

FAQs

Rugged Connectors and Cable Assemblies

Where are rugged connectors and cable assemblies used?

Almost everywhere you look outdoors, you're likely to see cables leading up to the points to which they deliver power or data. To make the transfer reliably, each of these cable assemblies needs to be rugged and terminate in a rugged connector.

Outdoor applications that need rugged connectors and cable assemblies are found in myriad industries, including military and aerospace, power generation, marine products and services, telecom, infrastructure, and construction.

What conditions are rugged assemblies designed to withstand?

Rugged connectors and cable assemblies are designed to work in outdoor applications. As such, they must be able to handle the temperature swings found in these extreme environments. Look for connectors that can handle winter cold down to -40°C and extreme heat up to 125°C .

Connectors and cable jacketing should also be rated F1, meaning they are found suitable for exposure to ultraviolet light by Underwriters' Laboratories (UL) using the ISO 4892-3 standard. In marine or inshore applications, also consider assemblies that pass the EIA 364-26B test for saltwater exposure.

If lightning strikes are a concern, look for shielded cables that meet IEC 62305-1, meaning they can withstand strikes of up to 20kA using a 10/350 msec waveform. Lightning is only one of many potential causes of fire in outdoor applications, so look for rugged connectors with good flammability ratings, like UL94-V0.

Are the assemblies sealed against dirt and water ingress?

Debris and dust blown by the wind or kicked up by industrial processes and rain, floods, and washdown are all concerns addressed by rugged connectors and cable assemblies. Look for assemblies with ingress protection (IP) ratings compatible with the application environment.

In IP ratings, the first digit indicates the ability to exclude solids, and the second relates to liquid exclusion. Most rugged assemblies have a rating of IP6X, meaning that they completely exclude all dust. Rugged connectors can be protected from water ingress from sprays of water (IP65), immersion at depths less than 1 m (IP67), or immersions of greater than 1 m in depth (IP68).

How do the rugged connectors install?

Because rugged connectors must often be installed in rough conditions, they must be designed to be easy to install. Some rugged connectors are designed for installation that requires no specialized tools or training.

Many outdoor applications also feature awkward angles and limited access, so look for connectors designed for blind installation or one-handed installation. Bayonet-style connectors often make mating easier, and—for connectors that twist to lock—look for lock angles of 30 deg. or less.

Also consider how technicians know whether the connector is properly seated. Some connectors supply three-sense feedback so technicians can feel, hear, and see that the connector is properly installed.

What options do I have when specifying a rugged connector?

Rugged connectors and cable assemblies are available for a variety of applications, including the fiber optic connectivity common in

high-capacity data and telecom applications. Multi-position optical (MPO) push-on connectors comply with IEC 61754-7 and connect



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12 to 16 fibers into a single cable. These are also known as ribbon connectors.

Other common snap-on connectors for fiber optic cabling are SC simplex and the smaller-profile LC duplex connectors. LC connectors, such as those on TE Connectivity's FullAXS units, work well with fiber-to-the-antenna (FTTA) applications.

In expanded beam connectors, lenses expand and collimate the optical signal to allow it to cross an air gap to another lens that refocuses it into the mating fiber. The gap gives the assembly resilience against vibrations, dirt, temperature fluctuations, and wear from multiple mating cycles.

In contrast, tactical military applications often require physical contact interfaces. Tactical assemblies often use hermaphroditic interfaces to prevent mating issues in the field. For such applications, look for connectors that are qualified to MIL-PRF-28876.

A further option that is attractive in many rugged applications is miniaturization. More compact connectors can improve system modularity and offer greater flexibility in the placement of the connector. One example is TE's MiniFullAXS line, which installs into a bulkhead 20% smaller than that needed for the full-size connector.

What are my options for the cable assembly?

Cable assemblies may have more than one termination to consider. For instance, it may connect multiple fibers via a MPO connector to a cable assembly that terminates in a tactical connector. The assembly may also carry optical fiber, conductive copper wire, or a combination of conductors.

The specifying engineer will also want to dictate the length of the cable assembly and how it is labeled, including any text required by specification or contract.

How can I be sure I'm choosing the right connector and cable assembly?

Look for data sheets, catalogs, and other electronic resources to help you select the connector and cable assembly options that are best for your application. You can also turn to suppliers and authorized distributors for help. For instance, TE Connectivity and Heilind both have engineers available to advise on connector and cabling options.

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