Industrial Field Plugs: Revolutionising CAT 6A Transmission

DIGISOL Systems Limited

Introduction

In the world of internet connectivity, Ethernet is the most popular networking technology used for local area network (LAN) requirements today. The technology currently follows the industry standard of IEEE 802.2. Transcending the boundaries of domestic and educational establishments, it is fast becoming the preferred mode of connectivity for advanced industrial applications and control processes. Industrial Ethernet is a product of harnessing the potential of Ethernet standards for communication in an industrial environment.

But for Ethernet to be technologically feasible at an industrial scale, core infrastructural components like the carriers and connectors must evolve to withstand harsh environmental factors. These may include exposure to corrosive chemicals, moisture, oil, Ozone, UV radiation, temperature fluctuations, and flexing. Also, network performance and signal quality may be inversely affected by environmental noise, originating from a host of electrical systems used in an industrial setup. It spikes EMI and RFI interference, impacting system performance.

Keeping in mind the increasing demand for real-time data by applications and the physical realities under which modern industrial networks are required to deliver, Category 6A (CAT 6A) Industrial Ethernet cables are the connectivity medium of choice for the industrial network engineers. Introduced in 2008, it is an improved variant of its predecessor, CAT 6. Defined by TIA/EIA 568 and ISO/IEC 11801 standards, CAT 6A supports 10GBASE-T, at a bandwidth of 500MHZ for 100 meters. Further, the additional insulation of CAT6A improves its alien crosstalk properties, making it a suitable choice for sites running several electrical systems in tandem. CAT 6A also offers backward compatibility with CAT-5e or CAT-6, making it a cost-effective alternative for a future proof industrial cabling system.

However, in network architecture, the connectors are as vital as the transmission cables and the data communication protocols. Its technological advancements are collinear with that of the other network components. For instance, recently, emerging technologies like Industrial Field Plugs are increasingly being used to achieve maximum efficiency for CAT 6A performances at field terminations.

These modular plugs are configured for termination of CAT 6A cable connected to a wide variety of terminals and field devices, including security cameras and similar industrial electronics. They are also a preferred mode of patching in areas demanding connection consistency and reinforcement. A

host of factors adds to the rising popularity of the Industrial Field Plugs, ranging from their compatibility with PoE requirements, performance efficiency, effortless installations to design innovations.

CAT 6A and Industrial Field Plugs: A Perfect Industrial Application Mix?

Currently, a $2.7 trillion economy, India aspires to scale up to $5 trillion by 2024-25. Along with reforms in the legislative and policy domains, such a quantum leap into the future demands a total digital transformation of India's SME and large industrial bases, incorporating global standards and technological interventions like Robotic Process Automation (RPA), Virtualisation, Internet of Things (IoT), etc. With the demand for industrial data transmission continuously on the rise, the need for a reliable communication backbone to support the economy is all the more evident today.

Evolutions in the field of industrial data communication must match India's economic and technological scales. They should fit diverse requirements, from large metro railways systems in urban agglomerations to upcoming smart cities, from powering critical healthcare in remote areas to conducting real-time online exams or meeting law enforcement and security requirements.

In this scenario, networks running on CAT 6A transmission cables, terminated with Industrial Field Plugs offer a turnkey solution with the near-universal application due to:

Cost Efficiency:

CAT 6A twisted pair cabling offers a simplified, low-cost option to prepare industrial establishments for future applications. The Industrial Field Plugs, equipped with the latest standards require fewer SCS products for networking. With increased emergence of 10-gigabit applications for industrial environments, the combination is expected to reduce network setup and maintenance cost over 20% vis-a-vis existing solutions, adding to business profitability. The RoHS compliance also ensures reduced eco-signatures of low environmental costs of such systems.

Durability and Handling:

The harsh industrial environment demands the deployment of high quality shielded CAT A cabling for on-field data communication roles. To maintain connection integrity, without the loss of data in such environments, Industrial Field Plugs have their contact pins assembled with a solderless

process to avoid performance issues due to oxidation of flux. They are made of high impact flame retardant plastic and can survive over a thousand mating cycles. The tool-free termination further enhances its tactical relevance.

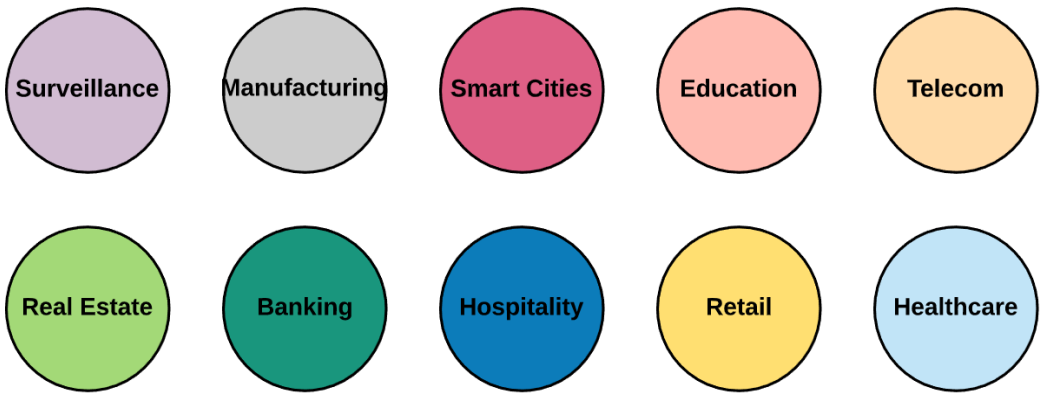
Boosted PoE Performance:

CAT 6A performs better in terms of thermal dissipation over its predecessors like CAT 5e and CAT 6, utilizing all the four pairs of copper cables to deliver power to devices.
To complement the Power over Ethernet performance of CAT 6A, Industrial Field Plugs, standardised to IEC 60603-7-41, are enabled to support PoE applications. This has significant applications in the field of high power IoT systems.

Reliability:

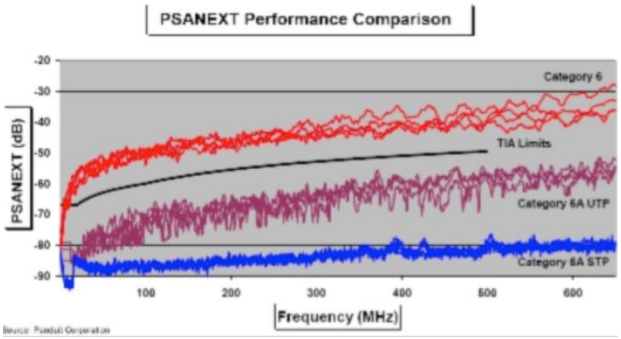
Mission-critical systems like surveillance infrastructure involve HDBase T equipment. They require round the clock service reliability over long-range and around tight corners and spaces. CAT 6A cables, with their sustained data transmission quality for over 100 meters is the media of choice in such roles. At termination, industrial field plugs ensure connectivity with gold plated contact pins, even in highly humid conditions. Also, the 360 degrees patch cord routing design terminates requirements for cable managers.

Due to its robustness, flexibility, and cost-efficiency, today the technology finds application in diverse industrial spheres including:



Industrial Field Plug: A Single Product For All Industrial Networking Environments

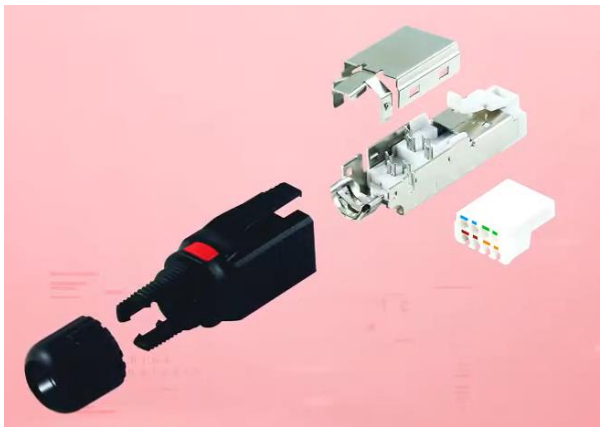
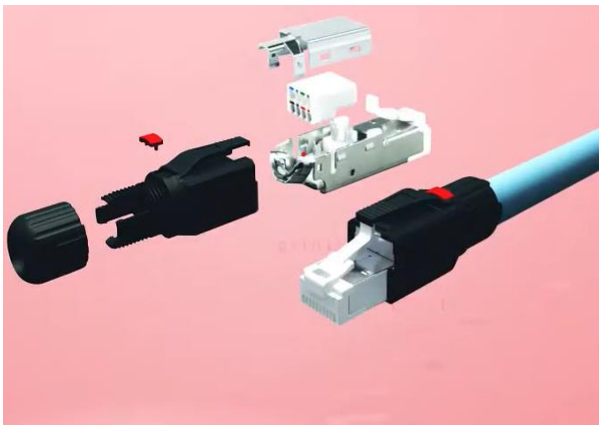
Undoubtedly, CAT 6A is the carrier of choice for modern industrial applications. But during installation or up-gradation of industrial network infrastructures, engineers are often faced with the decision of which type of network patch cable to consider. CAT 6A cables, consisting of two conductors entangled together to reduce electromagnetic interference (EMI), are available in unshielded twisted pair (UTP) and shielded twisted pair (STP) versions.



A key determinant of the type of CAT 6A to be used is a study of EMI intensity in the industrial environment where they are being installed. In industries, EMI can be caused by a host of factors including nearby air conditioners, electrical motors and even office equipment like desktops, printers and fluorescent lights. EMI generates ANEXT (Alien Near End CrossTalk) in circuits, degrading data quality, slowing down transmission and spiking error rates.

UTP	STP
• Lower cost compared to STP cables • Bigger cable diameter requires more installation space • Needs to be thoroughly checked for ANEXT, EMI, RFI	• More expensive than UTP cables • Uses less space during installation • Provides shielding against EMI/RFI and is suitable for sensitive communications • Eliminates or reduces ANEXT • Longer installation time for grounding and bonding requirements

Industrial Field Plugs have been developed, keeping in mind the variation of CAT 6A cable usages, according to the project needs. Today, Industrial Field Plugs for both UTP and STP versions of the CAT 6A cables are available in the market to address the full spectrum of installation and maintenance costs and can be deployed as per the requirements of the project.

Industrial Field Plug CAT 6A UTP, PoE+	Industrial Field Plug CAT 6A STP, PoE+
	

DIGISOL's Industrial Field Plug Product Stack

Acknowledging the potential of Industrial Field Plugs to revolutionise industrial communication infrastructure, we were the early adopters of the technology. We take pride in presenting a range of CAT 6A based Industrial Field Plugs, as part of our ConvergeX solutions portfolio. It includes:

- DIGISOL Industrial Field Plug, CAT 6A UTP, 3 Piece, 180°, Toolless, PoE+
- DIGISOL Industrial Field Plug, CAT 6A UTP, 90° (8*45°), PoE+
- DIGISOL Industrial Field Plug CAT 6A UTP, PoE+
- DIGISOL Industrial Field Plug CAT 6A STP, PoE+

Key Product Features
• PoE Enabled • No tool needed for termination • Optional with-tool termination • Contact pins assembled with solderless press-fit process • Oxidation resistant contact pins • 30 micron gold over nickel plated contact pins • High impact flame retardant plastic • Plug insertion life : 1000 mating cycles

These unique solderless Industrial Field Plugs are being made for the first time in India and are used to deliver maximum efficiency, achieving performance benchmarks for CAT 6A at field terminals. The products are PoE enabled. They are also ETL verified
and RoHS compliant. The DIGISOL Industrial Field Plugs are perfect for the surveillance camera systems. However, they are also suitable for networking infrastructure requirements in areas like manufacturing, smart cities, healthcare, education, telecom, real estate, banking, hospitality, retail, and IT/ITES. These industrial field plugs follow new standards, requiring fewer SCS products over their predecessors. They reduce costs by more than 60% and thus generate operational alpha for the customer.

The Way Forward

According to Market Research Future, the Industrial Ethernet market is predicted to grow at 23.1% CAGR to reach $70.9 billion by 2025. As Ethernet technology continues to expand into the industrial domains, network component manufacturers need to innovate to adapt existing connectors like Industrial Field Plugs to fulfill the communication requirements of tomorrow.

Soon, the development of Category 8 cable systems is anticipated to achieve a data transfer speed of over 40 Gbps. Further, we will find increased harnessing of Ethernet's fast speed and reliable connectivity for operational, maintenance, and surveillance roles under hazardous and inclement conditions in the industrial environments. In such a scenario, advanced connector technologies like Industrial Field Plugs are designed to maximise performance and operational alpha for the businesses under even the most challenging circumstances.