

Data Sheet

7-Port Ethernet 10G Micro Switch PoE++



10G Uplinks (IEEE 802.3ae)

2x 1/10G uplink for maximum performance and flexibility in the FTTO network



2.5/5G Downlink (IEEE 802.3bz)

Multi Gigabit port optimised for Wi-Fi 6 network operation



PoE++ PSE Local Port (IEEE 802.3bt)

Downlink with up to 60W PoE supply



IT Security

MICROSENS SECURE feature set for a high level of IT security



Compact Mounting Format M45

Compact M45 format for easy and construction conform mounting



Fanless Design

No noise emission at the workplace



Docker Virtualization Environment

Integrated Docker system for free programming of custom functions



Standardised Network Redundancy (ERPS nach G.8032v2)

Feature set for special redundancy topologies in the FTTO network

Characteristics

10 Gigabit Ethernet Switch

- Fanless 10 Gigabit Ethernet Switch
- Layer-2+ store-and-forward, full wire-speed, non-blocking
- Max. 16K MAC addresses, automatic learning and aging
- Jumbo frames (max. 10KBytes)

Network Management

- Support of common management standards
- Web manager (https, http, custom certificates)
- Industry standard CLI via SSH, Telnet
- Console interface
- SNMP v1/v2c/v3
Transport Security Model (TSM)
- Software integration with MICROSENS NMP as central management solution for network and device configuration
- Docker virtualization environment as platform for custom automation*

Security

- Selectable user authentication modes: Local DB, RADIUS, TACACS+
- Access permissions configurable for users and groups
- Port-based Network Access Control
 - MAC Locking
 - MAC via RADIUS, IEEE 802.1X
 - IEEE 802.1X Supplicant, incl. MD5, PEAP, PEAP-MSCHAP v2, TTLS, TLS v1.2/v1.3
- Access control lists
- Storm control
- DHCP snooping, ARP inspection, PPPoE snooping

Redundancy

- Spanning Tree: STP, RSTP, MSTP
- Ethernet Ring Protection Switching (ERPS), G.8032 v2
- MICROSENS Redundant Ring Protocol

Firmware Management

- Update via Web UI, FTP, FTPS
- Configuration import and export

Power over Ethernet (PoE+/++)

- 4x IEEE 802.3af/at PoE+ PSE (max. 30 W/Port)
- 1x IEEE 802.3af/at/bt PoE++ PSE (max. 60 W)
- Max. PoE-Budget: 120 W

Connectors

Uplink

- 2x SFP/SFP+ slot, 1/10GBase-X

Downlink

- 1x RJ-45 port, 1/2.5/5GBase-T

Local ports

- 4x RJ-45 port, 10/100/1000Base-T

Power Supply

- 3-pin screw pluggable connector for solid or stranded wires
- Additional grounding (PE) with 6,3 mm flat-pin lug

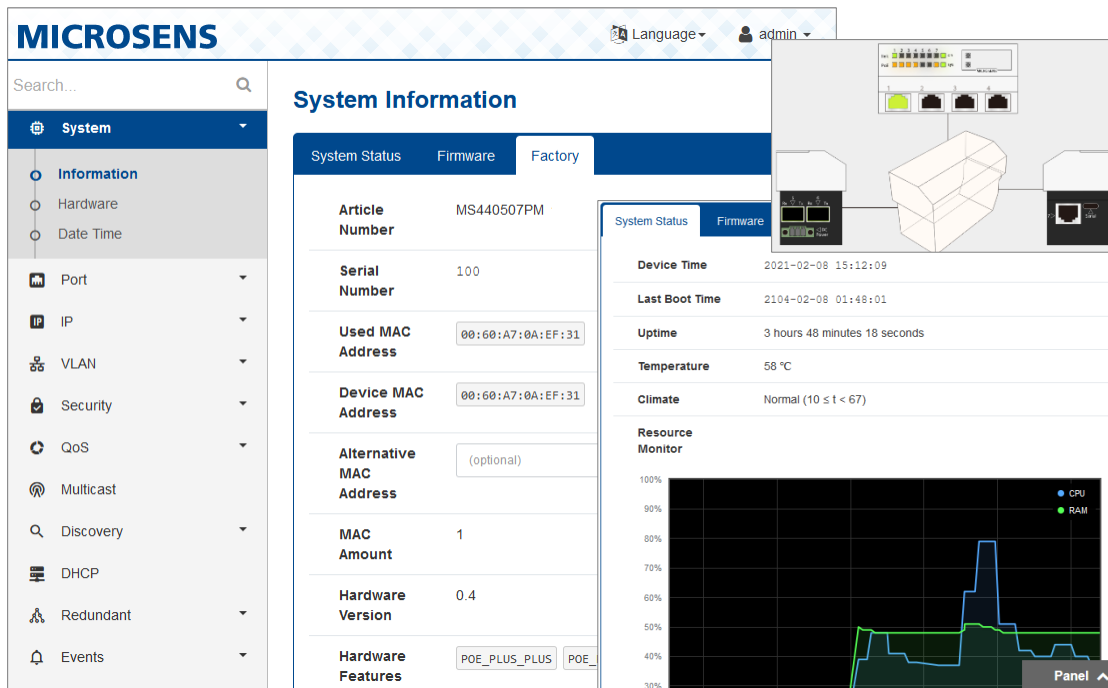
Console Port

- USB-C connector

Installation

- Snap-in mounting 45 mm (without screw fastening)
- Horizontal mounting, vertical arrangement possible
- Compatible with common electrical installation systems via adapter frames
- Extensive range of installation accessories available

Firmware Features



Provision of Inventory Information

- Factory and inventory data
- Custom defined device info

System

- Integrated thermal protection
- Activate/de-activate Energy Efficient Ethernet EEE (IEEE 802.3az)
- Configuration changes
- Alternative MAC address
- LED mode

IP Stack

- Dual stack (IPv4, IPv6)
- DHCP options 66/67
- Ping, trace route
- Secondary IPv4 address
- Hostname
- DNS

SFP

- SFP/SFP+ Digital diagnostics

Ethernet Port Features

- Cable tester
- Loop protection
- Port enable/disable
- Port alias
- Port roles: local, uplink, downlink
- Speed negotiation
- Jumbo frame support
- Port mirroring

PoE-Power Management

- PoE available max power configuration
- PoE enable/disable
- PoE+ PSE enable
- PoE++ PSE enable
- Emergency port

Switch / MAC

- MAC table
- MAC filter
- SNMP access
- MAC limit per port
- Configurable MAC aging time

RMON Statistics

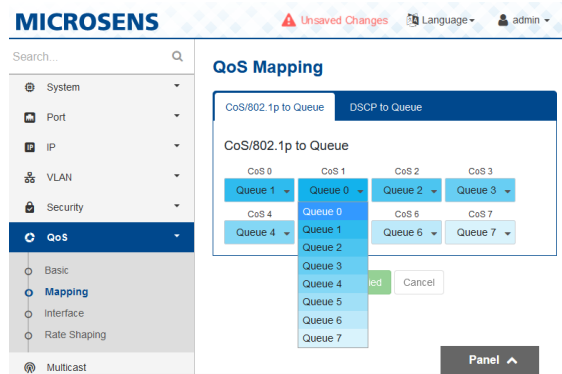
- RMON counters
- Port utilization

Virtual LANs (VLANs)

- Port VLANs, tagged VLANs
- Up to 4094 VLANs
- VLAN filter
- Configurable port modes:
 - access, hybrid, trunk
- Multiple VLAN Registration Protocol (MVRP)
- Stacked VLANs (Q-in-Q)
- Priority override
- Voice VLAN
- Unauthorized VLAN
- Management VLAN
- Force port default VID

Quality of Service (QoS)

- 8 Priority queues per port
- Prioritization scheme
- Layer1 priority
- Layer2 priority (802.1p)
- Layer3 priority (IPv4 / IPv6)
- Egress rate shaping
- Ingress rate shaping



Spanning Tree Protocols

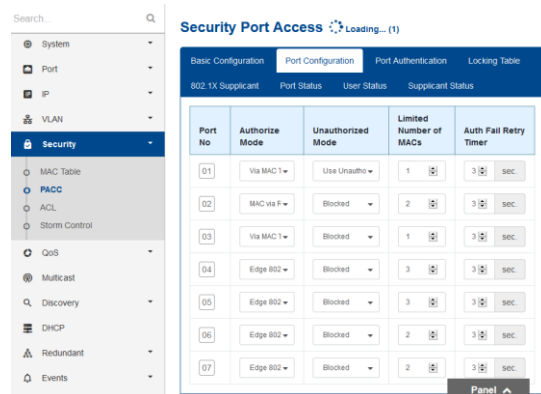
- Spanning Tree (STP)
- Rapid Spanning Tree (RSTP)
- Multiple Spanning Tree (MSTP)
- BPDU Guard

Ring Protocols

- MICROSENS Redundant Ring Protocol (MICROSENS Ring)
- Ethernet Ring Protocol (ITU G.8032 ERPS v2)

Port Access Control

- IEEE 802.1X Authentication
- IEEE 802.1X Supplicant
- RADIUS MAC Authentication
- MAC locking
- MAC learning
- Limited number of MACs
- Limited number of MACs per VLAN
- Learned MAC time out
- Dynamic VLAN
- Wake-on-LAN support
- Network edge authentication
- Authentication fail retry timer



Multicast (IGMP-/MLD-Snooping)

- IGMP snooping per VLAN
- MLD snooping per VLAN
- IGMP querier
- Static multicast router port

DHCP

- DHCP snooping
- IP-MAC binding table
- DHCP filtering
- DHCP flooding detection
- DHCP relay agent incl. support of option 82
- Dynamic ARP inspection

Network Time Protocol (NTP)

- NTP client

Link Layer Discovery Protocols (LLDP, CDP)

- LLDP operation
- LLDP-MED
- CDP operation
- CDP voice VLAN

Access Control Lists (ACL)

- Access control lists (ACL)
- Dynamic ACL via RADIUS

Command Line Interface (CLI)

- Context sensitive help
- Show config of device
- Show status of device
- Create snapshot
- Live syslog
- Telnet
- Secure Shell (SSH)
- Welcome message

Login Access Protection

- Unlimited number of Users
- General access rights
- Disable insecure interfaces
- User permissions
- Encrypted passwords
- View model for SNMP V1, V2c
- Firewall with black and white List
- Authentication, Authorization
 - TACACS+
 - RADIUS

Web Interface (WEB)

- User authentication
- HTTPS
- Custom TLS certificates
- Animated device visualization
- Firmware update
- Online documentation
- SNMP MIB download
- Event display
- RESTful API
- Supported browsers:
Mozilla Firefox, Microsoft Edge

Simple Network Management Protocol (SNMP)

- SNMPv1/v2c
- SNMPv1/v2c security
- SNMPv3
- SNMP Transport Security Model (TSM)
- Trap/Inform (SNMPv1/v2c/v3)
- Enterprise specific notifications
- Enterprise and standard MIBs

Link Aggregation Control Protocol (LACP)

- Protocol based link aggregation
- Load balancing and trunking

File Management

- File Transfer Protocol (FTP)
- Secure File Transfer Protocol (FTPS)
- FTP server support
- Secure firmware update
- Configuration export and import
- Compare configuration
- Temporary configuration
- Save configuration

Event Logging

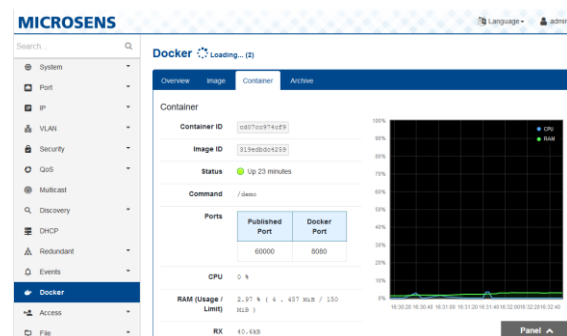
- Syslog to CLI
- Local logfile
- Log filters
- Recent logs

Diagnostic Functions

- Ping, trace route
- Port mirroring
- Test event
- DNS_lookup
- LED test
- ARP cache

Automation

- Docker virtualization environment for custom device and management automation



Miscellaneous

- Broadcast storm control
- Multicast Storm Control

IEEE / RFC Standards

RFC Standards

RFC 791	IPv4
RFC 792	ICMP
RFC 826	ARP
RFC 1155	SNMPv1
RFC 1156	SNMPv1
RFC 1157	SNMP
RFC 1157	SNMPv1
RFC 1158	MIBII
RFC 1213	MIBII
RFC 1493	Bridge MIB
RFC 1573	IF MIB
RFC 1901	SNMPv2
RFC 1905	SNMPv2
RFC 1906	SNMPv2
RFC 2131	DHCP
RFC 2233	IF MIB
RFC 2460	IPv6
RFC 2462	Address Configuration
RFC 2463	ICMPv6
RFC 2464	IPv6
RFC 2574	USM
RFC 2575	VACM
RFC 2674	Q-Bridge MIB
RFC 2819	RMON MIB
RFC 2863	IF MIB
RFC 2865	RADIUS
RFC 2866	Accounting
RFC 2868	Tunnel Attributes
RFC 3315	DHCPv6
RFC 3411	SNMPv3
RFC 3412	SNMPv3

RFC 3414	USM
RFC 3415	VACM
RFC 3484	IPv6
RFC 3513	IPv6
RFC 3584	SNMPv3
RFC 4330	NTP
RFC 4541	IGMP
RFC 5424	SYSLOG

IEEE Standards

IEEE 802.1AB	Link Layer Discovery Protocol (LLDP)
IEEE 802.1d	Spanning Tree
IEEE 802.1p	Class of Service
IEEE 802.1Q	VLAN Tag
IEEE 802.1s	Multiple Spanning Tree
IEEE 802.1w	Rapid Spanning Tree
IEEE 802.1X	User Authentication (Radius)
IEEE 802.3	10Base-T
IEEE 802.3ab	1000Base-T
IEEE 802.3ad	Link Aggregation Control Protocol (LACP)
IEEE 802.3ad	Port trunk with LACP
IEEE 802.3ae	10Gbase-SR/LR
IEEE 802.3at/af/bt	Power over Ethernet
IEEE 802.3az	Green IT
IEEE 802.3bz	2.5G/5Gbase-T
IEEE 802.3u	100Base-T
IEEE 802.3x	Flow control and back pressure

Technical Specifications

Switch

Type	Gigabit Ethernet Switch Layer 2+, IEEE 802.3 compliant
Performance	Store-and-forward, full wire-speed, non-blocking on all ports
Switching capacity	84 Gbps
Jumbo frames	max. 10.240 Bytes
Flow Control	Pause frames (IEEE 802.3x), configurable

Embedded Controller

CPU	ARM 7
RAM	512 MB
Flash memory	1 GB

Twisted-Pair Ports (local)

Port number	1-4
Type	Gigabit Ethernet, triple speed 10/100/1000Base-T
Connector	RJ-45 port, shielded
Cable type	Twisted-Pair cable, Category 5e, impedance 100 Ohm, length max. 100 m
Pin out	Auto MDI/MDI-X, Auto Polarity
Power-over-Ethernet (PoE)	Power Sourcing Equipment (PSE) IEEE 802.3af/at max. 30 W

Twisted-Pair Port (downlink)

Port number	7
Type	Gigabit Ethernet, triple speed 1/2.5/5GBase-T
Connector	RJ-45 port, shielded
Cable type	Twisted-Pair cable, Category 6, impedance 100 Ohm, length max. 100 m
Pin out	Auto MDI/MDI-X, Auto Polarity
Power-over-Ethernet (PoE)	Power Sourcing Equipment (PSE 802.3af/at/bt) max. 60 W

Fiber Port (uplink)

Port number	5-6
Type	2x SFP/SFP+ slot, 1/10GBase-R (Dual Speed), support of SFP digital diagnostics function
Connector	LC typ. (depending on SFP)

Security

Secure storage of configuration data	SHA-512 encryption to make user passwords irreversible
Min. encryption key length	- Asymmetric: 1024 Bit - Symmetric: 128 Bit
HASH algorithm	Equal or later than SHA 256
Not included encryption	DES, DSA, 3DES
Self protection	Use of a built-in dedicated secure boot circuit

Displays

Type	16 LEDs
Link	Twisted pair ports 1..4 and 7 <i>Off:</i> Link down <i>Green:</i> Link up, port open <i>Red:</i> Link up, blocked <i>Blinking:</i> Port is sending or receiving data
PoE	Twisted pair ports 1..4 and 7 <i>Off:</i> PoE+/PoE++ inactive <i>Green:</i> PoE+ on, port supplying power <i>Orange:</i> PoE+/PoE++ on, port not supplying power <i>Red:</i> PoE error <i>Blue:</i> PoE++ on, port is supplying power
On	<i>Off:</i> Device unpowered <i>Green:</i> Device powered
Sys	<i>Off:</i> System not ready <i>Green:</i> System in operation <i>Other:</i> see 'Factory default button' in 'Control Panel'

Control Panel

HW-Reset button	Erase memory and MAC table, reinitialise all connections; current configuration remains unchanged
Factory default button	Pressing the 'Factory defaults' triggers the following actions: 2 s → <i>Blue:</i> Switch requesting IP address from Switch IP Configuration Tool or NMP. 10 s → <i>Blue blinking:</i> Switch is resetting to factory defaults, IP configuration remains unchanged. 20 s → <i>Magenta blinking:</i> Switch is resetting to factory defaults, IP configuration is reset. 30 s → <i>green:</i> Switch is aborting the selected recovery function (see above), the entire configuration remains unchanged.

Technical Specifications (ctd.)

Power Supply

Input	50..57 VDC (54 VDC typ.)
Power consumption	Typ. 13 W (without PoE) max. 135 W (incl. PoE) (full power only with suitable installation conditions)
Connectors	3 pin screw connector, PE/-/+
Grounding (FG)	6,3 mm flat-pin plug

Console Interface

Connector	USB-C for compatible computer systems*
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Standards

CE	2014/30/EU (EMC) 2011/65/EU (RoHS)
Safety	EN 62368-1
Emitted interference	EN 55032 (Class B)
Immunity	EN 55024 EN 55035 EN 61000-6-2

Reliability

MTBF (Method)	269.549h ₀ @25°C (SR332)
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Environmental Conditions

Temperature	Storage	20..+85 °C
	Operation	0..35 °C
	(Assumes the use of MICROSENS low power consumption SFPs)	
Rel. humidity	10..90%, non-condensing	

Mechanical

Dimensions	90 mm x 45 mm x 62 mm (w x d x h, without connectors)
Mounting depth	35 mm
Weight	Approx. 280 g
Mounting	Horizontal, vertical arrangement possible

Documentation

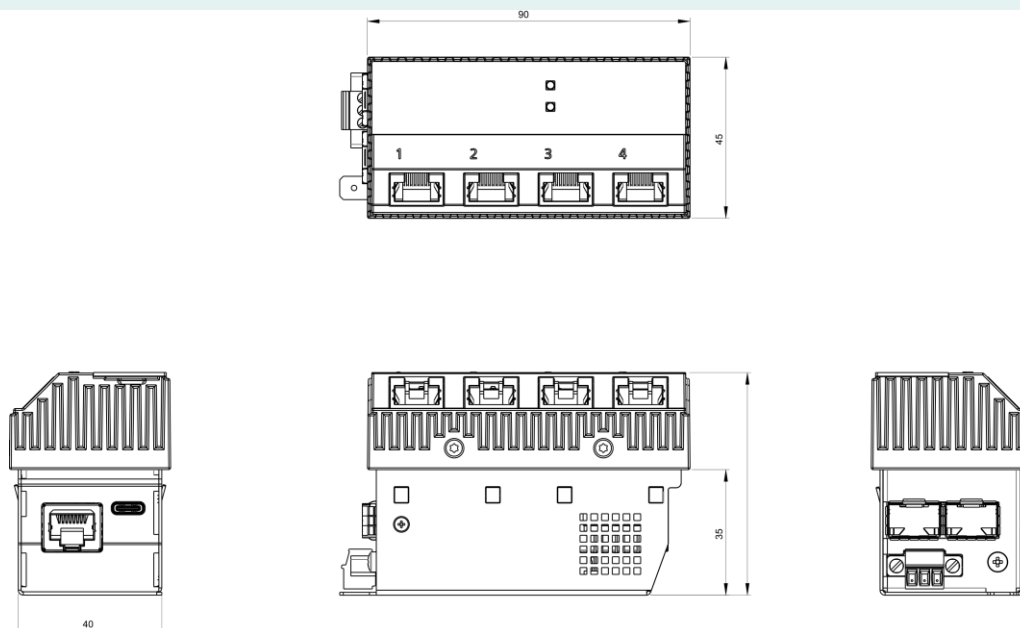
Quick Start Guide	Flyer, included in delivery unit; Download from microsens.de
User manual	Download from microsens.de
CLI Reference manual	- Included in device firmware for local download - Download from microsens.de
MIB-File	Included in device firmware for local download

Delivery / Contents

Standard Packaging

Package unit	1 piece.
Dimensions	127 mmx 68 mmx 75 mm (w x d x h)
Weight	Approx. 350 g
Contents	1x Micro Switch 1x Power supply plug 1x Printed Quick Start Guide Included in device firmware: 1x CLI-Reference manual 1x MIB-File

Mechanical Dimensions / [mm]



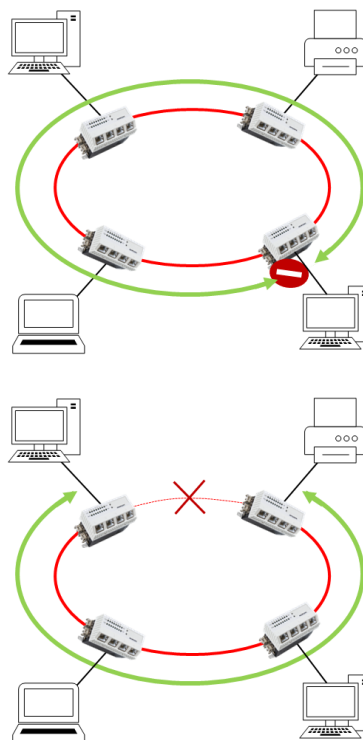
MICROSENS Ring Topology

Normal operation


- All switches are configured for ring operation
- One switch is assigned as ring master
- Ring master cuts the ring logically

Ring error

- Switches signalize segment failure via ethernet
- Master gets that information via ethernet and closes the logical cut
- Switches relearn the actual network topology (MAC-addresses)



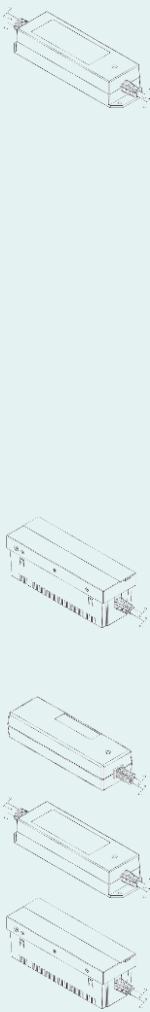
Order Information

	Description	Article Number
	10G Micro Switch	
	7-Port 10GbE Micro Switch PoE++ 2x SFP/SFP+ Slots, 1/10GBase-R, 5 RJ-45 Ports, 1x 1/2.5/5GBase-T, PoE (PSE 802.3af/at/bt), 4x 10/100/1000T, PoE+ (PSE 802.3af/at), horizontal mounting, 50..57 VDC power supply	MS440507PM



Accessories

	Description	Article Number
	SFP/SFP+ Transceiver (approved for MS440507PM)	
	LPC SFP+ 10G Transceiver SR Multimode 850nm, DDM, LC duplex, -40..+85°C	MS100700DX-V2
	LPC SFP+ 10G Transceiver LR SingleMode 1310nm, 10km, DDM, LC duplex, -40..+85°C	MS100702DX-V2
	LPC SFP+ 10G Transceiver LR SingleMode TX 1270nm, RX 1330nm, 10km, DDM, LC simplex, -40..+85°C	MS100702DXA-V2
	LPC SFP+ 10G Transceiver LR SingleMode TX 1330nm, RX 1270nm, 10km, DDM, LC simplex, -40..+85°C	MS100702DXB-V2
	LPC SFP GbE Transceiver 1.25G SX Multimode 850nm, DDM, LC, -40..+85°C	MS100200DX-V2
	LPC SFP GbE Transceiver 1.25G LX SingleMode 1310nm, 10km, DDM, LC, -40..+85°C	MS100210DX-V2
	LPC SFP GbE WDM-Transceiver 1.25G BX SingleMode TX1310nm / RX1550nm, 20km, DDM, LC simplex, -40..+85°C	MS100221DXA-V2
	LPC SFP GbE WDM-Transceiver 1.25G BX SingleMode TX1550nm / RX1310nm, 20km, DDM, LC simplex, -40..+85°C	MS100221DXB-V2

Accessories

	Console Cable	
	Console Cable f. Micro Switches w. USB-C connector USB-C female to USB-A male, 2,0m	MS190412-02,0
	150 W Power Supplies for PoE++ Micro Switches	
	Installation Power Supply PoE+ 150W prim. 115..230VAC, 3x 1.5mm ² 1m, sec. 54VDC / 1.2A, 1m, Combicon-con.	MS700742
	Installation Power Supply PoE+ 150W prim. 115..230VAC, 3x 1.5mm ² 1m, sec. 54VDC / 1.2A, 1m, Combicon-con. adapted for C-profile / 35mm DIN-Rail	MS700742-UNI
	Installation Power Supply PoE+ 150W prim. 115..230VAC, 3x 1.5mm ² 1m, WAGO-con., sec. 54VDC / 1.2A, 1m, Combicon-con. adapted for C-profile / 35mm DIN-Rail	MS700742-UNI-WG
	Installation Power Supply PoE+ 150W prim. 115..230VAC, 3x 1.5mm ² 1m, WAGO-con., sec. 54VDC / 1.2A, 1m, Combicon-con.	MS700742-WG
	Installation Power Supply PoE+ 150W prim. 115..230VAC, 3x 1.5mm ² 1m, GST18-con., sec. 54VDC / 1.2A, 1m, Combicon-con. adapted for C-profile / 35mm DIN-Rail	MS700742-WL
	Micro Power Supply PoE+/++ 150W prim. 115..230VAC, Combicon-con., M45-design, sec. 54VDC / 2.8A, Combicon-con., 1m	MS700751
	Power Supplies for PoE+ Applications	
	Desktop power supply for PoE+ Switches, 65W prim. 110..230VAC, Euro-8 power cord, sec. 54VDC / 1.2A, 1m, Combicon-con.	MS700731
	Installation Power Supply PoE+ 65W prim. 110..230VAC, 3x 1.5mm ² 1m, sec. 54VDC / 1.2A, 1m, Combicon-con.	MS700741
	Micro Power Supply PoE+ 70W prim. 90..264VAC, Combicon-con., M45-design, sec. 54VDC / 1.3A, Combicon-con., 0.5m	MS700750
	Mounting adapters for above power supplies	
	Mounting adapter MS70074x adapted for front-mounted steel trunkings 80mm (power supply not included)	MS140078-F
	Magnetic mounting adapter MS700741x (power supply not included)	MS140078-MAG
	Mounting adapter MS70074x adaptation for C-profile / 35mm DIN-Rail	MS140078-UNI
	Sockets for specific primary connectors for above power supplies	
WAGO-WINSTA® MIDI socket, matching the WAGO connector used in MS70074x-UNI-WG, MS70074x-WG	MS190261-F	
Wieland Gesis connection socket, matching the Wieland Gesis connector used in MS70074x-WL	MS190260-F	

Accessories

	Software for Management and Configuration of Networks	
	NMP Web+ Enterprise Base Installation, 1 x usage right for NMP Web+ Enterprise, incl. download and installation of updates, installation of server SW on max. 1 computer, electronic user manual included (.pdf)	MS200500
	NMP Web+ Professional Base Installation, 1 x usage right for NMP Web+ Professional, incl. download and installation of updates, installation of server SW on local computer, electronic user manual included (.pdf)	MS200501
	One year device license grants the right to administrate a MICROSENS device via NMP Web+ for one year	MS200509-01
	Two year device license grants the right to administrate a MICROSENS device via NMP Web+ for two years	MS200509-02
	Additional Software-Variants Additional variants of the device licenses are listed in the data sheet for NMP Web+; please refer to www.microsens.de	
	Mounting Kits	
	Universal mounting kit for E2 device casing, plate and cover frame, RAL9010	MS140029
	45x45 universal mounting set, 2xmounting box, device bracket, cover frame 2x45 2x gear tray, pre-assembled, RAL9010	MS140040BR2
	Mounting set sub floor Ackermann 3fold triple box with covers, M45 blind module UF, end face milled	MS140027
Further installation accessories for all installation situations are listed in the MICROSENS document " Accessories for FTTO Installation Components ".		

Services

Description	Article Number
Warranty Extension following the 24-Month Manufacturer Warranty	
1 year warranty extension	MSGV01
2 year warranty extension	MSGV02
3 year warranty extension	MSGV03
Custom-made pre-configuration	
Custom-made pre-configuration of a component	MSKonfig
Custom-made pre-configuration (configuration file already available)	MSKonfig-OK
Manufacturer Warranty is defined in General Terms and Conditions of Sale (§10) of MICROSENS GmbH & Co. KG	

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* For communication between the console port and the USB port of the computer, support for communication with a 'USB to UART Bridge CP2102N' is a prerequisite. A driver, if required, is not included in the scope of delivery.

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