<th>First ID Number</th>
<th>Protection from Penetration of...</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Unprotected</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>Solid Foreign Particles Ø50 mm</td>
<td>No full penetration of sphere with Ø50 mm</td>
</tr>
<tr>
<td>2</td>
<td>Solid Foreign Particles Ø12.5 mm</td>
<td>No full penetration of sphere with Ø12.5 mm</td>
</tr>
<tr>
<td>3</td>
<td>Solid Foreign Particles Ø2.5 mm</td>
<td>No penetration of rod with Ø2.5 mm</td>
</tr>
<tr>
<td>4</td>
<td>Solid Foreign Particles Ø1.0 mm</td>
<td>No penetration of wire with Ø1.0 mm</td>
</tr>
<tr>
<td>5</td>
<td>Dust</td>
<td>Dust may only penetrate in such quantity that function and safety are not impacted</td>
</tr>
<tr>
<td>6</td>
<td>Dust</td>
<td>No penetration of dust</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second ID Number</th>
<th>Protection from Penetration of...</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Unprotected</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>Dripping water</td>
<td>Vertically falling drips may not cause any damage.</td>
</tr>
<tr>
<td>2</td>
<td>Dripping water when the enclosure is in a slanted position of up to 15°</td>
<td>Vertically falling drips may not cause any damage.</td>
</tr>
<tr>
<td>3</td>
<td>Spraying water</td>
<td>Spraying water, which is sprayed in a perpendicular angle of up to 60° may not cause any damage.</td>
</tr>
<tr>
<td>4</td>
<td>Splashing water</td>
<td>Water splashing against the enclosure from every direction may not cause any damage.</td>
</tr>
<tr>
<td>4K</td>
<td>Splashing water with increased pressure</td>
<td>Water splashing against the enclosure from every direction and with increased pressure may not cause any damage.</td>
</tr>
<tr>
<td>5</td>
<td>Jet water</td>
<td>Water which is hosed against the enclosure from every direction may not cause damage.</td>
</tr>
<tr>
<td>6</td>
<td>Intense jet water</td>
<td>Water which is hosed against the enclosure with high intensity may not cause any damage.</td>
</tr>
<tr>
<td>6K</td>
<td>Intense jet water with increased pressure</td>
<td>Water which is hosed against the enclosure with high intensity and increased pressure may not cause any damage.</td>
</tr>
<tr>
<td>7</td>
<td>Temporary immersion in water</td>
<td>Water may not enter the enclosure in such quantity as to cause damage when the enclosure is held under water for a set period of time using predetermined pressure (1 m for 30 min).</td>
</tr>
<tr>
<td>8</td>
<td>Continuous immersion in water</td>
<td>Water may not enter the enclosure in such quantity as to cause damage when the enclosure is held under water for a set period of time using predetermined pressure (TURCK standard is 6’ of water, and other chemicals, for a period of 24 hours).</td>
</tr>
<tr>
<td>9K</td>
<td>Water at high-pressure/steam jet cleaning</td>
<td>Water which is directed against the enclosure from every direction with extremely high pressure may not cause any damage (14 to 16 l/min at 8,000 to 10,000 kPa).</td>
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</tbody>
</table>
### NEMA Standards

<table>
<thead>
<tr>
<th>Rating Type</th>
<th>NEMA 1</th>
<th>NEMA 2</th>
<th>NEMA 3</th>
<th>NEMA 4</th>
<th>NEMA 4X</th>
<th>NEMA 6</th>
<th>NEMA 6P</th>
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<tbody>
<tr>
<td>Protection against: Test Number</td>
<td>Indoor</td>
<td>Outdoor</td>
<td>Indoor/Outdoor</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Incidental Contact</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Falling Dirt</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Rust</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Circulating Dust, lint, fibers (nonhazardous)</td>
<td>✔.5.1.2(2)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Windblown Dust</td>
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<td>✔</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Falling Liquids/Light Splashing</td>
<td>✔.3.2.2</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Rain</td>
<td>✔.4.2.1</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<td>✔</td>
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<tr>
<td>Snow and Sleet</td>
<td>✔.6.2.2</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<td>✔</td>
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<tr>
<td>Water Down and Splashing</td>
<td>✔.6.7</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<td>✔</td>
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<tr>
<td>Occasional Prolonged Submersion</td>
<td>✔.11(2)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Oil and Coolant Drip</td>
<td>✔.3.2.2</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Corrosive Agents</td>
<td>✔.9</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>
6.2 Rod Entry Test - a ½" diameter rod may not enter the enclosure and a 1/8" rod cannot enter within 4" of live components

6.3 Drip Test - 20 drops per minute for 30 minutes with no water entering enclosure 6.3.2.2 Evaluation, no water shall enter enclosure

6.4 Rain Test - All exposed surfaces are sprayed with 5 psi of water for 60 minutes at a rate of 18" per hour rise in a straight sided pan. 6.4.2.1 Evaluation, No water shall have reached live parts, insulation, or mechanisms. 6.4.2.2 Evaluation, No water shall have entered enclosure

6.5.1.1 (2) Outdoor Dust Test (alternate method) - Stream of water at 45 gallons per minute from a 1" diameter nozzle, from all directions at a distance from 10’ to 12’. Test time is a minimum of 5 minutes. No water shall enter enclosure.

6.5.1.2 (2) Indoor Dust Test (alternate method) - Atomized water at 30 psi is sprayed from all directions from a distance of 12’ to 15’ at a rate of 3 gallons per hour. No water shall enter enclosure.

6.6 External Icing Test - The enclosure is sprayed with water between 0°C and 3°C in a room at 2°C. The spray is between 1 and 2 gallons per hour per square foot. Spray for 1 hour. The room temp is then dropped to between -7°C and -3°C with the spray still going. Ice needs to build up on a test bar at a rate of 1/4 inch per hour. Spray continues until 3/4 inch of ice is on the enclosure. Room temperature is maintained for at least 3 hours. 6.6.2.2 Evaluation, enclosure is undamaged after ice has melted.

6.7 Hose down Test - Stream of water at 65 gallons per minute from a 1" diameter nozzle from all angles at a distance of 10’ to 12’. Test time is 48 seconds times (height + width + depth of enclosure in feet) or a minimum of 5 seconds. No water shall enter enclosure.

6.8 Rust Resistance Test - only applicable to enclosures incorporating external ferrous parts

6.9 Corrosion Protection - Test per UL 508, 6.9 or 6.10.

6.11 (2) Air Pressure Test (alternate method) - Enclosure is submerged in water at a pressure equal to a depth of 6’ for 24 hours. No water shall enter enclosure.

6.12 Oil Exclusion Test - Stream of test liquid at 2 gallons per minute from a 3/8" nozzle for 30 minutes. Water with 0.1% wetting agent is directed from all angles from a distance of 12” to 18”. No test liquid shall enter the enclosure.
### Conversion Chart

**AWG to Metric**

<table>
<thead>
<tr>
<th>AWG</th>
<th>Diameter (mm)</th>
<th>Section (mm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>3.26</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>2.59</td>
<td>6</td>
</tr>
<tr>
<td>12</td>
<td>2.05</td>
<td>4</td>
</tr>
<tr>
<td>14</td>
<td>1.63</td>
<td>2.5</td>
</tr>
<tr>
<td>16</td>
<td>1.29</td>
<td>1.5</td>
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<tr>
<td>18</td>
<td>1.024</td>
<td>0.75</td>
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<tr>
<td>20</td>
<td>0.813</td>
<td>0.5</td>
</tr>
<tr>
<td>22</td>
<td>0.643</td>
<td>0.34</td>
</tr>
<tr>
<td>24</td>
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<td>0.23</td>
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<tr>
<td>26</td>
<td>0.405</td>
<td>0.14</td>
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<td>28</td>
<td>0.32</td>
<td>0.05</td>
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<tr>
<td>30</td>
<td>0.255</td>
<td>0.05</td>
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### Thread Conversion Chart

**PG to Metric Threads**

<table>
<thead>
<tr>
<th>PG</th>
<th>Diameter (mm)</th>
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<tbody>
<tr>
<td>7</td>
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</tr>
<tr>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td>11</td>
<td>20</td>
</tr>
<tr>
<td>16</td>
<td>25</td>
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</table>

### Cable Length Tolerance Chart

**All Lengths**

<table>
<thead>
<tr>
<th>Strip Length</th>
<th>Diameter (mm)</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7 mm</td>
<td>±0.5 mm</td>
<td></td>
</tr>
<tr>
<td>8-29 mm</td>
<td>±1.0 mm</td>
<td></td>
</tr>
<tr>
<td>30-49 mm</td>
<td>±2.0 mm</td>
<td></td>
</tr>
<tr>
<td>50-69 mm</td>
<td>±3.0 mm</td>
<td></td>
</tr>
<tr>
<td>70-100 mm</td>
<td>±4.0 mm</td>
<td></td>
</tr>
<tr>
<td>Over 100 mm</td>
<td>±5.0 mm</td>
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</tbody>
</table>
Installing Cable Products in Accordance with the National Electrical Code (NEC)

The NEC is a set of guidelines for installation of electrical devices, including cables, meant to reduce the risk of electrical shock, fire, etc. The NEC is simply a code and local laws may or may not require installation based on the NEC. Check local laws for applicability.

The NEC generally does not cover cables installed inside a machine. Any cables installed in an exposed manner, on the outside of a machine or from one machine to something else, must be an approved type and installed in accordance with the appropriate NEC articles.

UL (Underwriters Laboratory) and CSA (Canadian Standards Association) are the primary sources in North America for approving cables to specific standards. While a cable installed within a piece of machinery does not fall under the NEC, most people want to install an approved cable. TURCK cables have both UL and CSA approvals. Many of these approvals are the UL AWM (Appliance Wiring) approvals and are acceptable for use in a UL approved device. A UL Listed cable may be installed outside a machine per the NEC standards. UL Listed cables available from TURCK include NEC designations for hard duty cables (SOOW, SJOOW, STOOW, SEOW), armored cables (MC), and tray-rated cables (PLTC, ITC).

Hard duty cables designations are:
- S - Service Grade (600 V)
- SJ - Service Grade Junior (300 V)
- ST - Service Grade Thermoplastic (600 V)
- SE - Service Grade Thermoplastic Elastomer (600 V)
- O - Oil resistant jacket material
- OO - Oil resistant jacket and conductor insulation
- W - Weather proof

TURCK armored cables are available in 3 different configurations. Type MC cables, type MC cables with ITC/PLTC approvals and simply ITC/PLTC approved. Armored cables with ITC/PLTC approvals may be installed in an exposed run without being offered additional mechanical protection.

Tray-rated cables from TURCK include Instrument Tray Cable (ITC) and/or Power Limited Tray Cable (PLTC).

TURCK NEC type approved cables are dual listed with other UL type approvals. For example, the RKM 126-*M cordset has a 12 conductor 16 AWG cable with UL AWM 600V approval and ITC/PLTC approval.

Please refer to the NEC and local laws for specific installation requirements based on your environment.
**Cable Applications**

Proper management of cabling systems can mean the difference between a dependable and smooth operating installation and costly reoccurring down time. The suggestions outlined below illustrate some of the common sources of problems and provide simple and effective solutions.

**Proper Bend Radius for Fixed and Moving Applications**

Providing sufficient bend radius will allow the cable to absorb the energy of bending over a greater portion of its length, increasing its effective working life. Small increases in the radius of the bend can produce substantial increases in cable life.

- **Fixed Applications:**
  - Minimum bend radius: 5x cable diameter

- **Moving Applications:**
  - Minimum bend radius: 10x cable diameter

**Eliminating Stress Points in Cable Dress**

Installing cables to allow for adequate stress loops and freedom of motion increase the life of the cables. TURCK cordsets incorporate molded strain reliefs that will assist in preventing stress.

- **Tie Down Loops**
  - Correct
  - Incorrect

- **Strain Relief**
  - Correct
  - Incorrect
Cable Bundling Techniques

When bundling several cables together, always keep the bundle loose enough to move within itself. Tightly tied bundles create both compression and tension stresses when the bundle is moved.

Correct

Incorrect

Cabling for Motion Applications

Where cabling is subjected to linear, angular or rotational motion between two points, always allow adequate cable length to absorb the energy imparted by the motion. Use of coiled cords, mechanical support mechanisms, or large, well supported cable loops will maximize cable life.

Coil Cord

"C" Track

Cable Loop
TURCK
Network Media Products

Tying Cables with Cable Ties

When tying cable with self locking cable ties, always leave the ties loose enough for the cables to slide freely under the tie. Over tightening will create stress concentrations that can cause the conductors to fail prematurely. Never tighten the tie to the point where the cable jacket becomes deformed or pinched.

Correct

Incorrect

Note: Do not use tools to tighten coupling nut. Hand-tighten only!!
### Glossary of Terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Abrasion Resistance</strong></td>
<td>Ability of wire, cable or material to resist surface wear.</td>
</tr>
<tr>
<td><strong>AC Alternating Current</strong></td>
<td>Current in which the charge-flow periodically reverses and is represented by: ( I = I_0 \cos (2 \pi f + \phi) ) where ( I ) is the current, ( I_0 ) is the amplitude, ( f ) the frequency, ( \phi ) the phase angle.</td>
</tr>
<tr>
<td><strong>Active Hub</strong></td>
<td>A multiple port repeater or amplifier that lengthens the branching ability of a bus.</td>
</tr>
<tr>
<td><strong>Address</strong></td>
<td>A unique logical point on the bus.</td>
</tr>
<tr>
<td><strong>Ambient Temperature</strong></td>
<td>The temperature of a medium (gas or liquid) surrounding an object.</td>
</tr>
<tr>
<td><strong>Ampere (A)</strong></td>
<td>The unit of current. One ampere is the current flowing through one ohm of resistance at one volt potential.</td>
</tr>
<tr>
<td><strong>Amplifier</strong></td>
<td>A product that strengthens a signal in real time, precisely copying the old signal. Links two portions of the same bus together when the signal is weakened by electrical losses as it travels down a wire. An amplifier is used when the signal is weak but not distorted.</td>
</tr>
<tr>
<td><strong>ANSI</strong></td>
<td>Abbreviation for American National Standards Institute.</td>
</tr>
<tr>
<td><strong>armorfast®</strong></td>
<td>TURCK’s brand name for a cordset with metal clad cable (NEC type MC).</td>
</tr>
<tr>
<td><strong>Armored Cable</strong></td>
<td>A cable provided with a wrapping of metal for mechanical protection.</td>
</tr>
<tr>
<td><strong>AWG (American Wire Gauge)</strong></td>
<td>The standard system used for designating wire diameter. The lower the AWG number, the larger the diameter. Also called the Brown and Sharpe (B&amp;S) wire gauge.</td>
</tr>
<tr>
<td><strong>AWM (Appliance Wiring Material)</strong></td>
<td>A UL designation covering insulated wire and cable for internal wiring of appliances and equipment.</td>
</tr>
<tr>
<td><strong>BA - Bitwise Arbitration</strong></td>
<td>A form of collision detection on a network. All senders must also be receivers. Bus line must be a specific length or less so all nodes hear the bit at the same time.</td>
</tr>
<tr>
<td><strong>Barrier Box</strong></td>
<td>Limits current voltage to an area.</td>
</tr>
<tr>
<td><strong>Binder</strong></td>
<td>A spirally served tape or thread used for holding assembled cable components in place awaiting subsequent manufacturing operations.</td>
</tr>
<tr>
<td><strong>Bit</strong></td>
<td>One piece of data that means either ‘High-Low’ or ‘ON-OFF’.</td>
</tr>
<tr>
<td><strong>Bit Encoding</strong></td>
<td>A time reference placed on an electrical or light signal to distinguish high and low bits.</td>
</tr>
<tr>
<td><strong>Braid</strong></td>
<td>A fibrous or metallic group of filaments interwoven in cylindrical form to form a covering over one or more wires.</td>
</tr>
<tr>
<td><strong>Branch</strong></td>
<td>One type is a double-sided node that connects two segments together that are the same protocol but different transmission speeds. The other is a smart repeater that only repeats the data between two bus segments when the source and destination are in different protocols.</td>
</tr>
<tr>
<td><strong>Bus</strong></td>
<td>A simple straight-line topology.</td>
</tr>
<tr>
<td><strong>Bus Junction</strong></td>
<td>TURCK’s designation for a Connectorized passive hub.</td>
</tr>
<tr>
<td><strong>Bus Module</strong></td>
<td>TURCK’s designation for any field node, whether it uses terminal screws, connectors, or a combination of connecting means.</td>
</tr>
<tr>
<td><strong>Bus Occupant</strong></td>
<td>Any active or passive device on a network.</td>
</tr>
<tr>
<td><strong>Bus Station</strong></td>
<td>TURCK’s designation for a fully Connectorized field node, but not a master or gateway.</td>
</tr>
<tr>
<td><strong>Busline</strong></td>
<td>Any group of wires that carries data from node to node.</td>
</tr>
<tr>
<td><strong>Byte</strong></td>
<td>8 bits of information</td>
</tr>
<tr>
<td><strong>Cable</strong></td>
<td>A stranded conductor with or without insulation and other coverings (single-conductor cable), or a combination of conductors (multiple-conductor cable).</td>
</tr>
<tr>
<td><strong>Carrier</strong></td>
<td>The bit encoded signal carrying the data can ride on top of an AC or DC carrier. Advantages to using a carrier are that both power and data can be sent on just 2 wires and longer transmission capabilities without distortion.</td>
</tr>
<tr>
<td><strong>CD - Collision Detection</strong></td>
<td>A form of collision detection on a network. All senders must also be receivers. If two nodes start talking at the same time they will hear a collision. Both stop talking, wait a random amount of time, then look for a clear line to start talking again.</td>
</tr>
<tr>
<td><strong>Checksum</strong></td>
<td>A numerical representation of all the bits that is prepared by the sender and included in the message. The receiver performs the same calculation and compares the results. If they are not equal the data is considered bad and not used.</td>
</tr>
<tr>
<td><strong>Client/Server</strong></td>
<td>Upload/download information, set point changes, alarm management, remote diagnostics and one-to-one communications.</td>
</tr>
</tbody>
</table>
Glossary of Terms

Color Code
Wire or circuit identification by color, utilizing solid color, tracers, braids, surface printing, etc.

Contact Holder
Insulating device that holds the contacts in their proper position.

Conductivity
The ability of a material to allow electrons to flow, measured by the current per unit of voltage applied. It is the reciprocal of resistivity.

Conductor
A wire (or combination of wires not insulated from one another) suitable for carrying electric current.

Conduit
A tube or trough in which insulated wires and cables are run.

Connector
A device used to provide rapid connect / disconnect service for electrical cable and wire terminations.

Contact
The parts of a connector that actually carry the electrical current and that are touched together or separated to control the flow.

Cordset
Portable cord fitted with a wiring device at one or both ends.

Cord
A small, flexible insulated cable.

CPE (Chlorinated Polyethylene)
A flexible material with high tear strength and good resistance to most inorganic chemicals. It is inherently difficult to ignite. A Thermoset plastic.

Creepage
The conduction of electricity across the surface of a dielectric.

Crimp Termination
A connection in which a metal sleeve is secured to a conductor by mechanically crimping the sleeve with pliers, presses or automated crimping machines.

Current (I)
The rate of transfer of electricity. Practical unit is the ampere, which represents the transfer of one coulomb per second. In a simple circuit, current (I) produced by a cell or electromotive force (E) when there is an external resistance (R) and internal resistance (r) is: I = E / R + r

Current Carrying Capacity
The maximum current an insulated conductor can safely carry without exceeding its insulation and jacket temperature limitations.

Cut-Through Resistance
The ability of a material to withstand mechanical pressure, usually a sharp edge or small bending radius, without separation.

Dielectric Strength
The voltage that an insulator can withstand before breakdown occurs. Usually expressed as a voltage gradient (such as volts per mil).

Direct Current (DC)
An electric current that flows in only one direction.

Drain Wire
In a cable, the bare wire laid over the component or components and used as a ground connection.

Dropline
A reduced branch (spur) from a trunk line.

Earth
British terminology for zero-reference ground.

EDS - Electronic Data Sheet
Electronically readable ASCII text files that contain both general and device-specific parameters for communication and network configuration (DeviceNet™).

EIA RS-485
A standard that defines the number of signal generators (the components that create the signal), the receiver and a combination of the called a transceiver. It also defines the electrical signal.

End of Message
Let other occupants of the bus know the transmission is over and other messages can be sent.

EPDM
Ethylene-propylene-diene monomer rubber. A material with good electrical insulating properties. A Thermoset plastic.

eurofast®
M12x1 threads, single key, 2 - 6, 8, 10, 12 pin

Explicit Message
A command from another node.

Extruded Cable
Cable with conductors that are uniformly insulated and formed by applying a homogeneous insulation material in a continuous extrusion process.

Fillers
Non-conducting components cabled with the insulated conductors or optical fibers to impart roundness, flexibility, tensile strength, or a combination of all three, to the cable.

firefast®
High temperature protective sleeving.

FKS - Frequency Shift Key
A common bit encoding method for modulated signals.

flexlife-10®
Unique cable designed for robotic and other continuous motion applications.

Gateway
A node on two different buses that serves as a signal and data translator between the buses.

Ground
An electrical connection to the earth, generally through a ground rod. Also a common return to a point of zero potential, such as the metal chassis of equipment.

Ground Loop
A completed circuit between shielded pairs of a multiple pair created by random contact between shields. An undesirable circuit condition in which interference is created by ground currents when grounds are connected at more than one point.
Glossary of Terms

Ground Potential
The potential of the earth. A circuit, terminal or chassis is said to be at ground potential when it is used as a reference point for other potentials in the system.

GSD - General Station Description
Electronically readable ASCII text files that contain both general and device-specific parameters for communication and network configuration (PROFIBUS).

Hygroscopic
Capable of absorbing moisture from the air.

IEC
European Standardization agency; International Electrotechnical Commission.

Input
A signal (or power) which is applied to a piece of electrical apparatus or the terminals on the apparatus to which a signal or power is applied.

Insulation
A material having good dielectric properties that is used to separate close electrical components, such as cable conductors and circuit components.

ITC
Instrument Tray Cable. NEC classification for cable resistant to the spread of fire and suitable for use in cable trays. 150 V rating.

Irradiation
In insulation, the exposure of the material to high-energy emissions for the purpose of favorably altering the molecular structure.

Jacket
Pertaining to wire and cable, the outer protective covering, may also provide additional insulation.

LAS - Link Active Scheduler
Controls communication on the bus. Creates a token circulation list that defines access on the bus. Multiple devices may have LAS but only one can communicate at a time.

LED
Light Emitting Diode used to indicate device status.

Limited Peer-to-Peer
An exclusive one-to-one relationship between the input node and the output node. Also called exclusive peer-to-peer.

Line Voltage
The value of the potential existing on a supply or power line.

Load
A device that consumes power from a source and uses that power to perform a function.

Manchester
A common bit encoding for digital signals.

Media Access
The “right-of-way” for talking on the bus.

Message Collision Avoidance
A process for eliminating communication collisions on a network. The two major ways to handle a potential collision are CD (Collision Detection) and BA (Bitwise Arbitration).

Messaging
Ways to communicate on the network. The three major types in the run mode are Solicited, Unsolicited and Explicit.

MC
Metal Clad Cable. NEC classification for cable resistant to crush and impact based on an outer covering of metal.

microfast ®
1/2-20UNF threads, dual key, 2 - 6 pin

minifast ®
7/8-16UN threads, 2 - 6 pin

minifast B size
1-16UN threads, 6 - 8 pin

minifast C size
1 1/8-16UN threads, 9, 10, 12-pin

Moisture Resistance
The ability of a material to resist absorbing moisture from the air or from water when immersed.

Molded Plug
A connector molded onto either end of a cord or cable.

MOV
Acronym for Metal Oxide Varistor. A solid state device used to suppress voltage surges/spikes.

MSHA
Mine Safety and Health Administration.

multibox ®
Junction boxes, 4, 6, 8 and 16 port

multifast ®
M23 threads, 12, 16 and 19-pin or M27 threads, 26 and 28-pin

Mylar
DuPont trademark for polyester film.

National Electrical Code (NEC)
A set of regulations governing construction and installation of electrical wiring and apparatus in the United States, established by the American National Board of Fire Underwriters.

NEMA
National Electrical Manufacturers Association.

Neoprene
A synthetic rubber with good resistance to oil, chemical, and flame. Also called polychloroprene. A Thermoset plastic.

Node
An addressable device on the bus.

Noise
In a cable or circuit, any extraneous signal that tends to interfere with the signal normally present in or passing through the system.

NPN Output
Transistor output that switches the common or negative voltage to the load (current sinking). Load connected between output and positive supply.

NRZ - Non Return to Zero
An encoding method on differential signals such as RS-485 and CANbus.
# Glossary of Terms

**Ohm** (Ω)
The electrical unit of resistance. The value of resistance through which a potential difference of one volt will maintain a current of one ampere.

**Ohm’s Law**
\[ E = I \times R \]
Voltage (E) is directly proportional to the product of current (I) and resistance (R) of circuit.

**Output**
The useful power or signal delivered by a circuit or device.

**PA (Polyamide, Nylon)**
An abrasion-resistant thermoplastic with good chemical resistance, also known as polyamide.

**Passive Hub**
A multi-port tee.

**pentafast**
M5 threads, 3 and 4-pin

**picofast**
Snap lock or M8 threads, 3, 4 and 6-pin

**Plastic**
High-polymeric substances, including both natural and synthetic products, but excluding the rubbers, that are capable of flowing under heat and pressure.

**Plug**
A connector associated with being attached to a cable.

**PLTC**
Power Limited Tray Cable. NEC classification for cable resistant to the spread of fire and suitable for use in cable trays. 300 V rating.

**PNP Output**
Transistor output that switches the positive voltage to the load (current sourcing). Load connected between output and common.

**POM (Polyoxymethylene, Acetal, Delrin)**
Polyoxymethylene - a crystalline thermoplastic polymer with a high melting point. It is suitable for mechanical parts or electrical insulators that require structural strength at above normal temperatures.

**Potting**
The sealing of a cable termination or other component with a liquid that thermosets into an elastomer.

**Power Conditioner**
Device used to condition the power to be used for a bus segment. Allows power and data to exist on the same wires.

**powerfast**
1 3/8-16 threads, 2, 3 and 4 pin or M23 threads, 6, 7 and 9-pins.

**Power Tap**
A tee which provides power to the network.

**Protocol**
A small program that is embedded in sending and listening devices to organize the meaning of bits. DeviceNet, AS-interface, PROFIBUS, Ethernet, etc. are all examples of different protocols.

**Publisher / Subscriber**
Scheduled distribution of data to nodes on the subscriber list.

**PUR (Polyurethane)**
Broad class of polymers noted for good abrasion and solvent resistance.

**PVC (Polvinyl Chloride)**
A general-purpose thermoplastic widely used for wire and cable insulation and jackets.

**Repeater**
Strengthens the bus signal by producing a fresh signal without distortions. It also links two portions of the same bus together. A repeater is used when the signal is weak or distorted.

**Resistance**
A measure of the difficulty in moving electrical current through a medium when voltage is applied. It is measured in ohms.

**Retractile Cord**
A cord having a specially treated jacket or insulation so that it will retract like a spring. Retractility may be added to all or part of a cord’s length.

**Ring**
A network topology where every node is also a repeater. Information comes into a node, information that pertains to that node is read, new information is added and the message is sent on to the next node.

**Router**
A higher level bridge for connection of wide area networks.

**Rubber**
A general term used to describe wire insulation made of thermosetting elastomers, such as natural or synthetic rubbers, neoprene, Hypalon, CPE butyl rubber and others.

**Scanner Module**
Allen-Bradley’s designation for the gateway that plugs into their PLC and interfaces the PLC’s bus to the network.

**Serial Data Communication**
“ON-OFF” or “HIGH-LOW” electrical signals.

**Serial Data Transfer**
Information transmitted one piece at a time in a specific order.

**Serve**
A filament or group of filaments such as fibers or wires, wound around a central core.

**Shield**
In cables, a metallic layer placed around a conductor or group of conductors to prevent electrostatic or electromagnetic interference between the enclosed wires and external fields.

**Signal**
Any visible or audible indication that can convey information. Also, the information conveyed through a communication system.

**Simple Device**
Anything that does not have LAS capabilities.

**SJOOW**
Junior hard service, rubber insulated, portable cord with oil resistant rubber outer jacket. Stranded copper conductors with separator and individual oil and water resistant rubber insulation. Two or more color coded conductors cables with filler, wrapped with separator and rubber jacketed overall.
**Solicited Message**
A response to another node or a response when it is the node's predetermined time to speak.

**Solid Conductor**
A conductor consisting of a single wire.

**Solid State**
Pertains to circuits and components using semiconductors without moving parts. Example: transistors, diodes, SCR, etc.

**SOOW**
Heavy duty, rubber-insulated portable cord with oil resistant rubber outer jacket. Stranded copper conductors with separator and individual oil and rubber insulation. Two or more color-coded conductors cabled with filler, wrapped with separator and rubber jacketed overall. 300 V.

**Spanner**
TURCK’s designation for a double-sided slave node. Unit has bi-directional data from one control area segment to another in a free form format.

**Star**
Bus lines radiate from a single point.

**Start of Message**
A certain number of high bits that start a message. These consecutive bits allow the listener time to prepare to receive the data.

**STOW**
Heavy duty, PVC insulated, portable cord with oil resistant PVC outer jacket. Stranded copper conductors, PVC insulation. Two or more color-coded conductors cabled with filler, wrapped with separator and PVC jacketed overall. Approved for outdoor use. 600 V.

**Stranded Conductor**
A conductor composed of groups of wires twisted together.

**System Tee**
A field wireable tee.

**Tee**
Creates a branch or drop from a bus.

**Temperature Rating**
The maximum temperature at which a material may be used in continuous operation without loss of its basic properties.

**Terminating Resistor**
A resistor that is put at the beginning and end of the main bus line to stabilize and minimize reflections.

**Thermoplastic**
A material that will soften, flow or distort appreciably when subjected to heat and pressure.

**Thermoset**
A material that hardens or sets when heat is applied, and which, once set, cannot be re-softened by heating. The application of heat is called “curing”.

**Topology**
A bus term that describes how the data lines connect the nodes together.

**TPE**
Thermo Plastic Elastomer. Broad class of polymers noted for flexibility and weld slag resistance.

**TPR**
Thermo Plastic Rubber. Another name for TPE.

**Twisted Pairs**
A cable composed of two small, insulated conductors twisted together without a common covering.

**Unsolicited Message**
A response to a change-of-state at the node.

**Unlimited Peer-to-Peer**
Output node gets information from several input nodes.

**Versafast™**
MTb threads, 5, 6, 7, 8, 12, 14 and 19-pin

**V*fast®**
DIN 43650, type A, B, I and C.

**VDE**
German approval agency.

**Volt (V)**
A unit of electrical pressure. One volt is the electrical pressure that will cause one amper of current to flow through one ohm of resistance.

**Voltage**
The term most often used in place of electromotive force, potential difference, or voltage drop. Designates the electric pressure existing between two points that is capable of producing a current when a closed circuit is connected between these points.

**Voltage Rating**
The highest voltage that may be continuously applied to a wire in conformance with standards or specifications.

**VW-1**
A flammability rating established by Underwriters Laboratories for wires and cables that pass a specially designed vertical flame test, formerly designated FR-1.

**Wicking**
The longitudinal flow of a liquid in a wire or cable due to capillary action.

**Word**
2 bytes.
TURCK Network Media Products

Innovative Sensor and Connector Solutions

TURCK is the market leader for providing innovative sensor and connectivity solutions for industrial automation. Combining TURCK’s high quality, high performance sensors with our ability to quickly mold multiple styles of cordsets, gives our customers an infinite selection of uniquely connectorized sensing solutions.

All TURCK sensors with potted-in cable are available with customized cable length and connector options. The broadest selection of connector options provides custom sensing solutions for the most diverse industrial applications. Because it is TURCK, you can expect the same fast, flexible support. Even with custom configurations, YOUR sensor can often be made within several days. Best of all, minimum quantity for YOUR sensor: ONE!

Part numbers are developed through your TURCK representative or application support. In general, the formula below illustrates how to configure a custom, connectorized TURCK sensor.

\[ \text{New Part Number} = \text{Bi} \ 4\text{-M12-AN6X-0.5-RS} \ 4T \]

Sensors with Connector Examples:

- **Bi 4-M12-AN6X - 0.5 Meters - RS 4T**
- **Bi 5-MT18-AN6X - 0.2M - RS 4T**
- **Bi 2-EG08K-AP6X - 0.5M - RS 4T**

Innovative Sensor and Connector Solutions

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
Innovative Sensor and Connector Solutions

Sensors with Connector Examples:

- **B1 2-08SE-AN6X** - 0.2M - eurofast® Male Connector
- **B10U-EN30-AP6X** - 0.2M - RS 4T Male Connector
- **B1 2-08SE-AN6X** - 0.3M - PSG 3 Male Connector
- **B1 8-M18-AN6X** - 0.1M - RSM 40 Male Connector
- **B1 5-6T18-AD30X2** - 0.2M - microfast® Male Connector
- **Bi 2-010S-AN6X** - 0.4M - PSG 3 Male Connector
- **Bi 8-M18-AN6X** - 0.3M - PSG 3 Male Connector
- **Bi 2-010S-AN6X** - 0.4M - PSG 3 Male Connector
TURCK Network Media Products

**Proximity Sensors**

- **weldguard®**
  - Resists high heat, weld slag build-up and abrasion
  - Up to 500 times more durable than other sensors
  - Embeddable or non-embeddable
  - Available in weld-field immune Uprox® and standard ferrite core versions
  - Armorguard® protection for sensors in impact-prone locations

- **Uprox®**
  - Detect all metal types at the same sensing range
  - Inherently weld-field immune
  - Up to 350% more range than conventional sensors
  - Wide -30°C (-22°F) to +85°C (+185°F) temperature range

- **Uprox®**
  - Tiny 3, 4, 5, 6.5 and 8 mm diameter stainless steel housings
  - Extended sensing range up to 4 mm

**Capacitive Sensors**

- Non-contact sensing of metallic and non-metallic materials
- Ideal for level detection
- Available in DC, AC and IS models
- Solid-state output, high switching frequency, no moving parts

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**Inductive Sensors**

- **amphibian™** washdown versions
- High and low temperature
- Harsh duty (IP 67, 68, 69K)
- Die protection
- Ring and slot versions

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  - Detect all metal types at the same sensing range
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- **plcoprox®**
  - Detect all metal types at the same sensing range
  - Inherently weld-field immune
  - Up to 350% more range than conventional sensors
  - Wide -30°C (-22°F) to +85°C (+185°F) temperature range

**Intrinsically Safe Systems**

- **excom®** Remote I/O for Hazardous Areas
  - Eliminate need for conventional IS barriers
  - Modular backplane bus with integrated voltage supply for

- **multimodul®** IS Barriers
  - Complete line features isolated design with no need for dedicated ground
  - Hazardous circuits are galvanically isolated from non-hazardous circuits
  - DIN-rail or Eurocard styles

- **Q-pak®**
  - Compact size fits in confined areas where other sensors can’t
  - Superior 3 mm (0.01”) to 50 mm (0.20”) range
  - Models from 5 mm to 80 mm size with embeddable versions.

- **ZENER Barriers**
  - FM, CSA, BASEEFA/CENELEC certified
  - Shunt-diode intrinsic safety barriers feature narrow 7 mm width
  - Meet worldwide standards for use in classified atmospheres
Industrial Automation

Measurement, Monitoring and Position Sensing

Kübler by TURCK Encoders
- Incremental and absolute, shaft and hollow-shaft models
- Single and multi-turn absolute models in shaft and hollow-shaft styles
- Temperature and aging compensation

Linear Analog Sensors
- Voltage and or current output proportional to target distance from sensor
- Available in limit switch, barrel or O-pak® rectangular styles
- Remote amplifiers available with adjustable switching points

Rotational Controls
- Speed meters & monitors (overspeed/underspeed detector)
- Analog output and direction discriminators
- DIN 19 234 and intrinsically safe NAMUR sensor input

Valve Position Sensors
- Dual inductive solid state sensors
- Monitor valve position on rotary actuators

Relays
- Unique design provides higher reliability and longer relay life
- Integral mounting bracket and pin numbering on the socket for faster wiring

Pressure Sensors
- Bar or PSI measuring units and peak pressure memory function
- 13 pressure ranges from Vacuum to 600 bar
- Standard hysteresis mode for over/under pressure

EZ-Track™
Linear Displacement Transducers
- Magnetorestrictive non-contact sensing
- Absolute position sensing
- +/-0.01% accuracy and repeatability of up to +/-0.001% of full stroke

Cylinder Position Sensors
- permaprox®
- provides a precise sensing point anywhere along the stroke
- Ultra-miniature 5 mm BIM-INT fits into grooves of new-style cylinders
- Intrinsically safe models

Flow Monitors
- Insertion and in-line styles, self-contained or remote amplifier
- Omnidirectional stainless steel, plastic or Teflon® housings

Ultrasonic Sensors
- Epoxy-potted units with adjustable sensing ranges
- Accurate over long sensing ranges for all types of objects
TURCK
Network Media Products

Radio Frequency Identification Systems (RFID)
- Track products and manage information
- Not reliant upon line-of-sight
- Read only, read/write, high speed, infrared TAGs, transceivers, control boards and interfaces

Network Devices and Interfaces
- Intelligent bus stations with built-in bus electronics interface with existing devices and provide diagnostics, short-circuit protection and automatic baud rate detection

Connectivity Solutions

3 to 5-pin Standard Cordsets
- Industry standard cordsets and connectors
- eurofast®, picofast®, minifast®, microfast®, multifast®, pentafast®, and V®fast®

Custom Solutions
- Jacket options for any environment
- Diameters from 4.4 mm to 13.2 mm
- From 16 to 26 AWG, 2 to 19 conductors, braided or foil shields

OEM Connectors
- Components for buses, networks, panels, circuit boards, enclosures and machines in eurofast®, picofast®, minifast®, microfast®, multifast®, pentafast®, and V®fast® style connectors
- Front mount, rear mount, feed-through with solder cups, leads, or PCB pins in straight or right angle styles

Rugged Junction Boxes
- multiflex® junction boxes and splitters enable wiring consolidation from sensors and other devices
- Die-cast aluminum or industrial hardened plastic housings
- Choice of cable or a quick-disconnect multifast® homerun cable

flexlife-10® Continuously Flexible Cable
- Performance to 10 million continuous flexing cycles
- Ideal for power and signals to factory automation equipment
- Available with molded cordsets using industry standard connections
- UL recognized and CSA approved, with operating temperatures up to 105 °C (221 °F) and cold flexibility to -40 °C (40 °F)

multifast® 5-28 Conductor Solutions
- Solid metal connector shell and fully molded connectors
- Receptacles in standard or long thread lengths
- NAMUR cordsets and extensions in blue PVC and PLTC rated

reefast® Bulk Cable
- Spooled cable in 30 m, 100 m or 200 m lengths in self feeding packages
- 170+ different PUR, PVC and rubber cables to choose from PLTC, high-flex and more
- 2-day drop-ship delivery available

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- 2-day drop-ship delivery available
TURCK has an extensive line of industrial wiring solutions that are optimized for process applications. The receptacles, drop cords, junction boxes, home-run cables and accessories comprise a process wiring system designed for the demanding conditions of process applications.

- Quick-disconnect design eliminates mis-wiring and speeds installation.
- Instrument receptacles, drop cords, junction boxes and home-run cables reduce multiple cable runs.
- Shielded-twisted pair construction serves analog and HART applications.
- Cables with premium PVC insulation provide superior chemical resistance and flexibility.
- Choice of stainless steel or nickel-plated brass hardware.
- Rated and approved for installation in process applications.
- Many products are FM approved for installations in hazardous locations.
- Cables are UL recognized and CSA certified.
TURCK Network Media Products

Code Requirements for Flexible Process Wiring Products: Ordinary (Nonhazardous) Locations

Figure 1

Type ITC cable, or Instrumentation Tray Cable, provides a cost effective alternative for installing low power instrument and control circuits. NEC Article 727 permits the use of ITC-rated cables “in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation.” It may also be used in “instrumentation and control circuits operating at 150 volts or less and 5 amps or less.” Permitted uses include installation in cable trays or raceways (Figure 1), or as open wiring in specified circumstances.

One of the permitted uses as open wiring is illustrated in Figure 2. NEC Article 727.4(5) allows ITC cable to be used “as open wiring without metallic sheath or armor between cable tray and equipment in lengths not to exceed 15 m (50 ft), where the cable is supported and protected against physical damage using mechanical protection, such as struts, angles, or channels.”

This concept enables convenient wiring methods, given that drops from a cable tray may be made without additional auxiliary trays or raceways. Additionally, ITC cable uses 300 volt insulation, resulting in smaller diameter, more flexible cable, with no requirement for special (e.g. Class 2) power supplies. When the ITC cable concept is combined with the TURCK process wiring system, the result is an extremely flexible and cost-effective system for process wiring.

The basic building blocks of the system are device receptacles, junction boxes, and molded cordsets.

Figure 2

Receptacles with 1/2-14NPT and 3/4-14NPT threads, as well as M20x1.5, easily extend the benefits of quick-disconnect wiring to most process instruments.
Junction boxes significantly consolidate field wiring. They are available with 4, 7 or 8-ports, with home-run quick-disconnect or integral home-run cable, in metal, nylon or molded polyurethane housing.

The TURCK process wiring system provides an integrated, code-compliant wiring method that adds the benefits of quick-disconnects to the ITC cable installation concepts.

Molded quick-disconnect cordsets, using ITC cables, provide the ratings and performance characteristics required for process applications.

Another permitted use of ITC cable that increases flexibility is illustrated in Figure 3. NEC Article 727.4 (4) allows ITC cable to be used “as open wiring where enclosed in a smooth metallic sheath, continuous corrugated metallic sheath, or interlocking tape armor applied over the nonmetallic sheath in accordance with 727.6. The cable shall be supported and secured at intervals not exceeding 1.8 m (6 ft.).”

When using armored cable, there is no requirement for further mechanical protection or a length limitation.
Hazardous Locations

Even more value can be derived from the TURCK process wiring system in hazardous locations. The system is now FM approved for use in Class I, Divisions 1 and 2 when installed per TURCK drawing QCF-00147. Contact TURCK for a copy of the approval or visit www.TURCK.com/fmc. The following are the highlights of the approval.

Intrinsically Safe Circuits

Class I, Division 1
Hazardous Location

Nonhazardous Location

Intrinsically Safe Apparatus

Intrinsically Safe Barrier

Nonincendive Equipment

Class I, Division 2
Hazardous Location

Nonhazardous Location

Nonincendive Equipment

ITC cable is a recognized Division 2 wiring method. NEC in Article 501.4 (B)(1)(5) states “Type ITC cable in cable trays, in raceways, supported by messenger wire, afforded mechanical protection and run as open wiring, or directly buried where the cable is listed for this use.” This is further reinforced by Article 727.4 (3), which states that ITC cable is permitted “in hazardous locations as permitted in 501.4,...”.

The requirements for mechanical protection and length limitations are equivalent to nonhazardous locations.

Connectors that do not require a tool to disengage are considered to be “normally arcing” and are not allowed to be used in Division 2 for incendive circuits without additional protection.

lokfast guards enable the use of quick-disconnect technology in Class I, Division 2 hazardous locations. lokfast guards render a QD connection not “normally arcing” by:
- Making disconnection impossible by eliminating access to coupling nut.
- Warning the user to disconnect power before removing.
- Requiring the use of a tool for removal.

lokfast guards are available for 7/8-16UN minifast® and M12 eurofast® molded and field-wireable connectors.

Optional multifast home-run connectors with set screw locks similarly render a connection not “normally arcing”.

Intrinsically Safe Circuits may be wired using any of the wiring methods suitable for unclassified locations. The use of connectors is allowed as intrinsically safe circuits are safe against faults, including opening, shorting or grounding. The requirements for mechanical protection and length limitations are equivalent nonhazardous to locations.
Intrinsic Safety Summary

Intrinsically safe circuits do not require guards on quick disconnects.

Junction boxes have FM-approved spacings and Entity Parameters for Intrinsically safe circuits.

Boundary seals are not required as the molded construction of the home-run connector and the gas/vapor tight continuous sheath of the cable meet the requirements of NEC Article 501-5(C) for cable seals in Class I, Divisions 1 and 2.

Requirements for mechanical protection and length limitations are equivalent to nonhazardous locations.