

## SAFN-CM Flexible Transport/Access Multiplexer



Introducing the **SAFN-CM Multiplexer**, a state-of-the-art solution specifically designed for Access and Transport networks in the energy market, enabling a smooth and efficient transition from traditional SDH systems to modern MPLS/IP-based infrastructures. The SAFN-CM Multiplexer is engineered to provide highly reliable and secure communication for mission-critical services in utility networks, such as RTU, SCADA, teleprotection, and operational voice services.

The SAFN-CM Multiplexer bridges legacy TDM/PDH/SDH networks with packet-based MPLS/IP architectures, supporting a hybrid network environment to ensure continuity during the transition phase. With advanced features like integrated Ethernet and IP/MPLS functionality, the SAFN-CM is ideal for managing both traditional and future-proof IP-based applications within the same platform, minimizing the need for costly infrastructure upgrades.

Designed for flexibility, the SAFN-CM supports a variety of interface modules, enabling utilities to customize their network according to specific operational requirements. Its modular architecture provides scalability, allowing for easy expansion as network demands grow, and ensures high availability through robust redundancy mechanisms. This ensures seamless communication for critical applications like protection relays, substation automation, and data acquisition, all while ensuring low-latency and high-availability performance.

The SAFN-CM also ensures comprehensive cyber security compliance, safeguarding communication networks in an increasingly digital energy landscape. Its dual functionality in both SDH and MPLS/IP environments makes it the ideal choice for energy providers looking to optimize their operational efficiency and prepare for the demands of smart grid infrastructure, ensuring a future-ready, resilient communication network.

## SAFN-CM - EQUIPPING OPTIONS

### SDH NODE, 6-SLOT SUBRACK

F A N	1	A-DXC	Tributary	Power <sup>1)</sup>		4
	2	CU SDH <sup>3)</sup>	Tributary	Power <sup>5)</sup>	Tributary	5
	3	CU SDH		A-DXC	Tributary	6

### SDH NODE, 16-SLOT SUBRACK

Tributary	Tributary	CU SDH	Tributary	Tributary	Tributary	Power <sup>1) 2)</sup>	Power <sup>2) 5)</sup>	Tributary	Tributary	Tributary	Tributary	Tributary	Tributary	Tributary	Tributary	Tributary
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
FAN 1								FAN 2 <sup>6)</sup>								

1) Power adapter unit in the primary power slot is mandatory because the local Ethernet management and external synchronization are connected to it.

2) Must be Power Adapter with Bus Extension.

3) When two SDH trunk units are used, they can either work in a hot-standby mode or as individual control units each with their own dedicated tributary units.

5) On redundant power units, the Ethernet management interfaces and the external synchronization interfaces are not supported.

6) Depending on the subrack equipping, a second fan unit may be needed.

## SAFN-CM - EQUIPPING OPTIONS

### HYBRID MPLS-TP/SDH, 6-SLOT SUBRACK

F A N	1	CE 8 ports	Tributary	Power <sup>1)</sup>		4
	2	CU SDH <sup>3)</sup>	Tributary	Tributary	CU CE 24 ports <sup>7)</sup>	Power <sup>5)</sup>
	3	CU SDH		CE 8 ports		Tributary

### HYBRID MPLS-TP/SDH, 16-SLOT SUBRACK

	CU CE 24 ports <sup>7)</sup>				CU CE 24 ports <sup>7)</sup>											
	CE8 ports	CE8 ports		Tributary	CE8 ports	CE8 ports			Tributary							
	Tributary	Tributary	CU SDH	CU SDH <sup>3)</sup>	Tributary	Tributary	Power <sup>1) 2)</sup>	Power <sup>2) 5)</sup>	Tributary	Tributary	Tributary	Tributary	Tributary	Tributary	Tributary	Tributary
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
FAN 1								FAN 2 <sup>6)</sup>								

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5) On redundant power units, the Ethernet management interfaces and the external synchronization interfaces are not supported.

6) Depending on the subrack equipping, a second fan unit may be needed.

7) CU CE 24 ports occupies two slots.

## SAFN-CM - EQUIPPING OPTIONS

### NATIVE PACKET MPLS-TP, 6-SLOT SUBRACK.

FAN	1	CEI	Power <sup>2)</sup>	Power	Tributary	4
	2	CU CE 8 ports		Power <sup>2)</sup>	Tributary	5
	3	CU CE 8 ports		CEI	Power <sup>2)</sup>	6

FAN	1	N/A		Power		4
	2	CU CE 24 ports <sup>4)</sup>		Power <sup>2)</sup>		5
	3			N/A		6

### NATIVE PACKET MPLS-TP, 16-SLOT SUBRACK.

Tributary <sup>5)</sup>	Tributary <sup>5)</sup>	CU CE 8 ports	CU CE 8 ports	CEI	CEI	Power <sup>1)</sup>	Power <sup>1) 2)</sup>	Tributary	Tributary	Tributary	Tributary	Tributary	Tributary	Tributary	Tributary	Tributary
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
FAN 1								FAN 2 <sup>3)</sup>								

- 1) Must be Power Adapter with Bus Extension.
- 2) The local Ethernet management interfaces and the external synchronization interfaces are not supported.
- 3) Depending on the subrack equipping, a second fan unit may be needed.
- 4) CU CE 24 ports occupies two slots.
- 5) Slot 1 and 2 supported by CE8+ unit version.

### SAFN-CM - EQUIPPING OPTIONS

#### TECHNICAL DATA –CONTROL UNIT SDH

CU SDH	
Low Order cross-connect capacity	500 VC-12s (add-drop terminal mux) 250 x 250 VC-12s (bypass)
High Order cross-connect capacity	80 x 80 VC-4s (bypass)
DS0/64kbps cross-connect capacity	230 x 230 VC-12s/E1
LO/HI order VCAT	32 groups
Ethernet encapsulation	GFP, LAPS, PPP/HDLC: 32 channels
SDH protection	MSP 1+1 uni-directional MSP 1+1 bi-directional SNCP/UPSR ring Switch over time 50 ms
SFP interfaces	4 x STM-4/16, 4 x STM-1/4 or 4 x STM-4/16, 2 x STM-1/4, 2 x GE  Transceiver type selected by SFP Digital diagnostics
Cooling	Forced cooling; fan is mandatory
Redundancy	1+1 hot stand-by Switch over time 500 ms

#### SDH Management – Multiservice Manager

Compatible operating systems	Windows 11 Windows 10 Windows Server 2016 Windows Server 2019
Encryption	User names and passwords encrypted
Management Information Bases (MIBs)	SAFN-CM Private MIB RFC 1213 SONET MIB SNMP v2c compatible SNMP v3 compatible
PC requirements	Processor: 1 GHz or faster processor or SoC RAM: 1 GB (32-bit) or 2 GB (64-bit) Hard disk space: 16 GB (32-bit) or 20 GB (64-bit); 100 MB free hard disk space for each SAFN-CM SDH Multiservice Manager release Minimum screen resolution: 1280x1024
Protocol/Port	TCP / 5138 (stand-by CU 5139)

### SAFN-CM - EQUIPPING OPTIONS

#### TECHNICAL DATA – CARRIER ETHERNET CONTROL UNIT

CU Carrier Ethernet Plus, 8 ports	
CU Carrier Ethernet Plus, 24 ports	
Ethernet interfaces	4 x 100 MbE / 1/2.5/10 GbE SFP and 4 x 100 MbE / 1/2.5 GbE SFP
Ethernet interfaces	4 x 100 MbE / 1/2.5/10 GbE SFP and 4 x 100 MbE / 1/2.5 GbE SFP and 16 x 10/100/1000 BASE-T RJ-45
Layer 2 switching	Switching capacity max. 80 Gbps Link aggregation (IEEE 802.3ad) VLANs (IEEE 802.1Q) Flow control (IEEE 802.3x) Spanning tree (IEEE 802.1D, 802.1w) IGMP snooping GVRP
Layer 3 forwarding	IPv4/IPv6 L3 routing OSPF routing for remote management L3 multicast
Carrier Ethernet features (MEF CE2.0)	MEF UNI and NNI functionality HW-based OAM, performance, monitoring, and testing (IETF RFC 2544, ITU-T Y.1564) 454 x Ethernet Virtual Circuits (EVC) E-LINE, E-LAN VLAN Stacking Q-in-Q (IEEE 802.1ad)
MPLS-TP 1)	Linear protection switching Virtual Private Wire & LAN Service (VPWS & VPLS) 200 x pseudo wires 200 x MPLS-TP tunnels 200 x LSP support Static LSP/PW provisioning via NMS 8 x CoS
TDM over Packet 2)	SAToP 128 x E1/VC-12 (IETF RFC 4553 MEF8) 1+1 path protection, TDM + SAToP
TDM cross connection, time slot level	Connection Matrix size 128 x E1 B-type point-to-point connections
Quality of Service (QoS)	Advanced QoS Hierarchical QoS Dual rate policing, shaping, queuing & statistics
Protection	Protection switching (sub 50 ms) 1:1 port protection (ITU-T G.8031/Y.1342) 1:N Port Protection G.8031 ERPS (ITU-T G.8032v2/Y.1344)

1) Functional license needed.

2) SAToP enabler license needed at native packet node. SAToP included to Hybrid node basic license.

### SAFN-CM - EQUIPPING OPTIONS

#### TECHNICAL DATA – CARRIER ETHERNET

CU Carrier Ethernet Plus, 8 ports	
CU Carrier Ethernet Plus, 24 ports	
Synchronization	Precision Time Protocol (PTP) over Ethernet (IEEE 1588v2; ITU-T G.8275.1) Precision Time Protocol (PTP) over IP (IEEE 1588v2; ITU-T G.8265.1) Precision Time Protocol (PTP) Power profile C37.238 ) <sup>1)</sup> Synchronous Ethernet (SyncE; ITU-T G.8261 ) SDH / PDH signal
Data encryption 1)	L2 level AES-GCM 128/192/256 Encryption with authentication or authentication only Per VLAN/VLANs at a port Maximum 256 individual services Maximum encryption capacity 2 Gbps MTU decrypted 1972 bytes / encrypted 2042 bytes
OAM	End to end circuit provisioning via NMS OAM for Ethernet (IEEE 802.1ag, ITU-T Y.1731) OAM for MPLS-TP (ITU-T G.8113/Y.1372)
Management	CLI Web GUI SNMP v2c / v3

1) Functional license needed

### SAFN-CM - EQUIPPING OPTIONS

#### TECHNICAL DATA – INTERFACES

<b>CEI - Carrier Ethernet Interface Unit RJ45</b>	
Ethernet interface	8 x 10/100/1000 BASE-T RJ-45
Switching capacity	Non-blocking
Switching functionality	All CU CE features; switch matrix at CU CE units
Maximum frame size	10240 bytes
Switchover time from active to stand-by CU CE unit	Maximum 500 ms
PoE PSE	IEEE 802.3af Type 1 IEEE 802.3.at Type 2
PoE PSE maximum power	Type 1: 15 W Type 2: 30 W
Alarms	Loss of Link Port MEP
<b>CEI - Carrier Ethernet Interface Unit SFP</b>	
Ethernet interface	8 x 100 MbE / 1 GbE SFP Digital diagnostics
Switching capacity	Non-blocking,
Switching functionality	All CU CE features, switch matrix at CU CE units
Maximum frame size	10240 bytes
Switchover time from active to standby CU CE unit	Maximum 500 ms
Alarms	Loss of Link Port MEP



### SAFN-CM - EQUIPPING OPTIONS

#### TECHNICAL DATA – INTERFACES

<b>Ethernet Unit 1000BT, 8 ports</b>	
RJ-45 interface	6 x 10/100/1000BASE-T Full duplex or half duplex Auto negotiation 4 x PoE
SFP interface	1 x 10/100/1000BASE 1 x 1000BASE  Transceiver type selected by SFP Digital diagnostics
Maximum frame size	1632 bytes
L2 switching	VLAN (IEEE 802.1Q) QoS (IEEE 802.1p) Port statistics
PoE PSE	IEEE 802.3af
PoE PSE maximum power	15 W
Alarms	Loss of Link
<b>E1/T1 Unit, 8 ports, 75 ohm E1/T1 Unit, 8 ports, 120 ohm</b>	
G.703 interface	8 x SMB 8 x RJ-45
Impedance	75 ohm 120 ohm
Framing	G.704 or unframed
E1 interface	Short haul, maximum attenuation 6 dB
Alarms	Loss of Signal, RxAIS, Loss of Frame, Loss of Multiframe (LOM), BER 10E-3, RDI (Remote Defect Indicator)
Testing utilities	Loop to Equipment, Loop to Line (local loop), Loop to Equipment and Line

### SAFN-CM - EQUIPPING OPTIONS

### TECHNICAL DATA – INTERFACES

<b>Data Unit V and X, 4 ports</b>	
4-port SSC interface	V.28, V.11, V.35, X.21, RS-530, RS-530A
Interface type	DCE or DTE
Transmission mode	Asynchronous / synchronous: V.28, V.11, V.35, X.21, RS-530, RS-530A Asynchronous: By using async / sync conversion (ITU-T Rec. V.14 or over sampled) Transition coded (ITU-T Rec. R.111) / sampling / sampling&filtered
Transmission rate	48 kbit/s, 56 kbit/s, nx64 kbit/s up to 1984 kbit/s Subrates by using V.110 rate adaptation: 0.6...56 kbit/s Subrates by using transition coded, sampling or sampling&filtered: 0.6...19.2 kbit/s
Alarms	Loss of Signal, Loss of Clock, Loss of V.110 Frame
Testing utilities	Loop to Line (local loop), Loop to Equipment, BERT towards line or equipment
<b>Data Unit G.703/64k, 8 ports</b>	
G.703 / 64 kbit/s interfaces	8 x RJ-45
Impedance	120 ohm
Signaling	co-directional / contra-directional
Alarms	Loss of Signal, AIS, Loss of Octet Timing
Testing utilities	Loop to Line (local loop), Loop to Equipment, BERT towards line or equipment
<b>Data Unit V.24, 20 ports</b>	
V.24 interfaces	4 x SSC connectors, 5 ports / SSC
Transmission mode	DCE Asynchronous V.110: By using async / sync conversion (ITU-T Rec. V.14 or over sampled) Transition coded (ITU-T Rec. R.111) Sampled 64k
Transmission rate	V.110: 0.6...38.4 kbit/s Transition coded and sampled 64k: 0.6...19.2 kbit/s
Alarms	Toggled (non-activity of incoming signal), Loss of V.110 Frame
Testing utilities	Loop to Line (local loop), Loop to Equipment, BERT towards line or equipment

### SAFN-CM - EQUIPPING OPTIONS

#### TECHNICAL DATA – INTERFACES

Optical Teleprotection Unit, 4 ports	
Optical interfaces	8 x ST connector, 4 ports nx64 kbit/s payload (n = 1...12); multimode fiber; transmission capacity per port: 64...768 kbit/s
Protocol	IEEE C37.94
Fiber type	50/125 µm or 62.5/125 µm multimode optical fiber
Distance	Max. 1.5...2 km; depends on used fiber and the selected OTP transmitter level
Optical receiver sensitivity	-32 dBm (±2 dB)...-11 dBm (±2 dB)
Optical transmitter wavelength	830 nm ± 40 nm
Optical transmitter level	50 µm fiber: > -23.0 dBm (±2 dB) and < -11.0 dBm (±2 dB) 62.5 µm fiber: > -20.5 dBm (±2 dB) and < -14.3 dBm (±2 dB) OTP transmitter level is SW settable
Bit rate	2048 kbit/s ± 100 ppm
Alarms	Loss of Signal Loss of Clock Loss of Frame Remote Defect Indicator (RDI) AIS
Testing utilities	Loop to Line (local loop), Loop to Equipment BERT towards line or equipment Round trip delay measurement
Optical Teleprotection SFP Unit , 4 ports	
Optical interfaces	4 x SFP nx64 kbit/s payload (n = 1...12); multimode or single-mode fiber; transmission capacity per port: 64...768 kbit/s
Protocol	IEEE C37.94
Fiber type	50/125 µm or 62.5/125 µm multimode optical fiber 9/125 µm single-mode fiber
SFP type	Standard (LVDS) Single-ended (LVTTTL)
Distance	Depends on used fiber and SFP
Bit rate	2048 kbit/s ± 100 ppm
Alarms	Loss of Signal Loss of Clock Loss of Frame, Remote Defect Indicator (RDI) AIS Tx Fault SFP
Testing utilities	Loop to Line (local loop), Loop to Equipment BERT towards line or equipment Round trip delay measurement'

### SAFN-CM - EQUIPPING OPTIONS

#### TECHNICAL DATA – INTERFACES

VF/E&M Unit, 8 ports	
8-port SSC interface	8 x 2-wire / 4-wire
Impedance 4-wire	600 ohm
Impedance 2-wire	600 ohm 900 ohm 600 ohm + 2.16 $\mu$ F 900 ohm + 2.16 $\mu$ F 270 ohm + 750 ohm    150 nF 220 ohm + 820 ohm    120 nF 220 ohm + 820 ohm    115 nF 370 ohm + 620 ohm    310 nF
Transmit / Receive Level settings	-30.0...+15.5 dB (freely selectable values)
Signaling	3 x E and 3 x M per port
Alarms	AIS
Testing utilities	Tx/Rx test tone, Equipment loop from digital to digital direction, Line loop from analog to analog direction
FXS Unit, 16 ports	
RJ-45 interface	8 connectors, 2 ports/connector
Integrated ring generator	25 Hz / 50 Hz
Impedance	600 ohm 900 ohm 600 ohm + 2.16 $\mu$ F 900 ohm + 2.16 $\mu$ F 270 ohm + 750 ohm    150 nF 220 ohm + 820 ohm    120 nF 220 ohm + 820 ohm    115 nF 370 ohm + 620 ohm    310 nF
Cable maximum length	10 km @ 0,4mm
Transmit / Receive Level settings	-30.0...+6.0 dB; selectable values: -30.0, -20.0, -15.0, -12.0, -10.0, -8.0, -6.0, -5.0, -4.0, -3.0, -2.0, -1.0, 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0
Signaling	R2 / Hot Line / Custom CAS
Alarms	AIS
Testing utilities	Tx/Rx test tone, Equipment loop from digital to digital direction, Line loop from analog to analog direction,

### SAFN-CM - EQUIPPING OPTIONS

### TECHNICAL DATA – INTERFACES

<b>FXO Unit, 16 ports</b>	
RJ-45 interface	8 connectors, 2 ports/connector
Alarms	AIS
Transmit / Receive Level settings	-15.0...+12.0 dB (values selectable in 1 dB steps)
Signaling	R2 / Hot Line / Custom CAS
Testing utilities	Tx/Rx test tone, Equipment loop from digital to digital direction, Line loop from analog to analog direction.
<b>Advanced DXC Unit</b>	
Cross-connect capacity	Based on license Maximum cross-connect capacity: 189 x E1 / VC-12 links (equivalent to 63 E1 Y loops) Granularity: 8 kbit/s...nx64 kbit/s, non-blocking
Connection types	B, point-to-point connection with support for max. 2 condition bits Y, loop protection with support for pilot bit C, digital summing with support for max. 2 condition bits S, VF summing with support for max. 2 condition bits M, bit masking with support for max. 2 condition bits D, fixed data pattern with support for max. 2 condition bits
Framing	G.704 framed; PCM30, PCM30CRC4, PCM31, PCM31CRC4
Redundancy	1+1 hot stand-by

### SAFN-CM - EQUIPPING OPTIONS

### TECHNICAL DATA – INTERFACES

Alarm Unit	
Relay interface	1 connector, 3 relay outputs, cable connector 6-position Phoenix MC1.5/6-ST-3.81; dry loop or ground connection
Relay output	Logical "0" level resistance > 100 kohm Logical "1" level resistance < 100 ohm Maximum voltage between relay contacts (relay open) 100 V Maximum current 100 mA; 2A with jumper NR5/6/7R connected
Digital interfaces	3 connectors, 15 inputs, cable connector 6-position Phoenix MC1.5/6-ST-3.81; E&M or TTL; Alarm filtering time 10 ms...10 min
Digital input E&M state	Logical "0" level < 100 ohm to ground Logical "1" level > 100 kohm to ground Nominal voltage -10.0 V (open circuit) Nominal current limit (shorted to ground) -1.8 mA
Digital input TTL state	Logical "0" level < 0.8 V Logical "1" level > 2.4 V Nominal voltage 3.0 V (open circuit) Nominal current limit (shorted to ground) 1.5 mA
Analog interface	1 connector, 4 inputs, cable connector 6-position Phoenix MC1.5/6-ST-3.81; Alarm filtering time 10 ms...10 min
Analog input	Measurement scale: -120 VDC...+120 VDC (LSB 0.3 V) or 0.0 VDC...3.3 VDC (LSB 4 mV) Accuracy 1% 10-bit A/D conversion Sampling rate approx. 10 kHz Averaging filter follows alarm filter setup.

### SAFN-CM - EQUIPPING OPTIONS

#### TECHNICAL DATA – MECHANICS

<b>Subrack 6-Slot</b>	
Installation capacity	2...4 tributary units
Size (w x h x d)	439 mm x 88 mm x 282 mm
<b>Subrack 16-Slot</b>	
Installation capacity	12...14 tributary units
Size (w x h x d)	439mm x 269mm x 282mm
Air Filter	Optional dust filter to left hand side fan.
<b>Fan Unit for 6-Slot Subrack</b>	
Maximum rotation	6900 rpm
Lifetime of fans	8 years (at +20 °C ambient temperature)
Air flow	75 m <sup>3</sup> /h (6900 rpm)
<b>Fan Unit for 16-Slot with alarm output</b>	
Maximum rotation	6000 rpm
Lifetime of fans	8 years (at +20 °C ambient temperature)
Air flow	130 m <sup>3</sup> /h (6000 rpm)
Alarm interface	3-position Phoenix MC1.5/3-G-3.81 (unit connector) 3-position Phoenix MC1.5/3-ST-3.81 (cable connector) Characteristics of relay contact: U = 57 V , I max = 500 mA

### SAFN-CM - EQUIPPING OPTIONS

#### TECHNICAL DATA – POWER

Power Adapter DC	Interfaces
Battery	2 x voltage inputs
RJ-45 interface SYNC	E1, 120 ohm
Alarms	Loss of Signal, RxAIS, Loss of Frame
Testing utilities	Loop to Equipment, Loop to Line (local loop),
RJ-45 interfaces ETH1 and ETH2	10/100BASE-T local management interfaces

Power adapter options	6-Slot Subrack	16-Slot Subrack	ETH1, PoE PSE 3)	Voltage monitor 4)
Power Adapter DC 48V	✓	○ <sup>2)</sup>	✓	✓
Power Adapter DC 48V Lite	✓	○ <sup>2)</sup>	-	-
Power Adapter DC 24-60V/48V <sup>1)</sup>	✓	-	✓	✓
Power Adapter DC 48V Bus Ext.	-	✓	✓	✓
Power Adapter DC 48V Bus Ext. Lite	-	✓	-	-
Power Adapter DC 110V Bus Ext.	✓	✓	✓	✓

1) Mixed installation of the power adapter variant DC 24-60V/48V and the other variants – DC 48V and DC 2) 110V – in a single subrack is not acceptable

3) Only slots 1-8 supported

4) IEEE802.3af

5) Battery input voltage and current monitor

#### DC Power Adapter voltages

Unit	U <sub>max</sub> (V)	U <sub>min</sub> (V)	P <sub>max</sub> out (W)	I <sub>max</sub> (A)	Breaker size (at 80V) <sup>2)</sup>
Power Adapter DC 48V	-40.5	-57.0	400 W	9.98 A	10 A
Power Adapter DC 24-60/48V	-20.0	-72.0	80 W at 24V 120 W at 48V	4 A (24V) 3 A (48V)	10 A
Power Adapter DC 48V Bus Extension	-40.5	-57.0	400 W	9.98 A	10 A
Power Adapter DC 110V Bus Extension	-77	-138	300 W	3.90 A	5 A <sup>3)</sup>

2) Breaker located on the board

3) Glass tube fuse



### SAFN-CM - EQUIPPING OPTIONS

#### TECHNICAL DATA – POWER CONSUMPTION, WEIGHT AND MTBF

Product	Power consumption (max. W)	Weight (g) (includes package)	MTBF (years)
CU SDH	50	750	26
CU Carrier Ethernet plus 8 ports	30	600	40
CU Carrier Ethernet plus 24 ports	40	880	30
Carrier Ethernet RJ45 IF Unit, 8 ports	18 <sup>1)</sup>	530	65
Carrier Ethernet SFP IF Unit, 8 ports	15	500	94
Ethernet Unit 1000BT, 8 Ports	12 <sup>1)</sup>	540	60
E1/T1 Unit, 8 ports, 75 ohm	8	490	104
E1/T1 Unit, 8 ports, 120 ohm	8	490	114
Data Unit V and X, 4 ports	9	500	69
Data Unit G.703/64k, 8 ports	5	560	62
Data Unit V.24, 20 ports	5	500	69
Optical Teleprotection Unit, 4 ports	5	490	43
Optical Teleprotection SFP Unit, 4 ports	10	490	118
VF/E&M Unit, 8 ports	10	580	26
FXS Unit, 16 ports	20	600	54
FXO Unit, 16 ports	20	520	45
Fan Unit for 6-Slot Subrack	9	400	190
Fan Unit for 16-Slot Subrack with alarm output	29	1780	230
Power Adapter DC 48V	6 <sup>1)</sup>	630	91
Power Adapter DC 48V Lite	6	630	111
Power Adapter DC 24-60/48V	15	690	82
Power Adapter DC 48V Bus Extension	15 <sup>1)</sup>	720	69
Power Adapter DC 48V Bus Extension Lite	15	720	80
Subrack 6-Slot	n/a	3920	568
Subrack 16-Slot	n/a	9160	326
Advanced DXC Unit	8	450	122
Alarm Unit	5	490	50
SFP transceiver <sup>2)</sup>	1	40	380

1) Without PoE (Power over Ethernet) load.

2) Maximum values for all tested SFP models

### SAFN-CM - EQUIPPING OPTIONS

#### TECHNICAL DATA – ENVIRONMENTAL – COMPLIANCE WITH STANDARDS

Climatic	Operation: EN 300 019-1-3, Class 3.2 Continuous operating temperature: -5 to +55 °C Continuous operating relative humidity: 5 to 95% Temporary operation: maximum 16 h at +65 °C  Storage: EN 300 019-1-1 Class 1.2 (-25 to +55 °C) Transport: EN 300 019-1-2 Class 2.3 (-40 to +70 °C)
EMC	EN 300 386 V1.6.1 EN 55032 EN 50121-4
Safety	EN 60950-1
RoHS	EN IEC 63000:2018

### SAFN-CM - EQUIPPING OPTIONS

### TECHNICAL DATA – FUNCTIONALITIES – COMPLIANCE WITH STANDARDS

SAFN-CM complies with the relevant parts of the below standards

<b>SDH standards</b>	<p>ITU-T G.702 Digital hierarchy bit rates</p> <p>ITU-T G.707 Network node interface for the synchronous digital hierarchy (SDH)</p> <p>ITU-T G.783 Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks</p> <p>ITU-T G.784 SDH management</p> <p>ITU-T G.803 Architecture of transport networks based on the SDH</p> <p>ITU-T G.825 The control of jitter and wander within digital networks which are based on the SDH</p> <p>ITU-T G.826 End-to end performance parameters and objectives</p> <p>ITU-T G.828 Error performance parameters and objectives for international, constant bit-rate synchronous digital paths</p> <p>ITU-T G.829 Error performance events for SDH multiplex and regenerator sections</p> <p>ITU-T G.841 Types and characteristics of SDH network protection architectures</p> <p>ITU-T G.7041/Y.1303 Ethernet encapsulation (GFP)</p> <p>ITU-T X.85, X.86, Y.1321 Ethernet encapsulation</p> <p>ITU-T G.7042/Y.1305 Link capacity adjustment scheme (LCAS) for virtual concatenated signals</p> <p>ITU-T G.707/Y.1322 Network node interface for SDH</p> <p>RFC 1619/1662/2615, PPP data encapsulation over SONET/SDH for remote communications</p>
<b>E1 standards</b>	ITU-T G.703, G.704, G.706, G.732, G.736, G.823
<b>Clocking</b>	ITU-T G.957, G.692, G.810, G.811, G.812, G.813
<b>V and X standards</b>	ITU-T V.14, V.110, R.111, V.24/V.28, X.21(V.11), V.35
<b>Ethernet</b>	<p>RJ-45 interfaces</p> <p>10BASE-T IEEE 802.3i</p> <p>100BASE-T IEEE 802.3u</p> <p>1000BASE-T IEEE 802.3ab</p> <p>SFP interfaces</p> <p>100BASE-T IEEE 802.3u</p> <p>1000BASE IEEE802.3z</p> <p>2.5GBASE IEEE802.3bz</p> <p>10GBASE IEEE8023.ae</p>
<b>Voice channels</b>	ITU-T G.711, G.712
<b>Optical teleprotection</b>	IEEE C37.94-2002
<b>DCC Interoperability</b>	ITU-T G.7712 IP only mode RFC STD51/RFC 1661
<b>Management</b>	RFC 1213 MIB 2 RFC 2558 SONET MIB
<b>Routing (DCC channel)</b>	RFC 1058, RFC 2453 RIP RFC 2328 OSPF
<b>Syslog</b>	RFC 3164 RFC 3195
<b>Power over Ethernet</b>	IEEE802.3af IEEE802.3at

## SAFN-CM - EQUIPPING OPTIONS

### TECHNICAL DATA – FUNCTIONALITIES – COMPLIANCE WITH STANDARDS

SAFN-CM complies with the relevant parts of the below standards

#### MPLS-TP standards

MPLS label stack as per RFCs 3031 and 3032

Static and bidirectional hierarchical LSPs as per RFC 3031

MPLS E-LSPs and L-LSPs as per RFC 3270

Diff-Serv tunneling models over MPLS as per RFC 3270

MPLS TTL processing as per RFC 3443

Static Ethernet PWs (raw and tagged) as per RFC 4448

Optional, generic PW MPLS control word (w/o sequence number check algorithm) as per RFC 4448

VPLS support (static) in full mesh topologies and H-VPLS support (static) as per RFC 4762

PW VCCV types 1–3 (w CW) as per RFC 5085

Marking of CoS as per RFC 5462

Identifying and processing of MPLS-TP OA&M frames using GAL as per RFCs 5586 and 7026

Point-to-point bidirectional sections and LSPs as per RFC 5960

PW stitching i.e. statically configured MS-PWs as per RFC 6073

Static, unicast addressing for labelled frames over LAN media as per RFC 7213

PW VCCV type 4 (w/o CW) as per RFC 7708

1:1 bidirectional EVC protection with working and protection LSPs using G.8031

1:1 bidirectional EVC protection with working and protection PWs using G.8031

Ring protection with LSP monitoring using G.8032

MPLS-TP OA&M functions as per G.8113.1 (Y.1731)

### SAFN-CM - EQUIPPING OPTIONS

#### TECHNICAL DATA – COMPLIANCE WITH STANDARDS – DETAILS

Standard	Test	Test object	Level
EN 55032 (2012)	Radiated emissions	Enclosure port, 30 MHz...6 GHz	Class B
EN 55032 (2012)	Conducted emissions	DC power port	Class B
		Signal port	Class B
EN 61000-4-2 (2009)	Electrostatic discharge immunity	Contact discharge	±6 kV
		Indirect contact discharge	±6 kV
		Air discharge	±8 kV
EN 61000-4-3 (2006); +A1 (2008); +A1 (2010)	Radiated RF field immunity	Enclosure ports, 80...2700 MHz	10 V/m
		Enclosure ports, 800...1000 MHz	20 V/m
EN 61000-4-4 (2004); +A1 (2010)	Electrical fast transient/burst immunity	DC power port	±4 kV
		Signal ports	±2 kV
EN 61000-4-5 (2006)	Surge immunity	DC power port line to line	±2 kV
		DC power port line to GND	±2 kV
		Signal ports line to GND	±2 kV
EN 61000-4-6 (2009)	Conducted RF immunity	DC power port	10 V
		Signal ports	10 V
EN 61000-4-8 (2010)	Power frequency magnetic field immunity	Enclosure port	300 A/m
EN 61000-4-9 (2009)	Pulsed magnetic field immunity	Enclosure port	±300 A/m
EN 61000-4-18 (2010); +A1 (2010)	Slow damped oscillatory wave immunity	DC power input, common mode	2.5 kV
		DC power input, differential	2.5 kV
		Signal ports, common mode	1 kV
		Signal ports, differential	1 kV
IEC 61000-4-12 (1995)	Oscillatory waves immunity	DC power port	2.5 kV
		Signal ports	2.5 kV
IEC 61000-4-17	DC power, ripple immunity	DC power port	10%
ITU-T K.45	Surge immunity	Signal ports outdoor	±1500 V



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