

Single Pair Ethernet CONNECTOR CLARITY

Single Pair Ethernet (SPE) was developed by IEEE as a foundational transmission technology.

It is built to address multiple markets, such as transportation, process control, industrial machines, industrial and building automation control panels, and smart buildings. Single Pair Ethernet standards support various connector styles depending on the needs of the application. While this support provides a lot of design freedom, it can also be confusing and could reduce the rate of adoption as device manufacturers and users sift through their choices. As has been the case with two- and four-pair Ethernet systems, connector styles are chosen considering the challenges of their focused application. There are many different environments in these markets, but IP20 dominates the volume, as it makes up 84% of industrial Ethernet connections, according to a 2018 IHS Markit report. IP20 signifies the Ingress Protection rating, offering protection from solid objects greater than 12mm, where no liquid protection is required. The IEC 63171-1 (Type 1) connector is the best option for IP20 applications, offering device and design flexibility that provides multiple benefits to device vendors and end users. The following table shows some of the applications you may be seeing, along with the traditional BASE-T connectors, and the recommended SPE connectors:

| | Building Automation (IP20) | Industrial & Building Control Panel (IP20) | Industrial Machine Connections (IP65+) | Process Automation (IP67+) | Automotive, Rail & Aerospace |
|-------------------------|---|--|---|--|------------------------------|
| VERTICAL 2- & 4-PAIR | RJ45 Unshielded  | RJ45 Shielded  | M12 X-Code, D-Code  | M12 D-Code  | |
| SINGLE PAIR | IEC 63171-1 Type 1 Unshielded & Shielded  | IEC 63171-1 Type 1 Shielded  | IEC 63171-6 M8 A-Code  | M8 A-Code Field Wiring  | Various custom connectors |

The Type 1 Connector Is Purpose Built for Building and Campus Devices

The building and campus are dynamic environments that require a dynamic style of connector. The IEC 63171-1 (Type 1) connector provides the density needed for limited space applications. A simple interface that can be easily field terminated is critical for deployments because preterminated cables are not always practical.

The Type 1 Connector Is Optimized for Control Panel Connections

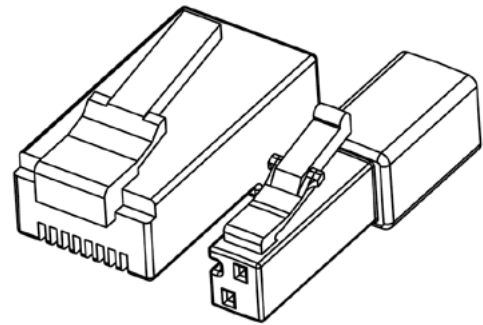
Within building and industrial environments, active Ethernet equipment is protected within control panel enclosures. For these devices that operate factories and buildings, downtime is not an option. The IEC 63171-1 (Type 1) connector supports a fully shielded channel to protect from EMI common to both HVAC and industrial panels.

Benefits of IEC 63171-1 Type 1 Connector:

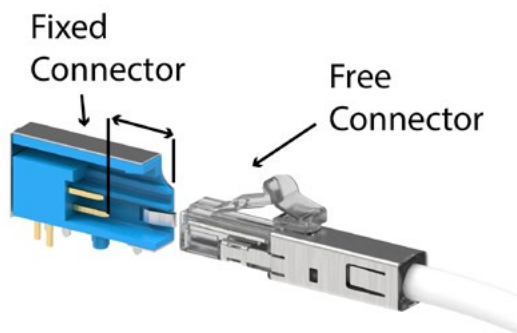
The LC type connector provides flexibility, installation, and economic advantages.

Type 1 Device and Design Flexibility

- **FTP & UTP**—Supports shielded and unshielded cabling applications to enable the greatest flexibility for structured cabling deployment.
- **Transmission Performance**—Supports up to 600 MHz to easily accommodate future standards supporting higher bandwidth IoT and M2M applications.
- **Power Delivery**—Fully compatible with Single Pair Power over Data Lines (PoDL) delivery, including the maximum power class (15) offering 52W. Goodbye, IoT batteries!
- **Size**—Connector area is 70% smaller than the common Ethernet RJ45 interface, to connect to small sensors and control devices.
- **Structured Cabling**—Accommodates up to 96 connectors per RU, improving reliability and future system flexibility.
- **Proven Connector**—Proven design based on the dominant optical fiber LC connector design provides tactile feedback to indicate when connection is fully engaged, helping to ensure the connectors remain in place after installation.



IEC 63171-1 (Type 1) connector
70% smaller than RJ45



Benefits to Device Vendors

- **Robust Contact Interface**—Embedded Type 1 fixed connectors consist of straight rigid contact blades that are deep seated within the fixed connector housing to help ensure proper alignment with the mating-free connector.
- **EMI Performance**—360-degree shield provides protection from electromagnetic emissions with E3 performance based on IEC 61000-4-6.
- **Familiar Footprint**—Separable interface design is based on the optical fiber LC connector housings (IEC 61754-20) that have over 23 years of history in providing alignment reliability and robustness.
- **Multi-Port**—Design supports high-density multi-port board-mounted connectors.

Benefits to Users

- **Cost Effective**—Many SPE applications are general use (IP20) environments, which do not require protection from small particulates and water. The cost-effective Type 1 connector supports both shielded and unshielded applications.
- **Field Termination**—Type 1 connectors are ideally suited for cable terminations in the field, where they may utilize Insulation Displacement Crimp (IDC) technology to provide a fast and reliable termination onto cable.
- **Error Proofing**—Design features prevent incorrect wiring, and connector interface design prevents accidental mixing of copper and fiber media.
- **Field Testing**—Ability to field test for performance verification.

For more SPE info click on [TIA SPEC](#) and [Ethernet Alliance](#)

“The convergence of IT and OT networks is key to delivering on the promise of Industry 4.0. Moving to modern physical interfaces and protocol stacks is an imperative. SPE provides the simplicity and power of Ethernet designed for the OT environment. The features and performance of the IEC 63171-1 connector give it the ability to become the “RJ45” of SPE and unlock a new generation of convergence.”

Peter Jones,
Distinguished Engineer at Cisco Systems

