Industrial L2+ 4-Port 10/100/1000T Managed TSN Ethernet Switch

Innovative Industrial TSN Ethernet Switch Guarantees Delivery of Time-Sensitive Data

PLANET TSN-5225-4T is a brand-new Industrial-grade Layer 2+ **Time-Sensitive Networking (TSN)** Managed Ethernet Switch which features **4 10/100/1000BASE-T RJ45 ports** in a rugged IP30 metal case for stable operation in heavy environments, and addresses all levels of the industrial automation network, from the field bus to the factory backbone. And it guarantees end-to-end transmission of high-priority traffic with extremely low latency.

The TSN-5225-4T can be installed in any difficult environment as it can operate stably under the temperature range from **-40** to **75 degrees C**. It also allows either DIN-rail or wall mounting for efficient use of cabinet space.

Building a Sustainable Future for Innovation with ESG Principles

The TSN-5225-4T can help businesses achieve more efficient operations and production while reducing energy consumption and resource wastage, thereby enhancing both the economic and social benefits of the enterprise, aligning with the core values of ESG. For instance, the application of the TSN-5225-4T in industrial automation enables precise control of the manufacturing process, reducing energy consumption and waste generation. Similarly, their use in transportation can optimize logistics routes, mitigating issues such as carbon emissions and traffic congestion.

A Simplified Pathway to a TSN-compatible Infrastructure

PLANET TSN-5225-4T provides real-time, low-latency network communication for industrial automation, 5G NR networks, Industry 4.0, 4K/8K video streaming, and VR/AR gaming industry by using the **Time-sensitive Networking (TSN)** technology and **IEEE 1588 Precision Time Protocol (PTPv2)** for time synchronization on all ports.

The TSN-5225-4T supports TSN IEEE standards needed for a complete real-time communication solution. These include IEEE 802.1AS-REV profile for time synchronization, IEEE 802.1Qbv for Enhancements for Scheduled Traffic, IEEE 802.1Qbu Frame Preemption, IEEE 802.3br Interspersing Express Traffic (**IET**), IEEE 802.1Qci for per-stream filtering and policing (**PSFP**) and IEEE 802.1CB frame replication and elimination for reliability (**FRER**) for seamless redundancy.

The TSN-5225-4T eliminates the need for separating information technology (IT) and operational technology (OT) Ethernet networks, providing a more ubiquitous approach to synchronization and precision timing for today's industrial automation systems.

Physical Port

- **4 10/100/1000BASE-T** Gigabit Ethernet RJ45 ports
- One RJ45 console interface for basic management and setup

Industrial Case and Installation

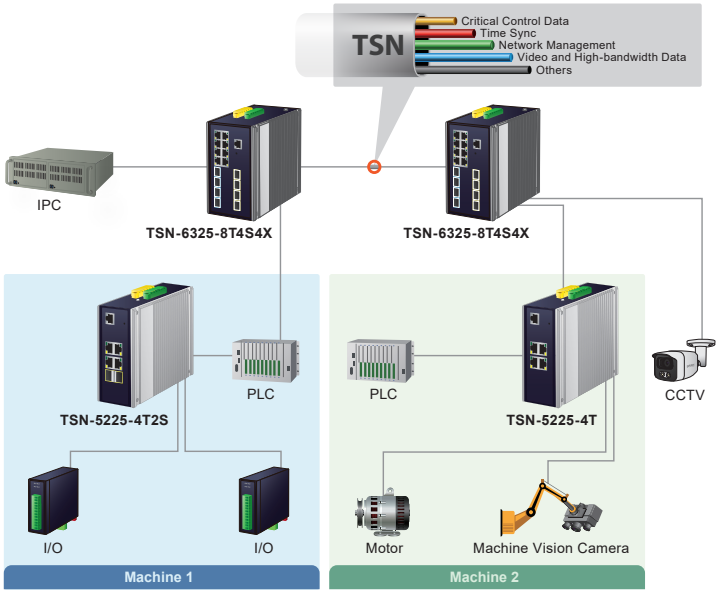
- Dual power input, redundant power with reverse polarity protection
  - DC 9 to 48V input or AC 24V input
  - Active-active redundant power failure protection
  - Backup of catastrophic power failure on one supply
  - Fault tolerance and resilience
- IP30 metal case
- DIN-rail and wall-mount designs
- Supports 5000V DC Ethernet ESD protection
- -40 to 75 degrees C operating temperature

Digital Input and Digital Output

- 2 digital input (DI)
- 2 digital output (DO)
- Integrates sensors into auto alarm system
- Transfers alarm to IP network via email and SNMP trap

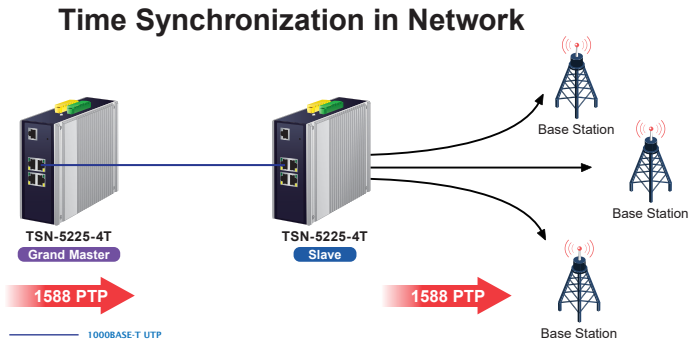
Time Sensitive Networking

- **High Precision Time Synchronization**
  - IEEE1588 (Time Stamping)
  - 802.1AS-Rev gPTP default profile
- **Shapers**
  - 802.1Qbv Enhancements for Scheduled Traffic
  - 802.1Qch (Cyclic Queuing and Forwarding)
- **TSN Stream Policing**
  - 802.1Qci (Per Stream Filtering and Policing)
- Redundancy
  - 802.1CB FRER for seamless redundancy
  - Also standard Linear and Ring protection
- **Delay Reduction**
  - IEEE 802.1Qbu Frame Preemption,
  - IEEE 802.3br Interspersing Express Traffic (IET)



1588 Time Protocol for Industrial Computing Networks

The TSN-5225-4T features IEEE 1588v2 PTP (Precision Time Protocol) with hardware-based time stamping for precise time synchronization of networks, and support for **Boundary Clock**, **End to End** and **Peer to Peer Transparent Clock** modes. It is ideal for telecom and carrier Ethernet applications, supporting MEF service delivery and timing over packet solutions for IEEE 1588 and synchronous Ethernet.



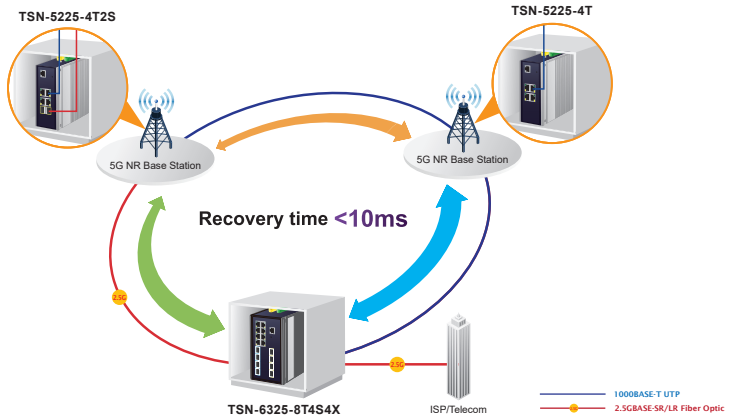
Redundant Ring, Fast Recovery for Critical Network Applications

The TSN-5225-4T supports redundant ring technology and features strong, rapid self-recovery capability to prevent interruptions and external intrusions. It incorporates advanced **ITU-T G.8032 ERPS (Ethernet Ring Protection Switching)** technology, Spanning Tree Protocol (802.1s MSTP), and **redundant power** input system into customer's industrial automation network to enhance system reliability and uptime in harsh factory environments. In a simple ring network, the recovery time of data link can be as fast as 10ms.

Layer 2 Features

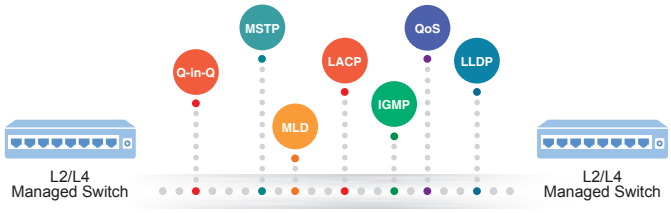
- Prevents packet loss with back pressure (half-duplex) and IEEE 802.3x pause frame flow control (full-duplex)
- High performance of Store-and-Forward architecture, and runt/CRC filtering eliminates erroneous packets to optimize the network bandwidth
- Storm Control support
  - Broadcast/Multicast/Unicast
- Supports **VLAN**
  - IEEE 802.1Q tagged VLAN
  - Supports provider Bridging (VLAN Q-in-Q, IEEE 802.1ad)
  - Private VLAN Edge (PVE)
  - Port Isolation
  - MAC-based VLAN
  - Protocol-based VLAN
  - Voice VLAN
  - VLAN Translation
  - GVRP
- Supports **Spanning Tree Protocol**
  - IEEE 802.1D Spanning Tree Protocol (STP)
  - IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
  - IEEE 802.1s Multiple Spanning Tree Protocol (MSTP), spanning tree by VLAN
  - BPDU Guard
- Supports **Link Aggregation**
  - 802.3ad Link Aggregation Control Protocol (LACP)
  - Cisco ether-channel (static trunk)
  - Maximum 2 trunk groups with 4 ports per trunk group
- Provides port mirror (many-to-1)
- Port mirroring to monitor the incoming or outgoing traffic on a particular port
- Loop protection to avoid broadcast loops
- Supports ERPS (Ethernet Ring Protection Switching)
- Compatible with Cisco Uni-directional link detection(UDLD) that monitors a link between two switches and blocks the ports on both ends of the link if the link fails at any point between the two devices
- Link Layer Discovery Protocol (LLDP) and LLDP-MED

ERPS Ring for Data Transmission Redundancy



Robust Layer 2 Features

The TSN-5225-4T can be programmed for advanced Layer 2 switch management functions such as dynamic port link aggregation, 802.1Q tagged VLAN, Q-in-Q VLAN, private VLAN, Multiple Spanning Tree Protocol (MSTP), Layer 2 to Layer 4 QoS, bandwidth control, IGMP snooping and MLD snooping. Via the aggregation of supporting ports, the TSN-5225-4T allows the operation of a high-speed trunk group that comes with multiple ports and supports fail-over as well.



Cybersecurity Network Solution to Minimize Security Risks

The cybersecurity features that virtually need no effort and cost to have include the protection of the switch management and the enhanced security of the mission-critical network. Both SSHv2 and TLSv1.2 protocols are utilized to provide strong protection against advanced threats. The network administrator can now construct highly-secure corporate networks with considerably less time and effort than before.

Modbus TCP Provides Flexible Network Connectivity for Factory Automation

With the supported **Modbus TCP/IP** protocol, the TSN-5225-4T can easily integrate with **SCADA** systems, **HMI** systems and other data acquisition systems in factory floors. It enables administrators to remotely monitor the industrial Ethernet switch's **operating information**, **port information**, communication status, and DI and DO status, thus easily achieving enhanced monitoring and maintenance of the entire factory.

Layer 3 IP Routing Features

- Supports maximum 32 static routes and route summarization

Quality of Service

- Ingress Shaper and Egress Rate Limit per port bandwidth control
- 8 priority queues on all switch ports
- Traffic classification
  - IEEE 802.1p CoS
  - IP TOS/DSCP/IP precedence
  - IP TCP/UDP port number
  - Typical network application
- Strict priority and Weighted Round Robin (WRR) CoS policies
- Supports QoS and In/Out bandwidth control on each port
- Traffic-policing on the switch port
- DSCP remarking
- Voice VLAN

Multicast

- Supports IPv4 IGMP snooping v1, v2 and v3
- Supports IPv6 MLD snooping v1 and v2
- Querier mode support
- IPv4 IGMP snooping port filtering
- IPv6 MLD snooping port filtering
- Multicast VLAN Registration (MVR) support

Security

- Authentication
  - IEEE 802.1x Port-based/MAC-based network access authentication
  - Built-in RADIUS client to co-operate with the RADIUS servers
  - TACACS+ login users access authentication
  - RADIUS/TACACS+ users access authentication
- Access Control List
  - IP-based Access Control List (ACL)
  - MAC-based Access Control List
- Source MAC/IP address binding
- **DHCP Snooping** to filter un-trusted DHCP messages