Mining Underground Rugged Network Deployment - Official Technical Overview & Hardware Datasheet

MINING UNDERGROUND RUGGED NETWORK DEPLOYMENT

PRODUCT OVERVIEW & OFFICIAL HARDWARE DATASHEET

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EXECUTIVE SUMMARY

The global mining industry faces a critical challenge: deploying reliable, high-bandwidth ethernet connectivity in underground environments characterized by extreme dust, high humidity, corrosive gases (methane, hydrogen sulfide), continuous mechanical vibration, and wide temperature fluctuations (-40°C to +75°C). Standard enterprise networking equipment fails catastrophically under these conditions. The MTX-7000 Series Ruggedized Network Deployment Platform is a purpose-engineered, carrier-grade switching and routing solution specifically hardened for underground mining tunnels, shaft bottoms, and longwall faces. Built upon a sealed, convection-cooled, IP67-rated chassis and featuring intrinsic safety (IS) barrier interfaces, this platform delivers uninterrupted voice, video, telemetry, and automation control communication for autonomous haulage, personnel tracking, environmental monitoring, and remote blasting operations.



HARDWARE ARCHITECTURE & SILICON

The MTX-7000 Series employs a modular, no-fan, cold-wall thermal conduction cooling system, eliminating single points of failure due to dust-laden air ingestion. The core is a 480 Gbps non-blocking switching fabric based on a purpose-built ASIC (Application-Specific Integrated Circuit) with hardened silicon rated for 100,000 hours continuous operation at 85 ° C junction temperature. All circuit boards receive conformal coating (MIL-V-173C specification) and full underfilling for vibration resistance up to 5 Grms (IEC 60068-2-6). Two modular field-replaceable units (FRUs) are available: the MTX-7208 (8-port full Gigabit Ethernet) and MTX-7224 (24-port fast Ethernet with 4 Gigabit uplinks). The system integrates dual-redundant, hot-swappable power inputs supporting 12-48 VDC mining locomotive power, with galvanic

isolation of 1500 Vrms per port to mitigate ground potential rise in long cable runs.

KEY FEATURES & ROUTING LOGIC

- Intrinsic Safety Compliance: All copper ports are equipped with energy-limiting barriers meeting ATEX/IECEx Zone 1 and MSHA (Mine Safety and Health Administration) approval for potentially explosive methane/dust atmospheres. Maximum output power per port limited to 1.2W.

- Redundant Ring Topology Integration: Hardware-based ITU-T G.8032 ERPS (Ethernet Ring Protection Switching) with sub-50ms failover recovery time, enabling seamless linear or ring trunk deployment across up to 240 nodes in a 5km tunnel segment.

- Industrial Protocol Transparency: Hardware-level forwarding support for PROFINET, EtherNet/IP, Modbus TCP, and CC-Link IE Field, with configurable Quality of Service (QoS) queues (8 priority levels) to prioritize time-critical control frames over best-effort video.

- Port Isolation & Surge Protection: Every RJ45 port features 6 kV surge immunity (IEC 61000-4-5) and 15 kV ESD protection (IEC 61000-4-2). Fiber SFP

ports accept ruggedized optical transceivers with 2km to 40km range for backbone links.

- Layer 3 Static & Dynamic Routing: Supports static routing, RIP v1/v2, and OSPF v2 for segmented underground subnets (e.g., separating ventilation control from personnel Wi-Fi). VRF-Lite enables multi-tenancy on a single physical infrastructure.

- Management & Diagnostics: SNMP v3, CLI via serial console (RS-232), and web GUI. Embedded fault detection includes port link-flap monitoring, power input voltage logging, and internal temperature history.

COMPLIANCE & STANDARDS

- Mining Safety: MSHA (P-2024-XXX), ATEX II 2G Ex nA IIC T4 Gc, IECEx SIR 24.0012X, GB3836.1-2021 (China)
- Environmental: IP67 (Ingress Protection - dust-tight and immersion up to 1m), IEC 60068-2-27 (50g shock), IEC 60068-2-32 (free fall), MIL-STD-810H (humidity, salt fog)
- EMC/EMI: FCC Part 15 Subpart B Class A, EN 55032, EN 55035, IEC 61000-6-2 (Industrial Immunity)
- Industrial Networking: IEC 61850-3 (Electric substations), IEEE 1613 (Power

utility environment)

TECHNICAL SPECIFICATIONS

- Switching Capacity: 480 Gbps (MTX-7224), 240 Gbps (MTX-7208)

- Forwarding Rate: 357 Mpps (64-byte packets)

- MAC Address Table: 32K entries

- Jumbo Frame Support: 10,240 bytes

- Buffer Memory: 12 MB shared packet buffer

- Operating Temperature: -40°C to +75°C (cold-start capable at -40°C)

- Storage Temperature: -40°C to +85°C

- Relative Humidity: 5% to 95% non-condensing

- Altitude: 5000m (16,404 ft) maximum

- MTBF (Mean Time Between Failures): 875,000 hours (Telcordia SR-332, Ground Fixed, 40°C)

- Power Consumption: 45W maximum (MTX-7224), 28W maximum (MTX-7208)

- Dimensions: 440mm (W) x 270mm (D) x 44mm (H) - 1RU (MTX-7224); 230mm (W) x 150mm (D) x 60mm (H) - compact (MTX-7208)

- Weight: 4.2 kg (MTX-7224), 1.8 kg (MTX-7208)

Parameter	Specification
Form Factor	1RU Standard (MTX-7224) / Compact

	Wall/DIN (MTX-7208)
Switching Capacity	480 Gbps (MTX-7224) / 240 Gbps (MTX-7208)
Power Supply	Dual Hot-Swappable 12-48 VDC with Galvanic Isolation (1500 Vrms)
Port Types	10/100/1000Base-T(X) RJ45 with IS barriers, 1000Base-X SFP slots
Ingress Protection	IP67 (dust-tight, temporary immersion)
Safety Certification	ATEX Zone 1 / IECEx / MSHA (pending)

ORDERING SKU INFORMATION

MTX-7208-8GE: 8-port Gigabit Ethernet, rugged IP67, 12-48 VDC, console port, wall/DIN mount (includes 2x SFP slots)

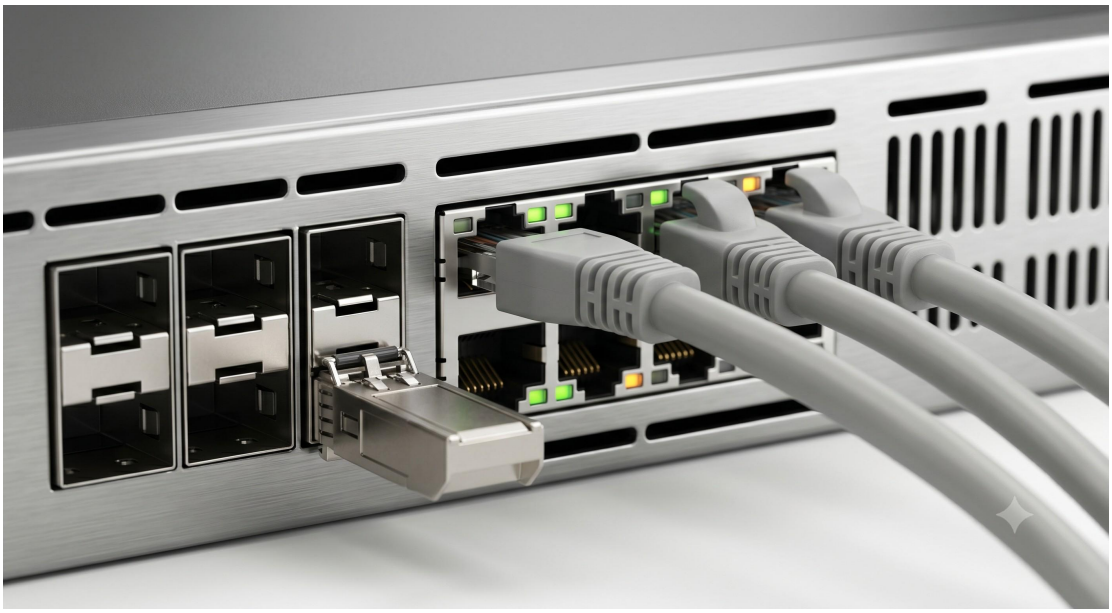
MTX-7224-24FE4GE: 24-port Fast Ethernet (10/100), 4-port combo Gigabit Ethernet/SFP, dual DC inputs, 1RU rackmount

MTX-PS-DC48-120W: Spare/redundant 48 VDC 120W power supply module

MTX-SFP-GE-SX: 1000BASE-SX SFP transceiver, 550m, multimode, industrial temp (-40°C to +85°C)

MTX-SFP-GE-LX40: 1000BASE-LX SFP, 40km, single mode, industrial temp

CBL-M12-D-5M: M12 to RJ45 ruggedized patch cord, 5m, IP68, shielded (for vibration-prone connections)



LIFECYCLE & SUPPORT

All MTX-7000 Series units carry a 5-year limited hardware warranty covering component failure under specified operating limits. Extended support packages (24x7 technical assistance, advanced replacement, on-site commissioning) are available for mining operators requiring zero-downtime SLAs. The platform is designed for 10+ years of service life with no scheduled fan replacements, as the passive thermal design eliminates rotating parts. Field-upgradeable firmware via TFTP or USB maintains security and protocol compliance for the duration of mine lifecycles.