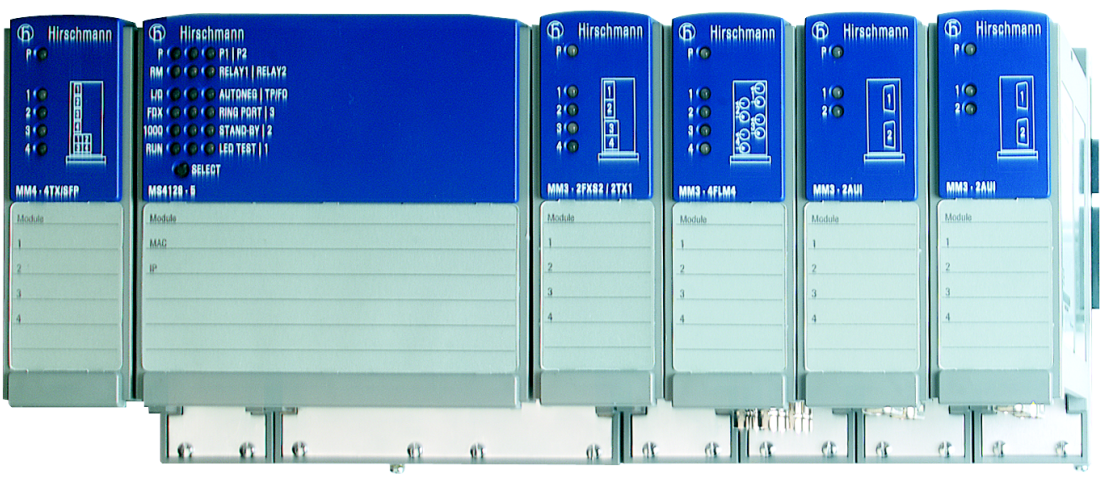
HIRSCHMANN
A BELDEN BRAND

User Manual

Installation
Industrial ETHERNET Switch
PowerMICE



PowerMICE
Release 06 03/10

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You can get the latest version of this manual on the Internet at the Hirschmann product site (www.hirschmann-ac.de).

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Content

Safety instructions

This documentation contains instructions which must be observed to ensure your own personal safety and to avoid damage to devices and machinery.

Certified usage

Please observe the following: The device may only be employed for the purposes described in the catalog and technical description, and only in conjunction with external devices and components recommended or approved by the manufacturer. The product can only be operated correctly and safely if it is transported, stored, installed and assembled properly and correctly. Furthermore, it must be operated and serviced carefully.

Supply voltage

For safety reasons the devices have been designed to operate at low voltages. Thus, they may only be connected to the supply voltage connections and to the signal contact with SELV circuits with the voltage restrictions in accordance with IEC/EN 60950-1.
The supply voltage is electrically isolated from the housing.

Note: Only the PoE media module MM22-T1T1T1T1 has an external power supply.

- ☐ Use only undamaged parts.
- ☐ Relevant for North America: For use in Class 2 circuits.
  The device may only be connected to a supply voltage of class 2 that fulfills the requirements of the National Electrical Code, Table 11(b). If the voltage is being supplied redundantly (two different voltage sources), the combined supply voltages must fulfill the requirements of the National Electrical Code, Table 11(b).
- ☐ Relevant for North America: For use in Class 2 circuits.
  Only use copper wire/conductors of class 1, 75 °C.
- ☐ Relevant for North America
  for devices certified for hazardous locations:
  Power, input and output (I/O) wiring must be in accordance with Class I, Division 2 wiring methods [Article 501-4(b) of the National Electrical Code, NFPA 70] and in accordance with the authority having jurisdiction.
- ☐ Relevant for Europe:
  Products that are installed in explosive gas atmospheres according to ATEX RL 94/9 EG must have a device label with the identifier ⟨Ex⟩ II 3G Ex ... For this product:
  The product must be mounted in a suitable IP 54-certified housing – tested to 4 J impact to minimize the risk of mechanical damage.

Shielding ground

The shielding ground of the connectable twisted pairs lines is connected to the front panel as a conductor.

☐ Beware of possible short circuits when connecting a cable section with conductive shielding braiding.

Housing

Warning!
Never insert sharp objects (small screwdrivers, wires, etc.) into the inside of the product. There is the risk of an electric shock.

Warning!
When installing the device, make sure the ventilation slots remain free, as otherwise damage can occur through overheating.

Only technicians authorized by Hirschmann are permitted to open the housing.

The lower panel of the device is grounded by means of the DIN rail and optionally by means of the separate ground screw.

☐ The switch basic module forms an inseparable unity. By removing the display and connecting parts, you risk the damage of the switch basic module.

☐ Make sure that the electrical installation meets local or nationally applicable safety regulations.

☐ The ventilation slots must not be covered so as to ensure free air circulation.

☐ The clearance to the ventilation slots of the housing must be at least 10 cm (3.94 in).

☐ The device has to be mounted in an upright position (see fig. 13).

☐ If installed in a living area or office environment, the device must be operated exclusively in switch cabinets with fire protection characteristics according to EN 60950-1.

Environment

The device may only be operated at the specified maximum ambient temperature (temperature of the surrounding air at a distance of up to 5 cm (1.97 in) to the device) and relative air humidity (non-condensing).

☐ Install the device in a location where the climatic threshold values specified in the technical data are adhered to.

☐ Only to be used in an environment with a pollution degree specified in the technical data.

Qualification requirements for personnel

Qualified personnel as understood in this manual and the warning signs, are persons who are familiar with the setup, assembly, startup, and operation of this product and are appropriately qualified for their job. This includes, for example, those persons who have been:

- trained or directed or authorized to switch on and off, to ground and to label power circuits and devices or systems in accordance with current safety engineering standards;
- trained or directed in the care and use of appropriate safety equipment in accordance with the current standards of safety engineering;
- trained in providing first aid.

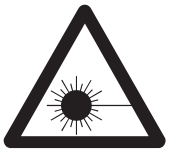
General safety instructions

Electricity is used to operate this equipment. Comply in every detail with the safety requirements specified in the operating instructions regarding the voltages to apply (see page 4).

Non-observance of these safety instructions can therefore cause material damage and/or serious injuries.

- ☐ Only appropriately qualified personnel should work on this device or in its vicinity. These personnel must be thoroughly familiar with all the warnings and maintenance procedures in accordance with this operating manual.
- ☐ The proper and safe operation of this device depends on proper handling during transport, proper storage and assembly, and conscientious operation and maintenance procedures.
- ☐ Never start operation with damaged components.
- ☐ Only use the devices in accordance with this manual. In particular, observe all warnings and safety-related information.
- ☐ Any work that may be required on the electrical installation may only be carried out by personnel trained for this purpose.

Note: LED or LASER components in compliance with IEC 60825-1 (2001):
CLASS 1 LASER PRODUCT
CLASS 1 LED PRODUCT



Warning
LED LIGHT (...-...P4... and ...-P9... POF media modules) DO NOT STARE INTO THE BEAM OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS (e.g. lens, microscope). Failure to observe this warning within a distance of 100 mm can endanger your eyes. Light is emitted from the optical connections or from the ends of the optical fibers that are connected to them. Light Emitting Diode CLASS 2M, Wave length 650 nm, Power <2 mW, according to IEC/CEI 60825-1:2003-10.

National and international safety regulations

☐ Make sure that the electrical installation meets local or nationally applicable safety regulations.

ESD guidelines (MM... - ...P4...)

The media modules MM2-2FXP4 and MM3-4FXP4 contain components highly sensitive to electrostatic fields. These components can be easily destroyed or have their lives shortened by an electrical field or by a discharge caused by touching the contacts. You can find more information about devices vulnerable to electrostatic fields in DIN EN 61340-5-1 (2001-08) and DIN EN 61340-5-2 (2002-01).

Note on the CE marking

The devices comply with the regulations contained in the following European directive(s):

2004/108/EG
Directive of the European Parliament and the council for standardizing the regulations of member states with regard to electromagnetic compatibility.

In accordance with the above-named EU directive(s), the EU conformity declaration will be at the disposal of the relevant authorities at the following address:

Hirschmann Automation and Control GmbH
Stuttgarter Str. 45-51
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The product can be used in living areas (living area, place of business, small business) and in industrial areas.

- Interference immunity: EN 61000-6-2:2005
- Emitted interference: EN 55022:2006 + A1:2007 Class A

Warning!
This is a class A device. This device can cause interference in living areas, and in this case the operator may be required to take appropriate measures.
The assembly guidelines provided in these instructions must be strictly adhered to in order to observe the EMC threshold values.

FCC note:

Appropriate testing has established that this device fulfills the requirements of a class A digital device in line with part 15 of the FCC regulations.
These requirements are designed to provide sufficient protection against interference when the device is being used in a business environment.
The device creates and uses high frequencies and can radiate same, and if it is not installed and used in accordance with this operating manual, it can cause radio transmission interference. The use of this device in a living area can also cause interference, and in this case the user is obliged to cover the costs of removing the interference.

Recycling note

After usage, this product must be disposed of properly as electronic waste in accordance with the current disposal regulations of your county / state / country.

About this Manual

The following manuals are available as PDF files on the CD-ROM supplied:

- Installation user manual
- Basic Configuration user manual
- Redundancy Configuration user manual
- Router Configuration user manual
- Web-based Interface reference guide
- Command Line Interface user manual

The HiVision Network Management Software provides you with additional options for smooth configuration and monitoring:

- Event log
- Configuration of “System Location” and “System Name”
- Configuration of the network address range and the SNMP parameters
- Saving the configuration on the device
- Simultaneous configuration of multiple devices
- Configuration of the port display color red for a connection error

With the Industrial HiVision Network Management software, you increase your network security in industrial application areas:

- ETHERNET Early Warning System
- Easy monitoring of industrial networks
- Fast display
- Interface with diagnostic and configuration programs
- Low deployment cost

Legend

The symbols used in this manual have the following meanings:

▶	Listing
☐	Work step
■	Subheading

1 Device description

The PowerMICE devices consist of a switch with media modules that can be plugged into it. The devices have 4 slots for 10/100 Mbit/s media modules and 1 slot for 1 Gigabit module. The slot for the Gigabit module supports 2 Gigabit ports. The expansion module provides you with 2 additional slots for 10/100 Mbit/s media modules. Each media module provides you with 2 to 4 ports for connecting network segments.

The PowerMICE devices are designed for the special requirements of industrial automation. They meet the relevant industry standards, provide very high operational reliability, even under extreme conditions, and also long-term reliability and flexibility.

The devices allow you to set up switched industrial ETHERNET networks that conform to the IEEE 802.3 and 802.3u standards using copper wires or optical fibers in a line or ring structure.

The devices work without a fan.

The voltage is supplied redundantly.

Mount the devices by
- simply snapping them onto a DIN rail

You can choose various media to connect terminal devices and other infrastructure components:
- twisted pair cable
- multimode F/O
- singlemode F/O

The twisted pair ports support:
- Autocrossing
- Autonegotiation
- Autopolarity

There are a number of convenient options for managing the device. Administer your devices via:
- a Web browser
- Telnet
- management software (e.g. HiVision)
- a V.24 interface (locally on the Switch)

The HIPER-Ring redundancy concept enables a quick reconfiguration. With one additional connection, projection remains simple.

Product configuration data can be provided by:
- diagnosis displays
- displaying the operating parameters
- large label areas

The clear division of the diagnosis displays and the connection level allows you to view the LEDs easily.

Depending on the software you choose, the devices provide you with a large range of functions:

- Redundancy functions
  - Rapid Spanning Tree Protocol (RSTP)
  - Redundant ring structure
  - HIPER-Ring
  - Redundant coupling
  - Link aggregation
  - Redundant power supply
- Security
  - Protection from unauthorized access
  - Blocking of unauthorized messages (MAC or IP based)
- Synchronized system time in the network
- Network load control
- Operation diagnosis
- Diagnostics (hardware self-testing)
- Reset
- Priority
- VLAN
- Topology Discovery
- Web-based Interface
- Command Line Interface CLI
- SNMP
- 802.1x port authentication
- Real Time Clock (Professional software variant)

The Hirschmann network components help you to establish continuous communication across all levels of the company. Connect your devices to:

- devices of the Open Rail family
- backbone devices of the MACH family
- the BAT wireless transmission system
- the EAGLE security system
- products for the LION control room / MACH 100 family

The following software variants are available:

- MICE MS4128-L2P: Layer 2 Professional
- MICE MS4128-L3E: Layer 3 Enhanced
- MICE MS4128-L3P: Layer 3 Professional

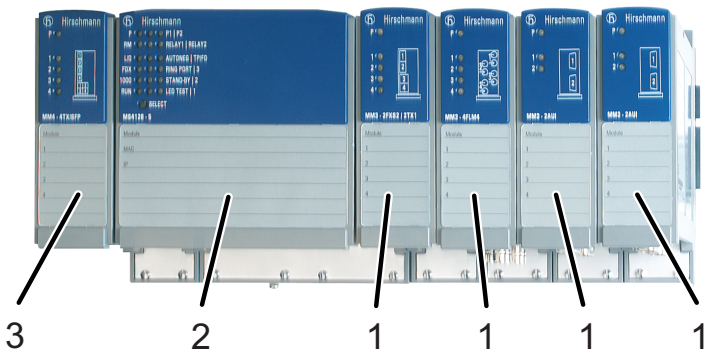


Figure 1: Basic module with media modules attached
1 – Slots for one 10/100 Mbit/s media module
2 – Basic module
3 – Slot for the Gigabit media module

1.1 Description of the modules

The industrial ETHERNET series PowerMICE (Modular Industrial Communication Equipment) consists of a basic switch module and the media modules. These devices can be managed. A basic module contains all the functions of this industrial Switch, with the exception of the interfaces to the LAN that is connected. Pluggable media modules provide these interfaces. They differ with regard to the number of interfaces and the media type for connecting segments. An expansion module enables you to add 2 slots for media modules to the basic module.

For the sake of simplicity, the basic switch module with various plugged in media modules will be referred to as PowerMICE in this document.

The devices comply with the specifications of the standard(s):
- ISO/IEC 8802-03 10BASE-T/100BASE-TX/1000BASE-T
- ISO/IEC 8802-03 100BASE-FX
- ISO/IEC 8802-03 1000BASE-SX/LX

1.1.1 PowerMICE basic module MS4128

The basic module of the PowerMICE contains all the function units, such as: switch function, management function, redundancy function, display control, voltage connection, management connection, adjustable controls, slots for media modules.

Family	Designed for:
PowerMICE	larger numbers of ports
	larger bandwidth requirement
	Selectable via media modules: Number of 100/1000 Mbit/s ports

The basic module provides:

- 4 slots for 10/100 Mbit/s media modules
- 1 slot for 1 Gbit/s media modules

With the expansion module you add 2 more slots for 10/100 Mbit/s media modules. With its 4-port media modules, the basic module allows you to connect up to:

- 16 network segments or
- 24 network segments when using an expansion module and additionally
- 4 Gigabit network segments when using a 4-port Gigabit media module.

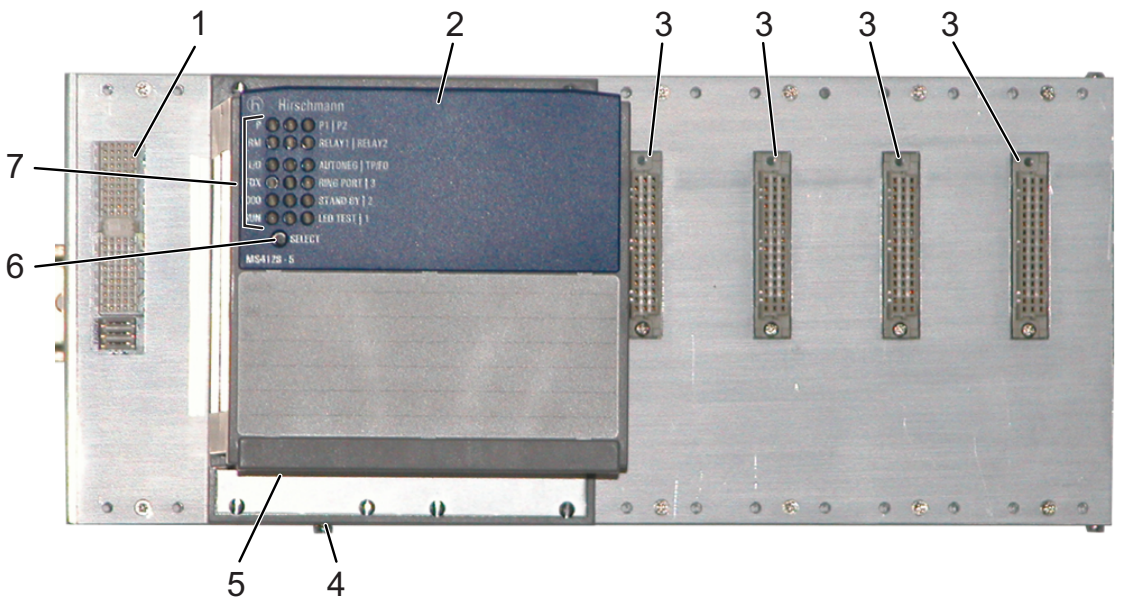


Figure 2: Front of the basic module
1 – Slot for SFP module MM4...
2 – Basic module
3 – Slot for media modules MM2… or MM3… with 2 to 4 ports each
4 – Ground screw
5 – Connections on the bottom of the basic module
6 – Button for setting the display status
7 – LEDs for device status and display status

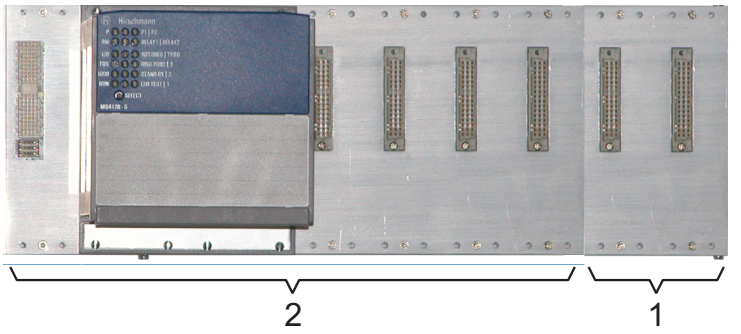


Figure 3: Basic module with expansion module
1 – Expansion module MB-2T
2 – Basic module

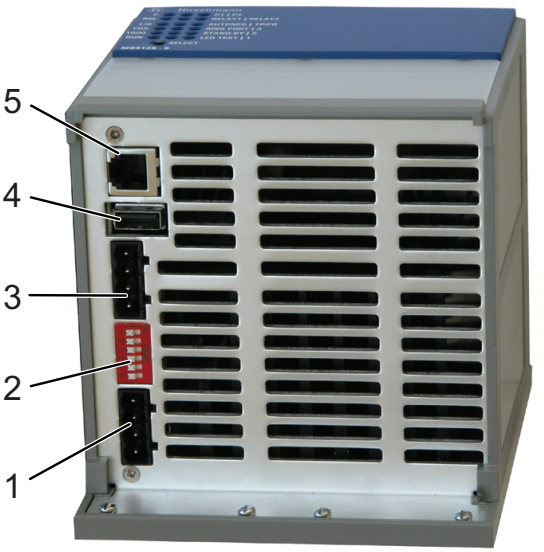


Figure 4: Connections on the bottom of the basic module
1 – Terminal block (Power 2)
2 – DIP switch
3 – Terminal block (Power 1)
4 – USB port
5 – V.24 port

1.1.2 Media modules

The media modules form the interface from the device to the LAN.
The media modules can be used in the basic module.
An expansion module enables you to add 2 slots for media modules to the basic module.

They differ with regard to the number of interfaces and the media type. The different interfaces of the media modules provide you with the following interface-specific functions:

- Specific functions of TP/TX interface
  - Link Control

- Auto Polarity Exchange
- Autonegotiation
- Autocrossing (device may be connected with a crossed-over or an uncrossed cable)

- Specific functions of F/O interface
  - Link Down monitoring

- Transceiver-specific (AUI-specific) functions
  - Collision recognition
  - Collision test (SQE)
  - Protection from permanent network connection (Jabber Control)
  - DTE Power Monitor

Depending on the basic module setting, the LEDs display, among other things, the data reception and the connection status.

MM2 media modules

MM2 media modules Module type	AUI port	TP ports 10/100 Mbit/s	F/O port multi-mode 10 Mbit/s	F/O port multi-mode POF 100 Mbit/s	F/O port multi-mode 100 Mbit/s	F/O port single-mode 1300 nm, 100 Mbit/s	F/O port single-mode 1550 nm, 100 Mbit/s
MM2 - 4TX1 (- EEC)	–	4, RJ45	–	–	–	–	–
MM2 - 2FLM4	–	–	2, ST	–	–	–	–
MM2 - 2FXP4	–	–	–	2, ST	–	–	–
MM2 - 4FXM3	–	–	–	–	4, MTRJ	–	–
MM2 - 2FXM3 / 2TX1	–	2, RJ45	–	–	2, MTRJ	–	–
MM2 - 2FXM2	–	–	–	–	2, DSC	–	–
MM2 - 2FXS2	–	–	–	–	–	2, DSC	–

Table 1: Media connections per MM2 media modules (number and type)

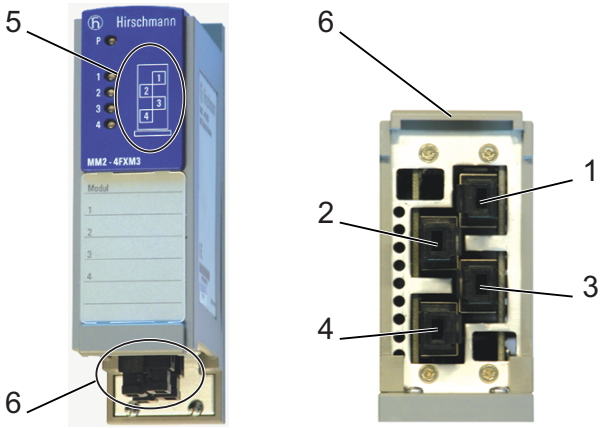


Figure 5: Port assignment
1 - Port 1
2 - Port 2
3 - Port 3
4 - Port 4
5 - Illustration of the port numbers
6 - Bottom side of the device

MM3 media modules

MM3 media modules Module type	AUI port	TP ports 10/100 Mbit/s	F/O port multi-mode 10 Mbit/s	F/O port multi-mode POF 100 Mbit/s	F/O port multi-mode 100 Mbit/s	F/O port single-mode 1300 nm, 100 Mbit/s	F/O port single-mode 1550 nm, 100 Mbit/s
MM3-2AUI	2, Sub-D	–	–	–	–	–	–
MM3-4TX5	–	4, M12	–	–	–	–	–
MM3-4TX1-RT	–	4, RJ45	–	–	–	–	–
MM3-2FLM4/2TX1-RT	–	2, RJ45	2, ST	–	–	–	–
MM3-4FLM4	–	–	4, ST	–	–	–	–
MM3-4FXP4	–	–	–	4, ST	–	–	–
MM3-1FXM2/3TX1	–	3, RJ45	–	–	1, DSC	–	–
MM3-2FXM2/2TX1(-EEC)	–	2, RJ45	–	–	2, DSC	–	–
MM3-2FXM2/2TX1-RT	–	2, RJ45	–	–	2, DSC	–	–
MM3-2FXM4/2TX1	–	2, RJ45	–	–	2, ST	–	–
MM3-4FXM2	–	–	–	–	4, DSC	–	–
MM3-4FXM4	–	–	–	–	4, ST	–	–
MM3-1FXS2/3TX1(-EEC)	–	3, RJ45	–	–	–	1, DSC	–
MM3-2FXS2/2TX1	–	2, RJ45	–	–	–	2, DSC	–
MM3-2FXS2/2TX1-RT	–	2, RJ45	–	–	–	2, DSC	–
MM3-4FXS2	–	–	–	–	–	4, DSC	–
MM3-1FXL2/3TX1	–	3, RJ45	–	–	–	–	1, DSC

Table 2: Media connections per MM3 media modules (number and type)

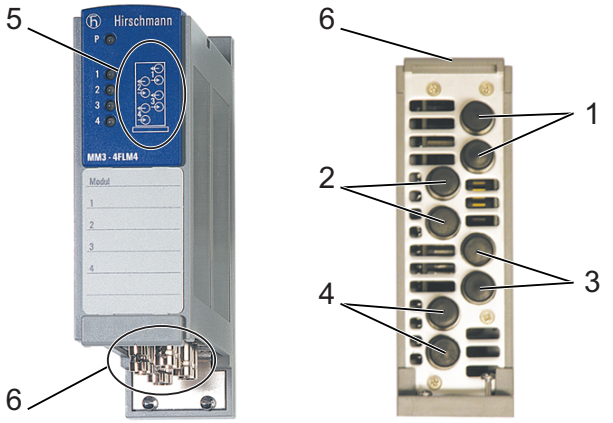


Figure 6: Port assignment
1 - Port 1
2 - Port 2
3 - Port 3
4 - Port 4
5 - Illustration of the port numbers
6 - Bottom side of the device

MM22-T1T1T1T1 PoE media module

The MM22-T1T1T1T1 PoE media module (deeper module design) supports Power over ETHERNET (PoE) according to IEEE 802.3af. It allows the connection and remote supply of IP telephones (Voice over IP), webcams, sensors, printer servers and WLAN access points via 10BASE-T/100BASE-TX, for example. With PoE, these terminal devices are powered by the twisted-pair cable.

The MM22-T1T1T1T1 media module has four 10BASE-T/100BASE-TX ports (RJ45 connections) for connecting network segments or PoE terminal devices (PD, Powered Device) up to class 0 (or respectively class 3).

The current is supplied on the free line pair (spare pairs); the individual ports are not electrically insulated from each other.
The following conditions are met in accordance with IEEE 802.3af:

- Endpoint PSE
- Alternative B.

MM4 media modules

The 4-port MM4-4TX/SFP media module has 4 TP interfaces and 4 sockets for SFP modules from Hirschmann.
The 2-port MM4-2TX/SFP media module has 2 TP interfaces and 2 sockets for SFP modules from Hirschmann.

The Gigabit slot of the PowerMICE (slot on the left side next to the switch basic module) supports two Gigabit ports.

When you use an SFP module, you get an optical interface. You thus deactivate the corresponding TP interface.

Note: Only use SFP modules from Hirschmann (see table 19).

MM4 media modules Module type	TP ports 10/100/1000	SFP ports as alternatives to TP ports
MM4 - 2TX/SFP	2, RJ45	2
MM4 - 4TX/SFP	4, RJ45	4

Table 3: Media connections per MM4 media module (number and type)

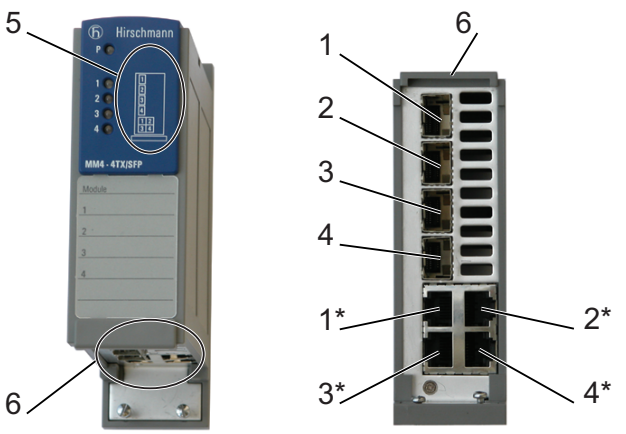


Figure 7: Port assignment
1 - Port 1 (twisted pair)
2 - Port 2 (twisted pair)
3 - Port 3 (twisted pair)
4 - Port 4 (twisted pair)
1 - Port 1* (SFP slot, can be used as alternative to port 1)*
2 - Port 2* (SFP slot, can be used as alternative to port 2)*
3 - Port 3* (SFP slot, can be used as alternative to port 3)*
4 - Port 4* (SFP slot, can be used as alternative to port 4)*
5 - Representation of port numbers
6 - Bottom of device

1.1.3 MB-2T expansion module

The MB-2T expansion module allows you to add 2 slots for media modules to the basic module.

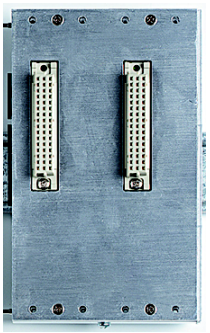


Figure 8: MB-2T expansion module

1.1.4 SFP modules

SFP modules are optical transceivers (Fast ETHERNET and Gigabit ETHERNET SFP modules (see table 19). SFP stands for Small Form-factor Pluggable and is often named mini-GBIC (GigaBit Interface Converter).

The SFP modules are plugged into the SFP slots of the Fast ETHERNET media module MM20-Z6Z6Z6Z6... or of the Gigabit ETHERNET media modules MM4-4TX/SFP / MM4-2TX/SFP to provide a F/O port.
The MM20-Z6Z6Z6Z6... has four slots for SFP modules (100 Mbit/s).

The MM4-4TX/SFP / MM4-2TX/SFP has four/two TP interfaces and four/two slots for SFP modules (100/1000 Mbit/s).
Inserting the SFP module deactivates the corresponding TP interface.

Module type	Transmission	Range	Connection
M-SFP-SX/LC	850 nm multimode	0.55 km	LC
M-SFP-LX/LC	1330 nm multimode 1330 nm singlemode	0.55 km 20 km	LC LC
M-SFP-LH/LC	Long Haul	8-72 km	LC
M-SFP-LH+/LC	Long Haul +	60-120 km	LC

Table 4: Gigabit ETHERNET SFP modules

Module type	Transmission	Range	Connection
M-FAST SFP-MM / LC	1310 nm Multimode	4 km	LC
M-FAST SFP-SM / LC	1310 nm Singlemode	25 km	LC
M-FAST SFP-SM+/ LC	1310 nm Singlemode	25-65 km	LC
M-FAST SFP-LH / LC	1550 nm Longhaul	40-104 km	LC

Table 5: Fast ETHERNET SFP modules

2 Assembly and start-up

The devices have been developed for practical application in a harsh industrial environment. The installation process is correspondingly simple.

On delivery, the device is ready for operation.
The following procedure has been proven to be successful for the assembly of the device:

- Unpacking and checking
- Installing the media modules
- Filling out and attaching labels
- Installing the SFP modules
- Adjusting DIP switch settings on basic module
- Adjusting the DIP switch settings on the MM3-2AUI media module (if there is one)
- Connecting the MM22-T1T1T1T1 PoE media module
- Connect the terminal block for voltage supply and signal contact and connect the supply voltage
- Install the terminal block, start-up procedure
- Install the basic module on the DIN rail, grounding
- Installing the data lines
- Installing the MB-2T expansion module

2.1 Installing the device

2.1.1 Unpacking and checking

☐ Check whether the contents of the package are complete (see page 45 „Scope of delivery“).
☐ Check the individual parts for transport damage.

2.1.2 Installing the media modules

On delivery, the device is ready for operation.
You can install and remove media modules during running operation.

☐ To attach a media module, first remove the protective cap on the plug.
☐ Plug the media module onto the plug.
☐ Fasten the 4 screws at the corners of the media module.
☐ Fit the media modules in sequence from left to right.
☐ Check whether the switch default settings match your requirements.

2.1.3 Filling out and attaching labels

The labels included in the delivery help you to organize your network installation clearly.

The large label areas enable you to designate the modules and uniquely assign the devices to be connected. You can print them, write on them and replace them at any time.

Figure 9: Attaching the labels

Figure 10: Label areas

1 – Labeling the media modules: name of the module
2 – Labeling the media modules: port assignment of module for each port
3 – Labeling the basic module: additional entries if required
4 – Labeling the basic module: IP address of the device
5 – Labeling the basic module: MAC address of the device
6 – Labeling the basic module: name of the module

☐ Attach the labels included in the delivery to the basic module and the media modules as required.

2.1.4 Installing the SFP modules

☐ To attach an SFP module, first remove the protective cap over the socket.
☐ Push the SFP module with the lock closed into the socket until it latches audibly in place.

Note: Only use Hirschmann SFP modules.

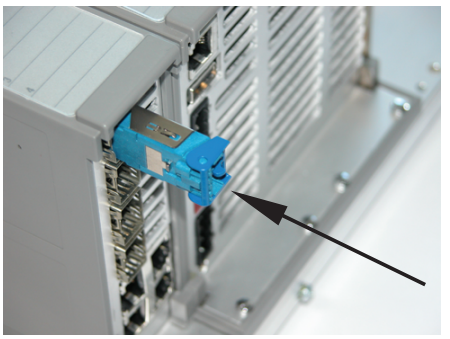


Figure 11: Installing an SFP module

2.1.5 Adjusting DIP switch settings on basic module

The 6-pin DIP switch on the bottom panel of the basic module provides you with the following options:

DIP switch	Function	Default setting
RM (Redundancy Manager)	Switch the RM (Redundancy Manager) function on and off when the HIPER-Ring function is activated (see “User Manual - Redundancy Configuration”).	OFF position (RM function deactivated)
Ring port	Select the port for the HIPER-Ring. The changes to the switch setting are taken over after the restart. In the ON position, ports 1 and 2 in module 2 form the connection for the HIPER-Ring.	OFF position (ports 1 and 2 in module 1 form the connection for the HIPER-Ring).
Stand-by	With the redundant coupling of rings, you assign the redundancy function to the PowerMICE in the redundant line (see “User Manual - Redundancy Configuration”).	OFF position (normal operation)
HIPER-Ring[a]	Switch the HIPER-Ring functions on and off. When the function is switched off, you can use the Ring ports as normal ports. In the ON position, RSTP (Rapid Spanning Tree) is globally deactivated.	OFF position
Software configuration / DIP configuration	Give the software configuration precedence over the DIP switch position. In this case, the other switch positions are meaningless.	OFF position (software configuration has precedence)
Service	Switch the device to the service mode.	OFF position (normal operation)

a. Control port: module 1, port 3; coupling port: module 1, port 4

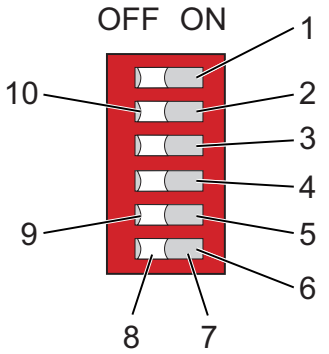


Figure 12: 6-pin DIP switch on basic module

1 – Switch 1, position ON, function: Redundancy Manager (RM)
2 – Switch 2, position ON, function: module 2, port 1 and port 2
3 – Switch 3, position ON, function: stand-by
4 – Switch 4, position ON, function: HIPER-Ring
5 – Switch 5, position ON, function: DIP configuration
6 – Switch 6, position ON, function: service mode
7 – Switch position ON
8 – Switch position OFF
9 – Switch 5, position OFF, function: software configuration
10 – Switch 2, position OFF, function: module 1, port 1 and port 2

☐ Before starting operation of the device, check whether the default settings of the DIP switch correspond to your requirements.

2.1.6 Adjusting the DIP switch settings on the MM3-2AUI media module

With the 3-pin DIP switch in the bottom panel of the MM3-2AUI media module, you enter settings for the SQE test function and for monitoring the DTE voltage.

Note: Before starting operation, check whether the device in question operates the transceiver with or without an SQE test.

☐ Before starting operation of the device, check whether the default settings of the DIP switch correspond to your requirements.

2.1.7 Connecting the MM22-T1T1T1T1 PoE media module

The MM22-T1T1T1T1 PoE media module with PoE voltage (48 V DC safety extra-low voltage) is supplied with power via an external power supply unit. The PoE voltage is fed into the 3-pin terminal block of the PoE media module. The twisted-pair cables at ports 1 to 4 are supplied with PoE voltage via the spare pairs (pins 4 & 5 and 7 & 8 of the RJ45 sockets).

Note: Only use the Hirschmann RPS60/48V EEC power supply unit to supply the PoE voltage.

☐ Make sure that the external power supply unit you use to provide the PoE voltage fulfills the following basic prerequisites:
- ▶ Insulation requirements according to IEEE 802.3af (insulation resistance 48 V output to “rest of the world” 2250 V DC for 1 min.).
- ▶ Output power < 100 W.
- ▶ Current limitation < 2 A.
- ▶ The power supply unit and the PoE media module form a limited power source according to IEC60950-1.
- ▶ The external PoE power supply unit must be able to provide the power for the connected PDs.

Power supply unit RPS60/48V EEC fulfills these requirements.

Note: The RPS60/48V EEC power supply unit does not fulfill the requirements according to Germanischer Lloyd, criterion EMC1, relating to conducted emissions on the 230 V AC side. If this requirement must be fulfilled, connect a corresponding power supply unit that fulfills both this requirement **and** the basic requirements.

☐ Connect the PoE voltage to the 3-pin terminal block included in the scope of delivery, as shown in the following diagram.
Make sure the following requirements are met:
- ▶ Supply line length < 3 m.
- ▶ Supply line cross section is suitable for 1.5 A.

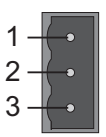
Figure	Pin	Assignment
	1	+ 48 V
	2	—
	3	0 V

Table 6: Pin assignment of the 3-pin terminal block

☐ Mount the terminal block for the PoE supply voltage on the bottom of the PoE module using the snap lock. Make sure it latches securely in place.

Note: Use 4-pair twisted pair cables to connect the terminal devices. Only connect terminal devices that conform to IEEE 802.3af.

2.1.8 Terminal block for supply voltage and signal contact

The supply voltage and the signal contacts are connected via a 4-pin terminal block and a redundant 4-pin terminal block with a snap lock.

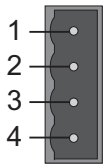
Figure	Pin	Assignment	Rated voltage range DC
	1	+ 24 V	18.0 V to 32.0 V
	2	0 V	
	3	Signal Contact	
	4	Signal Contact	

Table 7: Pin assignment of the 4-pin terminal block

Supply voltage

The supply voltage can be connected redundantly. Both inputs are uncoupled. There is no distributed load. With redundant supply, the power supply unit supplies the device alone with the higher output voltage. The supply voltage is electrically isolated from the housing.

Note: With non-redundant supply of the main voltage, the device reports a loss of power. You can avert this message by applying the supply voltage via both inputs, or by changing the configuration in the Management.

Signal contact

- The signal contact monitors proper functioning of the device, thus enabling remote diagnostics. You can specify the type of function monitoring in the Management.
- You can also use the switch Web page to switch the signal contact manually and thus control external devices.

A break in contact is used to report the following conditions via the potential-free signal contact (relay contact, closed circuit):

- The detected inoperability of at least one of the two voltage supplies (voltage supply 1 or 2 is below the threshold value).
- A continuous malfunction in the device (internal supply voltage).
- The defective link status of at least one port with active link monitoring. In the delivery state, link status monitoring is deactivated.
- An error during the self-test.
- Incorrect configuration of the HIPER-Ring or ring coupling.
- The temperature threshold has been exceeded or has not been reached.
- Failure of the redundancy.
- The removal of the AutoConfiguration Adapter.

The following condition is also reported in RM mode:

- Ring redundancy guaranteed. By default, there is no ring redundancy monitoring

☐ Pull the terminal block off the device and connect the voltage supply lines and the signal lines.

2.1.9 Installing the terminal block, start-up procedure

☐ Mount the terminal blocks for the voltage supply and the signal contact on the bottom of the device using the snap locks.
Make sure the snap lock latches securely in place.

By connecting the voltage supply via the terminal blocks, you start the operation of the device.

2.1.10 Installing the device on the DIN rail, grounding

☐ Mount the device on a 35 mm DIN rail in accordance with DIN EN 60175.
☐ Attach the upper snap-in guide of the device into the DIN rail and press it down against the DIN rail until it snaps into place.

Note: The shielding ground of the industrial connectable twisted pair lines is connected to the lower panel as a conductor.

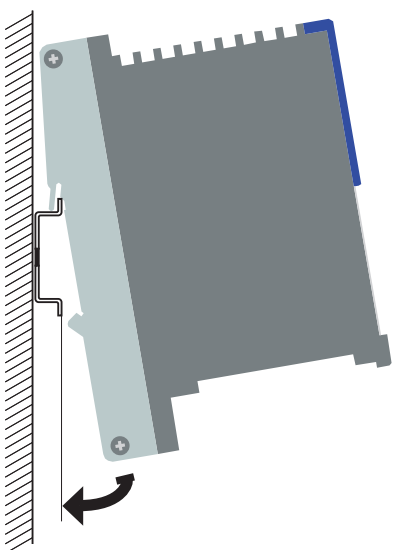


Figure 13: Assembly

Grounding
The lower panel of the device housing is grounded by means of the DIN rail and optionally by means of the separate ground screw (see fig. 2).

2.1.11 Connecting the data lines

Connect the ports of the media modules plugged into the basic module as required in order to set up your industrial ETHERNET or expand your existing network.

☐ Install the data lines according to your requirements.

10/100 Mbit/s twisted pair connection

These connections are RJ45 sockets or M12 sockets.
10/100 Mbit/s TP ports enable the connection of terminal devices or independent network segments according to the IEEE 802.3 10BASE-T/ 100BASE-TX standard.
These ports support:

- Autonegotiation
- Autopolarity
- Autocrossing (if autonegotiation is activated)
- 100 Mbit/s half-duplex mode, 100 Mbit/s full duplex mode
- 10 Mbit/s half-duplex mode, 10 Mbit/s full duplex mode

State on delivery: autonegotiation activated.

The socket housing is electrically connected to the bottom panel.

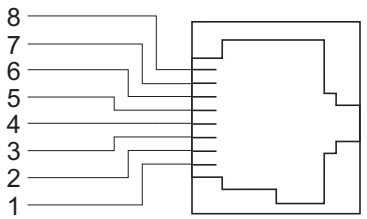
Figure	Pin	Function
	1+2	One line pair
	3+6	One line pair
	4,5,7,8	Not used

Table 8: Pin assignment of a TP/TX interface in MDI-X mode, RJ45 socket

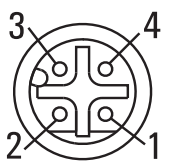
Figure	Pin	Function	
	1	TD+	Transmit Data +
	2	RD+	Receive Data +
	3	TD-	Transmit Data -
	4	RD-	Receive Data -
	Housing: shield		

Table 9: Pin assignment of a TP/TX interface (M12 socket)

10/100 Mbit/s twisted pair connection on MM22-T1T1T1T1 PoE media module

These connections are RJ45 sockets.
10/100 Mbit/s TP PoE ports enable the connection of terminal devices or independent network segments according to the IEEE 802.3 10BASE-T/ 100BASE-TX and IEEE 802.3af (Power over ETHERNET on data lines) standards.
These ports support:

- Autonegotiation
- Autopolarity
- Autocrossing (if autonegotiation is activated)
- 100 Mbit/s half-duplex mode, 100 Mbit/s full duplex mode

- 10 Mbit/s half-duplex mode, 10 Mbit/s full duplex mode
- Power over ETHERNET (PoE)

State on delivery: autonegotiation activated.
The socket housing is electrically connected to the front panel.
The PoE voltage is fed in via pins 4&5 and 7&8 (spare pairs).

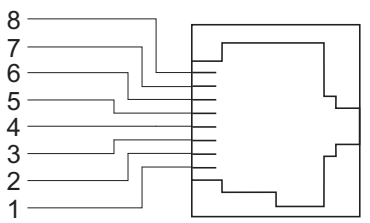
Figure	Pin	Function	
	1	RD+	Receive Data +
	2	RD-	Receive Data -
	3	TD+	Transmit Data +
	4	V+	Plus terminal of the supply voltage
	5	V+	Plus terminal of the supply voltage
	6	TD-	Transmit Data -
	7	V-	Minus terminal of the supply voltage
	8	V-	Minus terminal of the supply voltage

Table 10: Pin assignment of the TP/TX interface for PoE for supply via the free line pairs (spare pairs), RJ45 plug

10/100/1000 Mbit/s twisted pair connection

These connections are RJ45 sockets.

10/100/1000 Mbit/s TP ports enable the connection of terminal devices or independent network segments according to the IEEE 802.3 10BASE-T/ 100BASE-TX/1000BASE-T standard.

These ports support:

- Autonegotiation
- Autopolarity
- Autocrossing (if autonegotiation is activated)
- 1000 Mbit/s full duplex
- 100 Mbit/s half-duplex mode, 100 Mbit/s full duplex mode
- 10 Mbit/s half-duplex mode, 10 Mbit/s full duplex mode

State on delivery: autonegotiation activated.
The socket housing is electrically connected to the front panel.
The pin assignment corresponds to MDI-X.

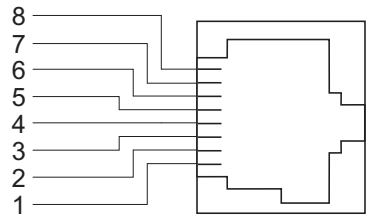
Figure	Pin	Function
	1	BI_DB +
	2	BI_DB -
	3	BI_DA +
	4	BI_DD +
	5	BI_DD -
	6	BI_DA -
	7	BI_DC +
	8	BI_DC -

Table 11: Pin assignment of a 1000 MBit/s TP interface in MDI-X mode, RJ45 socket

100 Mbit/s F/O connection

These ports are DSC connectors, ST connectors or MTRJ connectors. 100 MBit/s F/O ports enable the connection of terminal devices or independent network segments in compliance with the IEEE 802.3 100BASE-FX standard.

These ports support:

- Full or half duplex mode

State on delivery: full duplex FDX

Note: Make sure that the LH ports are only connected with LH ports, SM ports are only connected with SM ports, and MM ports only with MM ports.

1 Gbit/s F/O connection

These ports are SFP slots.

1 Gbit/s F/O ports enable the connection of terminal devices or independent network segments according to the IEEE 802.3 1000BASE-SX/ 1000BASE-LX standard.

These ports support:

- Autonegotiation
- Full duplex mode

State on delivery: autonegotiation activated.

Note: Make sure that the LH ports are only connected with LH ports, SX ports are only connected with SX ports, and LX ports only with LX ports.

AUI connection

AUI ports (Attachment Unit Interface) enable you to connect a terminal device via an AUI cable in accordance with IEEE 802.3-2002. These ports support:

- SQE test
- DTEPower-Monitor

Delivery condition: Both functions not enabled. The housing of the Sub-D plug is electrically isolated from the lower panel of the device.

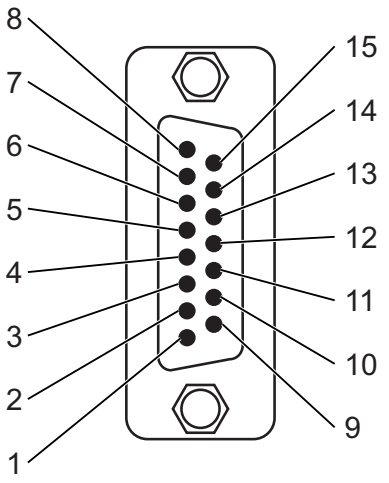


Figure 14: Pin assignment of an AUI interface

1 - Pin 1: Shielding CI
2 - Pin 2: Output CI-A
3 - Pin 3: Input DO-A
4 - Pin 4: Shielding DI
5 - Pin 5: Output DI-A
6 - Pin 6: GND
7 - Pin 7: not connected
8 - Pin 8: Shielding CO
9 - Pin 9: Output CI-B
10 - Pin 10: Input DO-B
11 - Pin 11: Shielding DO
12 - Pin 12: Output DI-B
13 - Pin 13: Voltage 12 V
14 - Pin 14: Shielding 12 V
15 - Pin 15: not connected

2.1.12 Installing the MB-2T expansion module

The MB-2T expansion module enables you to add 2 slots for media modules to the basic module. You can install the expansion module while the device is operating.

☐ On the right side of the basic module, loosen the screws at the top and bottom (1-3 revolutions).
☐ Take off the side panel.
☐ If you have not already done so, mount the basic module on the DIN rail.
☐ Push the expansion module on the DIN rail to the basic module until the modules are plugged together.
☐ Tighten the screws on the top and bottom of the basic module again.

2.1.13 Defining the meaning of the display LEDs

You use the “SELECT” button on the basic module to define the meaning of the LEDs of the media modules. You press the button to switch to the next display meaning. The display status LEDs of the basic module show the current meaning of the port LEDs of the media modules.

Figure 15: “SELECT” button on the basic module
1 – “SELECT” button
2 – Display LEDs

2.2 Display elements

After establishing the operating voltage, the software starts and initializes itself. Afterwards, the device performs a self-test. During this process, various LEDs light up. The process lasts around 60 seconds.

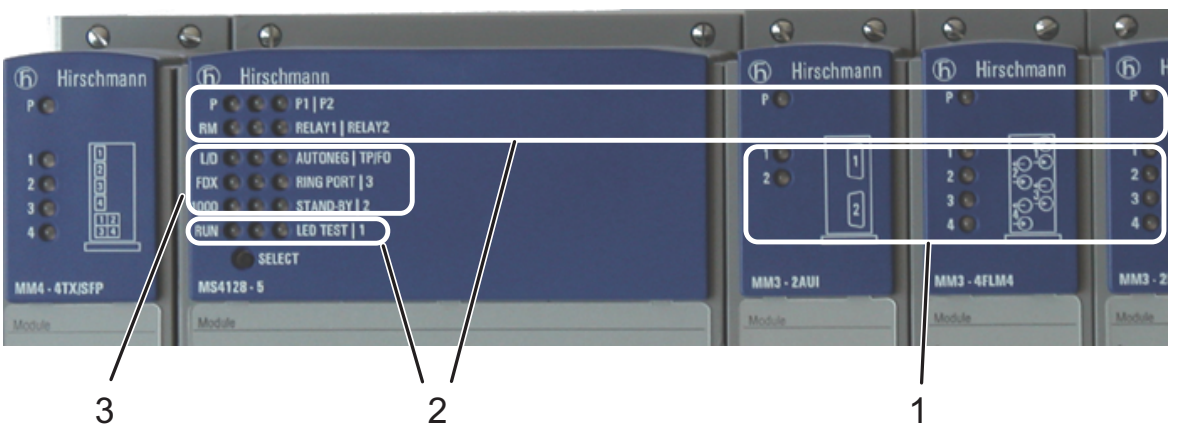


Figure 16: Display elements
1 - Port status
2 – Device status
3 – Display status

- **Device status**
  These LEDs provide information about conditions which affect the operation of the whole device.

P - Power (green LED)	
Glowing green	Internal supply voltage present.
Not glowing	Internal supply voltage is too low.
P1 - Power 1 (green LED)	
Glowing green	Supply voltage 1 is present.
Not glowing	Supply voltage 1 is less than 18 V.
P2 - Power 2 (green LED)	
Glowing green	Supply voltage 2 is present.
Not glowing	Supply voltage 2 is less than 18 V.
RM - Redundancy Manager (green/yellow LED)	
Glowing green	RM function activeredundant port disabled.
Glowing yellow	RM function active, redundant port enabled.
Not glowing	RM function not enabled.
Flashing green	Incorrect configuration of the HIPER-Ring (e.g. the ring is not connected to the ring port).
RUN - BOOT/RUN (green LED)	
Glowing green	System is ready for operation.
Flashing green	System is booting.
Not glowing	System is in reset mode.
RL1 - Relay 1, signal contact (red/yellow LED)	
Glowing red	Signal contact 1 is open, i.e. it is reporting an error.
Glowing yellow	Signal contact 1 is open, the "Manual Setting" is active
Not glowing	Signal contact 1 is closed, i.e. it is not reporting an error.
RL2 - Relay 2, signal contact (red/yellow LED)	
Glowing red	Signal contact 2 is open, i.e. it is reporting an error.
Glowing yellow	Signal contact 2 is open, the "Manual Setting" is active
Not glowing	Signal contact 2 is closed, i.e. it is not reporting an error.
RUN, 1 - display saving processes of the AutoConfiguration Adapter (ACA)	
Flashing alternately	Error during saving process.
LED's flash synchronously, two times a second	Loading configuration from the ACA.
LED's flash synchronously, once a second	Saving the configuration in the ACA.

If the manual adjustment is active on the signal contact, then the error display is independent of the setting of the signal contact.

Display status

Every media module has one LED per port. The meaning of this port status LED depends on the setting on the basic module. You define the display meaning with the “SELECT” button on the basic module.

☐ Press the button for approx. 2 seconds to change the meaning of the display. If the button is not pressed for approx. 20 seconds, the display status changes back to “L/D”.

L/D - data, link status (green LED)	
Glowing green	The port LEDs of the media modules display the connection status.
FDX - full duplex (green LED)	
Glowing green	The port LEDs of the media modules display the half-duplex or full-duplex connection status.
1000 - 10/100/1000 Mbit/s (green LED)	
Glowing green	The port LEDs of the media modules display the set transmission speed.
AUTONEG - Autonegotiation (green LED)	
Glowing green	The port LEDs of the media modules display the port configuration type.
RING PORT - Ring port (green LED)	
Glowing green	The port LEDs of the media modules display the HIPER-Ring assignment.
STAND-BY - Stand-by (green LED)	
Glowing green	The port LEDs of the media modules display the assignment to a redundant coupling of network segments.
LED TEST - LED test (green LED)	
Glowing green	The status, display status and port status LED test is active. The “P1/P2“ LEDs glow green. The “RM” status LED flashes green/yellow. The “RELAY1/RELAY2” status LEDs flash yellow/red. The display status LEDs flash green. The port status LEDs of the media modules flash green/yellow.
TP/FO - twisted pair / fiber optic (green LED)	
Glowing green	The port LEDs of the media modules display the media type.
All display status LEDs (green LEDs)	
Flashing in sequence	Initialization phase after restart
2 - PoE status (green/yellow LED)	
Glowing green	The port LEDs of the media modules display the Power over Ethernet status.
Not glowing	- No PoE port or PoE deactivated (PoE status “disabled”) - PoE status “error”
3 (green LEDs)	
	Service LED

Port status

These LED's display port-related information. You set the content of the information with the button on the basic module. (see on page 32 „Display status“).

1 to 4 - data, link status (green/yellow LED)	
Not glowing	No valid connection. No DTE voltage at the port (for MM3-2AUI).
Glowing green	Valid connection. DTE voltage present at the port (for MM3-2AUI).
Flashing green (once a period)	Port is switched to stand-by (Port 1).
Flashing green (3 times a period)	Port is switched off.
Flashing yellow	Data reception.
1 to 4 - FDX (green/yellow LED	
Not glowing	Half-duplex is active.
Glowing green	Half-duplex is active.
1 to 4 - 1000 (green/yellow LED)	
Not glowing	10 Mbit/s is active.
Glowing green	100 Mbit/s is active.
Glowing yellow	1000 Mbit/s is active.
1 to 4 - AUTONEG (green/yellow LED)	
Glowing green	Autonegotiation is active.
1 to 4 - RING PORT (green/yellow LED)	**Meaning**
Glowing green	This port is assigned to the HIPER-Ring.
1 to 4 - STAND-BY (green/yellow LED)	**Meaning**
Glowing green	Connection port for the data line.
Glowing yellow	Connection port for the control line.
Flashing green/yellow	No stand-by partner available.
TP/FO - twisted pair / fiber optic (green/yellow LED)	**Meaning**
Glowing green	The port LEDs of the media modules display the twisted pair ports.
Glowing yellow	The port LEDs of the media modules display the F/O ports.
PoE status (green/yellow LED)	**Meaning**
Not glowing	No PoE port or PoE disabled; PoE status "fault".
Glowing yellow	PoE port searching for terminal device (PD); PoE status "searching".
Glowing green	PoE port supplying terminal device (PD); PoE status "delivering power".
1 to 4 - LED TEST (green/yellow LED)	**Meaning**
Not glowing	LED defective.
Flashing green/yellow	LED test is active.

2.3 Basic set-up

The IP parameters must be entered when the device is installed for the first time. The device provides 6 options for configuring IP addresses:

- Entry via V.24 connection
- Entry using the HiDiscovery protocol
- Configuration via BOOTP
- Configuration via DHCP
- Configuration via DHCP Option 82
- Auto Configuration Adapter

Further information on the basic settings of the device can be found in the "Basic Configuration" user manual on the CD ROM.

Default settings

- IP address: The device looks for the IP address using DHCP
- Password for management:
  Login: user; password: public (read only)
  Login: admin; password: private (read and write)
- V.24 data rate: 9,600 Baud
- Ring redundancy: deactivated
- Ethernet ports: link status is not evaluated (signal contact)
- Optical 100 Mbit/s ports: 100 Mbit/s, full duplex
  All other ports: autonegotiation
- Ring manager disabled
- Stand-by coupling: disabled
- The configuration is controlled via the software

USB interface

The USB socket has an interface for the local connection of an AutoConfiguration Adapter ACA 21-USB. It is used for saving/loading the configuration and for updating the software.

Contact number	Signal name
1	VCC
2	- Data
3	+ Data
4	Ground

V.24 interface (external management)

The V.24 interface is an RJ11 socket.
At the V.24 connection, a serial interface is provided for the local connection of an external management station (VT100 terminal or PC with corresponding terminal emulation) or an AutoConfiguration Adapter ACA 11. This enables you to set up a connection to the Command Line Interface (CLI) and to the system monitor.

VT 100 terminal settings	
Speed	9,600 Baud
Data	8 bit
Stopbit	1 bit
Handshake	off
Parity	none

The socket housing is electrically connected to the front panel of the device.
The V.24 interface is not electrically isolated from the supply voltage.

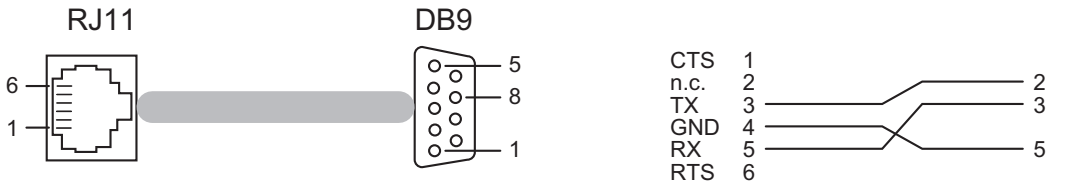


Figure 17: Pin assignment of the V.24 interface and wiring to the DB9 connector

Note: You will find the order number for the terminal cable, which is ordered separately, in the Technical Data chapter (see on page 38 „Technical data“).

You will find a description of the V.24 interface in the “Basic Configuration User Manual” on the CD-ROM.

2.4 Disassembly

Disassembling the device

☐ To remove the device from the hat rail, press the device downwards and pull it out from under the hat rail.

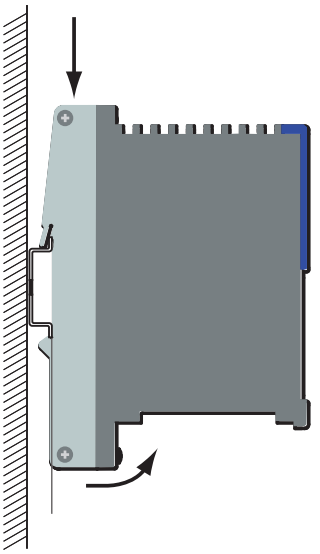


Figure 18: Disassembly

Disassembling the SFP modules

☐ Pull the module out of the socket by means of the opened lock.
☐ Close the socket with the protective cap.

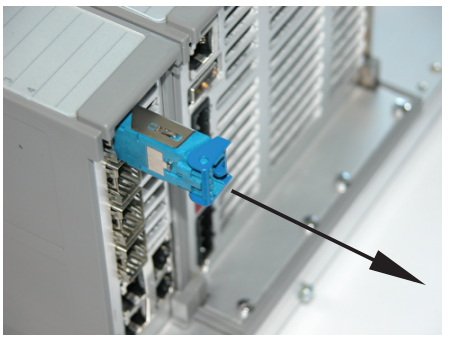


Figure 19: Deinstalling an SFP module

3 Technical data

General technical data

Dimensions W x D x H	MS4128	317 mm x 134 mm x 140 mm
Weight	MS4128	2.0 kg
Power supply	Operating voltage	24 V DC -25% +33% safety extra-low voltage (SELV/PELV) redundant inputs disconnected. Relevant for North America: Nec Class 2 power source max. 5A.
Overload current protection at input		Non-replaceable fuse
Insulation voltage between operating voltage connections and housing		800 V DC Protective elements limit the insulation voltage to 45 V DC (1 mA).
Signal Contact	Switching current	max. 1 A, SELV
	Switching voltage	max. 60 V DC or max. 30 V AC, SELV
Environment	Storage temperature Humidity Atmospheric pressure	Ambient air: -25 °C to +70 °C 10 % to 95 % (non-condensing) Up to 2000 m (795 hPa), higher altitudes on request
Operating temperature		0 °C to +60 °C
Pollution degree		2
Protection classes	Laser protection Protection class	Class 1 according to EN 60825-1 (2001) IP 20

EMC and immunity

EMC interference immunity		
IEC/EN 61000-4-2	Electrostatic discharge	
	Contact discharge Air discharge	6 kV 8 kV
IEC/EN 61000-4-3	Electromagnetic field	
	80 - 3,000 MHz	10 V/m
IEC/EN 61000-4-4	Fast transients (burst)	
	Power line Data line	2 kV 4 kV
IEC/EN 61000-4-5	Voltage surges	
	Power line, line / line Power line, line / earth Data line	1 kV 2 kV 2 kV
IEC/EN 61000-4-6	Line-conducted interference voltages	
	150 kHz - 80 MHz	10 V
EN 61000-4-9	Impulse-shaped magnetic fields	300 A/m
EMC emitted interference		
EN 55022	Class A	Yes

EMC emitted interference		
FCC 47 CFR Part 15	Class A	Yes
German Lloyd	Classification + Construction Guidelines VI-7-3 Part 1 Ed.2001	Yes
Stability		
Vibration	IEC 60068-2-6 Test FC test level according to IEC 61131-2	Yes
	Germanischer Lloyd Guidelines for the Performance of Type Tests Part 1	Yes
Shock	IEC 60068-2-27 Test Ea test level according to IEC 61131-2	Yes

Network range

AU port	
Length of an AUI cable	max. 50 m

Table 12: AUI port

TP port	
Length of a twisted pair segment	max. 100 m / 300 ft (cat5e cable with 1000BASE-T)

Table 13: TP port 10BASE-T / 100BASE-TX / 1000BASE-T

Product code		Wave length	Fiber	System attenuation	Expansion	Fiber data
-F4	MM	820 nm	50/125 µm	0-9.5 dB	0-2.1 km	3.0 dB/km; 400 MHz*km
-F4	MM	820 nm	62.5/125 µm	0-12.5 dB	0-3.0 km	3.2 dB/km; 200 MHz*km

Table 14: F/O port 10BASE-FL

Product code		Wave length	Fiber	System attenuation	Expansion	Fiber data
-M2, -M4	MM	1300 nm	50/125 µm	0-8 dB	0-5 km	1.0 dB/km, 800 MHz*km
-M2, -M4	MM	1300 nm	62.5/125 µm	0-11 dB	0-4 km	1.0 dB/km, 500 MHz*km
-S2	SM	1300 nm	9/125 µm	0-16 dB	0-30 km	0.4 dB/km; 3.5 ps/(nm*km)
-L2	LH	1550 nm	9/125 µm	7-29 dB	24-86 km	0.3 dB/km; 19 ps/(nm*km)

Table 15: F/O port 100BASE-FX

Product code M-FAST SFP-...		Wave length	Fiber	System attenuation	Expansion	Fiber data
-MM/LC...	MM	1310 nm	50/125 µm	0-8 dB	0-5 km	1.0 dB/km, 800 MHz*km
-MM/LC...	MM	1310 nm	62.5/125 µm	0-11 dB	0-4 km	1.0 dB/km, 500 MHz*km
-SM/LC...	SM	1310 nm	9/125 µm	0-13 dB	0-25 km	0.4 dB/km; 3.5 ps/(nm*km)
-SM+/ LC...	SM	1310 nm	9/125 µm	10-29 dB	25-65 km	0.4 dB/km; 3.5 ps/(nm*km)
-LH/LC	SM	1550 nm	9/125 µm	10-29 dB	40-104 km	0.25 dB/km; 19 ps/(nm*km)

Table 16: Fiber port 100BASE-FX (SFP fiber optic Fast ETHERNET Transceiver)

Product code M-SFP-...		Wave length	Fiber	System attenuation	Expansion	Fiber data
-SX/LC...	MM	850 nm	50/125 µm	0-7.5 dB	0-550 m	3.0 dB/km, 400 MHz*km
-LX/LC...	MM	1310 nm[a]	50/125 µm	0-11 dB	0-550 m	1.0 dB/km, 800 MHz*km
-SX/LC...	MM	850 nm	62.5/125 µm	0-7.5 dB	0-275 m	3.2 dB/km, 200 MHz*km
-LX/LC...	MM	1310 nm [a]	62.5/125 µm	0-11 dB	0-550 m	1.0 dB/km, 500 MHz*km
-LX/LC...	SM	1310 nm	9/125 µm	0-11 dB	0-20 km	0.4 dB/km; 3.5 ps/(nm*km)
-LH/LC...	LH	1550 nm	9/125 µm	6-22 dB	24-72 km	0.25 dB/km; 19 ps/(nm*km)
-LH+/LC	LH	1550 nm	9/125 µm	15-32 dB	60-120 km	0.25 dB/km; 19 ps/(nm*km)

Table 17: Fiber port 1000BASE-FX (SFP fiber optic Gigabit ETHERNET Transceiver)

a. With F/O adapter compliant with IEEE 802.3-2002 clause 38 (single-mode fiber offset-launch mode conditioning patch cord)

MM = Multimode, SM = Singlemode, LH = Singlemode Longhaul

Power consumption/power output, temperature range and order numbers

Basic module	Power consumption	Power output	Operating temperature (ambient air temperature)	Order number
MS4128-L2P	16.0 W	54.7 Btu (IT)/h	0 °C to +60 °C	943 009-101
MS4128-L3E	16.0 W	54.7 Btu (IT)/h	0 °C to +60 °C	943 009-201
MS4128-L3P	16.0 W	54.7 Btu (IT)/h	0 °C to +60 °C	943 009-301

Table 18: Basic module: power, temperature, order numbers

Module	Power consumption	Power output	Operating temperature (ambient air temperature)	Order number
MM2 media modules:				
MM2-4TX1	0.8 W	2.8 Btu (IT)/h	0 °C to +60 °C	943 722-101
MM2-4TX1-EEC	0.8 W	2.8 Btu (IT)/h	-40 °C to +70 °C	943 722-051
MM2-2FXP4	3.4 W	11.6 Btu (IT)/h	0 °C to +60 °C	943 842-101
MM2-4FXM3	7.0 W	23.9 Btu (IT)/h	0 °C to +60 °C	943 721-101
MM2-2FXM3 / 2TX1	3.4 W	11.6 Btu (IT)/h	0 °C to +60 °C	943 720-101
MM2-2FXM2	3.4 W	11.6 Btu (IT)/h	0 °C to +60 °C	943 718-101
MM2-2FXS2	3.4 W	11.6 Btu (IT)/h	0 °C to +60 °C	943 719-101
MM3 media modules:				
MM3-2AUI	3.4 W	11.6 Btu (IT)/h	0 °C to +60 °C	943 840-101
MM3-4FLM4	5.0 W	17.1 Btu (IT)/h	0 °C to +60 °C	943 760-101
MM3-2FLM4 / 2TX1-RT	5.0 W	17.1 Btu (IT)/h	0 °C to +55 °C	943 117-004
MM3-4TX5	0.8 W	2.8 Btu (IT)/h	0 °C to +60 °C	943 841-101
MM3-4TX1-RT	0.8 W	2.8 Btu (IT)/h	0 °C to +55 °C	943 117-001
MM3-4FXP4	7.0 W	23.9 Btu (IT)/h	0 °C to +60 °C	943 843-101
MM3-1FXM2 / 3TX1	2.2 W	7.5 Btu (IT)/h	0 °C to +60 °C	943 839-101
MM3-1FXM2 / 3TX1-EEC	2.2 W	7.5 Btu (IT)/h	-40 °C to +70 °C	943 839-051
MM3-2FXM2 / 2TX1	3.4 W	11.6 Btu (IT)/h	0 °C to +60 °C	943 761-101
MM3-2FXM2 / 2TX1-EEC	3.4 W	11.6 Btu (IT)/h	-40 °C to +70 °C	943 761-151
MM3-2FXM2 / 2TX1-RT	3.4 W	11.6 Btu (IT)/h	0 °C to +55 °C	943 117-002
MM3-2FXM4 / 2TX1	3.4 W	11.6 Btu (IT)/h	0 °C to +60 °C	943 837-101
MM3-4FXM2	7.0 W	23.9 Btu (IT)/h	0 °C to +60 °C	943 764-101
MM3-4FXM4	7.0 W	23.9 Btu (IT)/h	0 °C to +60 °C	943 835-101
MM3-1FXS2 / 3TX1	2.2 W	7.5 Btu (IT)/h	0 °C to +60 °C	943 838-101
MM3-2FXS2 / 2TX1	3.4 W	11.6 Btu (IT)/h	0 °C to +60 °C	943 762-101
MM3-2FXS2 / 2TX1-RT	3.4 W	11.6 Btu (IT)/h	0 °C to +55 °C	943 117-003
MM3-4FXS2	7.0 W	23.9 Btu (IT)/h	0 °C to +60 °C	943 836-101
MM3-1FXL2 / 3TX1	3.4 W	11.6 Btu (IT)/h	0 °C to +60 °C	943 763-101
MM4 media modules:				
MM4-4TX / SFP	9.0 W	30.8 Btu (IT)/h	0 °C to +60 °C	943 010-101
MM4-2TX / SFP	5.8 W	19.8 Btu (IT)/h	0 °C to +60 °C	943 622-101
Open variant media modules:				
MM20-... 4 TX-/0 FX ports	0.8 W	2.8 Btu (IT)/h	See table 20	See table 20
MM20-... 3 TX-/1 FX ports	2.3 W	7.9 Btu (IT)/h	- “ -	- “ -
MM20-... 2 TX-/2 FX ports	3.8 W	13.0 Btu (IT)/h	- “ -	- “ -
MM20-... 0 TX-/2 FX ports	3.8 W	13.0 Btu (IT)/h	- “ -	- “ -
MM20-... 1 TX-/3 FX ports	5.3 W	18.1 Btu (IT)/h	- “ -	- “ -
MM20-... 0 TX-/4 FX ports	6.8 W	23.2 Btu (IT)/h	- “ -	- “ -
MM20-A8A89999...	3.4 W	11.6 Btu (IT)/h	- “ -	- “ -
MM20-F4F4F4F4...	5.0 W	17.1 Btu (IT)/h	- “ -	- “ -
MM20-Z6Z6Z6Z6...	8.0 W	27.3 Btu (IT)/h	- “ -	- “ -
MM20-P9P9P9P9SAHH	8.0 W	27.3 Btu (IT)/h	0 °C to +60 °C	- “ -
MM20-P9P9T1T1SAHH	5.2 W	17.8 Btu (IT)/h	0 °C to +60 °C	- “ -

Table 19: Other modules: power, temperature, order numbers

Module	Power consumption	Power output	Operating temperature (ambient air temperature)	Order number
MM30-O7O7O7O7...	9.0 W	30.8 Btu (IT)/h	See table 20	- “ -
MM30-O7O79999...	5.8 W	19.8 Btu (IT)/h	- “ -	- “ -
MM21-T1T1T1T1...	0.8 W	2.8 Btu (IT)/h	- “ -	- “ -
MM21-F4F4T1T1...	5.0 W	17.1 Btu (IT)/h	- “ -	- “ -
MM21-M2M2T1T1...	3.8 W	13.0 Btu (IT)/h	- “ -	- “ -
MM21-S2S2T1T1...	3.8 W	13.0 Btu (IT)/h	- “ -	- “ -
MM22-T1T1T1T1... - internal operating voltage - external PoE voltage - no PD - 4 x Class0-PD	 0.8 W 1.3 W 2 W + PDs	 2.8 Btu (IT)/h 4.3 Btu (IT)/h 6.9 Btu (IT)/h	- “ -	- “ -
MM23-T1T1T1T1...SAHH	4.5 W	15.4 Btu (IT)/h	0 °C to +60 °C	- “ -
MM23-M2M2T1T1...SAHH	6.0 W	20.5 Btu (IT)/h	0 °C to +60 °C	- “ -
MM23-S2S2T1T1...SAHH	5.5 W	18.8 Btu (IT)/h	0 °C to +60 °C	- “ -
MM23-F4F4T1T1...SAHH	5.5 W	18.8 Btu (IT)/h	0 °C to +60 °C	- “ -
MM33-O7O79999...SAHH	7.5 W	25.6 Btu (IT)/h	0 °C to +60 °C	- “ -
Expansion module:				
MB - 2T	0 W	0 Btu (IT)/h	0 °C to +60 °C	943 733-102
Fast ETHERNET SFP modules:				
M-FAST SFP-MM / LC	0 W	0 Btu (IT)/h	0 °C to +60 °C	943 865-001
M-FAST SFP-MM / LC EEC	0 W	0 Btu (IT)/h	-40 °C to +70 °C	943 945-001
M-FAST SFP-SM / LC	0 W	0 Btu (IT)/h	0 °C to +60 °C	943 866-001
M-FAST SFP-SM / LC EEC	0 W	0 Btu (IT)/h	-40 °C to +70 °C	943 946-001
M-FAST SFP-SM+/ LC	0 W	0 Btu (IT)/h	0 °C to +60 °C	943 867-001
M-FAST SFP-SM+/ LC EEC	0 W	0 Btu (IT)/h	-40 °C to +70 °C	943 947-001
M-FAST SFP-LH / LC	0 W	0 Btu (IT)/h	0 °C to +60 °C	943 868-001
Gigabit ETHERNETSFP modules:				
M-SFP-SX / LC	0 W	0 Btu (IT)/h	0 °C to +60 °C	943 014-001
M-SFP-SX / LC EEC	0 W	0 Btu (IT)/h	-40 °C to +70 °C	943 896-001
M-SFP-LX / LC	0 W	0 Btu (IT)/h	0 °C to +60 °C	943 015-001
M-SFP-LX / LC EEC	0 W	0 Btu (IT)/h	-40 °C to +70 °C	943 897-001
M-SFP-LH / LC	0 W	0 Btu (IT)/h	0 °C to +60 °C	943 042-001
M-SFP-LH / LC EEC	0 W	0 Btu (IT)/h	-40 °C to +70 °C	943 898-001
M-SFP- LH+/LC	0 W	0 Btu (IT)/h	0 °C to +60 °C	943 049-001

Table 19: Other modules: power, temperature, order numbers

Open variant product code

As an alternative to the order number (see in table 19, last column) you can use the product code. This gives you a wider range of variants when selecting the media module that is specially tailored to your requirements. The product code of your media module is made from combining the desired product characteristics in accordance with the following table. The short designation is in "Ident." column. Example: Product code MM30-O7O7O7O7SA = media module 1000 Mbit/s with four Gigabit Ethernet combo ports (four SFP ports or alternatively TP ports RJ45). This example corresponds to the MM4-4TX/SFP module with the order number 943 010-001.

Item	Characteristic feature	Ident.	Property
1 to 4	Product	MM20	Media module 10/100 Mbit/s (standard)
		MM21	Media module 10/100 Mbit/s (realtime)
		MM22	Media module 10/100 Mbit/s (Power over Ethernet)
		MM23	Media module 10/100 Mbit/s (PTP version 2)
		MM30	Media module 1000 Mbit/s (standard)
		MM33	Media module 1000 Mbit/s (PTP version 2)
5	- (hyphen)	-	
6 to 7	1st port (medium/connector)	T1	Twisted pair (TX) / RJ45
		T5	Twisted pair (TX) / M12
		M2	Multi-mode FX DSC (100 Mbit/s)
		M3	Multi-mode FX MTRJ (100 Mbit/s)
		M4	Multi-mode FX ST (100 Mbit/s)
		S2	Single-mode FX DSC (100 Mbit/s)
		S4	Single-mode FX ST (100 Mbit/s)
		L2	Single-mode Long Haul FX DSC (100 Mbit/s)
		G2	Single-mode Long Haul FX DSC 200km (only100 Mbit/s)
		F4	Multi-mode FL ST (10 Mbit/s)
		P4	POF FX ST (100 Mbit/s)
		P9	POF FX SCRJ (100Mbit/s)
		O7	Combo port Gigabit Ethernet (SFP 1000 Mbit/s)
		A8	AUI Sub-D
		Z6	Fiber optic / SFPslot (100 Mbit/s)
8 to 9	2nd port (medium/connector)	...	See items 6 to 7
10 to 11	3rd port (medium/connector)	...	See items 6 to 7
		99	Empty
12 to 13	4th port (medium/connector)	...	See items 6 to 7
		99	Empty
14	Temperature range	S	Standard: operation 0 °C to +60 °C; storage -40 °C to +70 °C
		T	Extended: operation -40 °C to +70 °C; storage -40 °C to +85 °C
		E	Extended: operation -40 °C to +70 °C; storage -40 °C to +85 °C, with Conformal Coating
15	Certifications	A	CE, UL 508, ISA 12.12.01 (UL 1604)
		H	A plus GL, IEC 61850, IEEE 1613 Sub-station, EN 50121-4 Railway (along track)
		B	H plus ATEX100a

Table 20: Combination possibilities of the MM20/MM30 media module variants

Interfaces

PowerMICE MS4128	V.24 port: external management, 2 terminal blocks, each 1 x signal contact, max. 1 A, 24 V each 1 x voltage supply USB: ACA 21-USB
MM2 media modules	see table under „MM2 media modules“ on page 15
MM3 media modules	see table under „MM3 media modules“ on page 16
MM4 media modules	see table under „MM4 media modules“ on page 18

Scope of delivery

Device	Scope of delivery
PowerMICE MS4128	MS4128 device 2 terminal blocks for supply voltage and signal contact CD ROM with user manual ML-MS2/MM labels Description and operating instructions

Accessories

Name	Order number
Pocket Guide	280 710-851
AutoConfiguration Adapter ACA 21-USB	943 271-001
Terminal cable	943 301-001
4-pin terminal block (50 pcs.)	943 845-004
Rail Power Supply RPS 30	943 662-003
Rail Power Supply RPS 80 EEC	943 662-080
Rail Power Supply RPS 120 EEC	943 662-120
ML-MS2/MM labels	943 767-001
ML-MS3 labels	943 768-001
HiVision Network Management software	943 471-100
Industrial HiVision Network Management software	943 156-...
OPC Server software HiOPC	943 055-001

Underlying norms and standards

Name	
EN 61000-6-2:2005	Generic norm – immunity in industrial environments
EN 55022:2006 + A1:2007	IT equipment – radio interference characteristics
IEC/EN 60950-1:2006	Safety for the installation of IT equipment
EN 61131-2:2003	Programmable logic controllers
EN 50121-4:2000	Railway applications - EMC - emitted interference and interference immunity for signal and telecommunication systems
FCC 47 CFR Part 15:2006	Code of Federal Regulations
German Lloyd	Classification and Construction Guidelines VI-7-3 Part 1 Ed.2003
cUL 508:1998	Safety for Industrial Control Equipment
ISA 12.12.01 (cUL 1604), CSA C22.2 No. 213	Electrical Equipment for Use in Class I and Class II, Div.2 and Class III Hazardous (Classified) Locations
EN 60079-15	Electrical equipment for explosive gas atmospheres – part 15: Construction, testing and marking of protection type "n" electrical apparatus.
cUL 60950-1	Safety for Information Technology Equipment

Table 21: List of based specifications and standards. Certified devices are marked with a certification identifier.

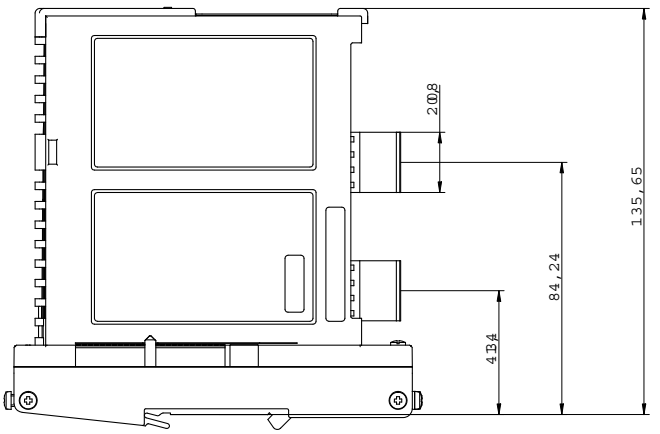
Certifications

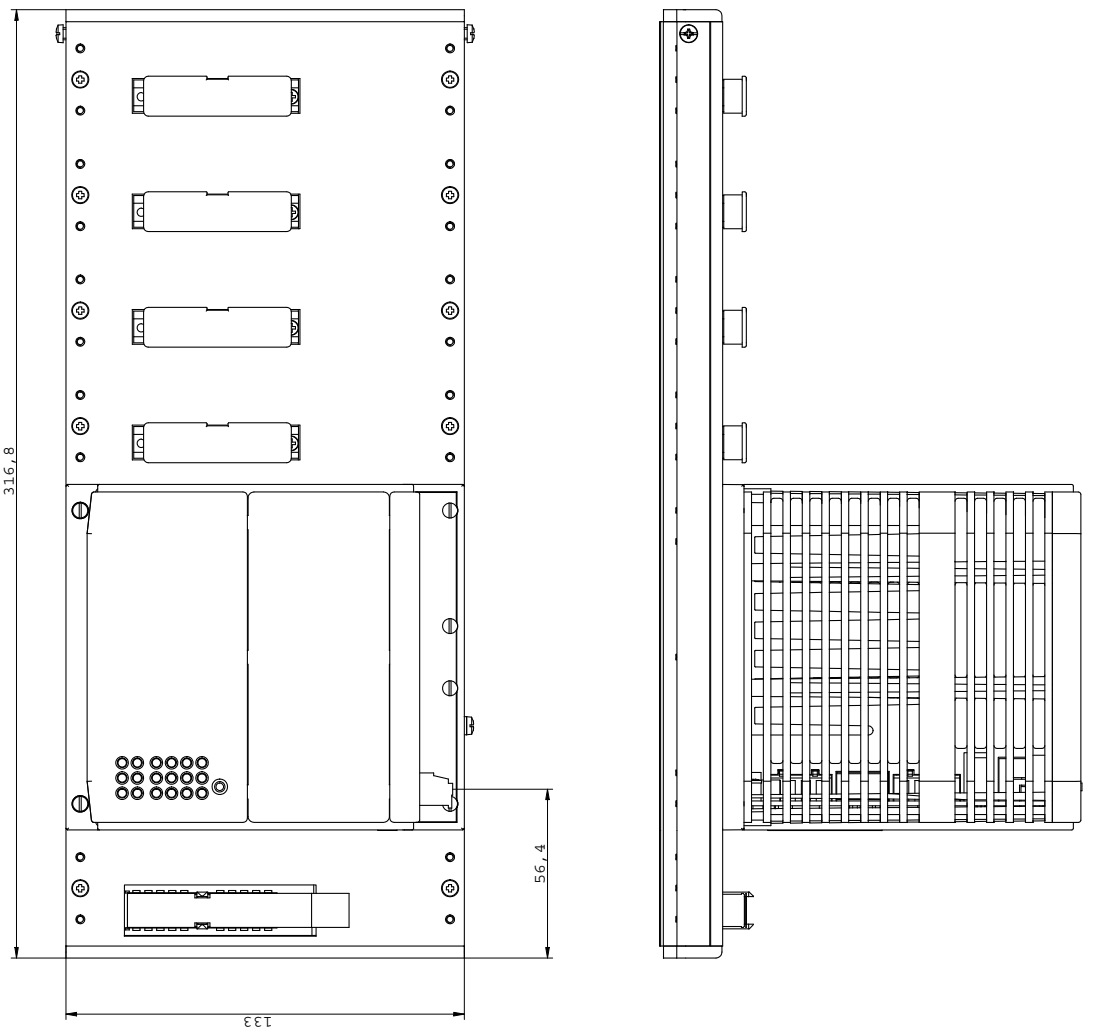
The following table shows the status of the certification of the devices.

Standard
cUL 508 / CSA C22.2 No.142
ISA 12.12.01 / CSA C22.2 No.213
ATEX RL 94/9 EG
German Lloyd

Table 22: Certifications - for the current status, visit www.hirschmann.com

Dimension drawing





A Further support

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