# HIRSCHMANN

A **BELDEN** BRAND

User Manual

## Installation
Industrial ETHERNET Workgroup Switch
MACH102 Family
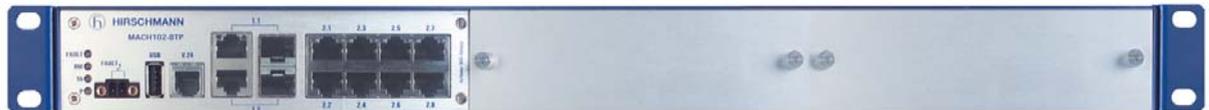
MACH102-8TP-F
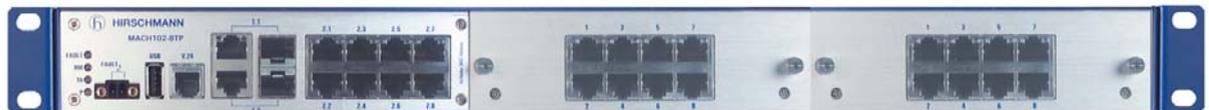
MACH102-24TP-F
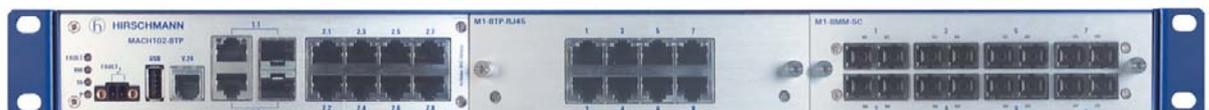
MACH102-8TP + M1-8TP-RJ45 + M1-8MM-SXC

MACH102-8TP + M1-8SM-SXC + M1-8SFP

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Contents

Important information

Note: Read these instructions carefully, and familiarize yourself with the device before trying to install, operate, or maintain it. The following notes may appear throughout this documentation or on the device. These notes warn of potential hazards or call attention to information that clarifies or simplifies a procedure.

■ Symbol explanation

This is a general warning symbol. This symbol alerts you to potential personal injury hazards. Observe all safety notes that follow this symbol to avoid possible injury or death.

If this symbol is displayed in addition to a safety instruction of the type "Danger" or "Warning", it means that there is a danger of electric shock and failure to observe the instructions will inevitably result in injury.

This symbol indicates the danger of hot surfaces on the device. In connection with safety instructions, non-observance of the instructions will inevitably result in injuries.

> ⚠ **DANGER**
>
> **DANGER** draws attention to an immediately dangerous situation, which will **inevitably** result in a serious or fatal accident if not observed.

> ⚠ **WARNING**
>
> **WARNING** indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury.

> ⚠ **CAUTION**
>
> **CAUTION** indicates a possible danger which, if not avoided, **may** result in minor injuries.

NOTICE
NOTE provides information about procedures that do not involve the risk of injury.

Safety instructions

⚠ WARNING
UNCONTROLLED MACHINE ACTIONS To avoid uncontrolled machine actions caused by data loss, configure all the data transmission devices individually. Before you start any machine which is controlled via data transmission, be sure to complete the configuration of all data transmission devices. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

■ General safety instructions

You operate this device with electricity. Improper usage of the device entails the risk of physical injury or significant property damage. The proper and safe operation of this device depends on proper handling during transportation, proper storage and installation, and careful operation and maintenance procedures.
☐ Before connecting any cable, read this document, and the safety instructions and warnings.
☐ Operate the device with undamaged components exclusively.
☐ The device is free of any service components. In case of a damaged or malfunctioning device, turn off the supply voltage and return the device to Hirschmann for inspection.

■ Qualification requirements for personnel

☐ Only allow qualified personnel to work on the device.
Qualified personnel have the following characteristics:
▶ Qualified personnel are properly trained. Training as well as practical knowledge and experience make up their qualifications. This is the prerequisite for grounding and labeling circuits, devices, and systems in accordance with current standards in safety technology.
▶ Qualified personnel are aware of the dangers that exist in their work.
▶ Qualified personnel are familiar with appropriate measures against these hazards in order to reduce the risk for themselves and others.
▶ Qualified personnel receive training on a regular basis.

■ Certified usage
☐ Use the product only for the application cases described in the Hirschmann product information, including this manual.

☐ Operate the product only according to the technical specifications. See "General technical data" on page 49.

☐ Connect to the product only components suitable for the requirements of the specific application case.

■ Media modules
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.

■ National and international safety regulations
Verify that the electrical installation meets local or nationally applicable safety regulations.

■ Requirements for connecting electrical wires
Before connecting the electrical wires, **always** verify that the requirements listed are complied with.

The following requirements apply without restrictions:
▶ The electrical wires are voltage-free.
▶ The cables used are permitted for the temperature range of the application case.
▶ The device is grounded via the voltage supply socket (see figure 19 und figure 20).
▶ Exclusively switch on the device when it is installed.
▶ Relevant for North America: Exclusively use 60/75 °C (140/167 °F) or 75 °C (167 °F) copper (Cu) wire.

Table 1: Requirements for connecting electrical wires

■ Requirements for connecting the signal contact

The following requirements apply without restrictions:
▶ Limit the connected voltage with a current limitation or in accordance with its application. Observe the electrical threshold values for the signal contact. See "General technical data" on page 49.

Table 2: Requirements for connecting the signal contact

■ Requirements for connecting the supply voltage

Device variant	Prerequisites:
All variants	**All** of the following requirements are complied with:
	▶ The supply voltage corresponds to the voltage specified on the type plate of the device.
	▶ The power supply conforms to overvoltage category I or II.
	▶ The power supply has an easily accessible disconnecting device (for example a switch or a plug). This disconnecting device is clearly identified. So in the case of an emergency, it is clear which disconnecting device belongs to which power supply cable.
	▶ Install a fuse in the outer conductor of the power supply. Connect the neutral conductor to the ground potential. If the neutral conductor is not connected to the ground potential, also install an external fuse in the neutral conductor. Regarding the properties of this fuse: See "Power supply" on page 49. The wire diameter of the power supply cable is at least 0.75 mm² (North America: AWG18) on the supply voltage input.
	▶ The cross-section of the ground conductor is the same size as or bigger than the cross-section of the power supply cables.
	▶ Use a power supply cable which is suitable for the voltage, the current and the physical load.
	▶ Install an external fuse in the conductor that is not on ground potential.
	▶ The power supply complies with the requirements for a safety extra-low voltage (SELV) according to IEC 60950-1 or ES1 according to IEC/EN 62368-1.
	▶ The power supply is potential-free. For power supply modules capable of PoE, exclusively use a potential-free SELV power supply.
	▶ With redundant power supply: A positive grounding is prohibited.

Table 3:   Requirements for connecting the supply voltage

■ Supply voltage
The supply voltage is electrically isolated from the housing.

Note: When using devices with redundant power supply (MACH102-8TP-R, MACH102-8TP-FR, MACH102-24TP-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.

■ Shielded ground
The shielded ground wire of the twisted pairs cables is connected to the front panel as a conductor.
Beware of possible short circuits when connecting a cable section with conductive shield braiding.

■ ESD Guidelines

Media modules are equipped with electrostatically sensitive components. These can be destroyed by the effect of an electric field or by charge equalization when touching the printed circuit board or the contacts, or their lifetime can be affected. Media modules are therefore delivered packed in a conductive ESD protection bag. The packaging is reusable. 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.

Further information about electrostatic sensitive modules can be found in DIN EN 61340-5-1 (2007-08) and DIN EN 61340-5-2 (2007-08).

■ Device casing

Only technicians authorized by the manufacturer are permitted to open the casing.
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 in (10 cm) of space in front of the ventilation slits of the casing.

☐ Do not touch the housing during operation or shortly after switching off the device. Hot surfaces can cause injury.

☐ Mount the device horizontally or vertically, either as a desktop device, in the switch cabinet (figure 16 on page 31) or on the wall (figure 17 on page 31).

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

☐ Only switch on the device when the housing is closed.

■ Installation site requirements

Operate the device at the specified ambient temperature (temperature of the ambient air at a distance of 2 in (5 cm) from the device) and at the specified relative humidity exclusively.

▶ When you are selecting the installation location, make sure you observe the climatic threshold values specified in the technical data.

▶ Use the device in an environment with a maximum pollution degree that complies with the specifications in the technical data.

▶ If the device is not installed in a horizontal position, it must be installed in a control cabinet or other enclosure with fire protection properties. The enclosure can be made of metal or plastic with fire protection properties of at least V-1 according to IEC 60695-11-10. Bottom openings must not exceed 2 mm in diameter.

■ Strain relief

Note: If the strain relief is insufficient, there is a risk of torsion, contact problems and creeping interruptions.

☐ Relieve the connection points of cables and lines from mechanical stress.

☐ Design strain relieves in such a way that they prevent any mechanical damage to cables, wires or conductors caused by external influences or their own weight.

☐ To prevent damage to device connections, connectors and cables, follow the instructions for proper installation in accordance with DIN VDE 0100-520:2013-06, sections 522.6, 522.7 and 522.13.

■ Connecting data cables

Note the following general recommendations for data cable connections in environments with high electrical interference levels:

☐ Keep the length of the data cables as short as possible.

☐ Use optical data cables for the data transmission between the buildings.

☐ When using copper cables, provide a sufficient separation between the power supply cables and the data cables. Ideally, install the cables in separate cable channels.

☐ Verify that power supply cables and data cables do not run parallel over longer distances. To reduce inductive coupling, verify that the power supply cables and data cables cross at a 90° angle.

☐ Use shielded data cables for gigabit transmission via copper cables, for example SF/UTP cables according to ISO/IEC 11801. Exclusively use shielded data cables to meet EMC requirements according to EN 50121-4 and marine applications.

☐ Connect the data cables according to your requirements.
See "Description of the device variants" on page 18.

☐ 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.

■ CE marking

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

2014/30/EU (EMC)
Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

2011/65/EU and 2015/863/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.

2014/35/EU
Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

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
www.doc.hirschmann.com/certificates.html

The product can be used in the industrial sector.
▶ Interference immunity: EN 61000-6-2
▶ Emitted interference: EN 55032
▶ Safety: EN 62368-1

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.

■ LED or laser components

LED or LASER components according to IEC 60825-1 (2014):
CLASS 1 LASER PRODUCT
CLASS 1 LED PRODUCT

■ FCC note

Supplier's Declaration of Conformity
47 CFR § 2.1077 Compliance Information

MACH102
MACH102-Module

U.S. Contact Information
Belden – St. Louis
1 N. Brentwood Blvd. 15th Floor
St. Louis, Missouri 63105, United States
Phone: 314.854.8000

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: 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 radio communications. 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 "Installation" user manual contains a device description, safety instructions, a description of the display, and the other information that you need to install the device.

Documentation mentioned in the "User Manual Installation" that is not supplied with your device as a printout can be found as PDF files for downloading on the Internet at: https://www.doc.hirschmann.com

Key

The symbols used in this manual have the following meanings:

▶	Listing
☐	Work step
■	Subheading

1   Description

1.1   General device 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 end 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 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 Hirschmann network components help you ensure continuous communication across all levels of the company.

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.

■ Basic device

Figure 1:   Basic device: MACH102

You can choose from a wide range of variants. You have the option to set up your device individually based on different criteria:
▶ Number of ports
▶ Transmission speed
▶ Types of connectors
▶ Temperature range
▶ Supply voltage range
▶ Certifications
The device works without a fan.

If desired and depending on the device variant, the power can be supplied redundantly.

The basic device has the following mounting options:

▶ Horizontal mounting in a 19" rack
▶ Horizontal mounting on a flat surface
▶ Vertical mounting on a flat surface
▶ Desktop device

The device provides you with a large range of functions, which the manuals for the operating software inform you about. You find these manuals as PDF files on the Internet at http://www.doc.hirschmann.com

1.2 Description of the device variants

1.2.1 MACH102 basic devices

A basic device contains all functions of the industrial Workgroup Switch as well as up to 24 Fast Ethernet ports and up to 2 Gigabit Ethernet ports for connection to the LAN. The devices are manageable.

The device is designed for the special requirements of industrial automation. The device meets the relevant industry standards, provides very high operational reliability, even under extreme conditions, and also long-term reliability and flexibility.

The device allows you to set up switched Industrial Ethernet networks according to standard IEEE 802.3.

▶ The Gigabit Ethernet Combo ports (alternatively connectable via F/O or TX) of the basic devices are suitable for connecting end 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 off the TX port.

▶ The Fast Ethernet ports (10/100 Mbit/s) of the basic devices are suitable for connecting end 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 casings of the RJ45 sockets are electrically connected to the front panel of the device. The pin assignment is identical to MDI-X. When the autonegotiation function is enabled, these ports also support autocrossing.

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 MACH102-8TP, and MACH102-8TP-R devices from the Industrial Ethernet family MACH102 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: Power supply is designed redundantly.
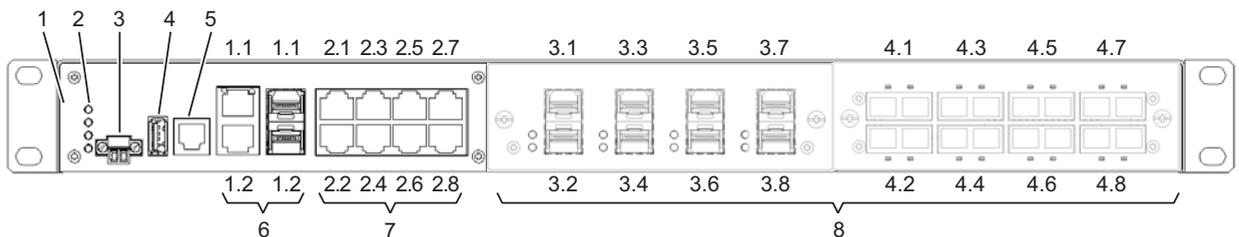
Figure 2:   Overview over interfaces, display and operating elements
            of the MACH102-8TP, and MACH102-8TP-R
            1 - MACH102 device
            2 - LED display elements
            3 - Signal contact
            4 - USB port
            5 - V.24 access for external management
            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, 2 (Combo ports)	Fast ETHERNET FE ports 1 ... 8	Fast ETHERNET FE ports 9 ... 24 2 slots for optional media modules
100/1000 Mbit/s F/O, SFP slots Alternatively: 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-configuration MACH102 basic devices

The devices MACH102-8TP-F, MACH102-8TP-FR, MACH102-24TP-F and MACH102-24TP-FR from the Industrial ETHERNET family MACH102 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: Power supply is designed redundantly.
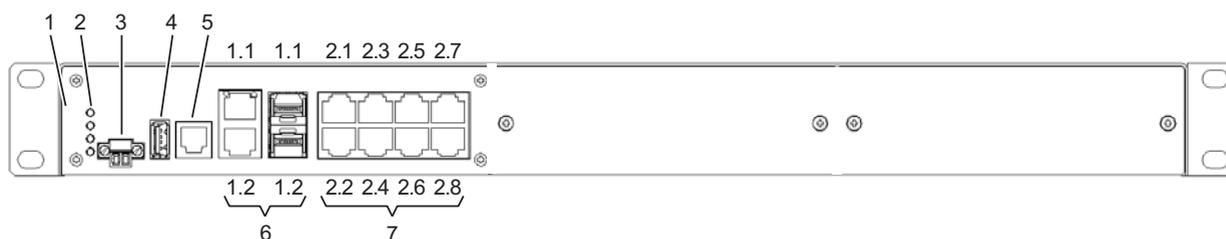
Figure 3: Overview over interfaces, display and operating elements
of the MACH102-8TP-F, and MACH102-8TP-FR
1 - MACH102 device
2 - LED display elements
3 - Signal contact
4 - USB port
5 - V.24 access for external management
6 - See the following table, column 1
7 - See the following table, column 2

Gigabit ETHERNET - GE ports 1, 2 (Combo ports)	Fast ETHERNET - FE ports 1 ... 8
100/1000 Mbit/s F/O, SFP slots Alternatively: 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: Power supply is designed redundantly.
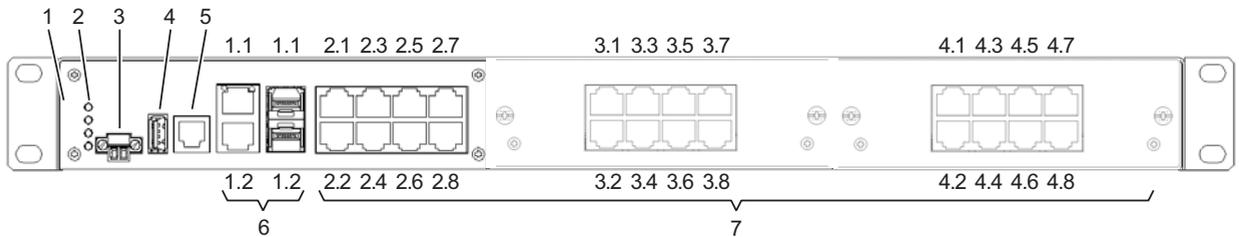
Figure 4: Overview over interfaces, display and operating elements
of the MACH102-24TP-F, and MACH102-24TP-FR
1 - MACH102 device
2 - LED display elements
3 - Signal contact
4 - USB port
5 - V.24 access for external management
6 - See the following table, column 1
7 - See the following table, column 2

Gigabit ETHERNET GE ports 1.1 and 1.2 (Combo ports)	Fast ETHERNET FE ports 2.1 ... 2.8, 3.1 ... 3.8, 4.1 ... 4.8
100/1000 Mbit/s F/O, SFP slots Alternatively: 10/100/1000 Mbit/s Twisted Pair, RJ45 ports	24 × Twisted pair TX, RJ45, 10/100 Mbit/s

1.2.2 MACH102 media modules
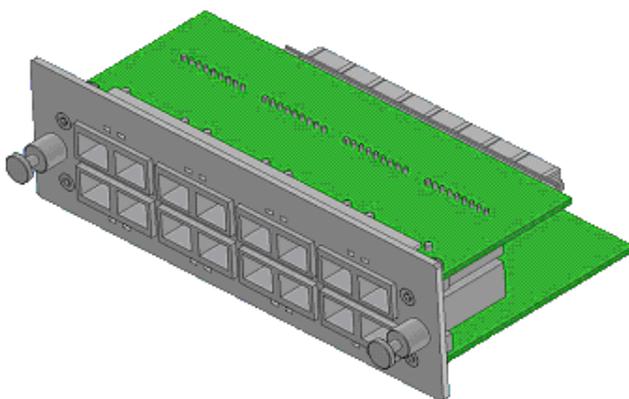
Figure 5: Media module for MACH102, Example: M1-8MM-SC

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

The modules are can be used in
▶ Basic device MACH102-8TP
▶ Basic device MACH102-8TP-R

The media modules are hot-plug-compatible. This means that you have the option to replace modules with modules of the same kind during operation.

Note: If you are replacing media modules, for example removing a TX media module and plugging in an FX media module in its place, the MACH102 device performs a warm start. This also applies if you plug a MACH102 media module into an empty slot.

The media modules have 8 Fast Ethernet ports each and only differ in the type of port.

The different interfaces of the MACH102 media modules provide you with the following interface-specific functions:

▶ Specific functions TP/TX port
  ▶ 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 4:   Media connections per MACH102 media module (number and type)

■ Media module M1-8TP-RJ45

The media module M1-8TP-RJ45 has 8 × 10/100 Mbit ports for connecting end 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 casings of the RJ45 sockets are electrically connected to the front panel of the device. The pin assignment is identical to MDI-X. When the autonegotiation function is enabled, these ports also support autocrossing.
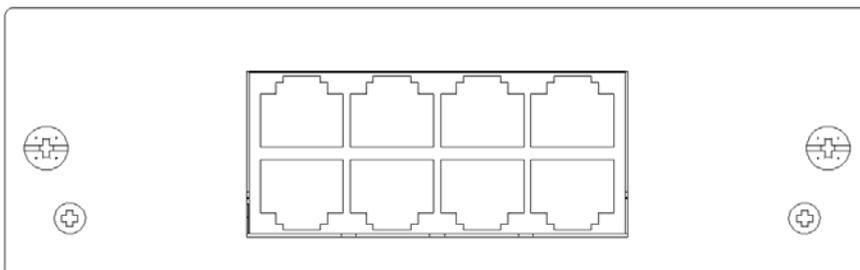
Figure 6: Media module M1-8TP-RJ45

■ 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)

The devices support the connection and a remote power supply of e.g., IP phones (Voice-over-IP), webcams, sensors, print servers, and WLAN access points via 10BASE-T/100BASE-TX. With PoE, these end 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.
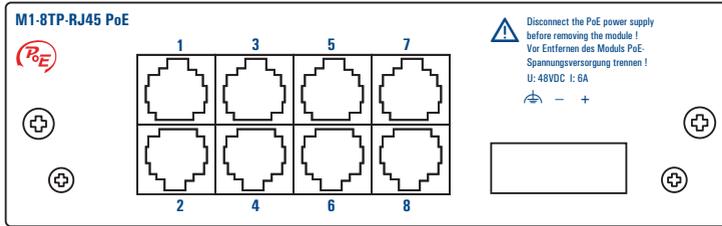
Figure 7:   Media module M1-8TP-RJ45 PoE

Note: 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.

■ **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.
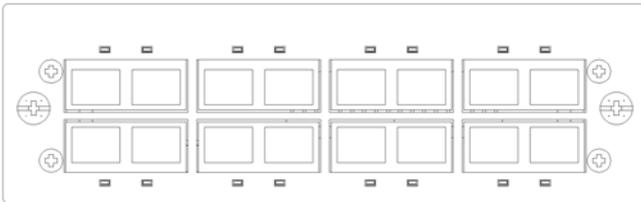
Figure 8:   Media module M1-8MM-SC

■ **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.
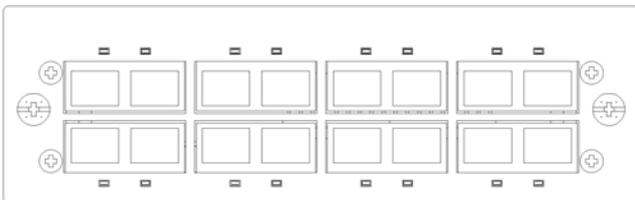
Figure 9:   Media module M1-8SM-SC

■ Media module M1-8SFP

The M1-8MM-SC media module has 8 FX ports for connecting end 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 full duplex (FDX) and support FEFI. These ports are SFP slots and are designed for the M-FAST SFP-... Hirschmann SFP module types.
See "Accessories" on page 58.
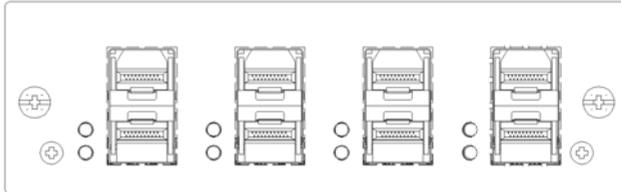
Figure 10: Media module M1-8SFP: Front view

1.2.3 SFP modules

SFP modules are optical transceivers (Fast Ethernet SFP modules and Gigabit Ethernet SFP modules see page 57 "Power consumption/power output, temperature range and order numbers"). SFP stands for Small Form-factor Pluggable and is also often 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. Use only Hirschmann SFP transceivers which are suitable for usage with the device.
See "Accessories" on page 58.

1.3 USB interface

The USB interface allows you to connect the AutoConfiguration Adapter ACA22 storage medium. This is used for saving/loading the configuration data and diagnostic information, and for loading the software.

Figure	Pin	Function
1 2 3 4	1	VCC (VBus)
	2	- Data
	3	+ Data
	4	Ground (GND)
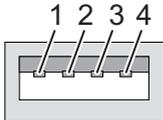
Table 5: Pin assignment of the USB interface

1.4 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 corresponding terminal emulation). This enables you to set up a connection to the Command Line Interface (CLI) and to the system monitor.

VT 100 terminal settings	
Speed	9600 Baud
Data	8 bit
Stopbit	1 bit
Handshake	off
Parity	none

The socket casing is electrically connected to the front panel of the device. The V.24 interface is not electrically isolated from the supply voltage.
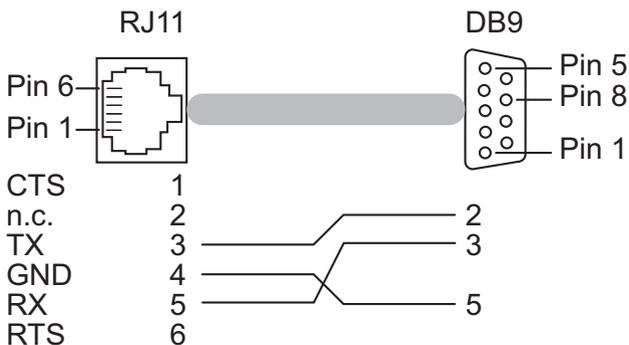
Figure 11: Pin assignment of the V24 interface

Note: You find the order number for the terminal cable, which can be ordered separately, here: See "Accessories" on page 58.

2 Assembly and start-up

The device was 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:
- ▶ "Checking the package contents"
- ▶ "Installing media modules"
- ▶ "Installing an SFP transceiver (optional)"
- ▶ "Signal contact "FAULT""
- ▶ "Installing the device and grounding"
- ▶ "Supply voltage"
- ▶ "Installing an SFP transceiver (optional)"
- ▶ "Operating the device"
- ▶ "Connecting data cables"

2.1 Installing the device

2.1.1 Checking the package contents

☐ Check whether the package includes all items named in the section "Scope of delivery" on page 58.
☐ Check the individual parts for transport damage.

2.1.2 Installing media modules

On delivery, the device is ready for operation.

The modules are can be used in the following basic devices:
- ▶ MACH102-8TP
- ▶ MACH102-8TP-R

☐ Note the chapters "ESD Guidelines" on page 10 and "General safety instructions".

The media modules are hot-plug-compatible. This means that you have the option to replace modules with modules of the same kind during operation.

Note: If you are replacing media modules, for example removing a TX media module and plugging in an FX media module in its place, the MACH102 device performs a warm start. This also applies if you plug a MACH102 media module into an empty slot.
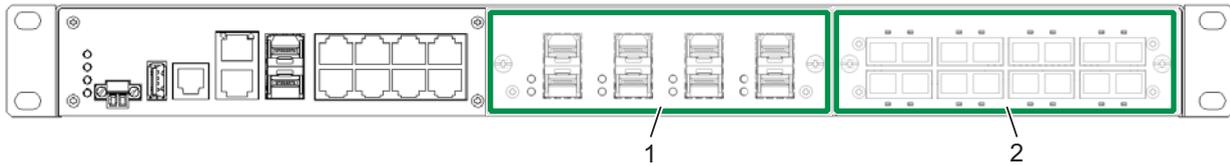
Figure 12: MACH102 device equipped with media modules
      1 - media module 1
      2 - media module 2

☐ 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 an SFP transceiver (optional)

Prerequisites:
Exclusively use Hirschmann SFP transceivers.
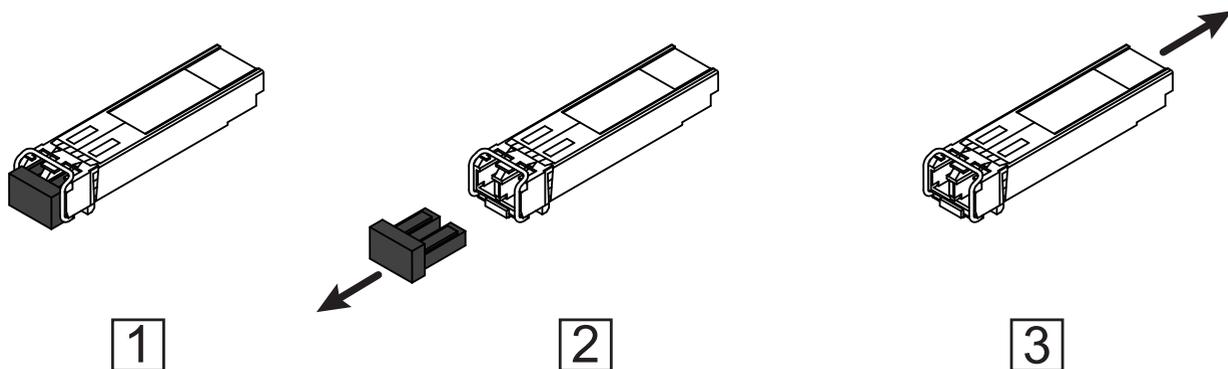
Figure 13: Installing SFP transceivers: Installation sequence

Proceed as follows:
☐ Take the SFP transceiver out of the transport packaging (1).
☐ Remove the protection cap from the SFP transceiver (2).
☐ Push the SFP transceiver with the lock closed into the slot until it latches in (3).

2.1.4 Signal contact "FAULT"

Figure 14: MACH102 device, front view
    1 - Signal contact

Connect the signal contact via a 2-pin terminal block with screw lock.

▶ The signal contact ("FAULT", pin assignment of terminal block see figure 15) is used to monitor the device function, and thus supports remote diagnostics. You can specify the type of function monitoring in the management.

▶ You can use the Management to set the signal contact manually and thus control external devices.

The potential-free signal contact (relay contact, closed circuit) reports through a break in contact:

▶ The detected failure of at least one of the two supply voltages (supply voltage 1 or 2 is below the threshold value).

▶ A detected continuous malfunction in the device.

▶ The detected defective link status of at least one port. The link state can be masked for each port in the graphic user interface. In delivery state,. link monitoring is inactive.

▶ Exceeding or falling below the set temperature threshold values.

▶ Removal of the ACA22.

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.
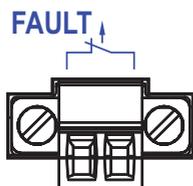
Figure 15: 2-pin terminal block

Note: Observe the electrical threshold values for the signal contact (see on page 50 "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 lock. Check whether the terminal block is correctly plugged and screwed on.

2.1.5   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 (see on page 7 "General safety instructions").
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 in (10 cm) of space in front of the ventilation slits of the casing.
☐ 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 supply 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 twisted pair cables 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 30.

■ 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.
☐ Ensure adequate ventilation. If necessary, install an additional fan in the switch cabinet to prevent the device 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.
☐ Assemble the sliding or mounting rails in the 19" switch cabinet as specified by the manufacturer.
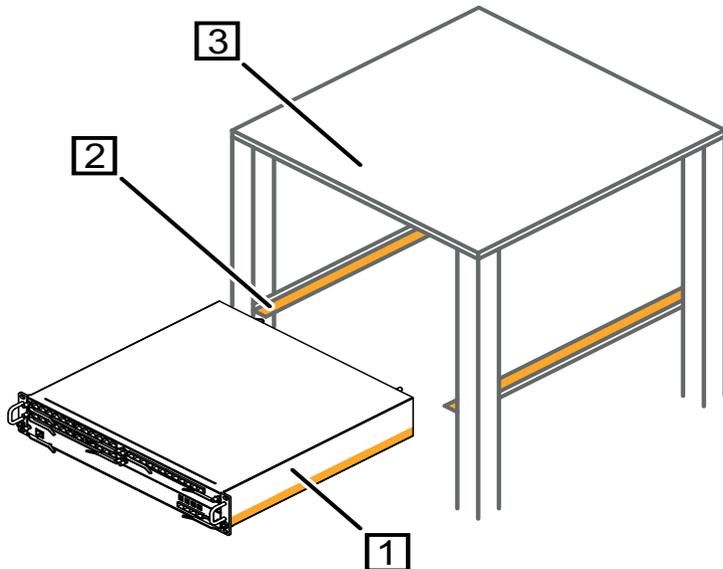
Figure 16: Assembly in a switch cabinet with sliding/mounting rails
   1 - MACH102 device
   2 - sliding/mounting rail
   3 - 19" switch cabinet

On delivery, two brackets are attached to the sides of the device (see figure below).
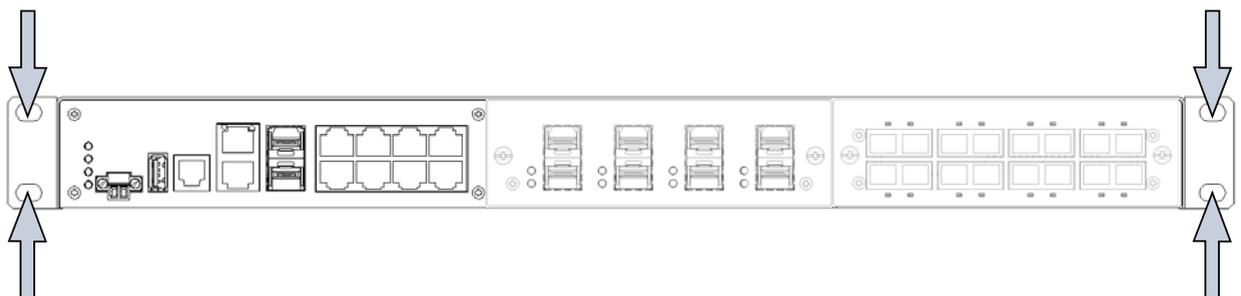
Figure 17: Mounting the MACH102 in the 19" cabinet

☐ Fasten the device in the switch cabinet by screwing it in with the mounting brackets.

⚠ CAUTION

OVERHEATING OF THE DEVICE

When installing the device, make sure any ventilation slots remain free. Maintain a clearance of at least 3.94 in (10 cm).

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 device to the switch cabinet using 2 holding brackets on the back of the device. You obtain the additional brackets as accessories.
See "Accessories" on page 58.

■ **Mounting on the wall**

⚠ CAUTION

OVERHEATING OF THE DEVICE

When installing the device, make sure any ventilation slots remain free. Maintain a clearance of at least 3.94 in (10 cm).

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

☐ Move the two pre-installed mounting brackets into the position shown below.
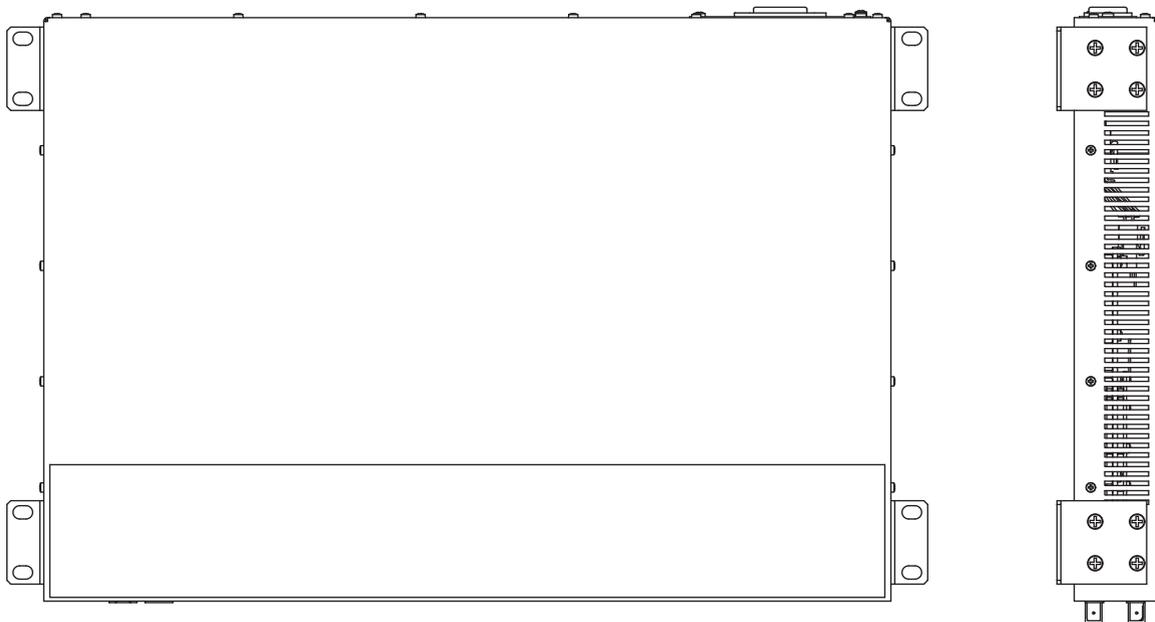
Figure 18: Vertical mounting on the wall

☐ Additionally attach 2 brackets to the back of the device.
(see figure 18)
You obtain the additional brackets as accessories.
See 7.12.
☐ Fasten the device by screwing the brackets to 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 19) and (see figure 20).

2.1.6   Supply voltage

┌───┐
│   ⚠ **WARNING**   │
├───┤
│ **ELECTRIC SHOCK**   │
│   │
│ Connect only a supply voltage that corresponds to the type │
│ plate of your device.   │
│   │
│ **Failure to follow these instructions can result in   │
│ death, serious injury, or equipment damage.**   │
└───┘

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.

■ MACH102-8TP, MACH102-8TP-F, MACH102-24TP-F

1   2
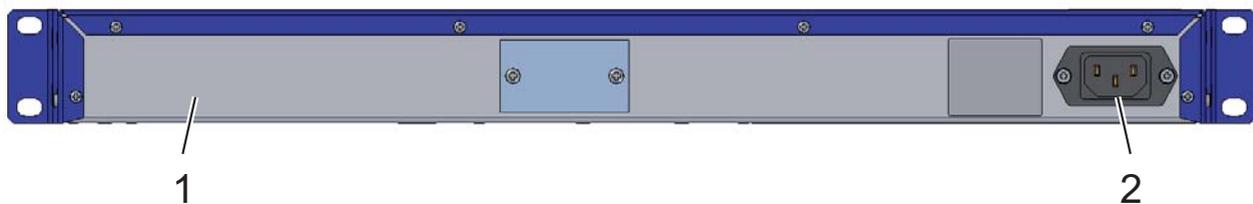
Figure 19: Connections of the MACH102-8TP, MACH102-8TP-F and
MACH102-24TP-F at the rear side of the device
1 - MACH102-8TP, MACH102-8TP-F or MACH102-24TP-F device
2 - Power supply 100 V AC ... 240 V AC

■ MACH102-8TP-R, MACH102-8TP-FR, MACH102-24TP-FR
The supply voltage can be connected redundantly. Both inputs are uncoupled. The load is not distributed. With redundant supply, the standard power supply supplies the device on its own. The redundant power supply becomes active automatically if the standard power supply fails. Normally the redundant power supply runs in stand-by mode.
The supply voltage is electrically isolated from the casing.
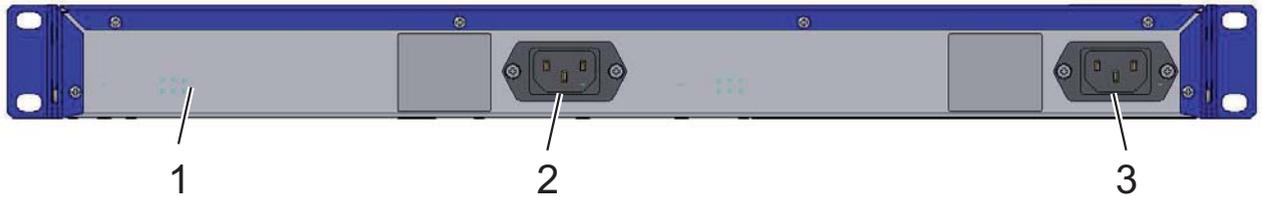
*Figure 20: Connections of the MACH102-8TP-R, MACH102-8TP-FR and
        MACH102-24TP-FR at the rear side of the device
        1 - MACH102-8TP-R, MACH102-8TP-FR or
            MACH102-24TP-FR device
        2 - Redundant power supply 100 V AC ... 240 V AC
        3 - Standard power supply 100 V AC ... 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 only 48 V DC (PoE) SELV or ES1 or 54 V DC (PoE+) SELV or ES1 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 with slow-blow characteristic.

Install this device only 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 electric conductors, and do not touch the terminals.

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

⚠ 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.

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.
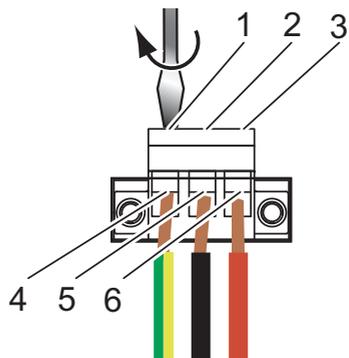
Figure 21: Connecting the supply voltage via the 3-pin terminal block
        1 - Fastening screw for functional earth
        2 - Fastening screw for supply voltage: -
        3 - Fastening screw for supply voltage: +
        4 - Connection for functional earth
        5 - Connection for supply voltage: -
        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.

2.1.7   Operating the device

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

2.1.8   Connecting data cables

Note the following general recommendations for data cable connections in environments with high electrical interference levels:
☐ Keep the length of the data cables as short as possible.
☐ Use optical data cables for the data transmission between the buildings.
☐ When using copper cables, provide a sufficient separation between the power supply cables and the data cables. Ideally, install the cables in separate cable channels.
☐ Verify that power supply cables and data cables do not run parallel over longer distances. To reduce inductive coupling, verify that the power supply cables and data cables cross at a 90° angle.

☐ Use shielded data cables for gigabit transmission via copper cables, for example SF/UTP cables according to ISO/IEC 11801. Exclusively use shielded data cables to meet EMC requirements according to EN 50121-4 and marine applications.

☐ Connect the data cables according to your requirements.

■ 10/100 Mbit/s twisted pair port

This port is an RJ45 socket.

The 10/100 Mbit/s twisted pair port allows you 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 activated

The port casing is electrically connected to the front panel.

	Pin	Function	
	1	RD+	Receive path
	2	RD-	Receive path
	3	TD+	Transmission path
	6	TD-	Transmission path
	4, 5, 7, 8	–	

Table 6:   Pin assignment 10/100 Mbit/s twisted pair port, RJ45 socket, MDI-X mode

■ 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 activated

The port casing is electrically connected to 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	1	RD+	Receive path	Minus terminal
2	2	RD-	Receive path	Minus terminal
3	3	TD+	Transmission path	Plus terminal
4	6	TD-	Transmission path	Plus terminal
5	4, 5, 7, 8 —			
6				
7				
8				
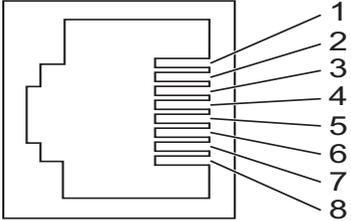
Table 7: Pin assignment 10/100-Mbit/s PoE port, RJ45 socket, MDI-X mode, phantom supply

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

The 10/100/1000 Mbit/s twisted pair port allows you to connect network components according to the standard IEEE 802.3 10BASE-T/100BASE-TX/1000BASE-T.
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 casings are electrically connected to the front panel.
The pin assignment corresponds to MDI-X.

BI_DC-	8
BI_DC+	7
BI_DA-	6
BI_DD-	5
BI_DD+	4
BI_DA+	3
BI_DB-	2
BI_DB+	1
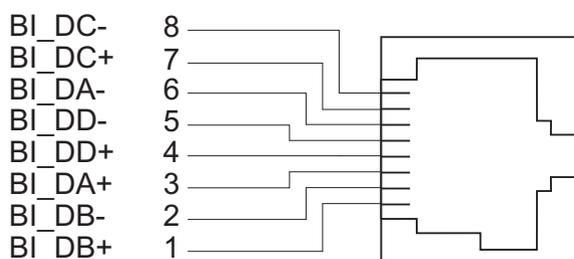
Figure 22: Pin assignment of the 1000 Mbit/s twisted pair port

■ 100 Mbit/s F/O port

This port is a DSC socket, or an SFP slot.
The 100 Mbit/s F/O port allows you 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: Verify that the LH ports are connected only with LH ports, SM ports only with SM ports, and MM ports only 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 activated

Verify that you connect LH ports only with LH ports, SX ports only with SX ports, and LX ports only with LX ports.

2.1.9   Support of PoE

Note: Poe/PoE+ is exclusively available with PoE-capable media modules. The Workgroup Switch basic device has no PoE-capable ports.
Exclusively media module M1-8TP-RJ45 PoE supports Power over Ethernet (PoE).

Prerequisites for the support of PoE:
▶ At least 1 media module with PoE functionality (M1-8TP-RJ45 PoE) is mounted in the basic device.
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.
The PoE power is supplied via the wire pairs transmitting the signal (phantom voltage).
For more details see chapter "General technical data" on page 49.

2.2   Display elements

After the supply voltage is set up, the Software starts and initializes the device. Afterwards, the device performs a self-test. During this process, various LEDs light up.
The process takes around 70 seconds.
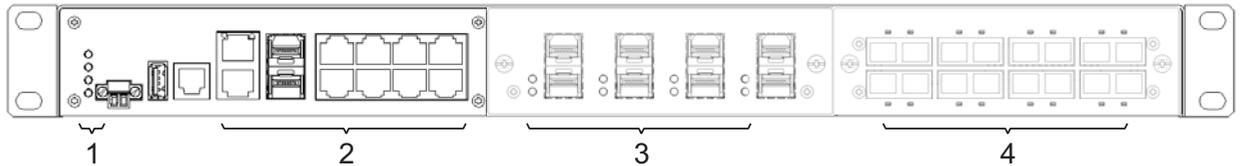
Figure 23: MACH102 display elements
> *1 - Display elements for the device status*
> *2 - Display elements for the port status*
> *3 - Display elements for the port status, media module 1*
> *4 - Display elements for the port status, media module 2*

■ Device state

These LEDs provide information about conditions which affect the operation of the whole device.

P - Power (green/yellow LED)	
Glowing green	MACH102-8TP, MACH102-8TP-F, MACH102-24TP-F: Supply voltage is on. MACH102-8TP-R, MACH102-8TP-FR, MACH102-24TP-FR: Supply voltages 1 and 2 are on.
Glowing yellow	MACH102-8TP-R, MACH102-8TP-FR, MACH102-24TP-FR: Supply voltage 1 or 2 is on.
Not glowing	MACH102-8TP, MACH102-8TP-F, MACH102-24TP-F: Supply voltage is below minimum value. MACH102-8TP-R, MACH102-8TP-FR, MACH102-24TP-FR: Supply voltages 1 and 2 are below minimum value.

RM - Ring Manager (green/yellow LED)	
Glowing green	RM function active, redundant port not active
Glowing yellow	RM function active, redundant port active
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	The The signal contact is open, i.e. it is indicating a detected fault.
Not glowing	The signal contact is closed, i.e. it is not indicating a detected fault.

RM and Stand-by - display saving processes of the AutoConfiguration Adapter (ACA)	
Flashing alternately:	Error during saving process.
LEDs flash synchronously, 2 times a second	Loading configuration from the ACA.
LEDs flash synchronously, 1 times a second	Saving the configuration in the ACA.

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

■ Port status
These LEDs display port-related information.

LS - Data, Link Status (1 green/yellow LED or 1 green and 1 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 time a period)	Port is disabled.
Flashing yellow	Data reception.

Table 8:   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 8. The right LED informs you about PoE voltage supply on a port, as shown in table 9:

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

Table 9:   Activity of the right LED on the M1-8TP-RJ45 PoE media module

3 Making basic settings

Note: 2 or more devices configured with the same IP address can cause unpredictable operation of your network.
Install and maintain a process that assigns a unique IP address to every device in the network.

The IP parameters must be entered when the device is installed for the first time. The device provides the following options for configuring the IP addresses:
- ▶ V.24 interface (Command Line Interface)
- ▶ BOOTP[a]
- ▶ DHCP[a]
- ▶ DHCP Option 82[a]
- ▶ AutoConfiguration Adapter
- ▶ Input via the HiView or Industrial HiVision application. You find further information about the applications HiView or Industrial HiVision on the Internet at the Hirschmann product pages:
  HiView
  http://www.hirschmann.com/en/QR/INET-HiView
  Industrial HiVision
  http://www.hirschmann.com/en/QR/INET-Industrial-HiVision

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[a]
  - ▶ Password for management:
    Login: user; password: public (read only)
    Login: admin; password: private (read and write)
  - ▶ Parameters that can be set via the management are set to pre-defined values in accordance with the MIB
  - ▶ V.24 data rate: 9600 Baud
  - ▶ Ring redundancy: disabled
  - ▶ Ethernet ports: link status is not evaluated (signal contact)
  - ▶ Stand-by coupling: disabled
  - ▶ Rapid Spanning Tree enabled
  - ▶ Optical 100 Mbit/s ports: 100 Mbit/s full duplex
    All other ports: autonegotiation
  - ▶ Out-of-band management port:
    Default IP address: 192.168.1.1 / 255.255.255.0

3.1 First login (Password change)

To help prevent undesired access to the device, it is imperative that you change the default password during initial setup.

Perform the following steps:
☐ Open the Graphical User Interface, the Command Line Interface, or HiView the first time you log on to the device.
☐ Log on to the device with the default password "private". The device prompts you to type in a new password.
☐ Type in your new password.
To help increase security, choose a password that contains at least 8 characters which includes upper-case characters, lower-case characters, numerical digits, and special characters.
☐ When you log on to the device with the Command Line Interface, then the device prompts you to confirm your new password.
☐ Log on to the device again with your new password.

Note: If you lost your password, then use the System Monitor to reset the password.

For further information see:
https://hirschmann-support.belden.com/en/kb/required-password-change-new-procedure-for-first-time-login

4 Disassembly

4.1 Removing an SFP transceiver (optional)
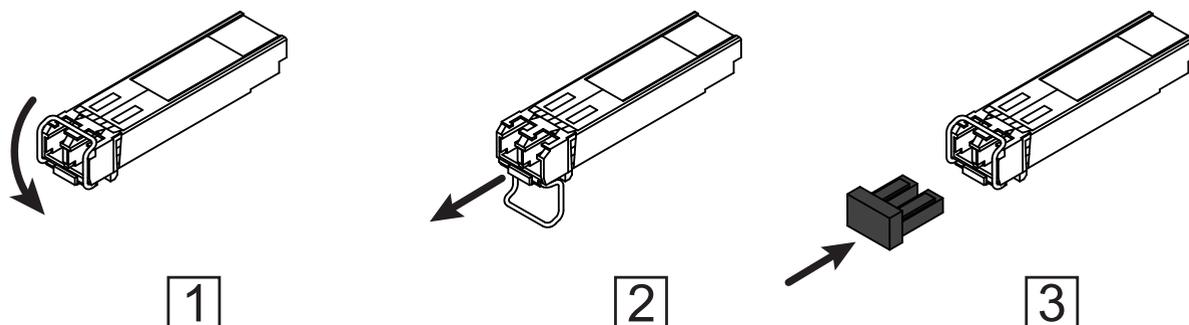
Figure 24: De-installing SFP transceivers: De-installation sequence

Proceed as follows:
☐ Open the locking mechanism of the SFP transceiver (1).
☐ Pull the SFP transceiver out of the slot via the open locking mechanism (2).
☐ Close the SFP transceiver with the protection cap (3).

4.2 Removing a media module

⚠ 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.

4.3   Removing the device

> ### ⚠ WARNING
>
> **ELECTRIC SHOCK**
>
> Disconnect the grounding only after disconnecting all other cables.
>
> **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Proceed as follows:
- ☐ Disconnect the data cables.
- ☐ Disable the supply voltage.
- ☐ Disconnect the terminal blocks.
- ☐ Disconnect the grounding.
- ☐ To detach the device from the switch cabinet or the wall, remove the screws from the brackets on the device.
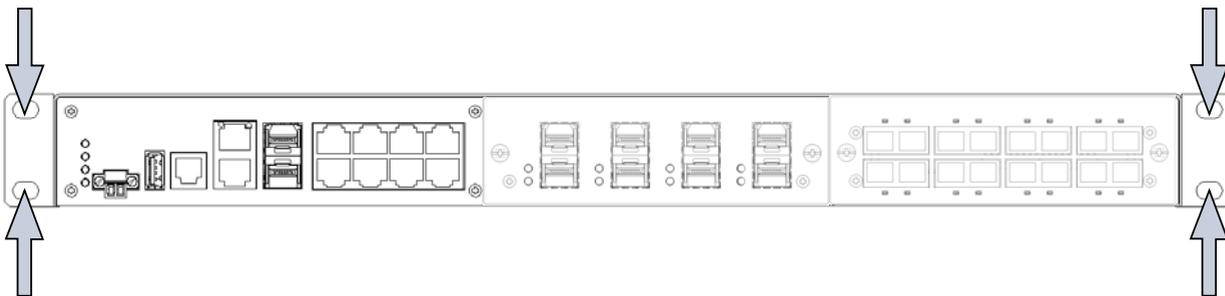
Figure 25: Dismounting

5 Monitoring the ambient air temperature

Operate the device below the specified maximum ambient air temperature exclusively.

The ambient air temperature is the temperature of the air at a distance of 2 in (5 cm) from the device. It depends on the installation conditions of the device, for example the distance from other devices or other objects, and the output of neighboring devices.

The temperature displayed in the CLI and the GUI is the internal temperature of the device. It is higher than the ambient air temperature. The maximum internal temperature of the device named in the technical data is a guideline that indicates to you that the maximum ambient air temperature has possibly been exceeded.

6 Maintenance and service

☐ When designing this device, Hirschmann largely avoided using high-wear parts. The parts subject to wear and tear are dimensioned to last longer than the lifetime of the product when it is operated normally. Operate this device according to the specifications.

☐ Relays are subject to natural wear. This wear depends on the frequency of the switching operations. Check the resistance of the closed relay contacts and the switching function depending on the frequency of the switching operations.

☐ Internal fuses are triggered only in the case of a detected error in the device. In case of damage or malfunction of the device, turn off the supply voltage and return the device to the plant for inspection.

☐ Hirschmann is continually working on improving and developing their software. Check regularly whether there is an updated version of the software that provides you with additional benefits. You find information and software downloads on the Hirschmann product pages on the Internet (http://www.hirschmann.com).

☐ Depending on the degree of pollution in the operating environment, check at regular intervals that the ventilation slots in the device are not obstructed.

You find information on settling complaints on the Internet at http://www.beldensolutions.com/en/Service/Repairs/index.phtml.

7 Technical data

7.1 General technical data

7.1.1 Basic device

Dimensions	See "Dimension drawings" on page 52.	
Weight	MACH102-8TP	7.94 lb (3600 g)
	MACH102-8TP-R	8.49 lb (3850 g)
	MACH102-8TP-F	7.94 lb (3600 g)
	MACH102-8TP-FR	8.49 lb (3850 g)
	MACH102-24TP-F	8.49 lb (3850 g)
	MACH102-24TP-FR	9.05 lb (4100 g)
Pollution degree		2
Protection classes	Laser protection	Class 1 in compliance with IEC 60825-1
	Degree of protection	IP20

7.1.2 Media modules

Dimensions	See "Dimension drawings" on page 52.	
Weight	M1-8TP-RJ45	0.46 lb (210 g)
	M1-8MM-SC	0.46 lb (210 g)
	M1-8SM-SC	0.4 lb (180 g)
	M1-8SFP	4.59 oz (130 g)
	M1-8TP-RJ45 PoE	0.57 lb (260 g)
Max. PoE power	Per media module:	124 W
Pollution degree		2
Protection classes	Laser protection	Class 1 in compliance with IEC 60825-1

7.2 Power supply

7.2.1 Basic device

Rated voltage range	100 V AC ... 240 V AC, 50 Hz ... 60 Hz
Voltage range including maximum tolerances	90 V AC ... 264 V AC, 47 Hz ... 63 Hz
Rated power	0.2 A ... 0.4 A
Overload current protection on the device	Non-replaceable fuse
Peak inrush current	typ. <40 A at 264 V AC and cold start

7.2.2 Media modules

■ M1-8TP-RJ45 PoE

Rated voltage range	Type 1 PD, SELV/ES1	48 V DC
Voltage range including maximum tolerances		45 V DC ... 57 V DC
Rated power		2.5 A
Rated voltage range	Type 2 PD, SELV/ES1	54 V DC
Voltage range including maximum tolerances		51 V DC ... 57 V DC
Rated power		2.5 A
Overload current protection on the device		Non-replaceable fuse

7.3 Signal contact

Nominal value	Switching current	max. 1 A
	Switching voltage	max. 60 V DC or max. 30 V AC, SELV according to IEC 60950-1 or ES1 according to IEC/EN 62368-1
Connection type	Version	2-pin terminal block with screw lock
	Tightening torque	3 lb-in (0.34 Nm)
	max. conductor diameter	AWG16 (1.3 mm²)

Table 10: Signal contact

7.4 Interfaces

Basic devices		
MACH102-8TP MACH102-8TP-R MACH102-8TP-F MACH102-8TP-FR MACH102-24TP-F MACH102-24TP-FR	1 × V.24 connection: external management
	2 × terminal block, 2-pin: signal contact, max. 1 A, 24 V
	1 × USB interface: ACA22
MACH102-8TP MACH102-8TP-R	2 × Combo ports (alternatively 100/1000-Mbit/s F/O slot or 10/100/1000 Mbit/s RJ45 port)
	8 × 10/100 Mbit/s twisted pair, RJ45 socket
	2 × slot for media module M1-8TP-RJ45 PoE, M1-8TP-RJ45, M1-8MM-SC, M1-8SM-SC or M1-8SFP
MACH102-8TP-F MACH102-8TP-FR	2 × Combo ports (alternatively 100/1000-Mbit/s F/O slot or 10/100/1000 Mbit/s RJ45 port)
	8 × 10/100 Mbit/s twisted pair, RJ45 socket

MACH102-24TP-F MACH102-24TP-FR	2 × Combo ports (alternatively 100/1000-Mbit/s F/O slot or 10/100/ 1000 Mbit/s RJ45 port)
	24 × 10/100 Mbit/s twisted pair, RJ45 socket
Media modules	
M1-8TP-RJ45	8 × 100 Mbit/s twisted pair, RJ45 socket
M1-8TP-RJ45 PoE	8 × 100 Mbit/s twisted pair PoE, RJ45 socket
M1-8MM-SC	8 × 100 Mbit/s Multimode, Duplex SC connector
M1-8SM-SC	8 × 100 Mbit/s Singlemode, Duplex SC connector
M1-8SFP	8 × 100 Mbit/s, SFP slot

7.5 Climatic conditions during operation

Climatic conditions during operation		
Ambient air temperature[a]	Standard up to 6562 ft ASL (2000 m ASL)	+32 °F ... +122 °F (0 °C ... +50 °C)
Maximum inner temperature of device (guideline)		+203 °F (+95 °C)
Humidity		10 % ... 95 % (non-condensing)
Air pressure		min. 600 hPa (+13123 ft; +4000 m)
		max. 1060 hPa (-1312 ft; -400 m)

Table 11: Climatic conditions during operation

a. Temperature of the ambient air at a distance of 2 in (5 cm) from the device

7.6 Climatic conditions during storage

Climatic conditions during storage	
Ambient temperature	-4 °F ... +185 °F (-20 °C ... +85 °C)
Humidity	5 % ... 95 % (non-condensing)
Air pressure	min. 600 hPa (+13123 ft; +4000 m)
	max. 1060 hPa (-1312 ft; -400 m)

Table 12: Climatic conditions during storage

7.7 Dimension drawings
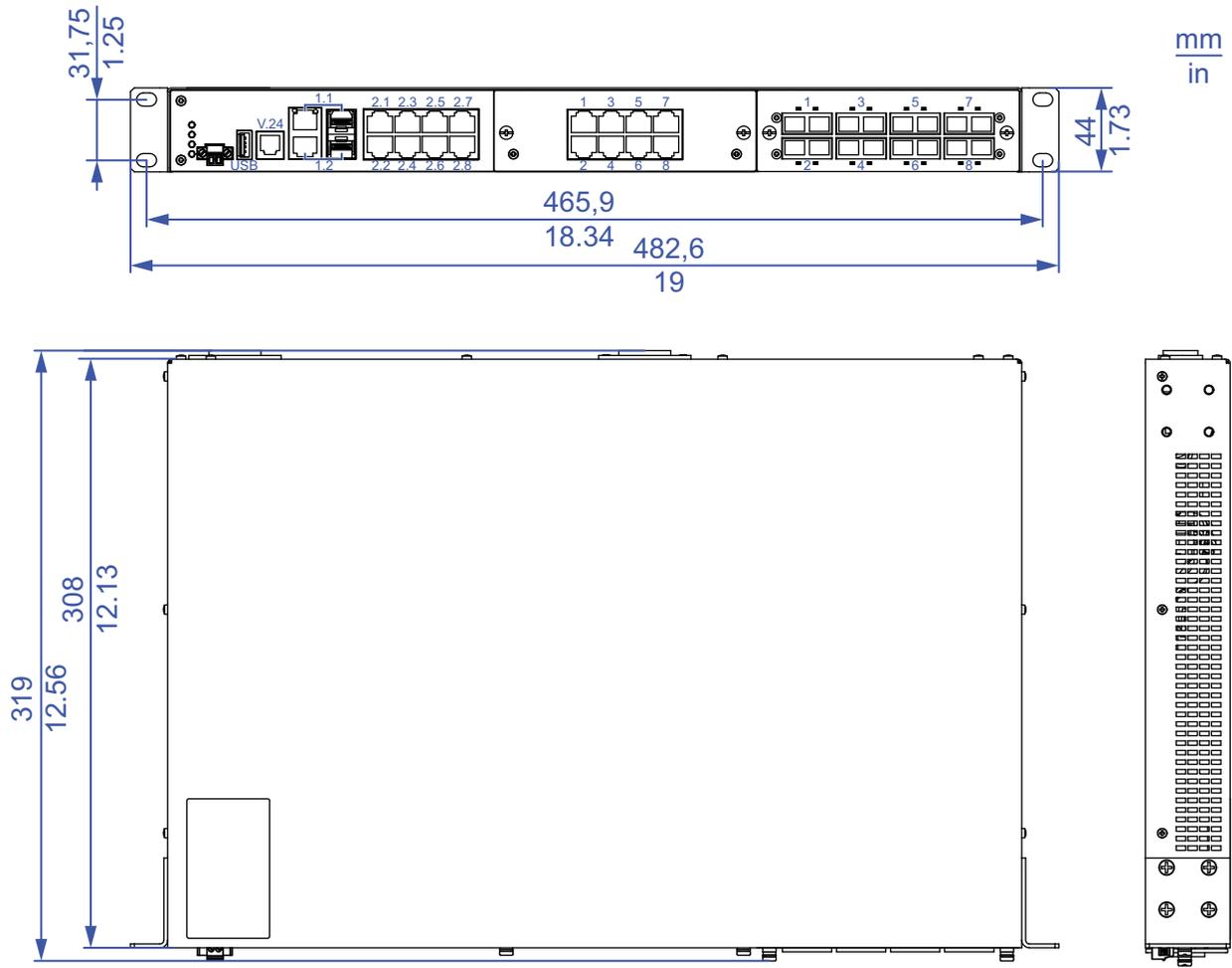
7.8   EMC and immunity

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	 max. 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 55032	Class A	Yes
FCC 47 CFR Part 15	Class A	Yes

7.9 Network range

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

7.9.1 10/100/1000 Mbit/s twisted pair port

10/100/1000 Mbit/s twisted pair port	
Length of a twisted pair segment	max. 328 ft (100 m) (for Cat5e cable)

Table 13: Network range: 10/100/1000 Mbit/s twisted pair port

7.9.2 Fast Ethernet SFP transceiver

Product code	Mode[a]	Wave length	Fiber	System attenuation	Example for F/O line length[b]	Fiber attenuation	BLP/dispersion
M-FAST-SFP-MM/LC...	MM	1310 nm	50/125 µm	0 dB ... 8 dB	0 mi ... 3.11 mi (0 km ... 5 km)	1.0 dB/km	800 MHz×km
M-FAST-SFP-MM/LC...	MM	1310 nm	62.5/125 µm	0 dB ... 11 dB	0 mi ... 2.49 mi (0 km ... 4 km)	1.0 dB/km	500 MHz×km
M-FAST-SFP-SM/LC...	SM	1310 nm	9/125 µm	0 dB ... 13 dB	0 mi ... 15.53 mi (0 km ... 25 km)	0.4 dB/km	3.5 ps/(nm×km)
M-FAST-SFP-SM+/LC...	SM	1310 nm	9/125 µm	10 dB ... 29 dB	15.53 mi ... 40.39 mi (25 km ... 65 km)	0.4 dB/km	3.5 ps/(nm×km)
M-FAST-SFP-LH/LC...	SM	1550 nm	9/125 µm	10 dB ... 29 dB	29.20 mi ... 64.62 mi (47 km ... 104 km)	0.25 dB/km	19 ps/(nm×km)
M-FAST-SFP-LH/LC...	SM	1550 nm	9/125 µm	10 dB ... 29 dB	14.29 mi ... 86.99 mi (55 km ... 140 km)	0.18 dB/km[c]	18 ps/(nm×km)

Table 14: F/O port 100BASE-FX (SFP Fiber Optic Fast Ethernet Transceiver)

a. MM = Multimode, SM = Singlemode, LH = Singlemode Longhaul
b. Including 3 dB system reserve when compliance with the fiber data is observed.

c. With ultra-low-loss optical fiber.

7.9.3 Gigabit Ethernet SFP transceiver

Product code	Mode[a]	Wave length	Fiber	System attenuation	Example for F/O line length[b]	Fiber attenuation	BLP/dispersion
M-SFP-SX/LC...	MM	850 nm	50/125 μm	0 dB ... 7.5 dB	0 mi ... 0.34 mi (0 km ... 0.55 km)	3.0 dB/km	400 MHz×km
M-SFP-SX/LC...	MM	850 nm	62.5/125 μm	0 dB ... 7.5 dB	0 mi ... 0.17 mi (0 km ... 0.275 km)	3.2 dB/km	200 MHz×km
M-SFP-MX/LC...	MM	1310 nm	50/125 μm	0 dB ... 12 dB	0 mi ... 0.93 mi (0 km ... 1.5 km	1.0 dB/km	800 MHz×km
M-SFP-MX/LC...	MM	1310 nm	62.5/125 μm	0 dB ... 12 dB	0 mi ... 31.06 mi (0 km ... 50 km)	1.0 dB/km	500 MHz×km
M-SFP-LX/LC...	MM	1310 nm[c]	50/125 μm	0 dB ... 10.5 dB	0 mi ... 0.34 mi (0 km ... 0.55 km)	1.0 dB/km	800 MHz×km
M-SFP-LX/LC...	MM	1310 nm[d]	62.5/125 μm	0 dB ... 10.5 dB	0 mi ... 0.34 mi (0 km ... 0.55 km)	1.0 dB/km	500 MHz×km
M-SFP-LX/LC...	SM	1310 nm	9/125 μm	0 dB ... 10.5 dB	0 mi ... 12.43 mi (0 km ... 20 km)[e]	0.4 dB/km	3.5 ps/(nm×km)
M-SFP-LX+/LC...	SM	1310 nm	9/125 μm	5 dB ... 20 dB	8.70 mi ... 26.10 mi (14 km ... 42 km)	0.4 dB/km	3.5 ps/(nm×km)
M-SFP-LH/LC...	LH	1550 nm	9/125 μm	5 dB ... 22 dB	14.29 mi ... 49.71 mi (23 km ... 80 km)	0.25 dB/km	19 ps/(nm×km)
M-SFP-LH+/LC	LH	1550 nm	9/125 μm	15 dB ... 30 dB	44.12 mi ... 67.11 mi (71 km ... 108 km)	0.25 dB/km	19 ps/(nm×km)
M-SFP-LH+/LC	LH	1550 nm	9/125 μm	15 dB ... 30 dB	44.12 mi ... 79.54 mi (71 km ... 128 km)	0.21 dB/km (typically)	19 ps/(nm×km)

Table 15: F/O port 1000BASE-FX (SFP fiber optic Gigabit Ethernet Transceiver)

Product code	Mode[a]	Wave length	Fiber	System attenuation	Example for F/O line length[b]	Fiber attenuation	BLP/dispersion
M-SFP-LH+/LC EEC	LH	1550 nm	9/125 µm	13 dB ... 32 dB	38.52 mi ... 72.07 mi (62 km ... 116 km)	0.25 dB/km	19 ps/(nm×km)
M-SFP-LH+/LC EEC	LH	1550 nm	9/125 µm	13 dB ... 32 dB	38.52 mi ... 85.75 mi (62 km ... 138 km)	0.21 dB/km (typically)	19 ps/(nm×km)

Table 15: F/O port 1000BASE-FX (SFP fiber optic Gigabit Ethernet Transceiver)

a. MM = Multimode, SM = Singlemode, LH = Singlemode Longhaul
b. Including 3 dB system reserve when compliance with the fiber data is observed.
c. With F/O adapter compliant with IEEE 802.3-2002 Clause 38 (single-mode fiber offset-launch mode conditioning patch cord).
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.

7.10 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 PoE
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 temperature)	Order number
Basic devices				
MACH102-8TP	12 W	41 Btu (IT)/h	+32 °F ... +122 °F (0 °C ... +50 °C)	943 969-001
MACH102-8TP-R	13 W	44 Btu (IT)/h	+32 °F ... +122 °F (0 °C ... +50 °C)	943 969-101
MACH102-8TP-F	12 W	41 Btu (IT)/h	+32 °F ... +122 °F (0 °C ... +50 °C)	943 969-201
MACH102-8TP-FR	13 W	44 Btu (IT)/h	+32 °F ... +122 °F (0 °C ... +50 °C)	943 969-301
MACH102-24TP-F	16 W	55 Btu (IT)/h	+32 °F ... +122 °F (0 °C ... +50 °C)	943 969-401
MACH102-24TP-FR	17 W	58 Btu (IT)/h	+32 °F ... +122 °F (0 °C ... +50 °C)	943 969-501
Media modules				
M1-8TP-RJ45	2 W	7 Btu (IT)/h	+32 °F ... +122 °F (0 °C ... +50 °C)	943 970-001
M1-8TP-RJ45 PoE - internal supply voltage	2.2 W	7.6 Btu (IT)/h	+32 °F ... +122 °F (0 °C ... +50 °C)	942 028-001

Table 16: Power, temperature and order numbers

MACH102 Family Device/module	power consumption	power output	Operating temperature (ambient air temperature)	Order number
M1-8TP-RJ45 PoE - external PoE voltage: No PD	1.2 W	4.1 Btu (IT)/h	+32 °F ... +122 °F (0 °C ... +50 °C)	942 028-001
M1-8TP-RJ45 PoE - external PoE voltage: 8 × Class-0-PD	2 W + PDs	6.9 Btu (IT)/h	+32 °F ... +122 °F (0 °C ... +50 °C)	942 028-001
M1-8MM-SC	10 W	34 Btu (IT)/h	+32 °F ... +122 °F (0 °C ... +50 °C)	943 970-101
M1-8SM-SC	10 W	34 Btu (IT)/h	+32 °F ... +122 °F (0 °C ... +50 °C)	943 970-201
M1-8SFP (incl. SFP modules)	11 W	37 Btu (IT)/h	+32 °F ... +122 °F (0 °C ... +50 °C)	943 970-301

Table 16: Power, temperature and order numbers

7.11 Scope of delivery

Device	Number	Scope of delivery
MACH102-8TP MACH102-8TP-R MACH102-8TP-F MACH102-8TP-FR MACH102-24TP-F MACH102-24TP-FR	1 ×	MACH102 device
	1 ×	Terminal block for signal contact
	2 ×	Mounting brackets with fastening screws (pre-mounted)
	1 ×	Casing feet, stick on
	1 ×	Non-heating appliance cable (Euro model)
	1 ×	CD/DVD with manual
	1 ×	Safety and information sheet

7.12 Accessories

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

Name	Order number
AutoConfiguration Adapter ACA22-USB (EEC)	942 124-001
Terminal cable	943 301-001
2-pin terminal block (50 pieces)	943 845-010
Bracket for fastening the casing	943 943-001

Name	Order number
HiVision Network Management software	943 471-100
Network management software Industrial HiVision	943 156-xxx
ELWIKA 5012 PG7 connector (5-pin M12 socket for power supply and signal contact)	933 175-100
3-pin terminal block Low Voltage Interlock (50 pcs.)	943 845-011
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
M-SFP- LH+/ LC	943 049-001

7.13 Underlying technical standards

Name	
EN 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments
EN 55032	Electromagnetic compatibility of multimedia equipment – Emission Requirements
IEC/EN 62368-1	Equipment for audio/video, information and communication technology - Part 1: safety requirements
FCC 47 CFR Part 15	Code of Federal Regulations
UL 508	Safety for Industrial Control Equipment
UL 60950-1	Information technology equipment – Safety – Part 1: General requirements

Table 17: List of the technical 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 18: 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 19: List of IEEE standards

The device has an approval based on a specific standard exclusively if the approval indicator appears on the device casing.
If your device has a shipping approval according to DNV GL, you find the approval mark printed on the device label. You will find out whether your device has other shipping approvals on the Hirschmann website at www.hirschmann.com in the product information.

A   Further support

Technical questions

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

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

A list of local telephone numbers and email addresses for technical support directly from Hirschmann is available at https://hirschmann-support.belden.com.

This site also includes a free of charge knowledge base and a software download section.

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