T1 INDUSTRIAL SINGLE-PAIR ETHERNET CONNECTORS AND CABLE ASSEMBLIES

NPI INNOVATION

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T1 INDUSTRIAL SINGLE-PAIR ETHERNET CONNECTORS AND CABLE ASSEMBLIES

Molex T1 Industrial Single-Pair Ethernet Connectors and Cable Assemblies provide the standard T1 industrial interface and single-twisted-pair cabling to make Ethernet connectivity easy and affordable, including the transmission of data from the cloud to devices and sensors, while supporting miniaturization.

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Key Product Information

Category: SPE Connectors and Cable Assemblies

Current (max.): 4.0A

Voltage (max.): 60V DC

Cable Structure: AWG26 (T1 SPE IP20)
AWG22 (M12 T1 SPE IP65/67)

Series

220957 **Single-Pair Ethernet Connectors and Cable Assemblies**

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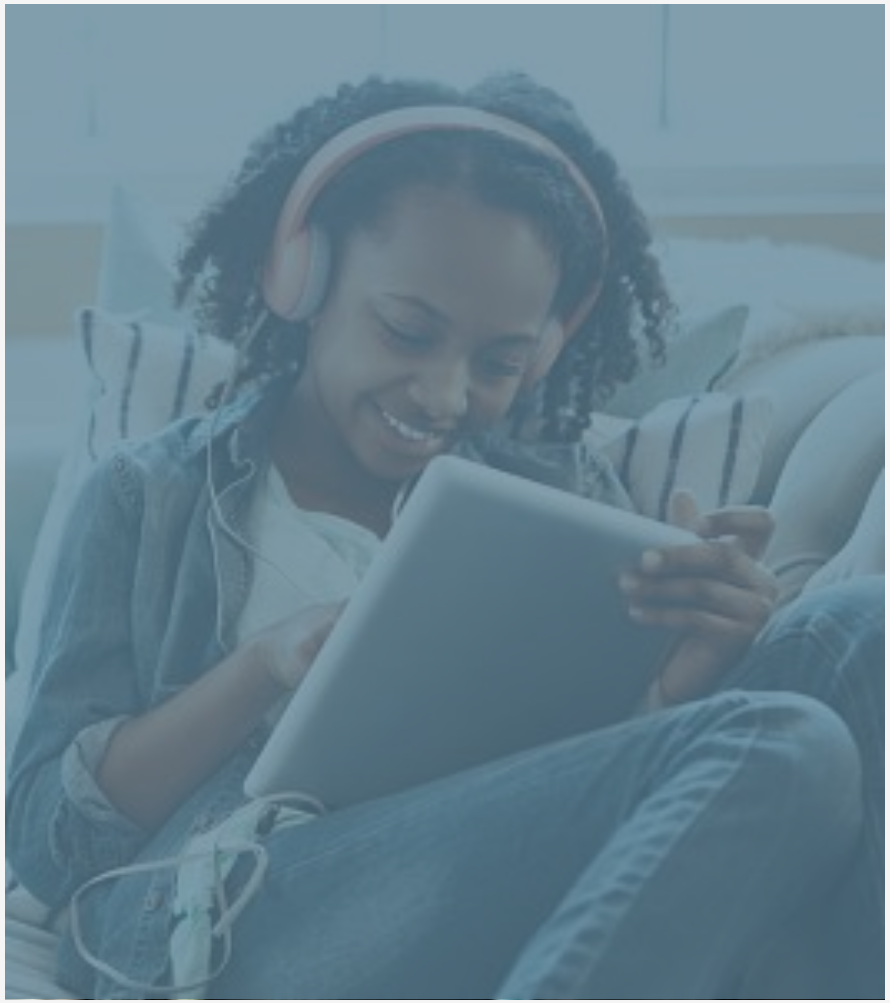
VITAL PRODUCT INFORMATION



What makes this product different from the competition's?

Molex T1 Industrial SPE IP20 Connector System and Cable Assemblies enable the continuous-intelligent, scalable-deterministic networking of applications across all levels. Various companies are already developing products (e.g., cables, connectors, switches and I/O modules) that implement current and future SPE standards.

In order to ensure compatibility between the proprietary devices, lines and connectors of the various manufacturers, the parties involved have pushed forward international standardization.

How does this product/solution create value for our customers?

The major objective is to develop and open up the SPE market for new business opportunities. For Molex customers, this means a simple picture of IIoT in conjunction with SPE with clarity and transparency across the board — from standardization to components and devices and through their applications.
SPE was designed as a lightweight, space saving, secure and cheaper transmission protocol for ethernet.

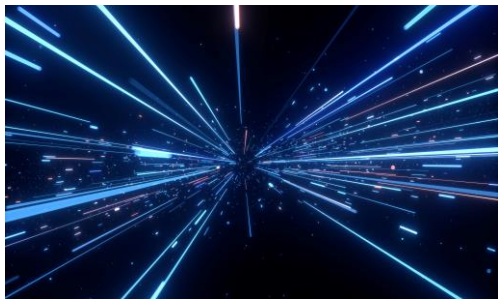
What is the Molex Advantage?

Molex offers global manufacturing capability, robust engineering support and the latest high-performance components for best-in-class capability solutions. Customers can take advantage of our quality cable assemblies, our short lead times and the convenience of shopping with one vendor.

PRODUCT OVERVIEW

Faster Data Speeds

Single-pair Ethernet set-ups enable data transmission by Ethernet using only two wires and simultaneous power supply for terminals via PoDL up to 50W. Being able to integrate Ethernet interfaces with simple sensors, cameras, reading/ID devices or similar equipment makes implementation of integrated industry and IIoT possible.

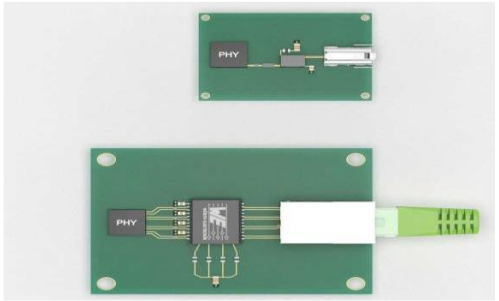


End-to-End TCP/IP-Based Communication

Standardized T1 SPE connectivity enables smart technology at the field level and simplifies parameter setting, initialization and programming. As a result, the set-up, operation and maintenance of equipment becomes more efficient and more cost-effective

Miniaturization SPE vs MPE

Molex's T1 SPE cable assemblies use only one twisted-pair with a gauge as small as 26 AWG (T1 SPE IP20) and 22 AWG (M12 T1 SPE IP65/67). Customers will have an easier time routing these small and flexible T1 SPE cable assemblies from Molex, which also weigh less and cost less due to the fact that they require less copper.



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NEW PRODUCT RELEASE

MARKETS AND APPLICATIONS

Industrial Automation

- Smart sensors
- Valves
- Actuators
- Drives
- Control panels
- Process automation & control
- Factory automation
- Robotics

Internet of Things

- Building automation
- Intelligent lighting systems/Networks
- Lift/Escalator control systems
- Security/Access control systems
  Fire alarm systems

Commerical Vehicles

- Railway

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FREQUENTLY ASKED QUESTIONS

Why does Industry 4.0 need single-pair Ethernet (SPE) technology?

The digitization of industrial plants has led to an increased need for Ethernet cabling. In fact, while transmission rates are fine in most instances, Industry 4.0 and the IIoT present new requirements for longer cable runs and miniaturization. Consequently, SPE technology is being embraced by standardization committees and has become a fixture in the next generation of communication architecture.

For the very first time, SPE ensures the cost-effective use of Ethernet in every aspect of industrial automation. The technology uses one pair of wires to transmit data at speeds from 10 Mbps up to 1 Gbps and can work well in a cable run up to 1,000m making SPE ideal.

What are the advantages of SPE over conventional Ethernet?

Conventional Ethernet requires two or four pairs of wires; SPE requires only one pair. This newer arrangement reduces cabling costs and weight. Slim cables and connectors allow comprehensive connection of the most sophisticated sensors at field level, including PoDL with an output of up to 50W which means the sensors can be supplied with a both power and data interface even in extremely cramped conditions.

FREQUENTLY ASKED QUESTIONS

What data rate can be transmitted over SPE?

The single-pair Ethernet technology based on IEEE 802.3bp 1000BASE-T1, a standard for industrial sensors, delivers 1 Gbps transmission speed over only one pair of copper wires. IEEE professionals are currently working on a standard for even higher data rates of up to 10 Gbps (IEEE 802.3ch), which is required for high-resolution sensors and video transmissions.

In addition, a standard for 10 Mbps (IEEE 802.3cg) is being developed. This standard enables transmission distances of up to 1,000m and can therefore replace almost all fieldbus types.

SOLVING INDUSTRY CHALLENGES

Industry Need	Industry Challenge	Industry Solution	Anticipated Results
Faster Data Speeds	Until now, two twin wires for fast Ethernet (100 MB) or four twin wires for Gigabit of Ethernet were necessary to achieve high-speed data-rate transmission.	Molex's T1 Industrial SPE Connector System and Cable Assemblies enable the transmission of data by Ethernet using only two wires and the simultaneous power supply for terminals via power over data line (PoDL) up to 50W.	By being able to integrate Ethernet interfaces onto simple sensors, cameras, reading/ID devices and similar equipment, it's possible to implement "integrated industry" and "industrial internet of things(IIOT)".
End-to-End TCP/IP-Based Communication	Manufacturers are increasingly reliant on the internet of things (IoT) and the industrial internet of things (IIoT) to run their production facilities. **To optimize the benefits of IIoT, a cost-effective and reliable method for integrating sensors/actuators from the field to the cloud is crucial**. Therefore, a continuous and future-proof network philosophy is needed.	Molex's T1 SPE Industrial Connector System and Cable Assemblies permit a barrier-free connection of equipment, sensor/actuator technology and much more via end-to-end IP-based communications.	Standardized T1 SPE connectivity enables smart technology at the field level and simplifies parameter setting, initialization and programming. As a result. the set-up, operation and maintenance of equipment becomes more efficient and more cost-effective.
Miniaturization	As the sizes of sensors and other devices needed for IIoT shrink to accommodate the increased use of smart equipment on factory floors, cabling and interfaces must shrink too. Also, the proliferation of smart devices and sensors in industrial setting means that cable management is becoming more difficult.	Molex's T1 Industrial SPE cable assemblies use only one twisted pair with a gauge as small as 26 AWG (T1 SPE IP20) and 22 AWG (M12 T1 SPE IP65/67).	Customers will have an easier time routing the small and flexible T1 SPE cable assemblies from Molex, which also weigh and cost less due to the fact that they require less copper.

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PRODUCT FEATURES AND ADVANTAGES

Provides protection from objects up to 12.00mm, and is touchproof

Plug, jack and cable assembly with IP20

Reduces implementation time with plug-and-play connectivity; eliminates the need to source cable assembly or invest in tooling and avoids the need for cable testing

Preassembled cable assemblies available

Enables easy-to-implement wire-to-board connectivity; ensures superior signal integrity performance by shielding

Through-hole jack with 2 contacts plus shielding

Withstands harsh industrial environments

Halogen-free, oil-resistant, flame-retardant off-the-shelf cable assemblies

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PRODUCT FEATURES AND ADVANTAGES

Provides faster data speeds
Cable assemblies enable the transmission of data using only two wires and the simultaneous power supply for terminals via PoDL up to 50W

T1 SPE IP20 1x2x26 AWG/19 PUR

Permits a barrier-free connection of equipment, and sensor/actuator technology
End-to-End TCP/IP-Based Communication

T1 SPE M12 IP65/67 1x2x22 AWG/19 PUR

Facilitates miniaturization so that the customer has an easier time routing the small, flexible cable assemblies.
Cable assemblies use only one twisted-pair with a gauge as small as 26 AWG and 22 AWG

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SPECIFICATIONS AND SUPPORTING INFORMATION

Electrical

Voltage (max.): 60V DC
Current (max.): 4.0A @ 60°C / 1.5A@85°C
Test voltage UDC (voltage proof): 1.0KV DC (pin to pin), 2.25kV DC pin to pin)
Contact Resistance: ≤ 20 mΩ
Shielding Resistance: ≤ 100 mΩ

MICE3 Performance

EMC Resistance: According to E3 for all connector versions
Shock and vibration resistance: According to IEC 61373 Category 1B (railway standards)

Degree of protection according to IEC 60529: IP20 (IP20) and IP65 / IP67 mated condition (M12)
Operating Temperatures: -40 to +85°C

Mechanical

Number of contacts: 2 industrial pin-socket contact design for high reliability and mating security (2 contact points per contact)

Mating Cycles: Minimum 1.000 mating cycles for the core element and the IP20 version
For the M8 and M12 versions >500 mating cycles based on the locking mechanism

Physical

Housing: LCP UL 94 V-0
Contact: Copper Alloy
Plating: Gold over Nickel

Additional Resources	
Web Overview Page	www.molex.com/link/spe.html
Datasheet	987652-5381.pdf
Training Presentation	T1 Industrial SPE Connectors and Cable Assemblies_PRES.pdf
Global Product Manager	Wolfgange Stanke, ISBU, TIS

SPECIFICATIONS AND SUPPORTING INFORMATION

Jacks and Receptacles

Category: Connectors/PCB connectors

Termination method: Reflow soldering termination (THR)

Shielding: Fully shielded, 360° shielding contact

Transmission characteristics: 4 GHz Bandwidth

Data rate: 10 Mbit/s, 100 Mbit/s, 1 Gbit/s, 2.5 Gbit/s, 5 Gbit/s, 10 Gbit/s

Moisture sensitivity level (MSL): 1 according to ECA/IP/JEDEC J-STD-020D

Process Sensitivity Level (PSL): R0 according to ECA/IP/JEDEC J-STD-020D

RoHS: Compliant

ELV status: Compliant

China RoHS: e

Specifications and approvals Jacks and Plugs

Specifications: IEC 63171-6
IEEE 802.3bu (remote power supply over power over data line (PoDL)

IEEE 802.3cg (10BASE-T1)

IEEE 802.3bw (100BASE-T1)
IEEE 802.3bp (1000BASE-T1)
IEEE 802.3ch (2.5GBASE- T1/5GBASE-T1/10GBASE-T1)

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SPECIFICATIONS AND SUPPORTING INFORMATION

Cabling

Category: System cabling

Conductor cross-section: AWG 26/19 (IP20) and AWG22/19 (M12)

Transmission characteristics: 600 MHz Bandwidth

Data Rate: 10 Mbit/s, 100 Mbit/s, 1 Gbit/s

Limiting temperature: 40 to +80°C (unmoved), -25 to +80°C (moved)

Mating cycles: ≥ 1000

Material (cable): PUR

Color (cable): Green

RoHS: Compliant

ELV status: Compliant

China RoHS: e

Specifications and approvals cabling

Specifications: IEC 63171-6
IEEE 802.3bu (remote power supply over power over data line (PoDL)
IEEE 802.3cg (10BASE-T1)
IEEE 802.3bw (100BASE-T1)
IEEE 802.3bp (1000BASE-T1)
IEC 60332-1-2 Flame retardancy
EN 60811-404 Oil resistance

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