

## Data sheet

6-Port GbE Ruggedized Micro Switch Combo  
with extended temperature range  $-25^{\circ}\text{C}$ .. $+65^{\circ}\text{C}$ ,  
optional with PoE+ PSE



### **1G Combo Up- and Downlinks (IEEE 802.3ab/z)**

2x 100/1000Base-X resp. 2x 10/100/1000Base-T Ports for maximum of flexibility



### **PoE+ PSE User- and Downlink ports (IEEE 802.3at)\***

Up to 6x 10/100/1000Base-T User ports with up to 30W PoE supply



### **IT Security**

MICROSENS SECURE Feature set for high level of IT security



### **Compact Mounting Format M45**

Compact mounting format on DIN rail, angled port outlet  $45^{\circ}$



### **Fanless Design**

Easy to maintain hardware design, no noise emissions



### **Docker Virtualization Environment**

Integrated Docker system for free programming of custom functions



### **Standardized network redundancy (ERPS according to G.8032v2)**

Feature set for special redundancy topologies (e.g. ring)



### **MICROSENS NMP integrated**

Integrated in MICROSENS NMP software for simple configuration and administration

## Characteristics

### Gigabit Ethernet Switch

- Fanless 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)
- 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 for users and groups
- Port-based Network Access Control
  - MAC Locking
  - MAC via RADIUS, IEEE 802.1X
  - IEEE 802.1X Supplicant, incl. MD5, PEAP-MSCHAP v2, TLS
- Access Control Lists
- Storm Control
- DHCP Snooping, ARP Inspection, PPPoE Snooping

### Redundancy

- Spanning Tree: STP, RSTP
- 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(+) (DC-Version)\*

- max. 6x IEEE 802.3af/at PoE(+) PSE (max. 30 W/Port)
- max. PoE-Budget: 120 W (PoE(+) Requires input >44 VDC)

### Connectors

#### **Up- and Downlink**

- 2x Combo ports:
  - 2x 100/1000Base-X SFP Slots resp.
  - 2x 10/100/1000Base-T RJ-45 Ports

#### **User Ports**

- 4x 10/100/1000Base-T RJ-45 Ports

#### **Power Supply**

- 3-pin screw pluggable connector for solid or stranded wires (PE/+/- resp. PE/N/L)
- Additional grounding (PE) with 6.3mm flat-pin lug

#### **Console Port**

- USB-C connector

#### **micro SD Card slot**

### Installation

- DIN rail adapter for mounting on DIN rail (EN 50 022)

## Firmware Features

### **Provision of Inventory Information**

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- Factory and inventory data
- Custom defined device info

### **System**

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

### **IP Stack**

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

### **SFP**

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- SFP DDM (Digital Diagnostic Man.)

### **Quality of Service (QoS)**

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- 4 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**

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

### **Ethernet Port Features**

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

### **PoE-Power Management (DC-Version)\***

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

### **Switch / MAC**

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

### **RMON Statistics**

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- RMON counters
- Port utilization

### **Virtual LANs (VLANs)**

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

### **Ring Protocols**

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

### **Port Access Control**

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

### **Multicast (IGMP-/MLD-Snooping)**

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

### **DHCP**

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- 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)**

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- NTP client

### **Link Layer Discovery Protocols (LLDP, CDP)**

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

### **Access Control Lists (ACL)**

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

### **Command Line Interface (CLI)**

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

### **Login Access Protection**

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- Unlimited number of users
- General access rights
- Disable insecure interfaces
- User permissions
- Public key encrypted passwords
- View model for SNMP V1, V2c
- Firewall with black and whitelist
- Authentication, Authorization
  - TACACS+
  - RADIUS

### **Web Interface (WEB)**

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

### **Simple Network Management Protocol (SNMP)**

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- 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)\*\***

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- Static Link Aggregation
- Dynamic Link Aggregation
- Load balancing and trunking

**File Management**

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- 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**

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

**Diagnostic Functions**

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- Ping, trace route
- Port mirroring
- Test event
- DNS\_lookup
- LED test
- ARP cache

**Automation**

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- Docker virtualization environment for custom applications

**Miscellaneous**

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- Broadcast storm control

## IEEE / RFC Standards

## RFC Standards

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

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

## IEEE Standards

<b>IEEE 802.1AB</b>	Link Layer Discovery Protocol (LLDP)
<b>IEEE 802.1d</b>	Spanning Tree
<b>IEEE 802.1p</b>	Class of Service
<b>IEEE 802.1Q</b>	VLAN Tag
<b>IEEE 802.1w</b>	Rapid Spanning Tree
<b>IEEE 802.1X</b>	User Authentication (Radius)
<b>IEEE 802.3</b>	10Base-T
<b>IEEE 802.3ab</b>	1000Base-T
<b>IEEE 802.3ad</b>	Link Aggregation Control Protocol (LACP)**
<b>IEEE 802.3ad</b>	Port trunk with LACP**
<b>IEEE 802.3at/af</b>	Power over Ethernet
<b>IEEE 802.3az</b>	Green IT
<b>IEEE 802.3u</b>	100Base-T/FX
<b>IEEE 802.3x</b>	Flow control and back pressure
<b>IEEE 802.3z</b>	1000Base-X

## Technical Specifications

### Switch

<b>Type</b>	Gigabit Ethernet Switch Layer 2+, IEEE 802.3 compliant
<b>Performance</b>	Store-and-forward, full wire-speed, non-blocking on all ports
<b>Switching capacity</b>	12Gbps
<b>Jumbo frames</b>	max. 10,240 Bytes
<b>Flow Control</b>	Pause frames (IEEE 802.3x), configurable

### Twisted-Pair Ports (User ports)

<b>Port number</b>	1-4, 5-6e (Combo ports)
<b>Type</b>	Gigabit Ethernet, triple speed 10/100/1000Base-T
<b>Connector</b>	RJ-45 Port, shielded
<b>Cable type</b>	Twisted-Pair cable, Category 5e, impedance 100 Ohm, length max. 100m
<b>Pin out</b>	Auto MDI/MDI-X, Auto Polarity
<b>Power-over- Ethernet (PoE) (DC Version)*</b>	Power Sourcing Equipment (PSE) IEEE 802.3af/at max. 30 W

### Fiber Ports (Uplinks)

<b>Port number</b>	5-6o
<b>Type</b>	2x SFP Slots, 100/1000Base-X support of SFP digital diagnostics function
<b>Connector</b>	LC typ. (depending on SFP)

### Security

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

### Displays

<b>Type</b>	18 LEDs
<b>Link</b>	RJ-45 Ports 1..6 <i>Off:</i> Link down <i>Green:</i> Link up, port open <i>Red:</i> Link up, blocked
<b>PoE (+) (DC-Version)*</b>	Twisted pair ports 1..6 <i>Off:</i> PoE+ inactive <i>Green:</i> PoE+ on, port supplying power <i>Orange:</i> PoE+ on, port not supplying power <i>Red:</i> PoE error, port not supplying power
<b>On</b>	<i>Off:</i> Device unpowered <i>Green:</i> Device powered
<b>Sys</b>	<i>Off:</i> System not ready <i>Green:</i> System in operation <i>Other:</i> see 'Factory default button' in 'Control Panel'

### Control Panel

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

## Technical Specifications (ctd.)

### Power Supply

<b>Input (DC-Version)*</b>	17..57 VDC (PoE+:44..57 VDC, 54 VDC typ.)
<b>Input (AC-Version)*</b>	100..240VAC
<b>Power consumption</b>	Typ. 8W (without PoE) max. 130W (incl. PoE) (Full power only with suitable installation conditions)
<b>Connector</b>	3 pin screw connector, PE/-/+ (DC version)* PE/N/L (AC version)*
<b>Grounding (FG)</b>	6.3 mm flat-pin lug

### Console Interface

<b>Connector</b>	USB-C
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### Standards

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

### Reliability

<b>MTBF (Method)</b>	>200.000h@25°C (SR332)
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### Environmental Conditions

<b>Temperature</b>	Operation	-25..+65°C
	Storage	-20..+85°C
<b>Humidity</b>	10..90%, non-condensing	

### Mechanical

<b>Dimensions (horizontal)</b>	90mm x 60mm x 45mm (b x t x h, without connectors)
<b>Weight</b>	Approx. 300g
<b>Mounting</b>	horizontal (MS440307x), vertical (MS440317x)

### Documentation

<b>Quick Start Guide</b>	Flyer, included in delivery unit; Download from <a href="https://microsens.de">microsens.de</a>
<b>User manual</b>	Download from <a href="https://microsens.de">microsens.de</a>
<b>CLI Reference manual</b>	- Included in device firmware for local download - Download from <a href="https://microsens.de">microsens.de</a>
<b>MIB-File</b>	Included in device firmware for local download

### Delivery / Contents

#### Standard Packaging

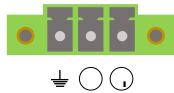
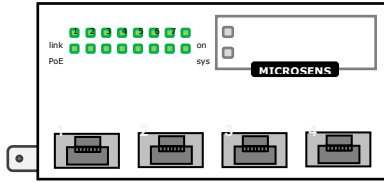
<b>Package unit</b>	1 piece
<b>Contents</b>	1x Micro Switch 1x Power supply plug 1x Printed Quick Start Guide
	Included in device firmware: 1x CLI-Reference manual 1x MIB-File



## Power supply (typ. Operating voltage)

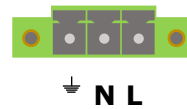
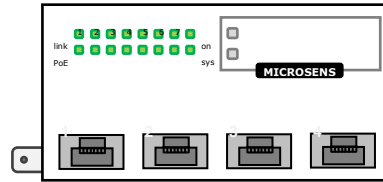
### DC Version MS440317PMXH (PoE+)

**Input** 17..57 VDC



### AC Version MS440317MXH

**Input** 100..240 VAC

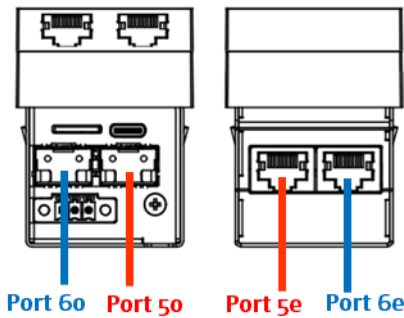


**Input 24 VDC** Operating without PoE  
**Input 54 VDC** Supports PSE function

**Input AC** Operating without PoE

## Combo Ports

The Ruggedized Micro Switch Combo is a 6-port switch with eight physical network interfaces. Of these, two ports each are designed as interconnection ports (also referred to as "combo", FO/TP with same port number).

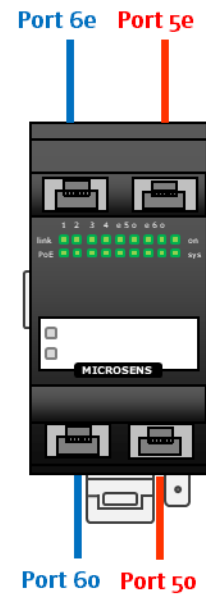


Port 6o Port 5o Port 5e Port 6e

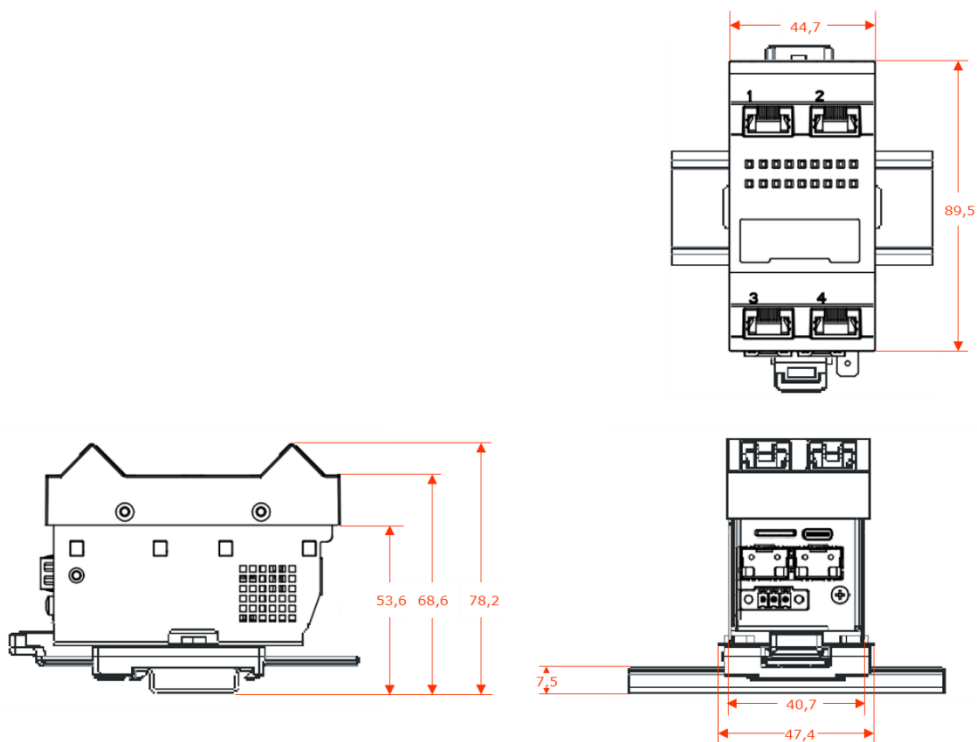
The two different ports cannot be used at the same time, for example, if an RJ45 port (e.g. port 5e, e for electrical) is enabled, the SFP port (port 5o, o for optical) is automatically disabled and vice versa.



On the LED board of the Micro Switch, the active ports are then shown as active via the corresponding LEDs.



## Mechanical Dimensions (in mm)



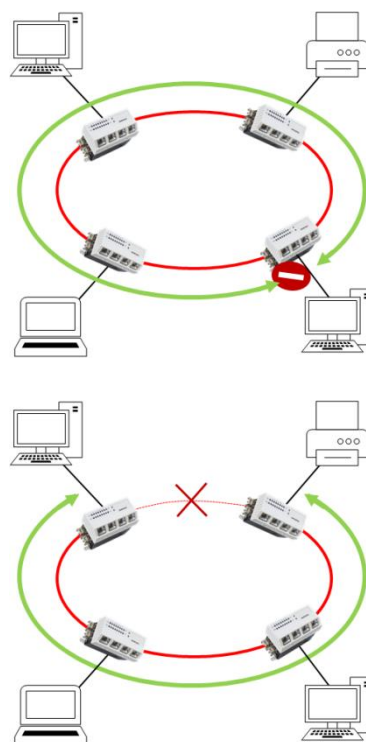
## MICROSENS Ring Redundancy Protocol

### Normal operation

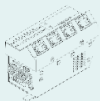
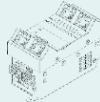
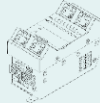
- All switches are configured for ring operation
- One switch is assigned as ring master
- Ring master cuts the ring logically

### 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
	<b>6-Port GbE Ruggedized Micro Switch Combo PoE+</b>	
	6-Port GbE Ruggedized Micro Switch Combo PoE+ 2x 100/1000X SFP-S. bzw. 10/100/1000T PoE+ (Cb.), 4x 10/100/1000T PoE+, 44..57VDC, microSD-Slot, horizontal, managed, Console port (USB-C), DIN-Rail, erw. ETB -25°..+65°C	<b>MS440307PMXH</b>
	6-Port GbE Ruggedized Micro Switch Combo PoE+ 2x 100/1000X SFP-S. bzw. 10/100/1000T PoE+ (Cb.), 4x 10/100/1000T PoE+, 44..57VDC, microSD-Slot, vertikal, managed, Console port (USB-C), DIN-Rail, erw. ETB -25°..+65°C	<b>MS440317PMXH</b>
	<b>6-Port GbE Ruggedized Micro Switch Combo</b>	
	6-Port GbE Ruggedized Micro Switch Combo 230V 2x 100/1000X SFP-Slots bzw. 10/100/1000T (Combo), 4x 10/100/1000T, 100..240VAC, microSD-Slot, vertikal, managed, Console port (USB-C), DIN-Rail, erw. ETB -25°..+65°C	<b>MS440317MXH</b>

## Accessories

	Description	Article Number
	<b>Storage Media Card for Ruggedized Micro Switches (optional)</b>	
	Micro Storage Media Card (microSD) for Micro Switches, -25..+85°C	<b>MS140894X-4G</b>
	<b>SFP Transceiver (further models available upon request)</b>	
	SFP GbE Transceiver 1.25G SX Multimode 850nm, DDM, LC, -40..+85°C	<b>MS100200DX</b>
	SFP GbE Transceiver 1.25G LX SingleMode 1310nm, 10km, DDM, LC, -40..+85°C	<b>MS100210DX</b>
	SFP FE Transceiver 155M FX Multimode 1310nm, DDM, LC, -40..+85°C	<b>MS100190DX</b>
	SFP FE Transceiver 155M FX SingleMode 1310nm, 15km, DDM, LC, -40..+85°C	<b>MS100191DX</b>
	<b>Beschriftungsfeld</b>	
	Labeling sheets Micro Switch G6 10 sheets, 80 labels per sheet	<b>MS140005</b>
	<b>Console Cable</b>	
	Console Cable f. Micro Switches w. USB-C connector USB-C female to USB-A male, 2.0m	<b>MS190412-02,0</b>
	<b>External Power Supply 44..57VDC</b>	
	Industrial DIN-Rail Power Supply 48VDC / 2,5A PoE+ (120W) Input 90..264VAC/127..370VDC, Output 48..55VDC, -20..+70°C	<b>MS700446</b>

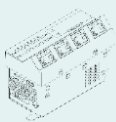
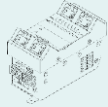
## Accessories (ctd.)

	<b>Software for Management and Configuration of Networks</b>	
	NMP 2 Enterprise Software inkl. Nutzungsrecht für 200 managed Objekte inkl. SW Updatelizenz für 1 Jahr"	<b>MS200100</b>
	n-Jahres Updatelizenz für NMP 2 Enterprise inkl. 200 managed Objekte	<b>MS200101-n</b>
	NMP 2 Professional Software inkl. Nutzungsrecht für 50 managed Objekte inkl. SW Updatelizenz für 1 Jahr	<b>MS200070</b>
	n-Jahres Updatelizenz für NMP 2 Professional inkl. 50 managed Objekte	<b>MS200071-n</b>

## Services

Description	Article Number
<b>Warrenty Extension following the 24-Month Manufacturer Warranty</b>	
1 year warranty extensions	<b>MSGV01</b>
2 year warranty extensions	<b>MSGV02</b>
3 year warranty extensions	<b>MSGV03</b>
<b>Custom-made pre-configuration</b>	
Custom-made pre-configuration of a component	<b>MSKONFIG</b>
<b>Labeling ex works according to customer requirements</b>	
Creation and application of a device labeling for switch labeling field, according to customer specification, max. 3 lines	<b>MSLABEL</b>

## Alternative PoE+ Switches

	Description	Article Number
	<b>8-Port GbE Ruggedized Micro Switch MACsec PoE+</b>	
	-Port GbE Ruggedized Micro Switch MACsec PoE+ 2x 100/1000X SFP-Slots, DIN-Rail horiz., managed, 5x 10/100/1000T PoE+ PSE, 44..57VDC, 1x 10/100/1000T PoE+ PD, microSD-Slot, console port (USB-C), erw. ETB -25°..+65°C	<b>MS440407PMXH-54</b>
	8-Port GbE Ruggedized Micro Switch MACsec PoE+ 2x 100/1000X SFP-Slots, DIN-Rail vertikal, managed, 5x 10/100/1000T PoE+ PSE, 44..57VDC, 1x 10/100/1000T PoE+ PD, microSD-Slot, console port (USB-C), erw. ETB -25°..+65°C	<b>MS440417PMXH-54</b>

\* AC/DC versions see paragraph Power supply (typ. operating voltage), page 9

\*\* Functions are currently still being tested.

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