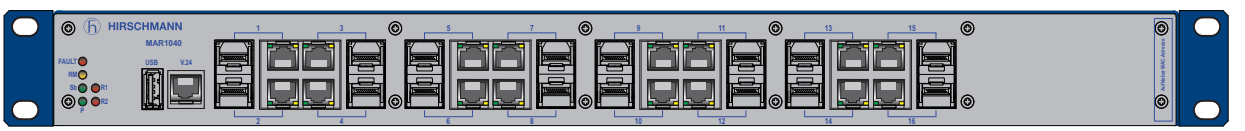
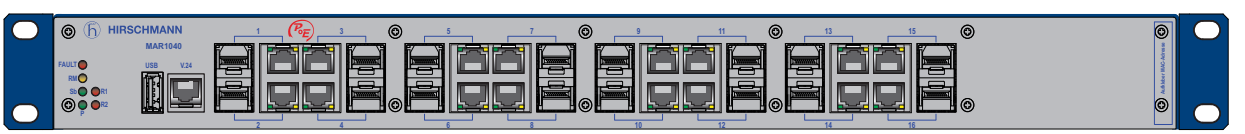
HIRSCHMANN
A BELDEN BRAND

User Manual

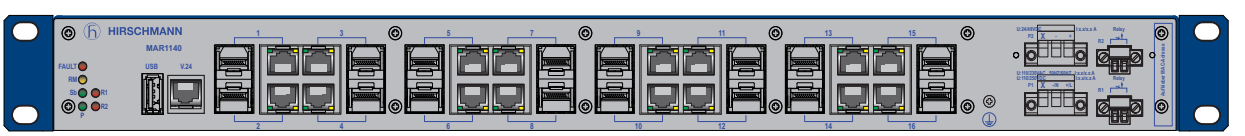
Installation
Industrial Ethernet Ruggedized Switch
MACH 1040 Family Full Gigabit



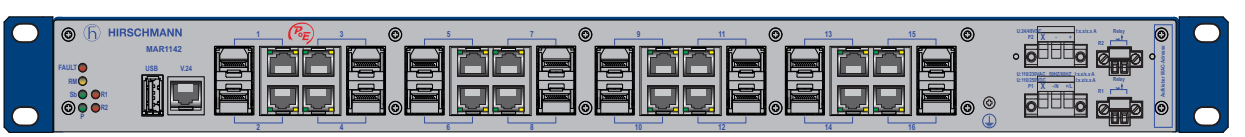
MAR1040



MAR1042



MAR1140



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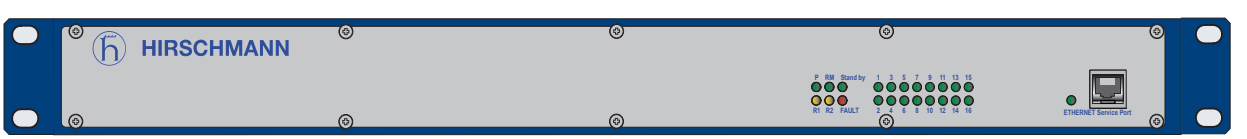

MAR1140, MAR1142

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

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Contents

Safety instructions

Certified usage

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 the manufacturer. 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

Note: The supply voltage is electrically isolated from the housing.

⚠ WARNING

ELECTRIC SHOCK
Only connect a supply voltage that corresponds to the type plate of your device.

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

☐ For every supply voltage to be connected, make sure the following requirements are met:

- The voltage supply conforms to overvoltage category II.
- The voltage supply has an easily accessible disconnecting device (e.g. a switch or a plug).
- The disconnecting device is clearly identified so that in the case of an emergency, it is clear which disconnecting device belongs to which line.
- The lines to be connected are voltage-free.
- The ground screw on the back of the device is connected to the protective conductor.
- There is a fuse in the outer conductor (AC) or the positive conductor (DC) of the voltage supply.
  Regarding the properties of this fuse: See „General technical data” on page 41.
- When using a DC voltage supply: the fuse is suitable for a DC voltage.
- If the neutral conductor (AC) or the negative conductor (DC) is not grounded: there is a fuse on each of the two wires.
- Supply with AC voltage: the wire diameter for the input supply line is at least 0.75 mm² (North America: AWG18).

- Supply with DC voltage: the wire diameter for the input supply line is at least 1 mm² (North America: AWG16).
- The cross-section of the protective conductor cable is the same size as or bigger than the cross-section of the voltage supply cables.
- The connection cables used are permitted for the specified temperature range.
- Relevant for North America:
  The power supply lines are made up of copper wire.

⚠ WARNING

ELECTRIC SHOCK
Only start connecting the supply voltage if **all** the above mentioned requirements are fulfilled.

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

- ☐ Make sure that the electrical installation meets local or nationally applicable safety regulations.
- ☐ Use undamaged parts.
- ☐ The device does not contain any service components. Internal fuses are only triggered if there is a fault in the device. If the device is not functioning correctly, or if it is damaged, switch off the voltage supply and return the device to the plant for inspection.
- ☐ Only switch on the device when the housing is closed.
- ☐ First connect the ground screw on the back of the device with the protective conductor before you set up the other connections. When removing the connections, you remove the protective conductor last.
- ☐ For voltage supply connections with a protective conductor connection: first connect the protective conductor before connecting the lines for the supply voltages.
  If your device has a second voltage supply connection of this type: here you also first connect the protective conductor before connecting the lines for the supply voltages.

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

⚠ WARNING

ELECTRIC SHOCK

Never insert any pointed objects (small screwdrivers, wires, etc.) into the product!
Never insert sharp objects (small screwdrivers, wires, etc.) into the connection terminals for the supply voltage or the signal contact, and do not touch the terminals!
Only install this device in a switch cabinet or in an operating site with limited access, to which only maintenance staff have access.

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

⚠ WARNING

FIRE HAZARD
Install the device in a fire protected shell if you are mounting it vertically.

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

Only technicians authorized by the manufacturer are permitted to open the housing.
The device is grounded via a ground connection on the front panel of the device.

- ☐ The ventilation slots must not be covered to promote free air circulation.
- ☐ The clearance to the ventilation slots of the housing must be at least 10 cm (3.94 in).
- ☐ Do not touch the housing during operation or shortly after switching off the device. Hot surfaces can cause injury.
- ☐ The device must be installed in the horizontal or upright position, either in the switch cabinet or on the wall (see page 28 „Installing the device“). The device is not intended for operation as a table unit.
- ☐ Operating the device in the maximum surrounding air temperature and stacking devices: When installing the device, make sure there is at least one free rack space (approx. 5 cm) above the device, because heat is discharged via the housing of the device.
- ☐ If you are operating the device in a 19" switch cabinet: install sliding/ mounting rails for holding the device (see fig. 10).

Environment

The device may only be operated at the specified surrounding air temperature (temperature of the surrounding air at a distance of up to 5 cm (1.97 in) from the device) and relative air humidity specified in the technical data.

- ☐ Install the device in a location where the climatic threshold values specified in the technical data will be observed.
- ☐ Use the device only in an environment within the pollution degree specified in the technical data.

Relevant for use in Hazardous Locations (Class 1, Division 2):
This equipment is suitable for use in Class 1, Division 2, Groups A, B, C and D or Non-Hazardous (unclassified) locations only.

When used in Class 1 Division 2 Hazardous Locations, the following applies:

c UL us

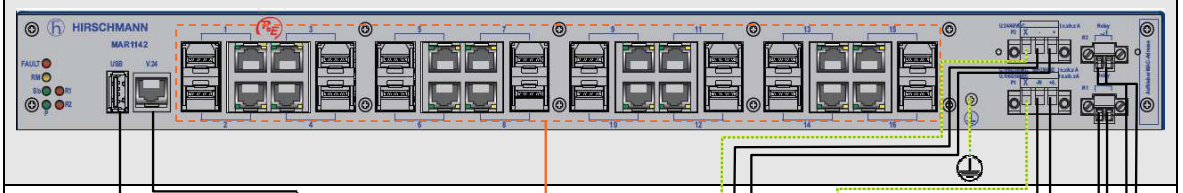
CLASS I; DIV. 2
GROUPS A; B; C AND D
TEMPERATURE CODE T4
AMBIENT -30 °C ... +70 °C
List of Standards: ISA 12.12.01:2007, CSA C22.2 No. 213-M1987

This equipmnt must be installed in a tool-locked enclosure when the USB port will be used.

Warning: Do not remove or replace while circuit is live unless the area is known to be free of ignitable concentrations or flammable substances.

For use in Hazardous Locations according ISA12.12.01-2007 Class I Div. 2 Groups A, B, C, D
Control Drawing MACH1040-Family

Hazardous Location



ACA21-USB Auto Configuration Adapter For maintenance only – See Installation Instructions	V.24 Interface (External management)	Data communication Ethernet Ports	**Power Supply 1** L: 24VDC to 48VDC M: 100VAC to 240VAC 50/60Hz **Power Supply 2** 9: Not present L: 24VDC to 48VDC M: 100VAC to 240VAC 50/60Hz	**Signal Contacts** (On: O.K. Open: fault) Associated Apparatus: Equipment with nonincendive field wiring parameters

Ordinary Location - Non-Hazardous Area

The Use in Hazardous Locations is only allowed for MACH1040-Family model No´s which are individually labelled “FOR USE IN CLASS I, DIVISION 2 HAZARDOUS LOCATIONS”

Notes:
The nonincendive field wiring circuit concept allows interconnection of nonincendive field wiring apparatus and associated nonincendive field wiring apparatus using any of the wiring methods permitted for unclassified locations when certain parametric conditions are met.

Capacity: $C_a \geq C_i + C_{Cable}$

Inductivity: $L_a \geq L_i + L_{Cable}$

The maximum cable length has to be determined as follows:
(a) max. Cable Length < (L_a - L_i) / Cable $_L$ and (b) max. Cable Length < (C_a - C_i) / Cable $_C$
The lower value of (a) and (b) is to apply.
Cable $_L$: inductance per unit length of used cable.
Cable $_C$: capacitance per unit length of used cable.
Other C-parameters and L-parameters are according to ANSI / ISA 12.12.01 2007 section 7.
Where cable capacitance and inductance values are unavailable, use the following default values: 60pF/foot (200pF/m), 0.2uH/foot (0,7uH/m)

Nonincendive field wiring circuits must be wired in accordance with the National Electrical Code (NEC), NFPA 70 , article 501.

The Relay Terminals are dependent upon the following Entity Parameters:	**Vmax**	**Imax**	**Ci**	**Li**
	30V	90mA	50pF	2µH

The MACH1040-Family is an open type which must be installed within an enclosure appropriate for environmental protection.

WARNING - Explosion Hazard – Do not disconnect Equipment while the circuit is live or unless the area is known to be free of ignitable concentrations.

WARNING – Explosion Hazard – Substitution of any component may impair suitability for Class I, Division 2.

Do not open when energized.

CONTROL DRAWING for Full Gigabit Ethernet Switch MACH1040 Family according to ANSI / ISA-12.12.01 – 2007			HIRSCHMANN A BELDEN BRAND	
Rev.: 2	Date: 2011-03-18	Document No.: 000154226DNR		Page 1 of 1

Figure 1: Control Drawing 000154226DNR

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

Electricity is used to operate this equipment. Comply with every detail of the safety requirements specified in the operating instructions regarding the voltages to apply.

Non-observance of these safety instructions can therefore cause material damage and/or injuries.

- ☐ Only appropriately qualified personnel should work on this device or in its vicinity. These personnel must be thoroughly familiar with the warnings and maintenance procedures in accordance with this operating manual.
- ☐ The proper and safe operation of this device depends on proper handling during transport, proper storage and assembly, and conscientious operation and maintenance procedures.
- ☐ Never start operation with damaged components.
- ☐ Only use the devices in accordance with this manual. In particular, observe the warnings and safety-related information.
- ☐ Any work that may be required on the electrical installation may only be carried out by personnel trained for this purpose.
- ☐ Please note that products recommended as accessories may have characteristics that do not fully correspond to those of the corresponding product. This may limit their possible usage in the overall system.

Note: LED or LASER components in compliance with IEC 60825-1 (2007):
CLASS 1 LASER PRODUCT
CLASS 1 LED PRODUCT

National and international safety regulations

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

CE marking

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

2004/108/EC
Directive of the European Parliament and the council for standardizing the regulations of member states with regard to electromagnetic compatibility.

2006/95/EC
Directive of the European Parliament and the council for standardizing the regulations of member states with regard to electrical equipment to be used within specific voltage ranges.

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

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

The product can be used in the industrial sector.

- Interference immunity: EN 61000-6-2:2005
- Emitted interference: EN 55022:2010
- Safety: EN 60950-1:2006 + A11:2009 + A1:2010

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

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

FCC note:

This device complies with part 15 of FCC rules. Operation is subject to the following two conditions : (1) This device may not cause harmful interference; (2) this device must accept any interference received, including interference that may cause undesired operation.
Appropriate testing has established that this device fulfills the requirements of a class A digital device in line with part 15 of the FCC regulations.
These requirements are designed to provide sufficient protection against interference when the device is being used in a business environment. The device creates and uses high frequencies and can 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 and country.

About this Manual

The “Installation” user manual contains a device description, safety instructions, a description of the display, and the other information that you need to install the device.

The following manuals are available as PDF files on the CD-ROM supplied:

- Installation user manual
- Basic Configuration user manual
- Redundancy Configuration user manual
- Router Configuration user manual
- Graphical User Interface reference manual
- Command Line Interface user manual

The Industrial HiVision Network Management Software provides you with additional options for smooth configuration and monitoring:

- Simultaneous configuration of multiple devices
- Graphic interface with network layout
- Auto-topology discovery
- Event log
- Event handling
- Client/server structure
- Browser interface
- ActiveX control for SCADA integration
- SNMP/OPC gateway.

Legend

The symbols used in this manual have the following meanings:

▶	Listing
☐	Work step
■	Subheading

1 Device description

1.1 General device description

The MACH 1040 family provides you with a range of device variants. You can set up your device individually based on different criteria:

- Media type
- Temperature range
- Voltage range
- Software variant

The MACH 1040 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 devices allow you to set up switched industrial Ethernet networks that conform to the IEEE 802.3 standard using copper wires or optical fibers in a line or ring structure.

The devices work without a fan.

If required, the devices are PoE-capable.

For devices without PoE, the voltage supply can be redundant if required.

The following installation options are available:

- 19" switch cabinet
- Flat surface mounting

You can choose various media to connect terminal devices and other infrastructure components:

- twisted pair cable
- multimode F/O
- singlemode F/O

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

Product configuration data can be provided by:

- diagnosis displays
- displaying the operating parameters

There are convenient options for managing the device. Administer your devices via:

- a Web browser
- Telnet
- HiDiscovery (software for setting up operation of the device)

- management software (e.g. Industrial HiVision)
- a V.24 interface (locally on the Switch)

The devices provide you with a large range of functions, which the manuals for the operating software inform you about. These manuals are available as PDF files on the CD ROM provided, or you can download them from the Internet on the Hirschmann product pages (www.hirschmann.com).
The Hirschmann network components help you ensure continuous communication across all levels of the company.

1.2 Description of the device variants

- The MACH 1040 devices are Ruggedized Switches with 16 Gigabit ETHERNET ports (10/100/1000 Mbit/s, can be connected optically or with TX). These ports are suitable for the connection of terminal devices or network segments according to the standards IEEE 802.3 100/1000BASE-FX (SFP slot) and IEEE 802.3 1000BASE-T / 100BASE-TX / 10BASE-T (RJ45 socket). A plugged SFP module switches the TX port off.
- In the MAR1140... and MAR1142... devices, all the cable outlets are at the back, i.e. the ports are on the back of the device. They have an additional Fast Ethernet port on the front of the device that you can use for diagnosis purposes.
- The MAR1042... and MAR1142... devices support PoE (Power over Ethernet) in accordance with IEEE 802.3af. The PoE ports are the Gigabit Ethernet ports 1 to 4.

1.2.1 MAR1040-... with 16 Gigabit ports

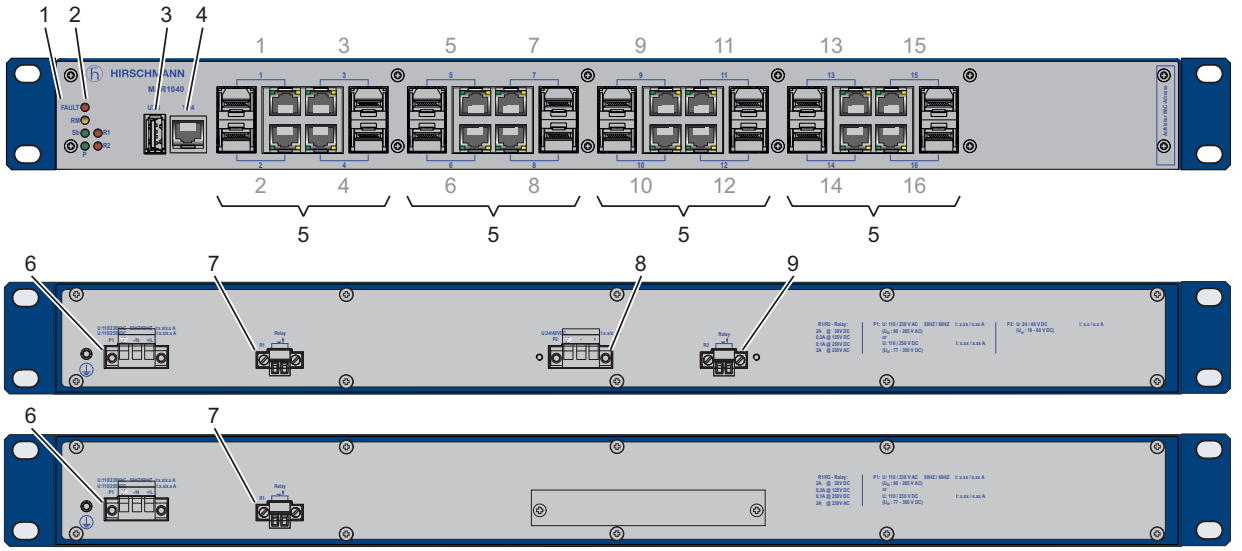


Figure 2: 1 - MAR1040 device
2 - LED display elements
3 - USB interface
4 - V.24 connection for external management
5 - Gigabit Ethernet combo ports: 100/1000 Mbit/s fiber optic SFP slots. Alternative connections: 10/100/1000 Mbit/s twisted pair, RJ45 connections

Back of device:
6 - P1: Connection for the voltage supply
7 - Relay 1: signal contact
Back of device for device variants with 2 power supply units:
8 - P2: Connection for redundant voltage supply
9 - Relay 2: signal contact

1.2.2 MAR1042-... with 16 Gigabit ports and PoE

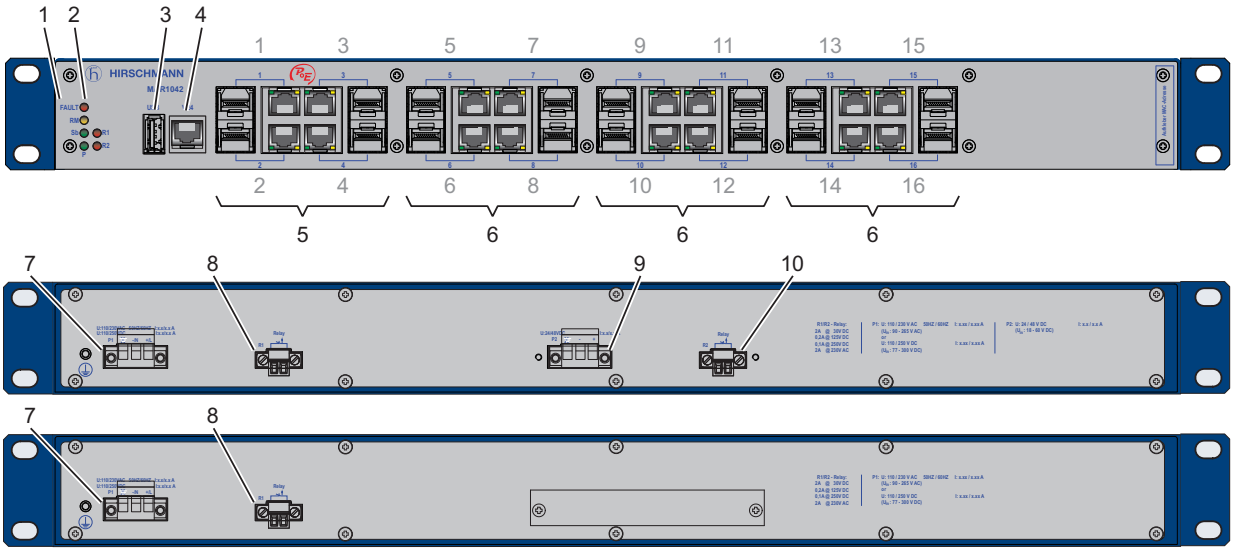


Figure 3: 1 - MAR1042 device
2 - LED display elements
3 - USB interface
4 - V.24 connection for external management
5 - Gigabit Ethernet combo ports with Power over Ethernet (PoE): 100/1000 Mbit/s fiber optic SFP slots. Alternative connections: 10/100/1000 Mbit/s twisted pair, RJ45 connections
6 - Gigabit Ethernet combo ports: 100/1000 Mbit/s fiber optic SFP slots. Alternative connections: 10/100/1000 Mbit/s twisted pair, RJ45 connections

Back of device:
7 - P1: Connection for the voltage supply
8 - Relay 1: signal contact
Back of device for device variants with 2 power supply units:
9 - P2: Connection for the PoE voltage supply
10 - Relay 2: signal contact

1.2.3 MAR1040-... with 16 Gigabit ports, ports on back

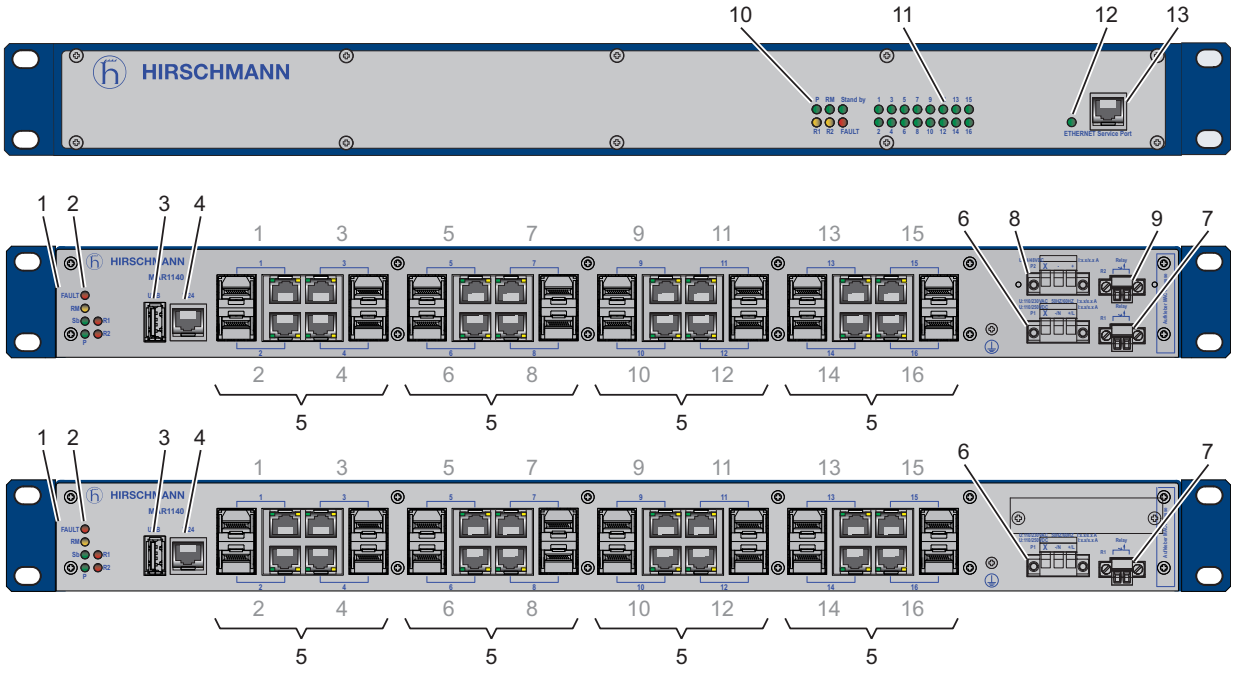


Figure 4: Back of device:
1 - MAR1140 device
2 - LED display elements
3 - USB interface
4 - V.24 connection for external management
5 - Gigabit Ethernet combo ports: 100/1000 Mbit/s fiber optic SFP slots. Alternative connections: 10/100/1000 Mbit/s twisted pair, RJ45 connections
6 - P1: Connection for the voltage supply
7 - Relay 1: signal contact
For device variants with 2 power supply units:
8 - P2: Connection for redundant voltage supply
9 - Relay 2: signal contact

Front of device:
10 - LED device status display elements
11 - LED port status display elements
12 – LED service port display element
13 - Service port

1.2.4 MAR1142-... with 16 Gigabit ports, ports on back and PoE

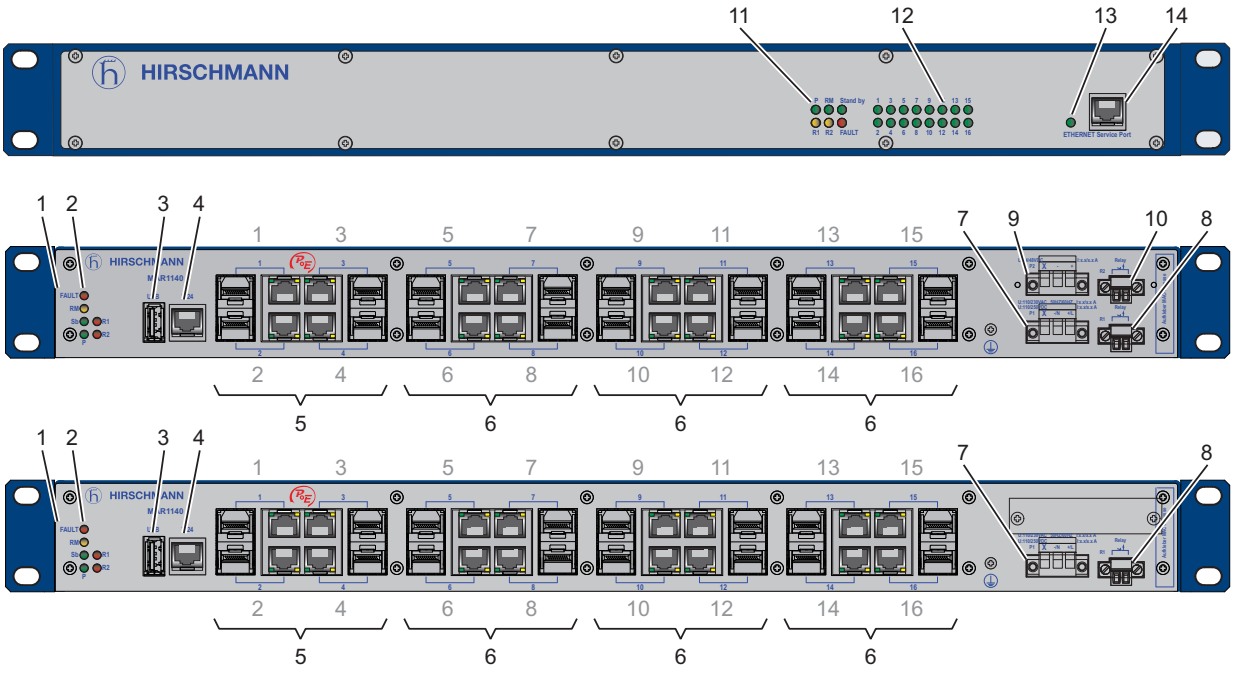


Figure 5: Back of device:
1 - MAR1142 device
2 - LED display elements
3 - USB interface
4 - V.24 connection for external management
5 - Gigabit Ethernet combo ports with Power over Ethernet (PoE): 100/1000 Mbit/s fiber optic SFP slots. Alternative connections: 10/100/1000 Mbit/s twisted pair, RJ45 connections
6 - Gigabit Ethernet combo ports: 100/1000 Mbit/s fiber optic SFP slots. Alternative connections: 10/100/1000 Mbit/s twisted pair, RJ45 connections
7 - P1: Connection for the voltage supply
8 - Relay 1: signal contact
For device variants with 2 power supply units:
9 - P2: Connection for redundant voltage supply
10 - Relay 2: signal contact

Front of device:
11 - LED device status display elements
12 - LED port status display elements
13 - LED service port display element
14 - Service port

The device variants of the MACH 1040 with ports on the rear panel have the following characteristics:

- The display LEDs are on the front of the device. There are 16 LEDs for displaying the status of the Gigabit Ethernet ports and 6 LEDs for displaying the device status.
- The supply voltage connection and the ports are on the back of the device. The device has 16 Gigabit Ethernet ports and an additional Fast Ethernet port on the front of the device that you can use for diagnosis purposes.

1.2.5 PoE ports

The MAR1042/MAR1142 device variants support Power over Ethernet (PoE) in accordance with IEEE 802.3af.

They allow the connection and remote supply of, for example, IP telephones (Voice over IP), webcams, sensors, printer servers and WLAN access points via 10BASE-T/100BASE-TX/1000BASE-T. With PoE, these terminal devices are powered by the twisted-pair cable.

The MAR1042 and MAR1142 provide four 10BASE-T/100BASE-TX/1000BASE-T ports (RJ45 sockets) for connecting network segments or PoE terminal devices (PD, Powered Device) for all IEEE802.3af classes up to a maximum power output of 15.4 W.

The 4 PoE-capable ports are the 4 first ports on the device (ports 1 to 4, see fig. 3 and fig. 5). The PoE ports are indicated with the red PoE logo on the device.
The current is supplied on wire pairs transmitting the signal; the individual ports are not electrically insulated from each other.
(see page 32 „10/100/1000 Mbit/s twisted pair connection“)
The following conditions are met in accordance with IEEE 802.3af:

- Endpoint PSE
- Alternative A

1.2.6 Combo ports

At the four Gigabit Ethernet combo ports (see fig. 2 to fig. 5) you can connected either F/O (via SFP modules) or twisted pair.

- **SFP modules**
  SFP modules are optical transceivers (Fast ETHERNET and Gigabit ETHERNET SFP modules, see page 48 „Accessories“). SFP stands for Small Form-factor Pluggable and is also frequently referred to as mini-GBIC (GigaBit Interface Converter).

The SFP modules are plugged into the SFP slots of the MACH 1040 device in order to obtain an F/O port. The MACH 1040 has 16 TP interfaces and 16 slots for inserting SFP modules (100/1000 Mbit/s). By inserting the SFP module you deactivate the corresponding TP interface.

Note: Only use Hirschmann SFP modules (see page 48 „Accessories“).

1.2.7 Signal contact

Depending on the MACH 1040 device variant (equipped with one or two power units), you have either one or two signal contacts.

- The signal contact 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 switch the signal contact manually and thus control external devices.

A break in contact is used to report the following conditions via the potential-free signal contact (relay contact, closed circuit):

- The failure of at least one supply voltage.
- The device is not operational.
- The loss of connection at at least one port. The report of the link status can be masked by the Management for each port. In the delivery state, link status monitoring is deactivated.
- The loss of ring redundancy reserve.
- A detected error during the self-test.
- Incorrect configuration of the HIPER-Ring or ring coupling.
- Permitted temperature range exceeded/not reached.

The following condition is also reported in RM mode:

- Ring redundancy reserve is available. On delivery, there is no ring redundancy monitoring.

Note: You can use the signal contact functions when the voltage supply is connected. If there is redundant voltage supply, but this is turned off, there is a contact interruption at the corresponding signal contact.

1.3 Combination options

The product designation of your device is made from combining the desired product characteristics in accordance with the following table. The corresponding short designation is in column 3.

Item	Characteristic	Ident.	Property
1 to 7	Product	MAR1040 MAR1042 MAR1140 MAR1142	MACH Ruggedized Gigabit Ethernet Switch MACH Ruggedized Gigabit Ethernet Switch with PoE MACH Ruggedized Gigabit Ethernet Switch, ports on the back MACH Ruggedized Gigabit Ethernet Switch, ports on the back and with PoE
8	- (hyphen)	-	
9 to 10	10/100/1000 Mbit/s ports 1 to 4	4C	4 * combo port (SFP slot: 100/1000 Mbit/s, alternatively twisted pair RJ45 socket: 10/100/1000 Mbit/s)
11 to 12	10/100/1000 Mbit/s ports 5 to 8	4C	See 9 to 10
13 to 14	10/100/1000 Mbit/s ports 9 to 12	4C	See 9 to 10
15 to 16	10/100/1000 Mbit/s ports 13 to 16	4C	See 9 to 10
17 to 18	Ports 17 to 20	99	Not present
19 to 20	Ports 21 to 24	99	Not present
21	Temperature range	S	Standard 0 °C to +60 °C
		T	Extended -40 °C to +70 °C
		E	Extended -40 °C to +70 °C, conformal coating
22	Voltage range Power supply unit 1	L	(see page 41 „General technical data“)
		M	(see page 41 „General technical data“)
23	Voltage range Power supply unit 2 or PoE power supply unit	9	Not present
		L	(see page 41 „General technical data“)
		M	(see page 41 „General technical data“)
24	Certifications	H	CE, UL 508, GL, IEC 61850, IEEE 1613 Substation, EN 50121-4 Railway (along track)
25	Software variant	P	Layer 2 Professional
		R	Layer 3 Professional

Table 1: Combination options for the device variants of the MACH 1040

Example of MACH 1040 product designation

MAR1040-	MACH Ruggedized Switch with 16 Gigabit Ethernet ports	
4C	10/100/1000 Mbit/s ports 1 to 4:	4 * Gigabit Ethernet combo ports
4C	10/100/1000 Mbit/s ports 5 to 8:	4 * Gigabit Ethernet combo ports
4C	10/100/1000 Mbit/s ports 9 to 12:	4 * Gigabit Ethernet combo ports
4C	10/100/1000 Mbit/s ports 13 to 16:	4 * Gigabit Ethernet combo ports
99	Ports 17 to 20:	Not present
99	Ports 21 to 24:	Not present
T	Temperature range extended:	-40 °C to +70 °C
L	Voltage range, power supply unit 1:	18 VDC to 60 VDC
M	Voltage range, power supply unit 2:	77 VDC to 300 VDC or 90 VAC to 265 VAC
L	Voltage range, power supply unit 1:	(see page 41 „General technical data“)
M	Voltage range, power supply unit 2:	(see page 41 „General technical data“)
H	Certifications:	CE, UL 508, GL, IEC 61850, IEEE 1613 Substation, EN 50121-4 Railway (along track)
P	Software variant:	Layer 2 Professional

Table 2: Example of product designation for MACH 1040 with 16 Gigabit Ethernet ports: MACH 1040 - 4C 4C 4C 4C 99 99 T L M H P

2 Assembly and start-up

The devices have been developed for practical application in a harsh industrial environment.

On delivery, the device is ready for operation.
The following procedure has been proven to be successful for the assembly of the device:

- Unpacking and checking
- Installing the SFP modules (optional)
- Connecting the power unit connections for supply voltage and signal contact
- Installing the device
- Startup
- Connecting the data lines

2.1 Installing the device

2.1.1 Unpacking and checking

☐ Check that the contents of the package are complete (see page 47 „Scope of delivery“).
☐ Check the individual parts for transport damage.

2.1.2 Installing the SFP modules (optional)

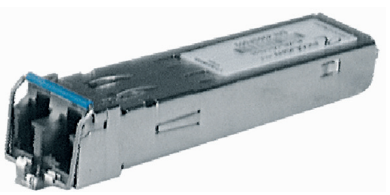


Figure 6: Fast Ethernet / Gigabit Ethernet fiber optic SFP module

☐ Push the SFP module with the lock closed into the socket until it latches audibly in place.

Note: Only use Hirschmann SFP modules (see page 48 „Accessories“).

2.1.3 Connecting the power unit connections for supply voltage and signal contact

The voltage supply is connected via a 3-pin terminal block with screw locking.

The signal contact is connected via a 2-pin terminal block with screw locking (1 or 2 locks, depending on the device design).

Note: For device variants without PoE: The supply voltage in MACH1040/MACH1140 device types can be connected redundantly with two power units. Both inputs are uncoupled.

Note: The supply voltage is electrically isolated from the housing.

MACH 1040 devices without PoE

MACH 1040 device variants without PoE (Power over Ethernet) are, depending on the device type, equipped with one or two power units of the following type:

- Type “L” (see page 41 „General technical data“)
- Type “M”(see page 41 „General technical data“)

Note: For device variants without PoE: For device variants with two power units, if there is non-redundant voltage supply, the device reports the failure of one supply voltage. You can prevent this message by applying the supply voltage via both inputs, or by changing the configuration in the Management.

MACH 1040 devices with PoE

MACH 1040 device variants with PoE (Power over Ethernet) are equipped with two power units.

- Power unit 2 is a PoE power unit, see product code item 23 in table (see table 1).
- You can choose the connections to power unit 1, see product code item 22 in table (see table 1).

Connecting the supply voltage

WARNING

ELECTRIC SHOCK
Only connect a supply voltage that corresponds to the type plate of your device.
Never insert sharp objects (small screwdrivers, wires, etc.) into the connection terminals for the supply voltage, and do not touch the terminals!

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

Note: Relevant for North America:
The tightening torque for fixing the power supply terminal block to the device is 4.5 lb in (0.51 Nm).

Note: The terminal blocks for devices with power unit type “M” (type “L”) are coded to prevent them from being accidently connected to devices with power unit type “L” (type “M”).

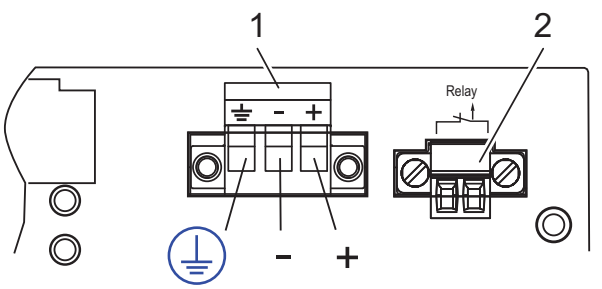


Figure 7: Power supply unit “L”, DC voltage *(see page 41 „General technical data“)*
Connection for
1 - supply voltage
2 - signal contact

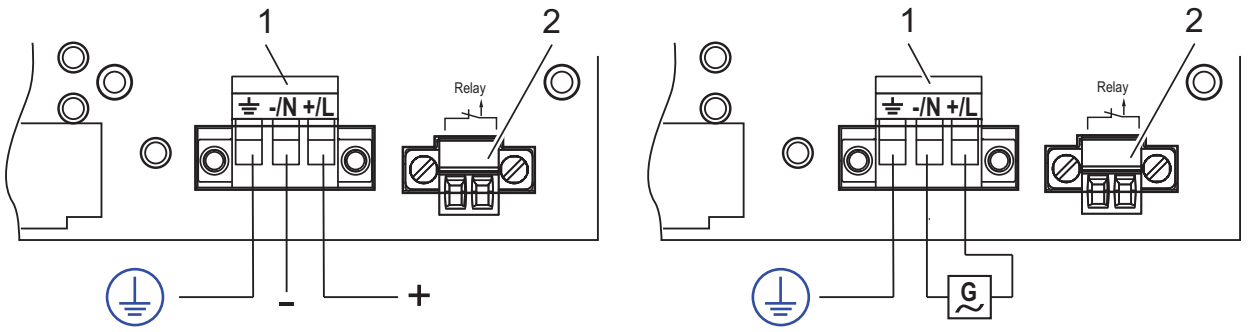


Figure 8: Power supply unit “M” (see page 41 „General technical data“):
AC voltage (pictured on right) or DC voltage (pictured on left)
Connecting
1 - Supply voltage
2 - Signal contact

Connection	Type “L”	Type “M” VDC	Type “M” VAC
⏚ , pin 1	Protective conductor	Protective conductor	Protective conductor
-/N, pin 2	Minus terminal of the supply voltage	Minus terminal of the supply voltage	Neutral conductor
+/L, pin 3	Plus terminal of the supply voltage	Plus terminal of the supply voltage	Line conductor

Table 3: Pin assignment of terminal block for voltage supply

For every supply voltage to be connected, perform the following steps:

☐ Ensure the required conditions for connecting the supply voltage (see page 4 „Supply voltage“).

WARNING

ELECTRIC SHOCK
Only start connecting the supply voltage if **all** the above mentioned requirements are fulfilled.
(see page 4 „Supply voltage“)

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

☐ Pull the terminal block off the device.
☐ Connect the protective conductor to the protective conductor terminal.
☐ Connect the lines for the supply voltage to the terminals +/L and -/N.
☐ Mount the terminal block on the device using screws.

Connecting the signal contact

WARNING

ELECTRIC SHOCK
Never insert sharp objects (small screwdrivers, wires, etc.) into the connection terminals for the signal lines, and do not touch the terminals!

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

Note: Relevant for North America:
The tightening torque for fixing the signal contact terminal block to the device is 3 lb in (0.34 Nm).

For every signal contact to be connected, make sure the following requirements are met:

- The lines to be connected are voltage-free.
- The connected voltage is limited by a current limitation or a fuse. Observe the electrical threshold values for signal contact (see on page 41 „General technical data“).

For every signal contact to be connected, perform the following steps:

- ☐ Connect the signal contact lines with the terminal block connections.
- ☐ Mount the terminal block on the device using screws.

2.1.4 Installing the device

⚠ WARNING

ELECTRIC SHOCK
Only install this device in a switch cabinet or in an operating site with limited access, to which only maintenance staff have access.

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

⚠ CAUTION

OVERHEATING OF THE DEVICE
When installing the device, ensure that the ventilation slots are not covered.

Non-adherence to these instructions can lead to minor physical injury or material damage.

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

Mounting in a switch cabinet

Note: Install the device in the 19" switch cabinet using sliding or mounting rails.
This provides a more stable position of your device in environments subject to vibration.
For more information on sliding/mounting rails and how to install them, please contact your switch cabinet manufacturer.

The devices are designed to be mounted in a 19" rack.

☐ Make sure there is sufficient ventilation. If necessary, provide a fan for the 19" rack. This will prevent the basic devices from overheating.

☐ Measure the depth of the 19" cabinet so that all the lines to be connected can be fed in easily.

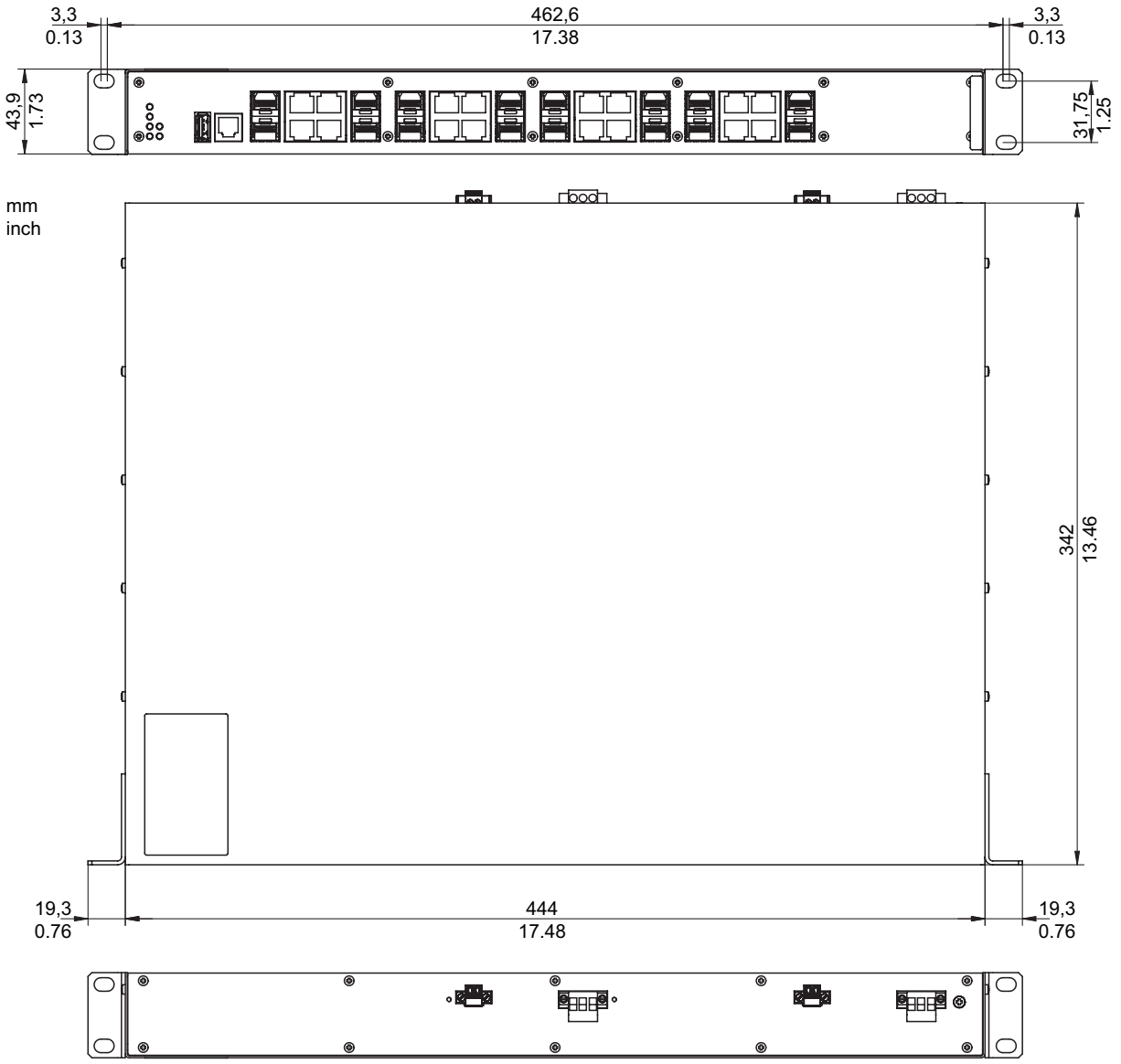


Figure 9: Dimensions

☐ Install the sliding/mounting rails in the 19" switch cabinet as instructed by the manufacturer, and make sure the device is resting on both rails.

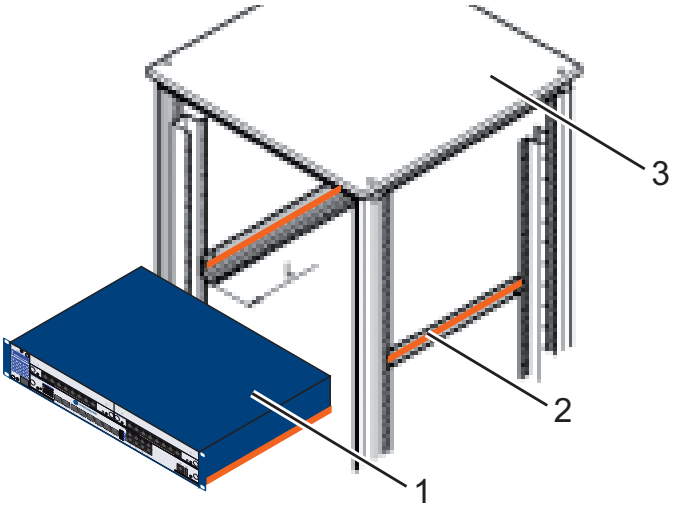


Figure 10: Installation in the switch cabinet with sliding/mounting rails
1 - MACH 1040 device
2 - Sliding/mounting rail
3 - 19" cabinet

On delivery, two brackets are attached to the sides of the device (see figure below).

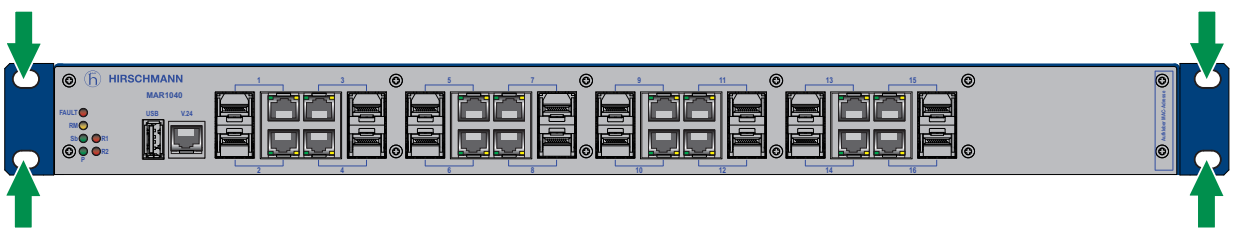


Figure 11: Mounting in the switch cabinet

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

Note: When operating the device in environments with strong vibrations, the device can be fastened with two additional brackets at the back of the switch cabinet (see on page 48 „Accessories“), not included in the delivery.

Vertical mounting on the wall

WARNING

FIRE HAZARD
Install the device in a fire protected shell if you are mounting it vertically.

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

- ☐ Use the pre-mounted brackets included in the delivery as shown in the following figure (see fig. 13).
- ☐ Attach two additional brackets to the device (see on page 48 „Accessories“, not included in the delivery) as shown in the following figure (see fig. 13).
- ☐ Fasten the device by screwing the brackets to the wall.

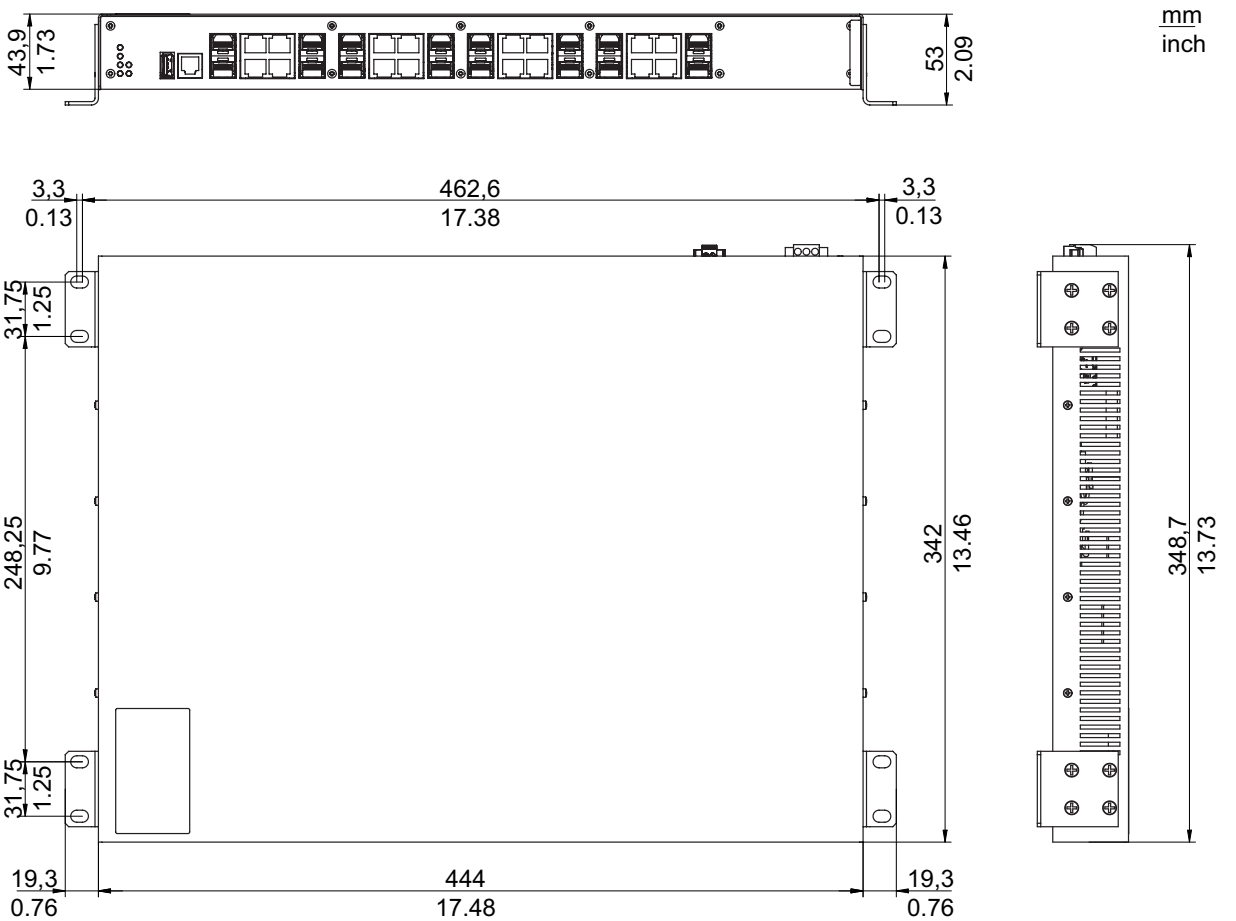


Figure 12: Dimensions

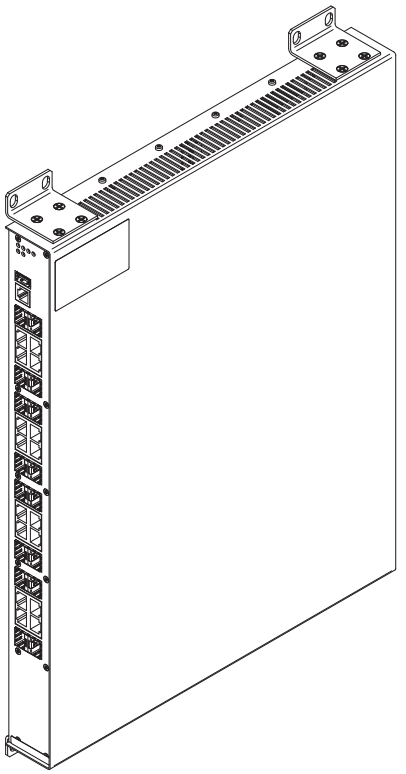


Figure 13: Vertical mounting on the wall

2.1.5 Startup procedure

When you connect the supply voltage, you start up the device.

2.1.6 Connecting the data lines

You can connect terminal devices and other segments at the ports of the device via twisted pair cables or F/O cables.

☐ Install the data lines according to your requirements.

10/100/1000 Mbit/s twisted pair connection

These connections are RJ45 sockets.

10/100/1000 Mbit/s TP ports enable the connection of terminal devices or independent network segments according to the IEEE 802.3 10BASE-T/ 100BASE-TX/1000BASE-T standard.

The MAR1042 and MAR1142 devices also allow:
IEEE 802.3af (Power over Ethernet on data lines).

These ports support:

- Autonegotiation
- Autopolarity

- Autocrossing (if autonegotiation is activated)
- 1000 Mbit/s full duplex
- 100 Mbit/s half-duplex mode, 100 Mbit/s full duplex mode
- 10 Mbit/s half-duplex mode, 10 Mbit/s full duplex mode
- Also for MAR1042 and MAR1142:
  Power over Ethernet (PoE, at the first four ports of the device)
  The PoE voltage is input via the wire pairs transmitting the signal (phantom voltage).

State on delivery: autonegotiation activated.
The socket housing is electrically connected to the front panel.
The pin assignment corresponds to MDI-X.

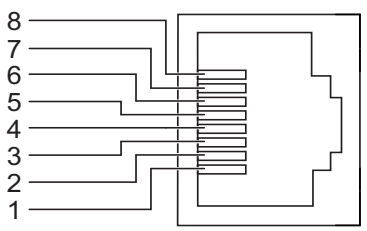
Figure	Pin	Function	For MAR1042 and MAR1142: Power over Ethernet (PoE)
	1	BI_DB +	V -
	2	BI_DB -	V -
	3	BI_DA +	V +
	4	BI_DD +	
	5	BI_DD -	
	6	BI_DA -	V +
	7	BI_DC +	
	8	BI_DC -	

Table 4: Pin assignment of a 1000 MBit/s TP interface in MDI-X mode, RJ45 socket - for PoE with the power supplied via the wire pairs transmitting the signal

Note: In general, you should adhere to the following recommendations for data cable connections using copper in environments with high electrical interference levels:

- Keep the length of the data cables as short as possible. Use optical cables for the data transmission between the buildings.
- Make sure there is a sufficient gap between the power supply cables and the data cables if they are laid over a long distance. Ideally, install the cables in separate cable channels.
- Use shielded cables.

100 Mbit/s F/O connection

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

- Full or half duplex mode

State on delivery: full duplex FDX

Note: Make sure that the LH ports are only connected with LH ports, SM ports are only connected with SM ports, and MM ports only with MM ports.

1 Gbit/s fiber optic connection

1 GBit/s fiber optic ports (SFP slot) 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 standards. These ports support:

- Autonegotiation
- Full duplex mode

Default settings: autonegotiation

Note: Make sure that the LH ports are only connected with LH ports, SX ports are only connected with SX ports, and LX ports only with LX ports.

2.2 Display elements

After the operating voltage is set up, the software starts and initializes itself. Afterwards, the device performs a self-test. During this process, various LEDs light up.
The process takes around 15 seconds.

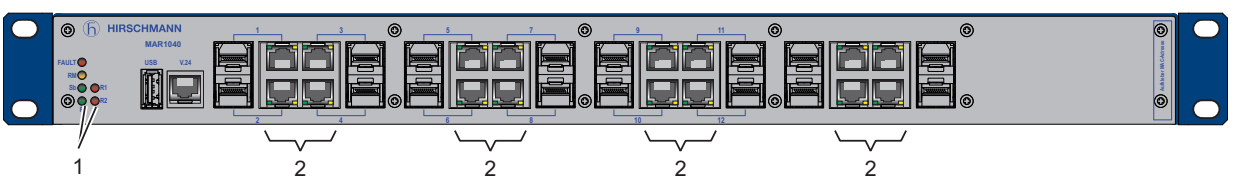


Figure 14: Display elements for MAR1040 and MAR1042
1 - Device status display elements
2 - Port status display elements

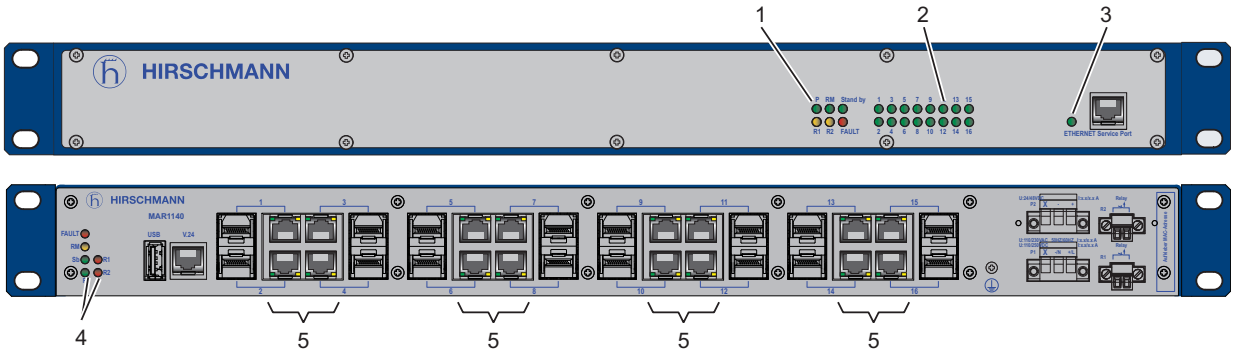
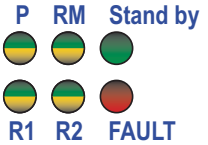


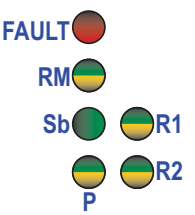
Figure 15: Display elements for MAR1140 and MAR1142

Front of device:
1 - Device status display elements
2 - Port status display elements for 16 Gigabit Ethernet ports
3 - Diagnosis port with display element
Back of device:
4 - Device status display elements
5 - Port status display elements

Device state



MAR1140, MAR1142



MAR1040, MAR1042, MAR1140, MAR1142

These LEDs provide information about conditions which affect the operation of the whole device.
The following table applies only to device variants with 2 power supply units:

LED	Display	Color	Activity	Meaning
P	Power supply	Green	Lights up	The supply voltages 1 **and** 2 are on.
		Yellow	Lights up	The supply voltages 1 **or** 2 are on.
			None	The supply voltages 1 **and** 2 are too low.

The following table applies only to device variants with one power supply unit:

LED	Display	Color	Activity	Meaning
P	Power supply	Green	Lights up	The supply voltage is on.
			None	The supply voltage is too low.

The following table applies to all device variants:

LED	Display	Color	Activity	Meaning
Stand-by/Sb	Stand-by mode		None	Stand-by mode not enabled
		Green	Lights up	Standby mode enabled
RM	Ring Manager		None	The RM function is deactivated.
		Green	Lights up	The RM function is active. The redundant port is disabled.
			flashing	Incorrect configuration of the HIPER-Ring (e.g. the ring is not connected to the ring port).
		Yellow	Lights up	The RM function is active. The redundant port is enabled.
RM and Stand-by/Sb	ACA memory operation		Flashing alternately	Error in the memory operation
			flash synchronously – 2 x per period	Save a configuration file from the ACA to the device.
			flash synchronously – 1 x per period	Saving a configuration file from the device to the ACA.

Applies to software releases previous to 06.0.00:

LED	Display	Color	Activity	Meaning
FAULT	Signal contact 1	Red	Lights up	The signal contact is open, it is reporting an error.
			None	Signal contact is closed, it is not reporting a detected error.

Applies to software release 06.0.00 and higher:

LED	Display	Color	Activity	Meaning
FAULT	Signal contact 1	Red	Lights up	The signal contact is open, it is reporting an error.
			None	Signal contact is closed, it is not reporting a detected error.
	Duplicate IP detection	Red	flashes 4 times a period	Reports an IP conflict.

Applies to software releases previous to 06.0.00:

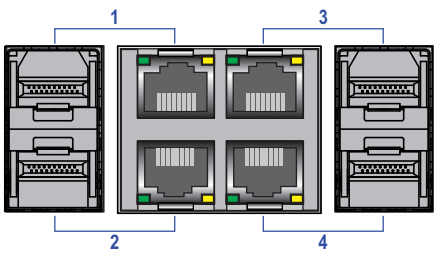
LED	Display	Color	Activity	Meaning
R1	Signal contact 1	Yellow	Lights up	The signal contact is closed in manual operation.
			None	The signal contact is open in manual operation.
R2	Signal contact 2	Yellow	Lights up	The signal contact is closed in manual operation.
			None	The signal contact is open in manual operation.

Applies to software release 06.0.00 and higher:

LED	Display	Activity	Color	Meaning
R1	Signal contact 1	Lights up	Green	The signal contact is open in non manual operation.
			Yellow	The signal contact is open in manual operation.
		None		The signal contact is closed.
R2	Signal contact 2	Lights up	Green	The signal contact is open in non manual operation.
			Yellow	The signal contact is open in manual operation.
		None		The signal contact is closed.

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

Port state



MAR1040, MAR1042, MAR1140, MAR1142

MAR1140, MAR1142

The green and yellow LEDs at the individual port display port-related information. During the boot phase, these LEDs are used to display the status of the boot procedure.

LS, DA - link status, data (one green/yellow LED or one green and one yellow LED per port)	
Not glowing	No valid connection.
Glowing green	Valid connection.
Flashing green (1 time a period)	Port is switched to stand-by.
Flashing green (3 times a period)	Port is switched off.
Flashing yellow	Receive data / send data.

2.3 Basic set-up

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

- Entry via V.24 connection
- Entry using the HiDiscovery protocol via the HiDiscovery or Industrial HiVision application

- Configuration via BOOTP
- Configuration via DHCP (Option 82)
- AutoConfiguration Adapter

Further information on the basic settings of the device can be found in the “Basic Configuration” user manual on the CD ROM.

Default settings

- IP address: The device looks for the IP address using DHCP
- Password for management:
  Login: user; password: public (read only)
  Login: admin; password: private (read and write)
- Parameters that can be set via the management are set to pre-defined values in accordance with the MIB
- V.24 data rate: 9,600 Baud
- Ring redundancy: disabled
- Ethernet ports: link status is not evaluated (signal contact)
- Optical 100 Mbit/s ports: 100 Mbit/s, full duplex
  All other ports: autonegotiation
- Ring manager disabled
- Stand-by coupling: disabled
  Port 4 = control port, port 3 = coupling port for red. Ring coupling

USB interface

The USB socket has an interface for the local connection of an AutoConfiguration Adapter (part number ACA 21-USB see on page 48 „Accessories“). It is used for saving/loading the configuration and for loading the software.

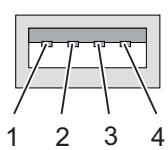
Figure	Pin	Operation
	1	VCC (VBus)
	2	− Data
	3	+ Data
	4	Ground (GND)

Table 5: Pin assignment of the USB interface

V.24 interface (external management)

The V.24 interface is an RJ11 socket.
At the V.24 connection, a serial interface is provided for the local connection of an external management station (VT100 terminal or PC with corresponding terminal emulation). This enables you to set up a connection to the Command Line Interface (CLI) and to the system monitor.

VT 100 terminal settings	
Speed	9,600 Baud
Data	8 bit
Stopbit	1 bit
Handshake	off
Parity	none

The socket housing is electrically connected to the front panel of the device.
The V.24 interface is not electrically isolated from the supply voltage.

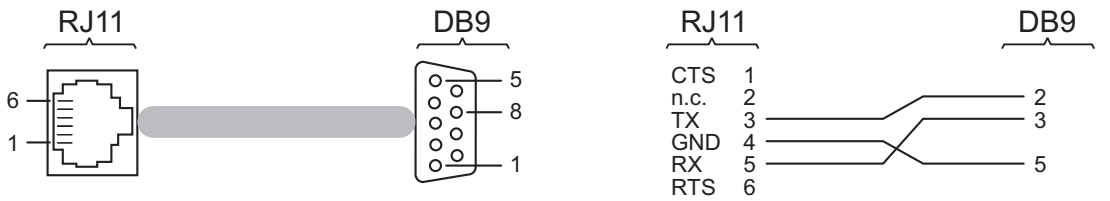


Figure 16: Pin assignment of the V.24 interface and the DB9 connector

Note: You will find the order number for the terminal cable, which is ordered separately, in the Technical Data chapter (see page 48).

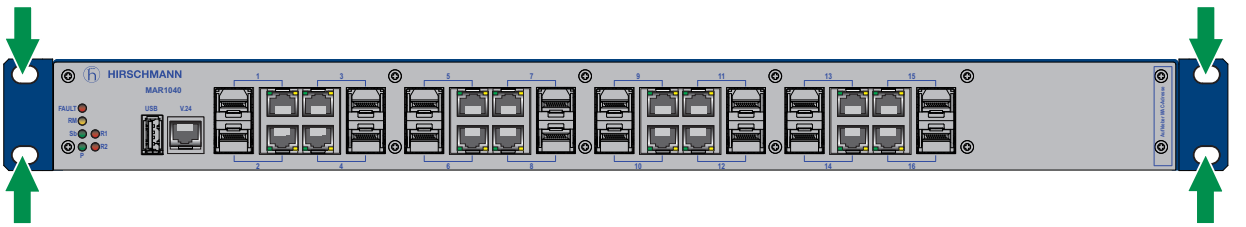
You will find a description of the V.24 interface in the “Basic Configuration User Manual” on the CD-ROM.

2.4 Maintenance

- ☐ When designing this device, Hirschmann was largely able to forego using wear parts. The parts subject to wear are dimensioned to last longer than the lifetime of the product when it is operated normally. Operate this device according to the specifications (see „Technical data“).
- ☐ Relays are subject to natural wear. This wear depends on the frequency of the switching operations. Depending on the frequency of the switching operations, check the volume resistance of the closed relay contacts and the switching function.
- ☐ Hirschmann are continually working on improving and developing their software. You should regularly check whether there is a new version of the software that provides you with additional benefits. You will find software information and downloads on the product pages of the Hirschmann website.
- ☐ Depending on the degree of pollution in the operating environment, check at regular intervals that the ventilation slots in the device are not obstructed.

2.5 Disassembling the device

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



3 Technical data

General technical data

Dimensions W x D x H	MAR1...	448 x 44 x 345 mm (without brackets)
Weight	MAR1040..., MAR1140...	max. 4.2 kg
	MAR1040..., MAR1140... Devices with redundant power unit	max. 4.4 kg
	MAR1042..., MAR1142... Devices with PoE power unit	max. 4.6 kg
Power supply Power unit type “M”	Nominal voltage range AC	100 V-240 V, 50 Hz-60 Hz
	Voltage range AC incl. maximum tolerances	90 V-265 V, 47 Hz-63 Hz
	Nominal voltage range DC	110 V-250 V
	Voltage range DC incl. maximum tolerances	77 V-300 V
	Connection type	3-pin terminal block
	Power failure bridging	> 20 ms at 230 V AC
Power supply Power unit type “L”	Nominal voltage range DC	24 V-48 V
	Voltage range DC incl. maximum tolerances	18 V-60 V
	Connection type	3-pin terminal block
	Power failure bridging	> 10 ms at 20.4 V DC
Properties of the back-up fuse to be installed for the voltage supply	Power units “L”	Nominal rating: 6.3 A
		Characteristic: slow blow
	Power units “M”	Nominal rating: 2.5 A
		Characteristic: slow blow
Signal contact (ordinary locations)	Nominal value for AC	I_{max} = 2 A at U_{max} = 230 V
	Nominal value for DC	I_{max} = 2 A at U_{max} = 30 V I_{max} = 0.2 A at U_{max} = 125 V I_{max} = 0.1 A at U_{max} = 250 V
	Connection type	2-pin terminal block
Signal contact (Hazardous Locations Class 1, Division 2)	Entity parameters	V_{max} = 30 V I_{max} = 90 mA C_i = 50 pF L_i = 2 µH For details refer to the figure on page 8 „Control Drawing 000154226DNR“.
	Connection type	2-pin terminal block
Environment	Storage temperature (ambient air) Humidity Air pressure	Standard: -40 °C to +70 °C Extended: -40 °C to +85 °C 5% to 95% (non-condensing) Up to 2000 m (795 hPa), higher altitudes on request
Operating temperature	Standard (surrounding air)	0 °C to +60 °C[a]
	Extended (surrounding air)	-40 °C to +70 °C[a]

Pollution degree		2
Protection classes	Laser protection	Class 1 according to EN 60825-1 (2007)
	Protection class	IP 30

a. If you use SFP modules without the supplement „EEC“ then the operating temperature range of the device is 0 °C to 55 °C (see page 48 „Accessories“.)

EMC and immunity

EMC interference immunity IEC/EN 61850-3:2002 EMI TYPE tests, test in comp. with	Description	Test level
IEC/EN 61000-4-2	Electrostatic discharge	
	Contact discharge	± 8 kV
	Air discharge	± 15 kV
IEC/EN 61000-4-3	Electromagnetic field	
	80 MHz ... 2700 MHz	20 V/m
IEC/EN 61000-4-4	Fast transients (burst)	
	DC Power Line	± 4 kV
	AC Power Line	± 4 kV
	Data line	± 4 kV
IEC/EN 61000-4-5	Voltage surges	
	DC Power Line	± 2 kV line/earth; ± 1 kV line/line
	AC Power Line	± 4 kV line/earth; ± 2 kV line/line
	Data line	± 4 kV line/earth
IEC/EN 61000-4-6	Line-conducted interference voltages	
	150 kHz ... 80 MHz	10 V
IEC/EN 61000-4-12	damped oscillation	
	DC Power Line	± 2,5 kV line/earth; ± 1 kV line/line
	AC Power Line	± 2,5 kV line/earth; ± 1 kV line/line
	Data line	± 2,5 kV line/earth; ± 1 kV line/line
IEC 60255-5	dielectric strength	
	DC Power Line, power unit type „L“	500 V AC 500 V AC
	AC Power Line, power unit type „M“	2000 V AC 2000 V AC
	DC Power Line, power unit type „M“	2000 V AC
	signal contact type „L“ and „M“	2000 V AC

EMC interference immunity IEEE 1613:2009 EMI TYPE tests, test in comp. with	Description	Test level
IEEE C37.90.3	Electrostatic discharge	
	Contact discharge	± 8 kV
	Air discharge	± 15 kV
IEEE C37.90.2	Electromagnetic field	
	80 MHz ... 1000 MHz	35 V/m (peak)

EMC interference immunity IEEE 1613:2009 EMI TYPE tests, test in comp. with	Description	Test level
IEEE C37.90.1	Fast transients (burst)	
	DC Power Line	± 4 kV
	AC Power Line	± 4 kV
	Data line	± 4 kV
IEEE C37.90.1	damped oscillation	
	DC Power Line	± 2,5 kV line/earth; ± 1 kV line/line
	AC Power Line	± 2,5 kV line/earth; ± 1 kV line/line
	Data line	± 2,5 kV line/earth; ± 1 kV line/line
IEEE C37.90	H.V. Impulse	
	DC Power Line	± 5 kV line/earth
	AC Power Line	± 5 kV line/earth
IEEE C37.90	dielectric strength	
	DC Power Line, power unit type „L“	500 V AC
	AC Power Line, power unit type „M“	2000 V AC
	DC Power Line, power unit type „M“	2000 V AC
	signal contact type „L“ and „M“	2000 V AC

EMC emitted interference	
EN 55022	Class A
FCC 47 CFR Part 15	Class A
German Lloyd	Classification + Construction Guidelines VI-7-3 Part 1 Ed.2001

Environment type tests, test in comp. with	Description	Test level
IEC 60068-2-1	Cold	-40 °C, 16 hours
IEC 60068-2-2	Dry heat	+85 °C, 16 hours
IEC 60068-2-30	Relative humidity	95 % (non condensing) 55 °C, 4 cycles
IEC 60068-2-6	Vibration, test Fc	2- 9 Hz with 3 mm amplitude 1 g at 9 - 150 Hz 1.5 g at 200 - 500 Hz
IEC 60068-2-27	Shock, test Ea	15 g at 11 ms

Network range

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

TP port	
Length of a twisted pair segment	max. 100 m / 328 ft (cat5e cable with 1000BASE-T)

Table 6: TP port 10BASE-T / 100BASE-TX / 1000BASE-T

Product code M-SFP-...		Wave length	Fiber	System attenuation	Example for F/O line length [a]	Fiber attenuation	BLP[b]/ dispersion
-SX/LC...	MM	850 nm	50/125 µm	0-7.5 dB	0-550 m	3.0 dB/km	400 MHz*km
-SX/LC...	MM	850 nm	62.5/125 µm	0-7.5 dB	0-275 m	3.2 dB/km	200 MHz*km
-MX/LC	MM	1310 nm	50/125 µm	0-8 dB	2 km[c]	1.0 dB/km	500 MHz*km
-MX/LC	MM	1310 nm	62.5/125 µm	0-8 dB	1 km	1.0 dB/km	500 MHz*km
-LX/LC...	MM	1310 nm[d]	50/125 µm	0-10.5 dB	0-550 m	1.0 dB/km	800 MHz*km
-LX/LC...	MM	1310 nm [d]	62.5/125 µm	0-10.5 dB	0-550 m	1.0 dB/km	500 MHz*km
-LX/LC...	SM	1310 nm	9/125 µm	0-10.5 dB	0-20 km[e]	0.4 dB/km	3.5 ps/ (nm*km)
-LX+/LC...	SM	1310 nm	9/125 µm	5-20 dB	14-42 km	0.4 dB/km	3.5 ps/ (nm*km)
-LH/LC...	LH	1550 nm	9/125 µm	5-22 dB	23-80 km	0.25 dB/km	19 ps/ (nm*km)
-LH+/LC	LH	1550 nm	9/125 µm	15-30 dB	71-108 km	0.25 dB/km	19 ps/ (nm*km)
-LH+/LC	LH	1550 nm	9/125 µm	15-30 dB	71-128 km	0.21 dB/km (typically)	19 ps/ (nm*km)

Table 7: Fiber port 1000BASE-FX (SFP fiber optic Gigabit Ethernet Transceiver)

a. including 3 dB system reserve when compliance with the fiber data is observed
b. The bandwidth length product cannot be used to calculate the expansion.
c. Distances of up to 3 km reachable, 1000 MHz*km (1300 nm)
d. With F/O adapter compliant with IEEE 802.3-2002 clause 38 (single-mode fiber offset-launch mode conditioning patch cord)
e. including 2.5 dB system reserve when compliance with the fiber data is observed

Product code M-SFP-BIDI...		Wave length TX	Wave length RX	Fiber	System attenuation	Example for F/O line length [a]	Fiber attenuation	Dispersion
Type A LX/LC EEC	SM	1310 nm	1550 nm	9/125 µm	0-11 dB	0-20 km	0.4 dB/km	3.5 ps/ (nm*km)
Type B LX/LC EEC	SM	1550 nm	1310 nm	9/125 µm	0-11 dB	0-20 km	0.25 dB/km	19 ps/ (nm*km)
Type A LH/LC EEC	LH	1490 nm	1590 nm	9/125 µm	5-24 dB	23-80 km	0.25 dB/km	19 ps/ (nm*km)
Type B LH/LC EEC	LH	1590 nm	1490 nm	9/125 µm	5-24 dB	23-80 km	0.25 dB/km	19 ps/ (nm*km)

Table 8: F/O port (bidirectional Gigabit Ethernet SFP Transceiver)

a. including 3 dB system reserve when compliance with the fiber data is observed

Product code M-FAST-SFP-...		Wave length	Fiber	System attenuation	Example for F/O line length [a]	Fiber attenuation	BLP/ dispersion
-MM/LC...	MM	1310 nm	50/125 µm	0-8 dB	0-5 km	1.0 dB/km	800 MHz*km
-MM/LC...	MM	1310 nm	62.5/125 µm	0-11 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	47-104 km	0.25 dB/km	19 ps/(nm*km)
-LH/LC...	SM	1550 nm	9/125 µm	10-29 dB	55-140 km	0.18 dB/km[b]	18 ps/(nm*km)

Table 9: Fiber port 100BASE-FX (SFP fiber optic Fast Ethernet Transceiver)

a. including 3 dB system reserve when compliance with the fiber data is observed
b. with ultra-low-loss optical fiber

MM = Multimode, SM = Singlemode, LH = Singlemode Longhaul

Power consumption/power output

Device variants without PoE (MAR1040..., MAR1140...)	Maximum power consumption	Maximum power output
Device (without SFP modules, without TP links)	10 W	34 Btu (IT)/h
additionally for each connected SFP module	1 W	3 Btu (IT)/h
additionally for each TP port with link	0.8 W	3 Btu (IT)/h
Device at full capacity (16 links)	26 W	88 Btu (IT)/h
Device variants with PoE (MAR1042..., MAR1142...)	**Maximum power consumption**	**Maximum power output**
Device (without SFP modules, without TP links, without PDs)	10 W	34 Btu (IT)/h
additionally for each connected SFP module	1 W	3 Btu (IT)/h
additionally for each TP port with link	0.8 W	3 Btu (IT)/h
additionally for each TP port with link when one Class0-PD (powered device) is connected	19.5 W	12 Btu (IT)/h
Device at full capacity with 4 x Class0-PD (powered device) connected	100 W	136 Btu (IT)/h

Scope of delivery

Device	Scope of delivery
MAR...	MAR... device Installation user manual CD-ROM 2 brackets Connectors for power supply and relay contact

Order numbers/product description

Combination options and device names (see table 1).

You can also order the following device variants using their order numbers:

Name	Description	Order number
MAR1040-4C4C4C4C9999SM9HPHH	MACH 1040 device with - 16 x Gigabit Ethernet combo ports - ports on front of device, power supply connection on back of device - standard temperature range - 1 power unit type M - Layer2 Professional software	942 004 - 001

Accessories

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

Gigabit Ethernet SFP transceiver	Order number
M-SFP-SX/LC	943 014-001
M-SFP-SX/LC EEC	943 896-001
M-SFP-MX/LC	942 035-001
M-SFP-LX/LC	943 015-001
M-SFP-LX/LC EEC	943 897-001
M-SFP-LX+/LC	942 023-001
M-SFP-LX+/ LC EEC	942 024-001
M-SFP-LH/LC	943 042-001
M-SFP-LH/LC EEC	943 898-001
M-SFP-LH+/LC	943 049-001
Bidirectional Gigabit Ethernet SFP transceiver	**Order number**
M-SFP-BIDI Type A LX/LC EEC	943 974-001
M-SFP-BIDI Type B LX/LC EEC	943 974-002
M-SFP-BIDI Type A LH/LC EEC	943 975-001
M-SFP-BIDI Type B LH/LC EEC	943 975-002
M-SFP-BIDI Bundle LX/LC EEC (type A + B)	943 974-101
M-SFP-BIDI Bundle LH/LC EEC (type A + B)	943 975-101
Fast-Ethernet SFP transceiver	**Order number**
M-FAST SFP-MM/LC	943 865-001
M-FAST SFP-MM/LC EEC	943 945-001
M-FAST SFP-SM/LC	943 866-001
M-FAST SFP-SM/LC EEC	943 946-001
M-FAST SFP-SM+/LC	943 867-001
M-FAST SFP-SM+/LC EEC	943 947-001
M-FAST SFP-LH/LC	943 868-001
M-FAST SFP-LH/LC EEC	943 948-001

Other accessories	Order number
AutoConfiguration Adapter ACA 21-USB	943 271-001
Power Cord RSR/MACH1000	942 000-001
Terminal cable	943 301-001
3-pin terminal block high voltage interlock (50 pieces)	943 845-008
3-pin terminal block low voltage interlock (50 pieces)	943 845-011
2-pin terminal block for “Relay” signal contact	943 845-010
Bracket for fastening the housing (additional)	943 943-001
Long bracket (+ 50 mm) for fastening the housing (additional)	943 943-101
Dust protection cap for RJ 45 sockets (50 pcs.)	943 936-001
Dust protection cap for SFP slots (25 pcs.)	943 942-001
Industrial HiVision Network Management software	943 156-xxx

Underlying norms and standards

Name	
EN 61000-6-2	Generic norm – immunity in industrial environments
EN 55022	IT equipment – radio interference characteristics
EN 60950-1	Safety for the installation of IT equipment
EN 61131-2	Programmable logic controllers
EN 50121-4	Railway applications - EMC - emitted interference and interference immunity for signal and telecommunication systems
FCC 47 CFR Part 15	Code of Federal Regulations
Germanischer Lloyd	Ship Applications - Classification and Construction Guidelines VI-7-3 Part 1 Ed.2003
cUL 508:1998	Safety for Industrial Control Equipment
ISA 12.12.01:2010	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
EN 61850-3	Communications networks and systems in stations
IEEE 1613	Standard Environment and Testing Requirements for Communication Networking Devices in Electric Power Substations

Table 10: List of norms and standards

IEEE 802.1 D	Switching, GARP, GMRP, Spanning Tree
IEEE 802.1 D-1998	Media access control (MAC) bridges (includes IEEE 802.1p Priority and Dynamic Multicast Filtering, GARP, GMRP)
IEEE 802.1 Q	Tagging
IEEE 802.1 Q-1998	Virtual Bridged Local Area Networks (VLAN Tagging, GVRP)
IEEE 802.1 w.2001	Rapid Reconfiguration
IEEE 802.3-2002	Ethernet

Table 11: List of IEEE standards

The device has a certification based on a specific standard only if the certification indicator appears on the housing.
However, with the exception of Germanischer Lloyd, ship certifications are only included in the product information under www.hirschmann.com.

A Further Support

Technical Questions

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

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