
XMC20

Full Hybrid Multi-service Access & Transport Platform for Communications Networks in Mission-Critical Systems



XMC20 for Mission-Critical Systems

Network Solutions for Mission-Critical Systems

ABB defines Mission-Critical Systems (MCS) as dedicated network infrastructures that carry critical applications for HV/MV Energy & Distribution Grids, Gas & Oil Pipelines, Transportation, Homeland Security, Public Safety, Air Traffic Management & Control communications.

ABB believes that nothing is more important in MCS networks than guaranteeing the highest availability of each connection and the highest security for transferred data against attacks from outside. With mission-critical data, downtime and manipulation can mean risk to life and limb. The systems developed and produced by ABB stand apart due to their extreme reliability. From the outset, ABB developers in Germany and Switzerland have placed the highest priority on achieving this goal. Key attributes were confirmed during the developmental phase of the German-manufactured systems. These included top availability, maximum service life, simplicity of operation, easy maintenance, a good eco footprint, as well as being thoroughly future-proof in nature.

ABB products, based on decades of experience, bring solutions that meet the stringent access & transport networks requirements for MCS in the areas of clock synchronization, scalability, protection, reliability, ultra-long lifecycles and backward compatibility. In addition, they are highly

flexible providing multi-service access for a wide range of applications and the simultaneous availability of circuit-based and packet-based technologies e.g. PDH/SDH and MPLS-TP.

ABB addresses the evolution of MCS networks from TDM-based to packet-based services with its state-of-the-art full hybrid multi-service platform XMC20. The full hybrid concept allows for the co-existence of native TDM and packet-based access services within the same node, providing a perfect future-proof solution for MCS applications.

Highlights

- Full hybrid concept for coexistence and interworking of native TDM and packet services within the same node
- Protection, redundancy and encryption functions for secure data transmission and highest availability
- Wide range of applications and access interfaces supported
- Support for various transmission interfaces and protocols, including 10 Gbps, SDH STM-16, MPLS-TP and many others
- Guaranteed long lifecycles due to state-of-the-art FPGA technologies and own manufacturing plant
- Wide array of services which include 3rd party equipment integration and maintenance
- All ABB equipment and selected 3rd party equipment are managed under one Network Management System



Full Hybrid Multi-service Access and Transport Platform

XMC20 full hybrid platform supports the co-existence of native TDM and packet-based services within the same node, providing the flexibility for the customer to choose the best technology for its mission-critical application without the need to replace the network element. In addition, XMC20 platform offers a unique array of gateway functions such as: TDM over Ethernet (SAToP), Ethernet over SDH (EoS), Ethernet over TDM (EoTDM) SIP Media Gateway (VoIP Gateway).

The multi-service capabilities of the XMC20 platform support the increasingly wide range of Ethernet based access interfaces, whilst at the same time supporting existing TDM network technologies. Both can be directly connected to mission-critical applications without the need for additional external elements.

XMC20 operates as a centralized MPLS-TP switch, supporting state-of-the-art Packet-based Transport Networks (PTNs), to achieve the highest reliability in the market today (e.g. sub 50 ms switchover times). Simultaneously, it can operate as a SDH/PDH multiplexer for TDM transport networks achieving hitless switchovers in case of link failures. Having such a broad set of services and different technologies from one network element allows great flexibility in the total engineering of the solution. One single XMC20 platform covers the

needs of existing legacy networks, while at the same time providing future-proof equipment capable of evolving towards packet-based transport networks. This reduces the operational costs for our customers' networks and enhances the reliability and the availability of services through reduced network complexity.

All services in XMC20 are administrated by a central network management system (UNEM), which allows the monitoring of network performance, alarms, and fault management. The network management system is also capable of protection mechanisms that allow full redundancy of the management of the network. This integrated management system brings maximum synergy through managing all the services on one platform. In addition, an easy-to-use local craft terminal (ECST) is available for our customers, which provides offline configuration, enabling commissioning of a network in the office followed by later deployment to the node.

The systems developed and produced by ABB stand apart due to their extreme reliability.



XMC20 Applications

Packet Based Data Transmission – Ethernet/IP

Ethernet/IP services in XMC20 come naturally to its inherent Ethernet-switch design, which include: a native Ethernet/IP backplane with a switching capacity starting at 64 Gbps bi-directional. This native Ethernet/IP system functionality allows every packet-capable unit in the subrack, connected to the Ethernet/IP backplane, to act as a switch module or as an attachment circuit for MPLS-TP transport.

All Ethernet/IP functions can fully operate simultaneously alongside the TDM services and functions in the XMC20 system. Each slot is connected to the core unit with 10 Gbps. This guarantees sufficient bandwidth at any time for mission-critical Ethernet applications.

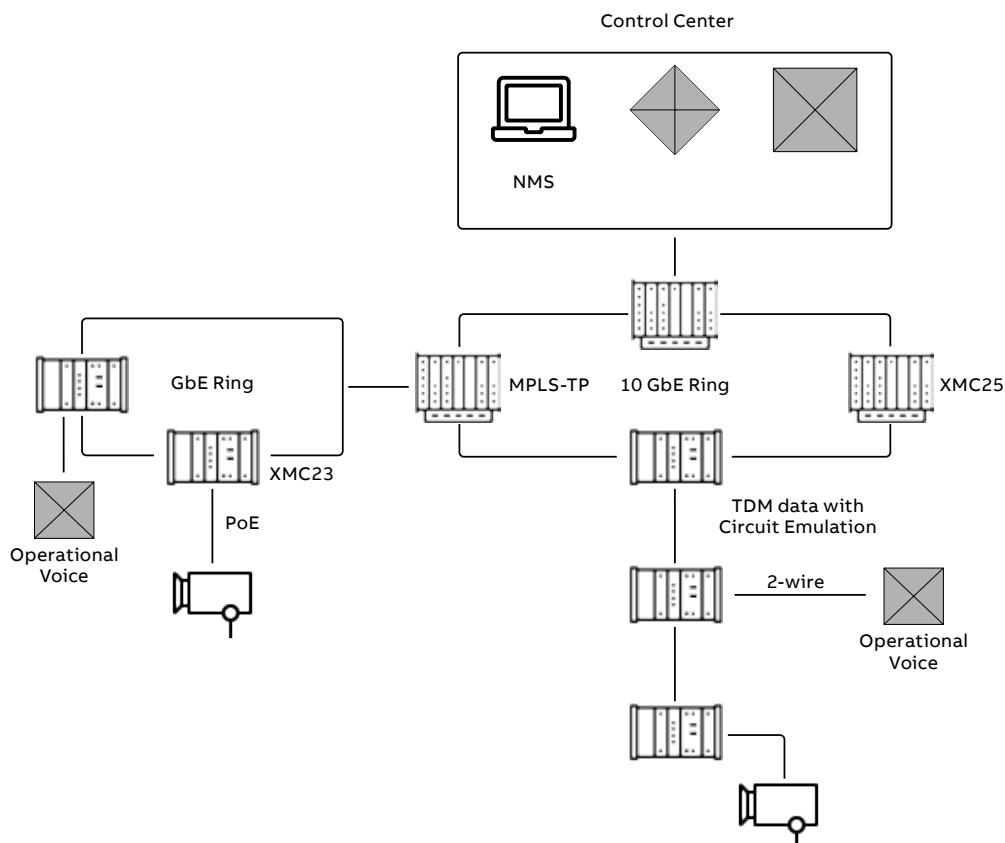
Packet-based access options include upgradable n x 1 GbE links with IEEE 802.1Q switching. Link protection mechanisms include xSTP and ERPS (Ethernet Ring Protection Switching) to guarantee highest availability.

In addition, XMC20 enables the powering of devices at remote locations via Ethernet. With its PoE+unit (Power over Ethernet) up to 30 W can be provided for every connected port.

Packet-based Transport Networks (PTNs) are supported by a central unit with 1 GbE optical/electrical and/or 10 GbE optical connections. A central MPLS-TP engine tunnels Ethernet/IP-data (Attachment Circuits) via deterministic bi-directional co-routed Label Switched Paths (LSPs) with 1:1 link protection to achieve recovery times below 50 ms.

IP routing with VRRP and VRF ensures additional secure connectivity at the IP layer.

XMC20 also offers comprehensive QoS functions (Quality of Service) to ensure an efficient and reliable transmission over the PTNs.



Circuit Switched Data Transmission – TDM

For the TDM uplink, customers can choose between $n \times E1$ and SDH with up to STM-16.

XMC20 comes with EoS functionality (Ethernet over SDH). With it, customers who have a TDM backbone can transport Ethernet services over the SDH network – thus a second transport network is not necessary.

TDM services in XMC20 are built on a TDM capable system solution including: native TDM backplane and a PDH cross connect with a capacity of $128 \times E1$ at 64k level non-blocking.

XMC20 allows customers to offer extensive voice services as POTS and E&M, including conferencing functions for voice channels.

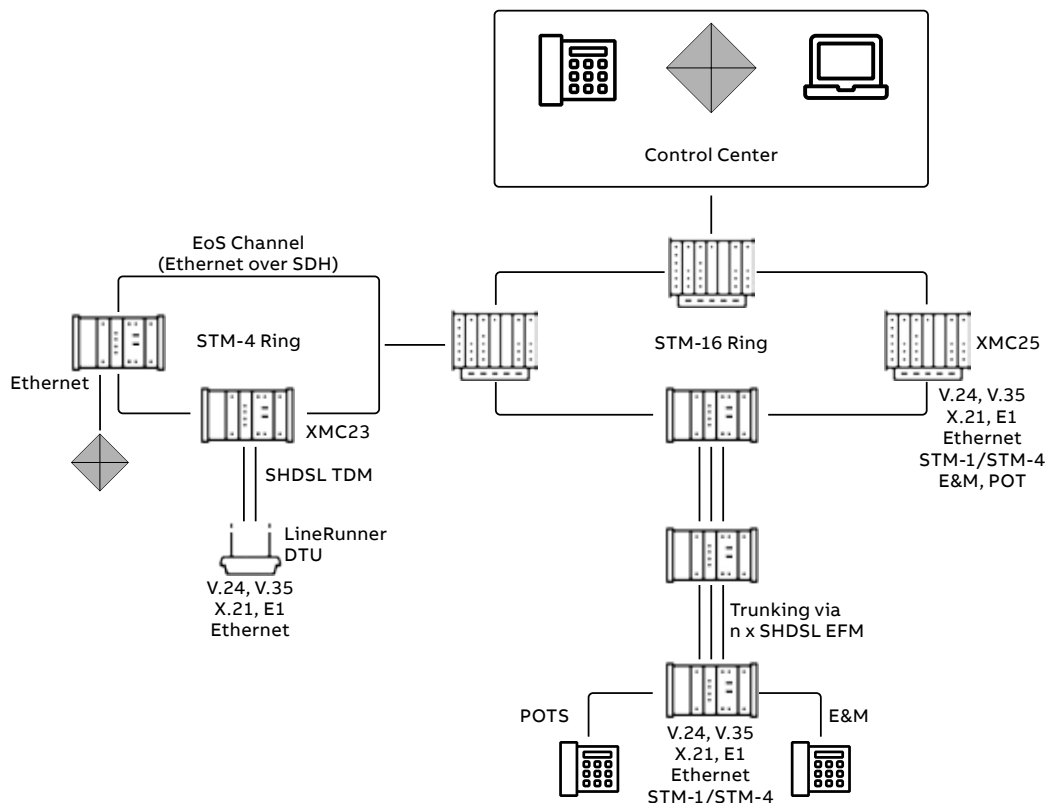
For TDM data services, XMC20 provides narrowband and broadband interfaces, for example E1, V.24,

V.35, X.21 and RS-485, including conferencing for data channels. 64 kbit/s G.703 codirectional and contradirectional is also supported.

SHDSL interfaces are available for trunking and the connection of remote locations, e.g. pump stations along pipelines. Regenerators are provided to connect locations beyond the standard SHDSL transmission range.

Reliable data transmission is secured with a multiplicity of protection and redundancy functions, such as 1+1 and 1:1 equipment protection, 1+1 path protection, or SNCP and LTP.

Should the TDM data be transported over a Packet-based Transport Network (MPLS-TP), data will be converted with XMC20 Circuit Emulation over Packet capabilities.



XMC20 Cyber Security

Cyber-Security in Mission-Critical Networks – SECU1

ABB offers the industry's first solution for highly secure end-to-end encryption of communications networks belonging to operators of critical infrastructure. ABB's hybrid XMC20 multi-service access and transport platform offers with its encryption card SECU1 the only way of making communications networks exceptionally secure in the long-term without risking availability.

The card encrypts all network traffic used to monitor and control networks belonging to energy utilities, railway companies, gas and oil pipelines, local authorities and for air-traffic control and defence purposes transparently and natively on Layer 2. The solution is tailored to these sectors' needs and can be integrated into an existing network without making any changes in the infrastructure.

Quantum-safe security

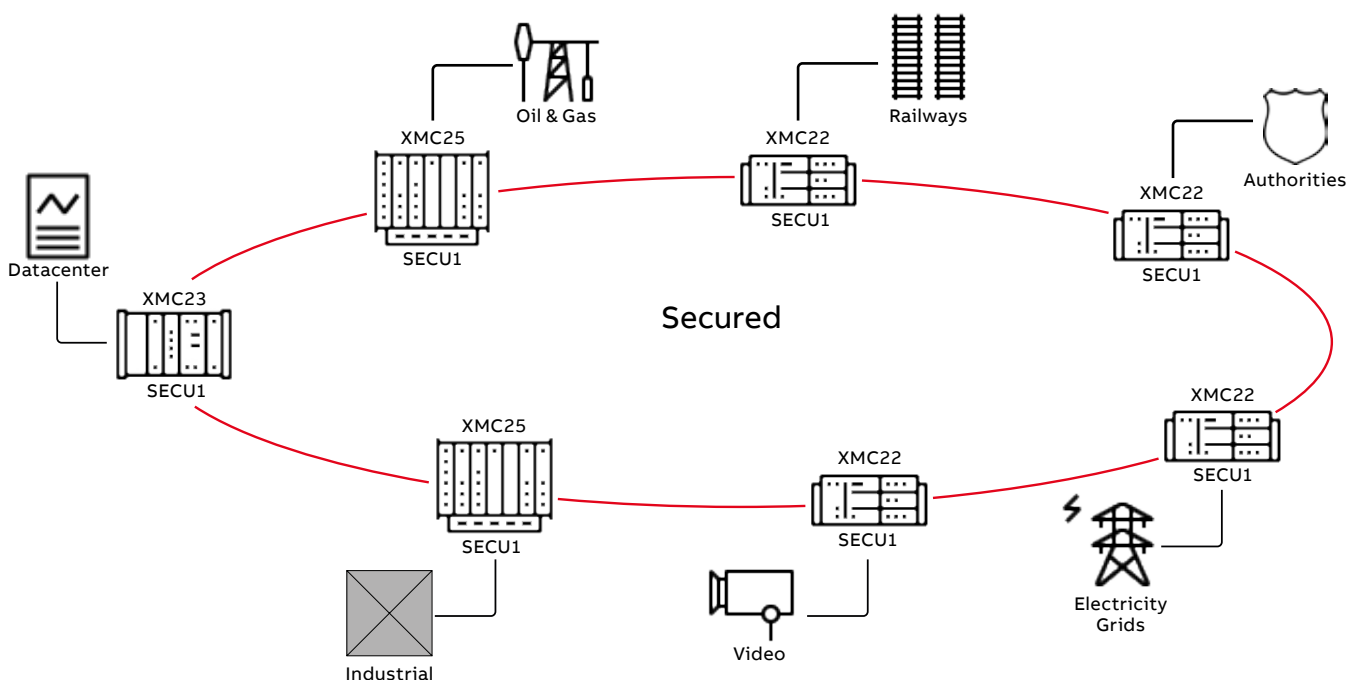
Fail-safe operation plays a key role in mission-critical networks, so as a board the card has a redundant design. Two separate encryption units are available that use a hardware-based quantum random number generator (QRNG). Physical Random Number Generator exploiting a phenomenon described by Quantum Physics to

generate truly random numbers for highly secure keys. To provide top security for mission-critical networks in the future too.

Furthermore, a Quantum Key Distribution (QKD) server from ID Quantique (IDQ) can be added to the encryption solution. IDQ is a Swiss-based, global supplier of quantum-cryptography solutions. The optional QKD server ensures true long-term protection, even in an era of quantum computers.

Highlights

- For critical services, extremely low jitter by encryption solution
- Deploy and Forget - reduce the significantly
- Complies with the stringent demands posed by mission-critical systems (MCS)
- Fanless, robust hardware integrated in the XMC20 platform
- End-to-end encryption to prevent cyber-attacks in packet-based transport networks (MPLS-TP)
- True random numbers generated by quantum physics - Quantum Random Number Generator (QRNG)
- Produced and developed in Germany and Switzerland -Trustworthiness
- The Next Level of Security for a secure, reliable and highly available solution

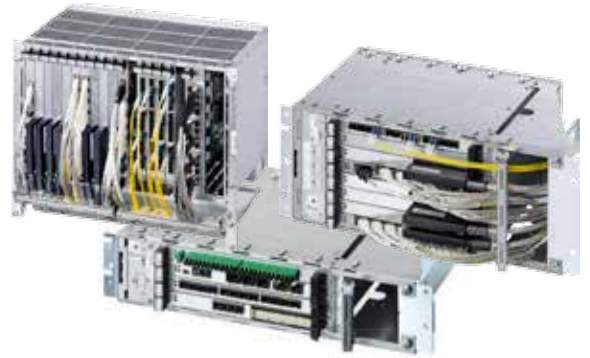


The XMC20 Subracks

XMC25 – Subrack for access points with a variety of interfaces. The XMC25 offers 21 slots for different units.

XMC23 – Offers the same functions as the XMC25 in a more compact subrack with 4 height units and 8 slots.

XMC22 – Subrack with 4 slots in a subrack with 2 height units for use in confined spaces.



Core Units and Security

COGE5/COGE5-F core units for the XMC20 platform for packet-based transport in mission critical networks.

The core units control all central functions of the system, data transfer for Ethernet data traffic and data synchronisation.

The SECU1 is a unit for the end-to-end encryption of traffic in mission-critical systems.



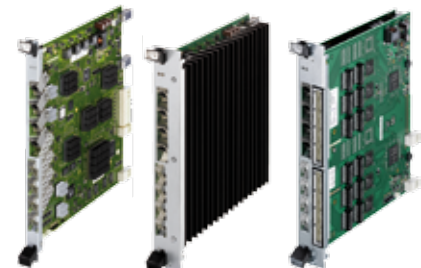
Line-Cards

The following Line Cards are available for the XMC20 platform:

Data transfer in SDH networks

To transport TDM and Ethernet services via SDH, for a smooth transition from SDH networks to pure Ethernet networks and to operate both transport modes in a single subrack.

- NUSA1(-F), NUSA2: Transport of TDM and Ethernet services via SDH STM-16/4/1 in dedicated networks



SHDSL cards

For mission-critical data transfer via symmetric SHDSL connections.

- SDSL8: Symmetric SHDSL connections for TDM services
- SUSE2(-F): Symmetric SHDSL connections for Ethernet Services over DSL (Ethernet First Mile, EFM)



Ethernet cards

High port densities, switching and extended Ethernet functions and Power-over-Ethernet for mission-critical applications.

- ETO12, ETO12-F: SFP-based Extended Ethernet functions
- ETE24: Ethernet ports with extended switching function
- SUP12: Ethernet ports with PoE+



TDM E1 and Serial data cards

For access and aggregation of important TDM services.

- SELI8: G.703 trunk / access interface
- TUGE1: Legacy 64 kbit/s G.703 interface
- TUDA1: Configurable Serial data interfaces



Interwork/Gateway cards

Optimum interaction and easy migration of TDM to Ethernet networks in a single system.

- SATP8: TDM circuit emulation
- VOIP1: SIP voice media gateway
- ETAG1: Layer 3 router and MLPPP/HDLC engine
- VRX10: IP router with VRF and VRRP



Cards for voice transmission

Legacy voice services and integration of POTS into the VOIP architecture.

- TUXA1: Foreign eXchange Office (FXO) ports
- SUPM1/2: POTS interfaces
- TUEM1: E&M voice bandwidth interfaces with conference function
- IMAG1: Port for local battery telephones



With its full-hybrid system architecture XMC20 enables new strategies for network planning. It reduces network complexity by providing a wide range of interfaces, services and technologies in a single compact subrack. This approach reduces costs and simultaneously raises the reliability of mission-critical networks by decreasing the number of utilized network components. With XMC20 your network is prepared for the challenges of today and tomorrow.

A future-proof Platform that secures your Investment

XMC20 will help you to flexibly develop and expand your MCS network. You can exploit its diverse range of services and transport technologies with a single network element thanks to its unique full hybrid platform. In addition, ABB's Cyber Security solutions offer easy to deploy and cost-efficient ways for end-to-end encryption of your mission-critical network.

XMC20 leverages transport-grade technologies with its state-of-the-art MPLS-TP and native TDM functions. In addition, XMC20 allows TDM and Packet-based services/networks to communicate via its unique gateway units. This gives you complete freedom in the choice of access and transport interfaces.

Latest developments are integrated step by step ensuring state of the art solutions and enabling

compliance with future requirements. This means that your investments are future-proof.

An extensive integrated management system (UNEM) gives you the means to efficiently monitor your network and take appropriate actions to maintain your services.

Don't hesitate to contact ABB for any questions or additional information.



Technical Data

System Features	
System architecture	Full hybrid modular platform, native TDM and Ethernet-based backplane access IEEE 802.1Q Switching Multi-Protocol Label Switching – Transport Profile (MPLS-TP) Extensive TDM-capabilities
Unit protection	1:1 equipment protection for core unit 1:1 protection for specific units
Link protection	Ethernet Ring Protection Switching – ERPS (G.8032 v2) MPLS-TP 1:1 Linear Protection
TDM protection mechanisms	1+1 path protection SNCP (Subnetwork Connection Protection)
Ethernet functionality	Customer Bridging (802.1Q VLAN), 4096 VLANs supported Port-based VLAN tunneling (Q-in-Q) Port-/PCP-/DSCP-based classification (CoS) of ingress traffic with 8 priority queues per port Maximum frame length of up to 9126 bytes (Jumbo Frames) Ingress Flow Policing (Bandwidth Profiles) Port Security (Ingress Storm Control a.k.a. Flood Control) Spanning Tree Protocols (MSTP, RSTP)
MPLS-TP functionality	MPLS-TP PE/P function acc. to IETF RFC5921 Deterministic (static) PW/LSP configuration via management plane (without control) plane Co-routed bidirectional LSP with 1:1 linear protection Layer 2 VPNs (VPWS, VPLS, H-VPLS)
Switching capacity	> 62 Gbps wire-speed
TDM cross-connect capacity	128 x 2 Mbps at 64 k level non-blocking

Security

Encryption card	Transparently and natively on Layer 2.5 (up to 10 Gbps) Hardware-based QRNG (Quantum Random Number Generator) Tamper-protected features to prevent mechanical manipulation
Encryption processes	acc. to BSI TR-02102-2 technical directive Asymmetrical – master key (key encrypting), Algorithm: ECC – Elliptic Curve Diffie-Hellman ECDH, Key length: 521 Bit, Key replacement: 60 minutes – automatic/manual, Authentication: X.509 certificate Symmetrical – session key (data encrypting), Algorithm: AES 256-GCM (Galois/counter mode– encryption and authentication), Key length: 256 Bit, Key replacement : 60 seconds –automatic Centralized and decentralized key distribution
Interfaces	4 x 10 Gbps SFP ports (two per card redundant)
Latency	3 µs

Synchronization

PETS function	Plesiosynchronous Equipment Timing Source for 2 Mbps traffic interfaces
SETS function	Synchronous Equipment Timing Source per SDH sector
SyncE function	Synchronous Ethernet acc. to ITU-T G.8262 to transfer clock signals over Ethernet PHY layer
Packet-based Synchronization	Precision Time Protocol acc. to IEEE 1588v2 for the synchronization of NE clock and ToD Technical Data XMC20

Gateways	
TDMoIP gateway	SAToP and CESoPSN functionality
Ethernet over SDH gateway	GFP acc. to ITU-T G.7041, LCAS acc. to ITU-T G.7042
Ethernet over PDH gateway	PPP and HDLC encapsulation
Voice media gateway	Session Initiation Protocol – SIP
L3 router	OSPFv2 router with VRF and VRRP

Interfaces – WAN Side	
MPLS-TP (per core unit)	2 x optical (SFP+/SFP); 3 x Electrical (RJ-45)
SDH (per service unit)	2 x STM-16/4/1 (optical), 2 x STM-1 (optical/electrical), 4 x 100/1000BaseT
Management	10/100/1000BaseT for central management

Interfaces – LAN Side	Ports per Service/Access units
Ethernet (optical/electrical, SFP-based)	12
Ethernet (electrical with PoE+)	12
Ethernet (electrical, high density)	24
Ethernet (TDM transport, with IPv4 routing)	4
SHDSL (TDM)	8
SHDSL (EFM)	24
POTS	16 (with enhanced voltage protection), 64
POTS (exchange line interface)	12
E&M	8
Serial data interfaces (V.24, V.35, X.21)	4
E1 (G.703)	8, 48

Network Management	
Management functions	Management and control of XMC20 subracks and all plug-in units Database with management information, Embedded software download Alarm collection and notification, External alarm interfacing via backplane and management
Management interface	SNMP
Local management system	ECST
Central management system	UNEM

Capacity	XMC25	XMC23	XMC22
Number of slots	21	8	4
Bandwidth per slot	1 and 10 Gbps protected (1:1)	backplane access	1 Gbps protected(1:1) backplane access

Dimensions (w x d x h) and Weights	XMC25	XMC23	XMC22
19" subrack with front cover	482.6 x 286 x 308.2 mm, 7430 g	482.6 x 283 x 177 mm, 5.050 g	482,6 x 306 x 95 mm, 3.600 g
Installation	19" and ETSI mounting practice		

EMC, Safety and Powering	
Product family standard	Telecommunication network equipment – EN 300 386 V1.3.2, class B
Safety	IEC/EN 60950-1
Input voltage nominal (min/max)	–48/–60 V DC (–39.5 V DC ... –72 V DC)

min/max) –48/–60 V DC (–39.5 V DC ... –72 V DC)	
Temperature range system	–25 °C ... +60 °C
Temperature range system (fanless operation)	–25 °C ... +55 °C
Humidity	According to class 3.2, up to 95 %, non-condensing

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