![HIRSCHMANN - A BELDEN BRAND]

User Manual

Installation
Industrial Ethernet Workgroup Switch
MACH104-PoEP Full Gigabit Family

MACH104-16TX-PoEP+2X...
MACH104-16TX-PoEP+2X-R...
MACH104-16TX-PoEP+2X-E...

MACH104-16TX-PoEP...
MACH104-16TX-PoEP-R...
MACH104-16TX-PoEP-E...

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 "Technical data" on page 43.
  ☐ Connect to the product only components suitable for the requirements of the specific application case.

■ **National and international safety regulations**
  ☐ Verify that the electrical installation meets local or nationally applicable safety regulations.
  ☐ Connect only PoE-supplier devices whose data connections are located in the interior of the building and are specified as SELV circuits according to IEC 60950-1 or ES1 according to IEC/EN 62368-1.

■ **Grounding the device**
  The device is grounded via the power supply connections.

■ **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.
▶ Only switch on the device when the casing is closed.
▶ Relevant for North America: Exclusively use 60/75 °C (140/167 °F) or 75 °C (167 °F) copper (Cu) wire.

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

Prerequisites:
All of the following requirements are complied with:

Prerequisites:

▶ 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.
▶ This applies to the following device variants only:
  ▶ MACH104-16TX-PoEP-R...
  ▶ MACH104-16TX-PoEP+2X-R...
  Unplug every non-heating device coupling to disconnect the device from the power supply.
▶ This applies to the following device variants only:
  ▶ MACH104-16TX-PoEP-R...
  ▶ MACH104-16TX-PoEP+2X-R...
  The wire diameter of the power supply cable is at least 1 mm² (North America: AWG16) 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.
▶ The power supply cable is suitable for the voltage, the current and the physical load. Hirschmann recommends a conductor cross section of 0.5 mm² to 0.75 mm² (AWG20 up to AWG18).
▶ This applies to the following device variants only:
  ▶ MACH104-16TX-PoEP-E...
  ▶ MACH104-16TX-PoEP+2X-E...
  Install an input fuse with a maximum rating of 10 A, characteristic B, into the supply line to the voltage input.

The following requirements apply alternatively:

Relevant when the device is supplied via 1 voltage input:

Alternative 1	The power supply complies with the requirements for a limited power source (LPS) according to IEC 60950-1 or PS2 according to IEC/EN 62368-1.
Alternative 2	Relevant for North America: The power supply complies with the requirements according to NEC Class 2.
Alternative 3	**All** of the following requirements are complied with: ▶ 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. ▶ Supply with DC voltage: A back-up fuse suitable for DC voltage is located in the plus conductor of the power supply. The minus conductor is on ground potential. Otherwise, a back-up fuse is also located in the minus conductor. Regarding the properties of this back-up fuse: See "Technical data" on page 43. ▶ Supply with AC voltage: A fuse is located in the outer conductor of the power supply. The neutral conductor is on ground potential at both voltage inputs. Otherwise, a fuse is also located in the neutral conductor. Regarding the properties of this fuse: See "Technical data" on page 43.

Relevant when the device is supplied via 2 voltage inputs:

Alternative 1	The **total** voltage supply complies with the requirements for a limited power source (LPS) according to IEC 60950-1 or IEC/EN 62368-1.
Alternative 2	Relevant for North America: The **total** voltage supply complies with the requirements as per NEC Class 2.

Prerequisites:

Alternative 3	**All** of the following requirements are complied with:
	▶ 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.
	▶ Supply with DC voltage: A fuse suitable for DC voltage is located at both voltage inputs in the plus conductor of the power supply. The minus conductor is on ground potential at both voltage inputs. Otherwise, a fuse is also located in the minus conductor. Regarding the properties of this fuse: See "Technical data" on page 43.
	▶ Supply with AC voltage: A fuse is located at both voltage inputs in the outer conductor of the power supply. The neutral conductor is on ground potential at both voltage inputs. Otherwise, a fuse is also located in the neutral conductor. Regarding the properties of this fuse: See "Technical data" on page 43.

■ Supply voltage

The supply voltage is connected to the device casing through protective elements exclusively.

The supply voltage is electrically isolated from the casing.

■ Device casing

Only technicians authorized by the manufacturer are permitted to open the casing.

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

☐ 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.

☐ Mount the device horizontally or vertically, either as a desktop device, in the switch cabinet (figure 7 on page 36) or on the wall (figure 8 on page 37).

☐ In order to fix the device to a concrete wall choose screws with a thread major diameter of at least 5 mm.

■ 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 switch cabinet or other fire enclosure. The fireenclosure 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.

■ CE marking

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

Device variant	Directive
MACH104-16TX-PoEP... MACH104-16TX-PoEP+2X... MACH104-16TX-PoEP-R... MACH104-16TX-PoEP+2X-R... MACH104-16TX-PoEP-E... MACH104-16TX-PoEP+2X-E...	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. 2014/30/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.
MACH104-16TX-PoEP... MACH104-16TX-PoEP+2X... MACH104-16TX-PoEP-R... MACH104-16TX-PoEP+2X-R...	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

You find the EU conformity declaration as PDF file for downloading on the Internet at: https://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.

Note: The assembly guidelines provided in these instructions must be strictly adhered to in order to observe the EMC threshold values.

■ 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

MACH104-PoEP

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.

■ BSMI note for use in Taiwan
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.

Devices with a specification according to BSMI standards CNS 13438, CNS 14336-1 and CNS 15663 are marked on the device label.

D45625
RoHS

警告使用者：
這是甲類的資訊產　品，在居住的環境中使用時，可能會造成射頻干擾，在這種
情況下，使用者會被要求採取某些適當的對策。

限用物質含有情況標示聲明書
Declaration of hazardous substances according to Chinese regulatory standard

設備名稱：交換機，型號（型式）：
Equipment name: Switch, Model designation:
MACH104-20TX-F...
MACH104-20TX-FR...
MACH104-20TX-F-4PoE...

單元 Component	限用物質及其化學符號 Restricted substances and their chemical symbol					
	鉛 (Pb) Lead	汞 (Hg) Mercury	鎘 (Cd) Cadmium	六價 (Cr (VI)) Hexavalent Chromium	多溴聯苯 (PBB) Polybrominated biphenyls	多溴二苯醚 (PBDE) Polybrominated diphenyl ethers
金屬部件 Metal components	X	O	O	O	O	O
電路模組 Printed circuit board assembly	X	O	O	O	O	O
塑膠和聚合物部件 Plastic and polymeric components	O	O	O	O	O	O
電源元件 Power supply unit	X	O	O	O	O	O

備考1. "超出0.1 wt %" 及 "超出0.01 wt %" 係指限用物質之百分比含量超出百分比含量基準值。
Note 1: "Exceeding 0.1 wt%" and "exceeding 0.01 wt%" indicates that the amount of the restricted substance within the component exceeds the reference percentage limit.

備考2. "O" 係指該項限用物質之百分比含量未超出百分比含量基準值。
Note 2: "O" indicates that the amount of the restricted substance does not exceed the reference percentage limit.

備考3. "X" 係指該項限用物質為排除項目。
Note 3: "X" indicates that the amount of the restricted substance corresponds with the exemption.

■ 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.

The following manuals are available as PDF files on the Internet on the Hirschmann product pages (www.hirschmann.com):

► Installation user manual
► Basic Configuration user manual
► Redundancy Configuration user manual
► Reference manual for the graphical user interface
► Command Line Interface reference manual

The Network Management Software Industrial HiVision provides you with options for smooth configuration and monitoring. You find further information on the Internet at the Hirschmann product pages:
http://www.hirschmann.com/en/QR/INET-Industrial-HiVision

Key

The symbols used in this manual have the following meanings:

▶	Listing
☐	Work step
■	Subheading

1　Description

1.1　General device description

The MACH104-PoEP family provides you with a range of device variants. 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 devices with software variant L2... allow you to set up switched industrial Ethernet networks that conform to the IEEE 802.3 standard.

The devices with software variant L2... allow you to set up switched and routed industrial Ethernet networks that conform to the IEEE 802.3 standard. The device works without a fan.

The following installation options are available:
▶ 19" switch cabinet
▶ Mounting on a flat surface

You have the option of choosing various media to connect to the end devices and other network components:
▶ Twisted pair cable
▶ Multimode F/O
▶ Singlemode F/O

The ring redundancy concept allows the network to be reconfigured quickly after a failure.

There are convenient options for managing the device. Manage your devices via:
▶ Web browser
▶ Telnet
▶ Network management software (for example Industrial HiVision)
▶ V.24 interface (locally on the device)

The device provides you with a large range of functions, which the manuals for the operating software inform you about. You can download these manuals as PDF files from the Internet on the Hirschmann product pages (http://www.doc.hirschmann.com).
The Hirschmann network components help you ensure continuous communication across all levels of the company.

1.2 Device name and product code

The device name corresponds to the product code. The product code is made up of characteristics with defined positions. The characteristic values stand for specific product properties.

Item	Product characteristic	Characteristic value	Description
1 ... 17	Basic properties of all device variants	MACH104-16TX-PoEP	Industrial Ethernet Workgroup Switch with:
			4 × 1000-Mbit/s Combo Ports
			16 × 1000-Mbit/s Twisted-Pair Ports with PoE+
18 + x	Special properties of the device variants	Blank	Rated voltage range 100 V AC ... 240 V AC, 50 Hz ... 60 Hz
		-R	▶ Rated voltage range 100 V AC ... 240 V AC, 50 Hz ... 60 Hz ▶ Redundant power supply
		-E	For the use of type-1-powered devices (PoE): ▶ Rated voltage 48 V DC
			For the use of Type 2 Powered Devices (PoE+): ▶ Rated voltage 54 V DC
		+2X	▶ Additionally: 2 × 10-Gbit/s F/O ports ▶ Rated voltage range 100 V AC ... 240 V AC, 50 Hz ... 60 Hz
		+2X-R	▶ Additionally: 2 × 10-Gbit/s F/O ports ▶ Rated voltage range 100 V AC ... 240 V AC, 50 Hz ... 60 Hz ▶ Redundant power supply
		+2X-E	Additionally: 2 × 10-Gbit/s F/O ports
			For the use of type-1-powered devices (PoE): ▶ Rated voltage 48 V DC
			For the use of Type 2 Powered Devices (PoE+): ▶ Rated voltage 54 V DC
Last 4 positions	Software variant	-L2P	Layer 2 Professional
		-L3P	Layer 3 Professional

Table 1: Device name and product code

1.3 Device variants available

Under "Accessories and order numbers" on page 53 you can see which device variants are available.

1.4 Device views

1.4.1 Front view

1	LED display elements	Device Status
2	Signal contact	
3	USB interface	
4	V.24 interface	
5	Ports 1 ... 4	1000-Mbit/s Combo Ports
6	Ports 5 to 12	1000-Mbit/s Twisted-Pair Ports with PoE+
7	Ports 13 to 20	1000-Mbit/s Twisted-Pair Ports with PoE+
8	Ports 21, 22	10-Gbit/s F/O ports
9	MAC address of device (label)	
10	Bracket	

Table 2:   Front view of device variants:
MACH104-16TX-PoEP+2X...
MACH104-16TX-PoEP+2X-R...
MACH104-16TX-PoEP+2X-E...

1	LED display elements	Device Status
2	Signal contact	
3	USB interface	
4	V.24 interface	
5	Ports 1 ... 4	1000-Mbit/s Combo Ports
6	Ports 5 to 12	1000-Mbit/s Twisted-Pair Ports with PoE+
7	Ports 13 to 20	1000-Mbit/s Twisted-Pair Ports with PoE+
8	MAC address of device (label)	
9	Bracket	

Table 3:   Front view of device variants:
MACH104-16TX-PoEP...
MACH104-16TX-PoEP-R...
MACH104-16TX-PoEP-E...

1.4.2   Rear view

1	Non-heating appliance socket	Connecting the supply voltage

Table 4:   Front view of device variants:
MACH104-16TX-PoEP...
MACH104-16TX-PoEP+2X...

1	Non-heating appliance socket	Connecting the supply voltage ▶ Supply voltage 2
2	Non-heating appliance socket	Connecting the supply voltage ▶ Supply voltage 1

Table 5:   Front view of device variants:
MACH104-16TX-PoEP-R...
MACH104-16TX-PoEP+2X-R...
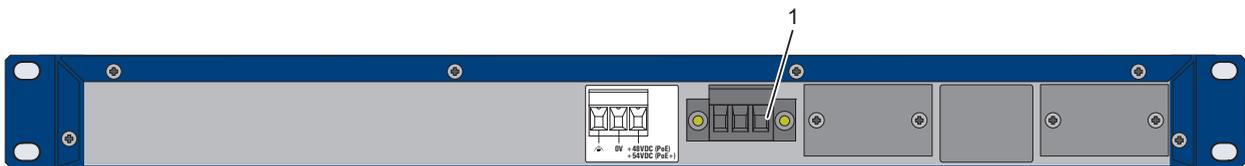
1	3-pin DC socket	Connecting the supply voltage

Table 6:   Front view of device variants:
MACH104-16TX-PoEP-E...
MACH104-16TX-PoEP+2X-E...

1.5   Supply voltage

Note: Note the safety instructions in "Requirements for connecting electrical wires" on page 9.

Note: Observe the information about the voltages to be connected:

1.5.1 MACH104-16TX-PoEP... und MACH104-16TX-PoEP+2X...

For the supply voltage, the following applies:
- ▶ A power module providing the PoE voltage and the internal supply voltage is integrated in the device.
- ▶ Supply voltage is connected via a non-heating appliance socket.
- ▶ The supply voltage is electrically isolated from the casing.

1.5.2 MACH104-16TX-PoEP-R... und MACH104-16TX-PoEP+2X-R...

For the supply voltage, the following applies:
- ▶ The supply voltage can be connected redundantly.
- ▶ Two power modules providing the PoE voltage and the internal supply voltage are integrated in the device. The power modules operate in load-sharing mode.
- ▶ Supply voltage is connected via non-heating appliance sockets.
- ▶ The supply voltage is electrically isolated from the casing.
- ▶ Both supply voltage inputs are uncoupled.

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

1.5.3 MACH104-16TX-PoEP-E... und MACH104-16TX-PoEP+2X-E...

For the supply voltage, the following applies:
- ▶ PoE voltage and internal supply voltage are provided by an external power module.
- ▶ The voltage supply is connected via a 3-pin terminal block with snap locks.

Further information:

1.6 Ethernet ports

You can connect end devices and other segments to the device ports using twisted pair cables or optical fibers (F/O).

1.6.1   10/100/1000 Mbit/s twisted pair port

This port is an RJ45 socket.

The 10/100/1000 Mbit/s twisted pair port allows you 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 mode, 100 Mbit/s full duplex mode
▶ 10 Mbit/s half-duplex mode, 10 Mbit/s full duplex mode

Note: Some of these ports also support Power over Ethernet (PoE).
See "PoE ports" on page 25.

Delivery state: Autonegotiation activated
The port casing is electrically connected to the front panel.
The pin assignment corresponds to MDI-X.

Figure	Pin	Function	Ports with PoE support: PoE voltage feed
	1	BI_DB+	Minus terminal of the supply voltage
	2	BI_DB−	Minus terminal of the supply voltage
	3	BI_DA+	Plus terminal of the supply voltage
	4	BI_DD+	
	5	BI_DD−	
	6	BI_DA−	Plus terminal of the supply voltage
	7	BI_DC+	
	8	BI_DC−	
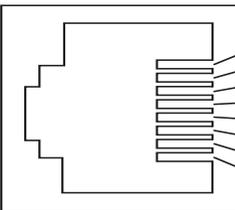
Table 7:   Pin assignment of a 1000 MBit/s TP interface in MDI-X mode, RJ45 socket - for PoE with the power supplied via the wire pairs transmitting the signal

1.6.2   100 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 100BASE-SX/1000BASE-LX standard.

This port supports:
▶ Full or half duplex mode
Default setting: Full duplex

1.6.3 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 100BASE-SX/1000BASE-LX standard.
This port supports:
▶ Autonegotiation
▶ Full duplex mode
Delivery state: Autonegotiation activated

1.6.4 10-Gbit/s F/O port

This port is an XFP slot.
The 10 Gbit/s F/O port allows you to connect network components according to the IEEE 802.3ae 10GBASE-SR/LR standard.
▶ Full duplex mode
Default setting: Full duplex

1.6.5 PoE ports

Note: Connect only PoE-supplier devices whose data connections are located in the interior of the building and are specified as SELV circuits.

Further information:
See "10/100/1000 Mbit/s twisted pair port" on page 24.

Some twisted-pair ports support Power over Ethernet (PoE):

Ports	PoE support
1 ... 4	No
5 ... 20	Yes

Table 8:   Twisted-pair ports and PoE support

The PoE ports support the connection and a remote power supply of (for example) IP phones (Voice-over-IP), webcams, sensors, print servers, and WLAN access points. With PoE, these end devices are powered via the twisted pair cable.

The PoE support complies with the following technical standards:

Standard	Description	
IEEE 802.3af	Brief description	PoE
	Classes	max. Powered Device (PD) class 0 (15.4 W)

Table 9:   PoE support: technical standards

Standard	Description	
IEEE 802.3at	Brief description	PoE Plus
	Classes	Max. Powered Device (PD) class 4 (30 W)

Table 9:   PoE support: technical standards

The following applies to PoE ports:
▶ 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.
▶ Maximum power available to PoE end devices in total:
  240 W

Note: We recommend to distribute the PoE power equally between the two port groups (ports 5 to 12 and ports 13 to 20).

1.6.6   Combo ports

You have the option of alternatively connecting a twisted pair cable via a RJ45 socket or an optical fiber via a SFP transceiver to a combo port.

Media type	Connection options		
Twisted pair	Standard	ISO/IEC 8802-03 10BASE-T/100BASE-TX/ 1000BASE-T	
	Connection type	RJ45	
Fiber optic cable	either	Standard	IEEE 802.3 100BASE-FX
		Connection type	Fast Ethernet SFP transceiver
	or	Standard	ISO/IEC 8802-03 1000BASE-SX/LX
		Connection type	1 Gigabit Ethernet SFP transceiver

Table 10:   Combo ports: Connection options

By inserting a SFP transceiver, you deactivate automatically the corresponding twisted pair interface.

1.6.7 SFP/XFP transceiver
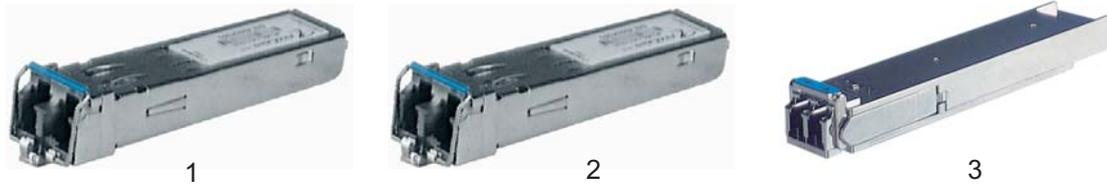
Figure 1: SFP transceiver and XFP transceiver
1 – Fast Ethernet F/O SFP transceiver
2 – Gigabit Ethernet F/O SFP transceiver
3 – 10-Gigabit Ethernet F/O XFP transceiver

SFP is the acronym for Small Form-factor Pluggable which is also commonly known as mini-GBIC (GigaBit Interface Converter).
Both Fast Ethernet SFP transceivers and Gigabit Ethernet SFP transceivers are available for your device.
XFP transceivers are slightly larger than SFP transceivers. They support 10-Gigabit Ethernet only.

Note: Use only Hirschmann SFP transceivers or XFP transceivers which are suitable for usage with the device.
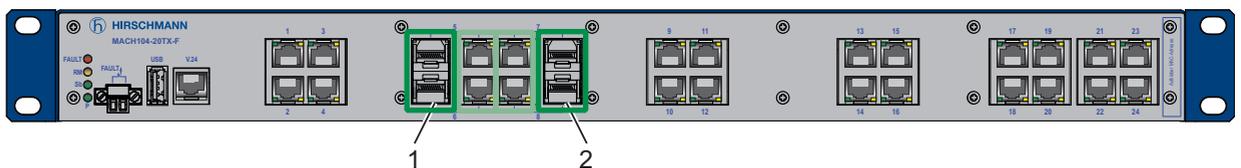
Figure 2: MACH104 device, front view
1 - Port 5 + 6: Two SFP slots, usable as an alternative to the RJ45 ports
2 - Port 7 + 8: Two SFP slots, usable as an alternative to the RJ45 ports

1.7 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 15 seconds.

1.7.1 Device state

FAULT ●
RM ●
Sb ●
P ●

These LEDs provide information about conditions which affect the operation of the whole device.
The following table applies to the stated device variants only:

▶ MACH104-16TX-PoEP-R...
▶ MACH104-16TX-PoEP+2X-R...

LED	Display	Color	Activity	Meaning
P	Supply voltage	—	none	Supply voltages 1 **and** 2 are too low.
		green	lights up	Supply voltage 1 **and** 2 is on
		yellow	lights up	Supply voltage 1 **or** 2 is on

The following table applies to the stated device variants only:

▶ MACH104-16TX-PoEP...
▶ MACH104-16TX-PoEP-E...
▶ MACH104-16TX-PoEP+2X...
▶ MACH104-16TX-PoEP+2X-E...

LED	Display	Color	Activity	Meaning
P	Supply voltage	—	none	Supply voltage is too low
		green	lights up	Supply voltage is on

The following table applies to every device variant:

LED	Display	Color	Activity	Meaning
Sb	Stand-by	—	none	Stand-by mode not enabled
		green	lights up	Standby mode enabled
FAULT	Signal contact	—	none	The signal contact is closed, it is **not** reporting any detected errors.
		red	lights up	The signal contact is open - it is reporting a detected error.
RM	Ring Manager	—	none	The RM function is deactivated.
		green	lights up	The RM function is active. The redundant port is disabled.
			flashing	The device detects an incorrect configuration of the HIPER-Ring (for example the ring is not connected to the ring port).
		yellow	lights up	The RM function is active. The redundant port is enabled.

LED	Display	Color	Activity	Meaning
RM and Sb	ACA memory operations	green	Flashing alternately	Error in the memory operation
			flashes synchronously 2 × per period	Saves a configuration file from the storage medium ACA to the device.
			flashes synchronously 1 × per period	Saves a configuration file from the device to the storage medium 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.

1.7.2   Port status

These LEDs display port-related information.
The LEDs are directly located on the ports.
The following table applies to ports 5 to 20:

LED	Display	Color	Activity	Meaning
left LED	Link status	—	none	Device detects an invalid or missing link
		green	lights up	Device detects a valid link
			flashes 1 time a period	Port is switched to stand-by
			flashes 3 times a period	Port is switched off
		yellow	flashing	Device is transmitting and/or receiving data
right LED	PoE	—	none	No PoE voltage at port.
		orange	lights up	No PoE voltage at port.
			flashes 1 time a period	No PoE voltage at port because power capacity is exhausted.
			flashes 3 times a period	The PoE voltage is deactivated in the management system.

The following table applies to the other ports:

LED	Display	Color	Activity	Meaning
left LED	Link status	—	none	Device detects an invalid or missing link
		green	lights up	Device detects a valid link
			flashes 1 time a period	Port is switched to stand-by
			flashes 3 times a period	Port is switched off
		yellow	flashing	Device is transmitting and/or receiving data
right LED (if present)		—	permanently active	

1.8 Management interfaces

1.8.1 V.24 interface (external management)

The V.24 interface is an RJ11 socket.
The V.24 user interface is serial and allows you to connect the following devices directly:

▶ External management station (VT100 terminal or PC with appropriate terminal emulation). With this management station, the Command Line Interface (CLI) is available to you. Furthermore, the system monitor is available to you at the system start.

VT100 terminal settings	
Speed	9600 Baud
Data	8 bit
Stopbit	1 bit
Handshake	off
Parity	none

The interface casing is electrically connected to the front panel.
The V.24 interface is not electrically isolated from the supply voltage.
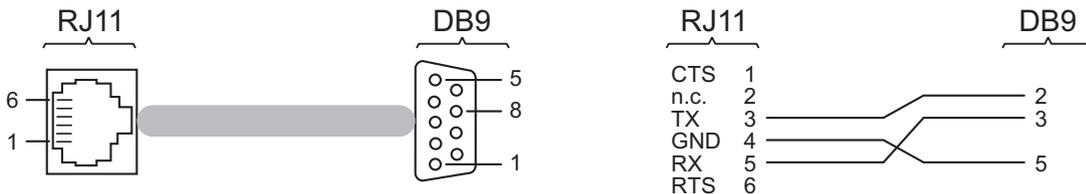
Figure 3: Pin assignment of the V.24 interface and the DB9 plug

You will find the order number for the terminal cable, which is ordered separately, in the Technical Data section .

1.8.2 USB interface

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

Figure	Pin	Function
	1	VCC (VBus)
	2	- Data
	3	+ Data
	4	Ground (GND)

Table 11: Pin assignment of the USB interface

1.9   Signal contact

The signal contact is a potential-free relay contact.
The device allows you to perform remote diagnosis via the signal contact. In the process, the device signals events such as a line interruption. When an event occurs, the device opens the relay contact and interrupts the closed circuit. The management setting specifies which events switch a contact. You can also use the management to switch the signal contact manually and thus control external devices.

2 Installation

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
▶ MACH104-16TX-PoEP-E..., MACH104-16TX-PoEP+2X-E...: Wiring and installation of the supply voltage
▶ Wiring and installing the signal contact
▶ Installing the device and grounding
▶ Operating the device
▶ Connecting data cables

Note: Note the safety instructions in "Requirements for connecting electrical wires" on page 9.

2.1 Checking the package contents

☐ Check whether the package includes all items named in the section "Scope of delivery" on page 53.
☐ Check the individual parts for transport damage.

2.2 Installing an SFP transceiver (optional)

Prerequisites:
Exclusively use Hirschmann SFP transceivers.
See "Accessories and order numbers" on page 53.
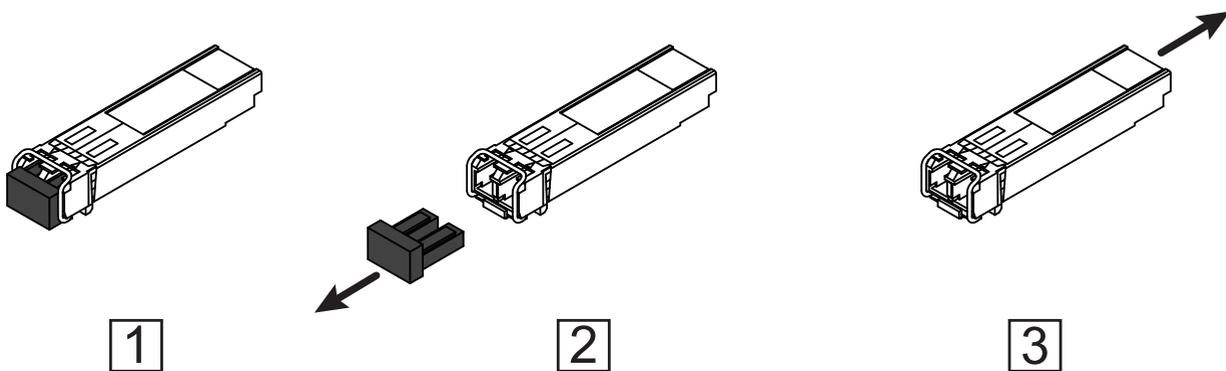
Figure 4:   Installing SFP transceivers: Installation sequence

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).

2.3 MACH104-16TX-PoEP-E..., MACH104-16TX-PoEP+2X-E...: Wiring and installation of the supply voltage

⚠ **WARNING**
ELECTRIC SHOCK Never insert sharp objects (small screwdrivers, wires, etc.) into the connection terminals for electric conductors, and do not touch the terminals. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

⚠ **WARNING**
FIRE HAZARD In the conductor to the voltage input, install an input fuse with a nominal rating of max. 10 A – charakteristic B. Use a cable cross-section of at least AWG17 (1 mm²) for the current conductors at the voltage input. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Note: Note the safety instructions in "Requirements for connecting electrical wires" on page 9.
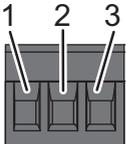
Figure	Pin	Function
	1	Protective grounding
	2	Minus terminal of the supply voltage
	3	Plus terminal of the supply voltage

Table 12:   3-pin terminal block pin assignment

☐ Remove the terminal connector from the device.
☐ Connect the protective conductor with the clamp.
☐ Connect the lines for the supply voltage to the + and - terminals.
☐ Fasten the wires in the terminal block by tightening the terminal screws.
☐ Plug the terminal block into the connection for the supply voltage on the device.

2.4   Wiring and installing the signal contact
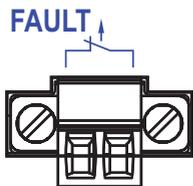
Figure 5:   2-pin terminal block

⚠ WARNING

ELECTRIC SHOCK

Never insert sharp objects (small screwdrivers, wires, or similar items) into the connection terminals for the signal lines, and do not touch the terminals.

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

Every time you connect the electrical conductors, make sure that the following requirements are met:
- ▶ The electrical wires are voltage-free.
- ▶ The connected voltage is limited by a current limitation device or a fuse. Observe the electrical threshold values for the signal contact.
  See "General technical data" on page 43.
- ☐ Remove the terminal connector from the device.
- ☐ Connect the signal contact lines with the terminal block connections.
- ☐ 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.
  You find the prescribed tightening torque in chapter:
  "General technical data" on page 43

2.5 Installing the device and grounding

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

2.5.1 Selecting the assembly location

Select the assembly location according to the safety guidelines (see on page 8 "Safety instructions").
When selecting the assembly location, also make sure the following requirements are met:
- ☐ 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.

2.5.2 Mounting on a flat surface

Before operating the device on a flat surface, such as a table, stick the supplied casing feet onto the bottom of the device, with approx. 0.8 in (2 cm) of space from the corners.
- ☐ If necessary, remove any dirt from the bottom of the device where you want to place the stick-on feet.
- ☐ Remove the protective foil from the adhesive surface of a casing foot and attach the casing foot on the device.

2.5.3 Mounting in a switch cabinet

Note: 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.
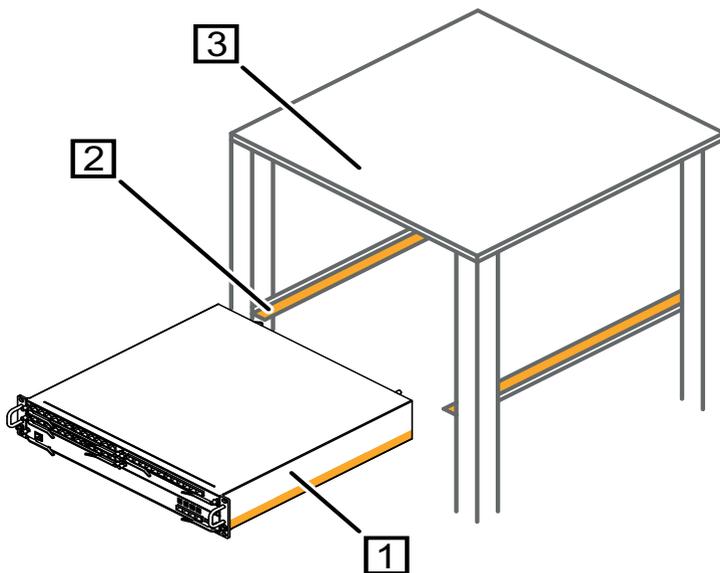
Figure 6: Assembly in a switch cabinet with sliding/mounting rails
1 - MACH104-PoEP device
2 - sliding/mounting rail
3 - 19" switch cabinet
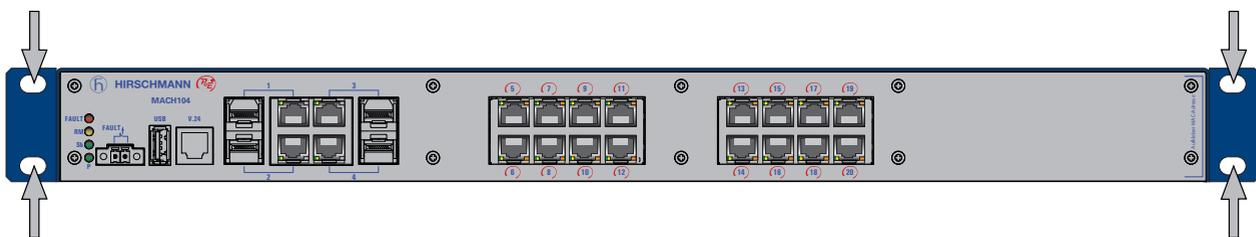
Figure 7: Mounting the MACH104-PoEP in the 19" cabinet

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

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 and order numbers" on page 53.

2.5.4 Mounting on the wall

Note: In order to fix the device to a concrete wall choose screws with a thread major diameter of at least 5 mm.

☐ Remove the screws on the pre-installed mounting brackets.
☐ Move the two pre-installed mounting brackets into the position shown below.
☐ Use the screws to secure the mounting brackets on the device.
☐ Additionally attach 2 brackets to the back of the device.
  See figure 8.
  You obtain the additional brackets as accessories.
  See "Accessories and order numbers" on page 53.
☐ Fasten the device by screwing the brackets to the wall.
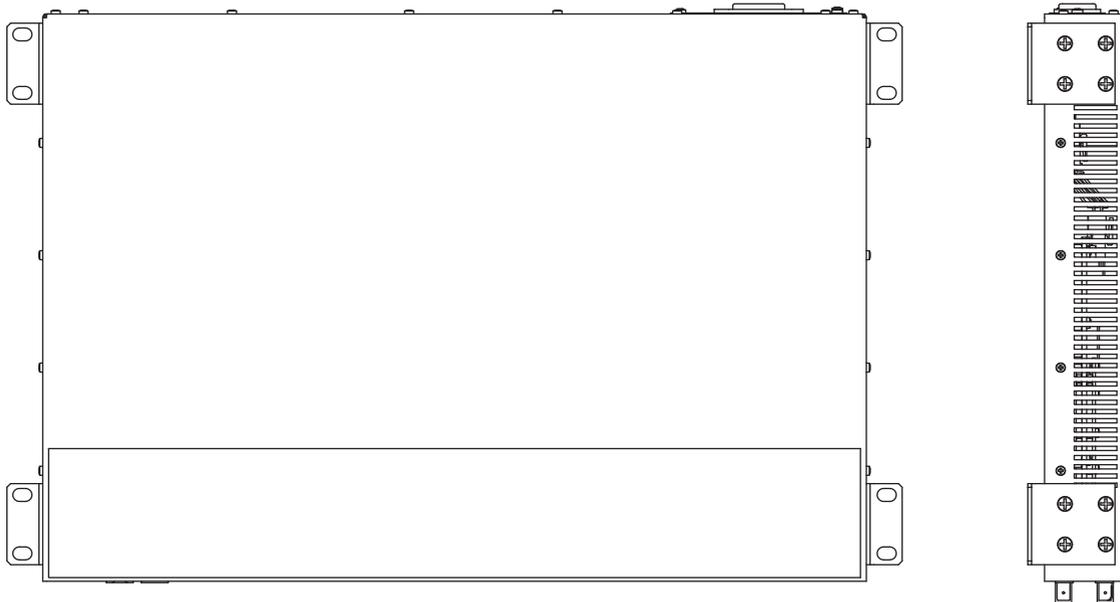
Figure 8:   Vertical mounting on the wall

2.5.5 Grounding the device

The device is grounded via the power supply connections.

2.6 Operating the device

⚠ 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.**

Note: Note the safety instructions in "Requirements for connecting electrical wires" on page 9.

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

2.7 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 "Ethernet ports" on page 23.

Note: Verify that you connect only optical ports with the same optical transmission properties with each other.

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.

When you install the device for the first time enter the IP parameters.

The device provides the following options for entering the IP parameters during the first installation:
▶ Configuration via DHCP (state on delivery)
▶ Input via the V.24 interface
▶ 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
▶ Configuration via BOOTP
▶ Configuration via DHCP (Option 82)
▶ AutoConfiguration Adapter

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

3.1 Default settings

▶ 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: 9600 Baud
▶ Ring redundancy disabled
▶ Ethernet ports: link status is not evaluated (signal contact)
▶ Optical 100 Mbit/s ports: 100 Mbit/s full duplex
   Other ports: Autonegotiation
▶ Redundancy manager disabled
   (DIP switch RM and Standby: ON)

▶ Standby coupling disabled
(DIP switch RM and Standby: ON)
Port 3 = control port, Port 4 = coupling port for redundant ring coupling
▶ Rapid Spanning Tree enabled

3.2   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 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.
See "Technical data" on page 43.

☐ 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.

☐ 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).

☐ 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.

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

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

5 Deinstallation

5.1 Removing the device

☐ Disconnect the data cables.
☐ Disable the supply voltage.
☐ Disconnect the supply voltage.
☐ Remove the terminal connector from the device.

☐ To detach the device from the switch cabinet or the wall, remove the screws from the brackets on the device.

Figure 9: Disassembling the device

5.2 Removing an SFP transceiver (optional)
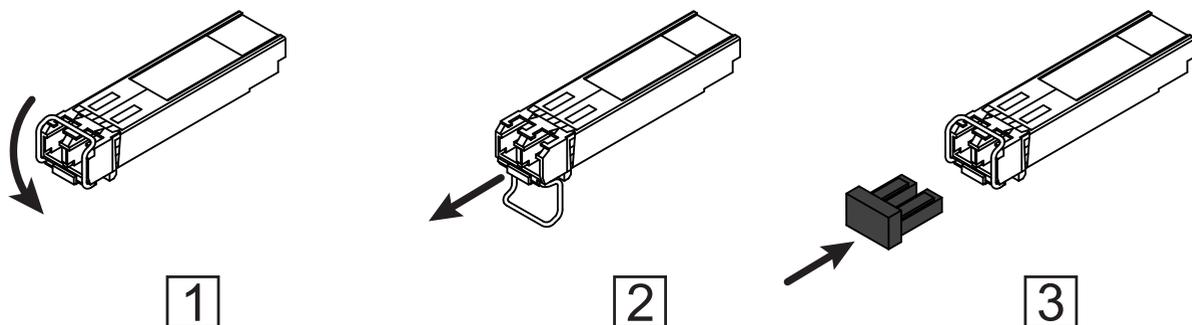
Figure 10: De-installing SFP transceivers: De-installation sequence

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).

6 Technical data

6.1 General technical data

Dimensions	See "Dimension drawings" on page 45.	
Weight	MACH104-16TX-PoEP... MACH104-16TX-PoEP+2X...	10.14 lb (4.6 kg)
	MACH104-16TX-PoEP-R... MACH104-16TX-PoEP+2X-R...	11.46 lb (5.2 kg)
	MACH104-16TX-PoEP-E... MACH104-16TX-PoEP+2X-E...	9.7 lb (4.4 kg)
Supply voltage	MACH104-16TX-PoEP... MACH104-16TX-PoEP+2X... MACH104-16TX-PoEP-R... MACH104-16TX-PoEP+2X-R...	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
	MACH104-16TX-PoEP-E... MACH104-16TX-PoEP+2X-E...	**Note:** Connect only SELV circuits with voltage restrictions according to IEC 60950-1 or IEC/EN 62368-1 to the power supply. Ensure that the connected supply voltage complies with the requirements according to IEEE 802.3af or IEEE 802.3at.
		For the use of type-1-powered devices (PoE): Rated voltage 48 V DC Max. Voltage range DC 45 V DC ... 57 V DC
		For the use of Type 2 Powered Devices (PoE+): Rated voltage 54 V DC Max. Voltage range DC 51 V DC ... 57 V DC
Current consumption	MACH104-16TX-PoEP... MACH104-16TX-PoEP+2X... MACH104-16TX-PoEP-R... MACH104-16TX-PoEP+2X-R...	max. 1.5 A (240 V AC) max. 3.5 A (100 V AC)
	MACH104-16TX-PoEP-E... MACH104-16TX-PoEP+2X-E...	max. 4.8 A (54 V DC) max. 5.5 A (48 V DC)
	Connection type	3-pin terminal block with snap lock
		max. conductor cross section AWG12 (2.5 mm²)

Activation current	MACH104-16TX-PoEP... MACH104-16TX-PoEP+2X... MACH104-16TX-PoEP-R... MACH104-16TX-PoEP+2X-R...	Typ. < 40 A at 240 V AC and cold boot
	MACH104-16TX-PoEP-E... MACH104-16TX-PoEP+2X-E...	typ. < 6 A
PoE power	Maximum number of Powered Devices (PDs)	8 × Powered Device (PD) class 4 (30 W)
		16 × Powered Device (PD) class 0 (15.4 W)
Power loss buffer	MACH104-16TX-PoEP... MACH104-16TX-PoEP+2X... MACH104-16TX-PoEP-R... MACH104-16TX-PoEP+2X-R...	>20 ms
	MACH104-16TX-PoEP-E... MACH104-16TX-PoEP+2X-E...	>10 ms **Note:** Applies to the basic device only, **not** to the Powered Devices connected.
Overload current protection on the device	Non-replaceable fuse	
Climatic conditions during operation	Ambient air temperature[a]	+32 °F ... +122 °F (0 °C ... +50 °C) **Note:** This applies to the following device variants only: ▶ MACH104-16TX-PoEP+2X... ▶ MACH104-16TX-PoEP+2X-R... ▶ MACH104-16TX-PoEP+2X-E... When using XFP transceivers without the extension "-EEC", the maximum operating temperature of the device lowers to +104 °F (+40 °C). For temperature ranges between +104 °F and +122 °F (+40 °C and +50 °C), use M-XFP...-EEC transceivers.
	Humidity	10 % ... 95 % (non-condensing)
	Air pressure	min. 795 hPa (+6562 ft; +2000 m) max. 1060 hPa (-1312 ft; -400 m)
Climatic conditions during storage	Ambient air temperature[b]	-4 °F ... +185 °F (-20 °C ... +85 °C)
	Humidity	10 % ... 95 % (non-condensing)
	Air pressure	min. 700 hPa (+9842 ft; +3000 m) max. 1060 hPa (-1312 ft; -400 m)
Signal contact	Switching current	max. 1 A SELV according to IEC 60950-1 or ES1 according to IEC/EN 62368-1
	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	2-pin terminal block
		max. conductor cross section AWG16 (1.3 mm²)
		Tightening torque 2.2 lb-in (0.25 Nm)
Pollution degree		2

| Protection classes | Laser protection | Class 1 according to IEC 60825-1 |
| | Degree of protection | IP20 |

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

6.2   Dimension drawings
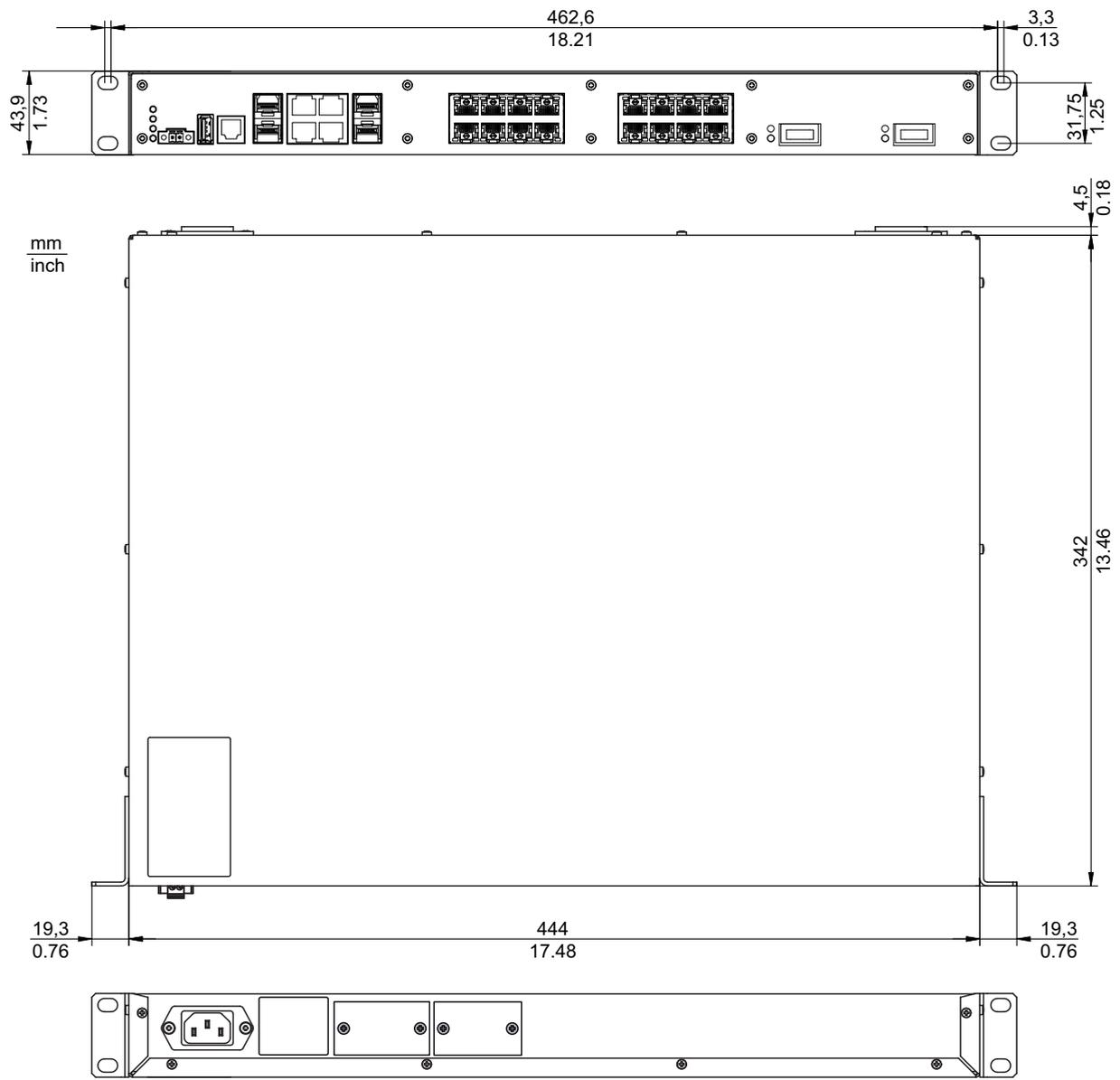
6.3 EMC and immunity

EMC interference immunity		
IEC/EN 61000-4-2	Electrostatic discharge	
	Contact discharge	6 kV
	Air discharge	8 kV
IEC/EN 61000-4-3	Electromagnetic field	
	80 MHz ... 3000 MHz	max. 20 V/m
IEC/EN 61000-4-4	Fast transients (burst)	
	Power line	2 kV
	Data line	4 kV
IEC/EN 61000-4-5	Voltage surges	
	This applies to the following device variants only: ▶ MACH104-16TX-PoEP-E... ▶ MACH104-16TX-PoEP+2X-E...	
	Power line, line / line	0.5 kV
	Power line, line / ground	1 kV
	Data line	1 kV
	This applies to the following device variants only: ▶ MACH104-16TX-PoEP... ▶ MACH104-16TX-PoEP+2X... ▶ MACH104-16TX-PoEP-R... ▶ MACH104-16TX-PoEP+2X-R...	
	Power line, line / line	1 kV
	Power line, line / ground	2 kV
	Data line	2 kV
IEC/EN 61000-4-6	Conducted disturbances	
	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

6.4   Network range

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

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

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)
SFP-FAST-MM/LC[d]	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
SFP-FAST-MM/LC EEC[d]	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

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

Product code	Mode[a]	Wave length	Fiber	System attenuation	Example for F/O line length[b]	Fiber attenuation	BLP/Dispersion
SFP-FAST-SM/LC[d]	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)
SFP-FAST-SM/LC EEC[d]	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)

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.
d.   You will find further information on certifications on the Internet on the Hirschmann product pages (www.hirschmann.com).

Product code	Mode[a]	Wave length TX	Wave length RX	Fiber	System attenuation	Example for F/O line length[b]	Fiber attenuation	BLP/Dispersion
SFP-FAST-BA MM/LC EEC	MM	1310 nm	1550 nm	50/125 µm 62.5/125 µm	0 dB ... 16 dB	0 mi ... 1.24 mi (0 km ... 2 km)	1.0 dB/km	800 MHz×km 500 MHz×km
SFP-FAST-BB MM/LC EEC	MM	1550 nm	1310 nm	50/125 µm 62.5/125 µm	0 dB ... 16 dB	0 mi ... 1.24 mi (0 km ... 2 km)	1.0 dB/km	800 MHz×km 500 MHz×km
SFP-FAST-BA SM/LC EEC	SM	1310 nm	1550 nm	9/125 µm	0 dB ... 18 dB	0 km ... 12.43 mi (0 km ... 20 km)	0.4 dB/km	3.5 ps/(nm×km)
SFP-FAST-BB SM/LC EEC	SM	1550 nm	1310 nm	9/125 µm	0 dB ... 18 dB	0 km ... 12.43 mi (0 km ... 20 km)	0.25 dB/km	19 ps/(nm×km)
SFP-FAST-BA SM+/LC EEC	SM	1310 nm	1550 nm	9/125 µm	0 dB ... 29 dB	0 mi ... 37.29 mi (0 km ... 60 km)	0.4 dB/km	3.5 ps/(nm×km)
SFP-FAST-BB SM+/LC EEC	SM	1550 nm	1310 nm	9/125 µm	0 dB ... 29 dB	0 mi ... 37.29 mi (0 km ... 60 km)	0.25 dB/km	19 ps/(nm×km)

Table 15: F/O port (bidirectional Fast Ethernet SFP transceiver)

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

Product code M-SFP-...	Mode[a]	Wave length	Fiber	System attenuation	Example for F/O cable length[b]	Fiber attenuation	BLP[c]/Dispersion
-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
-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
-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
-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
-LX/LC...	MM	1310 nm[d]	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
-LX/LC...	MM	1310 nm[e]	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
-LX/LC...	SM	1310 nm	9/125 µm	0 dB ... 10.5 dB	0 mi ... 12.43 mi (0 km ... 20 km)[f]	0.4 dB/km	3.5 ps/(nm×km)
-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)
-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)
-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)
-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 16: 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.   Using the bandwidth-length product is inappropriate for expansion calculations.

d. With F/O adapter compliant with IEEE 802.3-2002 Clause 38 (single-mode fiber offset-launch mode conditioning patch cord).
e. With F/O adapter compliant with IEEE 802.3-2002 Clause 38 (single-mode fiber offset-launch mode conditioning patch cord).
f. Including 2.5 dB system reserve when compliance with the fiber data is observed.

Product code	Mode[a]	Wave length TX	Wave length RX	Fiber	System attenuation	Example for F/O line length[b]	Fiber attenuation	BLP/Dispersion
M-SFP-BIDI Type A LX/LC EEC	SM	1310 nm	1550 nm	9/125 µm	0 dB ... 11 dB	0 km ... 12.43 mi (0 km ... 20 km)	0.4 dB/km	3.5 ps/(nm×km)
M-SFP-BIDI Type B LX/LC EEC	SM	1550 nm	1310 nm	9/125 µm	0 dB ... 11 dB	0 km ... 12.43 mi (0 km ... 20 km)	0.25 dB/km	19 ps/(nm×km)
M-SFP-BIDI Type A LH/LC EEC	LH	1490 nm	1590 nm	9/125 µm	5 dB ... 24 dB	14.29 mi ... 49.71 mi (23 km ... 80 km)	0.25 dB/km	19 ps/(nm×km)
M-SFP-BIDI Type B LH/LC EEC	LH	1590 nm	1490 nm	9/125 µm	5 dB ... 24 dB	14.29 mi ... 49.71 mi (23 km ... 80 km)	0.25 dB/km	19 ps/(nm×km)
SFP-GIG-BA LX/ LC EEC	SM	1310 nm	1550 nm	9/125 µm	0 dB ... 15 dB	0 km ... 12.43 mi (0 km ... 20 km)	0.4 dB/km	3.5 ps/(nm×km)
SFP-GIG-BB LX/ LC EEC	SM	1550 nm	1310 nm	9/125 µm	0 dB ... 15 dB	0 km ... 12.43 mi (0 km ... 20 km)	0.25 dB/km	19 ps/(nm×km)
SFP-GIG-BA LX+/LC EEC	SM	1310 nm	1550 nm	9/125 µm	3 dB ... 20 dB	7.45 mi ... 24.86 mi (12 km ... 40 km)	0.4 dB/km	3.5 ps/(nm×km)
SFP-GIG-BB LX+/LC EEC	SM	1550 nm	1310 nm	9/125 µm	3 dB ... 20 dB	7.45 mi ... 24.86 mi (12 km ... 40 km)	0.25 dB/km	19 ps/(nm×km)
SFP-GIG-BA LH/ LC EEC	LH	1490 nm	1550 nm	9/125 µm	4 dB ... 24 dB	11.80 mi ... 49.71 mi (19 km ... 80 km)	0.25 dB/km	19 ps/(nm×km)
SFP-GIG-BB LH/ LC EEC	LH	1550 nm	1490 nm	9/125 µm	4 dB ... 24 dB	11.80 mi ... 49.71 mi (19 km ... 80 km)	0.25 dB/km	19 ps/(nm×km)

Table 17: F/O port (bidirectional Gigabit Ethernet SFP transceiver)

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

Product code M-XFP-...	Mode[a]	Wave length	Fiber	System attenuation	Example for F/O cable length	Fiber attenuation	BLP[b]/Dispersion
-SR/LC	MM	850 nm	50/125 µm	0 dB ... 8.1 dB	max. 0.041 mi (0.066 km)	3.0 dB/km	400 MHz×km
-SR/LC	MM	850 nm	50/125 µm	0 dB ... 8.1 dB	max. 0.051 mi (0.082 km)	3.0 dB/km	500 MHz×km
-SR/LC	MM	850 nm	50/125 µm	0 dB ... 8.1 dB	max. 0.19 mi (0.30 km)	3.0 dB/km	2000 MHz×km
-SR/LC	MM	850 nm	62.5/125 µm	0 dB ... 8.1 dB	max. 0.016 mi (0.026 km)	3.2 dB/km	160 MHz×km
-SR/LC	MM	850 nm	62.5/125 µm	0 dB ... 8.1 dB	max. 0.021 mi (0.033 km)	3.2 dB/km	200 MHz×km
-LR/LC	SM	1310 nm	9/125 µm	0 dB ... 7.8 dB	typ. 6.21 mi (10 km)	0.4 dB/km	3.5 ps/(nm×km)
-ER/LC	SM	1550 nm	9/125 µm	3 dB ... 15 dB	6.21 mi ... 24.86 mi (10 km ... 40 km)	0.25 dB/km	19 ps/(nm×km)
-ZR/LC	SM	1550 nm	9/125 µm	11 dB ... 24 dB	24.86 mi ... 49.71 mi (40 km ... 80 km)	0.25 dB/km	19 ps/(nm×km)

Table 18: F/O Port 10GBASE-SR/LR (XFP fiber optic 10 Gigabit Ethernet transceiver)

a. MM = Multimode, SM = Singlemode, LH = Singlemode Longhaul
b. Using the bandwidth-length product is inappropriate for expansion calculations.

6.5 Power consumption/power output

MACH104-PoEPdevice	Maximum power consumption	Maximum power output
MACH104-16TX-PoEP... MACH104-16TX-PoEP+2X...	330 W	300 Btu (IT)/h
MACH104-16TX-PoEP-R... MACH104-16TX-PoEP+2X-R...	340 W	340 Btu (IT)/h
MACH104-16TX-PoEP-E... MACH104-16TX-PoEP+2X-E...	300 W	200 Btu (IT)/h

7 Scope of delivery, order numbers and accessories

■ Scope of delivery

Device	Scope of delivery
MACH104-16TX-PoEP... MACH104-16TX-PoEP+2X...	Device
	Safety and general information sheet
	Casing feet, stick on
	1 × 2-pin terminal block for signal contact
	1 × Non-heating appliance cable (Euro model)
	2 × Brackets with fastening screws (pre-mounted)
MACH104-16TX-PoEP-R... MACH104-16TX-PoEP+2X-R...	Device
	Safety and general information sheet
	Casing feet, stick on
	1 × 2-pin terminal block for signal contact
	2 × Non-heating appliance cable (Euro model)
	2 × Brackets with fastening screws (pre-mounted)
MACH104-16TX-PoEP-E... MACH104-16TX-PoEP+2X-E...	Device
	Safety and general information sheet
	Casing feet, stick on
	1 × 2-pin terminal block for signal contact
	1 × 3-pin terminal block for the supply voltage
	2 × Brackets with fastening screws (pre-mounted)

■ Accessories and order numbers

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.

MACH104-PoEPdevice	Order number
MACH104-16TX-PoEP-L2P	942 030-001
MACH104-16TX-PoEP-R-L2P	942 026-001
MACH104-16TX-PoEP-E-L2P	942 027-001
MACH104-16TX-PoEP+2X-L2P	942 031-001
MACH104-16TX-PoEP+2X-R-L2P	942 033-001
MACH104-16TX-PoEP+2X-E-L2P	942 032-001
MACH104-16TX-PoEP-L3P	942 030-002
MACH104-16TX-PoEP-R-L3P	942 026-002
MACH104-16TX-PoEP-E-L3P	942 027-002
MACH104-16TX-PoEP+2X-L3P	942 031-002
MACH104-16TX-PoEP+2X-R-L3P	942 033-002
MACH104-16TX-PoEP+2X-E-L3P	942 032-002

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
Bracket, long (+ 1.97 in (50 mm)), for fastening the casing (extra)	943 943-101
Network management software Industrial HiVision	943 156-xxx
OPC Server software HiOPC	943 055-001

Fast Ethernet SFP transceiver	Order number
M-FAST SFP-TX/RJ45	942 098-001
M-FAST SFP-TX/RJ45 EEC	942 098-002

The following operating conditions apply to twisted pair transceivers:
▶ Usable with:
   - HiOS as of software version 03.0.00
   - for PRP ports on RSP devices, as of software version 02.0.01
   - for PRP ports on EES devices, as of software version 02.0.02
   - Classic switch software as of software version 08.0.00
   - HiSecOS as of software version 01.2.00
▶ Longer RSTP switching times and link loss detection times compared to twisted pair ports provided by the device directly.
▶ Not applicable for combo ports.
▶ Not applicable for ports which support only Gigabit Ethernet.
▶ It is currently not possible to set autocrossing manually.

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
M-FAST SFP-LH/LC EEC	943 948-001
SFP-FAST-MM/LC[a]	942 194-001
SFP-FAST-MM/LC EEC[a]	942 194-002
SFP-FAST-SM/LC[a]	942 195-001
SFP-FAST-SM/LC EEC[a]	942 195-002

Table 19: Accessory: Fast Ethernet SFP transceiver

a. You will find further information on certifications on the Internet on the Hirschmann product pages (www.hirschmann.com).

Bidirectional Fast Ethernet SFP transceivers[a]	Order number
SFP-FAST-BA MM/LC EEC	942 204-001
SFP-FAST-BB MM/LC EEC	942 204-002
SFP-FAST-BA SM/LC EEC	942 205-001
SFP-FAST-BB SM/LC EEC	942 205-002
SFP-FAST-BA SM+/LC EEC	942 206-001
SFP-FAST-BB SM+/LC EEC	942 206-002

Table 20: Accessory: Bidirectional Fast Ethernet SFP transceiver

Gigabit Ethernet SFP transceiver	Order number
M-SFP-TX/RJ45	943 977-001
M-SFP-TX/RJ45 EEC	942 161-001

The following operating conditions apply to twisted pair transceivers:
▶ Usable with:
- HiOS as of software version 03.0.00
- Classic Switch software, as of software version 04.1.00.
- HiSecOS as of software version 01.2.00
Do not use with the following devices:
- SPIDER II
- MSP/MSM
- EES
▶ Longer RSTP switching times and link loss detection times compared to twisted pair ports provided by the device directly.
▶ Not applicable for combo and Fast Ethernet ports.
▶ Exclusively supports the autonegotiation mode including autocrossing.

M-SFP-SX/LC	943 014-001
M-SFP-SX/LC EEC	943 896-001
M-SFP-MX/LC EEC	942 108-001
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
M-SFP-LH+/LC EEC	942 119-001
SFP-GIG-LX/LC[a]	942 196-001
SFP-GIG-LX/LC EEC[a]	942 196-002

Table 21: Accessory: Gigabit Ethernet SFP transceiver

Bidirectional Gigabit Ethernet SFP transceiver	Order number
M-SFP-BIDI Type A LX/LC EEC	943 974-001
M-SFP-BIDI Type B LX/LC EEC	943 974-002
M-SFP-BIDI Type A LH/LC EEC	943 975-001
M-SFP-BIDI Type B LH/LC EEC	943 975-002
M-SFP-BIDI Bundle LX/LC EEC (Type A + B)	943 974-101
M-SFP-BIDI Bundle LH/LC EEC (Type A + B)	943 975-101

Table 22: Accessory: Bidirectional Gigabit Ethernet SFP transceiver

10-Gigabit Ethernet XFP transceiver	Order number
M-XFP-SR/LC	943 917-001
M-XFP-SR/LC EEC	942 054-001

10-Gigabit Ethernet XFP transceiver	Order number
M-XFP-LR/LC	943 919-001
M-XFP-LR/LC EEC	942 055-001
M-XFP-ER/LC	943 920-001
M-XFP-ER/ LC EEC	942 056-001
M-XFP-ZR/LC	943 921-001

8 Underlying technical standards

Name	
CAN/CSA 22.2 No. 60950-1	Information Technology Equipment – Safety – Part 1: General Requirements
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
FCC 47 CFR Part 15	Code of Federal Regulations
IEC/EN 62368-1	Equipment for audio/video, information and communication technology - Part 1: safety requirements
IEEE 802.1D	MAC Bridges (switching function)
IEEE 802.1Q	Virtual LANs (VLANs, MRP, Spanning Tree)
IEEE 802.1w	Rapid Reconfiguration
IEEE 802.3	Ethernet
UL 60950-1	Information technology equipment – Safety – Part 1: General requirements

Table 23: List of the technical standards

The device generally fulfills the technical standards named in their current versions.

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 Germanischer Lloyd or DNV GL, you find the respective approval mark printed on the device label. You will find out whether your device has other shipping approvals on the Hirschmann website under 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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