# Fast Ethernet Switch Modul
# 4x 10/100Base-TX, 1x 100Base-FX

**MICROSENS**

## Description

This Ethernet Switch Module has been designed with 4x10/100Base-TX ports and 1x100Base-FX fiber optic port for the interconnection of redundand datanetworks (Industrial Ring Networks) to a central point using 19" technology.

The Switch Module can be integrated into a redundant Industrial Ring and be used as uplink to the core switch of the entire enterprise LAN. A further application is the connection of end devices in the office environment to the 10/100TX ports for an uplink via fiber optic.

The interconnecteion with the redundant fiber optic ring will be realized by using two Switch Modules which have to be connected via a 10/100Base-TX connection. With this new Switch Module the procedure for fault tolerant "Fiber Optic Rings" patented by MICROSENS is extended to the medium copper on the ring side.

If the two Switch Modules will be installed in two separate 19" racks at different locations it is possible to integrate it into an over placed redundant architecture of the central switch via separated data paths.

The integrated SNMP Management Agent allows the central monitoring, configuration and administration of the entire ring network. This Switch Module offers an extendes Management including VLAN support and dataprioritisation (QoS) according to IEEE802.1p/Q.
The integration into a central Management System is possible. Beside the SNMP-functionality also further NMS standards e. g. Telnet and the proprietary Device Manager are supported.

## Features

- Fast Ethernet 5 Port Switch, 4x 10/100Base-TX, 1x 100Base-FX
- Redundant Ring Functionality also via copper (TP) possible
- Compatible to Industrial  Switches with Ring Redundancy
- Reconfiguration in < 100 ms
- Central Power Supply with Redundancy Option
  (110 - 230 V AC or 48 V DC)
- Integrated Agent for Network Management via PC-Tool, Web, SNMP or Telnet Interface
- Full VLAN Support / Dataprioritisation according to IEEE_802.1q
- Galvanic separated Alarm Contact (Relay Contact)
- Full compatible to all Modules of the NICROSENS Access Series

## Technical Data

| | |
|---|---|
| **Type** | Manageable Fast Ethernet Switch (Rack module)<br>with 4 x 10/100Base-TX and 1 x 100Base-FX ports<br>for fault tolerant Fiber Optical Rings |
| **Ports** | 4x 10/100/100Base-TX<br>Shielded Twisted Pair Cable, 100 Ohm, Category 5e<br><br>1x 100BaseFX |
| **Max. Cable length** | 100 m (Twisted-Pair) |
| **Optical Fiber Type** | Multimode fiber 50 oder 62,5/125 µm, duplex<br>with ST or SC connectors<br>optional 9/125 µm Single Mode fiber |
| **Datarate** | TX ports: 10/100 Mbps (Autonegotiation)<br>FX port : 100 Mbps (fullduplex mode configurable) |
| **LED indicators** | *PWR* Module active<br>*ALARM* Link lost<br>*LK* Twisted Pair connection o.k.<br><br>*FD* Connection in fullduplex mode |
| **Alarm contact** | Galvanic isolated, max. 60 V DC, max. 0,5 A |
| **Power Supply** | 12 V DC / max. 500 mA via the backplane |
| **Operating temperature** | 0°C to 55°C |
| **Storage temperature** | -20°C to 80°C |
| **Dimensions** | 128 mm x 31 mm |
| **Management** | - Statusinformation via web based Management (http server, standard)<br>- Optional support of SNMPv1 (Firmware)<br>- Optional support of Telnet (Firmware)<br>- Configuration via PC-based managementtool (has to be ordered seperately) |
| **Ring Function** | For Master and Slavemode, no limitation for the number of modules in the ring, no time out |

## Optical Parameters

**Mulitmode versions**

| | |
|---|---|
| *min. distance*:* | 2 km (fullduplex) |
| *min. opt. power:* | -19 dBm |
| *min. sensitivity:* | -31 dBm |
| *wavelength:* | 1310 nm |
| *connectors:* | ST or SC duplex |

**Single Mode versions**

| | |
|---|---|
| *min. distance*:* | 15 km (fullduplex) |
| *min. opt. power:* | -15 dBm |
| *min. sensitivity:* | -31 dBm |
| *max. input level**:* | -7 dBm |
| *wavelength:* | 1310 nm |
| *connectors:* | ST or SC duplex |

| | |
|---|---|
| *min. distance*:* | 40 km (fullduplex) |
| *min. opt. power:* | -5 dBm |
| *min. sensitivity:* | -34 dBm |
| *max. input level**:* | 0 dBm |
| *wavelength:* | 1310 nm |
| *connectors:* | ST or SC duplex |

| | |
|---|---|
| *min. distance*:* | 80 km (fullduplex) |
| *min. opt. power:* | -5 dBm |
| *min. sensitivity:* | -34 dBm |
| *max. input level**:* | 0 dBm |
| *wavelength:* | 1550 nm |
| *connectors:* | SC duplex |

| | |
|---|---|
| *min. Distance*:* | 125 km (fullduplex) |
| *min. Opt. power:* | 0 dBm |
| *min. sensitivity:* | -37 dBm |
| *max. Receiving level**:* | 0 dBm |
| *wavelength:* | 1550 nm |
| *connectors:* | SC duplex |

*The mentioned distances are recommendations, which are guaranteed during the duration of life. The distances are depending on the condition of the transmission line and can vary depending on the quality of the used fibers, connectors and other parameters. Decesive are the listed transmitter and receiver figures. Longer distances than above mentioned can be reached easily.

**Furthermore the max. input level of the receiver has to be considered. Especially because the mentioned power values are guaranteed figures, which could be exceeded by 5-7 dB. If the max.receiving level of the optical receiver is exceeded for a longer time it could be damaged unrepairable.

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Further it is recommended not to use the versions with different optical parameters mixed together e.g. a 15 km version not together with a 40 km version). A proper function cannot be guaranteed in this case.

## System Components

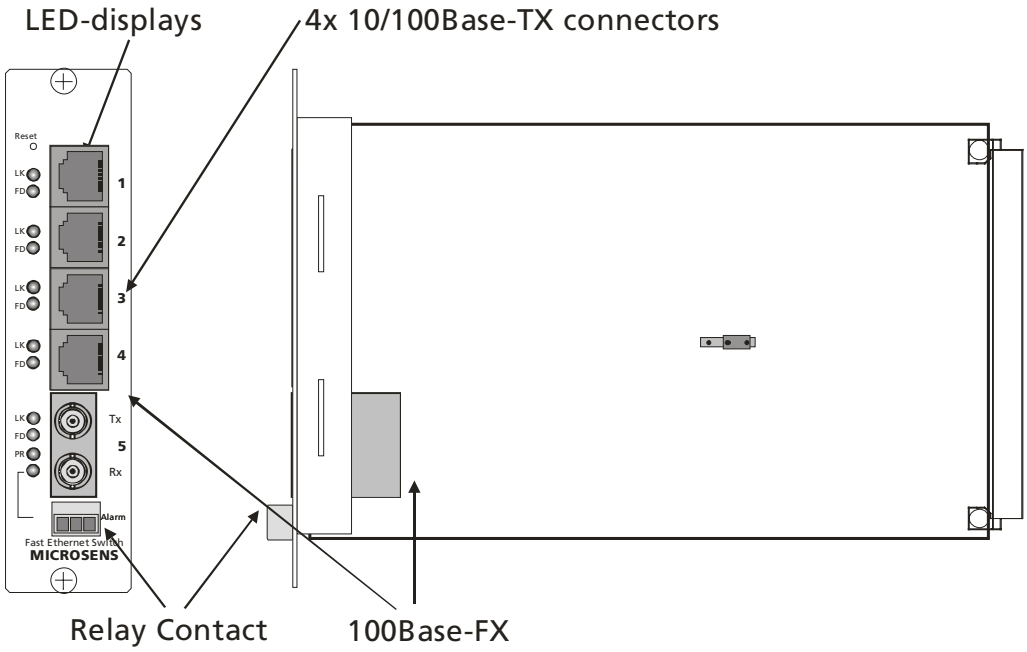



Fig. 1: Indicators and connectors

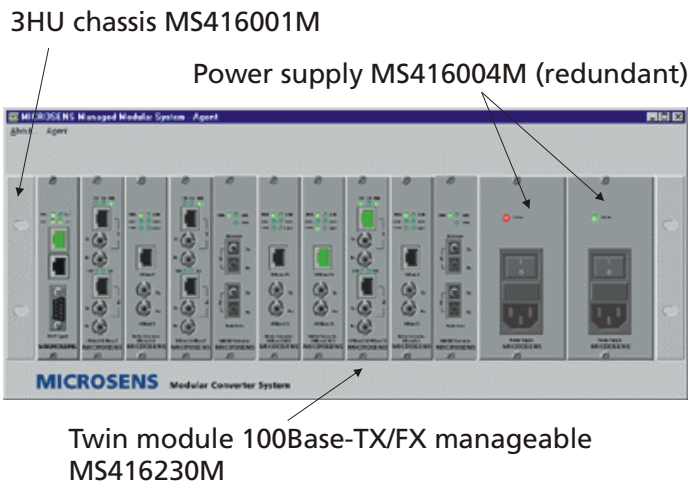
## Configuration possibilities

The Switch Module has been designed for installation in one of the MICROSENS chassis (19“ rack or standalone). It can be installed together with other modules of the “Access product group” in the same chassis.

The power suppy is realized by a central power supply via the backplane of the rack. Max. 12 modules can be installed including the power supply.

As an option a second power supply can be installed for power redundancy. In This case only 10 switch or converter modules can be equipped.

In case of partial equipment of the rack, the unused slots have to be covered with so called “blind plates” for EMC and air flow reasons.



## Alarm Contact (Relay Contact)

A 3 pin alarm contact allows the additional monitoring via external signalling. This contact is switching immediately after the link signal is lost. In case, that the switch module is configured for ring functionality the interruption of the optical link is indicated additionally.

In case of power failure the contact is also switched into alarm mode.

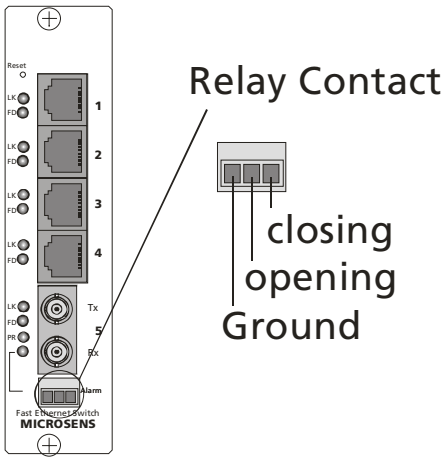



Fig. 2: Pinout Alarm Contact

Attention: The max. contact load is 0.5 A /60 V DC. It is not allowed to connect any devices with 230 V AC power supply directly!

## Management

The Management and configuration is possible via an optional powerfull PC software, the Device Manager. Beside the Device Manager use, the status can be checked web based via the integrated http server. Because of security reasons configurations are not possible via the web based management.

The switch module can be configured via the Device Manager. With this software the initial configuration of TCP/IP adjustments (IP address, Gateway etc) is possible. Later on these adjustments can be changed always via the Ethernet network.

Additionally to the standard firmware for the web based visualisation MICROSENS offers further firmware versions for the support of SNMP and Telnet alternatively. The Device Manager Software is supported of all different firmware versions.

All management informations are available in the Ethernet network (Inband Mangement). It is not necessary to connect the agent with a special connection. All TP ports are free for other application.

Also the adjustments fort he ring functionality are configured via the Device Manager software. The ring functionality is deactivated in the factory default adjustment.

For the configuration of the switch module the rack installed agent is not necessary, but it can be used independently of the integrated management agent.

## Reset Button

By pushing the reset button (see fig. 3) during operation it is possible to reset the switch manually. During the reset the internal memory of the switch is erased and all connections are initialized new.

The settings of the network management are not changed by the reset of the switch. Information such as TCP/IP address, VLAN settings etc. are stored in the permanent memory and are remaining.

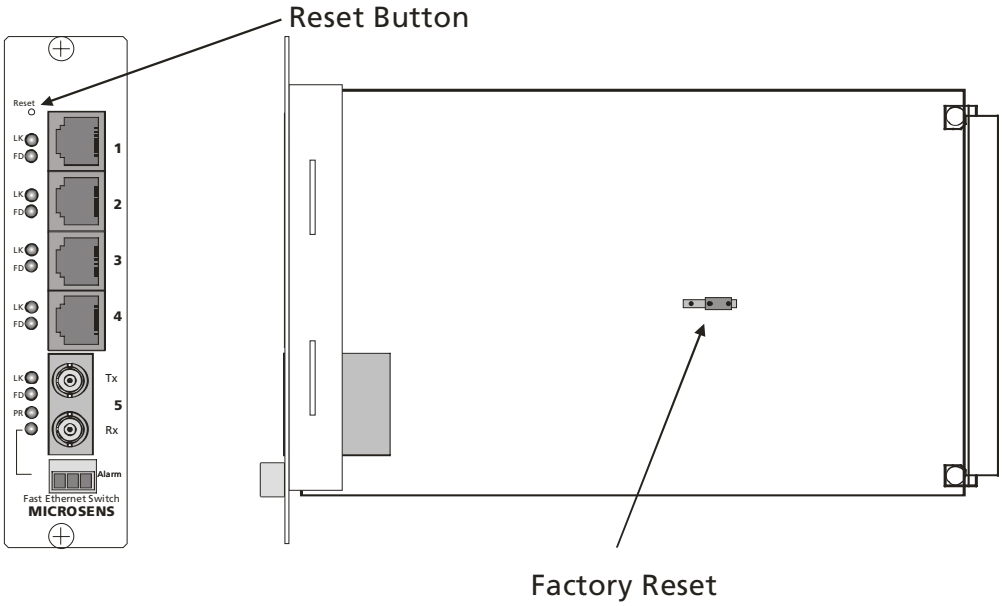



Fig. 3: Position Reset Button

The reset button has an additional function. By holding this button for approx. 5 sec., the management agent releases an IP request. With the Device Manager and this IP request it is possible to assign the IP address.

On the module there is a jumper located. In combination of the reset it is possible to delete the configuration of the switch (VLAN etc.) and to set them back to factory default (Factory Reset). The settings of the network management (e.g. TCP/IP address) are unchanged.

Jumper left position: Factory Reset
Jumper right position: Normal Reset (default)

## Ring Configuration

The switch module is for the central connetion of fault tolerant ring structures. The MICROSENS patented mechanism is doing a fast reconfiguration of the network in case of a failure. Standarised mechanism like Spanning Tree are not used and supported.

For the ring functionality one switch in the ring has the master function, all other switches are simple ring nodes (slaves). This configuration is done via the Device Manager. All switches can be configured as a master or slave switch.

Each switch in the ring is monitoring the status of the direct connected fiber segments. In case of a failure the switch sends a permanent failure signal through the Ethernet to the ring master. Now the ring master closes its logical segment splitting immediately.

If the normal operation status is reached again (repair of the faulty connection), this is recognized by the direct connected switches, and the permanent failure signal is stopped. The ring master opens the logical splitting again (normal operation).

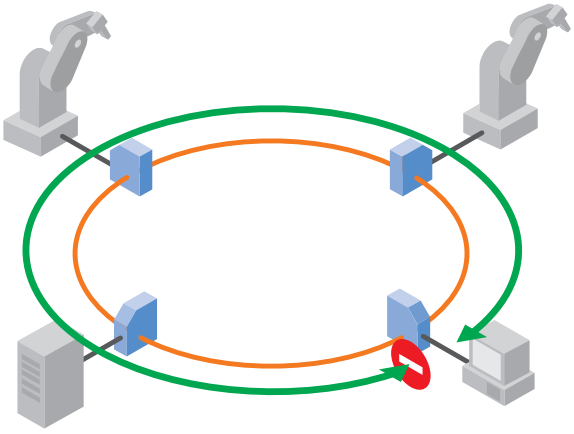


Fig. 4: Data transmission in normal operation mode (logical interruption of the ring by the ring master)

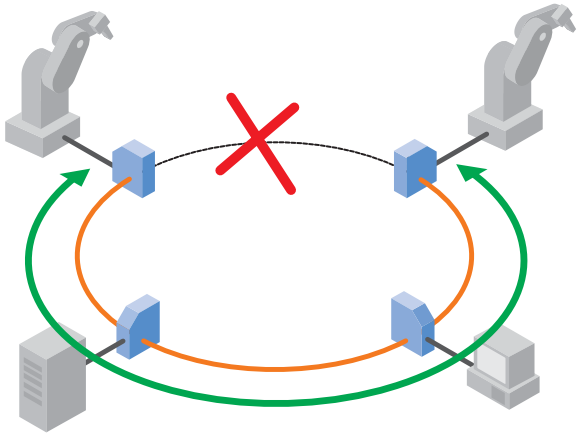


Fig. 5: Data transmission in failure operation mode (the ring master passes the data through)

## Advantages of the MICROSENS Patent

This solution for the fast redundancy offers many advantages:

- very fast redundancy without delaying mechanism such as Spanning Tree or Rapid Spanning Tree (reconfiguration in less than 100 ms)
- no special product for the central device of the ring, each switch can be configured as a master switch
- no rendundancy of the ring master necessary, if the switch with master function fails the logical splitting is remaining at the same position
- no newtwork load in normal operation mode, the failure signal is only sent in case of a broken connection
- no limitation in terms of transmit time and the maximum ring size ( fiber connections)
- no technical limitation of the number of ring nodes (switches)

## Ring Configuration

Management and configuration are done with a powerful PC software, the Device Manager. Under the menu point Hardware-Settings the modes master and slave can be selected. The switch configured to the master mode is acting as the ring manager and offers the logical segment splitting which avoids the data multiplication.

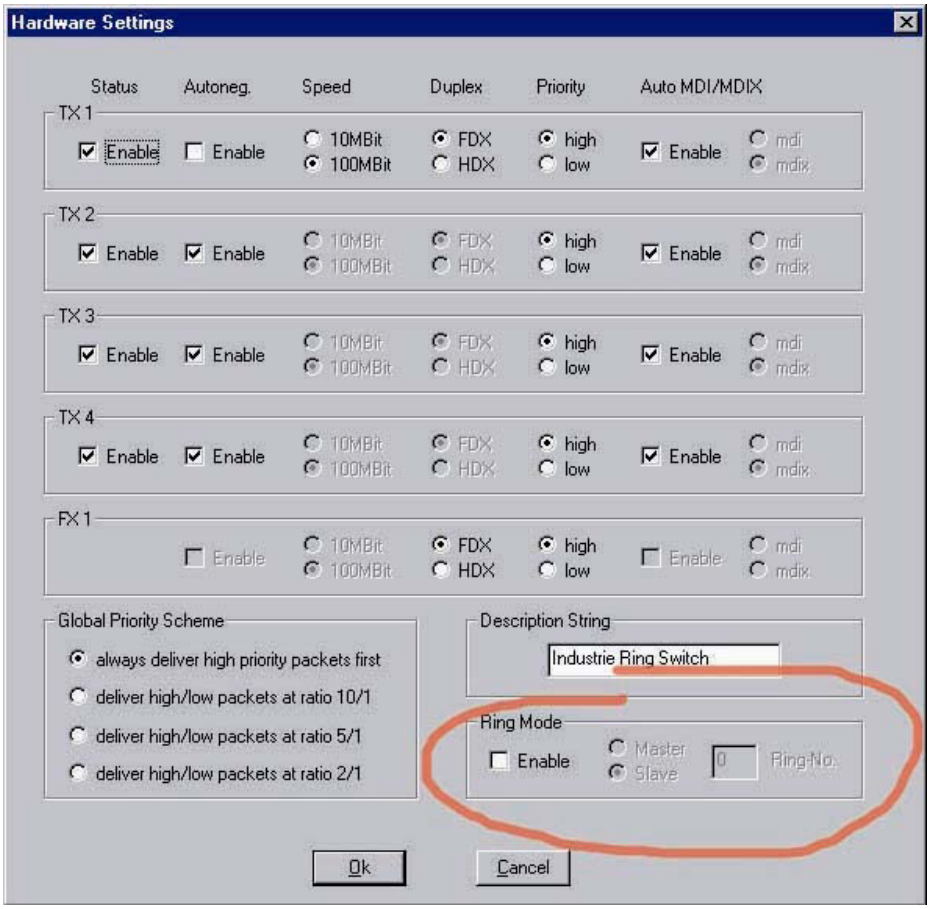



Fig. 5: Hardware Settings

With deactivated ring mode (factory default) the switch is working as a normal 5 port switch. According to the Ethernet standard a ring configuration is not allowed then (generating loop, multiplication of broadcast). It is necessary to activate the ring mode before configuring the ring physically.

To avoid a correlation between different fiber rings, a ring number (0-255) is assigned via the network management.

All switches with the ring feature are having a network management integrated and can recognize and signalize all failures.

## Connection (Ring Configuration)

The fault tolerant ring is closed with a RJ-45 connection cable using port 4 of the switch module. Because the TP ports are supporting auto crossover, it is not necessary to use a special crossed patch cable.

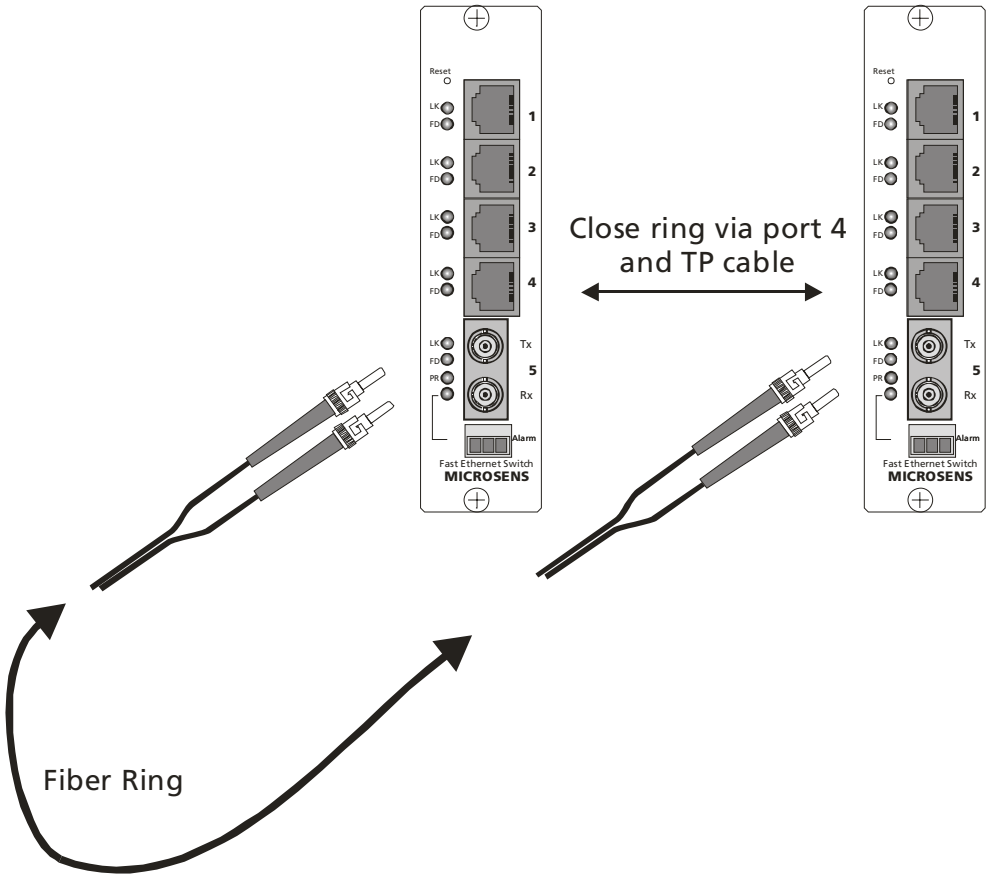



Fig. 6: Connections

Attention: before all connections for the ring are made, it is necessary to configure all switches to the ring mode and at least one switch must be configured as a master!

It is not necessary that both modules ar located in the same chassis. According to the standard it is possible to use Cat.5 connections up to 100m.

## Safety Notes

**WARNING:** Infrared radiation as used for data transmission within the fiber optic, although invisible to the human eye, can nevertheless cause damage.

To avoid damage to the eyes:

- never look straight into the output of fiber optic components – danger of blinding!
- cover all unused optical connections with caps.
- commission the transmission link only after completing all connections.

The active laser components used with this product comply with the provisions of **Laser Class 1**.

**DANGER:** Conductive components of power and telecommunications networks can carry dangerously high voltage.

To avoid electric shock:

- Do not carry out installation or maintenance work during lightning storms.
- All electric installations must be carried out in accordance with local regulations.

## Order Information

| Art.-No. | Description | Connectors |
|---|---|---|
| MS415221M | Fast Ethernet Switch module<br>4x10/100Base-TX, 1x100Base-FX<br>1310 nm Multimode ST, max. 2 km | 4x RJ-45<br>2x ST<br>1x Alarm Contact |
| MS415222M | Fast Ethernet Switch module<br>4x10/100Base-TX, 1x100Base-FX<br>1310 nm Multimode SC, max. 2 km | 4x RJ-45<br>1x SC duplex<br>1x Alarm Contact |
| MS415224M | Fast Ethernet Switch module<br>4x10/100Base-TX, 1x100Base-FX<br>1310 nm Single Mode SC, max. 15 km | 4x RJ-45<br>1x SC duplex<br>1x Alarm Contact |
| MS415225M | Fast Ethernet Switch module<br>4x10/100Base-TX, 1x100Base-FX<br>1310 nm Single Mode ST, max. 15 km | 4x RJ-45<br>2x ST<br>1x Alarm Contact |

Further versions on request

## Accessories

| Art.-No. | Description |
|---|---|
| MS200150 | Device Manager PC-Software V3.x, universal<br>MICROSENS Switch-Management |