APPLICATION AREAS
应用领域

汽车行业
Automotive industry

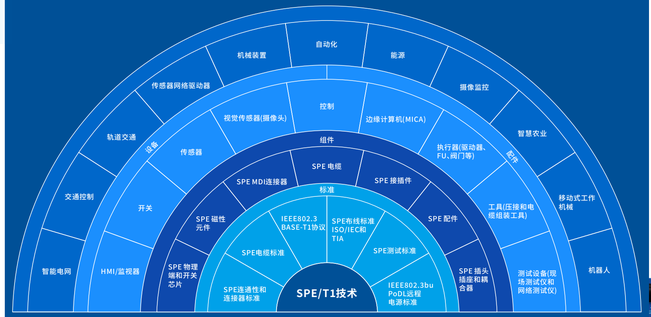
这种紧凑型技术特别适合汽车行业的应用场景。依托单对双绞线上 10 Mbps 至 1 Gbps 的传输速度，以及非屏蔽状态下 15 米、屏蔽状态下 40 米的线缆长度，单对以太网技术成为车辆电缆束的理想之选。此外，目前还有多项全新的 SPE 标准在制定中，预计能实现 10 Gbps 乃至更高的数据传输速率。所以，新一代汽车将采用 SPE 来替代 CAN、MOST、FlexRay 等其他总线系统，安全功能、控制与通信都通过以太网统一实现，而这正是联网或自动驾驶的基本前提

This space-saving technology is perfect for applications in the automotive industry. With transmission rates from 10 Mbps to 1 Gbps over just one twisted wire pair and a maximum cable length of 15 meters (unshielded) or 40 meters (shielded), it is ideally designed for use in vehicle cable harnesses. In addition, there are a number of new SPE standards under development that are expected to make data transfer rates up to 10 Gbps and even higher possible. In new generations of vehicles, SPE will therefore replace CAN, MOST, FlexRay, and other bus systems. Safety functions, control, and communications run uniformly via Ethernet. This is an essential prerequisite for connected or autonomous driving.

工业应用
Industrial applications

传感器集成在各类制造领域中都扮演着重要角色。SPE 技术可将传感器、执行器及现场设备可靠整合到现有以太网环境里。这意味着必要的数据与过程信息能直接传输至控制层或云端供分析使用。和现场总线协议不同，以太网适用于自动化的各个层级，因此不需要额外配备网关或接口。单对导线的简洁设计也简化了传感器在机器或系统中的直接布线工作，系统的搭建、运行与维护也因此更高效、更经济。

The integration of sensors plays a key role in all manufacturing areas. SPE reliably integrates sensors, actuators, and field devices into an existing Ethernet environment. This means that the necessary data and process information can be transmitted directly to the control level or to a cloud for analysis. As opposed to fieldbus protocols, Ethernet can be used in every level of automation. There is no need for additional gateways or interfaces. The reduction to a single wire pair also simplifies the cabling of sensors directly in machines or systems. The construction, operation, and maintenance of systems become more efficient and cost-effective.



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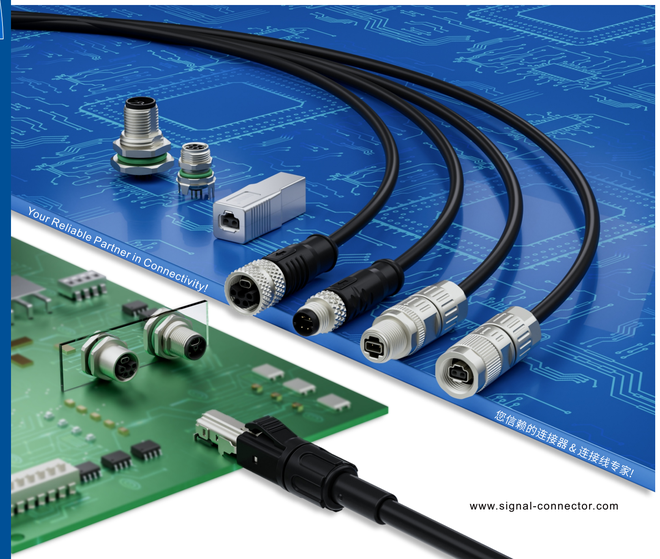
SPE



APPLICATION AREAS
应用领域

过程工业
Process industry

以太网 APL 能为易爆区域过程应用中的现场设备与传感器提供双绞线以太网直接连接。高级物理层 (APL) 遵循 IEEE 802.3cg 10BASE-T1-L 标准及 IEC TS 60079-47、2021-03 (2-WISE) 标准 (2-WISE 即本安型双绞线以太网)，可支持包括本安在内的各类防爆保护措施。以太网 APL 适用于易爆区域，且能在 10 Mbps 的速率下达成长达 1000 米的桥接距离。全新的通信基础设施能够实现过程行业中以太网的统一应用。

Ethernet APL enables the direct two-wire Ethernet connection of field devices and sensors in the ex zones of processing applications. Advanced Physical Layer (APL) uses the 10BASE-T1-L standard of the IEEE 802.3cg along with the IEC TS 60079-47, 2021-03 (2-WISE) standard (2-WISE = 2-Wire Intrinsically Safe Ethernet), and supports explosion protection methods including intrinsic safety. Use in potentially explosive areas is possible, as is the bridging of large distances up to 1000 meters at 10 Mbps. The new communication infrastructure ensures consistent Ethernet use in the process industry.

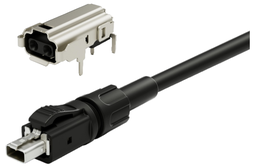
楼宇自动化
Building automation

联网楼宇具备高效率、高安全性以及更多便利功能。借助端到端 IP 协议，传感器、开关与恒温器都能通过本地数据网络及云端连接至楼宇管理系统。统一的 SPE 布线由此替代了现有的现场总线系统、复杂接口与网关。用户还能重复利用网络电缆等现有的两芯电缆基础设施，这会大幅减少安装与调试的工作量。

Networked buildings ensure high efficiency, increased security, and additional convenience functions. By using an end-to-end IP protocol, sensors, switches, and thermostats, for example, can be connected to the building management system via the local data network and the cloud. The consistent SPE cabling replaces existing fieldbus systems, complex interfaces, and gateways. There is also the option to reuse existing two-wire cable infrastructures such as network cables. This makes installation and commissioning significantly easier.

SPE ETHERNET
SPE以太网

是一种通过单对铜线进行数据传输的以太网技术，它突破了传统以太网在空间占用和成本上的限制，为工业自动化、物联网等领域的数据传输提供了新的解决方案。



It is an Ethernet technology that transmits data through a single pair of copper wires. It breaks through the limitations of traditional Ethernet in terms of space occupancy and cost, and provides a new solution for data transmission in industrial automation, the Internet of Things and other fields.

MAIN FEATURES
优势/特点

传统以太网已广泛连接起自动化金字塔的上部层级，但一般不适合连接最底层的现场层。问题主要在于其安装往往过于复杂，或是最大传输距离不够。在这方面，单对以太网（SPE）技术显著拓展了传统以太网的性能。

单对以太网是另一种物理层形式。和之前需要两对双绞线传输数据的快速以太网（100 Mbps）、或是需要四对双绞线的千兆以太网相比，单对以太网传输数据仅需一对双绞线（即单对）。这为现场层的紧凑型设备、传感器和执行器接线创造了全新可能，使得接线不用借助额外的子系统或网关。因此，SPE 是面向众多当下及未来应用的增强型以太网技术，既轻便又节省材料。

What exactly is Single Pair Ethernet?

1.The classic Ethernet, which already connects all upper levels in the automation pyramid, is often unsuitable for connecting the lowest field level. The installation is often too complex or the maximum distances are not sufficient. SPE technology decisively extends the performance profile of the classic Ethernet at this point.

2.Single Pair Ethernet is another form of the physical layer. Where previously two double wires were required for the transmission of Fast Ethernet (100 Mbps) or four double wires for Gigabit Ethernet, Single Pair Ethernet allows data transmission with just a single wire pair (single pair). This opens up new opportunities for connecting compact devices, sensors, and actuators directly from the field level. Additional subsystems or gateways are no longer required to realize this. SPE is therefore the lightweight and material-saving Ethernet enhancement for many current and future applications.

PRODUCT PARAMETERS
产品参数

产品图 Product picture						
芯数 Poles	2	2	2	2	2	2
订货号 Order No.	930002-01-001	930002-02-001	940000-00-467	940000-00-468	940000-00-1876	930000-10-001
针孔分布 Pinhole distribution						
额定电流 Rated current	4A	4A	4A	4A	4A	4A
额定电压 Rated voltage	60V	60V	60V	60V	60V	60V
IP等级 IP Rating	IP67	IP67	IP20	IP20	IP20	IP20
IEC标准 IEC Standards	IEC 63171–6	IEC 63171–6	IEC 63171–6	IEC 63171–6	IEC 63171–6	IEC 63171–6
接线方式 Termination	压接/crimp	压接/crimp	PCB	压接/crimp	压接/crimp	压接/crimp

SPE INDUSTRIAL PARTNER NETWORK®

SIGNAL is a PREMIUM MEMBER of SPE Industrial Partner Network e.V.
盛格纳（SIGNAL）是 SPE 工业合作伙伴网络注册协会 (e.V.) 的高级会员

Single Pair Ethernet System Alliance

SIGNAL is a Member of the Single Pair Ethernet System Alliance
盛格纳（SIGNAL）是单对以太网系统联盟的会员单位

小型化
轻量化

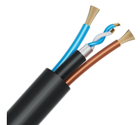
高可靠性
适应性强

高速率
高频率

PRODUCT PARAMETERS
产品参数

产品图 Product picture						
芯数 Poles	7	7	7	7	7	7
订货号 Order No.	121507-03-001	121507-04-001	121507-03-002	121507-04-002	121507-05-001	121507-06-001
针孔分布 Pinhole distribution						
额定电流 Rated current	2A/8A	2A/8A	2A/8A	2A/8A	2A/8A	2A/8A
额定电压 Rated voltage	50AC 63DC	50AC 63DC	50AC 63DC	50AC 63DC	50AC 63DC	50AC 63DC
IP等级 IP Rating	IP67	IP67	IP67	IP67	IP67	IP67
IEC标准 IEC Standards	IEC 63171-7	IEC 63171-7	IEC 63171-7	IEC 63171-7	IEC 63171-7	IEC 63171-7
接线方式 Termination	PCB插板式	PCB插板式	PCB插板式	PCB插板式	—	—

产品图 Product picture				
芯数 Poles	4	4	4	4
订货号 Order No.	080004-05-001	080004-06-001	080004-03-001	080004-04-001
针孔分布 Pinhole distribution				
额定电流 Rated current	4A/8A	4A/8A	4A/8A	4A/8A
额定电压 Rated voltage	60V	60V	60V	60V
IP等级 IP Rating	IP67	IP67	IP67	IP67
IEC标准 IEC Standards	IEC 63171-6	IEC 63171-6	IEC 63171-6	IEC 63171-6
接线方式 Termination	—	—	PCB插板式	PCB插板式



SPE M8/M12 HYBRID CONNECTOR
SPE M8/M12混合连接器

SPE M8/M12混合型连接器，即单对以太网（Single Pair Ethernet，SPE）M8/M12混合型连接器，可通过单对以太网传输数据和动力。它结合了信号连接器和电力连接器的特点，能够同时满足数据传输和电力供应的需求。

SPE M8/M12 hybrid connector, namely Single Pair Ethernet (SPE) M8/M12 hybrid connector, can transmit data and power through a single pair of Ethernet. It combines the characteristics of signal connector and power connector, and can meet the needs of data transmission and power supply at the same time.

Frequently Asked Questions
常见问题

通过单对以太网，数据传输速度能有多快?

当前的以太网技术可仅通过双绞线为应用提供高达10 Gbps的传输速度

What data speeds can I transmit with SPE?
The Ethernet technology already available today provides transmission speeds of up to 10Gbps over just one wire pair for your application.

为什么使用单对以太网?

使用单对以太网基础设施，可以减少数据布线，避免从现场到云端的光电故障和设备故障。可使用基于以太网的统一结构建立网络，无需网关。此外，单对以太网布线更容易，也更节省时间，因为只需要接上两根线。10Base-T1L标准支持1000 m范围内的以太网布线。

Why should I use SPE?
With SPE infrastructure, you can reduce data cabling and avoid media breakdowns fromthe field to the cloud as well as device failures. You can establish networks with aconsistent Ethernet-based structure so that gateways are no longer needed. Plus, cablingwith SPE is easier and more time saving, because only two wires have to be connected.The 10Base-TIL standard enables Ethernet cabling with ranges of up to 1000 m.

我也能用单对以太网传输电力吗?

是的，可通过数据线供电(PoDL)标准传输高达50W的电力。IEEE802.3bu和IEEE 802.3cg标准对各种性能等级进行了介绍。

Can I transmit power with SPE as well?
Yes, a power of up to 50 W can be transmitted via the PoDL (Power over Data Line)standard. The various performance classes are described in the IEEE 802.3bu and IEEE802.3cg standards.

如何处理现有的电缆基础设施?

因此，如满足要求，现有的电缆基础设施便可用于单对以太网。IEC61156-1x标准定义了单对以太网电缆。

What is to be done with the existing cable infrastructure?
It is conceivable that you could use existing cable infrastructures for SPE if they meet therequirements.SPE cables are defined in standard IEC 61156-1x.