The Integrated ETBN device is a perfect combination of an IEC standard Train Backbone Node implementation with a multi-port Ethernet Consist Switch. Due to this mix of backbone and consist ports, it provides an integrated and cost sensitive solution. Equipped with double switched backbone lines protected by bypass relays for train backbone use and an additional bypass relay between two Gigabit Ethernet or Fast Ethernet ports at consist level, it allows more reliable consist topologies implementation.

IEC Train inauguration procedure is fully supported as well as ETBN control interface for TRDP devices. Other interfaces (SNMP, REST) are also available in order to provide a wider range of potential implementations.

On the consist side, the TTCMP© protocol provides automatic device configuration and continuous monitoring giving the customer a way to reduce commissioning and maintenance costs.

Designed to operate in harsh environmental conditions typical of rolling stock applications, the Integrated ETBN can be powered from 24 Vdc to 110 Vdc nominal voltage.

Fully EN 50155 compliant, the Integrated ETBN provides the highest level of reliability and robustness required by the railway industry.

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### Technical Specifications

#### Management
- Device bypasses for maximum reliability
- Extended RMON counters
- Fallback firmware image for maximum reliability
- IPv4 protocol supported
- In-band (SSH) and out-of-band (console) CLI interface for device management
- In-band and out-of-band firmware upgrade
- Train Topology and Configuration Management Protocol (TTCMP©) for automatic device configuration
- RADIUS authentication
- Simple Network Management Protocol (SNMP) v1/v2c/v3

#### Backbone side features
- 4 FE or GbE ports protected by hardware bypasses
- Support for IPv4 protocol
- Standard IEC 61375 TTDP topology discovery protocol
- R-NAT (railway 1:1 NAT)
- Router Redundancy Protocol
- Static unicast/multicast routing
- Dynamic inter-consist routing following train inauguration
- Train-wide standard multicast routing

#### Consist side features
- 10 Fast Ethernet ports or 2 Gigabit Ethernet ports + 8 Fast Ethernet ports
- 1 hardware bypass on FE/GbE ports pair for maximum reliability
- Spanning tree (STP 802.1D) and Rapid Spanning Tree (RSTP 802.1w)
- Link aggregation protocol (LACP 802.3ad)
- DHCP option 82 handling
- Integrated per-port DHCP server
- IGMP versions 1, 2 and 3
- SNMP v1/v2c/v3 device management
- Extended RMON counters
- Link Layer Discovery Protocol (LLDP 802.1ab) with LLDP-MED extensions
- 802.1X port authentication
- RADIUS authentication
- IEEE 802.3af PoE delivered on 8 ports

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Technical Specifications

**PHYSICAL DATA**

- **System status indicators:** 8 LEDs
- **Fast Ethernet connectors:** M12, female, 4-ways, D-coding
- **Gigabit Ethernet connectors:** M12, female, 8-ways, X-coding
- **Power supply connector:** M12, male, 4-ways, A-coding
- **Maintenance port connector:** M12, female, 8-ways, A-coding
- **Power supply voltage range (isolated):**
  - 24 Vdc nominal: 14.4 Vdc – 40 Vdc, according to EN 50155
  - 37.5 Vdc nominal: 23 Vdc – 42.5 Vdc, according to EN 50155
  - 48 Vdc nominal: 28 Vdc – 72 Vdc, according to EN 50155
  - 72 Vdc nominal: 44 Vdc – 108 Vdc, according to EN 50155
  - 96/110 Vdc nominal: 66 Vdc – 165 Vdc, according to EN 50155
- **Power supply class:** S2, according to EN 50155
- **Power consumption (excluding PoE):**
  - 24/37.5/48 Vdc version: 15 W max
  - 72/96/110 Vdc version: 22 W max
- **PoE class:** 0, 1, 2, 3 and 4 (max 15 W per port), according to IEEE 802.3at Type-1
- **PoE max power:** 60 W
- **Overall dimensions:** 207 x 184 x 73 mm
- **Weight:** 2.6 Kg
- **Operating temperature:**
  - Standard: -25°C to +55°C (+70°C for 10 min. according to EN 50155 class T1)
  - Optional: -25°C to +70°C (+85°C for 10 min. according to EN 50155 class T3)
  - Optional: -40°C to +70°C (+85°C for 10 min. according to EN 50155 class TX)
- **Relative humidity (non condensing):** 0 – 95 %
- **Storage temperature:** -40°C to +85°C
- **Degree of protection:**
  - Standard: IP40
  - Optional: IP54, IP65

**APPROVALS / COMPLIANCE**

- **EN 50155** Railway Applications (Electronic equipment used on rolling stock)
- **EN 50121-3-2** Electromagnetic compatibility rolling stock apparatus
- **IEC 61000-4-2 (2008-12)** Electrostatic discharge immunity test
- **IEC 61000-4-3 (2006-02)** Radiated, radiofrequency, electromagnetic field immunity test 3
- **IEC 61000-4-4 (2004-07)** Electrical fast transient/burst immunity test
- **IEC 61000-4-5 (2005-11)** Surge immunity test
- **IEC 61000-4-6 (2008-10)** Immunity to conducted disturbances, induced by radiofrequency fields
- **IEC 60068-2-1** Environmental testing - Part 21: Tests - Test A: Cold
- **IEC 60068-2-2** Environmental testing - Part 22: Tests - Test B: Dry heat
- **EN 61373** Shock & Vibration
- **IEC 61375-2-5** Ethernet Train Backbone

**INTERNETWORKING STANDARDS**

- **IEEE 802.3u** Fast Ethernet
- **IEEE 802.3ab** Gigabit Ethernet
- **IEEE 802.1Q** Tagged VLANs
- **IEEE 802.1D** Spanning Tree Protocol
- **IEEE 802.1w** Rapid Spanning Tree Protocol
- **IEEE 802.1X** Port-based network access control
- **IEEE 802.1AB** Link Layer Discovery Protocol (LLDP)
- **IEEE 802.3ad** Link Aggregation Protocol (LACP)

**Wall Mounting**

Dimensions only for reference

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*H*: see overall dimensions specification