User Manual

Installation
Industrial Ethernet Workgroup Switch
MACH104 Full Gigabit Family

MACH104-20TX-F...

MACH104-20TX-FR...

MACH104-20TX-F-4PoE...
The naming of copyrighted trademarks in this manual, even when not specially indicated, should not be taken to mean that these names may be considered as free in the sense of the trademark and tradename protection law and hence that they may be freely used by anyone.

© 2019 Hirschmann Automation and Control GmbH

Manuals and software are protected by copyright. All rights reserved. The copying, reproduction, translation, conversion into any electronic medium or machine scannable form is not permitted, either in whole or in part. An exception is the preparation of a backup copy of the software for your own use.

The performance features described here are binding only if they have been expressly agreed when the contract was made. This document was produced by Hirschmann Automation and Control GmbH according to the best of the company's knowledge. Hirschmann reserves the right to change the contents of this document without prior notice. Hirschmann can give no guarantee in respect of the correctness or accuracy of the information in this document.

Hirschmann can accept no responsibility for damages, resulting from the use of the network components or the associated operating software. In addition, we refer to the conditions of use specified in the license contract.

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

Hirschmann Automation and Control GmbH
Stuttgarter Str. 45-51
72654 Neckartenzlingen
Germany
Contents

Safety instructions 5

About this manual 13

Legend 14

1 Description 15

1.1 General device description 15

1.2 Description of the device variants 16
   1.2.1 MACH104-20TX-F...: Devices with 24 GB ports 16
   1.2.2 MACH104-20TX-FR...: Devices with 24 GB ports and redundant power supply 17
   1.2.3 MACH104-20TX-F-4-PoE...: Devices with 24 GB ports, 4 of them PoE ports 18

1.3 Supply voltage 19
   1.3.1 MACH104-20TX-F... 19
   1.3.2 MACH104-20TX-FR... 19
   1.3.3 MACH104-20TX-F-4-PoE... 20

1.4 Ethernet ports 20
   1.4.1 10/100/1000 Mbit/s twisted pair port 20
   1.4.2 100 Mbit/s F/O port 21
   1.4.3 1000 Mbit/s F/O port 21
   1.4.4 PoE ports 21
   1.4.5 Combo ports 22

1.5 Display elements 22
   1.5.1 Device state 23
   1.5.2 Port status 24

1.6 Management interfaces 25
   1.6.1 V.24 interface (external management) 25
   1.6.2 USB interface 26

1.7 Signal contact 26

2 Installation 27

2.1 Checking the package contents 27

2.2 Installing an SFP transceiver (optional) 27
2.3 Wiring and installing the signal contact 28
2.4 Installing the device and grounding 29
   2.4.1 Selecting the assembly location 29
   2.4.2 Mounting on a flat surface 29
   2.4.3 Mounting in a switch cabinet 29
   2.4.4 Mounting on the wall 30
   2.4.5 Grounding the device 31
2.5 Operating the device 32
2.6 Connecting data cables 32

3 Making basic settings 33
3.1 Default settings 34

4 Maintenance and service 35

5 Deinstallation 36
5.1 Removing the device 36
5.2 Removing an SFP transceiver (optional) 36

6 Technical data 37
6.1 General technical data 37
6.2 Dimension drawings 38
6.3 EMC and immunity 38
6.4 Network range 40
6.5 Power consumption/power output 43

7 Scope of delivery, order numbers and accessories 44

8 Underlying technical standards 47

A Further support 48
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 37.
- 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.

**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:
- 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:
  - MACH104-20TX-FR...
    Unplug every non-heating device coupling to disconnect the device from the power supply.
- This applies to the following device variants only:
  - MACH104-20TX-FR...
    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 wire diameter of 0.5 mm² to 0.75 mm² (AWG20 up to AWG18).

The following requirements apply alternatively:
**Prerequisites:**

Relevant when the device is supplied via 1 voltage input:

<table>
<thead>
<tr>
<th>Alternative 1</th>
<th>The power supply complies with the requirements for a limited power source (LPS) as per EN 60950-1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 2</td>
<td>Relevant for North America: The power supply complies with the requirements according to NEC Class 2.</td>
</tr>
</tbody>
</table>
| Alternative 3 | All of the following requirements are complied with:  
  - The power supply complies with the requirements for a safety extra-low voltage (SELV) as per IEC/EN 60950-1.  
  - Supply with DC voltage:  
    - A fuse suitable for DC voltage is located in the plus conductor of the power supply.  
    - The minus conductor is on ground potential. Otherwise, a fuse is also located in the minus conductor.  
    - Regarding the properties of this fuse:  
      See “Technical data” on page 37.  
  - 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 37. |

Relevant when the device is supplied via 2 voltage inputs:

<table>
<thead>
<tr>
<th>Alternative 1</th>
<th>The total voltage supply meets the requirements for a limited power source (LPS) as per EN 60950-1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 2</td>
<td>Relevant for North America: The total voltage supply complies with the requirements as per NEC Class 2.</td>
</tr>
</tbody>
</table>
| Alternative 3 | All of the following requirements are complied with:  
  - The power supply complies with the requirements for a safety extra-low voltage (SELV) as per IEC/EN 60950-1.  
  - 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 37.  
  - 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 37. |
**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 12 on page 30**) or on the wall (**figure 14 on page 31**).
### CE marking
The labeled devices comply with the regulations contained in the following European directive(s):

- **2011/65/EU and 2015/863/EU (RoHS)**

- **2014/30/EU (EMC)**

- **2014/35/EU**

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

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

**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:**
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; (2) this device must accept any interference received, including interference that may cause undesired operation. Appropriate testing has established that this device fulfills the requirements of a class A digital device in line with part 15 of the FCC regulations. These requirements are designed to provide sufficient protection against interference when the device is being used in a business environment. The device creates and uses high frequencies and can also radiate these frequencies. If it is not installed and used in accordance with this operating manual, it can cause radio transmission interference. The use of this device in a residential area can also cause interference, and in this case the user is obliged to cover the costs of removing the interference.

**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.

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。
<table>
<thead>
<tr>
<th>Component</th>
<th>鉛 (Pb)</th>
<th>汞 (Hg)</th>
<th>鎘 (Cd)</th>
<th>六價 (Cr (VI))</th>
<th>多溴聯苯 (PBB)</th>
<th>多溴二苯醚 (PBDE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>金屬部件</td>
<td>X</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>電路模組</td>
<td>X</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>塑膠和聚合物部件</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>電源元件</td>
<td>X</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

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.
Relevant for installations in switch cabinets according to UL 60950-1

- Higher ambient air temperature during operation: If installed in a closed switch cabinet or a multi-unit switch cabinet, the ambient air temperature inside the switch cabinet during operation can be higher than the ambient air temperature in the room. Install devices in environments that are compatible with the maximum ambient air temperature of the device.
- Reduced air flow: When you install the device in a switch cabinet, make sure that a sufficient air flow is guaranteed in order to safely operate your devices.
- Mechanical stress: Check for potential dangers resulting from unevenly distributed weight when you install the device in a switch cabinet.
- Electric circuit overloading: Observe the effects of electric circuit overloads on the overload current protection and the power supply cables when you connect devices to the power supply. Refer to the device parameters specified on the type plate of the device.
- Safe grounding: Make sure that devices installed in switch cabinets are grounded safely. When you install a device in a switch cabinet, also watch out for power supply connections other than the direct connections to the circuit branch (for example socket boards).

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

Legend

The symbols used in this manual have the following meanings:

- Listing
- Work step
- Subheading
1 Description

1.1 General device description

The MACH104 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 devices work 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 (www.hirschmann.com).

The Hirschmann network components help you ensure continuous communication across all levels of the company.
1.2 Description of the device variants

1.2.1 MACH104-20TX-F...: Devices with 24 GB ports

- MACH104-20TX-F...
  - 4 Gigabit Ethernet combo ports
  - 20 Gigabit Ethernet ports

![Figure 1: Overview over interfaces, display and operating elements of the MACH104-20TX-F...](image)

1. MACH104-20TX-F... device
2. LED display elements
3. Signal contact
4. USB interface
5. V.24 interface for external management
6. See the following table, column 1
7. See the following table, column 2
8. Power supply connection (on the back of the device)

<table>
<thead>
<tr>
<th>4 × Gigabit Ethernet ports</th>
<th>4 × Gigabit Ethernet combo ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/100/1000 Mbit/s twisted pair, RJ45 sockets</td>
<td>100/1000 Mbit/s F/O, SFP slots</td>
</tr>
<tr>
<td>Alternatively: 10/100/1000 Mbit/s twisted pair, RJ45 sockets</td>
<td></td>
</tr>
</tbody>
</table>
1.2.2 MACH104-20TX-FR...: Devices with 24 GB ports and redundant power supply

- MACH104-20TX-FR...
  - 4 Gigabit Ethernet combo ports
  - 20 Gigabit Ethernet ports
  - The power supply is designed redundantly.

Figure 2: Overview over interfaces, display and operating elements of the MACH104-20TX-FR...
- 1 - MACH104-20TX-FR... device
- 2 - LED display elements
- 3 - Signal contact
- 4 - USB interface
- 5 - V.24 interface for external management
- 6 - See the following table, column 1
- 7 - See the following table, column 2
- 8 - P1: Power supply connection (on the back of the device)
- 9 - P2: Redundant power supply connection (on the back of the device)

<table>
<thead>
<tr>
<th>4 × Gigabit Ethernet ports</th>
<th>4 × Gigabit Ethernet combo ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/100/1000 Mbit/s twisted pair, RJ45 sockets</td>
<td>100/1000 Mbit/s F/O, SFP slots</td>
</tr>
<tr>
<td>Alternatively: 10/100/1000 Mbit/s twisted pair, RJ45 sockets</td>
<td></td>
</tr>
</tbody>
</table>
1.2.3 MACH104-20TX-F-4-PoE...: Devices with 24 GB ports, 4 of them PoE ports

- MACH104-20TX-F-4-PoE...
  - 4 Gigabit Ethernet combo ports
  - 20 Gigabit Ethernet ports, 4 of which are PoE-capable
  - Integrated PoE voltage supply for 4 PoE ports

![Diagram of MACH104-20TX-F-4-PoE... device with numbered parts]

Figure 3: Overview over interfaces, display and operating elements of the MACH104-20TX-F-4-PoE...

1 - MACH104-20TX-F-4-PoE... device
2 - LED display elements
3 - Signal contact
4 - USB interface
5 - V.24 interface for external management
6 - See the following table, column 1
7 - See the following table, column 2
8 - See the following table, column 3
9 - Power supply connection (on the back of the device)
10 - Integrated PoE PSU (on the back of the device)

<table>
<thead>
<tr>
<th>4 × Gigabit Ethernet PoE ports</th>
<th>4 × Gigabit Ethernet combo ports</th>
<th>4 × Gigabit Ethernet ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/100/1000 Mbit/s twisted pair, RJ45 sockets with PoE</td>
<td>100/1000 Mbit/s F/O, SFP slots</td>
<td>10/100/1000 Mbit/s twisted pair, RJ45 sockets</td>
</tr>
<tr>
<td>Alternatively: 10/100/1000 Mbit/s twisted pair, RJ45 sockets</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1.3 Supply voltage

Note: Note the safety instructions in “Requirements for connecting electrical wires” on page 6.

1.3.1 MACH104-20TX-F...
Supply voltage is connected via a non-heating appliance socket.

Figure 4: MACH104-20TX-F connections on the back of the device
1 - Power supply 100 V AC ... 240 V AC
2 - MACH104-20TX-F... device

1.3.2 MACH104-20TX-FR...
Supply voltage is connected via non-heating appliance sockets. 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 5: MACH104-20TX-FR... connections on the back of the device
1 - Standard power supply 100 V AC ... 240 V AC
2 - MACH104-20TX-FR... device
3 - Redundant power supply 100 V AC ... 240 V AC

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.
1.3.3 MACH104-20TX-F-4-PoE...

Supply voltage is connected via a non-heating appliance socket.

![Figure 6: MACH104-20TX-F-4-PoE... connections on the back of the device](image)

1 - Standard power supply 100 V AC ... 240 V AC
2 - MACH104-20TX-F-4-PoE... device

1.4 Ethernet ports

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

1.4.1 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 21.

Delivery state: Autonegotiation activated
The port casing is electrically connected to the front panel.
The pin assignment corresponds to MDI-X.
1.4.2 100 Mbit/s F/O port

This port is 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

1.4.3 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

1.4.4 PoE ports

The device variants MACH104-20TX-F-4-PoE... support Power over Ethernet (PoE) in accordance with IEEE 802.3af.

<table>
<thead>
<tr>
<th>Ports</th>
<th>PoE support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 4</td>
<td>Yes</td>
</tr>
<tr>
<td>5 to 20</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 1: 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

Table 2: 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 following applies to PoE ports:
- max. Powered Device (PD) class 0 (15.4 W)
- 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.

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

1.5 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.

Figure 7: MACH104-Display elements
1 - Display elements device status
2 - Display elements port status
### 1.5.1 Device state

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

The following table applies to the stated device variants only:

- MACH104-20TX-FR...

<table>
<thead>
<tr>
<th>LED</th>
<th>Display</th>
<th>Color</th>
<th>Activity</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Supply voltage</td>
<td>—</td>
<td>none</td>
<td>Supply voltages 1 and 2 are too low.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>green</td>
<td>lights up</td>
<td>Supply voltage 1 and 2 is on</td>
</tr>
<tr>
<td></td>
<td></td>
<td>yellow</td>
<td>lights up</td>
<td>Supply voltage 1 or 2 is on</td>
</tr>
</tbody>
</table>

The following table applies to the stated device variants only:

- MACH104-20TX-F...
- MACH104-20TX-F-4-PoE...

<table>
<thead>
<tr>
<th>LED</th>
<th>Display</th>
<th>Color</th>
<th>Activity</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Supply voltage</td>
<td>—</td>
<td>none</td>
<td>Supply voltage is too low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>green</td>
<td>lights up</td>
<td>Supply voltage is on</td>
</tr>
</tbody>
</table>

The following table applies to every device variant:

<table>
<thead>
<tr>
<th>LED</th>
<th>Display</th>
<th>Color</th>
<th>Activity</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sb</td>
<td>Stand-by</td>
<td>—</td>
<td>none</td>
<td>Stand-by mode not enabled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>green</td>
<td>lights up</td>
<td>Standby mode enabled</td>
</tr>
<tr>
<td>FAULT</td>
<td>Signal contact</td>
<td>—</td>
<td>none</td>
<td>The signal contact is closed, it is not reporting any detected errors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>red</td>
<td>lights up</td>
<td>The signal contact is open - it is reporting a detected error.</td>
</tr>
<tr>
<td>RM</td>
<td>Ring Manager</td>
<td>—</td>
<td>none</td>
<td>The RM function is deactivated.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>green</td>
<td>lights up</td>
<td>The RM function is active.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>flashing</td>
<td>The device detects an incorrect configuration of the HIPER-Ring (for example the ring is not connected to the ring port).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>yellow</td>
<td>lights up</td>
<td>The RM function is active.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The redundant port is enabled.</td>
</tr>
</tbody>
</table>
If the manual setting is active on the signal contact “FAULT”, then the error display is independent of the setting of the signal contact.

### 1.5.2 Port status

These LEDs display port-related information.

<table>
<thead>
<tr>
<th>LED</th>
<th>Display</th>
<th>Color</th>
<th>Activity</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS</td>
<td>Link status</td>
<td>—</td>
<td>none</td>
<td>Device detects an invalid or missing link</td>
</tr>
<tr>
<td></td>
<td>green</td>
<td></td>
<td>lights up</td>
<td>Device detects a valid link</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>flashes 1 time a period</td>
<td>Port is switched to stand-by</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>flashes 3 times a period</td>
<td>Port is switched off</td>
</tr>
<tr>
<td>DA</td>
<td>Data traffic</td>
<td>yellow</td>
<td>flashing</td>
<td>Device is transmitting and/or receiving data</td>
</tr>
</tbody>
</table>

| RM and Sb | ACA memory operations | green flashing alternately | Error in the memory operation |
|           |                       | flashes synchronously 2 x per period | Saves a configuration file from the storage medium ACA to the device. |
|           |                       | flashes synchronously 1 x per period | Saves a configuration file from the device to the storage medium ACA. |
1.6 Management interfaces

1.6.1 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.
- The AutoConfiguration Adapter ACA11

<table>
<thead>
<tr>
<th>VT100 terminal settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
</tr>
<tr>
<td>Data</td>
</tr>
<tr>
<td>Stopbit</td>
</tr>
<tr>
<td>Handshake</td>
</tr>
<tr>
<td>Parity</td>
</tr>
</tbody>
</table>

The interface casing is electrically connected to the front panel.
The V.24 interface is not electrically isolated from the supply voltage.

![Diagram of pin assignment of the V.24 interface and the DB9 plug](image)

*Figure 8: 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 (see on page 37 “Technical data”).
1.6.2 USB interface

The USB interface allows you to connect the AutoConfiguration Adapter ACA21-USB (EEC) storage medium. This is used for saving/loading the configuration data and diagnostic information, and for loading the software. See “Accessories and order numbers” on page 44.

<table>
<thead>
<tr>
<th>Figure</th>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>VCC (VBus)</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>- Data</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>+ Data</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Ground (GND)</td>
</tr>
</tbody>
</table>

Table 3: Pin assignment of the USB interface

1.7 Signal contact

The signal contact is a potential-free relay contact. The signal contact is open when the device is not connected to a power supply. The signal contact allows you to control external devices or monitor device functions.

In the configuration, you specify how the device uses the signal contact. You find detailed information regarding possible applications and configuration of the signal contact in the software user documentation on the Hirschmann product pages (www.hirschmann.com).
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
- Installing an SFP transceiver (optional)
- 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 6.

2.1 Checking the package contents

☐ Check whether the package includes all items named in the section “Scope of delivery, order numbers and accessories” on page 44.
☐ 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 44.

Figure 10: 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 Wiring and installing the signal contact

![Figure 11: 2-pin terminal block](image)

#### 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 37.

- 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 37
2.4 Installing the device and grounding

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

2.4.1 Selecting the assembly location

Select the assembly location according to the safety guidelines (see on page 5 “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.

2.4.2 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.

2.4.3 Mounting in a switch cabinet

Note: Note the instructions on installations in 19" switch cabinets according to UL 60950-1. See “Relevant for installations in switch cabinets according to UL 60950-1” on page 12.

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 12: Assembly in a switch cabinet with sliding/mounting rails
1 - MACH104 device
2 - sliding/mounting rail
3 - 19" switch cabinet

Figure 13: Mounting the MACH104 in the 19" cabinet

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

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 44.

2.4.4 Mounting on the wall

- 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 14.
You obtain the additional brackets as accessories. See “Accessories and order numbers” on page 44.

Fasten the device by screwing the brackets to the wall.

Figure 14: Vertical mounting on the wall

2.4.5 Grounding the device
The device is grounded via the power supply connections.
2.5 Operating the device

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELECTRIC SHOCK</td>
</tr>
<tr>
<td>Connect only a supply voltage that corresponds to the type plate of your device.</td>
</tr>
<tr>
<td>Failure to follow these instructions can result in death, serious injury, or equipment damage.</td>
</tr>
</tbody>
</table>

Note: Note the safety instructions in “Requirements for connecting electrical wires” on page 6.

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

2.6 Connecting data cables

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

Further information: See “Ethernet ports” on page 20.

☐ Connect the data cables according to your requirements.
3 Making basic settings

Note: Two 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
  - 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
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 37.

☐ 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.

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 15: Disassembling the device](image)

5.2 Removing an SFP transceiver (optional)

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).

![Figure 16: De-installing SFP transceivers: De-installation sequence](image)
# 6 Technical data

## 6.1 General technical data

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>See “Dimension drawings” on page 38.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>MACH104-20TX-F... 9.26 lb (4.2 kg)</td>
</tr>
<tr>
<td></td>
<td>MACH104-20TX-FR... 9.7 lb (4.4 kg)</td>
</tr>
<tr>
<td></td>
<td>MACH104-20TX-F-4-PoE... 10.14 lb (4.6 kg)</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>Rated voltage range 100 V AC ... 240 V AC, 50 Hz ... 60 Hz</td>
</tr>
<tr>
<td></td>
<td>Voltage range including maximum tolerances 90 V AC ... 265 V AC, 47 Hz ... 63 Hz</td>
</tr>
<tr>
<td>Current consumption</td>
<td>Rated current for devices without PoE max. 0.3 A (240 V AC) max. 0.5 A (100 V AC)</td>
</tr>
<tr>
<td></td>
<td>Rated current for devices with PoE max. 0.9 A (240 V AC) max. 1.7 A (100 V AC)</td>
</tr>
<tr>
<td>Activation current</td>
<td>typ. &lt; 40 A at 265 V AC and cold start</td>
</tr>
<tr>
<td>PoE power</td>
<td>Maximum number of Powered Devices (PDs) This applies to the following device variants only: MACH104-20TX-F-4-PoE... 4 × Powered Device (PD) Class 0 (15.4 W)</td>
</tr>
<tr>
<td>Power loss buffer</td>
<td>&gt; 12 ms (115 V AC)</td>
</tr>
<tr>
<td>Overload current protection at input</td>
<td>Non-replaceable fuse</td>
</tr>
<tr>
<td>Climatic conditions during operation</td>
<td>Ambient air temperatureᵃ +32 °F ... +122 °F (0 °C ... +50 °C)</td>
</tr>
<tr>
<td></td>
<td>Humidity 20 % ... 90 % (non-condensing)</td>
</tr>
<tr>
<td></td>
<td>Air pressure min. 795 hPa (+6562 ft; +2000 m) max. 1060 hPa (~1312 ft; ~400 m)</td>
</tr>
<tr>
<td>Climatic conditions during storage</td>
<td>Ambient air temperatureᵇ −4 °F ... +185 °F (−20 °C ... +85 °C)</td>
</tr>
<tr>
<td></td>
<td>Humidity 10 % ... 95 % (non-condensing)</td>
</tr>
<tr>
<td></td>
<td>Air pressure min. 700 hPa (+9842 ft; +3000 m) max. 1060 hPa (~1312 ft; ~400 m)</td>
</tr>
<tr>
<td>Signal contact</td>
<td>Switching current max. 1 A, SELV</td>
</tr>
<tr>
<td></td>
<td>Switching voltage max. 60 V DC or max. 30 V AC, SELV</td>
</tr>
<tr>
<td></td>
<td>Connection type 2-pin terminal block max. conductor cross section AWG16 (1.3 mm²)</td>
</tr>
<tr>
<td></td>
<td>Tightening torque 2.2 lb-in (0.25 Nm)</td>
</tr>
<tr>
<td>Pollution degree</td>
<td>2</td>
</tr>
<tr>
<td>Protection classes</td>
<td>Laser protection Class 1 in compliance with IEC 60825-1</td>
</tr>
<tr>
<td></td>
<td>Degree of protection IP30</td>
</tr>
</tbody>
</table>

---

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

<table>
<thead>
<tr>
<th>EMC interference immunity</th>
<th>60 Hz</th>
<th>60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC/EN 61000-4-2 Electrostatic discharge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact discharge</td>
<td>6 kV</td>
<td></td>
</tr>
<tr>
<td>Air discharge</td>
<td>8 kV</td>
<td></td>
</tr>
<tr>
<td>IEC/EN 61000-4-3 Electromagnetic field</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80 MHz ... 3000 MHz</td>
<td>max. 20 V/m</td>
<td></td>
</tr>
<tr>
<td>IEC/EN 61000-4-4 Fast transients (burst)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power line</td>
<td>2 kV</td>
<td></td>
</tr>
<tr>
<td>Data line</td>
<td>4 kV</td>
<td></td>
</tr>
</tbody>
</table>
### EMC interference immunity

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC/EN 61000-4-5</td>
<td>Voltage surges</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power line, line / line</td>
<td>1 kV</td>
</tr>
<tr>
<td></td>
<td>Power line, line / ground</td>
<td>2 kV</td>
</tr>
<tr>
<td></td>
<td>Data line</td>
<td>4 kV</td>
</tr>
<tr>
<td>IEC/EN 61000-4-6</td>
<td>Conducted disturbances</td>
<td></td>
</tr>
<tr>
<td></td>
<td>150 kHz ... 80 MHz</td>
<td>10 V</td>
</tr>
<tr>
<td>EN 61000-4-9</td>
<td>Pulse magnetic fields</td>
<td>300 A/m</td>
</tr>
</tbody>
</table>

### EMC interference emission

<table>
<thead>
<tr>
<th>Standard</th>
<th>Class</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN 55032</td>
<td>Class A</td>
<td>Yes</td>
</tr>
<tr>
<td>FCC 47 CFR Part 15</td>
<td>Class A</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### 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>
<thead>
<tr>
<th>Table 4: Network range: 10/100/1000 Mbit/s twisted pair port</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Product code</th>
<th>Modea</th>
<th>Wave length</th>
<th>Fiber</th>
<th>System attenuation</th>
<th>Example for F/O cable lengthb</th>
<th>Fiber attenuation</th>
<th>BLP/Dispersion</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-FAST-SFP-...</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-MM/LC...</td>
<td>MM</td>
<td>1310 nm</td>
<td>50/125 µm</td>
<td>0 dB ... 8 dB</td>
<td>0 mi ... 3.11 mi (0 km ... 5 km)</td>
<td>1.0 dB/km</td>
<td>800 MHz×km</td>
</tr>
<tr>
<td>-MM/LC...</td>
<td>MM</td>
<td>1310 nm</td>
<td>62.5/125 µm</td>
<td>0 dB ... 11 dB</td>
<td>0 mi ... 2.49 mi (0 km ... 4 km)</td>
<td>1.0 dB/km</td>
<td>500 MHz×km</td>
</tr>
<tr>
<td>-SM/LC...</td>
<td>SM</td>
<td>1310 nm</td>
<td>9/125 µm</td>
<td>0 dB ... 13 dB</td>
<td>0 mi ... 15.53 mi (0 km ... 25 km)</td>
<td>0.4 dB/km</td>
<td>3.5 ps/(nm×km)</td>
</tr>
<tr>
<td>-SM+/LC...</td>
<td>SM</td>
<td>1310 nm</td>
<td>9/125 µm</td>
<td>10 dB ... 29 dB</td>
<td>15.53 mi ... 40.39 mi (25 km ... 65 km)</td>
<td>0.4 dB/km</td>
<td>3.5 ps/(nm×km)</td>
</tr>
<tr>
<td>-LH/LC...</td>
<td>SM</td>
<td>1550 nm</td>
<td>9/125 µm</td>
<td>10 dB ... 29 dB</td>
<td>29.20 mi ... 64.62 mi (47 km ... 104 km)</td>
<td>0.25 dB/km</td>
<td>19 ps/(nm×km)</td>
</tr>
<tr>
<td>-LH/LC...</td>
<td>SM</td>
<td>1550 nm</td>
<td>9/125 µm</td>
<td>10 dB ... 29 dB</td>
<td>14.29 mi ... 86.99 mi (55 km ... 140 km)</td>
<td>0.18 dB/km</td>
<td>18 ps/(nm×km)</td>
</tr>
</tbody>
</table>

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

Table 6: 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.
<table>
<thead>
<tr>
<th>Product code</th>
<th>Mode&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Wave length TX</th>
<th>Wave length RX</th>
<th>Fiber</th>
<th>System attenuation</th>
<th>Example for F/O cable length&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Fiber attenuation</th>
<th>Dispersion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type A LX/LC EEC</td>
<td>SM</td>
<td>1310 nm</td>
<td>1550 nm</td>
<td>9/125 µm</td>
<td>0 dB ... 11 dB</td>
<td>0 km ... 12.43 mi (0 km ... 20 km)</td>
<td>0.4 dB/km</td>
<td>3.5 ps/(nm×km)</td>
</tr>
<tr>
<td>Type B LX/LC EEC</td>
<td>SM</td>
<td>1550 nm</td>
<td>1310 nm</td>
<td>9/125 µm</td>
<td>0 dB ... 11 dB</td>
<td>0 mi ... 12.43 mi (0 km ... 20 km)</td>
<td>0.25 dB/km</td>
<td>19 ps/(nm×km)</td>
</tr>
<tr>
<td>Type A LH/LC EEC</td>
<td>LH</td>
<td>1490 nm</td>
<td>1590 nm</td>
<td>9/125 µm</td>
<td>5 dB ... 24 dB</td>
<td>14.29 mi ... 49.71 mi (23 km ... 80 km)</td>
<td>0.25 dB/km</td>
<td>19 ps/(nm×km)</td>
</tr>
<tr>
<td>Type B LH/LC EEC</td>
<td>LH</td>
<td>1590 nm</td>
<td>1490 nm</td>
<td>9/125 µm</td>
<td>5 dB ... 24 dB</td>
<td>14.29 mi ... 49.71 mi (23 km ... 80 km)</td>
<td>0.25 dB/km</td>
<td>19 ps/(nm×km)</td>
</tr>
</tbody>
</table>

Table 7: 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.
## 6.5 Power consumption/power output

<table>
<thead>
<tr>
<th>MACH104 device</th>
<th>Maximum power consumption</th>
<th>Maximum power output</th>
</tr>
</thead>
<tbody>
<tr>
<td>MACH104-20TX-F...</td>
<td>35 W</td>
<td>119 Btu (IT)/h</td>
</tr>
<tr>
<td>MACH104-20TX-FR...</td>
<td>35 W</td>
<td>119 Btu (IT)/h</td>
</tr>
<tr>
<td>MACH104-20TX-F-4-PoE..., with 4 × Class 0 Powered-Device connected</td>
<td>110 W</td>
<td>170 Btu (IT)/h</td>
</tr>
</tbody>
</table>
7 Scope of delivery, order numbers and accessories

- **MACH104-20TX-F...**

<table>
<thead>
<tr>
<th>Number</th>
<th>Article</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ×</td>
<td>General safety instructions</td>
</tr>
<tr>
<td>1 ×</td>
<td>Device</td>
</tr>
<tr>
<td>1 ×</td>
<td>2-pin terminal block for signal contact</td>
</tr>
<tr>
<td>2 ×</td>
<td>Brackets with fastening screws (pre-mounted)</td>
</tr>
<tr>
<td>1 ×</td>
<td>Casing feet, stick on</td>
</tr>
<tr>
<td>1 ×</td>
<td>Non-heating appliance cable (Euro model)</td>
</tr>
</tbody>
</table>

- **MACH104-20TX-FR...**

<table>
<thead>
<tr>
<th>Number</th>
<th>Article</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ×</td>
<td>General safety instructions</td>
</tr>
<tr>
<td>1 ×</td>
<td>Device</td>
</tr>
<tr>
<td>1 ×</td>
<td>2-pin terminal block for signal contact</td>
</tr>
<tr>
<td>2 ×</td>
<td>Brackets with fastening screws (pre-mounted)</td>
</tr>
<tr>
<td>1 ×</td>
<td>Casing feet, stick on</td>
</tr>
<tr>
<td>2 ×</td>
<td>Non-heating appliance cable (Euro model)</td>
</tr>
</tbody>
</table>

- **MACH104-20TX-F-4-PoE...**

<table>
<thead>
<tr>
<th>Number</th>
<th>Article</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ×</td>
<td>General safety instructions</td>
</tr>
<tr>
<td>1 ×</td>
<td>Device</td>
</tr>
<tr>
<td>1 ×</td>
<td>2-pin terminal block for signal contact</td>
</tr>
<tr>
<td>2 ×</td>
<td>Brackets with fastening screws (pre-mounted)</td>
</tr>
<tr>
<td>1 ×</td>
<td>Casing feet, stick on</td>
</tr>
<tr>
<td>1 ×</td>
<td>Non-heating appliance cable (Euro model)</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>MACH104device</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>MACH104-20TX-F-L2P</td>
<td>942 003-001</td>
</tr>
<tr>
<td>MACH104-20TX-FR-L2P</td>
<td>942 003-101</td>
</tr>
<tr>
<td>MACH104-20TX-F-4-PoE-L2P</td>
<td>942 003-201</td>
</tr>
<tr>
<td>MACH104-20TX-F-L3P</td>
<td>942 003-002</td>
</tr>
<tr>
<td>MACH104-20TX-FR-L3P</td>
<td>942 003-102</td>
</tr>
<tr>
<td>MACH104-20TX-F-4-PoE-L3P</td>
<td>942 003-202</td>
</tr>
<tr>
<td>Name</td>
<td>Order number</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>AutoConfiguration AdapterACA21-USB (EEC)</td>
<td>943 271-003</td>
</tr>
<tr>
<td>AutoConfiguration AdapterACA11</td>
<td>943 751-001</td>
</tr>
<tr>
<td>Terminal cable</td>
<td>943 301-001</td>
</tr>
<tr>
<td>2-pin terminal block (50 pieces)</td>
<td>943 845-010</td>
</tr>
<tr>
<td>Bracket for fastening the casing</td>
<td>943 943-001</td>
</tr>
<tr>
<td>Bracket, long (+ 1.97 in (50 mm)), for fastening the casing (extra)</td>
<td>943 943-101</td>
</tr>
<tr>
<td>Network management software Industrial HiVision</td>
<td>943 156-xxx</td>
</tr>
<tr>
<td>OPC Server software HiOPC</td>
<td>943 055-001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gigabit Ethernet SFP transceiver</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-SFP-TX/RJ45</td>
<td>943 977-001</td>
</tr>
<tr>
<td>M-SFP-TX/RJ45 EEC</td>
<td>942 161-001</td>
</tr>
</tbody>
</table>

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.

- Only support of the autonegotiation mode including autocrossing.

<table>
<thead>
<tr>
<th>Gigabit Ethernet SFP transceiver</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-SFP-SX/LC</td>
<td>943 014-001</td>
</tr>
<tr>
<td>M-SFP-SX/LC EEC</td>
<td>943 896-001</td>
</tr>
<tr>
<td>M-SFP-MX/LC EEC</td>
<td>942 108-001</td>
</tr>
<tr>
<td>M-SFP-LX/LC</td>
<td>943 015-001</td>
</tr>
<tr>
<td>M-SFP-LX/LC EEC</td>
<td>943 897-001</td>
</tr>
<tr>
<td>M-SFP-LX+/LC</td>
<td>942 023-001</td>
</tr>
<tr>
<td>M-SFP-LX+/LC EEC</td>
<td>942 024-001</td>
</tr>
<tr>
<td>M-SFP-LH/LC</td>
<td>943 042-001</td>
</tr>
<tr>
<td>M-SFP-LH/LC EEC</td>
<td>943 898-001</td>
</tr>
<tr>
<td>M-SFP-LH+/LC</td>
<td>943 049-001</td>
</tr>
<tr>
<td>M-SFP-LH+/LC EEC</td>
<td>942 119-001</td>
</tr>
<tr>
<td>SFP-GIG-LX/LCa</td>
<td>942 196-001</td>
</tr>
<tr>
<td>SFP-GIG-LX/LCd</td>
<td>942 196-002</td>
</tr>
</tbody>
</table>

a. You find further information on certifications on the Internet at the Hirschmann product pages (www.hirschmann.com).
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.
- To set autocrossing manually is currently not possible.

<table>
<thead>
<tr>
<th>Fast Ethernet SFP transceiver</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-FAST SFP-TX/RJ45</td>
<td>942 096-001</td>
</tr>
<tr>
<td>M-FAST SFP-TX/RJ45 EEC</td>
<td>942 098-002</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bidirectional Gigabit Ethernet SFP transceiver</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-SFP-BIDI Type A LX/LC EEC</td>
<td>943 974-001</td>
</tr>
<tr>
<td>M-SFP-BIDI Type B LX/LC EEC</td>
<td>943 974-002</td>
</tr>
<tr>
<td>M-SFP-BIDI Type A LH/LC EEC</td>
<td>943 975-001</td>
</tr>
<tr>
<td>M-SFP-BIDI Type B LH/LC EEC</td>
<td>943 975-002</td>
</tr>
<tr>
<td>M-SFP-BIDI Bundle LX/LC EEC (type A + B)</td>
<td>943 974-101</td>
</tr>
<tr>
<td>M-SFP-BIDI Bundle LH/LC EEC (type A + B)</td>
<td>943 975-101</td>
</tr>
</tbody>
</table>

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

Hirschmann Competence Center
The Hirschmann Competence Center is ahead of its competitors on three counts with its complete range of innovative services:

▶ Consulting incorporates comprehensive technical advice, from system evaluation through network planning to project planning.

▶ Training offers you an introduction to the basics, product briefing and user training with certification.
  You find the training courses on technology and products currently available at http://www.hicomcenter.com.

▶ Support ranges from the first installation through the standby service to maintenance concepts.

With the Hirschmann Competence Center, you decided against making any compromises. Our client-customized package leaves you free to choose the service components you want to use.

Internet:
http://www.hicomcenter.com