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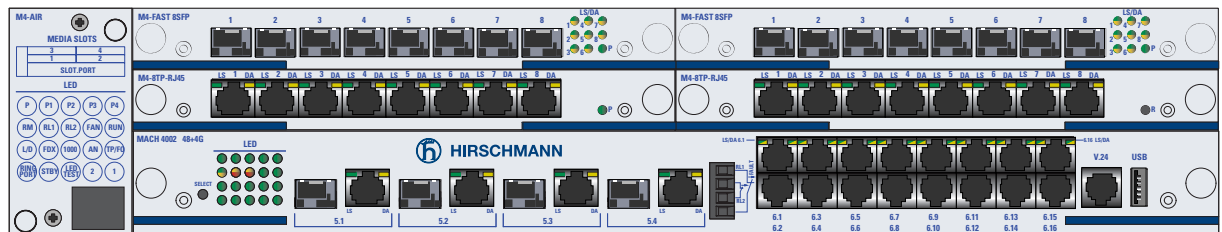
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



User Manual

Installation

Modular Industrial ETHERNET Backbone Switch MACH 4002 Family



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Hirschmann Automation and Control GmbH
Stuttgarter Straße 45-51
72654 Neckartenzlingen
Tel. +49 1805 141538

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Safety instructions

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

■ Certified usage

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

■ Supply voltage

For reasons of safety, the fuse installed in the slide-in power supply units must not be changed.

- The complete defective plug-in part must be replaced.
- Only switch on the device when the housing is closed. Close all empty slots with a panel.
- The devices may only be connected to the supply voltage shown on the type plate.
- The DC modules (M4-...-...VDC 300W) are designed for operation with a safety extra-low voltage. Thus, they may only be connected to the supply voltage connections with PELV circuits or alternatively SELV circuits with the voltage restrictions in accordance with IEC/EN 60950.
- For the case where the DC modules (M4-...-...VDC 300W) are operated with external power supply: Use only a safety extra-low voltage in accordance with IEC 950/EN 60 950/VDE 0805 to power the system.
- Connect the power supply cord only if the power supply unit is tightly screwed to the chassis.
- If you are using the M4-POWER power unit chassis: Check the configuration of the connection plug and the power supply cable to the switch chassis before you connect an external voltage to the M4-POWER inputs.
- Only use connecting cables which are permitted for a temperature range from 0°C to 60 °C.

Relevant for North America:

- Use 60/75°C or 75°C copper(CU)wire only.

■ Shielding ground

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

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

■ **Housing**

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

The device is grounded via the power supply connections.

- Make sure that the electrical installation meets local or nationally applicable safety regulations.
- The ventilation slits must not be covered so as to ensure free air circulation.
- The distance to the ventilation slots of the housing has to be a minimum of 10 cm.
- Never insert pointed objects (thin screwdrivers, wires, etc.) into the inside of the subrack! This especially applies to the area behind the socket connectors. Failure to observe this point may result in injuries caused by electric shocks.
- Cover empty slots with blank panels.
- Modules, fans and power supply units of a switched-on device may only be installed or deinstalled by an electrician.
- The Basic Board must not be deinstalled.
Deinstallation of the Basic Board invalidates the guarantee.
- The device has to be mounted in a horizontal position.
- After the device being switched off, the fan will continue to rotate a few moments. Never reach into the rotating fan!
- The internal workings of the chassis are not for users! Do not reach inside a switched-on device because of the danger caused by high energy densities.
- When fully equipped with media modules, the device weighs up to 10 kg. Please comply with the legally stipulated maximum weight when handling heavy objects.

■ **Ambient conditions**

The device may only be operated in the listed maximum surrounding air temperature range at the listed relative air humidity range (non-condensing).

- The installation location is to be selected so as to ensure compliance with the climatic limits listed in the Technical Data.
- To be used in an environment with a Pollution Degree according to the Technical Data only.

■ **Qualification requirements for personnel**

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

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

■ **General Safety Instructions**

This device is electrically operated. Adhere strictly to the safety requirements relating to voltages applied to the device as described in the operating instructions!

Failure to observe the information given in the warnings could result in serious injury and/or major damage.

- Only personnel that have received appropriate training should operate this device or work in its immediate vicinity. The personnel must be fully familiar with all of the warnings and maintenance measures in these operating instructions.
- Correct transport, storage, and assembly as well as careful operation and maintenance are essential in ensuring safe and reliable operation of this device.
- Only use undamaged parts!
- These products are only to be used in the manner indicated in this version of the manual.
- Any work that may have to be performed on the electrical installation should be performed by fully qualified technicians only.

Warning!

LED- or LASER components according to IEC 60825-1 (2001):
CLASS 1 LASER PRODUCT.
LIGHT EMITTING DIODE - CLASS 1 LED PRODUCT.

■ **National and international safety regulations**

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

■ **ESD guidelines**

The media modules contain components highly sensitive to electrostatic fields. These components can be easily destroyed or have their lives shortened by an electrical field or by a discharge caused by touching the card.

For these reasons, the extension modules are delivered in a conducting ESD protective bag. This packaging can be reused.

Be sure to observe the following precautions for electrostatic sensitive devices when handling the components:

Establish electrical potential equality between yourself and your surroundings, e.g. with the aid of a wrist bracelet that you attach to the chassis (knurled screw of an interface card). When the power supply cable is connected, the chassis is grounded via the power supply connection.

Only then remove the card from the conducting bag.

Store the card in its conducting bag whenever it is not in the chassis. ESD protective field kits are available for working with electrostatic sensitive devices.

You can find more information about devices vulnerable to electrostatic fields in DIN/IEC 47 (Sec) 1330; February 1994 Edition and DIN EN 100 015.

■ **Note on the CE marking**

The devices comply with the regulations contained in the following European directives:

89/336/EEC

Directive of the council for standardizing the regulations of member states on electromagnetic compatibility (changed by RL 91/263/EEC, 92/31/EEC and 93/68/EEC).

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

Hirschmann Automation and Control GmbH

Stuttgarter Straße 45-51

D-72654 Neckartenzlingen

Germany

Phone ++49 7127 14 1480

The product can be used in living areas (living area, place of business, small business) and in industrial areas.

▶ Interference immunity: EN 61000-6-2:2001

▶ Emitted interference: EN 55022:1998 + A1 2000 Class A

Warning!

This is a class A device. This device can cause interference in living areas, and in this case the operator may be required to take appropriate measures.

The assembly guidelines provided in these instructions must be strictly adhered to in order to observe the EMC value limits.

■ FCC note:

Appropriate testing has established that this device fulfills the requirements of a class A digital device in line with part 15 of the FCC regulations.

These requirements are designed to provide sufficient protection against interference where the device is being used in a business environment. The device creates and uses high frequencies and can radiate same, and if it is not installed and used in accordance with this operating manual, it can cause radio transmission interference. The use of this device in a living area can also cause interference, and in this case the user is obliged to cover the costs of removing the interference.

■ Recycling note:

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

About this manual

The following manuals are included as PDF files on the enclosed CD ROM:

- ▶ User manual "Installation"
- ▶ User manual "Basic configuration"
- ▶ User manual "Redundancy configuration"
- ▶ User manual "Router configuration"
- ▶ Reference manual "Web-based Interface" and
- ▶ Reference manual "Command Line Interface"

If you use Network Management Software HiVision you have further opportunities to:

- ▶ have an event logbook.
- ▶ configure the "System Location" and "System Name".
- ▶ configure the network address range and SNMP parameters.
- ▶ save the configuration on the Switch.
- ▶ simultaneous configuration of several Switches.
- ▶ configure the relevant ports to be displayed red if there is no link state.

With the network management software Industrial HiVision you increase network security in industrial applications:

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

Legend

The commendations used in this manual have the following meanings:

-
- ▶ Listing
 - Work step
 - **Subheading**
-

1 Description of the device

The modular, industry-compatible MACH 4002 Gigabit ETHERNET system is used as an industrial backbone system, and also in applications with high data volumes, such as Video over IP.

The MACH 4002 is a modular, industry-compatible Gigabit ETHERNET system in a 19" chassis that is also suitable for use as an industrial backbone system.

The MACH4002 devices are designed for the special requirements of industrial automation. They meet the relevant industry standards, provide very high operational reliability, even under extreme conditions, and also long-term reliability and flexibility. The power is supplied by an AC or DC power unit at the back of the device, or it is supplied redundantly via a power unit chassis with up to three hot-swap-capable slide-in power units. The switches and the power unit chassis can be mounted in the 19" rack.

The HIPER-Ring redundancy concept enables you to quickly carry out a reconfiguration, and also a simple configuration with only one additional connection. The diagnosis LEDs for displaying the operating parameters provide a quick overview.

It can be easily managed via a Web browser, via Telnet, with a management software product (such as *#iVision*) or locally on the switch (V.24 interface).

The MACH4002 is composed of a Switch with media modules that can be plugged into it. It allows you to construct switched Industrial ETHERNET networks that conform to the IEEE 802. and 802.3u standard using copper wires or optical fibers in a bus or ring topology. TP/TX/FL/FX terminal devices or other TP/TX/FL/FX segments can be connected to the 10/100/1000 Mbit/s ports of the media modules. The twisted pair ports support autocrossing, autonegotiation and autopolarity.

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

- ▶ Redundancy functions
(Rapid Spanning Tree, Redundant Ring Structure, HIPER-Ring, Redundant Coupling, Link Aggregation, Redundant Power Supply)
- ▶ Protection from unauthorized access
- ▶ Synchronized system time in the network
- ▶ Network load control
- ▶ Function diagnosis
- ▶ Diagnostics (hardware self-testing)
- ▶ Reset
- ▶ Priority
- ▶ VLAN
- ▶ Topology recognition

- ▶ Web-based interface
- ▶ Command Line Interface - CLI
- ▶ SNMP
- ▶ 802.1x port authentication
- ▶ Real Time Clock
- ▶ Routing
- ▶ Access Control List ACL

In addition, to the MACH family backbone switches, the RS20/RS30 Open Rail range of switches and the MICE family, the BAT wireless transmission system, the EAGLE security system, and products for the LION control room, provides continuous communication across all levels of the company.

1.1 Basic device MACH 4002 48+4G

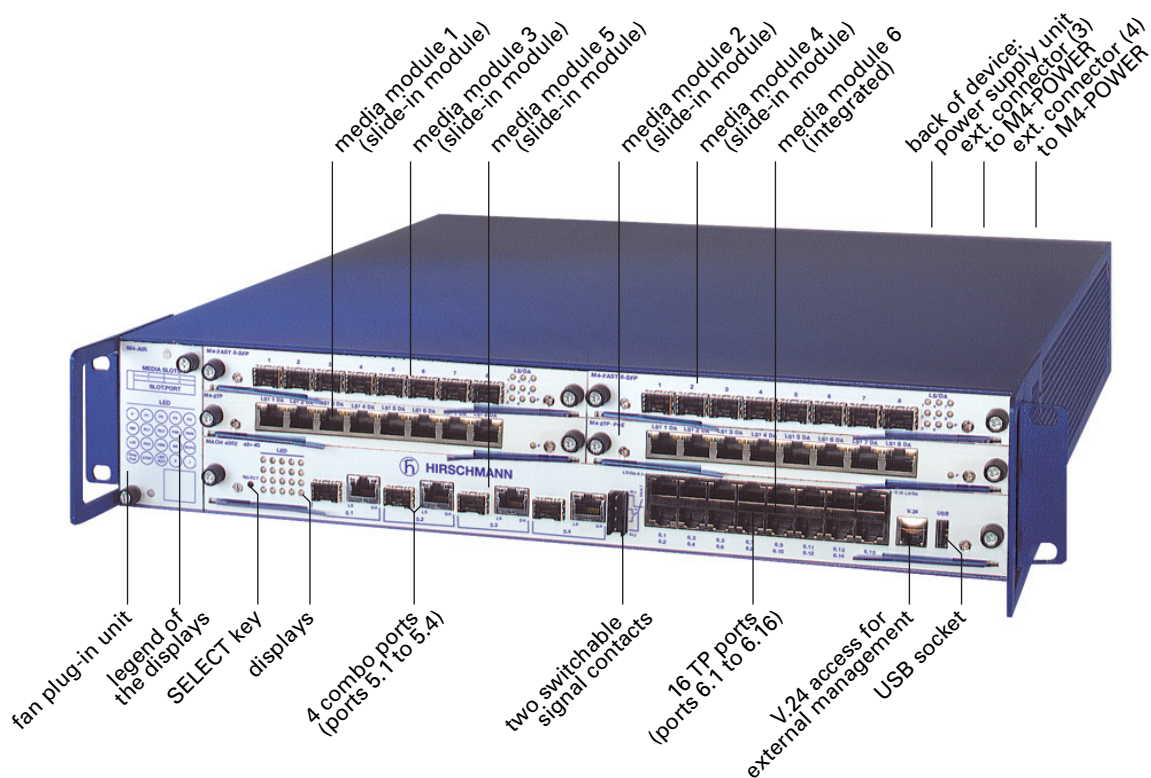


Fig. 1: Structure of the MACH 4002 48+4G basic device

The MACH 4002 48+4G chassis are 2 height modules high (approx. 88 mm) and, depending on the media modules that are connected, they provide you with up to 48 Fast ETHERNET and 4 Gigabit ETHERNET ports.

The chassis differ as to the range of functions of the software (see table [“Order numbers/Product name” on page 37](#)).

- ▶ Layer 2 Professional
- ▶ Layer 3 Enhanced
- ▶ Layer 3 Professional

A chassis has 4 slots for media modules (modules 1 to 4) that are hot-swappable and each provide 8 Fast ETHERNET ports. The media modules differ with regard to the number of interfaces and the media type for connecting segments.

The integrated Basic Board is located below the modules.

It has 4 Gigabit ETHERNET ports (comboports, which are SFP slots and RJ45 sockets for 10/100/1000BASE-T, module 5) and 16 Fast ETHERNET ports (10/100BASE-TX, module 6).

Along with the Gigabit and Fast Ethernet ports, the front of the Basic Board also has the following connections:

- ▶ A USB socket for connecting an ACA21-USB AutoConfiguration Adapter
- ▶ A V.24 socket for the network management connection
- ▶ Two signal contacts that are integrated on one socket together

The LED display block on the left side of the Basic Board informs you about the status of the device. You use the SELECT button to define the meaning of the LED displays.

At the front left of the base chassis of the MACH 4002, there is a replaceable fan plug-in unit.

At the back of the device, a power unit can be slotted directly into the chassis:

- ▶ AC slide-in power unit 300W
- ▶ 24 VDC slide-in power unit 300W (2 connections coupled via diodes)
- ▶ 48 VDC slide-in power unit 300W (2 connections coupled via diodes)

At the back of the device, there are also two external inputs (no. 3 + 4) for the redundant power supply via the M4-POWER power unit chassis.

The M4-POWER power unit chassis enables redundant power supply.

The power supply cable(s) between M4-POWER and MACH 4002 are connected at the back of the MACH 4002 device.

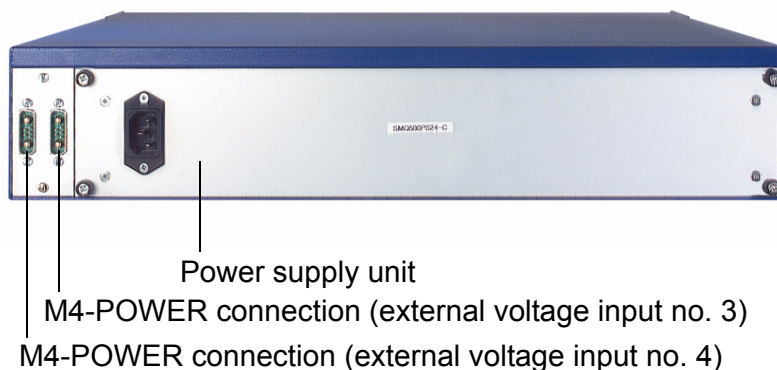
M4-POWER provides you with 3 slots for slide-in power units:

- ▶ AC slide-in power unit 300W
- ▶ 24 VDC slide-in power unit 300W (2 connections coupled via diodes)
- ▶ 48 VDC slide-in power unit slot 300W (2 connections coupled via diodes)

The device conforms to the specifications of the standards ISO/IEC 8802-3u 100BASE-TX/-1000BASE-T, ISO/IEC 8802-3 100BASE-FX and ISO/IEC 8802-3 1000BASE-SX/LX.

1.2 Voltage supply

On the back of the device there is a slot for a power supply unit (AC or DC) and two inputs for the redundant power supply via the M4-POWER power unit chassis.



1.2.1 Power supply on back of device

■ Slide-in power units for MACH 4002 switch chassis

- ▶ M4-S-AC/DC 300W
- ▶ M4-S-24VDC 300W, 2 inputs for redundant power supply
- ▶ M4-S-48VDC 300W, 2 inputs for redundant power supply

See [“Order numbers/Product name” on page 37](#)

Note: The slide-in power units of the power unit chassis cannot be used for the switch chassis.

1.2.2 M4-POWER power unit chassis

The M4-POWER power unit chassis enables redundant power supply. It has three slots for slide-in power units. The slide-in power units can be replaced during operation (hot-swappable).

Depending on the slide-in power units connected, you can use an M4-POWER power unit chassis to realize the redundant power supply for several MACH 4002 devices.

You connect the M4-POWER power unit to the M4-POWER connection on the back of the MACH 4002 device using exclusively the power supply cable supplied with the M4-P-xx slide-in power units.

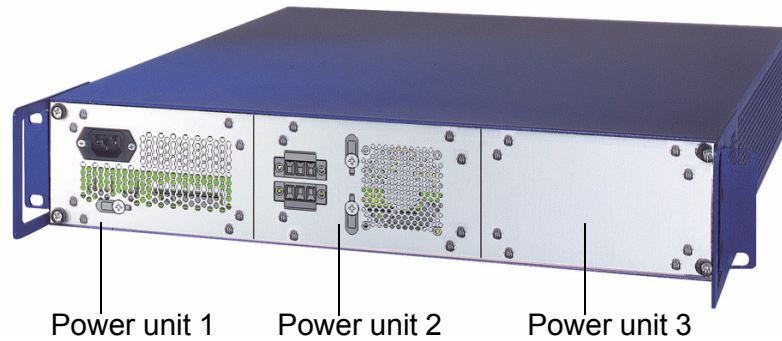


Fig. 2: M4-POWER power unit chassis with up to 3 slide-in power units

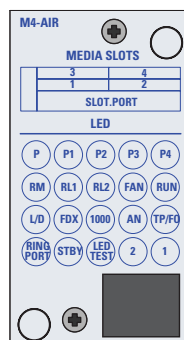
■ Slide-in power units for M4-POWER power unit chassis

- ▶ M4-P-AC/DC 300W
 - ▶ M4-P-24VDC 300W, 2 inputs for redundant power supply
 - ▶ M4-P-48VDC 300W, 2 inputs for redundant power supply
- see [“Order numbers/Product name” on page 37](#).

Note: The slide-in power units of the switch chassis cannot be used for the power unit chassis.

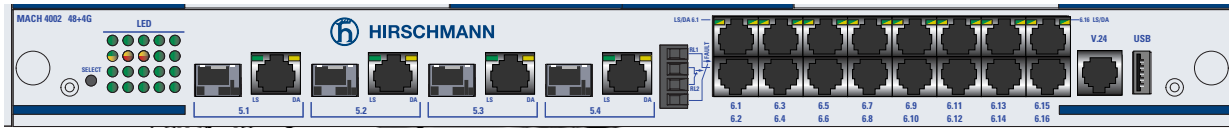
1.3 Fan plug-in unit M4-AIR

The M4-AIR fan input is located on the left of the front side of the MACH 4002 chassis. The fan can be replaced during running operation (see [“Replacing the M4-AIR fan plug-in unit \(if required\)” on page 25](#)).



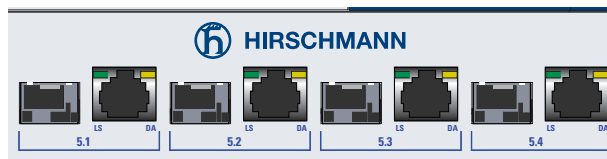
1.4 Integrated Basic Board

The integrated Basic Board provides you with 16 Fast ETHERNET and 4 Gigabit ETHERNET ports.



1.4.1 4 Gigabit ETHERNET ports (Combo)

There are four Gigabit ETHERNET ports (ports number 5.1 to 5.4) for connecting power unit segments on the left side of the Basic Board. The ports are RJ45 sockets, each with two integrated LEDs and an SFP slot.

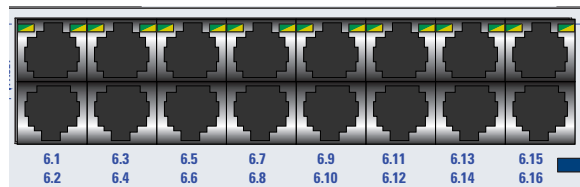


If an SFP plug-in module is mounted, the RJ45 socket is switched off. The LEDs each apply to the active port. You can use the SELECT button to test the TP or FO connections.

For the order numbers of the SFP plug-in modules, see [“Order numbers/Product name” on page 37](#).

1.4.2 16 Fast ETHERNET ports

There are 16 * 10/100BASE-TX ports (ports number 6.1 to 6.16) for connecting power unit segments on the right side of the Basic Board. These ports are RJ-45 connections.



1.5 Media modules

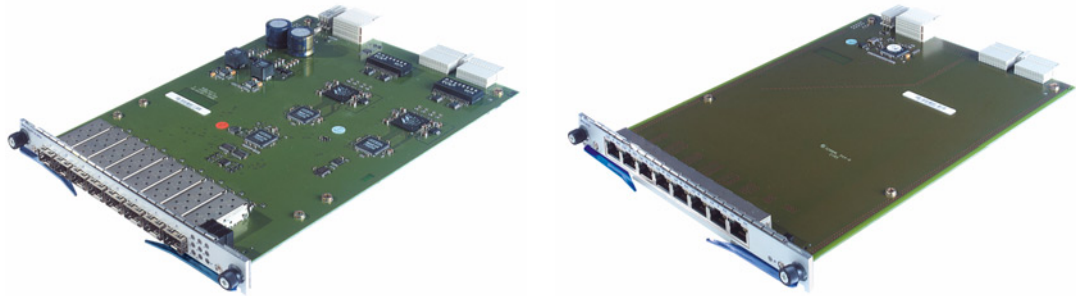
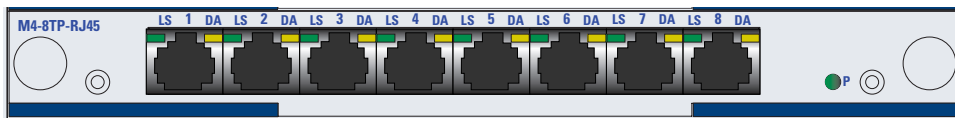


Fig. 3: SFP- and TP media module

1.5.1 Fast ETHERNET ports

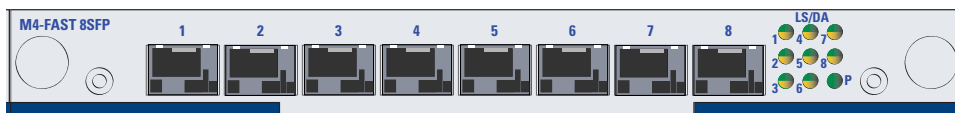
■ M4-8TP-RJ45

The M4-8TP-RJ45 media module provides you with eight 10/100BASE-TX ports (RJ-45 connections) for connecting power unit segments.



■ M4-FAST 8-SFP

The M4-FAST 8-SFP media module has eight 100BASE-FX ports (SFP slots for mounting SFP modules).



The following SFP plug-in modules (Fast ETHERNET SFP transceiver) are available to you for the M4-FAST 8-SFP media module:

- ▶ M-FAST SFP-MM/LC
- ▶ M-FAST SFP-SM/LC
- ▶ M-FAST SFP-SM+/LC
- ▶ M-FAST SFP-LH/LC

For the order numbers of the SFP plug-in modules, see [“Order numbers/Product name”](#) on page 37.

2 Assembly and startup procedure

The device has been developed for practical application in a harsh industrial environment. Accordingly, the installation process has been kept simple. On delivery, the device is ready for operation.

The following procedure is appropriate for assembly:

- ▶ Unpacking and checking
- ▶ Assembling the media modules
- ▶ Assembling the SFP modules (if required)
- ▶ Assembling the power supply unit on the back of the device
- ▶ Assembling the slide-in power units to the power unit chassis (if required)
- ▶ Setup or installation of the device in a 19" rack
- ▶ Grounding the device
- ▶ Assembling the power unit chassis (if required)
- ▶ Connecting to the MACH 4002
- ▶ Connecting the terminal block for signal contact
- ▶ Connecting the supply voltage, startup procedure
- ▶ Connecting the data lines
- ▶ Replacing the fan plug-in unit M4-AIR (if required)

2.1 Assembling the device

2.1.1 Unpacking and checking

- Check whether the package was delivered complete, see [“State of delivery” on page 31](#).
- Check the individual parts for transport damage.

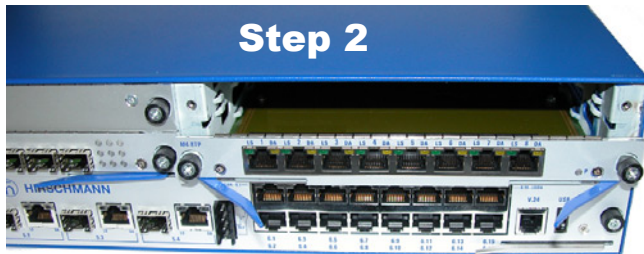
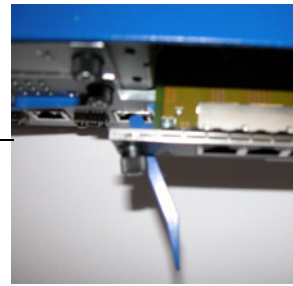
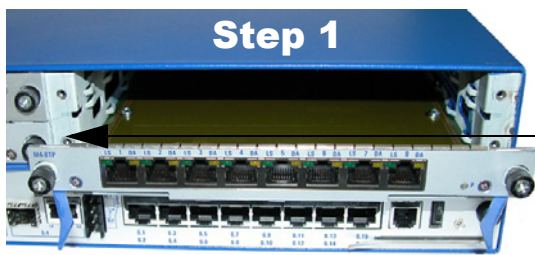
2.1.2 Assembling the media modules

The device has four inputs for connecting media modules.

The number of connectable network segments depends on the number of media modules installed. If the full four media modules with 8 ports each are connected, then in addition to the ports of the Basic Board, you get a further 32 ports for connecting power unit segments.

The modular design of the device allows you to easily expand the network yourself by installing the desired media modules.

Media modules can be assembled and disassembled during running operation (hot-swappable).

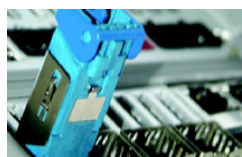


- Please observe the “ESD guidelines” on page 8 “ and the “Safety instructions” on page 5ff.
- Close the whole of the front surface beside the media modules with panels. This guarantees optimum shielding and convection. The slots for the media modules function identically. They can be selected in any order.
- Remove the covering panel to insert the media module.
- Note the positions of the blue insertion catches (see Fig., step 1).
- Insert the media module almost as far as it will go into the desired slot (see Fig., step 2).
- Make sure that there is a good connection between the multiple plugs of the media modules and the female multipoint of the system bus.
- Insert the media module as far as it will go into the desired slot by closing the blue insertion catches (see Fig., step 3).
- Screw the two knurled screws in the front panel of the media module flush with the frame of the chassis.

2.1.3 Assembling the SFP modules (if required)

- To fasten a SFP module, first remove the protective cap of the SFP module.
- Insert the SFP module with the closed lock into the socket until you hear it snap in.

Note: Only use SFP modules from Hirschmann.

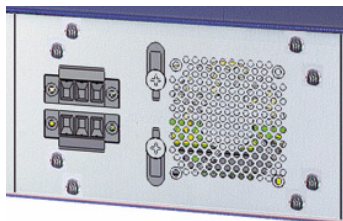


2.1.4 Assembling the power supply unit on the back of the device



- Remove the covering panel.
- Slide the power supply unit all the way into the chassis along the mounting rails above and below.
- Make sure that there is a good connection between the multiple plug of the slide-in power unit and the female multipoint of the system bus.
- Screw the four slotted-head screws in the front panel of the slide-in power unit flush with the frame of the chassis.

2.1.5 Assembling the slide-in power units to the power unit chassis (if required)



Replace a defective slide-in power supply unit only with a plug-in power supply unit of the same type.

- Disconnect the power cord.
- Loosen the eight screws used to fasten the plug-in power supply unit in the chassis and pull the unit out of the chassis or remove the covering plate of the power supply unit slot.
- Slide the new plug-in power supply unit into the chassis along the sub-racks above and below as far as it will go.
- Make sure that there is a good connection to the multipoint plug of the plug-in power supply unit the female multipoint connector of the system bus.
- Screw the slotted screws in the front panel of the unit with the frame of the chassis.
- Connect the power cord.

2.1.6 Setup or installation of the device in a 19" rack

■ Setup

Using the basic device as a desktop device:

- Attach the rubber foot delivered with the device to its underside.
 - First remove the protective film from the rubber foot.
 - Stick one rubber foot approximately 2 cm from each corner.

Note: The adhesive surface should be free of dust and grease.

■ Installation

The devices are intended to be installed in a 19" rack.

- Make sure there is sufficient ventilation. If necessary, provide a fan for the 19" rack. This will prevent the basic device from overheating.
- Measure the depth of the 19" rack so as to allow the power supply cable and, if required, the M4-POWER power supply cables from the back, and data cables to be connected from the front.

Note: For rack mounting use chassis runners.

2.1.7 Grounding the device

The device is grounded via the power supply connectors.

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

When the device is being operated by means of the 230/120 VAC power supply unit, it is grounded via the safety plug. When it is being operated with external DC voltage via the M4-POWER connections, the device is grounded via the M4-POWER connection.

2.1.8 Assembling the power unit chassis (if required), Connecting to the MACH 4002

- Connect the switch chassis and the M4-POWER power unit chassis with the mounting angle included in the delivery.
- For the redundant power supply, you use the power supply cable to connect the power unit(s) in the M4-POWER power unit chassis with the M4-POWER connection on the back of the MACH 4002 device.

2.1.9 Connecting the terminal block for signal contact

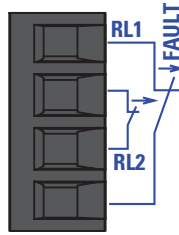


Fig. 4: 4-pin signal contact

- ▶ The signal contact (“FAULT”) monitors proper functioning of the device, thus enabling remote diagnostics. You can specify the type of function monitoring in the Management.
- ▶ You can also use the Management to set the signal contact manually and thus control external devices.

A break in contact is reported via the potential-free signal contact (relay contact, closed circuit):

- ▶ The failure of at least one of the two supply voltages (supply voltage 1 or 2 < 24 V).
- ▶ A continuous malfunction in the device.
- ▶ The defective link status of at least one port. With the device, the indication of link status can be masked by the management for each port. Link status is not monitored in the delivery condition.
- ▶ The loss of Redundancy guarantee.
- ▶ Error during self-test.

The following conditions are reported in stand-by mode

- ▶ Control cable disrupted
- ▶ Control cable shorted
- ▶ Partner device is in stand-by mode

The following conditions are reported in normal mode:

- ▶ Control cable shorted
- ▶ Partner device is in normal mode

The following condition is reported in RM mode additionally:

- ▶ Ring redundancy guaranteed. Ring redundancy is not monitored in the delivery condition.

- Pull the terminal blocks off the device and connect the signal lines.

- Mount the terminal block for both the signal contacts on the front of the device. Make sure that the snap lock snaps into place.

2.1.10 Connecting the supply voltage, startup procedure

- The devices may only be connected to the supply voltage shown on the type plate. Connect the power supply cable and plug it into the mains. Make sure the cable is not under strain.



Warning!

The DC modules (M4-...-...VDC 300W) are designed for operation with a safety extra-low voltage. Thus, they may only be connected to the supply voltage connections with PELV circuits or alternatively SELV circuits with the voltage restrictions in accordance with IEC/EN 60950.

The external supply voltage can be connected redundantly (see “[Voltage supply](#)” on page 14). Both inputs are uncoupled. With redundant supply, the power supply unit alone supplies the device with the higher output voltage. The supply voltage is electrically isolated from the housing.

The DC modules (M4-...-...VDC 300W) are grounded via a connector of the 3-pin DC socket.

Switching on the slide-in power supply units starts up the device.

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

Note: The 0V connectors within a DC module (M4-...-...VDC 300W) are connected to each other.

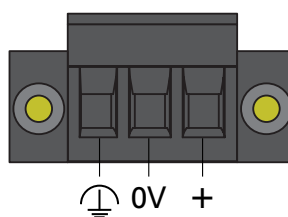


Fig. 5: Pin assignment of the DC socket (external supply voltage)

2.1.11 Connecting the data lines

The ports of the device enable you to connect terminal devices or further network segments via twisted pair or F/O cable.

■ 10/100 Mbit/s twisted pair connection

10/100 Mbit/s ports (RJ45 sockets) enable the connection of terminal devices or independent network segments in compliance with the IEEE 802.3 100BASE-TX / 10BASE-T standards. These ports support:

- ▶ autonegotiation
- ▶ autopolarity
- ▶ autocrossing (when autonegotiation is switched on)
- ▶ 100 Mbit/s half duplex mode, 100 Mbit/s full duplex mode
- ▶ 10 Mbit/s half duplex mode, 10 Mbit/s full duplex mode

State on delivery: autonegotiation is activated with exception of the HIPER-Ring ports: 100 Mbit/s full duplex.

The socket housings are electrically connected to the front covering.

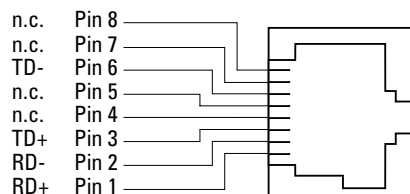


Fig. 6: Pin assignment of a TP/TX interface in MDI-X mode, RJ45 socket

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

1000 Mbit/s twisted pair connection 1000 Mbit/s twisted pair ports (RJ45 sockets) enable the connection of terminal devices or independent network segments in compliance with the IEEE 802-3, 2000 Edition 1000BASE-T standard.

These ports support:

- ▶ autonegotiation
- ▶ autopolarity
- ▶ autocrossing (when autonegotiation is switched on)
- ▶ 1000 Mbit/s full duplex
- ▶ 100 Mbit/s half duplex, 100 Mbit/s full duplex,
- ▶ 10 Mbit/s half duplex, 10 Mbit/s full duplex.

State on delivery: autonegotiation.

The socket housing is electrically connected to the front panel.

The pin assignment corresponds to MDI-X.

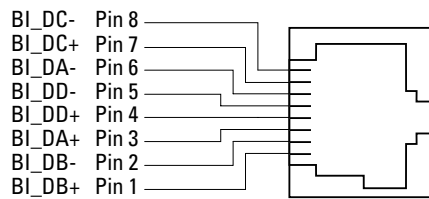


Fig. 7: Pin assignment of a 1000 MBit/s twisted pair interface

■ 100 Mbit/s F/O connection

100 MBit/s F/O ports (SFP slots) enable the connection of terminal devices or independent network segments in compliance with the IEEE 802.3 100BASE-FX standard. These ports support:

- ▶ full duplex mode

State on delivery: full duplex.

Note: Make sure, that you connect LH ports only to LH ports, SM ports only to SM ports and MM ports only to MM ports.

■ 1 Gbit/s F/O connection

1 Gbit/s F/O ports (SFP slots) enable the connection of terminal devices or independent network segments in compliance with the IEEE 802.3-2000 (ISO/IEC 8802-3:2000) 1000BASE-SX or 1000BASE-LX standard. These ports support:

- ▶ autonegotiation,
- ▶ full duplex mode

State on delivery: autonegotiation.

Note: Make sure, that you connect LH ports only to LH ports, SX ports only to SX ports and LX ports only to LX ports.

- Connect the data lines according to your requirements.

2.1.12 Replacing the M4-AIR fan plug-in unit (if required)

