SIEMENS

SIMATIC NET

Industrial Ethernet switches SCALANCE MM900

Compact Operating Instructions

05/2023
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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

> ⚠ **DANGER**
>
> indicates that death or severe personal injury **will** result if proper precautions are not taken.

> ⚠ **WARNING**
>
> indicates that death or severe personal injury **may** result if proper precautions are not taken.

> ⚠ **CAUTION**
>
> indicates that minor personal injury can result if proper precautions are not taken.

> **NOTICE**
>
> indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

> ⚠ **WARNING**
>
> Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Table of contents

Introduction

<div style="text-align: right; font-size: 3em;">1</div>

Purpose of the compact operating instructions

Based on the compact operating instructions, you will be able to install and connect the MM900 media modules correctly.

Validity of these compact operating instructions

These compact operating instructions apply to the MM900 product group within the SCALANCE X-300 product line:

- MM992-2CUC
- MM992-2CUC (C)
- MM992-2CU
- MM992-2M12 (C)
- MM992-2VD
- MM992-2SFP
- MM992-2SFP (C)
- MM991-2 (BFOC)
- MM991-2FM (BFOC)
- MM991-2LD (BFOC)
- MM991-2 (SC)
- MM991-2LD (SC)
- MM991-2LH+ (SC)
- MM991-2P (SC RJ)
- MM992-2 (SC)
- MM992-2 (C) (SC)
- MM992-2LD (SC)
- MM992-2LH (SC)
- MM992-2LH+ (SC)
- MM992-2ELH (SC)

Designations used

Classification	Description	Terms used
Product line	For all devices and variants of all product groups within the SCALANCE X-300 product line, the term IE switches X-300 is used.	IE switches X-300
Product group	For all devices and variants of a product group, only the product group is used.	MM900
Device	For a device, only the device name is used.	MM992-2SFP
Variant	For a variant of the device, the device name has the appropriate variant added to it in brackets (2x24V).	(-)
All variants of a device	For all variants of the device, the device name has (all) added to it.	(-)

SIMATIC NET glossary

Explanations of many of the specialist terms used in this documentation can be found in the SIMATIC NET glossary.

You will find the SIMATIC NET glossary here:

- SIMATIC NET Manual Collection or product DVD
  The DVD ships with certain SIMATIC NET products.

- On the Internet under the following address:
  50305045 (https://support.industry.siemens.com/cs/ww/en/view/50305045)

Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit
https://www.siemens.com/industrialsecurity (http://www.siemens.com/industrialsecurity).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under
https://www.siemens.com/cert (https://www.siemens.com/cert).

Device defective

If a fault develops, send the device to your SIEMENS representative for repair. Repairs on-site are not possible.

Recycling and disposal

The products are low in pollutants, can be recycled and meet the requirements of the WEEE directive 2012/19/EU for the disposal of electrical and electronic equipment.

Do not dispose of the products at public disposal sites.

For environmentally friendly recycling and the disposal of your old device contact a certified disposal company for electronic scrap or your Siemens contact (Product return (https:// support.industry.siemens.com/cs/ww/en/view/109479891)).

Note the different national regulations.

Safety notes

<div style="text-align: right; font-size: 2em;">**2**</div>

Read the safety notices

Note the following safety notices. These relate to the entire working life of the device.

You should also read the safety notices relating to handling in the individual sections, particularly in the sections "Installation" and "Connecting up".

> ⚠ **CAUTION**
>
> To prevent injury and damage, read the manual before using the device.

Safety notices on use in hazardous areas

General safety notices relating to protection against explosion

> ⚠ **WARNING**
>
> **EXPLOSION HAZARD**
>
> Do not open the device when the supply voltage is turned on.

Safety instructions for use in hazardous locations according to UL/FM HazLoc

If you use the device under UL or FM HazLoc conditions, you must also adhere to the following safety instructions in addition to the general safety instructions for protection against explosion:

This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D or non-hazardous locations only.

This equipment is suitable for use in Class I, Zone 2, Group IIC or non-hazardous locations only.

Security recommendations

3

NOTICE
Information security
Connect to the device and change the standard passwords for the users "admin" and "user" before you operate the device. To be able to change passwords you need to be logged in with write access to the configuration data.

To prevent unauthorized access to the device and/or network, observe the following security recommendations.

General

- Check the device regularly to ensure that these recommendations and/or other internal security policies are complied with.
- Evaluate the security of your location and use a cell protection concept with suitable products (https://www.industry.siemens.com/topics/global/en/industrial-security/pages/default.aspx).
- When the internal and external network are disconnected, an attacker cannot access internal data from the outside. Therefore operate the device only within a protected network area.
- No product liability will be accepted for operation in a non-secure infrastructure.
- Use VPN to encrypt and authenticate communication from and to the devices.
- For data transmission via a non-secure network, use an encrypted VPN tunnel (IPsec, OpenVPN).
- Separate connections correctly (WBM, SSH etc.).
- Check the user documentation of other Siemens products that are used together with the device for additional security recommendations.
- Using remote logging, ensure that the system protocols are forwarded to a central logging server. Make sure that the server is within the protected network and check the protocols regularly for potential security violations or vulnerabilities.

Physical access

- Restrict physical access to the device to qualified personnel because the plug-in data medium can contain sensitive data.
- Lock unused physical interfaces on the device. Unused interfaces can be used to gain access to the plant without permission.

Software (security functions)

- Keep the firmware up to date. Check regularly for security updates for the device. You can find information on this at the Industrial Security (https://www.siemens.com/industrialsecurity) website.

- Inform yourself regularly about security recommendations published by Siemens ProductCERT (https://www.siemens.com/cert/en/cert-security-advisories.htm).

- Only activate protocols that you require to use the device.

- Restrict access to the management of the device with rules in an access control list (ACL).

- The option of VLAN structuring provides protection against DoS attacks and unauthorized access. Check whether this is practical or useful in your environment.

- Use a central logging server to log changes and accesses. Operate your logging server within the protected network area and check the logging information regularly.

Authentication

Note

Accessibility risk - Risk of data loss

Do not lose the passwords for the device. Access to the device can only be restored by resetting the device to factory settings which completely removes all configuration data.

- Replace the default passwords for all user accounts, access modes and applications (if applicable) before you use the device.

- Define rules for the assignment of passwords.

- Use passwords with a high password strength. Avoid weak passwords, (e.g. password1, 123456789, abcdefgh) or recurring characters (e.g. abcabc).
  This recommendation also applies to symmetrical passwords/keys configured on the device.

- Make sure that passwords are protected and only disclosed to authorized personnel.

- Do not use the same passwords for multiple user names and systems.

- Store the passwords in a safe location (not online) to have them available if they are lost.

- Regularly change your passwords to increase security.

- A password must be changed if it is known or suspected to be known by unauthorized persons.

- When user authentication is performed via RADIUS, make sure that all communication takes place within the security environment or is protected by a secure channel.

- Watch out for link layer protocols that do not offer their own authentication between endpoints, such as ARP or IPv4. An attacker could use vulnerabilities in these protocols to attack hosts, switches and routers connected to your layer 2 network, for example, through manipulation (poisoning) of the ARP caches of systems in the subnet and subsequent interception of the data traffic. Appropriate security measures must be taken for non-secure layer 2 protocols to prevent unauthorized access to the network. Physical access to the local network can be secured or secure, higher layer protocols can be used, among other things.

Secure/non-secure protocols

- Avoid or disable non-secure protocols, for example Telnet and TFTP. For historical reasons, these protocols are available, however not intended for secure applications. Use non-secure protocols on the device with caution.

- Check whether use of the following protocols and services is necessary:

  - Non authenticated and unencrypted ports

  - MRP, HRP

  - LLDP

  - DHCP Options 66/67

  The following protocols provide secure alternatives:

  - HTTP → HTTPS

  - TFTP → FTPS

  - Telnet → SSH

  - SNTP → NTP
    Check whether use the use of NTP is necessary. NTP is classified as non-secure. Activate Secure NTP when the NTP server supports this protocol and use the authentication and encryption mechanisms of Secure NTP.

  - SNMPv1/v2c → SNMPv3
    Check whether use of SNMPv1/v2c. is necessary. SNMPv1/v2c are classified as non-secure. Use the option of preventing write access. The device provides you with suitable setting options.
    If SNMP is enabled, change the community names. If no unrestricted access is necessary, restrict access with SNMP.
    Use the authentication and encryption mechanisms of SNMPv3.

- Use secure protocols when access to the device is not prevented by physical protection measures.

- If you require non-secure protocols and services, operate the device only within a protected network area.

- Restrict the services and protocols available to the outside to a minimum.

- For the DCP function, enable the "DCP read-only" mode after commissioning.

Device description

4

4.1 Product overview

> **Note**
>
> **Type designation and labeling of a media module differ**
>
> Example: The device with article number 6GK5 992-2AS00-8AA0 is called "MM992-2SFP", the labeling on the device is "9922AS".
>
> The labeling on the devices is shown in bold in the following table following the [article numbers].

> **Note**
>
> **Media modules for SFP transceivers**
>
> Only the media modules MM992-2SFP andMM992-2SFP (C) may be fitted with approved SFP transceivers. These SFP media modules can be fitted with up to two SFPs.

> **Note**
>
> **Supplement (C) in the type name**
>
> Media modules with the supplement (C) in the type name have varnished printed circuit boards (conformal coating).

Media module	Properties	Article number **Labeling on the device**
MM992-2CUC	2 x 10/100/1000 Mbps, RJ-45 ports electrical with securing collar	6GK5 992-2GA00-8AA0 **9922GA**
MM992-2CUC (C)	2 x 10/100/1000 Mbps, RJ-45 ports electrical with securing collar, varnished	6GK5 992-2GA00-8FA0 **9922GA**
MM992-2CU	2 x 10/100/1000 Mbps, RJ-45 port electrical without securing collar	6GK5 992-2SA00-8AA0 **9922SA**
MM992-2M12 (C)	2 x 10/100/1000 Mbps, GE M12 connector electrical, varnished	6GK5 992-2HA00-0AA0 **9922HA**
MM992-2VD	2 x 10/100/1000 Mbps, RJ-45 ports electrical with securing collar, variable distance	6GK5 992-2VA00-8AA0 **9922VA**
MM992-2SFP	2 x 100/1000 Mbps, SFP media module	6GK5 992-2AS00-8AA0 **9922AS**
MM992-2SFP (C)	2 x 100/1000 Mbps, SFP media module, varnished	6GK5 992-2AS00-8FA0 **9922AS**
MM991-2 (BFOC)	2 x 100 Mbps, BFOC port optical, for glass FO cable (multimode), up to max. 5 km	6GK5 991-2AB00-8AA0 **9912AB**

| Media module	Properties	Article number
		Labeling on the device
MM991-2FM (BFOC)	2 x 100 Mbps, BFOC port optical, for glass FO cable (multimode) with diagnostics up to max. 5 km	6GK5 991-2AB01-8AA0 **9912AB**
MM991-2LD (BFOC)	2 x 100 Mbps, BFOC port optical, for glass FO cable (single mode), up to max. 26 km	6GK5 991-2AC00-8AA0 **9912AC**
MM991-2 (SC)	2 x 100 Mbps, SC ports optical, for glass FO cable (multimode), up to max. 5 km	6GK5 991-2AD00-8AA0 **9912AD**
MM991-2LD (SC)	2 x 100 Mbps, SC ports optical, for glass FO cable (single mode), up to max. 26 km	6GK5 991-2AF00-8AA0 **9912AF**
MM991-2LH+ (SC)	2 x 100 Mbps, SC ports optical, for glass FO cable (single mode), up to max. 70 km	6GK5 991-2AE00-8AA0 **9912AE**
MM991-2P (SC RJ)	2 x 100 Mbps SC RJ ports optical for Plastic Optical Fiber (POF) up to max. 50 m or Polymer Cladded Fiber (PCF) up to max. 100 m	6GK5 991-2AH00-8AA0 **9912AH**
MM992-2 (SC)	2 x 1000 Mbps, SC ports optical, for glass FO cable (multimode), up to max. 750 m	6GK5 992-2AL00-8AA0 **9922AL**
MM992-2 (C) (SC)	2 x 1000 Mbps, SC ports optical, for glass FO cable (multimode), up to max. 750 m, varnished	6GK5 992-2AL00-8FA0 **9922AL**
MM992-2LD (SC)	2 x 1000 Mbps, SC ports optical, for glass FO cable (single mode), up to max. 10 km	6GK5 992-2AM00-8AA0 **9922AM**
MM992-2LH (SC)	2 x 1000 Mbps, SC ports optical, for glass FO cable (single mode), up to max. 40 km	6GK5 992-2AN00-8AA0 **9922AN**
MM992-2LH+ (SC)	2 x 1000 Mbps, SC ports optical, for glass FO cable (single mode), up to max. 70 km	6GK5 992-2AP00-8AA0 **9922AP**
MM992-2ELH (SC)	2 x 1000 Mbps, SC ports optical, for glass FO cable (single mode), up to max. 120 km	6GK5 992-2AQ00-8AA0 **9922AQ**

Type key for the MM900 media modules

The type designation of an MM900 media module is made up of several parts that have the following meaning:
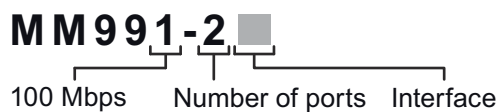
Interface	Property
[-]	BFOC port 100 Mbps multimode FO cable
LD	BFOC port 100 Mbps single mode FO cable
(SC)	SC port 100 Mbps multimode FO cable (up to max. 5 km)
LD (SC)	SC port 100 Mbps single mode FO cable (up to max. 26 km)
LH+ (SC)	SC port 100 Mbps single mode FO cable (up to max. 70 km)

Interface	Property
P	SC RJ port 100 Mbps POF or PCF
FM	BFOC port 100 Mbps multimode FO cable with diagnostics

M M 9 9 2 - 2 ▪

1000 Mbps   Number of ports   Interface
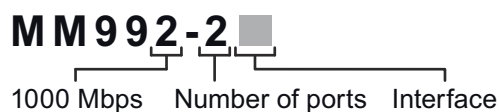
Interface	Property
CU	RJ-45 port electrical 10/100/1000 Mbps without securing collar
CUC	RJ-45 port electrical 10/100/1000 Mbps with securing collar
M12	M12 connection electrical 10/100/1000 Mbps
VD	RJ-45 port electrical 10/100/1000 Mbps with securing collar (up to max. 1000 m)
[-]	SC port 1000 Mbps multimode FO cable (up to max. 750 m)
LD	SC port 1000 Mbps single mode FO cable (up to max. 10km)
LH	SC port 1000 Mbps single mode FO cable (up to max. 40 km)
LH+	SC port 1000 Mbps single mode FO cable (up to max. 70 km)
ELH	SC port 1000 Mbps single mode FO cable (up to max. 120 km)
SFP	SFP media module

Ethernet standards of the media modules

The following table shows which Ethernet standards according to IEEE 802.3 the individual media modules comply with.

Media module	IEEE 802.3 standard
MM992-2CUC	1000Base-TX
MM992-2CUC (C)	1000Base-TX
MM992-2CU	1000Base-TX
MM992-2M12 (C)	1000Base-TX
MM992-2VD	1000Base-TX
MM991-2 (BFOC)	100Base-FX
MM991-2FM (BFOC)	100Base-FX
MM991-2LD (BFOC)	100Base-FX
MM991-2 (SC)	100Base-FX
MM991-2LD (SC)	100Base-FX
MM991-2LH+ (SC)	100Base-FX
MM991-2P (SC RJ)	100Base-FX
MM992-2 (SC)	1000Base-SX
MM992-2 (C) (SC)	1000Base-SX
MM992-2LD (SC)	1000Base-LX
MM992-2LH (SC)	1000Base-LX

Media module	IEEE 802.3 standard
MM992-2LH+ (SC)	1000Base-LX
MM992-2ELH (SC)	1000Base-LX

Note

Use media modules only in an approved modular device ("M")

Use an MM900 media module only in a device equipped with suitable slots for such modules. Example: X308-2M.

The MM900 media module decides what can be connected

The connection of end devices or other network segments does not depend on the module slot, but rather on the selected MM900 media module.

Possible attachment	Figure
BFOC ports optical	
BFOC-Ports optical with diagnostics	
Optical SC ports	
SC RJ ports optical	
Electrical RJ-45 ports without securing collar	
Electrical RJ-45 ports with securing collar	

Possible attachment	Figure
GE M12 connector electrical	
SFP transceivers Only the SFP media module MM992-2SFP may be fitted with approved SFP transceivers. The SFP media module can be fitted with up to two SFPs.	

Unpacking and checking

> ⚠ **WARNING**
>
> **Do not use any parts that show evidence of damage**
>
> If you use damaged parts, there is no guarantee that the device will function according to the specification.
>
> If you use damaged parts, this can lead to the following problems:
> - Injury to persons
> - Loss of the approvals
> - Violation of the EMC regulations
> - Damage to the device and other components
>
> Use only undamaged parts.

1. Make sure that the package is complete.

2. Check all the parts for transport damage.

Scope of delivery

The following components are supplied with a SCALANCE MM900 media module:

- MM99x-2xx media module

- Compact operating instructions

> **Note**
>
> **Identification labels**
>
> The location labels identify the media modules and ship with the SCALANCE device.

4.2 Product properties and device views

4.2.1 MM991-2 (BFOC)

Possible attachments

The MM991-2 (BFOC) media module has the following:

- 2 x 100 Mbps, BFOC port optical (multimode, glass) up to max. 5 km

Figure 4-1   MM991-2 (BFOC) [9912AB]

[Device labeling in square brackets]

4.2.2 MM991-2FM (BFOC)

Possible attachments

The MM991-2FM (BFOC) media module has the following:

- 2 x 100 Mbps, BFOC port optical (multimode, glass) with diagnostics up to max. 5 km
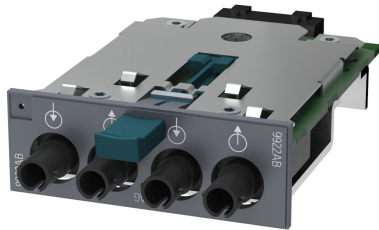
Figure 4-2   MM991-2FM (BFOC) [9912AB]

[Device labeling in square brackets]

4.2.3   MM991-2LD (BFOC)

Possible attachments

The MM991-2LD (BFOC) media module has the following:

- 2 x 100 Mbps, BFOC port optical, (single mode glass), up to max. 26 km

Figure 4-3   MM991-2LD (BFOC) [9912AC]

[Device labeling in square brackets]

4.2.4   MM991-2 (SC)

Possible attachments

The MM991-2 (SC) media module has the following:

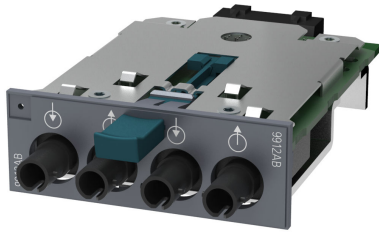- 2 x 100 Mbps, SC port optical, (multimode glass), up to max. 5 km

Figure 4-4   MM991-2 (SC) [9912AD]

[Device labeling in square brackets]

4.2.5 MM991-2LD (SC)

Possible attachments

The MM991-2LD (SC) media module has the following:

- 2 x 100 Mbps, SC port optical, (single mode glass), up to max. 26 km
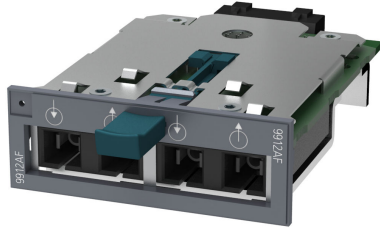
Figure 4-5   MM991-2LD (SC) [9912AF]

[Device labeling in square brackets]

4.2.6 MM991-2LH+ (SC)

Possible attachments

The MM991-2LH+ (SC) media module has the following:

- 2 x 100 Mbps, SC port optical, (single mode glass), up to max. 70 km

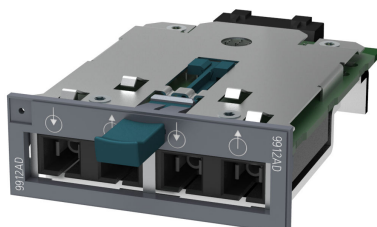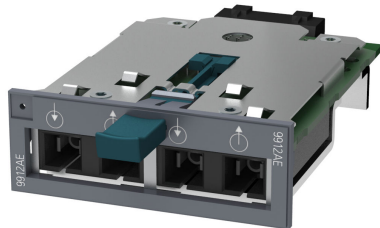Figure 4-6   MM991-2LH+ (SC) [9912AE]

[Device labeling in square brackets]

4.2.7 MM991-2P (SC RJ)

Possible attachments

The MM991-2P (SC RJ) media module has the following:

- 2 x 100 Mbps SC RJ ports optical for Plastic Optical Fiber (POF) up to max. 50 m or Polymer Cladded Fiber (PCF) up to max. 100 m
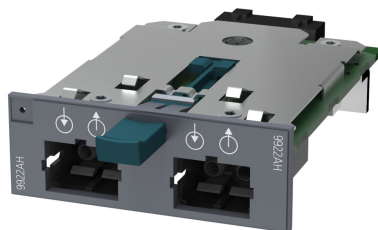
Figure 4-7 MM991-2P (SC RJ) [9912AH]

[Device labeling in square brackets]

Note

Installation of the XR-300M, XR-300M PoE and XR-300M EEC

Only the lower slots may be equipped with the MM991-2P.

- XR-300M: Maximum 6 modules in slots 7 to 12
- XR-300M PoE, XR-300M EEC: Maximum 2 modules in slots 3 and 4

The slot above an MM991-2P may only be used as follows:

- Without media module
- With media module MM992-2CUC or MM992-2CU

Example XR-300M: If the MM991-2P is plugged into slot 8, an MM992-2CUC may be used in slot 2.

See also table: "Operating temperature with media module MM991-2P (Page 47)"

4.2.8 MM992-2CU

Possible attachments

The MM992-2CU media module has the following:

• 2 x 10/100/1000 Mbps, RJ-45 port electrical without securing collar
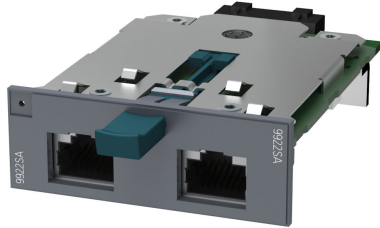
Figure 4-8   MM992-2CU [9922SA]

[Device labeling in square brackets]

Note

For connection to electrical networks note the information in Appendix A.1 and A.2.

4.2.9 MM992-2CUC

Possible attachments

The MM992-2CUC media module has the following:

• 2 x 10/100/1000 Mbps, RJ-45 ports electrical with securing collar
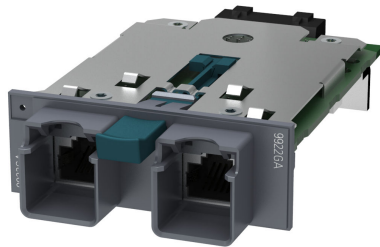
Figure 4-9   MM992-2CUC [9922GA]

[Device labeling in square brackets]

Note

For connection to electrical networks note the information in Appendix A.1 and A.2.

4.2.10 MM992-2VD

Possible attachments

The MM992-2VD media module has the following:

- 2 x 10/100/1000 Mbps, RJ-45 ports electrical with securing collar

- Additional two-wire transfer function (variable distance) for establishing Ethernet connections even using cables that do not conform to Ethernet. Possible distance covered depends on the cable quality.

- If you use the two-wire transfer function, you need to connect the MM992-2VD media module with a device that also supports the two-wire transfer function. Devices with the suffix "VD" in the type designation support the two-wire transfer function. In addition, observe the operating instructions for the VD device.
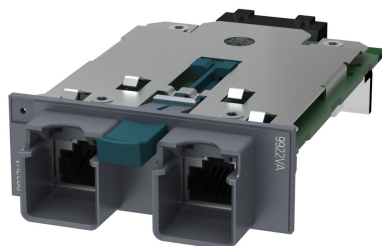
Figure 4-10   MM992-2VD [9922VA]

[Device labeling in square brackets]

NOTICE
Cable connection between VD devices
Use the same type of cable for the cable connection between two VD devices. Infrastructure cables as well as any patch cables in use must be of the same cable type.
If the cable type between the two VD devices changes during the transmission path, signal reflections can occur at the connection site of the different cables, which can result in frame losses.

Note

For connection to electrical networks note the information in Appendix A.1 and A.2.

Pin assignment for the RJ-45 connector of a PROFIBUS cable

If you use a PROFIBUS cable along with an IE FC RJ-45 plug 4x2, note the following:

RJ-45 connectors		PROFIBUS cable
Pin assignment	**Color**	**Wire color**
1	Yellow	Green
2	Orange	Red

RJ-45 connectors		PROFIBUS cable
Pin assignment	Color	Wire color
3	White	--
6	Blue	--

Note

Using PROFIBUS standard cable GP

If you use a PROFIBUS standard cable GP, the wires must be stripped before they are inserted in the FC connector.

Note

If you use cables with a length > 500 m, connection establishment can take up to 2 min.

Note

If you connect an MM992-2VD media module to existing PROFIBUS cabling, the same requirements relating to shield contact and the lightning protection concept apply as for PROFIBUS.

4.2.11 MM992-2 (SC)

Possible attachments

The MM992-2 (SC) media module has the following:

- 2 x 1000 Mbps, SC port optical, (multimode glass), up to max. 750 m

Figure 4-11   MM992-2 (SC) [9922AL]

[Device labeling in square brackets]

4.2.12   MM992-2LD (SC)

Core statement

The MM992-2LD (SC) media module has the following:

- 2 x 1000 Mbps, SC port optical, (single mode glass), up to max. 10 km
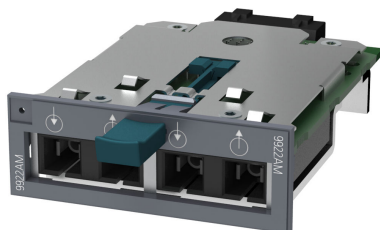
Figure 4-12   MM992-2LD (SC) [9922AM]

[Device labeling in square brackets]

4.2.13   MM992-2LH (SC)

Possible attachments

The MM992-2LH (SC) media module has the following:

- 2 x 1000 Mbps, SC port optical, (single mode glass), up to max. 40 km
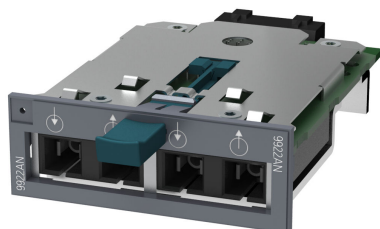
Figure 4-13   MM992-2LH (SC) [9922AN]

[Device labeling in square brackets]

4.2.14 MM992-2LH+ (SC)

Possible attachments

The MM992-2LH+ (SC) media module has the following:

- 2 x 1000 Mbps, SC port optical, (single mode glass), up to max. 70 km
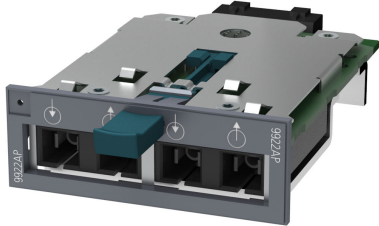
Figure 4-14   MM992-2LH+ (SC) [9922AP]

[Device labeling in square brackets]

4.2.15 MM992-2ELH (SC)

Possible attachments

The MM992-2ELH (SC) media module has the following:

- 2 x 1000 Mbps, SC port optical, (single mode glass), up to max. 120 km
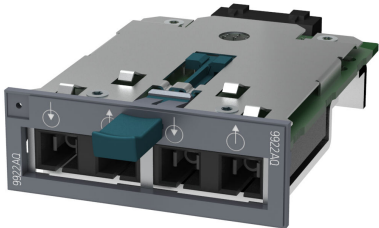
Figure 4-15   MM992-2ELH (SC) [9922AQ]

[Device labeling in square brackets]

4.2.16   MM992-2M12

Possible attachments

The MM992-2M12 media module has the following:

• 2 x 10/100/1000 Mbps, GE M12 connector electrical

Figure 4-16   MM992-2M12C [9922HA]

[Device labeling in square brackets]

Note

For connection to electrical networks note the information in Appendix (A.1, A.2 and A.3)

4.2.17   MM992-2SFP / MM992-2SFP (C)

Note

Only the media modules MM992-2SFP / M992-2SFP (C) may be fitted with approved SFP transceivers. The SFP media modules can be fitted with up to two SFPs.

Possible attachments

The media modules MM992-2SFP / M992-2SFP (C) have:

• 2 x 100/1000 Mbps, SFP slot
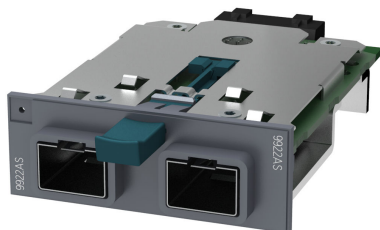
Figure 4-17   MM992-2SFP [9922AS]

[Device labeling in square brackets]

Installation and disassembly

<div style="text-align: right; font-size: 2em; font-weight: bold;">5</div>

5.1 Safety notices for installation

Safety notices

When installing the device, keep to the safety notices listed below.

> ⚠️ **WARNING**
>
> If a device is operated in an ambient temperature of more than 40 °C, the temperature of the device housing may be higher than 70 °C. The device must therefore be installed so that it is only accessible to service personnel or users that are aware of the reason for restricted access and the required safety measures at an ambient temperature higher than 40 °C.

> ⚠️ **WARNING**
>
> If the device is installed in a cabinet, the inner temperature of the cabinet corresponds to the ambient temperature of the device.

> ⚠️ **WARNING**
>
> If the temperature of the cable or housing socket exceeds 70 °C or the branching point of conductors exceeds 80 °C, special precautions must be taken. If the equipment is operated in an air ambient in excess of 50 °C to 60 °C, only use cables with a permissible operating temperature of at least 85 °C.

> **NOTICE**
>
> **Improper mounting**
>
> Improper mounting may damage the device or impair its operation.
>
> - Before mounting the device, always ensure that there is no visible damage to the device.
> - Mount the device using suitable tools. Observe the information in the respective section about mounting.

Safety notices on use in hazardous areas

General safety notices relating to protection against explosion

⚠ **WARNING**
EXPLOSION HAZARD
Replacing components may impair suitability for Class 1, Division 2 or Zone 2.

⚠ **WARNING**
The device is intended for indoor use only.

⚠ **WARNING**
The device may only be operated in an environment of contamination class 1 or 2 (see EN/IEC 60664-1, GB/T 16935.1).

⚠ **WARNING**
When used in hazardous environments corresponding to Class I, Division 2 or Class I, Zone 2, the device must be installed in a cabinet or a suitable enclosure.

Notes for use in hazardous locations according to ATEX, IECEx, UKEX and CCC Ex

If you use the device under ATEX, IECEx, UKEX or CCC Ex conditions you must also keep to the following safety instructions in addition to the general safety instructions for protection against explosion:

5.2 Requirements for the cabinet EN 60529 (ATEX), UKEX, IECEx and CCC-Ex

⚠ **WARNING**
To comply with EU Directive 2014/34 EU (ATEX 114), UK-Regulation SI 2016/1107 or the conditions of IECEx or CCC-Ex, the housing or cabinet must meet the requirements of at least IP54 (according to EN/IEC 60529, GB/T 4208) in compliance with EN IEC/IEC 60079-7, GB 3836.3.

> ⚠ **WARNING**
>
> **Requirements for the cabinet/enclosure**
>
> The fiber-optic bus connections labeled SCALANCE MM400 (see type plate) may also be led through a hazardous area zone1 (see chapterApprovals (Page 61), section "ATEX").

Additional notes

> ⚠ **CAUTION**
>
> **Use only approved components**
>
> If you use components and accessories that are not approved for SIMATIC NET devices or their target systems, this may violate the requirements and regulations for safety and electromagnetic compatibility.
> Only use components approved for the SIMATIC NET devices.

> **NOTICE**
>
> **Warming and premature aging of the IE switch due to direct sunlight**
>
> Direct sunlight can heat up the device and can lead to premature aging of the IE switch and its cabling.
>
> Provide suitable shade to protect the IE switch against direct sunlight.

Note

During installation and operation, keep to the installation guidelines and safety notices described in this document and in the system manuals "Industrial Ethernet / PROFINET Industrial Ethernet" and "Industrial Ethernet / PROFINET passive network components".

You will find information on the system manuals in the section "Introduction", under "Further documentation".

5.3 Installation and removal of media modules

Connecting media modules and SFP transceivers

⚠ WARNING
Install and remove media modules only when the power is off
Media modules may only be inserted in or removed from a SCALANCE device when the power supply to the device has been turned off.
Use only approved media modules
Use only "MM900" media modules in the module slots of SCALANCE devices.

⚠ CAUTION
Remember the orientation of media modules
On modular devices, there are always two module slots arranged opposite each other. Remember the correct orientation when installing MM900 media modules. Example:
• The first MM900 media module is installed in slot 3.
• The second MM900 media module installed in slot 4 must be turned through 180 degrees.
On modular devices for rack mounting, pairs of module slots are located one above the other in which modules can be inserted in a specific order:
Example of a rack device:
• The first MM900 media module is installed in slot 1.
• The second MM900 media module installed in slot 7 must be turned through 180 degrees.
Other modules are then inserted in slots 2 and 8 or 3 and 9 etc.
The permitted operating temperature is decided by the fully equipped device (switch + media module + SFP transceiver).
With modular devices, it is not only the switch that decides the permitted operating temperature of the overall device but also the temperature ranges of the MM900 media modules and the SFP transceivers. You will find details in the technical specifications of the relevant components.
The following aspects can restrict the maximum permitted operating temperature:
• The orientation of the carrier device.
• The use of SFP transceivers.
• The use of transceivers of the types LH, LH+ or ELH.

NOTICE

Failure of the data traffic due to contamination of optical plug-in connections

Optical sockets and plugs are sensitive to contamination of the end face. Contamination can lead to the failure of the optical transmission network.

Close unused optical sockets and plugs as well as pluggable transceivers and slots with the supplied protective caps.

Remove the protective caps only immediately before you use the plug-in connection.

NOTICE

Use only approved SFPs

If you use components not approved by Siemens AG, in particular SFPs, Siemens cannot accept any responsibility for the correct functioning of the "Ethernet switch system" according to the specification.

Moreover, if components are used that have not been Siemens approved, Siemens cannot vouch for their compatibility or for risk-free use of these components.

Note

Use media modules only in an approved modular device

Use an MM900 media module only for a device equipped with suitable slots for such modules. Example: X308-2M.

The names and labeling of the media modules differ

- Example: The device is called, for example, MM992-2SFP" [6GK5 992-2AS00-8AA0], the labeling on the device is "9922AS". You will find detailed information on the labeling of the media modules in the "MM900 media modules" compact operating instructions.

Note

SFP transceivers with the SCALANCE XR324-4M EEC

In contrast to the information in the product documentation for the SCALANCE MM900, MM992-2SFP media modules can be operated in the SCALANCE XR324-4M EEC at ambient temperatures up to a maximum of 70 °C if the following requirements are met:

- MM992-2SFP media modules as of hardware product version 02 are suitable. The hardware product version can be found on the device. You can also read out this information with the WBM or the CLI.
- Only the following SFP transceivers may be used:
  - SFP991-1
  - SFP991-1LD
  - SFP992-1
  - SFP992-1LD

Note

Slot number
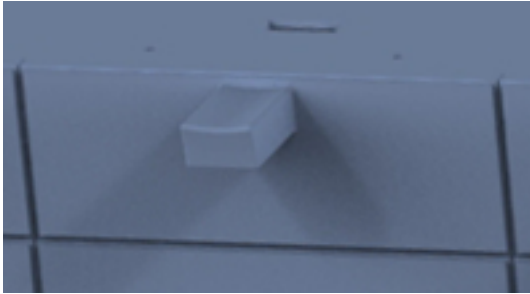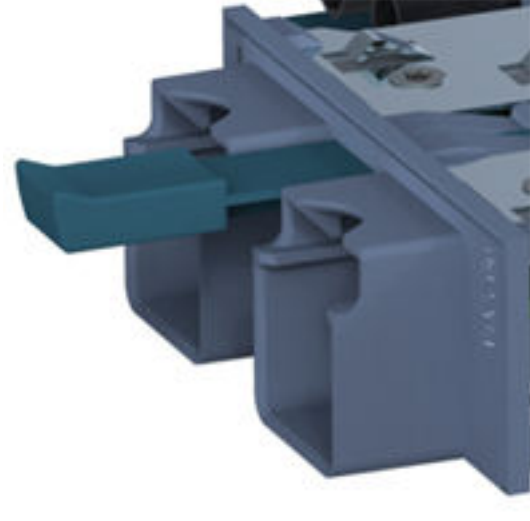
With modular devices, the MM900 media modules must be given a slot number.
The slot number labels are supplied with the modular devices.
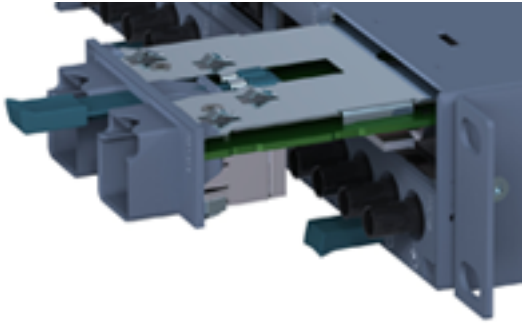
Installing a media module

The media module is inserted with the handle pulled out. When the handle is inserted, the media module is locked in the device.

Note

The figures in the following installation instructions show the installation of a media module in a rack device. The procedure for installation is identical for rack or compact devices.

1.	Select the required slot on the device (for example, X308-2M). Remove the dummy cover.	
2.	Pull out the handle on the selected media module.	

3.	Place the media module in the guide rails of the device slot. The media module is correctly installed when it clips easily into the device.	
4.	Push the handle back into the media module. This locks the media module in the device.	
5.	Insert the connectors.	

Removing a media module

> ⚠ **CAUTION**
>
> **Risk of burns due to the high temperature of the module housing**
>
> Before removing an MM900 media module, turn the switch off and allow the device to cool down first.

1. Remove all connectors from the media module.

2. Pull out the handle of the media module and remove the media module from the device slot.

3. Secure the dummy cover.
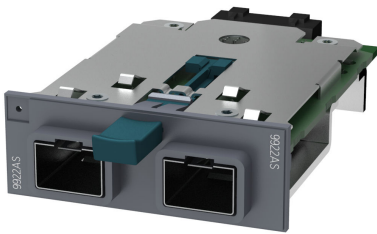
5.4 SFP installation in SFP media module
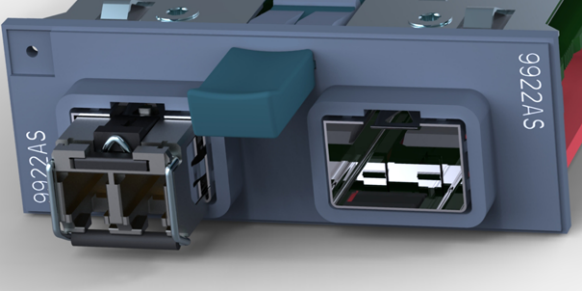
NOTICE
Use only approved SFPs
If you use SFPs that are not approved by Siemens AG, there is no guarantee that the device will function according to the specification.
If you use unapproved SFPs, this can lead to the following problems:
• Damage to the device
• Loss of the approvals
• Violation of the EMC regulations
Use only approved SFPs.

You can insert or remove the SFP during ongoing operation.

Inserting an SFP

> **Note**
>
> Only the media module MM992-2SFP may be fitted with approved SFPs. The SFP media module can be fitted with up to two SFPs.

Device: Media module	Variant	[Article number] Labeling on the device	Figure
MM992-2SFP (SFP media module)	2 x 100/1000 Mbps	[6GK5 992-2AS00-8AA0] 9922AS	

1.	Select the required SFP media module in the slot of the device. (Example: X-308-2M, slot 2)	
2.	Insert the SFP with the clip closed in the SFP media module. Notice: Closing the clip after insertion does not lock the device in the rack.	
3.	The SFP can be heard to lock in place and is therefore firmly secured.	
4.	Plug the connecting cable into the SFP. The connecting cable can be heard to lock in place and is then firmly secured.	

Removing an SFP

1. Remove the cable connected to the SFP.

2. Open the clip on the SFP and remove the SFP from the SFP media module.
   Notice: It must be possible to remove the SFP easy without using force.

3. Fit a blind plug to the SFP.

5.5 Disassembly

⚠ WARNING
Improper disassembly
Improper disassembly may result in a risk of explosion in hazardous areas.
For proper disassembly, observe the following: • Before starting work, ensure that the electricity is switched off. • Secure remaining connections so that no damage can occur as a result of disassembly if the system is accidentally started up.

Connecting

6

6.1   Safety when connecting up

Safety notices

When connecting up the device, keep to the safety notices listed below.

Safety notices on use in hazardous areas

General safety notices relating to protection against explosion

⚠ WARNING
EXPLOSION HAZARD
Do not connect or disconnect cables to or from the device when a flammable or combustible atmosphere is present.

⚠ WARNING
Suitable cables at high ambient temperatures in hazardous area
At an ambient temperature of ≥ 60 °C, use heat-resistant cables designed for an ambient temperature at least 20 °C higher. The cable entries used on the enclosure must comply with the IP degree of protection required by EN IEC / IEC 60079-0, GB 3836.1.

⚠ WARNING
Unsuitable cables or connectors
Risk of explosion in hazardous areas
• Only use connectors that meet the requirements of the relevant type of protection.
• If necessary, tighten the connector screw connections, device fastening screws, grounding screws, etc. according to the specified torques.
• Close unused cable openings for electrical connections.
• Check the cables for a tight fit after installation.

> ⚠ **WARNING**
>
> **Lack of equipotential bonding**
>
> If there is no equipotential bonding in hazardous areas, there is a risk of explosion due to equalizing current or ignition sparks.
>
> • Ensure that equipotential bonding is available for the device.

> ⚠ **WARNING**
>
> **Unprotected cable ends**
>
> There is a risk of explosion due to unprotected cable ends in hazardous areas.
>
> • Protect unused cable ends according to IEC/EN 60079-14.

> ⚠ **WARNING**
>
> **Improper installation of shielded cables**
>
> There is a risk of explosion due to equalizing currents between the hazardous area and the non-hazardous area.
>
> • Ground shielded cables that cross hazardous areas at one end only.
> • Lay a potential equalization conductor when grounding at both ends.

> ⚠ **WARNING**
>
> **Insufficient isolation of intrinsically safe and non-intrinsically safe circuits**
>
> Risk of explosion in hazardous areas
>
> • When connecting intrinsically safe and non-intrinsically safe circuits, ensure that the galvanic isolation is performed properly in compliance with local regulations (e.g. IEC 60079-14).
> • Observe the device approvals applicable for your country.

Safety notices when using the device according to Hazardous Locations (HazLoc)

If you use the device under HazLoc conditions you must also keep to the following safety notices in addition to the general safety notices for protection against explosion:

> ⚠ **WARNING**
>
> **EXPLOSION HAZARD**
>
> You may only connect or disconnect cables carrying electricity when the power supply is switched off or when the device is in an area without inflammable gas concentrations.

Notes for use in hazardous locations according to ATEX, IECEx, UKEX and CCC Ex

If you use the device under ATEX, IECEx, UKEX or CCC Ex conditions you must also keep to the following safety instructions in addition to the general safety instructions for protection against explosion:

⚠️ **WARNING**

Transient overvoltages

Take measures to prevent transient overvoltages of more than 40% of the rated voltage (or more than 119 V). This is the case if you only operate devices with SELV (safety extra-low voltage).

NOTICE

Failure of the data traffic due to contamination of optical plug-in connections

Optical sockets and plugs are sensitive to contamination of the end face. Contamination can lead to the failure of the optical transmission network. Take the following precautions to avoid functional impairments:

- Clean the end face of field-assembled connectors carefully before connecting. No residues of processing may remain on the connector.
- Only remove the dust caps of optical transceivers and pre-configured cables shortly before connecting the cables.
- Close unused optical sockets and plugs as well as pluggable transceivers and slots with the supplied protective caps.

6.2 Connecting a media module

Power supply of the MM900 media modules

The MM900 media modules are supplied with power by the switch.

Maintenance and cleaning

7

> **⚠ WARNING**
>
> **Unauthorized repair of devices in explosion-proof design**
>
> Risk of explosion in hazardous areas
>
> • Repair work may only be performed by personnel authorized by Siemens.

> **⚠ WARNING**
>
> **Impermissible accessories and spare parts**
>
> Risk of explosion in hazardous areas
>
> • Only use original accessories and original spare parts.
> • Observe all relevant installation and safety instructions described in the manuals for the device or supplied with the accessories or spare parts.

> **⚠ CAUTION**
>
> **Hot surfaces**
>
> Risk of burns during maintenance work on parts with a surface temperature above 70 °C (158 °F).
>
> • Take appropriate protective measures, for example, wear protective gloves.
> • Once maintenance work is complete, restore the touch protection measures.

> **NOTICE**
>
> **Cleaning the housing**
>
> If the device is not in a hazardous area, only clean the outer parts of the housing with a dry cloth.
>
> If the device is in a hazardous area, use a slightly damp cloth for cleaning.
>
> Do not use solvents.

Technical data

<div style="text-align: right; font-size: large;">8</div>

> **Note**
>
> **Validity of the technical specifications**
>
> All the technical specifications described in this section that are not specific to a product version, apply to the MM900 media module.

8.1 Construction, installation and environmental conditions

Table 8-1   Construction

Dimensions (W x H x D)	60 × 22 × 100 mm
Weight	80 g

Table 8-2   Operating temperature depending on the media modules used [1] [2]

Type	Installation location	Without media module	MM992-2CUC MM992-2CUC (C) MM992-2CU MM992-2M12 (C) MM992-2VD MM991-2 (BFOC) MM991-2FM (BFOC) MM991-2LD (BFOC) MM991-2 (SC) MM991-2LD (SC) MM992-2 (SC) MM992-2 (SC) (C) MM992-2LD (SC)	MM991-2LH+ (SC) MM992-2LH (SC) MM992-2LH+ (SC) MM992-2ELH(SC)	Media module MM992-2SFP with SFP transceiver SFP991-1 SFP991-1LD SFP992-1 SFP992-1LD	Media module MM992-2SFP with SFP transceiver SFP991-1LH+ SFP992-1+ SFP992-1LH SFP992-1LH+ SFP992-1ELH SFP991-1ELH200
X-300M	Horizontal	-40 °C to +70 °C				-40 °C to +60 °C	
	Vertical	-40 °C to +50 °C					
X-300M PoE	Horizontal	-40 °C to +60 °C		-40 °C to +50 °C	-40 °C to +60 °C	-40 °C to +50 °C	
	Vertical	-40 °C to +45 °C					

Type	Installation location	Without media module	MM992-2CUC MM992-2CUC (C) MM992-2CU MM992-2M12 (C) MM992-2VD MM991-2 (BFOC) MM991-2FM (BFOC) MM991-2LD (BFOC) MM991-2 (SC) MM991-2LD (SC) MM992-2 (SC) MM992-2 (SC) (C) MM992-2LD (SC)	MM991-2LH+ (SC) MM992-2LH (SC) MM992-2LH+ (SC) MM992-2ELH(SC)	Media module MM992-2SFP with SFP transceiver SFP991-1 SFP991-1LD SFP992-1 SFP992-1LD	Media module MM992-2SFP with SFP transceiver SFP991-1LH+ SFP992-1+ SFP992-1LH SFP992-1LH+ SFP992-1ELH SFP991-1ELH200
XR-300M	Horizontal	Not possible (fully modular device)	-40 °C to +70 °C	Maximum 2 modules in slots 11 and 12: -40 °C to +60 °C With more than 2 modules or other slot assignment: -40 °C to +50 °C	-40 °C to +60 °C	Maximum 2 modules in slots 11 and 12: -40 °C to +60 °C With more than 2 modules or other slot assignment: -40 °C to +50 °C
	Vertical	Not possible (fully modular device)	-40 °C to +50 °C			
XR-300M PoE	Horizontal	-40 °C to +60 °C		Maximum 2 modules in slots 3 and 4: -40 °C ... +60 °C With more than 2 modules or other slot assignment: -40 °C to +50 °C	-40 °C to +60 °C	Maximum 2 modules in slots 3 and 4: -40 °C to +60 °C With more than 2 modules or other slot assignment: -40 °C to +50 °C
	Vertical	-40 °C to +50 °C				
XR-300M EEC	Horizontal	-40 °C to +70 °C		Maximum 2 modules in slots 3 and 4: -40 °C ... +60 °C With more than 2 modules or other slot assignment: -40 °C to +50 °C	-40 °C to +70 °C SFP transceivers of this group can only be used in conjunction with media modules MM992-2CUC, MM992-2CUC (C) and MM992-2CU. When using other modules: -40 °C to +60 °C	Maximum 2 modules in slots 3 and 4: -40 °C to +60 °C With more than 2 modules or other slot assignment: -40 °C to +50 °C
	Vertical	-40 °C to +50 °C				

[1] Only hardware product version 02 of the media modules is permitted.
The hardware product version is shown on the product. You can also read out this information from the device with the WBM or the CLI.

[2] The permitted operating temperature depends on how the mounting device was installed. The installation is horizontal if the device labeling is from left to right. With a vertical installation, the device labeling is rotated through 90°.

Table 8-3   **Operating temperature with media module MM991-2P**

Type	Operating temperature
X-300M X-300M PoE	• - 25 °C to + 40 °C
XR-300M XR-300M PoE XR-300M EEC	The slot above an MM991-2P may be used as follows: • Without media module: - 25 °C to + 50 °C) • With media module MM992-2CUC or MM992-2CU: - 25 °C to + 40 °C) Note the information under "MM991-2P product character-istics".

Table 8-4   Permitted ambient conditions

Storage/transport temperature	-40 °C to +85 °C
Max. relative humidity in operation at 25 °C	<= 95% (no condensation)
Max. ambient temperature at operating altitude	As of 2000 m: -5 °C of the max. operating temperature[1)] As of 3000 m: -10 °C of the max. operating temperature[1)]

[1)]   See table: "Operating temperature depending on the media modules used"

8.2   Connectors and electrical data

Table 8-5   Interfaces

Media module	Interfaces
MM992-2CUC	2 x 10/100/1000 Mbps, RJ-45 ports electrical with securing collar
MM992-2CUC (C)	2 x 10/100/1000 Mbps, RJ-45 ports electrical with securing collar, varnished
MM992-2CU	2 x 10/100/1000 Mbps, RJ-45 port electrical without securing collar
MM992-2M12 (C)	2 x 10/100/1000 Mbps, GE M12 connector electrical
MM992-2VD	2 x 10/100/1000 Mbps, RJ-45 ports electrical with securing collar
MM991-2 (BFOC)	2 x 100 Mbps, BFOC ports optical, multimode FO cable, up to max. 5 km
MM991-2FM (BFOC)	2 x 100 Mbps, BFOC port optical, for glass FO cable (multimode) with diag-nostics up to max. 5 km
MM991-2LD (BFOC)	2 x 100 Mbps, BFOC ports optical, single mode FO cable, up to max. 26 km
MM991-2 (SC)	2 x 100 Mbps, SC ports optical, multimode FO cable, up to max. 5 km
MM991-2LD (SC)	2 x 100 Mbps, SC ports optical, single mode FO cable, up to max. 26 km
MM991-2LH+ (SC)	2 x 100 Mbps, SC ports optical, single mode FO cable, up to max. 70 km

Media module	Interfaces
MM991-2P (SC RJ)	2 x 100 Mbps SC RJ ports optical for Plastic Optical Fiber (POF) up to max. 50 m or Polymer Cladded Fiber (PCF) up to max. 100 m
MM992-2 (SC)	2 x 1000 Mbps, SC ports optical, multimode FO cable, up to max. 750 m
MM992-2 (C) (SC)	2 x 1000 Mbps, SC ports optical, multimode FO cable, up to max. 750 m, varnished
MM992-2LD (SC)	2 x 1000 Mbps, SC ports optical, single mode FO cable, up to max. 10 km
MM992-2LH (SC)	2 x 1000 Mbps, SC ports optical, single mode FO cable, up to max. 40 km
MM992-2LH+ (SC)	2 x 1000 Mbps, SC ports optical, single mode FO cable, up to max. 70 km
MM992-2ELH (SC)	2 x 1000 Mbps, SC ports optical, single mode FO cable, up to max. 120 km
MM992-2SFP[1)]	2 x 100/1000 Mbps, SFP media module, optical LC ports with corresponding SFP transceivers.

Table 8-6   Power supply

Power supply	(24 VDC SELV)
	The media modules are supplied with power by the SCALANCE device. No other power supply is permitted.

Table 8-7   Electrical data: Current consumption and power loss I

Media module	Current consumption	Effective power loss
MM992-2CUC	70 mA	1.65 W
MM992-2CUC (C)	70 mA	1.65 W
MM992-2CU	70 mA	1.65 W
MM992-2M12 (C)	70 mA	1.65 W
MM992-2VD	70 mA	1.65 W
MM991-2 (BFOC)	100 mA	2.42 W
MM991-2FM (BFOC)	100 mA	2.42 W
MM991-2LD (BFOC)	80 mA	2.04 W
MM991-2 (SC)	100 mA	2.42 W
MM991-2LD (SC)	80 mA	2.04 W
MM991-2LH+ (SC)	80 mA	2.04 W
MM991-2P (SC RJ)	140 mA	3.36 W
MM992-2 (SC)	70 mA	1.76 W
MM992-2 (C) (SC)	70 mA	1.76 W
MM992-2LD (SC)	80 mA	1.95 W
MM992-2LH (SC)	90 mA	2.11 W
MM992-2LH+ (SC)	100 mA	2.42 W
MM992-2ELH (SC)	110 mA	2.75 W

Table 8-8   Electrical data: Current consumption and power loss II

MM992-2SFP with	Current consumption	Effective power loss
SFP991-1	60 mA	1.54 W
SFP991-1LD	60 mA	1.54 W
SFP991-1LH+	70 mA	1.65 W
SFP992-1	60 mA	1.38 W
SFP992-1+	90 mA	1.97 W
SFP992-1LD	70 mA	1.60 W
SFP992-1LH	70 mA	1.71 W
SFP992-LH+	80 mA	1.93 W
SFP992-1ELH	100 mA	2.31 W
SFP991-1ELH200	100 mA	2.31 W

Note

Fusing and signal contacts with media modules

The MM900 media modules do not have their own fuses and have no signaling contacts. The fuses and the signaling contacts exist in the SCALANCE device.

Table 8-9   Electrical data: Transmitter output (optical) and receiver input

Media module	Transmitter output (optical)		Receiver input	
	min. [dBm]	max. [dBm]	Sensitivity min. [dBm]	Input power max. [dBm]
MM992-2CUC	-	-	-	-
MM992-2CUC (C)	-	-	-	-
MM992-2CU	-	-	-	-
MM992-2M12 (C)[2]	-	-	-	-
MM992-2VD	-	-	-	-
MM991-2 (BFOC)	-19	-14	-32	-3
MM991-2FM (BFOC)	-19	-14	-32	-3
MM991-2LD (BFOC)	-15	-8	-34	-3
MM991-2 (SC)	-19	-14	-34	-3
MM991-2LD (SC)	-15	-8	-32	-3
MM991-2LH+ (SC)	-5	0	-34	-3
MM991-2P (SC RJ)	-8	-2	-23	+1
MM992-2 (SC)	-9.5	-4	-17	-3
MM992-2 (C) (SC)	-9.5	-4	-17	-3
MM992-2LD (SC)	-9.5	-3	-21	-3
MM992-2LH (SC)	-6	0	-23	-3
MM992-2LH+ (SC)	0	5	-23	-3
MM992-2ELH (SC)	0	5	-30	-3
MM992-2SFP[1]	-	-	-	-

[1] You will find further information in the compact operating instructions "Transceiver SFP/ SFP+".

[2] The ports of the MM992-2M12 (C) only meet the requirements according to Environment A (IEEE 802.3), in other words, the electrical isolation of the ports is designed for 500 Vrms (1 minute).

8.3   Cable lengths

Copper cables

Table 8-10   Permitted cable lengths (copper cable - Fast Ethernet)

Media module	Cable	Permitted cable length
MM992-2CUC MM992-2CUC (C) MM992-2CU MM992-2M12 (C) MM992-2VD (without VD)[1]	IE TP torsion cable with IE FC Outlet RJ-45 + 10 m TP cord	0 to 45 m + 10 m TP cord
	IE TP torsion cable with IE FC RJ-45 Plug 180	0 to 55 m
	IE FC TP marine/trailing/flexible cable with IE FC Outlet RJ-45 + 10 m TP cord	0 to 75 m + 10 m TP cord
	IE FC TP marine/trailing/ flexible cable with IE FC RJ-45 Plug 180	0 to 85 m
	IE FC TP standard cable with IE FC Outlet RJ-45 + 10 m TP cord	0 to 90 m + 10 m TP cord
	IE FC TP standard cable with IE FC RJ-45 plug 180	0 to 100 m
MM992-2VD (with VD)[2]	IE FC TP standard cable GP 4X2 (24 AWG) with IE FC RJ-45 plug 4x2	0 to 500 m at 100 Mbps
	IE FC TP standard cable GP 2x2 with IE FC RJ-45 plug 2x2	0 to 300 m at 100 Mbps.
	IE FC TP standard cable GP 2x2 with IE FC RJ-45 plug 2x2	300 to 500 m at 10 Mbps
	PROFIBUS FC standard cable GP with IE FC RJ-45 plug 4x2	100 to 1000 m at 10 Mbps
	PROFIBUS FC standard cable GP with IE FC RJ-45 plug 4x2	0 to 100 m at 100 Mbps.

[1]   The VD mode (Variable Distance) is turned off.

[2]   The VD mode (Variable Distance) is turned on.

Table 8-11   Permitted cable lengths (copper cable - gigabit Ethernet)

Media module	Cable	Permitted cable length
MM992-2CUC MM992-2CUC (C) MM992-2CU MM992-2M12 (C) MM992-2VD (without VD)[1] [2]	IE FC standard cable, 4×2, 24 AWG IE FC flexible cable, 4×2, 24 AWG with IE FC RJ-45 Plug 180, 4x2	0 to 90 m
	IE FC standard cable, 4×2, 22 AWG with IE FC Outlet RJ-45 + 10 m TP cord	0 to 60 m + 10 m TP cord
	IE FC flexible cable, 4×2, 22 AWG with IE FC Outlet RJ-45 + 10 m TP cord	0 to 90 m + 10 m TP cord

[1]   The VD mode (Variable Distance) is turned off.

[2]   If the VD mode is turned on, the speed is reduced to 100 Mbps. For permitted cable lengths, see table Fast Ethernet.

Fiber-optic cables

Table 8-12   Permitted cable lengths (fiber-optic cable - Fast Ethernet)

Media module	Fiber-optic cable type	Max. permitted cable length	Attenuation
MM991-2 (BFOC)	50/125 µm multimode fiber	5 km	≤1 dB/km at 1300 nm;1200 MHz*km; maximum insertion loss 0.5 dB; 9 dB max. permitted FO cable attenuation at 3 dB link power margin
	62.5/125 µm multi-mode fiber	5 km	≤1 dB/km at 1300 nm; 1200 MHz*km; maximum insertion loss 0.5 dB; 9 dB max. permitted FO cable attenuation at 3 dB link power margin
MM991-2FM (BFOC)	50/125 µm multimode fiber	5 km	≤1 dB/km at 1300 nm;1200 MHz*km; maximum insertion loss 0.5 dB; 9 dB max. permitted FO cable attenuation at 3 dB link power margin
	62.5/125 µm multi-mode fiber	5 km	≤1 dB/km at 1300 nm; 1200 MHz*km; maximum insertion loss 0.5 dB; 9 dB max. permitted FO cable attenuation at 3 dB link power margin
MM991-2LD (BFOC)	9/125 µm single mode fiber	26 km	≤0.5 dB/km at 1310 nm; maximum insertion loss 0.5 dB; 14 dB max. permitted FO cable attenuation at 2 dB link power margin
MM991-2 (SC)	50/125 µm multimode fiber	5 km	≤1 dB/km at 1300 nm;1200 MHz*km; maximum insertion loss 0.5 dB; 9 dB max. permitted FO cable attenuation at 3 dB link power margin
	62.5/125 µm multi-mode fiber	5 km	≤1 dB/km at 1300 nm; 1200 MHz*km; maximum insertion loss 0.5 dB; 9 dB max. permitted FO cable attenuation at 3 dB link power margin
MM991-2LD (SC)	9/125 µm single mode fiber	26 km	≤0.5 dB/km at 1310 nm; maximum insertion loss 0.5 dB; 14 dB max. permitted FO cable attenuation at 2 dB link power margin
MM991-2LH+ (SC)	9/125 µm single mode fiber	70 km	≤0.28 dB/km at 1550 nm; maximum insertion loss 0.5 dB; 26 dB max. permitted FO cable attenuation at 2 dB link power margin, minimum cable attenuation 3 dB

Media module	Fiber-optic cable type	Max. permitted cable length	Attenuation
MM991-2P (SC RJ)	980/1000 plastic optical fiber	50 m	9 dB max. permitted FO cable attenuation with 3 dB link power margin
	200/230 polymer cladded fiber	100 m	6 dB max. permitted FO cable attenuation with 3 dB link power margin

Table 8-13   Permitted cable lengths (fiber-optic cable - gigabit Ethernet)

Media module	Fiber-optic cable type	Max. permitted cable length	Attenuation
MM992-2 (SC) MM992-2 (C) (SC)	62.5/125 µm multimode fiber	350 m	≤3.1 dB/km at 850 nm; 1200 MHz×km; maximum insertion loss 0.5 dB; 4.5 dB max. permitted FO cable attenuation at 3 dB link power margin
	50/125 µm multimode fiber	750 m	≤2.5 dB/km at 850 nm; 1200 MHz×km; maximum insertion loss 0.5 dB; 4.5 dB max. permitted FO cable attenuation at 3 dB link power margin
MM992-2LD (SC)	9/125 µm single mode fiber	10 km	≤0.5 dB/km at 1310 nm; maximum insertion loss 0.5 dB; 6 dB max. permitted FO cable attenuation at 3 dB link power margin
MM992-2LH (SC)	9/125 µm single mode fiber	40 km	≤0.4 dB/km at 1550 nm; maximum insertion loss 0.5 dB; 18 dB max. permitted FO cable attenuation at 2 dB link power margin, minimum cable attenuation 3 dB
MM992-2LH+ (SC)	9/125 µm single mode fiber	70 km	≤0.28 dB/km at 1550 nm; maximum insertion loss 0.5 dB; 21 dB max. permitted FO cable attenuation at 2 dB link power margin, minimum cable attenuation 8 dB
MM992-2ELH (SC)	9/125 µm single mode fiber	120 km	≤0.225 dB/km at 1550 nm; maximum insertion loss 0.5 dB; 27 dB max. permitted FO cable attenuation at 2 dB link power margin, minimum cable attenuation 8 dB

Copper / fiber-optic cables

Table 8-14   Permitted cable lengths (copper cable/fiber-optic cable) for the SFP media module

Media module	Max. permitted cable length
MM992-2SFP[*)	Depending on the SFP transceiver used.

[*)   You will find further information in the compact operating instructions "Transceiver SFP/SFP+".

Attenuators

Transceivers of the types LH, LH+, ELH and ELH200 are designed for long distances and therefore send more power than they can receive.

If you establish a connection between such transceivers with a short cable length, use attenuators. Attenuators increase the attenuation and therefore protect the receiving diode.

Select the attenuation so that the transmit power (transmitter output) behind the attenuator is lower than the maximum received power (input power):

Transmitter output max. [dBm] - attenuator [dB] < input power max. [dBm]

Recommendation for the attenuation of the attenuator on a connection with the same transceivers:

Transceiver type	Attenuator
LH	6 dB ... 12 dB
LH+	12 dB ... 20 dB
ELH, ELH200	16 dB ... 24 dB

If you have established a connection on a pluggable transceiver with a short cable length, it is possible that the transmitter will be turned off. In this case, pull the transceiver and plug it in again.

GI-PCF

For segment lengths longer than 100 m, you can use GI-PCF cables. Note the information of the manufacturer.

8.4 Other properties

Table 8-15   Mean time between failure (MTBF)

Device version (power supply)	MTBF[1]
MM992-2CUC, MM992-2CUC (C), MM992-2CU, MM992-2M12 (C)	> 250 years
MM991-2P (SC RJ)	> 230 years
MM992-2VD	> 200 years
MM991-2 (BFOC) MM991-2 (SC)	> 140 years
MM991-2FM (BFOC) MM992-2 (C) (SC)	> 135 years
MM991-2LD (BFOC) MM991-2LD (SC) MM992-2LD (LD)	> 115 years
MM991-2LH+ (SC) MM992-2LH (SC) MM992-2LH+ (SC)	> 105 years
MM992-2ELH (SC)	> 95 years
MM992-2SFP[2]	> 250 years [3]

[1]   These values apply at 40 °C

[2]   You will find further information in the compact operating instructions "Transceiver SFP/SFP+".

[3]   empty

Dimension drawings

9

Note

The following dimension drawings are available for the **MM900** product group.

Figure 9-1   MM900 dimension drawing 1: Electrical RJ-45 ports with securing collar
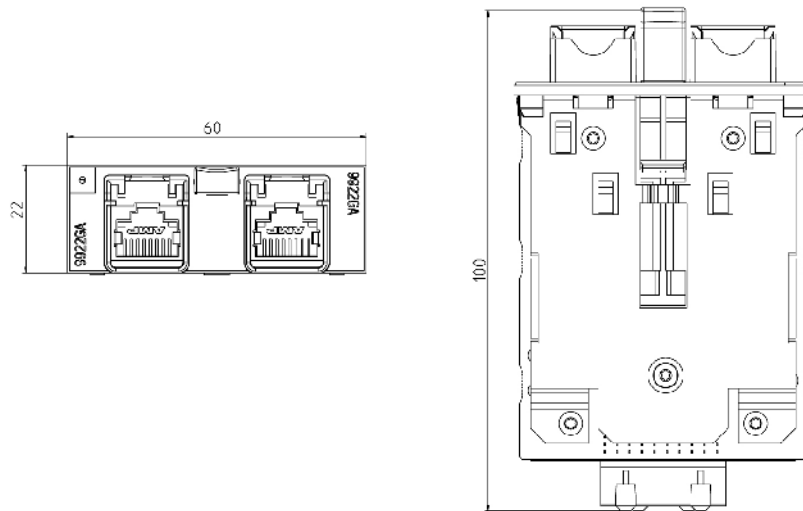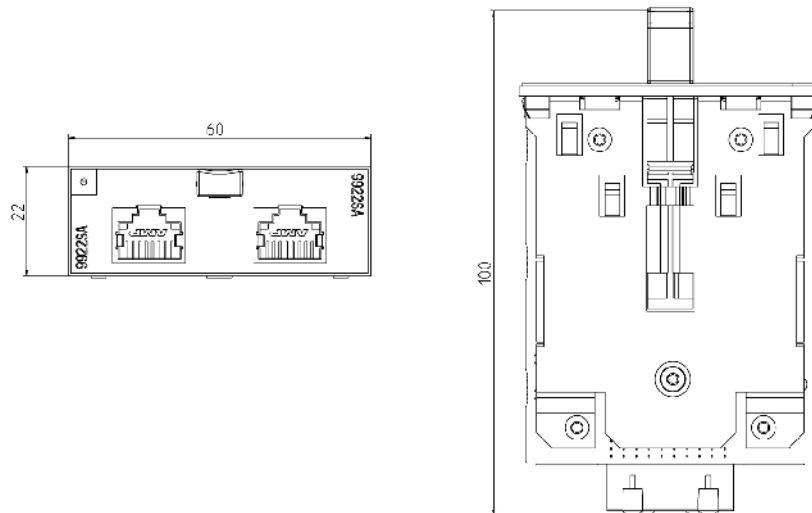

Figure 9-2   MM900 dimension drawing 2: Electrical RJ-45 ports without securing collar
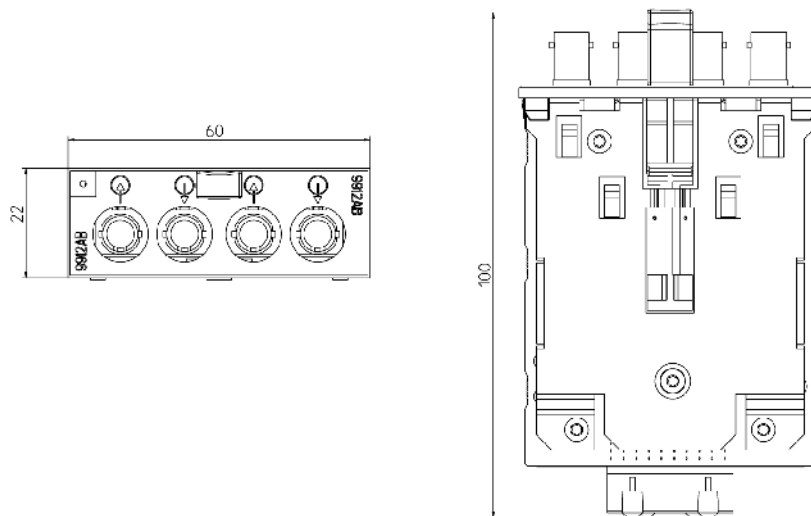
Figure 9-3   MM900 dimension drawing 3: BFOC ports
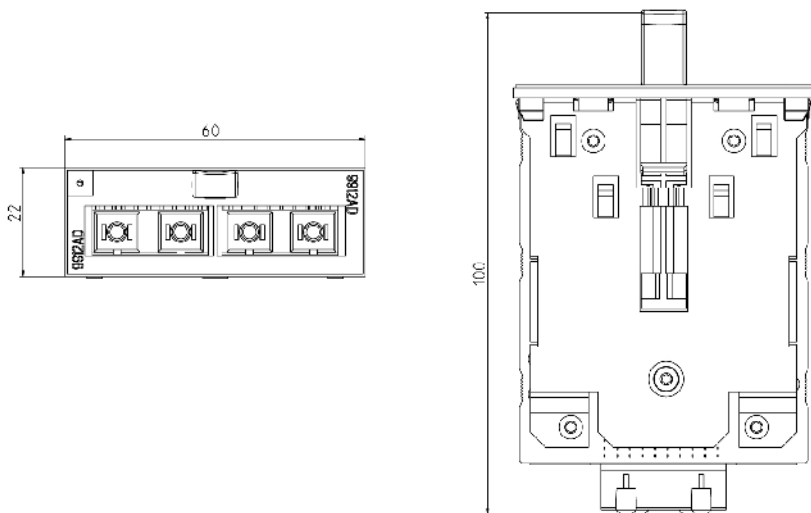

Figure 9-4   MM900 dimension drawing 4: Optical SC ports
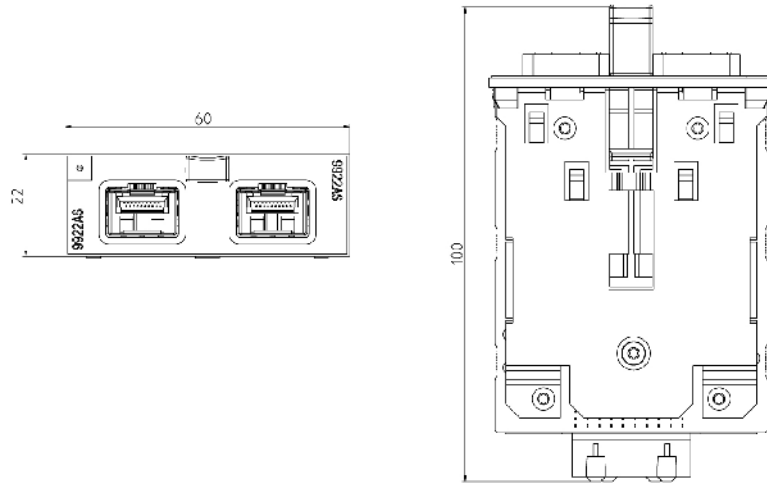
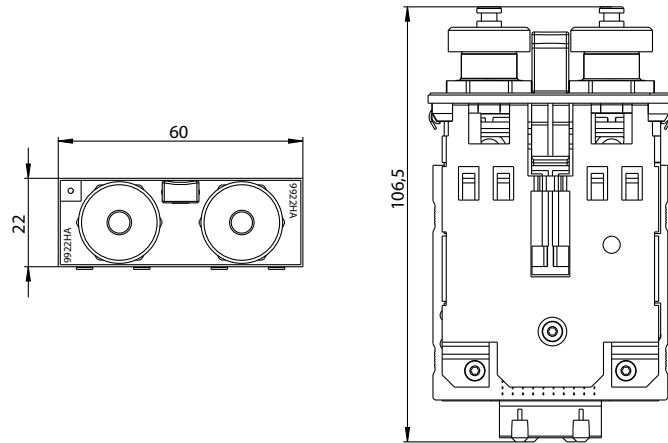Figure 9-5   MM900 dimension drawing 5: SFP media module

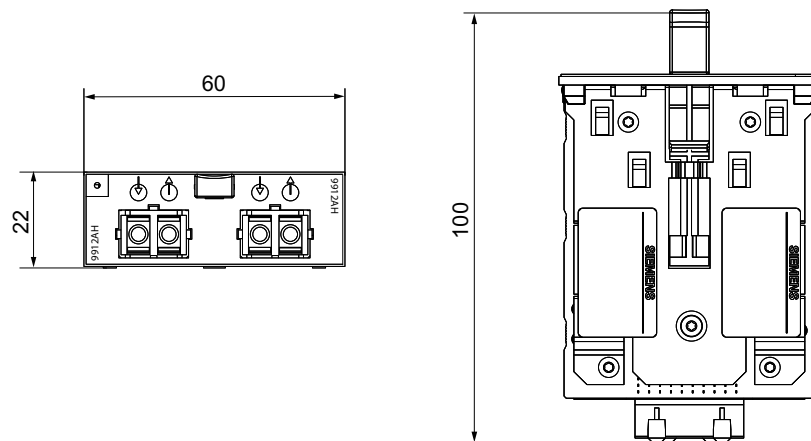Figure 9-6   MM900 dimension drawing 6: M12 ports electrical

Figure 9-7   MM900 dimension drawing 7: SC RJ ports optical

Approvals

<div align="right">

10

</div>

The SIMATIC NET products described in these Operating Instructions have the approvals listed below.

> **Note**
>
> **Issued approvals on the type plate of the device**
>
> The specified approvals apply only when the corresponding mark is printed on the product. You can check which of the following approvals have been granted for your product by the markings on the type plate.

Current approvals on the Internet

You will find the current approvals for the product on the Internet pages of Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/15303/cert).

Notes for the manufacturers of machines

This product is not a machine in the sense of the EC Machinery Directive or the Supply of Machinery (Safety) Regulations (UK).

There is therefore no declaration of conformity relating to the EC Machinery Directive 2006/42/EEC or the Supply of Machinery (Safety) Regulations 2008 (UK) for this product.

If the product is part of the equipment of a machine, it must be included in the procedure for obtaining the EU/UK conformity assessment by the manufacturer of the machine.

Machinery directive

The product is a component in compliance with the EC Machinery Directive 2006/42/EEC and the Supply of Machinery (Safety) Regulations 2008 (UK).

According to the Machinery Directive respectively the Supply of Machinery (Safety) Regulations (UK), we are obliged to point out that the product described is intended solely for installation in a machine.

Before the final product can be put into operation, it must be tested to ensure that it conforms with the Machinery Directive 2006/42/EEC and the Supply of Machinery (Safety) Regulations 2008 (UK).

EC declaration of conformity

The SIMATIC NET products described in these operating instructions meet the requirements and safety objectives of the following EC directives and comply with the harmonized

European standards (EN) which are published in the official documentation of the European Union and here.

- **2014/34/EU (ATEX explosion protection directive)**
  Directive of the European Parliament and the Council of 26 February 2014 on the approximation of the laws of the member states concerning equipment and protective systems intended for use in potentially explosive atmospheres, official journal of the EU L96, 29/03/2014, pages. 309-356

- **2014/30/EU (EMC)**
  EMC directive of the European Parliament and of the Council of February 26, 2014 on the approximation of the laws of the member states relating to electromagnetic compatibility; official journal of the EU L96, 29/03/2014, pages. 79-106

- **2011/65/EU (RoHS)**
  Directive of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, official journal of the EC L174, 01/07/2011, pages 88-110

You will find the EC declaration of conformity for these products on the Internet pages of Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/15303/cert).

The EC Declaration of Conformity is available for all responsible authorities at:

Siemens Aktiengesellschaft

Digital Industries
DE-76181 Karlsruhe
Germany

UK Declaration of Conformity

The UK declaration of conformity is available to all responsible authorities at:

Siemens Aktiengesellschaft
Digital Industries
Process Automation
DE-76181 Karlsruhe
Germany

Importer UK:

Siemens plc,
Manchester M20 2UR

You can find the current UK Declaration of Conformity for these products on the Internet pages under Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/15273/cert).

The SIMATIC NET products described in this document meet the requirements of the following directives:

- UK-Regulation
  SI 2016/1107 Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres Regulations 2016, and related amendments

- EMC Regulation
  SI 2016/1091 Electromagnetic Compatibility Regulations 2016, and related amendments

- RoHS Regulation
  SI 2012/3032 Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012, and related amendments

ATEX, IECEx, UKEX and CCC Ex certification

> ⚠ **WARNING**
>
> **Risk of explosion in hazardous areas**
>
> When using SIMATIC NET products in hazardous area zone 2, make absolutely sure that the associated conditions in the following document are adhered to:
>
> "SIMATIC NET Product Information Use of subassemblies/modules in a Zone 2 Hazardous Area".
>
> You will find this document
> - on the data medium that ships with some devices.
> - on the Internet pages under Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/view/78381013).
>
> Enter the document identification number "C234" as the search term.

The markings of the electrical devices are:

II 3 G   Ex ec IIC T4 Gc
DEKRA 18ATEX0025 X
DEKRA 21UKEX0001 X
IECEx DEK 18.0017X
Importer UK:
Siemens plc,
Manchester
M20 2UR
(Ex ec IIC T4 Gc, not on the nameplate)

The products meet the requirements of the following standards:

- EN/IEC 60079-7, GB 3836.3

- EN IEC/IEC 60079-0, GB 3836.1

You will find the current versions of the standards in the currently valid certificates.

Note for devices with CLASS 1 LASER

Important note on products certified according to Type Examination Certificate KEMA 07ATEX0145 X as of Issue 95 / DEKRA 18ATEX0025 X and IECEx Certificate of Conformity DEK 14.0025X as of Issue 43 / DEK 18.0017X and containing Class 1 optical radiation sources.

Note

CLASS 1 LASER

The device contains optical radiation sources which comply with the limits of Class 1 according to IEC 60825-1. Fiber-optic cables connected to these optical radiation sources may therefore be routed either to or through hazardous areas requiring Category 2G, 3G, 2D or 3D equipment.

EMC (electromagnetic compatibility)

The SIMATIC NET products described in these operating instructions meet the electromagnetic compatibility requirements according to the EU Directive 2014/30/EU as well as the UK-Regulation SI 2016/1091 and their associated amendments.

Applied standards:

* EN 61000-6-2 Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
* EN 61000-6-4 Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments

You will find the current versions of the standards in the currently valid EC/UK Declaration of Conformity.

EMC directive (railway applications)

The device variants with the supplement (C) in the type name have varnished printed circuit boards (conformal coating) and also meet the requirements of EU directive 2014/30/EU "Electromagnetic Compatibility" (EMC Directive).

Applied standards:

* EN 50121-3-2 Railway applications - Electromagnetic compatibility - part 3-2: Rolling stock - Devices
* EN 50121-4 Railway applications - Electromagnetic compatibility - part 4: Interference emissions and immunity of signal telecommunications equipment

You will find the current versions of the standards in the currently valid EC declaration of conformity.

RoHS

The SIMATIC NET products described in these operating instructions meet the requirements on the restriction of the use of certain hazardous substances in electrical and electronic equipment according to the EU Directive 2011/65/EU as well as the UK-Regulation SI 2012/3032 and their associated amendments.

Applied standard:

- EN IEC 63000

FM

The product meets the requirements of the standards:

- Factory Mutual Approval Standard Class Number 3611

- FM Hazardous (Classified) Location Electrical Equipment:
  Non Incendive / Class I / Division 2 / Groups A,B,C,D / T4 and
  Non Incendive / Class I / Zone 2 / Group IIC / T4

cULus Approval for Information Technology Equipment

cULus Listed I. T. E.

Underwriters Laboratories Inc. complying with

- UL 60950-1 (Information Technology Equipment)

- CSA C22.2 No. 60950-1-03

Report no. E115352

cULus approval for industrial control equipment

cULus Listed IND. CONT. EQ.

Underwriters Laboratories Inc. complying with

- UL 508

- CSA C22.2 No. 142-M1987

Report no. E85972

cULus Approval Hazardous Location

cULus Listed I. T. E. FOR HAZ. LOC.

Underwriters Laboratories Inc. complying with

- UL 60950-1 (Information Technology Equipment)

- ANSI/ISA 12.12.01-2007

- CSA C22.2 No. 213-M1987

Approved for use in
Cl. 1, Div. 2, GP A, B, C, D T4
Cl. 1, Zone 2, GP IIC T4

Report no. E240480

Note for Australia - RCM

The product meets the requirements of the RCM standard.

Applied standards:

- AS/NZS CISPR11 (Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement).
- EN 61000-6-4 Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments

You will find the current versions of the standards in the currently valid RCM SDoCs (Self-Declaration of Conformity).

Marking for the customs union

EAC

EAC (Eurasian Conformity)

Eurasian Economic Union of Russia, Belarus, Armenia, Kazakhstan and Kyrgyzstan

Declaration of conformity according to the technical regulations of the customs union (TR ZU)

Railway approval

Media modules with the supplement (C) in the type name have varnished printed circuit boards (conformal coating) and meet the requirements of the railway standard:

- EN 50155 "Railway applications - Electronic equipment used on rolling stock".

Note

When used on railway stock, a stabilized power supply must be used to comply with EN50155.

FDA and IEC approvals

The following MM900 media modules meet the FDA and IEC requirements listed below:

Media module	CLASS 1 LASER PRODUCT
MM992-2CUC	-
MM992-2CUC (C)	-
MM992-2CU	-
MM992-2M12 (C)	-
MM992-2VD	-
MM992-2SFP	(*)
MM992-2SFP (C)	(*)
MM991-2 (BFOC)	●
MM991-2FM (BFOC)	●

Media module	CLASS 1 LASER PRODUCT
MM991-2LD (BFOC)	●
MM991-2 (SC)	●
MM991-2LD (SC)	●
MM991-2LH+ (SC)	●
MM991-2P (SC RJ)	●
MM992-2 (SC)	●
MM992-2 (C) (SC)	●
MM992-2LD (SC)	●
MM992-2LH (SC)	●
MM992-2LH+ (SC)	●
MM992-2ELH (SC)	●

* You will find additional information in the compact operating instructions "Transceiver SFP/SFP+".

FDA   IEC

Complies with 21 CFR
1040.10 and 1040.11

CLASS 1 LASER PRODUCT

Figure 10-1   FDA and IEC approvals

> ⚠ **CAUTION**
>
> Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Installation guidelines

The devices meet the requirements if you adhere to the installation and safety instructions contained in this documentation and in the following documentation when installing and operating the devices.

* "Industrial Ethernet / PROFINET Industrial Ethernet" System Manual (https://support.industry.siemens.com/cs/ww/en/view/27069465)

* "Industrial Ethernet / PROFINET - Passive Network Components" System Manual (https://support.industry.siemens.com/cs/ww/en/view/84922825)

* "EMC Installation Guidelines" configuration manual (https://support.industry.siemens.com/cs/ww/en/view/60612658)

> ⚠ **WARNING**
>
> **Personal injury and property damage can occur**
>
> The installation of expansions that are not approved for SIMATIC NET products or their target systems may violate the requirements and regulations for safety and electromagnetic compatibility.
>
> Only use expansions that are approved for the system.

Note

The test was performed with a device and a connected communications partner that also meets the requirements of the standards listed above.

When operating the device with a communications partner that does not comply with these standards, adherence to the corresponding values cannot be guaranteed.

Appendix A

A.1 EMC-compatible installation of electrical Industrial Ethernet or PROFIBUS cabling

The Industrial Ethernet / PROFINET system manual "Passive network components" prescribes the use of fiber-optic cables for cabling between buildings and/or external facilities because there may be large potential differences between nodes.

If IE FC or PROFIBUS FC cables are used for such applications, the same rules apply as when installing cables indoors.
The following also applies:

- Install cables on metal cable racks

- Electrically connect the cable racks where they join

- Ground the cable racks

- Connect the shields of the cables to the grounding network as close as possible to the point of entry into the building or facility.

- Electrical bus cables installed outside buildings must be included in the lightening protection and grounding concept of the entire system. Follow the instructions in Appendix B "Lightning and Surge Voltage Protection for LAN Cables Between Buildings" of the SIMATIC NET PROFIBUS Networks manual.

- All SIMATIC NET PROFIBUS cables can be used if they are installed in cable channels protected against dampness. The safety clearances specified in Appendix C.7 "Cable categories and clearances" of the SIMATIC NET PROFIBUS Network Manual must then be adhered to.

A.2 Equipotential bonding

When do potential differences occur?

Potential differences can, for example, be caused by different power supplies. Potential differences between separate parts of the plant can be damaging to the system in the following situations:

- Programmable controllers and peripheral devices are linked on grounded connections

- Cable shields are contacted at both ends and grounded to different parts of the plant.

How do you avoid potential differences?

Potential differences must be reduced by installing bonding conductors so that the functions of the electronic components used are guaranteed.

When and why is equipotential bonding necessary?

Several good reasons for equipotential bonding are listed below:

- Devices with a grounded interface can be damaged by potential differences.

- The shield of the PROFIBUS cable must not be used for equipotential bonding. This is, however, the case if parts of the system connected by the cable shield are connected to different grounding points.

- Equipotential bonding is a requirement for lightning protection.

Rule for equipotential bonding

Remember the following points about equipotential bonding systems:

- The lower the impedance of the equipotential bonding cable, the greater the effectiveness of the equipotential bonding.

- The impedance of the additional bonding conductor must not exceed 10% of the shield impedance of the bus cable.

- Make largearea contact between the bonding conductor and the PE conductor.

- Protect the bonding conductor from corrosion.

- Install the bonding conductor so that the area enclosed by the bonding conductor and signal cables is as small as possible.

- Use copper or galvanized steel for the bonding conductor

- Include metal, conductive cable channels/racks in the equipotential bonding of the building and between the individual parts of the system. The individual segments of the channels/racks must be connected together with low inductance and low resistance and connected to the building ground system as often as possible. Expansion joints and angled connections should be bridged by additional flexible grounding bands.

- The connections between the individual segments of channels must be protected from corrosion (longterm stability)

- If there are connections between sections of buildings (for example separated by expansion joints) with their own reference point for the building ground network, a bonding conductor (equivalent copper crosssectional area $\geq 10\,\text{mm}^2$) must be installed parallel to the cables. This bonding conductor is not necessary if metal, conducting cable channels/racks are used.

Note

Bonding conductors are unnecessary if the sections of a system are connected exclusively using fiberoptic cable (FO).

Notes on systems in which no equipotential bonding is possible

To ensure greater immunity to interference, cables for SIMATIC NET PROFINET and PROFIBUS are always shielded. Due to the defined shielding property, the shield needs to make contact at both ends.

In systems in which no equipotential bonding is possible, the current flow via the shield needs to be prevented. Despite this, to be able to use the shield properties of the cable note the following:

- Contact the shield at one end with low resistance.

- Connect the other end of the shield to the grounding system using capacitive coupling.

Index

A

Approvals, 61
Attenuation, 54
Attenuator, 54

C

CE mark, 61

G

GI-PCF, 55
Glossary, 6

P

Power supply
    Media modules, 43

S

Safety notices
    for installation, 31
    general, 9
    Use in hazardous areas, 9, 31, 41
    when connecting up, 41
Scope of delivery, 19
SIMATIC NET glossary, 6
System manual, 33, 67

SCALANCE MM900
Compact Operating Instructions, 05/2023, A5E02630805-18