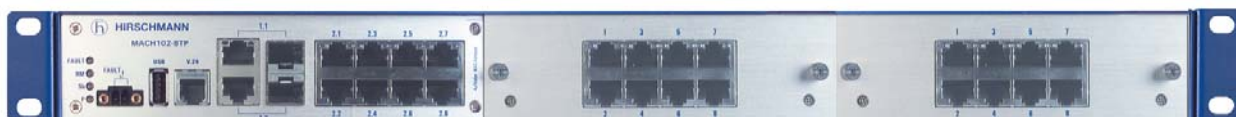# User Manual

Installation
Industrial Ethernet Workgroup Switch
MACH102 Family

MACH 102-8TP-F

MACH 102-24TP-F

MACH 102-8TP + M1-8TP-RJ45 + M1-8MM-SXC

MACH 102-8TP + M1-8SM-SXC + M1-8SFP

Contents

Safety instructions

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

■ Correct usage

Only use the device for those purposes specified in the catalog and in the technical description. Only operate the device with external devices and components that are recommended and permitted by the manufacturer. The proper and safe operation of this product depends on proper handling during transport, proper storage, assembly and installation, and conscientious operation and maintenance procedures.

■ Working voltage

The supply voltage is electrically isolated from the housing.
- ☐ Connect solely an working voltage that corresponds to the type plate of your device.
- ☐ Use undamaged parts.
- ☐ The device is free of any service components. Internal fuses are triggered solely in the case of a detected fault in the device. In case of damage or malfunction of the device, turn off the operating voltage and return the device to the plant for inspection.
- ☐ Only switch on the device when the housing is closed.
- ☐ Only use connection cables that are permitted for the specified temperature range.
- ☐ Relevant for North America:
  Only use copper wire/conductors of class 1, 60/75°C or 75°C.
- ☐ Make sure that the disconnecting device is easily accessible so that the MACH102 device can be disconnected from the mains voltage.
  If you disconnect the device from the mains voltage using
  - the plug in the socket
  - an on/off switch
  it must be easily accessible.

Note: When using devices with redundant power supply (MACH 102-8TP-R, MACH 102-8TP-FR, MACH 102-24TP-FR), pull both non-heating device plugs to disconnect the device from the power supply. When using PoE modules, also disconnect or remove the PoE voltage.

■ Shielding ground

The shielding ground of the connectable twisted pair lines is connected to the protective conductor connection via the front panel.
- ☐ Beware of possible short circuits when connecting a cable section with conductive shielding braiding.

■ **Housing**

Only technicians authorized by the manufacturer are permitted to open the housing.
The device is grounded via the voltage supply socket.

☐ Never insert sharp objects (small screwdrivers, wires, etc.) into the inside of the device.

☐ Verify that the electrical installation meets locally or nationally applicable safety regulations.

☐ Keep the ventilation slits free to ensure good air circulation.

☐ Make sure there is at least 3.94 inches (10 cm) of space in front of the ventilation slits of the housing.

☐ Close all empty slots with a covering panel.

☐ Mount the device horizontally or vertically, either as a desktop device, in the switch cabinet (see figure 15) or on the wall (see figure 16).

☐ If you are operating the device in a 19" switch cabinet: install sliding/mounting rails for supporting the weight of the device.

■ **Environment**

The device may only be operated at the specified ambient temperatures (temperature of the ambient air at a distance of up to 5 cm from the device) and at the specified humidity.

☐ Install the device in a location where the climatic limit values specified in the technical data are not exceeded.

☐ The device may only be used in environments with the pollution degrees not exceeding the values specified in the technical data.

■ **Qualification requirements for personnel**

Qualified personnel as understood in this manual and the warning signs are characterized by the following points:

▶ The qualified personnel has received an appropriate training. His training, knowledge, and experience constitute his qualification. This is the prerequisite to connect, to ground and to label power circuits, devices, and systems in accordance with current safety engineering standards.

▶ The qualified personnel are aware of the hazards associated with their tasks.

▶ The qualified personnel know proper measures against such hazards to minimize the risk for themselves and for other persons.

▶ The qualified personnel participate in regular further training.

Only trained service personnel are authorized to plug the M1-8TP-RJ45 PoE media module into the basic device or remove from the basic device.

■ General safety instructions

This device is operated by electricity. You must follow precisely the prescribed safety requirements for the voltage connections in this document.

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

▶ Only appropriately qualified personnel should work on this device or in its vicinity. The personnel must be thoroughly familiar with all the warnings and maintenance procedures outlined in this operating manual.

▶ The proper and safe operation of this device depends on proper handling during transportation, 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.

☐ Please note that products recommended as accessories may have characteristics that do not fully correspond to those of the corresponding product. This may limit their possible usage in the overall system.

Note: LED or LASER components in compliance with IEC 60825-1 (2007):
CLASS 1 LASER PRODUCT
CLASS 1 LED PRODUCT

■ National and international safety regulations

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

■ ESD Guidelines

The media modules are equipped with electrostatically sensitive components. These can be destroyed, or their life cycles reduced, by the effects of an electrical field or by a charge equalization if the card is touched.
For this reason, the cards are packaged in a conductive ESD protective bag on delivery. The packaging can be reused.

Make sure you adhere to the following protection measures for electrostatically endangered assemblies:

☐ Create electrical equipotential bonding between yourself and your environment, e.g. using a wristband, which you clamp to the basic device (knurled screw of an interface card). When the power supply cable is connected, the basic device is grounded via the power supply connection.

☐ Only now do you take the card out of the conductive bag.

☐ Outside the basic device, only store the cards in a conductive ESD protective bag.

ESD protective field equipment is available for the safe handling of electrostatically endangered assemblies.

You can find more information about electrostaticically endangered assemblies in DIN/IEC 47 (Sec) 1330; February 1994 Edition and DIN EN 100 015.

■ CE marking

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

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

2011/65/EU (RoHS)
Directive of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

2006/95/EC
Directive of the European Parliament and the council for standardizing the regulations of member states with regard to electrical equipment to be used within specific voltage ranges.

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
72654 Neckartenzlingen
Germany
Tel.: +49 1805 141538

The product can be used in the industrial sector.

▶ Interference immunity: EN 61000-6-2
▶ Emitted interference: EN 55022
▶ Reliability: EN 60950-1

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.

■ FCC note:

This device complies with part 15 of the FCC rules.
Operation is subject to the following two conditions:

▶ This device may not cause harmful interference, and
▶ This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules.
These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radiocommunications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

■ Recycling note

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

About this manual

The following manuals are available as PDF files on the CD/DVD supplied:
- ▶ Installation user manual
- ▶ Basic Configuration user manual
- ▶ Redundancy Configuration user manual
- ▶ Reference manual for the graphical user interface
- ▶ Command Line Interface user manual

The Industrial HiVision Network Management Software provides you with additional options for smooth configuration and monitoring:
- ▶ ActiveX control for SCADA integration
- ▶ Auto-topology discovery
- ▶ Browser interface
- ▶ Client/server structure
- ▶ Event handling
- ▶ Event log
- ▶ Simultaneous configuration of multiple devices
- ▶ Graphical user interface with network layout
- ▶ SNMP/OPC gateway.

Legend

The symbols used in this manual have the following meanings:

▶	Listing
☐	Work step
▪	Subheading

1 Description

The MACH102 devices are managed Workgroup switches with up to 24 Fast Ethernet ports and 2 Gigabit Ethernet ports. They consist of a basic device and—depending on the device variant—up to 2 pluggable media modules. They allow you to construct switched industrial Ethernet networks that conform to the IEEE 802.3 and 802.3u standards using copper wires or optical fibers in a bus or ring topology. You have the option of connecting terminal devices and other infrastructure components via twisted-pair cables, multi-mode F/O, and single-mode F/O. The twisted-pair ports support autocrossing, autonegotiation and autopolarity.
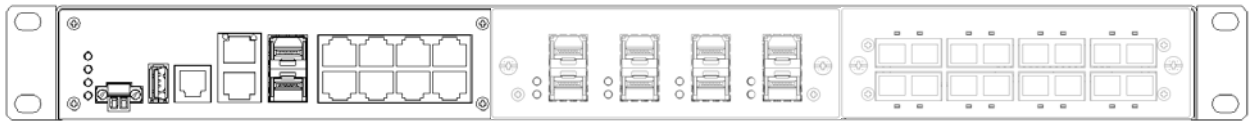
The MACH102 devices provide you with a range of switch variants. You can set up your switch to meet your individual requirements with regard to the transmission media type, the number of 10/100 Mbit/s ports you want (8, 16 or 24), the redundant voltage supply and the software variant.

The devices are modular network components. They 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 work without a fan. If desired, the voltage supply can be redundant - depending on the device variant. The basic devices are suitable for mounting on the 19" rack and for wall mounting.

The HIPER-Ring redundancy concept enables you to quickly carry out a reconfiguration, and also a simple configuration with only one additional connection. The diagnosis display and the display of the operating parameters and the large label areas provide a quick overview.
It can be easily managed via a Web browser, via Telnet, with a management software product (such as Industrial HiVision), or locally on the switch (V.24 interface).

The devices provide you with a large range of features:
▶ Redundancy functions
  (Rapid Spanning Tree, Redundant Ring Structure, HIPER-Ring, Redundant Coupling, Link Aggregation)
▶ Protection from unauthorized access
▶ 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
- ▶ SNMP
- ▶ 802.1x port authentication
- ▶ Real Time Clock

The addition, to the MACH102 family, of the RS20/RS30/RS40 open rail family switches, the MACH3000 and MACH4000 family of backbone switches, the BAT wireless transmission system, the EAGLE security system, and products for the RSR20/RSR30 and MACH1000 substation areas, provides continuous communication across all levels of the company.

1.1   Description of the device variants

1.1.1   MACH102 basic devices

A basic device contains all the functions of the industrial Workgroup Switch and up to 24 Fast Ethernet and 2 Gigabit Ethernet interfaces for connection to the LAN. The MACH 100 devices are managed.

- ▶ The Gigabit ETHERNET combo ports (can be connected optically or with TX) of the basic devices are suitable for the connection of terminal devices or network segments according to the standards IEEE 802.3 100/1000BASE-FX (SFP slot) and IEEE 802.3 1000BASE-TX/ 100BASE-TX / 10BASE-T (RJ45 socket).
  A plugged SFP module switches the TX port off.

- ▶ The Fast ETHERNET ports (10/100 Mbit/s) of the basic devices are suitable for connecting terminal devices or network segments according to the standards IEEE 802.3 100BASE-TX / IEEE 802.3 10 BASE-T. These ports support autonegotiation and autopolarity. The ports are RJ45 sockets. The housings of the RJ45 sockets are electrically connected to the front plate of the device. The pin assignment is identical to MDI-X. When the autonegotiation function is enabled, these ports also support autocrossing.

- ▶ Voltage range: 100 - 240 V AC

- ▶ Temperature range: 0°C to +50 °C

- ▶ Software variant: Professional

The devices comply with the specifications of the ISO/IEC standards
8802-3u 100BASE-TX/-1000BASE-T,
8802-3 100BASE-FX and
8802-3 1000BASE-SX/LX.

The MACH102 basic device comprises all function units such as: switch function, management function, redundancy function, voltage connection, management connection, slots for media modules (depending on the device variant).

■ Modular MACH102 basic devices

Note: The use of the M1-8TP-RJ45 PoE module will void the UL certification of the basic module.
Observe the instructions given in the information sheet of the media module M1-8TP-RJ45 PoE.

The MACH102-8TP, and MACH102-8TP-R devices from the Industrial Ethernet MACH102 family are modular switches. The devices consist of a basic switch device and—depending on the device variant—pluggable media modules for additional ports.

Up to 2 pluggable media modules each provide an additional 8 Fast Ethernet interfaces. They differ as to the media type for connecting segments.

For the sake of simplicity, the basic switch device with various plugged-in media modules will be referred to as MACH102 in this document.

The basic devices have the following properties:

▶ **MACH102-8TP, MACH102-8TP-R**
  ▶ 2 Gigabit Ethernet combo ports
  ▶ 8 Fast Ethernet ports
  ▶ You have the option of choosing the media for an additional 8 or 16 ports via the media modules.
  ▶ MACH102-8TP-R: The power supply is connected redundantly.

Figure 1: *Overview over interfaces, display and operating elements*
of the MACH102-8TP, and MACH102-8TP-R
1 - MACH102 device
2- LED display elements
3 - Signal contact
4 - USB port
5 - V.24 access for external management
6 - See the following table, column 1
7 - See the following table, column 2
8 - See the following table, column 3

Gigabit Ethernet GE ports 1 and 2 (Combo ports)	Fast Ethernet FE ports 1 to 8	Fast Ethernet FE ports 9 to 24 2 slots for media modules of your choice
100/1000 Mbit/s F/O, SFP slots Alternatively connectable: 10/100/1000 Mbit/s twisted-pair, RJ45 ports	8 * twisted-pair TX, RJ45, 10/100 Mbit/s	8 * twisted-pair TX, RJ45, 10/100 Mbit/s or 8 * twisted-pair TX PoE, RJ45, 10/100 Mbit/s or 8 * Multimode FX DSC 100 Mbit/s or 8 * Singlemode FX DSC 100 Mbit/s or 8 * SFP slot 100 Mbit/s

■ Fixed-configured MACH102 basic devices

The MACH102-8TP-F, MACH102-8TP-FR, MACH102-24TP-F, and MACH102-24TP-FR devices from the Industrial Ethernet MACH102 family are switches with fixed configurations.

The basic devices have the following properties:

▶ **MACH102-8TP-F, MACH102-8TP-FR**
  ▶ 2 Gigabit Ethernet combo ports
  ▶ 8 Fast Ethernet ports
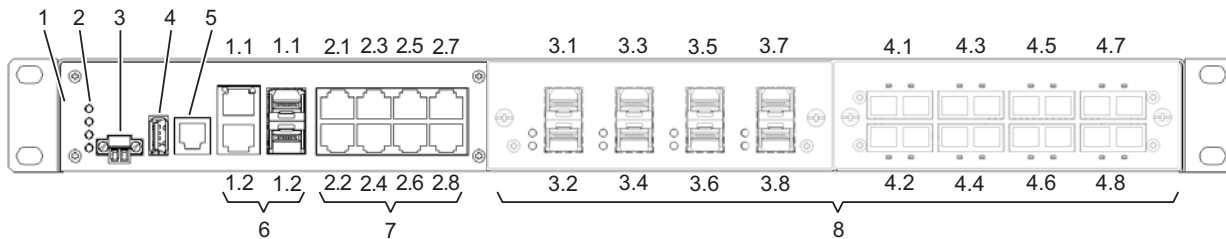 ▶ MACH102-8TP-FR: The power supply is designed redundantly.

Figure 2: *Overview over interfaces, display and operating elements*
of the MACH102-8TP-F, and MACH102-8TP-FR
1 - MACH102 device
2- LED display elements
3 - Signal contact
4 - USB port
5 - V.24 access for external management
6 - See the following table, column 1
7 - See the following table, column 2

Gigabit Ethernet - GE ports 1 and 2 (combo ports)	Fast Ethernet - FE ports 1 to 8
100/1000 Mbit/s F/O, SFP slots Alternatively connectable: 10/100/1000 Mbit/s twisted-pair, RJ45 ports	8 * twisted-pair TX, RJ45, 10/100 Mbit/s

► **MACH102-24TP-F, MACH102-24TP-FR**
  ► 2 Gigabit Ethernet combo ports
  ► 24 Fast Ethernet ports
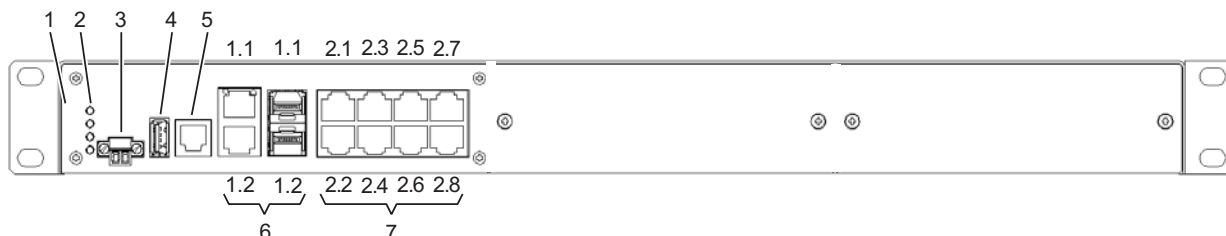 ► MACH102-24TP-FR: The power supply is designed redundantly.
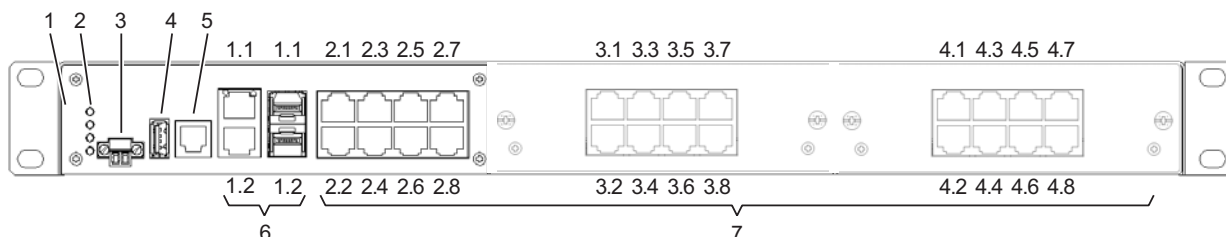
Figure 3: *Overview over interfaces, display and operating elements*
of the MACH102-24TP-F, and MACH102-24TP-FR
1 - MACH102 device
2- LED display elements
3 - Signal contact
4 - USB port
5 - V.24 access for external management
6 - See the following table, column 1
7 - See the following table, column 2

Gigabit Ethernet GE ports 1.1 and 1.2 (combo ports)	Fast Ethernet FE ports 2.1 to 2.8, 3.1 to 3.8, 4.1 to 4.8
100/1000 Mbit/s F/O, SFP slots Alternatively connectable: 10/100/1000 Mbit/s twisted-pair, RJ45 ports	24 * twisted-pair TX, RJ45, 10/100 Mbit/s

1.1.2   MACH102 media modules
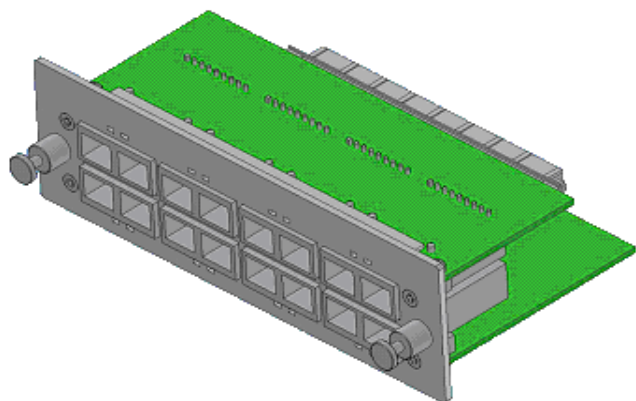
Figure 4:   Media module for MACH102, Example: M1-8MM-SC

The MACH102 media modules form the interface from the device to the LAN.

The modules are deployable in the
▶ MACH102-8TP basic device
▶ MACH102-8TP-R basic device

The media modules are hot-plug-compatible, which means that you have the option of replacing the modules with a module of the same kind during operation.

Note: If you are replacing media, e.g. removing a TX media module and plugging in an FX media module in its place, the MACH102 performs a warm start.

The media modules each have 8 Fast ETHERNET interfaces and differ as to their media type.

The different interfaces of the MACH102 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 un-crossed cable)

► Specific functions of fiber optic interface
   ► Link Down monitoring

MACH102 media modules Module Type	TP ports 10/100 Mbit/s	TP ports 10/100 Mbit/s PoE	F/O ports Multimode 100 Mbit/s	F/O ports Singlemode 100 Mbit/s	SFP ports Multimode Singlemode Longhaul 100 Mbit/s
M1-8TP-RJ45	8, RJ45	–	–	–	–
M1-8TP-RJ45 PoE	–	8, RJ45	–	–	–
M1-8MM-SC	–	–	8, DSC	–	–
M1-8SM-SC	–	–	–	8, DSC	–
M1-8SFP	–	–	–	–	8, SFP

Table 1:   Media connections per MACH102 media module (number and type)

■ Media module M1-8TP-RJ45

The M1-8TP-RJ45 media module has 8 × 10/100 Mbit ports for connecting terminal devices or network segments according to the standards IEEE 802.3 100BASE-TX / IEEE 802.3 10 BASE-T.
These ports support autonegotiation and autopolarity. The ports are RJ45 sockets. The housings of the RJ45 sockets are electrically connected to the front plate of the device. The pin assignment is identical to MDI-X. When the autonegotiation function is enabled, these ports also support autocrossing.
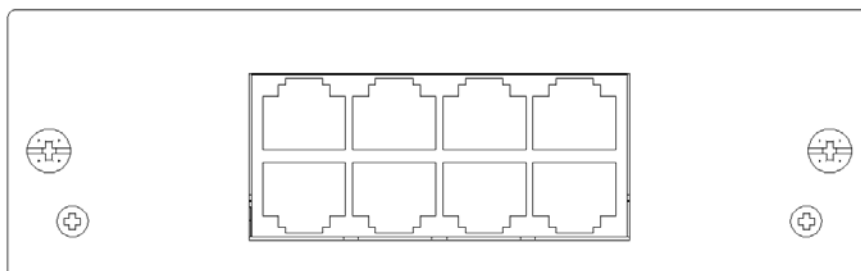
Figure 5: Media module M1-8TP-RJ45

■ Media module M1-8TP-RJ45 PoE

Note: The use of the M1-8TP-RJ45 PoE module will void the UL certification of the basic module.
Observe the instructions given in the information sheet of the media module M1-8TP-RJ45 PoE.

The M1-8TP-RJ45 PoE media module supports Power over ETHERNET (PoE). It has 8 10/100 Mbit/s TP PoE ports.
This port is an RJ45 socket.
The 10/100 Mbit/s PoE port allows you to connect network components as a PoE voltage sink according to the standard IEEE 802.3 10BASE-T/100BASE-TX and IEEE 802.3af.

▶ Autonegotiation
▶ Autopolarity
▶ Autocrossing (if autonegotiation is activated)

They allow the connection and remote supply of, for example, IP telephones (Voice over IP), webcams, sensors, printer servers and WLAN access points via 10BASE-T/100BASE-TX. With PoE, these terminal devices are powered by the twisted-pair cable.
You can connect PoE terminal devices (PD, Powered Device, type1 or type2) up to class 0.
The PoE power is supplied via the wire pairs transmitting the signal (phantom voltage).
The individual ports (joint PoE voltage) are not electrically insulated from each other.
The following conditions are met in accordance with IEEE 802.3af:
▶ Endpoint PSE
▶ Alternative A
The pin assignment corresponds to MDI-X.
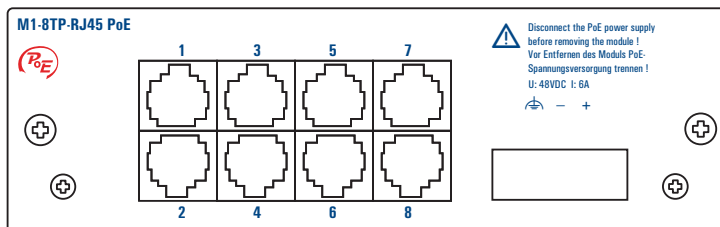
Figure 6: Media module M1-8TP-RJ45 PoE

■ **Media module M1-8MM-SC**
The M1-8MM-SC media module has 8 FX ports for connecting terminal devices or network segments in compliance with the IEEE 802.3u 100BASE-FX Multimode standard. The optical ports are configured in 100 Mbit/s Fullduplex (FDX) and support FEFI. They have a DSC design.
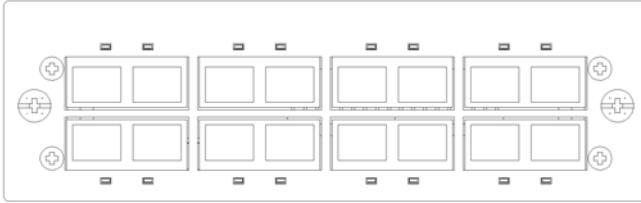
Figure 7: Media module M1-8MM-SC

■ **Media module M1-8SM-SC**

The M1-8SM-SC media module has 8 FX ports for connecting terminal devices or network segments in compliance with the IEEE 802.3u 100BASE-FX Singlemode standard. The optical ports are configured in 100 Mbit/s Fullduplex (FDX) and support FEFI. They have a DSC design.
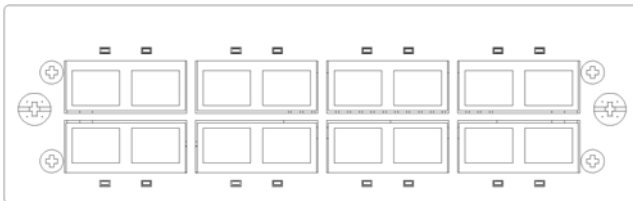
Figure 8: Media module M1-8SM-SC

■ **Media module M1-8SFP**

The M1-8MM-SC media module has 8 FX ports for connecting terminal devices or network segments in compliance with the IEEE 802.3u 100BASE-FX Multimode/Singlemode/Longhaul standard. The optical ports are configured in 100 Mbit/s Fullduplex (FDX) and support FEFI. They are designed as SFP slots for the Hirschmann SFP module types M-FAST SFP-... 46 "Accessories".
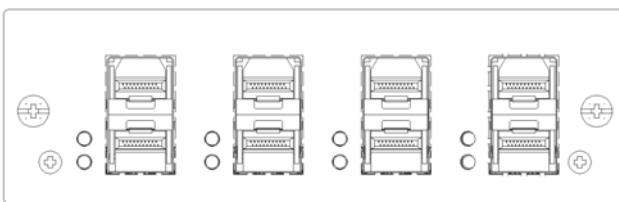
Figure 9: Media module M1-8SFP

1.1.3   SFP modules

SFP modules are optical transceivers (Fast ETHERNET and Gigabit ETHERNET SFP modules, see 46 "Accessories"). SFP stands for Small Form-factor Pluggable and is also frequently referred to as mini-GBIC (GigaBit Interface Converter).

The SFP modules are plugged into the SFP slots of the MACH102 basic device to obtain an F/O port. The MACH102 has 2 TP interfaces and 2 slots for inserting SFP modules (100/1000 Mbit/s).
By inserting the SFP module you deactivate the corresponding TP interface.

Module type	Transmission	Range	Connection
Fast ETHERNET SFP modules:			LC
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
Gigabit ETHERNET SFP modules:			LC
M-SFP-MX/LC	1310 nm Multimode	2 km	LC
M-SFP-SX/LC	850 nm Multimode	0.55 km	LC
M-SFP-LX/LC	1330 nm Multimode	0.55 km	LC
	1330 nm Singlemode	20 km	LC
M-SFP-LX+/LC	1310 nm Singlemode	14-42 km	LC
M-SFP-LH/LC	Longhaul	8-72 km	LC
M-SFP-LH+/LC	Longhaul +	71-108 km[a]	LC
		71-128 km[b]	

Table 2:   SFP modules

a. Relating to a maximum attenuation of 0.25 dB/km.
b. Relating to a typical attenuation of 0.21 dB/km.

Note: Only use Hirschmann SFP transceivers. See "Accessories" on page 46.

2 Assembly and start-up

The devices have been developed for practical application in a harsh industrial environment.

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
▶ Installing the SFP modules
▶ Signal contact
▶ Installing the device and grounding
▶ Supply voltage
▶ Startup
▶ Connecting the data lines

2.1 Installing the device

2.1.1 Unpacking and checking the content of the package

☐ Check whether the package includes all items named in section "Scope of delivery" on page 46.
☐ Check the individual parts for transport damage.

2.1.2 Installing media modules

On delivery, the device is ready for operation.

The modules can be used in
▶ MACH 102-8TP basic device
▶ MACH 102-8TP-R basic device

☐ See the ESD guidelines on 7 and the safety instructions on 7 onwards.

The media modules are hot-plug-compatible, which means that you have the option of replacing the modules with a module of the same kind during operation.

Note: If you are replacing media, e.g. removing a TX media module and plugging in an FX media module in its place, the MACH102 performs a warm start.
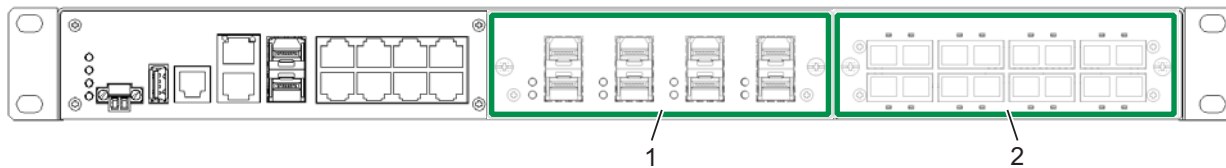
Figure 10: MACH102 device equipped with media modules
> *1 - media module 1*
> *2 - media module 2*

☐ To attach a media module, first remove the 2 screws on the protective cover of the media module slot and remove the protective cover.
☐ Plug the media module into the desired slot.
☐ Fasten the 2 screws at the corners of the media module.
☐ Fit the media modules in sequence from left to right.

2.1.3 Installing the SFP modules

Fast ETHERNET
fiberoptic SFP module

Gigabit ETHERNET
fiberoptic SFP module

Figure 11: MACH102 device, front view
         1 - 2 SFP slots

☐ Before installing an SFP transceiver or XFP transceiver, first remove the protection cap of the transceiver.
☐ Push the SFP transceiver or XFP transceiver with the lock closed into the socket until you hear it latch in.

Note: Only use Hirschmann SFP transceivers. See "Accessories" on page 46.
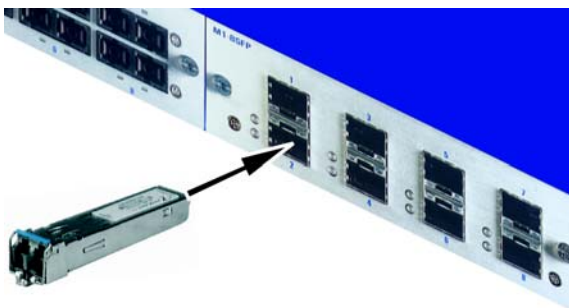
Figure 12: Installing an SFP module

2.1.4 "FAULT" signal contact
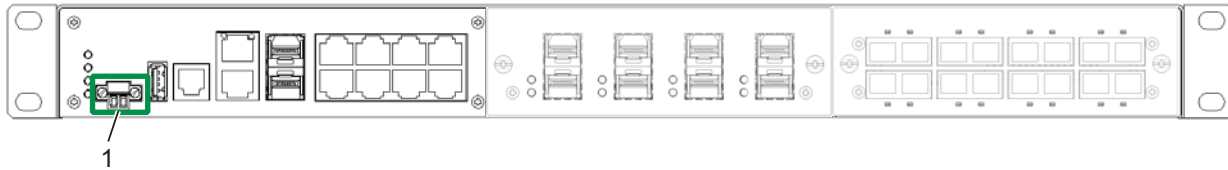
Figure 13: MACH102 device, front view
1 - Signal contact

The signal contacts are connected via a 2-pin terminal block with screw locking.

▶ The signal contact ("FAULT", for pin assignment of terminal block, see figure 14) monitors the functioning of the device, thus enabling remote diagnostics. You can specify the type of function monitoring in the Management.

▶ You can also use the Management 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 detected error in the device (internal supply voltage).

▶ The detected error of the link status of at least one port. The report of the link status can be masked by the Management for each port. In the default state, link status monitoring is deactivated.

▶ The temperature of the device is outside the range specified in the threshold values.

▶ The removal of the ACA.

The following condition is also reported in RM mode:

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

■ Connecting the terminal block
  ☐ Pull the terminal block off the device and connect the signal lines.
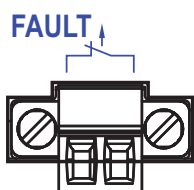
Figure 14: 2-pin terminal block

Note: Please note the electrical ratings for the signal contact .

Note: Relevant for North America:
The tightening torque of the terminal block screws is 3 lb in. (0.34 Nm).

☐ Mount the terminal block for the signal contact on the front of the device using the screw locking. Check whether the terminal block is mounted correctly and screwed on.

2.1.5   Dimension drawings
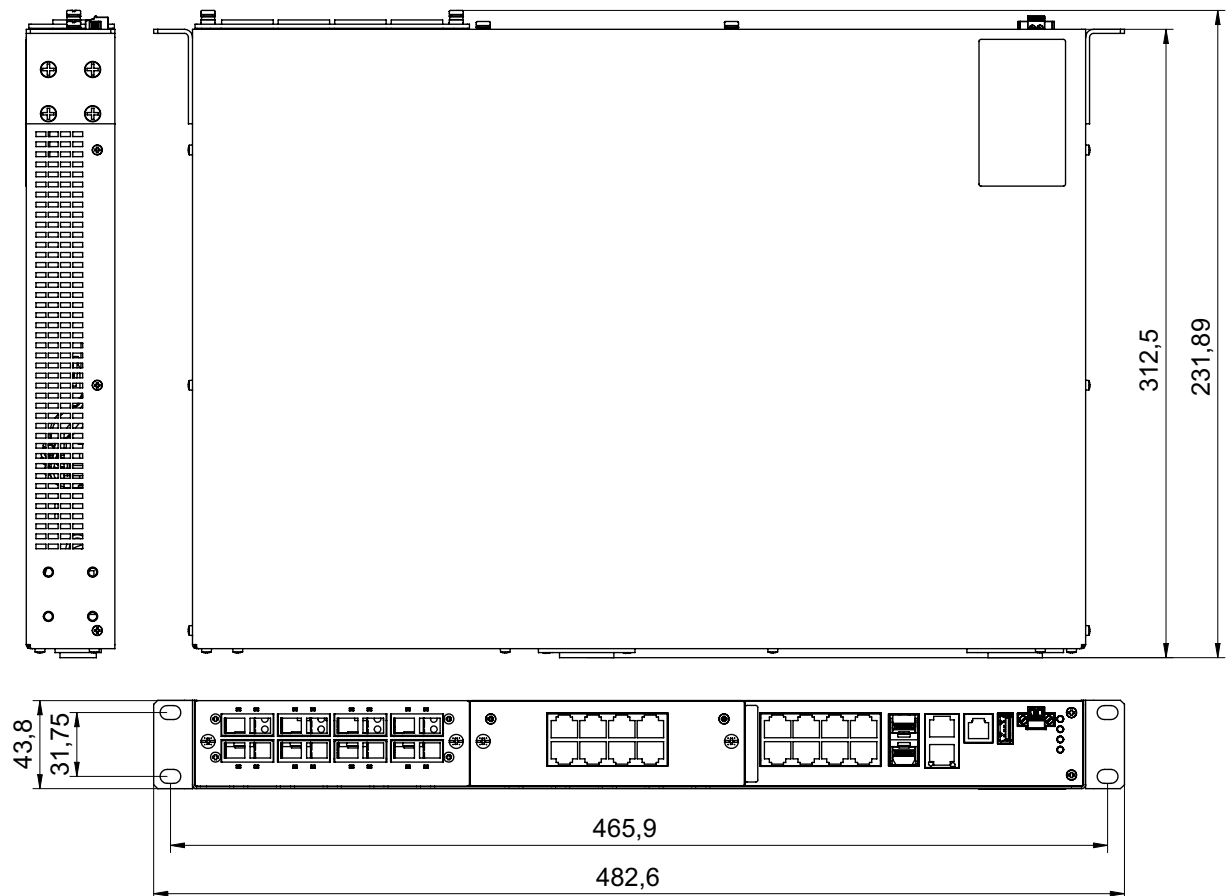
2.1.6   Installing the device and grounding

The device can be mounted on a flat surface, in a 19" standard switch cabinet, or on the wall.

Select the assembly location according to the safety guidelines .

When selecting the assembly location, also make sure the following requirements are met:

☐ The installation location should be close to a power outlet.
☐ Adhere to the climatic threshold values listed in the technical data.
☐ Keep the ventilation slits free to ensure good air circulation.
☐ Make sure there is at least 3.94 inches (10 cm) of space in front of the ventilation slits of the housing.
☐ The assembly location can be accessed for maintenance and repair work.
☐ The LED display elements are clearly visible.
☐ Twisted-pair cables are at a sufficient distance from potential sources of electrical interference, such as power cables.
☐ The device has a separate power source with a ground connection. The power supply can be interrupted by means of a separate isolator or power switch. We recommend using overvoltage protection for all devices.

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

■ Mounting on a flat surface

☐ Install the device in line with the criteria listed in "Installing the device and grounding" on page 25.

■ Mounting in a switch cabinet

Note: Install the device in the 19" switch cabinet using sliding or mounting rails.
This provides a more stable position of your device in environments subject to vibration.
For more information on sliding/mounting rails and how to install them, please contact your switch cabinet manufacturer.

The devices are designed to be mounted in a 19" switch cabinet.
☐ Make sure there is sufficient ventilation. If necessary, provide a fan for the 19" switch cabinet. This will prevent the basic devices from overheating.
☐ Measure the depth of the 19" switch cabinet so as to allow the power supply cables to be fitted at the back and the data cables to be fitted at the front.
☐ Install the sliding/mounting rails in the 19" switch cabinet as instructed by the manufacturer, and make sure the device is resting on both rails.
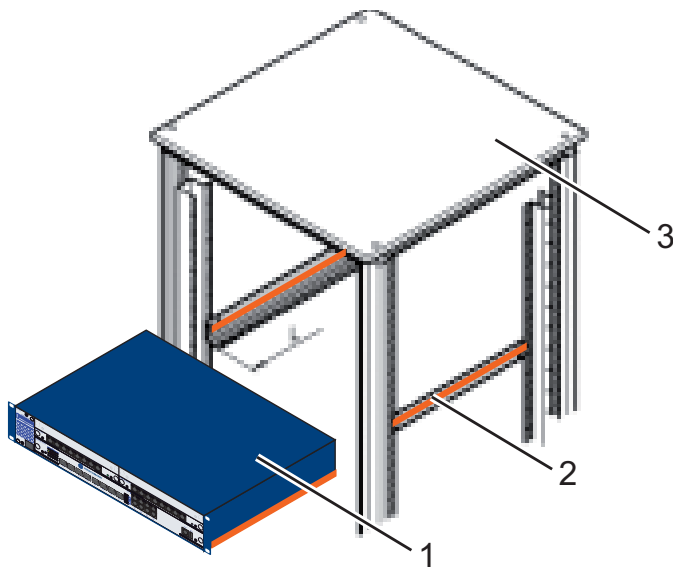
Figure 15: Assembly in a switch cabinet with sliding/mounting rails
       1 - MACH102 device
       2 - sliding/mounting rail
       3 - 19" switch cabinet

On delivery, two brackets are attached to the sides of the device (see figure below).
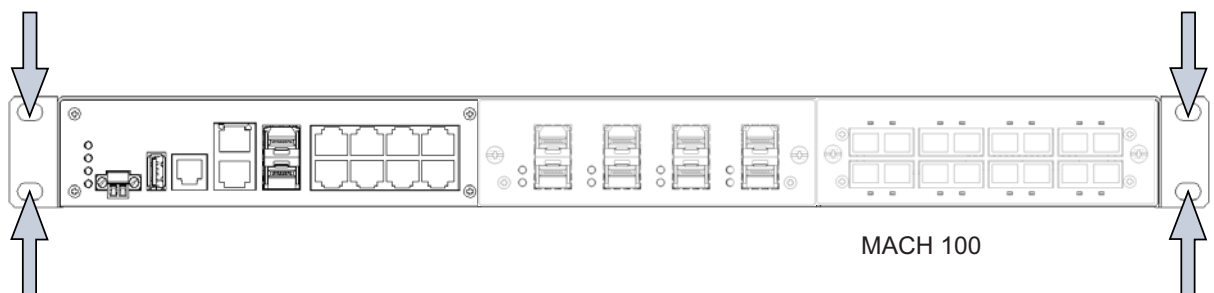
Figure 16: Mounting the MACH102 in the 19" cabinet

☐ Fasten the device by screwing the brackets to the switch cabinet.

⚠ CAUTION

OVERHEATING OF THE DEVICE

When installing the device, ensure that the ventilation slots are not covered. Make sure there is at least 10 cm (3.94 in) of space.

Failure to follow these instructions can result in injury or equipment damage.

Note: When operating the device in an environment with strong vibrations, you have the option to additionally fasten the back of the device to the switch cabinet using two brackets.
You can obtain additional brackets as accessories (see on page 46 "Accessories").

■ **Mounting on the wall**
  ☐ Use the pre-mounted brackets included in the delivery.
    (see figure 17)
  ☐ Additionally attach two brackets to the back of the device.
    (see figure 17)
    You can obtain additional brackets as accessories (see on page 46 "Accessories").
  ☐ Fasten the device by screwing the brackets to the wall.

⚠ **CAUTION**

OVERHEATING OF THE DEVICE

When installing the device, ensure that the ventilation slots are not covered. Make sure there is at least 10 cm (3.94 in) of space.

Failure to follow these instructions can result in injury or equipment damage.
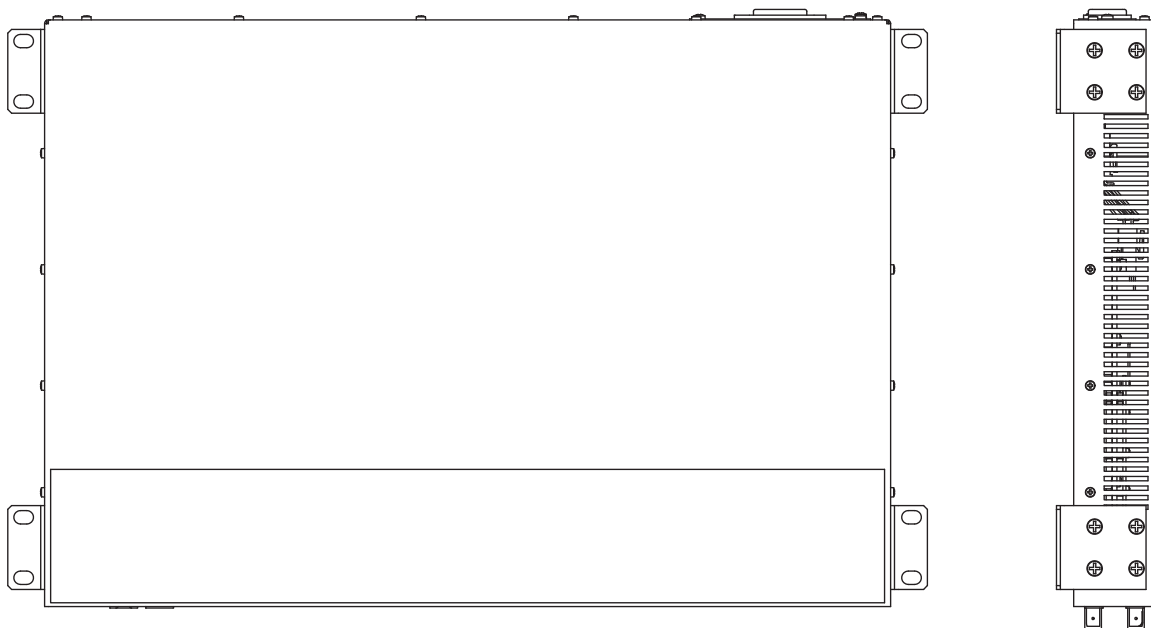
Figure 17: Vertical mounting on the wall

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

■ Grounding

The device is grounded via the voltage supply socket (see figure 18) and (see figure 19).

2.1.7   Supply voltage

The input voltage range of the MACH102 basic devices is designed as 100 V AC ... 240 V AC.
The power supply of the MACH102-8TP-R, MACH102-8TP-FR, and MACH102-24TP-FR devices is designed redundantly.

⚠ WARNING

ELECTRIC SHOCK
Connect solely an working voltage that corresponds to the type plate of your device.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

■ MACH 102-8TP, MACH 102-8TP-F and MACH 102-24TP-F
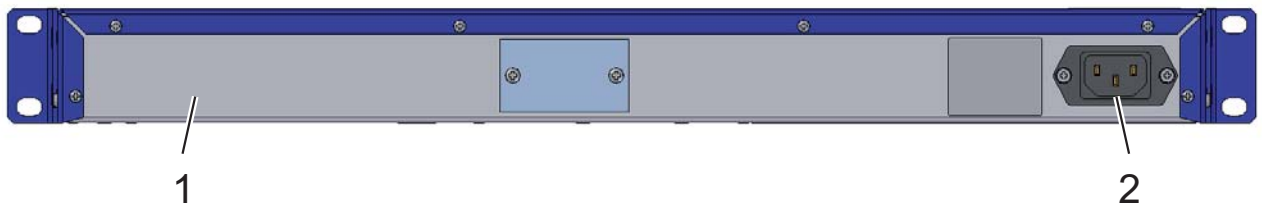
Figure 18: Connections for the MACH 102-8TP, MACH 102-8TP-F and
            MACH 102-24TP-F on the back of the device
            1 - MACH 102-8TP, MACH 102-8TP-F or MACH 102-24TP-F device
            2 - Power supply 100 - 240 V AC

■ MACH 102-8TP-R, MACH 102-8TP-FR, MACH 102-24TP-FR

The supply voltage can be connected redundantly. Both inputs are uncoupled. There is no distributed load. With redundant supply, the standard voltage supply alone supplies the device. The redundant voltage supply automatially becomes active if the standard voltage supply fails. In the normal case, the redundant voltage supply works in stand-by mode. The supply voltage is electrically isolated from the housing.
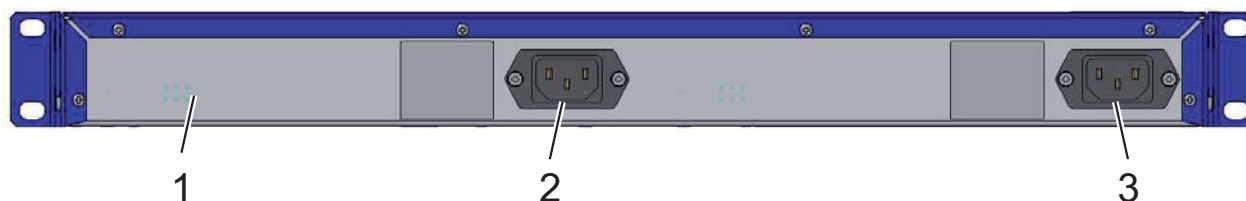
*Figure 19: Connections for the MACH 102-8TP-R, MACH 102-8TP-FR and
MACH 102-24TP-FR on the back of the device
1 - MACH 102-8TP-R, MACH 102-8TP-FR or MACH 102-24TP-FR device
2 - Redundant power supply 100 - 240 V AC
3 - Standard power supply 100 - 240 V AC*

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

■ Connecting the PoE supply voltage to the M1-8TP-RJ45 PoE media module (optional)

⚠ **WARNING**

ELECTRIC SHOCK

Supply solely 48 V DC SELV voltage (PoE) or 54 V DC SELV voltage
(PoE+) to the M1-8TP-RJ45 PoE media module.

For the PoE power supply to the M1-8TP-RJ45 PoE media module, use a
fuse of 5 A—slow-blow characteristic.

Install this device solely in a switch cabinet or in an operating site with
restricted access, to which maintenance staff have exclusive access.

Never insert sharp objects (small screwdrivers, wires, etc.) into the
connection terminals for the power lines, and do not touch the terminals!

**Non-adherence to these instructions can lead to death, serious
physical injury or material damage.**

<table>
<tr><td colspan="2">⚠️ WARNING</td></tr>
<tr><td colspan="2">FIRE HAZARD

Disconnect the PoE voltage supply before removing the M1-8TP-RJ45 PoE media module.

Non-adherence to these instructions can lead to death, serious physical injury or material damage.</td></tr>
</table>

The PoE power is supplied via the wire pairs transmitting the signal (phantom voltage).
The individual ports (joint PoE voltage) are not electrically insulated from each other.
The following values apply to the PoE supply voltage of the module:

Rated voltage	48 V DC SELV
Minimum voltage	46 V DC
Maximum voltage	57 V DC

To supply the module with PoE voltage you need an external power supply unit.

☐ 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 < 250 W and sufficient to provide the power for the connected PDs.

▶ Current limitation < 5 A or fuse 5 A slow blow.
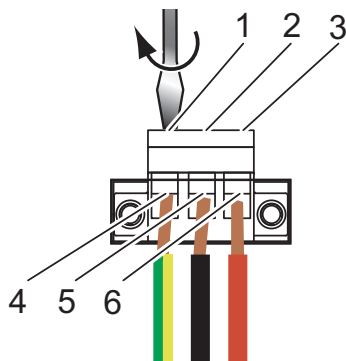
Figure 20: Connecting the supply voltage via the 3-pin terminal block
     1 - Fastening screw for functional earth
     2 - Fastening screw for supply voltage: -
     3 - Fastening screw for supply voltage: +
     4 - Connection for functional earth
     5 - Connection for supply voltage: -
     6 - Connection for supply voltage: +

Note: Relevant for North America:
The tightening torque of the terminal block screws is 3 lb in. (0.34 Nm).

Note: Make sure the following requirements are met:
▶ Supply line length < 3 m
▶ Supply line cross section is suitable for 5 A

☐ Pull the terminal block(s) off the switch and connect the voltage supply lines as follows:
☐ First connect the protective conductor to the protective conductor terminal.
☐ Connect the PoE voltage to the 3-pin terminal block.

2.1.8   Operating the device

By connecting the voltage supply via the voltage supply socket(s), you start the operation of the device.

2.1.9   Connecting network cables

■ 10/100 Mbit/s twisted pair port
This port is an RJ45 socket.
The 10/100 Mbit/s twisted pair port offers you the ability to connect network components according to the IEEE 802.3 10BASE-T/100BASE-TX standard.
This port supports:
▶ 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
Delivery state: autonegotiation active.
The socket housing is electrically connected with the front panel.

Figure	Pin	Operation
	1+2	One line pair: receiver path
	3+6	One line pair: sender path
	4,5,7,8	—

Table 3:   Pin assignment of a TP/TX interface in MDI-X mode, RJ45 socket

■ 10/100 Mbit/s PoE port

This port is an RJ45 socket.
The 10/100 Mbit/s PoE port allows you to connect network components
as a PoE voltage sink according to the standard IEEE 802.3 10BASE-
T/100BASE-TX and IEEE 802.3af.
This port supports:
▶ 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)
Delivery state: autonegotiation active.
The socket housing is electrically connected with the front panel.
The PoE power is supplied via the wire pairs transmitting the signal
(phantom voltage).
The individual ports (joint PoE voltage) are not electrically insulated from
each other.
The pin assignment corresponds to MDI-X.
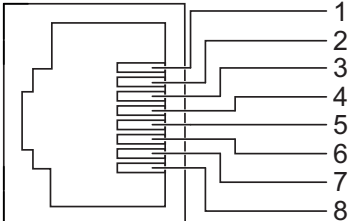
	Pin	Function		PoE voltage
	1	RD+	Receive path	Minus terminal
	2	RD−	Receive path	Minus terminal
	3	TD+	Transmission path	Plus terminal
	6	TD−	Transmission path	Plus terminal
	4,5,7,8	—		

*Table 4:   Pin assignment of the 10/100 Mbit/s PoE port, RJ45 socket, MDI-X mode,
phantom voltage*

■ **10/100/1000 Mbit/s twisted pair port**

The 10/100/1000 Mbit/s twisted pair port offers you the ability to connect network components according to the IEEE 802.3 10BASE-T/100BASE-TX/1000BASE-T standard.

This port supports:

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

Delivery state: Autonegotiation

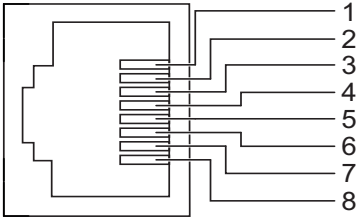The socket housings are electrically connected to the front panel.

The pin assignment corresponds to MDI-X.
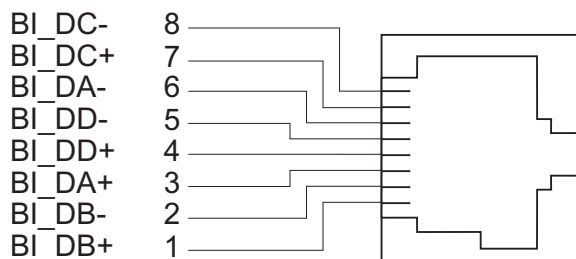
Figure 21: Pin assignment of the 1000 Mbit/s twisted pair interface

Note: In general, you should adhere to the following recommendations for data cable connections using copper in environments with high electrical interference levels:

▶ Keep the length of the data cables as short as possible - ideally max. 3 m long. You should not use any copper data cables for the data transmission between buildings.
▶ Power supply and data cables should not run parallel over longer distances, and ideally they should be installed in separate cable channels. If reducing the inductive coupling is necessary, verify that the power supply cables and data cables cross at a 90° angle.
▶ You may also choose to use shielded cables. Ground the cable shielding at one point in order to avoid causing a ground loop.

■ **100 Mbit/s F/O port**

This port is a DSC socket, or an SFP slot.

The 100 Mbit/s F/O port offers you the ability to connect network components according to the IEEE 802.3 100BASE-FX standard.

This port supports:

▶ Full or half duplex mode

Default setting: Full duplex

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

■ **1000 Mbit/s F/O port**
This port is an SFP slot.
The 1000 Mbit/s F/O port offers you the ability to connect network components according to the IEEE 802.3 1000BASE-SX/1000BASE-LX standard.
This port supports:
▶ Autonegotiation
▶ Full duplex mode
Delivery state: autonegotiation active.

Note: Make sure that you connect LH ports exclusively with LH ports, SX ports exclusively with SX ports, and LX ports exclusively with LX ports.

2.2 Display elements

After the working voltage is set up, the software starts and initializes itself. Afterwards, the device performs a self-test. During this process, various LEDs light up.
The process takes around 70 seconds.
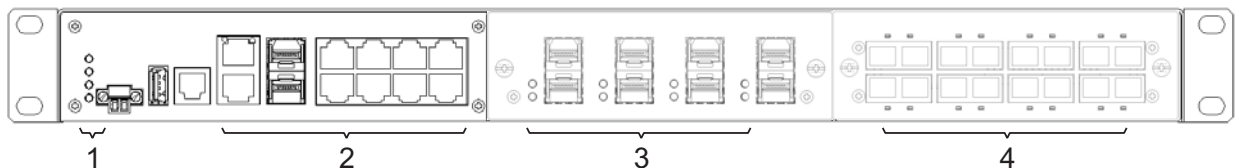
Figure 22: MACH102 Display elements
     1 - Display elements for the device status
     2 - Display elements for the port status
     3 - Display elements for the port status, media module 1
     4 - Display elements for the port status, media module 2

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

P - Power (green/yellow LED)	
Glowing green	MACH 102-8TP, MACH 102-8TP-F, MACH 102-24TP-F: Supply voltage is on. MACH 102-8TP-R, MACH 102-8TP-FR, MACH 102-24TP-FR: Supply voltages 1 and 2 are on.
Glowing yellow	MACH 102-8TP-R, MACH 102-8TP-FR, MACH 102-24TP-FR: Supply voltage 1 or 2 is on.
Not glowing	MACH 102-8TP, MACH 102-8TP-F, MACH 102-24TP-F: Supply voltage is below minimum value. MACH 102-8TP-R, MACH 102-8TP-FR, MACH 102-24TP-FR: Supply voltages 1 and 2 are below minimum value.
RM - Ring Manager (green/yellow LED)	
Glowing green	RM function active, redundant port disabled
Glowing yellow	RM function active, redundant port enabled
Not glowing	RM function not active
Flashing green	Incorrect configuration of the HIPER-Ring (e.g. the ring is not connected to the ring port).
Sb StandBy - stand-by mode (green LED)	
Glowing green	Stand-by mode enabled.
Not glowing	No stand-by mode.
FAULT - signal contact (red LED)	
Glowing red	Signal contact 1 is open, i.e. it is reporting an error.
Not glowing	Signal contact 1 is closed, i.e. it is not reporting an error.
RM and Stand-by - display saving processes of the AutoConfiguration Adapter (ACA)	
Flashing alternately	Error during saving process.
LEDs flash synchronously, two times a second	Loading configuration from the ACA.
LEDs flash synchronously, once a second	Saving the configuration in the ACA.

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

■ Port state
These LEDs provide port-related information.

LS - data, link status (one green/yellow LED or one green and one yellow LED)	
Not glowing	No valid connection.
Glowing green	Valid connection.
Flashing green (1 time a period)	Port is switched to stand-by.
Flashing green (3 times a period)	Port is switched off.
Flashing yellow	Data reception.

Table 5:   Data, link status

On the M1-8TP-RJ45 PoE media module, the left LED informs you about data and link state, as shown in table 5. The right LED informs you about PoE voltage supply on a port, as shown in table 6:

PoE voltage supply	
Not glowing	No PoE voltage on the port.
Glowing yellow	The port is supplied with PoE voltage.

Table 6:   Activity of the right LED on the M1-8TP-RJ45 PoE media module

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 via the application HiDiscovery or Industrial HiVision
▶ 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/DVD.

■ **Default settings**
▶ IP address: The device looks for the IP address using DHCP
▶ Management password:
  user, password: public (read only)
  admin, password: private (read and write)
▶ V.24 data rate: 9,600 Baud
▶ Ring redundancy: off
▶ Ethernet ports: link status is not evaluated (signal contact)
▶ Optical 100 Mbit/s ports: 100 Mbit/s full duplex
  All other ports: autonegotiation
▶ Redundancy manager switched off
▶ Stand-by coupling switched off
▶ Rapid Spanning Tree: on

■ **USB interface**
The USB socket provides an interface for the local connection of an AutoConfiguration Adapter. It is used for saving/loading the configuration and for loading the software.
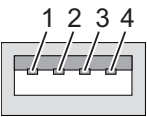
Figure	Pin	Operation
	1	VCC (VBus)
	2	− Data
	3	+ Data
	4	Ground (GND)

Table 7:   Pin assignment of the USB interface

■ V.24 interface (external management)

A serial interface is provided on the RJ11 socket (V.24 interface) for the local connection of an external management station (VT100 terminal or PC with appropriate terminal emulation) or an AutoConfiguration Adapter ACA 11. This enables a connection to the Command Line Interface (CLI) and the system monitor to be made.

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 V24 interface is not electrically isolated from the supply voltage.
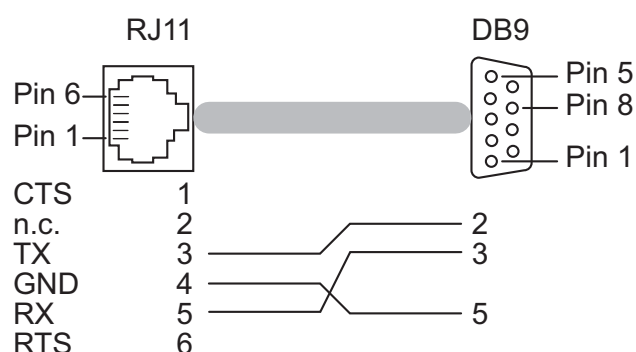
Figure 23: Pin assignment of the V24 interface

Note: You will find the order number for the terminal cable, which is ordered separately, in the Technical Data chapter (see on page 41 "Technical data").

2.4 Disassembly

■ **Removing the device**
  ☐ To detach the device from the switch cabinet or the wall, remove the screws from the brackets on the device.
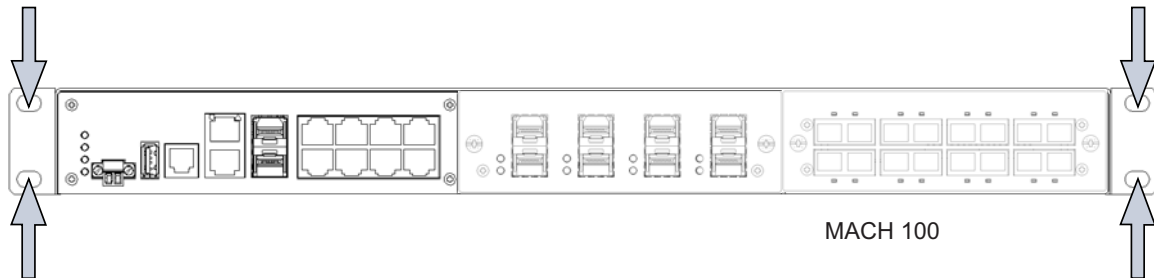
Figure 24: Disassembly

■ **Removing media modules**

⚠ **WARNING**
FIRE HAZARD Disconnect the PoE voltage supply before removing the M1-8TP-RJ45 PoE media module. **Non-adherence to these instructions can lead to death, serious physical injury or material damage.**

  ☐ To remove the media module, first remove the two screws at the corners of the media module.
  ☐ Pull the media module out of the slot.
  ☐ Fasten the protective cover to the slot using the two screws.

■ **Removing the SFP transceivers**
  ☐ Pull the module out of the socket by means of the opened lock.
  ☐ Close the socket with the protective cap.

Figure 25: Deinstalling an SFP transceiver

3 Technical data

■ General technical data

Dimensions W × H × D	MACH102-...	17.64 in. × 1.73 in. × 12.21 in. (448 mm × 44 mm × 310 mm) (without brackets)
Weight of devices	MACH102-8TP MACH102-8TP-R MACH102-8TP-F MACH102-8TP-FR MACH102-24TP-F MACH102-24TP-FR	7.94 lb (3.60 kg) 8.49 lb (3.85 kg) 7.94 lb (3.60 kg) 8.49 lb (3.85 kg) 8.49 lb (3.85 kg) 9.04 lb (4.10 kg)
Weight of media modules	M1-8TP-RJ45 M1-8MM-SC M1-8SM-SC M1-8SFP M1-8TP-RJ45 PoE	0.21 kg 0.21 kg 0.18 kg 0.13 kg 0.26 kg
Power supply Basic device	Nominal voltage AC	100 V ... 240 V
	Rated voltage range AC	90 V ... 264 V
	Rated frequency	50 Hz ... 60 Hz
	Rated frequency range	47 Hz ... 63 Hz
	Rated current range	0.4 A ... 0.2 A
Power supply M1-8TP-RJ45 PoE (for Type1 PD)	Rated voltage Rated current	48 V DC, SELV (45 V DC ... 57 V DC) 2.5 A
Power supply M1-8TP-RJ45 PoE (for Type2 PD)	Rated voltage Rated current	54 V DC, SELV (51 V DC ... 57 V DC) 2.5 A
Overload current protection at input		Non-replaceable fuse
Activation current		typ. <40 A at 265 V AC and cold start
Signal contact	Switching current	max. 1 A
	Switching voltage	max. 60 V DC or max. 30 V AC, SELV
Environment	Storage temperature (ambient air temperature) Humidity Air pressure (in operation)	-20 °C to +85 °C 10% to 95% (non-condensing) Up to 2000 m (795 hPa), higher altitudes on request
Operating temperature		0 °C to +50 °C
Pollution degree		2
Protection classes	Laser protection Level of protection	Class 1 according to EN 60825-1 (2001) IP20

■ EMC and immunity

EMC interference immunity		
EN 61000-4-2	Electrostatic discharge Contact discharge Air discharge	 6 kV 8 kV
EN 61000-4-3	Electromagnetic field 80 MHz ... 3000 MHz	 20 V/m
EN 61000-4-4	Fast transients (burst) - Power line - Data line	 2 kV 4 kV
EN 61000-4-5	Voltage surges - Power line, line/line: - Power line, line/earth - Data line	 1 kV 2 kV 4 kV
EN 61000-4-6	Line-conducted interference voltages 150 kHz - 80 MHz	 10 V
EN 61000-4-9	Pulse magnetic fields	300 A/m
EMC interference emission		
EN 55022	Class A	Yes
FCC 47 CFR Part 15	Class A	Yes

■ Network range

TP port	
Length of a twisted pair segment	max. 100 m/328 ft (for cat5e cable)

Table 8:   TP port 10BASE-T / 100BASE-TX / 1000BASE-T

Note: The line lengths specified for the transceivers apply for the respective fiber data (fiber attenuation and BLP/dispersion).

Product code M-FAST-SFP-...	Wave length	Fiber	System attenuation	Example for F/O line length [a]	Fiber attenuation	BLP/ dispersion
-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	47-104 km	0.25 dB/km	19 ps/(nm×km)
-LH/LC...	SM 1550 nm	9/125 µm	10-29 dB	55-140 km	0.18 dB/km[b]	18 ps/(nm×km)

Table 9:   Fiber port 100BASE-FX (SFP fiber optic Fast Ethernet Transceiver)

a.   including 3 dB system reserve when compliance with the fiber data is observed

b. with ultra-low-loss optical fiber

Product code M-SFP-...		Wave length	Fiber	System attenuation	Example for F/O line length [a]	Fiber attenuation	BLP[b]/ dispersion
-SX/LC...	MM	850 nm	50/125 μm	0-7.5 dB	0-550 m	3.0 dB/km	400 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
-MX/LC	MM	1310 nm	50/125 μm	0-8 dB	2 km[c]	1.0 dB/km	500 MHz×km
-MX/LC	MM	1310 nm	62.5/125 μm	0-8 dB	1 km	1.0 dB/km	500 MHz×km
-LX/LC...	MM	1310 nm[d]	50/125 μm	0-10.5 dB	0-550 m	1.0 dB/km	800 MHz×km
-LX/LC...	MM	1310 nm [d]	62.5/125 μm	0-10.5 dB	0-550 m	1.0 dB/km	500 MHz×km
-LX/LC...	SM	1310 nm	9/125 μm	0-10.5 dB	0-20 km[e]	0.4 dB/km	3.5 ps/(nm×km)
-LX+/LC...	SM	1310 nm	9/125 μm	5-20 dB	14-42 km	0.4 dB/km	3.5 ps/(nm×km)
-LH/LC...	LH	1550 nm	9/125 μm	5-22 dB	23-80 km	0.25 dB/km	19 ps/(nm×km)
-LH+/LC	LH	1550 nm	9/125 μm	15-30 dB	71-108 km	0.25 dB/km	19 ps/(nm×km)
-LH+/LC	LH	1550 nm	9/125 μm	15-30 dB	71-128 km	0.21 dB/km (typically)	19 ps/(nm×km)

Table 10: Fiber port 1000BASE-FX (SFP fiber optic Gigabit Ethernet Transceiver)

a. including 3 dB system reserve when compliance with the fiber data is observed
b. The bandwidth length product cannot be used to calculate the expansion.
c. Distances of up to 3 km reachable, 1000 MHz*km (1300 nm)
d. With F/O adapter compliant with IEEE 802.3-2002 clause 38 (single-mode fiber offset-launch mode conditioning patch cord)
e. including 2.5 dB system reserve when compliance with the fiber data is observed

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

■ Power consumption/power output, temperature range and order numbers

MACH102 family	Description
Basic devices	
MACH102-8TP	Basic device MACH102 family with 2 × Gigabit Ethernet combo port, 8 × Fast Ethernet TX, 2 sockets for media modules for up to 16 additional ports
MACH102-8TP-R	Basic device MACH102 family with 2 × Gigabit Ethernet combo port, 8 × Fast Ethernet TX, 2 sockets for media modules for up to 16 additional ports and redundant power supply
MACH102-8TP-F	Basic device MACH102 family with 2 × Gigabit Ethernet combo port, 8 × Fast Ethernet TX
MACH102-8TP-FR	Basic device MACH102 family with 2 × Gigabit Ethernet combo port, 8 × Fast Ethernet TX, and redundant power supply
MACH102-24TP-F	Basic device MACH102 family with 2 × Gigabit Ethernet combo port, 24 × Fast Ethernet TX
MACH102-24TP-FR	Basic device MACH102 family with 2 × Gigabit Ethernet combo port, 24 × Fast Ethernet TX, and redundant power supply
Media modules	
M1-8TP-RJ45	8 × Fast Ethernet TX RJ45
M1-8TP-RJ45 PoE	8 × Fast Ethernet TX RJ45

MACH102 family	Description
M1-8MM-SC	8 × Fast Ethernet Multimode, DSC connector
M1-8SM-SC	8 × Fast Ethernet Singlemode, DSC connector
M1-8SFP	8 × Fast Ethernet, SFP slot

MACH102 family Device/module	Power consumption	Power output	Operating temperature ambient air	Order number
Basic devices				
MACH102-8TP	12 W	41 Btu (IT)/h	+32°F to +122°F (0 °C to +50 °C)	943 969-001
MACH102-8TP-R	13 W	44 Btu (IT)/h	+32°F to +122°F (0 °C to +50 °C)	943 969-101
MACH102-8TP-F	12 W	41 Btu (IT)/h	+32°F to +122°F (0 °C to +50 °C)	943 969-201
MACH102-8TP-FR	13 W	44 Btu (IT)/h	+32°F to +122°F (0 °C to +50 °C)	943 969-301
MACH102-24TP-F	16 W	55 Btu (IT)/h	+32°F to +122°F (0 °C to +50 °C)	943 969-401
MACH102-24TP-FR	17 W	58 Btu (IT)/h	+32°F to +122°F (0 °C to +50 °C)	943 969-501
Media modules				
M1-8TP-RJ45	2 W	7 Btu (IT)/h	+32°F to +122°F (0 °C to +50 °C)	943 970-001
M1-8TP-RJ45 PoE - internal operating voltage - external PoE voltage - no PD - 8 × Class0-PD	2.2 W 1.2 W 2 W + PDs	7.6 Btu (IT)/h 4.1 Btu (IT)/h 6.9 Btu (IT)/h	+32°F to +122°F (0 °C to +50 °C)	942 028-001
M1-8MM-SC	10 W	34 Btu (IT)/h	+32°F to +122°F (0 °C to +50 °C)	943 970-101
M1-8SM-SC	10 W	34 Btu (IT)/h	+32°F to +122°F (0 °C to +50 °C)	943 970-201
M1-8SFP (incl SFP modules)	11 W	37 Btu (IT)/h	+32°F to +122°F (0 °C to +50 °C)	943 970-301
Fast Ethernet SFP module				
M-FAST SFP-MM / LC	0 W	0 Btu (IT)/h	+32°F to +122°F (0 °C to +60 °C)	943 865-001
M-FAST SFP-MM / LC EEC	0 W	0 Btu (IT)/h	+32°F to +122°F (–40 °C to +70 °C)	943 945-001
M-FAST SFP-SM / LC	0 W	0 Btu (IT)/h	+32°F to +122°F (0 °C to +60 °C)	943 866-001
M-FAST SFP-SM / LC EEC	0 W	0 Btu (IT)/h	+32°F to +122°F (–40 °C to +70 °C)	943 946-001
M-FAST SFP-SM+/ LC	0 W	0 Btu (IT)/h	+32°F to +122°F (0 °C to +60 °C)	943 867-001

Table 11: Power, temperature and order numbers

MACH102 family Device/module	Power consump tion	Power output	Operating temperature ambient air	Order number
M-FAST SFP-SM+/ LC EEC	0 W	0 Btu (IT)/h	+32°F to +122°F (–40 °C to +70 °C)	943 947-001
M-FAST SFP-LH / LC	0 W	0 Btu (IT)/h	+32°F to +122°F (0 °C to +60 °C)	943 868-001
Gigabit Ethernet SFP modules				
M-SFP-MX / LC	0 W	0 Btu (IT)/h	+32°F to +122°F (0 °C to +60 °C)	942 035-001
M-SFP-SX / LC	0 W	0 Btu (IT)/h	+32°F to +122°F (0 °C to +60 °C)	943 014-001
M-SFP-SX / LC EEC	0 W	0 Btu (IT)/h	+32°F to +122°F (–40 °C to +70 °C)	943 896-001
M-SFP-LX / LC	0 W	0 Btu (IT)/h	+32°F to +122°F (0 °C to +60 °C)	943 015-001
M-SFP-LX / LC EEC	0 W	0 Btu (IT)/h	+32°F to +122°F (–40 °C to +70 °C)	943 897-001
M-SFP-LX+ / LC	0 W	0 Btu (IT)/h	+32°F to +122°F (0 °C to +60 °C)	942 023-001
M-SFP-LX+/ LC EEC	0 W	0 Btu (IT)/h	+32°F to +122°F (–40 °C to +70 °C)	942 024-001
M-SFP-LH / LC	0 W	0 Btu (IT)/h	+32°F to +122°F (0 °C to +60 °C)	943 042-001
M-SFP-LH / LC EEC	0 W	0 Btu (IT)/h	+32°F to +122°F (–40 °C to +70 °C)	943 898-001
M-SFP- LH+/ LC	0 W	0 Btu (IT)/h	+32°F to +122°F (0 °C to +60 °C)	943 049-001

Table 11: Power, temperature and order numbers

■ Interfaces

Basic devices	
MACH102-8TP, MACH102-8TP-R, MACH102-8TP-F, MACH102-8TP-FR, MACH102-24TP-F or MACH102-24TP-FR	V.24 port: external management 1 terminal block, 2-pin: each 1 x signal contact, max. 1 A, 24 V USB: ACA 21-USB
MACH102-8TP or MACH102-8TP-R	- 2 combo ports (alternatively 100/1000 Mbit/s optical SFP slot or 1000/100/10 Mbit/s RJ45 socket) - 8 x 10/100 Mbit/s twisted pair, RJ45 socket - 2 slots for media modules (M1-8TP-RJ45, M1-8MM-SC, M1-8SM-SC or M1-8SFP)

MACH102-8TP-F or MACH102-8TP-FR	- 2 combo ports (alternatively 100/1000 Mbit/s optical SFP slot or 1000/100/10 Mbit/s RJ45 socket) - 8 x 10/100 Mbit/s twisted pair, RJ45 socket
MACH102-24TP-F or MACH102-24TP-FR	- 2 combo ports (alternatively 100/1000 Mbit/s optical SFP slot or 1000/100/10 Mbit/s RJ45 socket) - 24 x 10/100 Mbit/s twisted pair, RJ45 socket
Media modules	
M1-8TP-RJ45	8 x 100 Mbit/s twisted pair, RJ45 socket
M1-8TP-RJ45 PoE	8 x 100 Mbit/s twisted pair PoE, RJ45 socket
M1-8MM-SC	8 x 100 Mbit/s Multimode, duplex SC plug
M1-8SM-SC	8 x 100 Mbit/s Singlemode, duplex SC plug
M1-8SFP	8 x 100 Mbit/s, SFP slot

■ Scope of delivery

Device	Scope of delivery
MACH102-8TP MACH102-8TP-R MACH102-8TP-F MACH102-8TP-FR MACH102-24TP-F, or MACH102-24TP-FR	MACH102 device Terminal block for signal contact 2 brackets with fastening screws (pre-mounted) Housing feet, stick-on Non-heating device cable, Euro model CD ROM with user manual Installation user manual

■ Accessories

Note: Please note that products recommended as accessories may have characteristics that do not fully correspond to those of the corresponding product. This may limit their possible usage range in the overall system.

Name	Order number
Fast ETHERNET SFP modules:	
M-FAST SFP-MM / LC	943 865-001
M-FAST SFP-MM / LC EEC	943 945-001
M-FAST SFP-SM / LC	943 866-001
M-FAST SFP-SM / LC EEC	943 946-001
M-FAST SFP-SM+/ LC	943 867-001
M-FAST SFP-SM+/ LC EEC	943 947-001
M-FAST SFP-LH / LC	943 868-001
Gigabit ETHERNET SFP modules:	
M-SFP-MX / LC	942 035-001
M-SFP-SX/LC	943 014-001
M-SFP-SX / LC EEC	943 896-001
M-SFP-LX/LC	943 015-001
M-SFP-LX / LC EEC	943 897-001
M-SFP-LX+ / LC	942 023-001
M-SFP-LX+ / LC EEC	942 024-001
M-SFP-LH/LC	943 042-001
M-SFP-LH / LC EEC	943 898-001

Name	Order number
M-SFP-LH+/LC	943 049-001
AutoConfiguration Adapter ACA 21-USB	943 271-002
Terminal cable	943 301-001
2-pin terminal block (50 units)	943 845-010
Bracket for fastening the housing	943 943-001
HiVision Network Management software	943 471-100
Network management software Industrial HiVision	943 156-xxx
Connector ELWIKA 5012 PG7 (5-pin M12 socket for supply voltage and signal contact)	933 175-100
3-pin terminal block low voltage interlock (50 pieces)	943 845-011

■ Underlying norms and standards

Name	
EN 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments
EN 55022	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
EN 60950-1	Information technology equipment – Safety – Part 1: General requirements
FCC 47 CFR Part 15	Code of Federal Regulations
UL 508	Safety for Industrial Control Equipment
UL 60950-1	Safety for Information Technology Equipment

Table 12: List of norms and standards

RFC 768	UDP	RFC 1769	SNTP
RFC 783	TFTP	RFC 1907	MIB2
RFC 791	IP	RFC 1945	HTTP/1.0
RFC 792	ICMP	RFC 2131	DHCP
RFC 793	TCP	RFC 2132	DHCP Options
RFC 826	ARP	RFC 2236	IGMPv2
RFC 951	BOOTP	RFC 2239	MAU-MIB
RFC 1112	IGMPv1	RFC 3411	SNMP Framework
RFC 1157	SNMPv3	RFC 3412	SNMP MDP
RFC 1155	SMIv1	RFC 3413	SNMP Applications
RFC 1213	MIB2	RFC 3414	SNMP USM
RFC 1493	Dot1d	RFC 3415	SNMP VACM
RFC 1542	BOOTP Extensions	RFC 2613	SMON
RFC 1757	RMON	RFC 2674	Dot1p/Q

Table 13: List of RFCs

IEEE 802.1 D	Switching, GARP, GMRP, Spanning Tree
IEEE 802.1 D-1998	Media access control (MAC) bridges (includes IEEE 802.1p Priority and Dynamic Multicast Filtering, GARP, GMRP)
IEEE 802.1 Q	Tagging
IEEE 802.1 Q-1998	Virtual Bridged Local Area Networks (VLAN Tagging, GVRP)
IEEE 802.1 w.2001	Rapid Reconfiguration
IEEE 802.3-2002	Ethernet
IEEE 802.3af	Power over Ethernet

Table 14: Liste der IEEE-Normen

The device has a certification based on a specific standard or de facto standard solely if the certification indicator appears on the housing.
If your device has a shippingcertification according to Germanischer Lloyd, the certification mark can be found printed on the device label. You will find out whether your device has other shipping certifications on the Hirschmann website under www.hirschmann.com in the product information.

Note: The use of the M1-8TP-RJ45 PoE module will void the UL certification of the basic module.
Observe the instructions given in the information sheet of the media module M1-8TP-RJ45 PoE.

A   Further Support

■ Technical Questions

For technical questions, please contact any Hirschmann dealer in your area or Hirschmann directly.

You will find the addresses of our partners on the Internet at http://www.hirschmann.com

Contact our support at https://hirschmann-support.belden.eu.com

You can contact us

in the EMEA region at
▶ Tel.: +49 (0)1805 14-1538
▶ E-mail: hac.support@belden.com

in the America region at
▶ Tel.: +1 (717) 217-2270
▶ E-mail: inet-support.us@belden.com

in the Asia-Pacific region at
▶ Tel.: +65 6854 9860
▶ E-mail: inet-ap@belden.com

■ Hirschmann Competence Center

The Hirschmann Competence Center is ahead of its competitors:

▶ Consulting incorporates comprehensive technical advice, from system evaluation through network planning to project planning.
▶ Training offers you an introduction to the basics, product briefing and user training with certification.
   The current technology and product training courses can be found at http://www.hicomcenter.com
▶ Support ranges from the first installation through the standby service to maintenance concepts.

With the Hirschmann Competence Center, you have decided against making any compromises. Our client-customized package leaves you free to choose the service components you want to use.
Internet:
http://www.hicomcenter.com