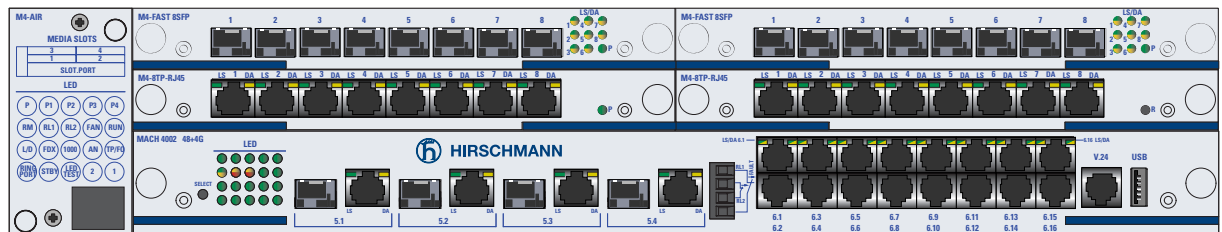


User Manual

Installation

Modular Industrial ETHERNET Backbone Switch MACH 4002 Family



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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 *HiVision*) 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

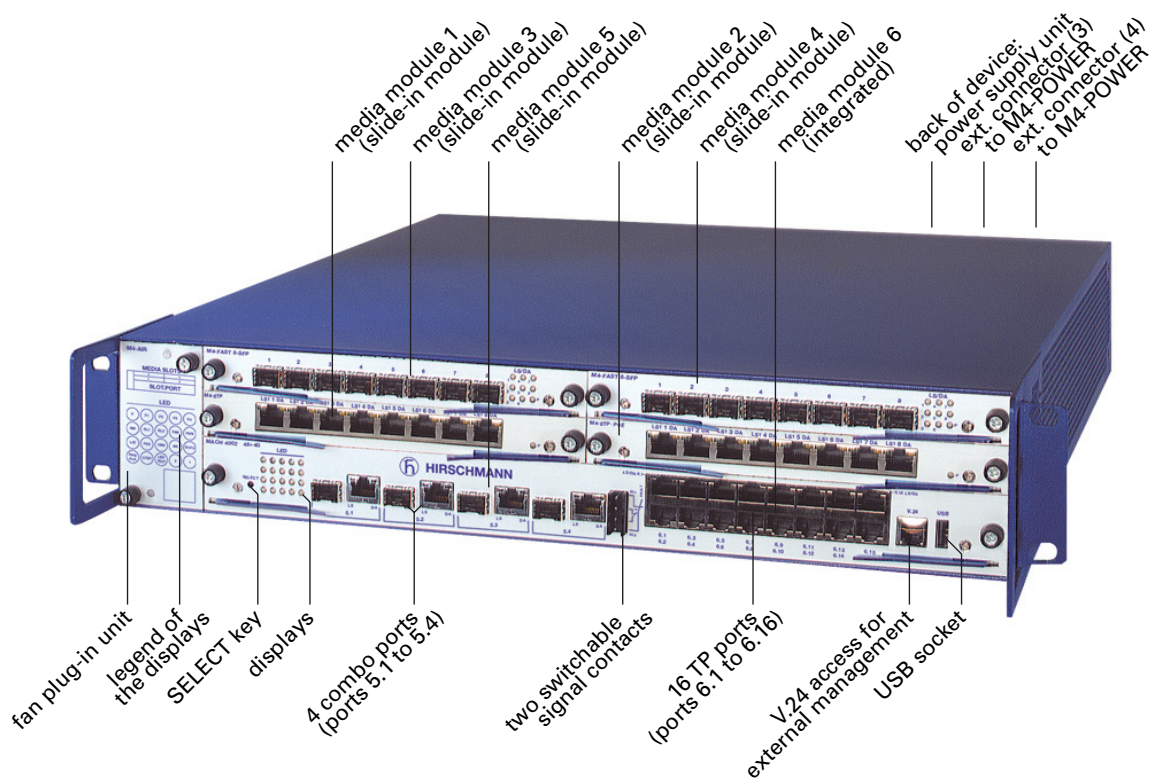


Fig. 1: Structure of the MACH 4002 48+4G basic device

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.

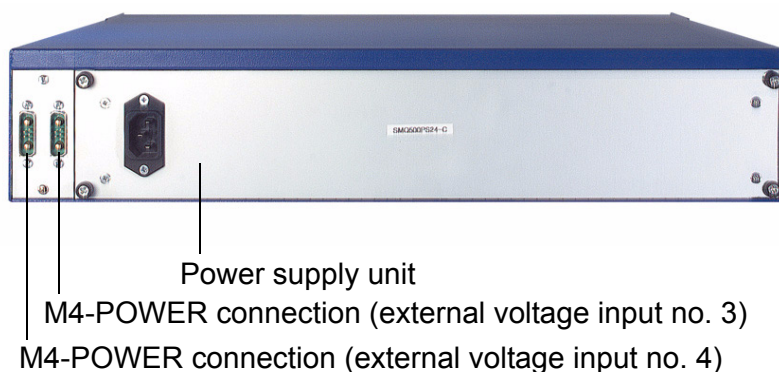
M4-POWER provides you with 3 slots for slide-in power units:

- ▶ 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.

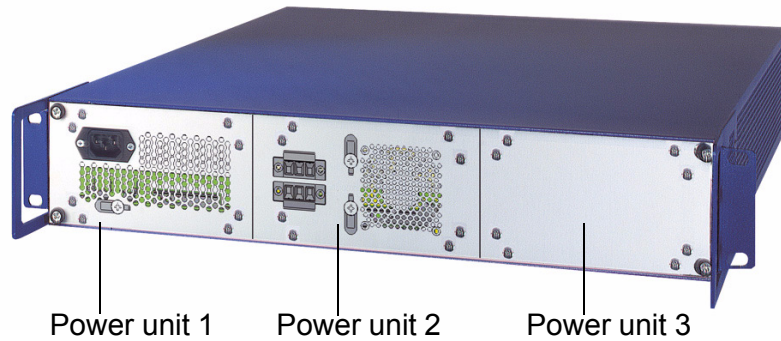


Fig. 2: M4-POWER power unit chassis with up to 3 slide-in power units

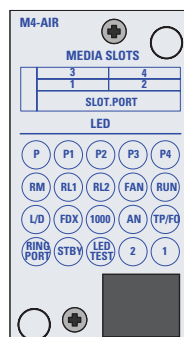
■ Slide-in power units for M4-POWER power unit chassis

- ▶ 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.

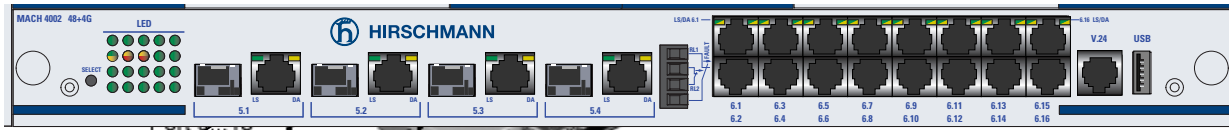
1.3 Fan plug-in unit M4-AIR

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](#)).



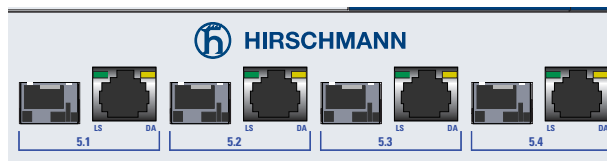
1.4 Integrated Basic Board

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.

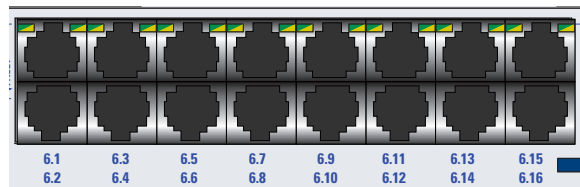


If an SFP plug-in module is mounted, the RJ45 socket is switched off. The LEDs each apply to the active port. You can use the SELECT button to test the TP or FO connections.

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

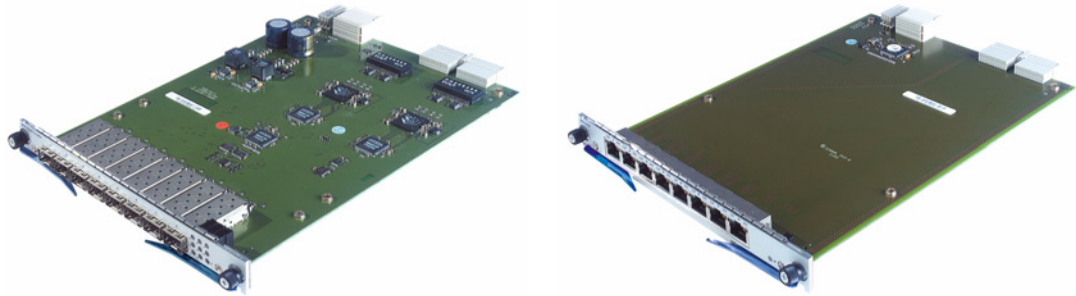
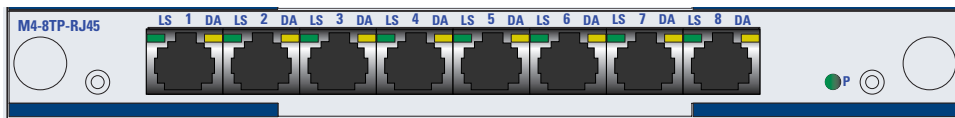


Fig. 3: SFP- and TP media module

1.5.1 Fast ETHERNET ports

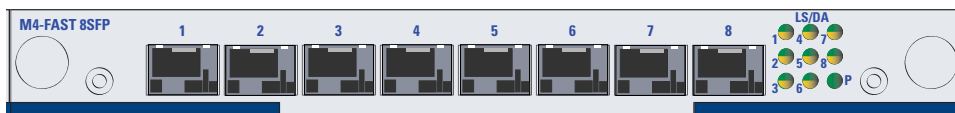
■ M4-8TP-RJ45

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.

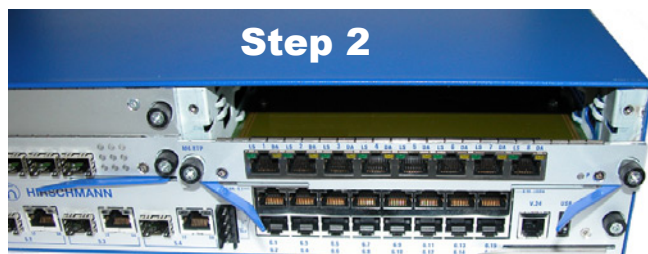
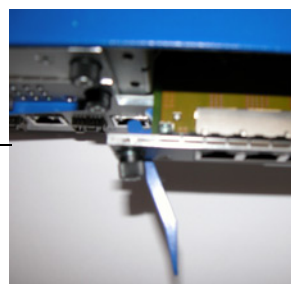
2.1.2 Assembling the media modules

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.

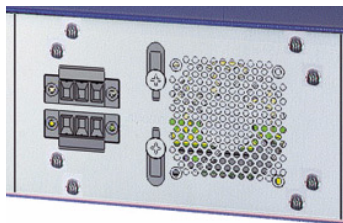


2.1.4 Assembling the power supply unit on the back of the device



- 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

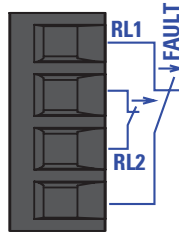


Fig. 4: 4-pin signal contact

- ▶ 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.

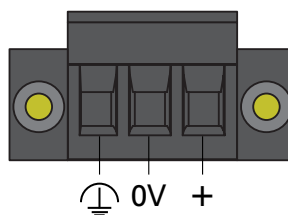


Fig. 5: Pin assignment of the DC socket (external supply voltage)

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.

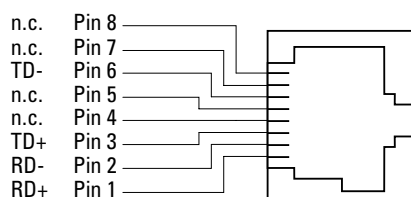


Fig. 6: Pin assignment of a TP/TX interface in MDI-X mode, RJ45 socket

■ 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.

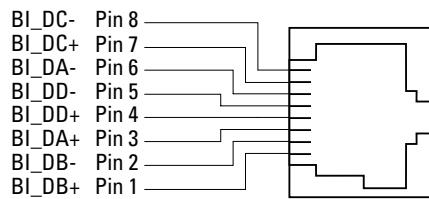


Fig. 7: Pin assignment of a 1000 MBit/s twisted pair interface

■ 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)



If required, the fan plug-in unit can be replaced. It may be replaced by an electrician without turning off the device. Depending on the ambient temperature the MACH 3000 can be operated up to one or two minutes with one disassembled fan.

■ Disassembly of M4-AIR

- Loosen the two screws in the front panel of the fan plug-in unit M4-AIR.

Caution: After a device is switched off, fan blades continue rotating for a number of seconds. Do not reach into the rotating fan!

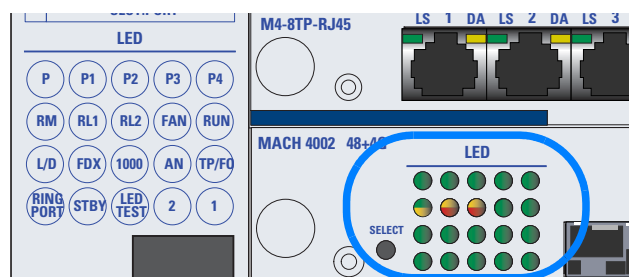
- Pull out the fan plug-in unit a few centimeters out and wait until the fan comes to a halt before removing it completely.

■ Assembly of M4-AIR

- Disassemble the fan plug-in unit, which is to be replaced, as described above.
- Slide the new fan plug-in unit into the chassis along the subracks 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 fan unit – the female multipoint connector of the system bus.
- Screw – the two knurled screws in the front panel of the plug-in fan unit – to the frame of the chassis.

2.2 Displays

After applying the operating voltage, the software starts and initializes itself. The device then performs a selftest. Various LEDs light up in the process. The process lasts approximately 60 seconds.



■ Device status

These LED's provide information about conditions which affect the operation of the whole device.

P- Power (green LED)	Meaning
lit green	internal supply voltage on
not lit	internal supply voltage too low
P1 - Power 1 (green LED)	Meaning
lit green	supply voltage 1 at the power supply plug-in unit on
not lit	no supply voltage 1 at the power supply plug-in unit or voltage too low
flashes green	supply voltage 1 on, but power supply plug-in unit indicates an error
P2 - Power 2 (green LED)	Meaning
lit green	supply voltage 2 at the power supply plug-in unit on
not lit	no supply voltage 2 at the power supply plug-in unit or voltage too low
flashes green	supply voltage 2 on, but power supply plug-in unit indicates an error
P3 - Power 3 (green LED)	Meaning
lit green	supply voltage 3 at the external input 3 on
not lit	supply voltage 3 at the external input 3 under 18 V
flashes green	supply voltage 3 on, but power supply plug-in unit indicates an error
P4 - Power 4 (green LED)	Meaning
lit green	supply voltage 4 at the external input 4 on
not lit	supply voltage 4 at the external input 4 under 18 V
flashes green	supply voltage 4 on, but power supply plug-in unit indicates an error
RM - Redundancy Manager (green/yellow LED)	Meaning
lit green	RM function active, redundant port not active
lit yellow	RM function active, redundant port active
not lit	RM function not active
flashes green	Incorrect configuration of the HIPER-Ring (e.g., the Ring is not connected to the ring port).
RL1 - Relay 1, signal contact (red/yellow LED)	Meaning
lit red	The signal contact 1 is open, i.e. it indicates an error
lit yellow	The signal contact 1 is open, the "manual setting" is active
not lit	The signal contact 1 is closed, i.e. it does not indicate an error, or has been closed via the "manual setting"
RL2 - Relay 2, signal contact (red/yellow LED)	Meaning
lit red	The signal contact 1 is open, i.e. it indicates an error
lit yellow	The signal contact 1 is open, the "manual setting" is active
not lit	The signal contact 1 is closed, i.e. it does not indicate an error, or has been closed via the "manual setting"

AIR - fan overall status (green LED)	Meaning
lit green	The existence of a fan slot but no fan indicates an error.
not lit	The existence of a fan slot and at least one fan indicates an error, or there is no fan slot.

RUN - BOOT/RUN (green LED)	Meaning
lit green	System ready
flashes green	System booting
not lit	System in reset state

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

■ Display status

Each media module has one LED per port. The meaning of these port status LEDs depends on the setting on the basic module. The display meaning can be set with the “SELECT” button on the basic module.

- Press the button approximately two seconds to continue switching the meaning of the display. If the button is not pressed for approximately 20 seconds, the display status changes to “L/D”.

L/D - Data, Link status (green LED)	Meaning
lit green	The port LEDs of the media modules display the connection status.

FDX - Full duplex (green LED)	Meaning
lit green	The port LEDs of the media modules display the connection type, full or half duplex.

1000 - 10/100/1000 Mbit/s (green LED)	Meaning
lit green	The port LEDs of the media modules indicate the transmission rate.

AN - Autonegotiation (green LED)	Meaning
lit green	The port LEDs of the media modules indicate the port configuration type

RING PORT - Ring port (green LED)	Meaning
lit green	The port LEDs of the media modules indicate the HIPER-Ring assignment.

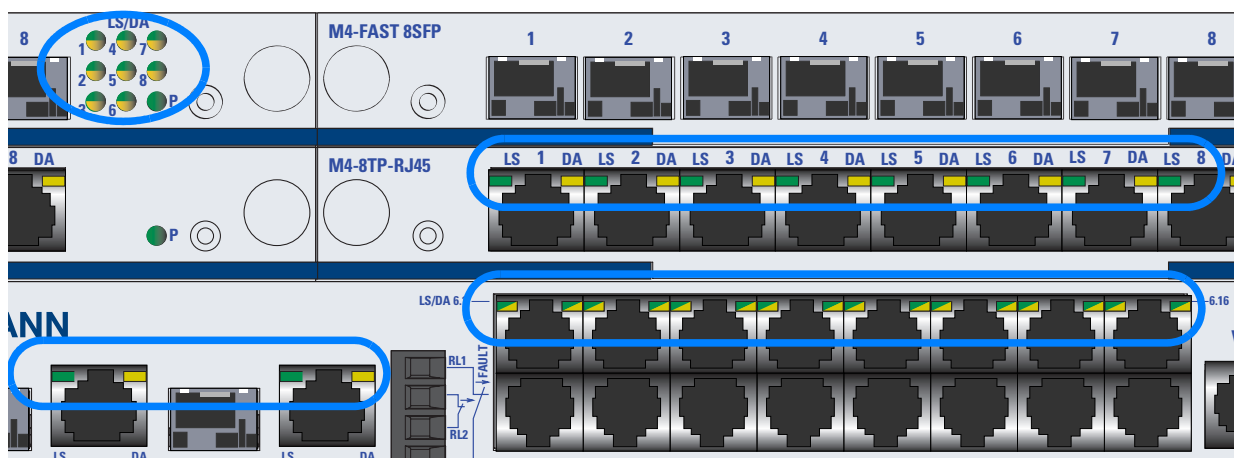
STBY - Stand by (green LED)	Meaning
lit green	The port LEDs of the media modules indicate the assignment to a redundant coupling of network segments.

LED TEST - LED test (green LED)	Meaning
lit green	The test of the LEDs status, display status and port status is active. The status LED „RM“ flashes green/yellow. The status LED "FAULT" flashes red. The display status LEDs blink green. The port status LEDs of the media modules blink green/yellow.
TP/FO - Twisted pair / Fiber optic (green LED)	Meaning
lit green	The port LEDs of the media modules display the media type.
All display status-LEDs (green LEDs)	Meaning
Running light	Initialization phase after restart.
1, 2 (green LEDs)	Meaning
	Service LEDs

■ ACA AutoConfiguration Adapter

RUN, 1 - Display memory operations of the Auto Configuration Adapter ACA	Meaning
flashing alternatively:	Error in teh memory operation.
LEDs flashing synchronously; 2 times per second	Loading the configuration from the ACA.
LEDs flashing synchronously; 1 time per second	Saving the configuration to the ACA.

■ Port status



These LEDs display port-related information.

The following LEDs are available for each port:

- ▶ two single-color LEDs (for each of the 4 combo ports of the Basic Boards)
- ▶ one two-color LED (for each of the 8 ports of the media modules and for each of the 16 TP ports of the Basic Boards)

Set the contents of the information with the button on the basic module. (see “[Display status](#)” on page 28) .

1 to 8 - Data, link status (green/yellow LED)	Meaning
not lit	no valid connection
lit green	valid connection
flashes green (1 time per period)	port is switched to stand-by (port 1).
flashes green (3 times per period)	port is disabled
flashes yellow	data reception at the specific port
1 to 8 - FDX (green/yellow LED)	Meaning
not lit	Half duplex is active
lit green	Full duplex is active
1 to 8 – 1000 (green/yellow LED)	Meaning
not lit	10 Mbit/s is active.
lit green	100 Mbit/s is active.
lit yellow	1000 Mbit/s is active.
1 to 8 – AUTONEG (green/yellow LED)	Meaning
lit green	Autonegotiation is active.
1 to 8 – TP/FO twisted pair / fiber optic (green/yellow LED)	Meaning
lit yellow	Fiber optic has been selected. The port LEDs of the media modules display fiber optic ports.
lit green	Twisted pair has been selected. The port LEDs of the media modules display twisted pair ports.
1 to 8 – RING PORT (green/yellow LED)	Meaning
lit green	This port belongs to the HIPER-Ring
1 to 8 – STAND-BY (green/yellow LED)	Meaning
lit green	Connection port for the data line
lit yellow	Connection port for the control line
flashes green/yellow	no Stand-by partner existing
1 to 4 – LED TEST (green/yellow LED)	Meaning
not lit	LED defective.
flashes green/yellow	LED test is active.

2.3 Carrying out basic settings

IP addresses must be entered when the device is installed for the first time. The device provides 6 options for configuring the IP addresses:

- ▶ Entry via the V.24 connection.
- ▶ Entry by HiDiscovery protocol
- ▶ Configuration via BOOTP
- ▶ Configuration via DHCP
- ▶ Configuration via DHCP Option 82
- ▶ The AutoConfiguration Adapter

■ State of delivery

- ▶ IP address: The device looks for the IP address using DHCP
- ▶ Password for management:
user, password: public (read only)
admin, password: private (read and write)
- ▶ V.24 data rate: 9.600 baud
- ▶ Ring redundancy: off
- ▶ ETHERNET ports: Link status is not evaluated (signal contact)
- ▶ Optical 100 Mbit ports: 100 Mbit full duplex
All other ports: autonegotiation
- ▶ Redundancy manager switched off
- ▶ Stand-by coupling off

■ USB interface

The USB socket offers an interface for the local connection of an Auto-Configuration Adapter ACA 21-USB. It is a device for saving/loading the configuration and for loading the software.

Pin number	Signal name
1	VCC
2	- Data
3	+ Data
4	Ground

■ V.24 interface (external management)

A serial interface is provided on the RJ11 socket (V.24 interface) for the local connection of an external management station (VT100 terminal or PC with appropriate terminal emulation). This makes it possible to establish a connection to the Command Line Interface CLI and to the system monitor.

VT 100 terminal settings

Speed	9.600 baud
Data	8 bit
Stopbit	1 bit
Handshake	off
Parity	none

The socket housing is electrically connected to the front cover of the device.

The V.24 interface is electrically connected to the supply voltage.

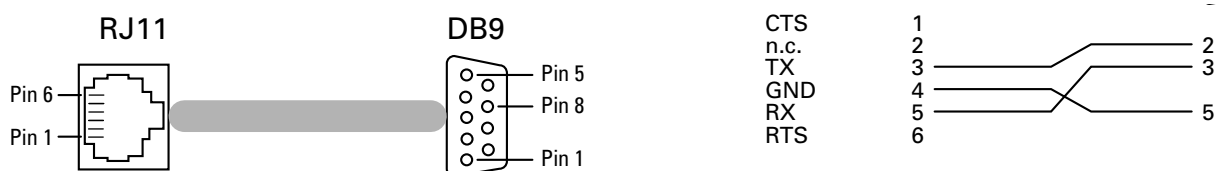


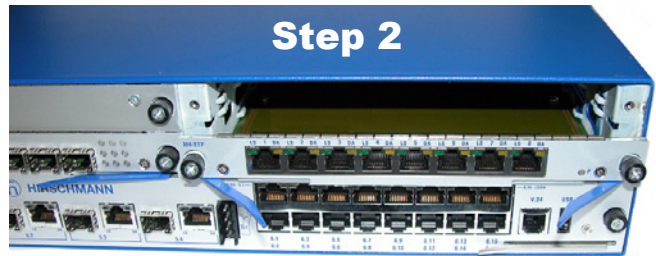
Fig. 8: Pin assignment of the V.24 interface

Note: In chapter “[Technical data](#)” on page 34ff you will find the order number for the terminal access cable which is to be ordered separately.

You will find a detailed description of the configuration in the “Basic Configuration User Manual” on the CD-ROM.

2.4 Disassembling the device

2.4.1 Disassembling the media modules



- Please notice the “[ESD guidelines](#)” on page 8 “ and the “[Safety instructions](#)” on page 5ff.
- Lever the selected media module from the slot by pulling the blue insertion catches (see Fig., steps 1 and 2).
- Pull the media module out of the slot (see Fig., step 3).
- Close the slot with a covering panel.
- Screw the four knurled screws in the covering panel flush with the frame of the chassis.

2.4.2 Disassembling the SFP modules

- Pull the SFP module on the opened lock out off the socket.
- Close the SFP module with the protective cap.



3 Technical data

General data

Dimensions	MACH 4002	W x H x D: 480 mm x 88 mm x 435 mm
Assembly	MACH 4002	19" rack
	M4-POWER	19" rack
Weight	MACH 4002	7.5 kg
Voltage supply	MACH 4002	M4-S-xx power supply or power unit chassis M4-POWER with M4-P-xx power supply, please order separately
Operating voltage	M4-S-AC/DC 300W	100-240 VAC, 120-350 VDC
	M4-S-24VDC 300W	24 VDC (19.2 V - 32 V) ¹⁾
	M4-S-48VDC 300W	48 VDC (38.4 V - 60 V) ¹⁾
	M4-P-AC/DC 300W	100-240 VAC, 120-350 VDC
	M4-P-24VDC 300W	24 VDC (19.2 V - 32 V) ¹⁾
	M4-P-48VDC 300W	48 VDC (38.4 V - 60 V) ¹⁾
Buffer time	M4-P-AC/DC 300W	1/2 mains period minimum
	M4-...-24VDC 300W	10 ms at 20.4 VDC minimum
	M4-...-48VDC 300W	10 ms at 40.8 VDC minimum
Current consumption	M4-S-AC/DC 300W	1.8 A (230 VAC) max., 4.2 A (110 VAC) max.
	M4-S-24VDC 300W	21.0 A (24 VDC) maximum
	M4-S-48VDC 300W	10.1 A (48 VDC) maximum
	M4-P-AC/DC 300W	1.8 A (230 VAC) max., 4.2 A (110 VAC) max.
	M4-P-24VDC 300W	21.0 A (24 VDC) maximum
	M4-P-48VDC 300W	10.1 A (48 VDC) maximum
Switch-on current	M4-S-AC/DC 300W	typ. <40 A at 265 VAC and cold start
	M4-P-AC/DC 300W	typ. <40 A at 265 VAC and cold start
Overload current protection at input		non-changeable fuse
Potential difference between input voltage and housing	M4-...-...VDC 300W	Potential difference to input voltage +24 VDC/ +48VDC: 60 VDC Potential difference to input voltage 0V: 60 VDC ²⁾
Surrounding	Storage temperature	Surrounding air: -25 °C to +70 °C
	Humidity	10% to 95% (non condensing)
	Atmospheric pressure	up to 2.000 m (795 hPa), higher altitudes on demand
Operating temperature	MACH 4002	0°C to 50°C
	M4-S-xx	0°C to 50°C
	M4-P-xx	0°C to 50°C
	M-SFP-xx/xx	0°C to 60°C
	M-FAST SFP-xx/xx	0°C to 60°C
	M4-AIR	0°C to 50°C
	M4-8TP-RJ45	0°C to 50°C
	M4-FAST 8-SFP	0°C to 50°C
Pollution degree		2
Protection types	Laser protection	Class 1 conforming to EN 60825-1 (2001)
	Protection types	IP 20

¹⁾ NEC Class 2 power source safety extra-low voltage (SELV/PELV)

²⁾ The 0V connectors within a DC module (M4-...-...VDC 300W) are connected to each other

Interfaces

	Interface	Design
MACH 4002	signal contact V.24 interface USB interface	4-pin pluggable terminal block 1 x RJ11 socket to connect an AutoConfiguration Adapter ACA 21-USB

EMV and stability

EMV interference proof		
EN 61000-4-2	Discharge of static electricity Contact discharge: test level 3 Air discharge: test level 3	6 kV 8 kV
EN 61000-4-3	Electromagnetic fields Test level 3 (80 - 2000 MHz)	10 V/m
EN 61000-4-4	Fast transients (burst), test level 3, x - Power line - Data line	2 kV 4 kV
EN 61000-4-5	Surge voltage - Power line, line/line: test level 2 - Power line, line/earth: test level 3 - Data line: test level 3	1 kV 2 kV 2 kV
EN 61000-4-6	Cable-based RF faults, test level 3 10 kHz - 150 kHz 150 kHz - 80 MHz	3 V 10 V
EN 61000-4-9	Impulse-shaped magnetic fields; test level 4	300 A/m
EMV emitted immunity		
EN 55022	Class A	Yes
FCC 47 CFR Part 15	Class A	Yes
Germanischer Lloyd	Rules for Classification and Construction VI - 7 - 3 Part 1, Ed. 2001	Yes
Festigkeit		
Vibration	IEC 60068-2-6 Test FC, testing level in line with IEC 61131-2 Germanischer Lloyd Guidelines for the Performance of Type Tests Part 1	Yes Yes
Shock	IEC 60068-2-27 Test Ea, testing level in line with IEC 61131-2	Yes

Network size

Length of a twisted pair segment	
100 m approx.	cat5e cable with 1000BASE-TX

Table 1: TP port 10BASE-T / 100BASE-TX / 1000BASE-T

Product code	Wave length	Fiber	System attenuation	Expansion	Fiber data
M-FAST SFP-...					
-MM/LC	MM 1310 nm	50/125 µm	0-11 dB	0-5 km	1.0 dB/km, 800 MHz*km
-MM/LC	MM 1310 nm	62.5/125 µm	0-8 dB	0-4 km	1.0 dB/km, 500 MHz*km
-SM/LC	SM 1310 nm	9/125 µm	0-13 dB	0-25 km	0.4 dB/km; 3.5 ps/(nm*km)
-SM+/LC	SM 1310 nm	9/125 µm	10-29 dB	25-65 km	0.4 dB/km; 3.5 ps/(nm*km)
-LH/LC	SM 1550 nm	9/125 µm	10-29 dB	40-104 km	0.25 dB/km; 19 ps/(nm*km)

Table 2: LWL-Port 100BASE-FX (SFP Fiberoptic Fast ETHERNET Transceiver)

Product code	Wave length	Fiber	System attenuation	Expansion	Fiber data
M-SFP...					
-SX/LC	MM 850 nm	50/125 µm	0-7.5 dB	0-550 m	1.0 dB/km, 800 MHz*km
-LX/LC	SM 1310 nm ¹⁾	50/125 µm	0-11 dB	0-550 m	1.0 dB/km, 800 MHz*km
-SX/LC	MM 850 nm	62.5/125 µm	0-7.5 dB	0-275 m	1.0 dB/km, 500 MHz*km
-LX/LC	SM 1310 nm ¹⁾	62.5/125 µm	0-11 dB	0-550 m	1.0 dB/km, 500 MHz*km
-LX/LC	SM 1310 nm	9/125 µm	0-11 dB	0-20 km	0.4 dB/km; 3.5 ps/(nm*km)
-LH/LC	LH 1550 nm	9/125 µm	6-22 dB	8-72 km	0.25 dB/km; 19 ps/(nm*km)
-LH+/LC	LH 1550 nm	9/125 µm	15-32 dB	60-120 km	0.25 dB/km; 19 ps/(nm*km)

Table 3: F/O port 1000BASE-FX (SFP Fiberoptic Gigabit ETHERNET Transceiver)

MM = Multimode
SM = Singlemode
LH = Singlemode Longhaul

¹⁾ with F/O adapter in line with IEEE 802.3-2002 clause 38 (single-mode fiber offset-launch mode conditioning patch cord)

Power consumption/power output

Name	Power consumption	Power output
MACH 4002 (without media modules)	70.0 W	239 Btu (IT)/h
M4-S-AC/DC 300W (230 V)	350.0 W	1.195 Btu (IT)/h
M4-S-AC/DC 300W (110 V)	370.0 W	1.263 Btu (IT)/h
M4-S-24VDC 300W	380.0 W	1.297 Btu (IT)/h
M4-S-48VDC 300W	350.0 W	1.195 Btu (IT)/h
M4-P-AC/DC 300W (230 V)	350.0 W	1.195 Btu (IT)/h
M4-P-AC/DC 300W (110 V)	370.0 W	1.263 Btu (IT)/h
M4-P-24VDC 300W	380.0 W	1.297 Btu (IT)/h
M4-P-48VDC 300W	350.0 W	1.195 Btu (IT)/h
M-SFP-LH+/LC	1.0 W	3.4 Btu (IT)/h
M-SFP-LH/LC	1.0 W	3.4 Btu (IT)/h
M-SFP-LX/LC	1.0 W	3.4 Btu (IT)/h
M-SFP-SX/LC	1.0 W	3.4 Btu (IT)/h

Name	Power consumption	Power output
M-FAST SFP-MM/LC	1.0 W	3.4 Btu (IT)/h
M-FAST SFP-SM/LC	1.0 W	3.4 Btu (IT)/h
M-FAST SFP-SM+/LC	1.0 W	3.4 Btu (IT)/h
M-FAST SFP-LH/LC	1.0 W	3.4 Btu (IT)/h
M4-8TP-RJ45	2.0 W	7.0 Btu (IT)/h
M4-FAST 8SFP	15.0 W	52.0 Btu (IT)/h

Scope of delivery

Device	Scope of delivery
MACH 4002	MACH 4002 device 1 terminal block for relay contact (4 contacts) Terminal cable Handles, mounted, 2 height units User manual installation CD-ROM
M4-POWER	M4-POWER power unit chassis User manual installation Mounting angle for connecting switch chassis and power unit chassis Handles, mounted, 2 height units; also handles, 4 height units, included
M4-S-... 300W	Power supply plug-in unit for M4-S-... switch chassis 300W User manual installation Cable for AC connection for AC supply Connector for each DC connection for DC supply
M4-P-... 300W	Power supply plug-in unit for M4-P-... power unit chassis 300W User manual installation Cable for AC connection for AC supply Connector for each DC connection for DC supply Power supply cable for connecting power unit chassis to switch chassis

Order numbers/Product name

Product name	Description	Order no.
Chassis:		
MACH4002-48+4G-Layer2 Professional	Switch Chassis 48/4G incl. slide-in fan unit without power supply, with Layer2 Professional software	943 859-101
MACH4002-48+4G-Layer3 Enhanced	Switch Chassis 48/4G incl. slide-in fan unit without power supply, with Layer2 Enhanced software	943 859-201
MACH4002-48+4G-Layer3 Professional	Switch Chassis 48/4G incl. slide-in fan unit without power supply, with Layer2 Enhanced software	943 859-301
M4-POWER	Power unit chassis (for 3 slide-in units)	943 874-001
Slide-in fan/power supply units:		
M4-AIR	Slide-in fan unit for switch chassis	943 869-001
M4-S-AC/DC 300W	Power supply plug-in unit AC (300 W) for switch chassis	943 870-001
M4-S-24VDC 300W	Power supply plug-in unit 24VDC, single-current, for switch chassis (2 connections coupled via diodes, one DC/DC converter)	943 871-001

Product name	Description	Order no.
M4-S-48VDC 300W	Slide-in 48VDC power unit, single-current, for switch chassis (2 connections coupled via diodes, one DC/DC converter)	943 872-001
M4-P-AC/DC 300W	Slide-in AC power unit (300 W) for power unit chassis	943 875-001
M4-P-24VDC 300W	Slide-in 24VDC power unit, single-current, for power unit chassis (2 connections coupled via diodes, one DC/DC converter)	943 876-001
M4-P-48VDC 300W	Slide-in 48VDC power unit, single-current, for power unit chassis (2 connections coupled via diodes, one DC/DC converter)	943 877-001
Media modules:		
M4-8TP-RJ45	Plug-in module 8 TP RJ45 (10/100, 10/100/1000)	943 863-001
M4-FAST 8-SFP	Plug-in module 8 SFP (100 HDX/FDX)	943 864-001

Asseccories

Name	Order number
Manual Basics Industrial ETHERNET and TCP/IP	280 720-834
AutoConfiguration Adapter ACA 21-USB	943 271-001
Terminal cable	943 301-001
4-pin terminal block (50 units)	943 845-004
Netzmanagement software HiVision	943 471-100
Netzmanagement software Industrial HiVision, operator edition	943 156-xxx
OPC server software HiOPC	943 055-001
Gigabit ETHERNET SFP transceiver:	
M - SFP - SX / LC	943 014-001
M - SFP - LX / LC	943 015-001
M - SFP - LH / LC	943 042-001
M - SFP - LH+ / LC	943 049-001
Fast ETHERNET SFP transceiver:	
M-FAST SFP-MM/LC	943 865-001
M-FAST SFP-SM/LC	943 866-001
M-FAST SFP-SM+/LC	943 867-001
M-FAST SFP-LH/LC	943 868-001

■ Based specifications and standards

EN 61000-6-2:2001	Generic standards – Immunity for industrial environments
EN 55022:1998 + A1 2000 + A2-2003	Information technology equipment – Radio disturbance characteristics
EN 60950:2001	Safety of Information Technology Equipment (ITE)
EN 61131-2:2000	Programmable Controllers
EN 50121-4:2000	Railway applications - EMC - emitted interference and interference immunity for signal and telecommunication systems

*Tab. 4: List of based specifications and standards
Certified devices are marked with a certification identifier.*

FCC 47 CFR Part 15:2003	Code of Federal Regulations
Germanischer Lloyd	Rules for Classification and Construction VI - 7 - 3 Part 1, Ed. 2003
cUL 508:1998	Safety for Industrial Control Equipment
cUL 60950	Safety for Information Technology Equipment

*Tab. 4: List of based specifications and standards
Certified devices are marked with a certification identifier.*

■ Certifications

The following table shows the status of the certifications of the devices.

cUL 508 / CSA C22.2 No.142	pending
cUL 60950 / CSA C22.2	pending
Germanischer Lloyd	pending

Tab. 5: Certifications, actual state see www.hirschmann.com

■ Software

Switch	Latency	1000 MBit/s	Layer 2: 3.5 µs typical; Layer 3: 4.5 µs typical
		100 MBit/s	Layer 2: 4.5 µs typical; Layer 3: 5.5 µs typical
		10 MBit/s	Layer 2: 19 µs typical; Layer 3: 20 µs typical
	MAC address table		up to 8000 entries
	Static address entries		up to 100 entries (in RM mode: 0 unicast entries)
VLAN	VLAN ID		1 up to 3966
	Number of VLANs		max. 256 simultaneously per switch max. 256 simultaneously per port
	Anzahl VLANs with GMRP	in VLAN 1 in VLAN 1	max. 256 simultaneously per switch max. 256 simultaneously per port

4 Further support

■ Technical questions and training courses

In the event of technical queries, please talk to the Hirschmann contract partner responsible for looking after your account or directly to the Hirschmann office. You can find the addresses of our contract partners on the Internet:

<http://www.hirschmann.com>

Our support line is also at your disposal:

- ▶ Tel. +49(1805) 14-1538
- ▶ Fax +49(7127) 14-1551

Answers to Frequently Asked Questions can be found on the Hirschmann internet site www.hirschmann.com/faq

■ Hirschmann Competence Center

In the longterm, product excellence alone is not an absolute guarantee of a successful project implementation. Comprehensive service makes a difference worldwide. In the current scenario of global competition, the Hirschmann Competence Center stands head and shoulders above the competition with its comprehensive spectrum of innovative services:

- ▶ Consulting incorporates comprehensive technical advice, from system evaluation through network planning to project planning.
- ▶ Training offers you an introduction to the technological fundamentals, product briefing and user training with certification.
- ▶ Support ranges from commissioning through the standby service to maintenance concepts.

With the Competence Center, you firmly rule out any compromise: the client-specific package leaves you free to choose the service components that you will use.

Internet: <http://www.hicomcenter.com>



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