SIEMENS

SIMATIC NET

Industrial Ethernet SCALANCE X-100

Operating Instructions

04
A2B00060666D

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

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

CAUTION

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

NOTICE

indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

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 for the specific task, 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 adhered to. The information in the relevant documentation must be observed.

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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.

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Table of contents

Introduction

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Overview

This chapter provides you with an overview of the functions of the unmanaged Industrial Ethernet switches of the SCALANCE X-100 product line.

Purpose of the Commissioning Manual

This commissioning manual supports you when commissioning networks with the Industrial Ethernet switches of the SCALANCE X-100 product line.

Validity of this Commissioning Manual

This commissioning manual is valid for the following devices:

SIMATIC NET SCALANCE X104-2 6GK5104-2BB00-2AA3

SIMATIC NET SCALANCE X106-1 6GK5106-1BB00-2AA3

SIMATIC NET SCALANCE X108 6GK5108-0BA00-2AA3

SIMATIC NET SCALANCE X108PoE 6GK5108-0PA00-2AA3

SIMATIC NET SCALANCE X112-2 6GK5112-2BB00-2AA3

SIMATIC NET SCALANCE X116 6 GK5116-0BA00-2AA3

SIMATIC NET SCALANCE X124 6 GK5124-0BA00-2AA3

Further documentation

The "SIMATIC NET Industrial Ethernet Twisted Pair and Fiber Optic Networks" manual contains additional information on other SIMATIC NET products that you can operate along with the switches of the SCALANCE X-100 product line in an Industrial Ethernet network.

Finding information

To help you to find the information you require more quickly, the manual includes not only the table of contents but also the following sections in the Appendix:

- Index
- Glossary

Audience

This commissioning manual is intended for persons involved in commissioning networks with the Industrial Ethernet switches of the SCALANCE X-100 product line.

Standards and approvals

The Industrial Ethernet switches of the SCALANCE X-100 product line meet the requirements for the CE, UL, C-Tick, FM and ATEX marks. You will find detailed information in the section "Approvals and Markings" in this commissioning manual in the "Approvals" table.

Note

The specified approvals apply only when the corresponding mark is printed on the product.

What is possible?

The devices of the SCALANCE X100 product line allow the cost-effective installation of Industrial Ethernet bus and star structures with switching functionality. The SCALANCE X104-2, SCALANCE X106-1 and SCALANCE X112-2 also allow the switchover between electrical/optical media. SCALANCE X devices with the suffix PoE also allow the supply of power to end devices over Ethernet cables with Power-over-Ethernet complying with 802.3af.

Note

It is not possible to use devices of the SCALANCE X-100 product line in a redundant ring because they do not support redundancy.

Note

If devices of the SCALANCE X-100 product line are supplied over long 24 V power supply lines or networks, measures are necessary to prevent interference by strong electromagnetic pulses on the supply lines. These can result, for example, as a result of lightning or large inductive loads.

One of the tests to attest the immunity of devices of the SCALANCE X-100 product line to electromagnetic interference was the "surge immunity test" according to EN61000-4-5. This test requires overvoltage protection for the power supply lines. A suitable device is, for example, the Dehn Blitzductor VT AD 24 V type no. 918 402 or comparable protective element.

Manufacturer:
DEHN+SÖHNE GmbH+Co.KG Hans Dehn Str.1 Postfach 1640 D-92306 Neumarkt, Germany

⚠ WARNING

When used under hazardous conditions (zone 2), a switch of the SCALANCE X-100 product line must be installed in an enclosure.

To comply with ATEX95 (EN 60079-15), this enclosure must meet the requirements of at least IP54 in compliance with EN 60529.

WARNING – EXPLOSION HAZARD: DO NOT DISCONNECT EQUIPMENT WHEN A FLAMMABLE OR COMBUSTIBLE ATMOSPHERE IS PRESENT.

Overview of the SCALANCE X product family

The SCALANCE X-100 product family is part of the SCALANCE X product family. Below, you will find a brief overview of this product family.

The SCALANCE X family comprises various product lines that complement each other and that are carefully tuned to specific automation tasks.

SCALANCE X005 Entry Level

Unmanaged switch with five twisted-pair ports and optical diagnostics on the device for use in machine and system islands.

SCALANCE X-100 unmanaged

Switches with redundant power supply and signaling contact for use in applications in the immediate vicinity of machinery.
A variety of device variants with different numbers and designs of electrical and optical ports.

SCALANCE X-200 managed

The devices of the SCALANCE X-200 product line can be used universally – in machine-level applications as well as in networked plant sections, in electrical or electrical/optical linear, ring or star structures and with single mode up to 26 km.
Devices with a high degree of protection (IP65) can be installed outside the control cabinet.

Configuration and remote diagnostics functions are integrated in the STEP 7 engineering tool. This increases plant availability and has advantages during the engineering, commissioning and operational phases. The devices of the SCALANCE X-200 line also have standard remote diagnostics functions (SNMP, Web server).

SCALANCE X-200IRT managed

In subsystem networks with hard real-time requirements (real time and isochronous real time (available soon)), the SCALANCE X-200IRT switches can be used. They include the enhanced real-time controller ERTEC. By using the "cut through" switching mechanism, the switches are ideal to meet the real-time requirements of PROFINET.

The standard data transmission (TCP/IP) can take place on the same network. Dual network structures are therefore not necessary.

Network installation, configuration and diagnostics involves the same procedures as for the other devices of the SCALANCE X-200 product line.

SCALANCE X-400 modular

The switches of the SCALANCE X-400 product series are suitable for the construction of optical/electrical linear, ring and star topologies (10/100/1000 Mbps) for high-speed systems. They have a modular structure, in which media modules and extender modules can be inserted in the switch as required. These expansions make as many as eight electrical and eight optical ports additionally available.

By supporting IT standards, for example, VLAN, RSTP, Layer 3, automation networks can be seamlessly connected to existing corporate networks.
The SCALANCE X-400 switches are ideally suited, for example, to process control systems such as PCS 7.

Network topologies

2

Switching technology allows extensive networks to be set up with numerous nodes and simplifies network expansion.

Which topologies can be implemented?

Using the Industrial Ethernet switches of the SCALANCE X-100 product line, you can implement bus and star topologies.

Note

Make sure that the maximum permitted cable lengths for the relevant devices are not exceeded. You will find the permitted cable lengths in the technical specifications.

Bus topology

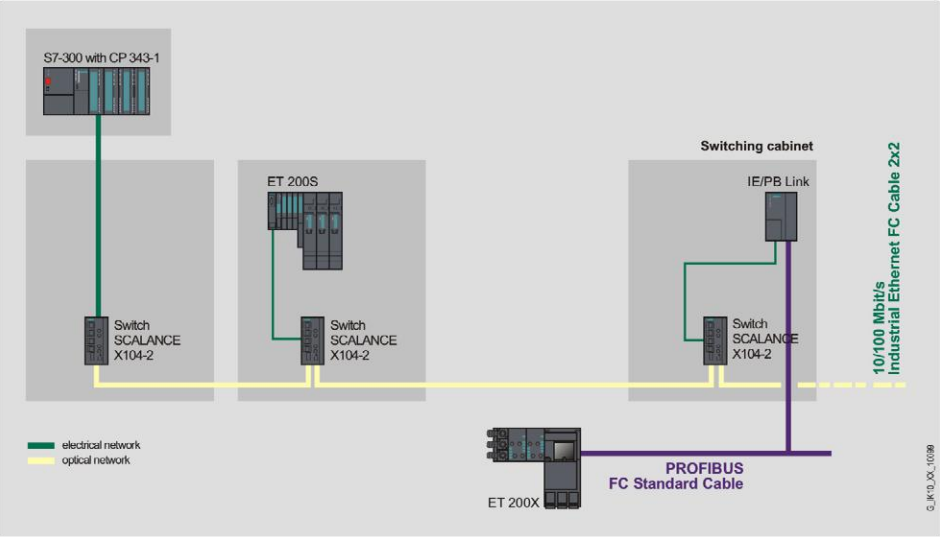

Figure 2-1 Electrical / optical linear topology with SCALANCE X-100

Star topology

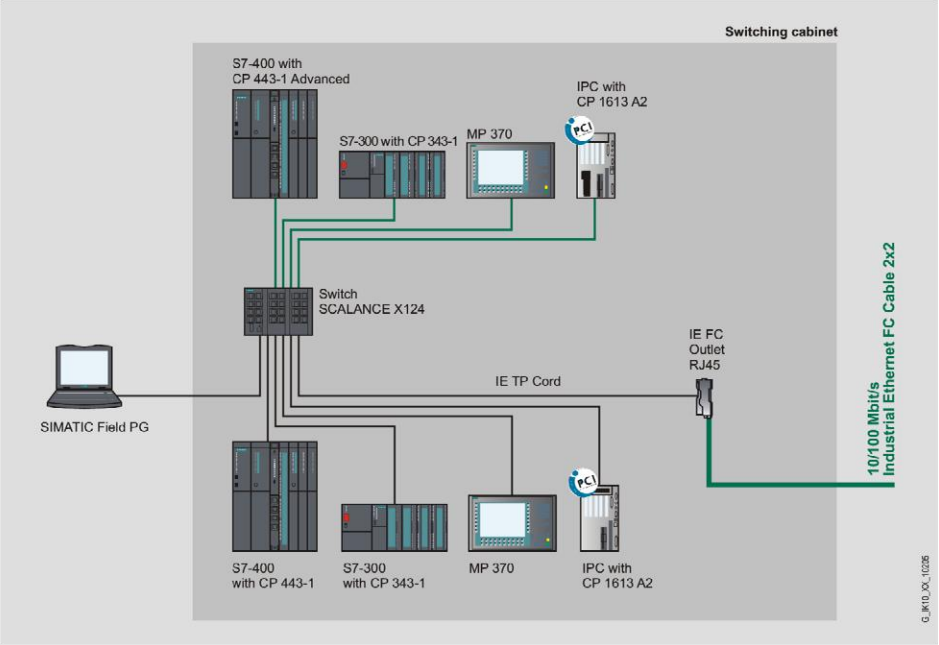

Figure 2-2 Electrical star topology. Example with SCALANCE X124

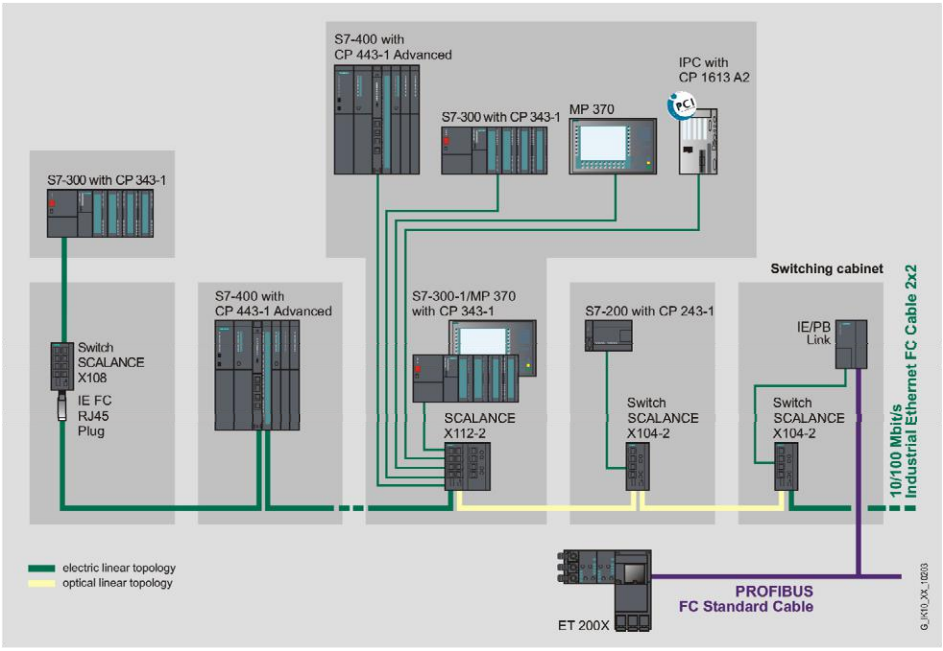

Figure 2-3 Electrical/optical star topology. Example with SCALANCE X112-2 and SCALANCE X104-2

Product properties

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3.1 Overview of the product characteristics

Table 3- 1 Overview of the product characteristics

Device type SCALANCE							
	X104-2	X106-1	X108	X108PoE	X112-2	X116	X124
SIMATIC environment	+	+	+	+	+	+	+
Diagnostics LED	+	+	+	+	+	+	+
24 V DC	+	+	+	+	+	+	+
Compact housing (securing collar, etc.)	+	+	+	+	+	+	+
2x 24 V DC	+	+	+	+	+	+	+
Signaling contact + on-site operation	+	+	+	+	+	+	+
Diagnostics: Web, SNMP, PROFINET	-	-	-	-	-	-	-
Passive ring redundancy	-	-	-	-	-	-	-
C-PLUG	-	-	-	-	-	-	-
Ring redundancy with RM	-	-	-	-	-	-	-
Standby redundancy	-	-	-	-	-	-	-
IRT capability	-	-	-	-	-	-	-
Fast learning	-	-	-	-	-	-	-
Passive listening	-	-	-	-	-	-	-
Log table	-	-	-	-	-	-	-
SNTP + SICLOCK	-	-	-	-	-	-	-
Cut Through	-	-	-	-	-	-	-
Number of PoE ports	-	-	-	2	-	-	-

Fast learning:
Quick recognition of MAC addresses on the device that change during operation (for example, when an end node is reconnected).

Table 3- 2 Overview of the connection options

Device type SCALANCE							
	X104-2	X106-1	X108	X108PoE	X112-2	X116	X124
TP (RJ-45) Fast Ethernet 10 / 100 Mbps	4	6	8	8	12	16	24
Fiber multimode (BFOC) Fast Ethernet 100 Mbps	2	1	-	-	2	-	-

3.2 Components of the product

The Industrial Ethernet switches of the SCALANCE X-100 product line always ship with a 2-pin and a 4-pin terminal block, a product information pamphlet and a CD. The CD contains the operating instructions. The CD also contains the PST tool, the GSD file and the SNMP OPC profile for devices of the SCALANCE X-200 product line.

3.3 Unpacking and checking

Unpacking, checking

1. Make sure that the package is complete.
2. Check all the parts for transport damage.

⚠ WARNING
Do not use any parts that show evidence of damage!

3.4 SCALANCE X104-2

3.4.1 SCALANCE X104-2 product characteristics

Possible connections

The SCALANCE X104-2 has four RJ-45 jacks and two BFOC ports for the connection of end devices or other network segments.

Note

The BFOC socket (Bayonet Fiber Optic Connector) corresponds to the ST socket.

Figure 3-1 SCALANCE X104-2

3.4.2 SCALANCE X104-2 TP ports

Connector pinout

On the SCALANCE X104-2, the TP ports are implemented as RJ-45 jacks with MDI-X assignment (Medium Dependent Interface–Autocrossover) of a network component.

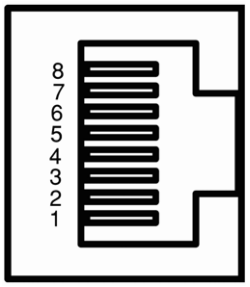

Figure 3-2 RJ-45 jack

Table 3- 3 Pin assignment of the RJ-45 jack

Pin number	Assignment
Pin 8	n. c.
Pin 7	n. c.
Pin 6	TD-
Pin 5	n. c.
Pin 4	n. c.
Pin 3	TD+
Pin 2	RD-
Pin 1	RD+

NOTICE
TP cords or TP-XP cords with a maximum length of 10 m can be connected to the RJ-45 TP port. With the IE FC cables and IE FC RJ-45 plug 180, an overall cable length of a maximum of 100 m is permitted between two devices depending on the cable type.

Autonegotiation

Autonegotiation means the automatic detection of the functionality of the port at the opposite end. Using autonegotiation, repeaters or end devices can detect the functionality available at the port of a partner device allowing automatic configuration of different types of device. With autonegotiation, two components connected to a link segment can exchange parameters and set themselves to match the supported communication functionality.

Note

Devices not supporting autonegotiation must be set to 100 Mbps half duplex or 10 Mbps half duplex.

Note

The SCALANCE X104-2 is a plug-and-play device that does not require settings to be made for commissioning.

Auto polarity exchange

If the pair of receiving cables are incorrectly connected (RD+ and RD- swapped over), the polarity is adapted automatically.

MDI /MDIX autocrossover function

The advantage of the MDI /MDIX autocrossover function is that straight-through cables can be used throughout and crossover Ethernet cables are unnecessary. This prevents malfunctions resulting from mismatching send and receive wires. This makes installation much easier for the user.

The devices of the SCALANCE X-100 product line all support the MDI / MDIX autocrossover function.

NOTICE
Please note that the direct connection of two ports on the switch or accidental connection over several switches causes an illegal loop. Such a loop can lead to network overload and network failures.

3.4.3 SCALANCE X104-2 FO ports

Transmission rate

The transmission rate of the optical Fast Ethernet ports is 100 Mbps.

Transmission mode

The transmission mode for 100Base-FX is specified in the IEEE 802.3 standard.

Since the full duplex mode and the transmission rate cannot be modified for optical transmission, autonegotiation cannot be selected.

Transmission medium

Data transmission is over multimode fiber-optic cable (FOC). The wavelength is 1310 nm.

Multimode fiber-optic cables are used with a core of 50 or 62.5 µm; the light source is an LED.

The outer diameter of the FOC is 125 µm.

Transmission range

The maximum transmission range (segment length) is 3 km.

Connectors

The cables are connected over BFOC sockets.

3.5 SCALANCE X106-1

3.5.1 SCALANCE X106-1 product characteristics

Possible connections

The SCALANCE X106-1 has six RJ-45 jacks and a BFOC port for the connection of end devices or other network segments.

Note

The BFOC socket (Bayonet Fiber Optic Connector) corresponds to the ST socket.

Figure 3-3 SCALANCE X106-1

3.5.2 SCALANCE X106-1 TP ports

Connector pinout

On the SCALANCE X106-1, the TP ports are implemented as RJ-45 jacks with MDI-X assignment (Medium Dependent Interface–Autocrossover) of a network component.

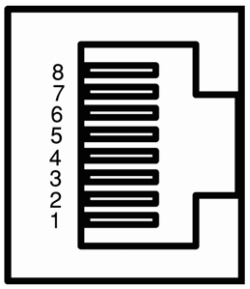

Figure 3-4 RJ-45 jack

Table 3- 4 Pin assignment of the RJ-45 jack

Pin number	Assignment
Pin 8	n. c.
Pin 7	n. c.
Pin 6	TD-
Pin 5	n. c.
Pin 4	n. c.
Pin 3	TD+
Pin 2	RD-
Pin 1	RD+

NOTICE
TP cords or TP-XP cords with a maximum length of 10 m can be connected to the RJ-45 TP port. With the IE FC cables and IE FC RJ-45 plug 180, an overall cable length of a maximum of 100 m is permitted between two devices depending on the cable type.

Autonegotiation

Autonegotiation means the automatic detection of the functionality of the port at the opposite end. Using autonegotiation, repeaters or end devices can detect the functionality available at the port of a partner device allowing automatic configuration of different types of device. With autonegotiation, two components connected to a link segment can exchange parameters and set themselves to match the supported communication functionality.

Note

Devices not supporting autonegotiation must be set to 100 Mbps half duplex or 10 Mbps half duplex.

Note

The SCALANCE X106-1 is a plug-and-play device that does not require settings to be made for commissioning.

Auto polarity exchange

If the pair of receiving cables are incorrectly connected (RD+ and RD- swapped over), the polarity is adapted automatically.

MDI /MDIX autocrossover function

The advantage of the MDI /MDIX autocrossover function is that straight-through cables can be used throughout and crossover Ethernet cables are unnecessary. This prevents malfunctions resulting from mismatching send and receive wires. This makes installation much easier for the user.

The devices of the SCALANCE X-100 product line all support the MDI / MDIX autocrossover function.

NOTICE
Please note that the direct connection of two ports on the switch or accidental connection over several switches causes an illegal loop. Such a loop can lead to network overload and network failures.

3.5.3 SCALANCE X106-1 FO Port

Transmission rate

The transmission rate of the optical Fast Ethernet ports is 100 Mbps.

Transmission mode

The transmission mode for 100Base-FX is specified in the IEEE 802.3 standard.

Since the full duplex mode and the transmission rate cannot be modified for optical transmission, autonegotiation cannot be selected.

Transmission medium

Data transmission is over multimode fiber-optic cable (FOC). The wavelength is 1310 nm.

Multimode fiber-optic cables are used with a core of 50 or 62.5 µm; the light source is an LED.

The outer diameter of the FOC is 125 µm.

Transmission range

The maximum transmission range (segment length) is 3 km.

Connectors

The cables are connected over BFOC sockets.

3.6 SCALANCE X108

3.6.1 SCALANCE X108 product characteristics

Possible connections

The SCALANCE X108 has eight RJ-45 jacks for the connection of end devices or other network segments.

Figure 3-5 SCALANCE X108

3.6.2 SCALANCE X108 TP ports

Connector pinout

On the SCALANCE X108, the TP ports are implemented as RJ-45 sockets with MDI-X assignment (Medium Dependent Interface–Autocrossover) of a network component.

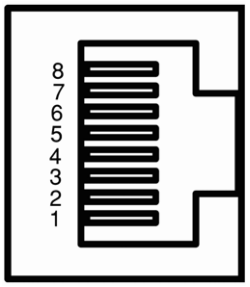

Figure 3-6 RJ-45 jack

Table 3- 5 Pin assignment of the RJ-45 jack

Pin number	Assignment
Pin 8	n. c.
Pin 7	n. c.
Pin 6	TD-
Pin 5	n. c.
Pin 4	n. c.
Pin 3	TD+
Pin 2	RD-
Pin 1	RD+

NOTICE
TP cords or TP-XP cords with a maximum length of 10 m can be connected to the RJ-45 TP port. With the IE FC cables and IE FC RJ-45 plug 180, an overall cable length of up to 100 m is permitted between two devices depending on the cable type.

Autonegotiation

Autonegotiation means the automatic detection of the functionality of the port at the opposite end. Using autonegotiation, repeaters or end devices can detect the functionality available at the port of a partner device allowing automatic configuration of different types of device. With autonegotiation, two components connected to a link segment can exchange parameters and set themselves to match the supported communication functionality.

Note

Devices not supporting autonegotiation must be set to 100 Mbps/ half duplex or 10 Mbps half duplex.

Note

The SCALANCE X108 is a plug and play device that does not require settings to be made for commissioning.

Auto polarity exchange

If the pair of receiving cables are incorrectly connected (RD+ and RD- swapped over), the polarity is adapted automatically.

MDI /MDIX autocrossover function

The advantage of the MDI /MDIX autocrossover function is that straight-through cables can be used throughout and crossover Ethernet cables are unnecessary. This prevents malfunctions resulting from mismatching send and receive wires. This makes installation much easier for the user.

The devices of the SCALANCE X-100 product line all support the MDI / MDIX autocrossover function.

NOTICE
Please note that the direct connection of two ports on the switch or accidental connection over several switches causes an illegal loop. Such a loop can lead to network overload and network failures.

3.7 SCALANCE X108PoE

3.7.1 SCALANCE X108 PoE product characteristics

Possible connections

The SCALANCE X108 PoE has eight RJ-45 jacks for the connection of end devices or other network segments.

Figure 3-7 SCALANCE X108PoE

3.7.2 SCALANCE X108 PoE TP ports

Connector pinout

Note

To supply PoE end devices with power, 4- or 8-wire connecting cables (complying with IEEE 802.3) can be used.

On the SCALANCE X108 PoE, the TP ports are implemented as RJ-45 sockets with MDI-X assignment (Medium Dependent Interface–Autocrossover) of a network component.

Over and above the pure Ethernet functionality, ports 1 and 2 can also be used to supply power to Power-over-Ethernet end devices (for example SCALANCE-W) in compliance with 802.3af.

The two ports providing PoE are supplied from the same power source. This means that they are electrically interconnected. They are however isolated from ground, from the ports that do not provide PoE and from the power connector (24 V). Their use is therefore subject to the conditions listed in IEEE 802.3af for Environment A.

The ports that do not provide PoE are all isolated from each other.

Ports 3 to 8 do not have the PoE function.

Note

Ethernet devices without PoE functionality can also be connected to ports 1 and 2. A voltage is applied only after the SCALANCE X108 PoE has detected a PoE end device complying with the standard at the port.

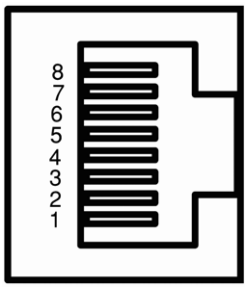

Figure 3-8 RJ-45 jack

Table 3- 6 Pin assignment of the RJ-45 jack

Pin number	Assignment	Additional assignment P1, P2
Pin 8	n. c.	-
Pin 7	n. c.	-
Pin 6	TD-	Positive supply voltage
Pin 5	n. c.	-
Pin 4	n. c.	-
Pin 3	TD+	Positive supply voltage
Pin 2	RD-	Negative supply voltage
Pin 1	RD+	Negative supply voltage

NOTICE

TP cords or TP-XP cords with a maximum length of 10 m can be connected to the RJ-45 TP port.

With the IE FC cables and IE FC RJ-45 plug 180, an overall cable length of up to 100 m is permitted between two devices depending on the cable type.

Autonegotiation

Autonegotiation means the automatic detection of the functionality of the port at the opposite end. Using autonegotiation, repeaters or end devices can detect the functionality available at the port of a partner device allowing automatic configuration of different types of device. With autonegotiation, two components connected to a link segment can exchange parameters and set themselves to match the supported communication functionality.

Note

Devices not supporting autonegotiation must be set to 100 Mbps/ half duplex or 10 Mbps half duplex.

Note

The SCALANCE X108 PoE is a plug-and-play device that does not require settings to be made for commissioning.

Auto polarity exchange

If the pair of receiving cables are incorrectly connected (RD+ and RD- swapped over), the polarity is adapted automatically.

MDI /MDIX autocrossover function

The advantage of the MDI /MDIX autocrossover function is that straight-through cables can be used throughout and crossover Ethernet cables are unnecessary. This prevents malfunctions resulting from mismatching send and receive wires. This makes installation much easier for the user.

The devices of the SCALANCE X-100 product line all support the MDI / MDIX autocrossover function.

NOTICE
Please note that the direct connection of two ports on the switch or accidental connection over several switches causes an illegal loop. Such a loop can lead to network overload and network failures.

Power-over-Ethernet (PoE) functionality

The PoE function allows power to be supplied to connected Ethernet devices over the Ethernet cable so that the end device does not require a separate power supply.

Per PoE port of the PSE (Power Sourcing Equipment), the standard 802.3af specifies that at maximum, 15.4 W power should be available.

Note

With a 100 m long cable connected, the end device then has a maximum of 12.95 W available.

3.8 SCALANCE X112-2

3.8.1 SCALANCE X112-2 product characteristics

Possible connections

The SCALANCE X112-2 has twelve RJ-45 jacks and two BFOC ports for the connection of end devices or other network segments.

Note

The BFOC socket (Bayonet Fiber Optic Connector) corresponds to the ST socket.

Figure 3-9 SCALANCE X112-2

3.8.2 SCALANCE X112-2 TP ports

Connector pinout

On the SCALANCE X112-2, the TP ports are implemented as RJ-45 jacks with MDI-X assignment (Medium Dependent Interface–Autocrossover) of a network component.

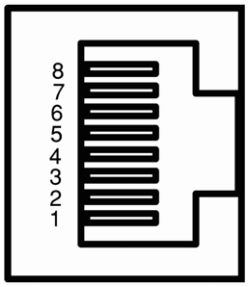

Figure 3-10 RJ-45 jack

Table 3- 7 Pin assignment of the RJ-45 jack

Pin number	Assignment
Pin 8	n. c.
Pin 7	n. c.
Pin 6	TD-
Pin 5	n. c.
Pin 4	n. c.
Pin 3	TD+
Pin 2	RD-
Pin 1	RD+

NOTICE
TP cords or TP-XP cords with a maximum length of 10 m can be connected to the RJ-45 TP port. With the IE FC cables and IE FC RJ-45 plug 180, an overall cable length of up to 100 m is permitted between two devices depending on the cable type.

Autonegotiation

Autonegotiation means the automatic detection of the functionality of the port at the opposite end. Using autonegotiation, repeaters or end devices can detect the functionality available at the port of a partner device allowing automatic configuration of different types of device. With autonegotiation, two components connected to a link segment can exchange parameters and set themselves to match the supported communication functionality.

Note

Devices not supporting autonegotiation must be set to 100 Mbps half duplex or 10 Mbps half duplex.

Note

The SCALANCE X112-2 is a plug-and-play device that does not require settings to be made for commissioning.

Auto polarity exchange

If the pair of receiving cables are incorrectly connected (RD+ and RD- swapped over), the polarity is adapted automatically.

MDI /MDIX autocrossover function

The advantage of the MDI /MDIX autocrossover function is that straight-through cables can be used throughout and crossover Ethernet cables are unnecessary. This prevents malfunctions resulting from mismatching send and receive wires. This makes installation much easier for the user.

The devices of the SCALANCE X-100 product line all support the MDI / MDIX autocrossover function.

NOTICE
Please note that the direct connection of two ports on the switch or accidental connection over several switches causes an illegal loop. Such a loop can lead to network overload and network failures.

3.8.3 SCALANCE X112-2 FO ports

Transmission rate

The transmission rate of the optical Fast Ethernet ports is 100 Mbps.

Transmission mode

The transmission mode for 100Base-FX is specified in the IEEE 802.3 standard.

Since the full duplex mode and the transmission rate cannot be modified for optical transmission, autonegotiation cannot be selected.

Transmission medium

Data transmission is over multimode fiber-optic cable (FOC). The wavelength is 1310 nm.

Multimode fiber-optic cables are used with a core of 50 or 62.5 µm; the light source is an LED.

The outer diameter of the FOC is 125 µm.

Transmission range

The maximum transmission range (segment length) is 3 km.

Connectors

The cables are connected over BFOC sockets.

3.9 SCALANCE X116

3.9.1 SCALANCE X116 product characteristics

Possible connections

The SCALANCE X116 has 16 RJ-45 jacks for the connection of end devices or other network segments.

Figure 3-11 SCALANCE X116

3.9.2 SCALANCE X116 TP ports

Connector pinout

On the SCALANCE X116, the TP ports are implemented as RJ-45 jacks with MDI-X assignment (Medium Dependent Interface–Autocrossover) of a network component.

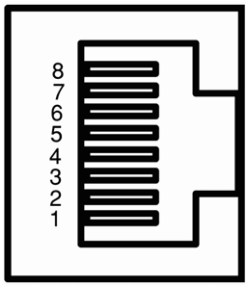

Figure 3-12 RJ-45 jack

Table 3- 8 Pin assignment of the RJ-45 jack

Pin number	Assignment
Pin 8	n. c.
Pin 7	n. c.
Pin 6	TD-
Pin 5	n. c.
Pin 4	n. c.
Pin 3	TD+
Pin 2	RD-
Pin 1	RD+

NOTICE
TP cords or TP-XP cords with a maximum length of 10 m can be connected to the RJ-45 TP port. With the IE FC cables and IE FC RJ-45 plug 180, an overall cable length of up to 100 m is permitted between two devices depending on the cable type.

Autonegotiation

Autonegotiation means the automatic detection of the functionality of the port at the opposite end. Using autonegotiation, repeaters or end devices can detect the functionality available at the port of a partner device allowing automatic configuration of different types of device. With autonegotiation, two components connected to a link segment can exchange parameters and set themselves to match the supported communication functionality.

Note

Devices not supporting autonegotiation must be set to 100 Mbps half duplex or 10 Mbps half duplex.

Note

The SCALANCE X116 is a plug-and-play device that does not require settings to be made for commissioning.

Auto polarity exchange

If the pair of receiving cables are incorrectly connected (RD+ and RD- swapped over), the polarity is adapted automatically.

MDI /MDIX autocrossover function

The advantage of the MDI /MDIX autocrossover function is that straight-through cables can be used throughout and crossover Ethernet cables are unnecessary. This prevents malfunctions resulting from mismatching send and receive wires. This makes installation much easier for the user.

The devices of the SCALANCE X-100 product line all support the MDI / MDIX autocrossover function.

NOTICE
Please note that the direct connection of two ports on the switch or accidental connection over several switches causes an illegal loop. Such a loop can lead to network overload and network failures.

3.10 SCALANCE X124

3.10.1 SCALANCE X124 product characteristics

Possible connections

The SCALANCE X124 has 24 RJ-45 jacks for the connection of end devices or other network segments.

Figure 3-13 SCALANCE X124

3.10.2 SCALANCE X124 TP ports

Connector pinout

On the SCALANCE X124, the TP ports are implemented as RJ-45 sockets with MDI-X assignment (Medium Dependent Interface–Autocrossover) of a network component.

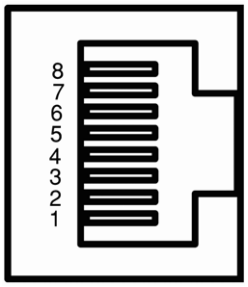

Figure 3-14 RJ-45 jack

Table 3- 9 Pin assignment of the RJ-45 jack

Pin number	Assignment
Pin 8	n. c.
Pin 7	n. c.
Pin 6	TD-
Pin 5	n. c.
Pin 4	n. c.
Pin 3	TD+
Pin 2	RD-
Pin 1	RD+

NOTICE
TP cords or TP-XP cords with a maximum length of 10 m can be connected to the RJ-45 TP port. With the IE FC cables and IE FC RJ-45 plug 180, an overall cable length of up to 100 m is permitted between two devices depending on the cable type.

Autonegotiation

Autonegotiation means the automatic detection of the functionality of the port at the opposite end. Using autonegotiation, repeaters or end devices can detect the functionality available at the port of a partner device allowing automatic configuration of different types of device. With autonegotiation, two components connected to a link segment can exchange parameters and set themselves to match the supported communication functionality.

Note

Devices not supporting autonegotiation must be set to 100 Mbps half duplex or 10 Mbps half duplex.

Note

The SCALANCE X124 is a plug-and-play device that does not require settings to be made for commissioning.

Auto polarity exchange

If the pair of receiving cables are incorrectly connected (RD+ and RD- swapped over), the polarity is adapted automatically.

MDI /MDIX autocrossover function

The advantage of the MDI /MDIX autocrossover function is that straight-through cables can be used throughout and crossover Ethernet cables are unnecessary. This prevents malfunctions resulting from mismatching send and receive wires. This makes installation much easier for the user.

The devices of the SCALANCE X-100 product line all support the MDI / MDIX autocrossover function.

NOTICE
Please note that the direct connection of two ports on the switch or accidental connection over several switches causes an illegal loop. Such a loop can lead to network overload and network failures.

3.11 SCALANCE X-100 button

What does the button do?

Using the button, you can display and modify the set fault mask. The fault mask setting is retained after device power off/on.

After pressing and holding down the button, the currently valid fault mask is displayed for approximately 3 seconds. The LEDs of the monitored ports flash at a frequency of 5 Hz.

To change the fault mask, keep the button pressed. Within the next 3 seconds, the current link status of the ports is displayed flashing at a frequency of 2.5 Hz. Keep the button pressed. This new status is adopted as the new fault mask. The monitored ports now are indicated by permanently lit LEDs until the button is released. As long as the LEDs are still flashing, however, the saving of the mask can be stopped by releasing the button.

If an empty fault mask is set (no port is monitored), the two neighboring port LEDs flash on and off alternately. To create an empty fault mask when you save as described above, the port cables must not be connected.

At the same time, the monitoring of the connected power supplies is set with the fault mask. The existence of the two power sources is monitored only if they are connected when the fault mask is saved.

The failure of the link of one of the monitored ports or one of the monitored power supplies is indicated by the red fault LED lighting up. At the same time, the signaling contact opens.

Note

Port monitoring and power supply monitoring are not activated when the device is delivered (factory default).

Note

The PoE voltage at the PoE ports cannot be monitored using the fault mask.

3.12 Displays

3.12.1 Fault indicator (red LED)

Fault indicator (red LED)

If the red LED is lit, the SCALANCE X-100 has detected a problem.
The signaling contact opens at the same time.

The LED signals that the device can adopt the following statuses:

Device type SCALANCE	LED lit red	LED not lit
X104-2	1, 2	4
X106-1	1, 2	4
X108	1, 2	4
X108PoE	1, 2	4
X112-2	1, 2, 3	4
X116	1, 2, 3	4
X124	1, 2, 3	4

1. Link down event on a monitored port.
2. Loss of one of the monitored power supplies or voltage dropped below approximately 14 V. Refer also to the Note in Section 3.11 SCALANCE X-100 button
3. Both supply voltages are below approximately 14 V (reduced voltage)
4. No fault detected by the SCALANCE X-100.

3.12.2 Power display

Power display

The LEDs signal that the device can adopt the following statuses.

The status of the power supply is indicated by two green LEDs or one green/yellow LED:

Device type SCALANCE	Green LED lit	LED not lit
X104-2	1	2
X106-1	1	2
X108	1	2
X108PoE	1	2
X112-2	1	2
X116	1	2
X124	1	2

1. Power supply L1 or L2 is connected.
2. Power supply L1 and/or L2 not connected or <14 V.

3.12.3 Port status indicator (green/yellow LEDs)

Port status indicator (green/yellow LEDs)

The LEDs signal that the device can adopt the following statuses.
The status of the interfaces is indicated by two-color LEDs:

Device type SCALANCE		LED lit green	LED lit yellow	LED flashes yellow
	Number of port LEDs			
X104-2	6 port LEDs	1	2	3
X106-1	7 port LEDs	1	2	3
X108	8 port LEDs	1	2	3
X108PoE	8 port LEDs	1	2	3
X112-2	14 port LEDs	1	2	3
X116	16 port LEDs	1	2	3
X124	24 port LEDs	1	2	3

1. TP link exists, no data reception.
2. TP link, data received at TP port.
3. Setting or display of the fault mask.

Installation, connecting up, sources of problems 4

4.1 Assembly

Types of installation

The Industrial Ethernet switches of the SCALANCE X-100 product line can be mounted in different ways:

- Installation on a 35 mm DIN rail
- Installation on a SIMATIC S7-300 standard rail
- Wall mounting

Note

When installing and operating the device, keep to the installation instructions and safety-related notices as described here and in the manual SIMATIC NET Industrial Ethernet Twisted Pair and Fiber Optic Networks /1/.

Unless stated otherwise, the mounting options listed below apply to all Industrial Ethernet Switches of the SCALANCE X-100 product line.

Note

Provide suitable shade to protect the device against direct sunlight. This avoids unwanted warming of the device and prevents premature aging of the device and cabling.

WARNING

If temperatures in excess of 70° C occur on the cable or at the cable feed-in point, or the temperature at the branching point of the cables exceeds 80° C, special measures need to be taken. If the equipment is operated at an ambient temperature of 50° C - 60° C, use cables with a permitted operating temperature of at least 80° C and if equipment is operated at an ambient temperature of 61° C - 70° C, use cables with a permitted operating temperature of at least 90° C.

WARNING

Protective measures must be taken to avoid the rated voltage of the equipment being exceeded by more than 40% by transient overvoltages. This is the case if the equipment is supplied exclusively by SELV circuits.

WARNING

If a device of the SCALANCE X-100 product line is operated at an ambient temperature higher than 55° C, the temperature of the device housing may be higher than 70°C.

The subject unit must be located in a Restricted Access Location where access can only be gained by SERVICE PERSONNEL or by USERS who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken when operated in an air ambient in excess of 55° C.

⚠ WARNING

When a SCALANCE X108PoE is operated in ambient temperatures between 55 and 60° C, at least 40 mm of space is required to adjacent modules.

4.1.1 Installation on a DIN rail

Assembly

Install the Industrial Ethernet switches of the SCALANCE X-100 product line on a 35 mm rail according to DIN EN 50022.

1. Place the upper catch of the device over the top of the DIN rail and then push in the lower part of the device against the rail until it clips into place.
2. Fit the connectors for the power supply.
3. Fit the connectors for the signaling contact.
4. Insert the terminal blocks into the sockets on the device.

⚠ WARNING

When used in shipbuilding, it is prohibited to mount the SCALANCE X108PoE on 35 mm DIN rails.

35 mm DIN rails cannot ensure sufficient stability when used in shipbuilding.

Figure 4-1 SCALANCE X-100 installation on a DIN rail (35 mm)

Uninstalling

To remove the Industrial Ethernet switches of the SCALANCE X-100 product line from the DIN rail:

1. First disconnect all connected cables.
2. Use a screwdriver to release the lower DIN rail catch of the device and pull the lower part of the device away from the rail.

Figure 4-2 SCALANCE X-100 removing from a DIN rail (35 mm)

4.1.2 Installation on a standard rail

Installation on a SIMATIC S7-300 standard rail

1. Place the upper guide at the top of the SCALANCE housing in the S7 standard rail.
2. Screw the Industrial Ethernet switches of the SCALANCE X-100 product line to the underside of the S7 standard rail.
3. Fit the connectors for the power supply.
4. Fit the connectors for the signaling contact.
5. Insert the terminal blocks into the sockets on the device.

Figure 4-3 SCALANCE X-100 installation on a SIMATIC S7-300 standard rail

Uninstalling

To remove Industrial Ethernet switches of the SCALANCE X-100 product line from the SIMATIC S7-300 standard rail:

1. First disconnect all connected cables.
2. Loosen the device screws on the underside of the S7 standard rail and lift the device away from the rail.

4.1.3 Wall mounting

Wall mounting

1. For wall mounting, use suitable mounting fittings for the wall (for example, for a concrete wall, four plugs 6 mm diameter and 30 mm long, 4 screws 3.5 mm diameter and 40 mm long).
2. Connect the electrical cable connecting cables.
3. Fit the connectors for the signaling contact.
4. Insert the terminal blocks into the sockets on the device.

For more exact dimensions, please refer to the section "Dimension drawings".

Note

The wall mounting must be capable of supporting at least four times the weight of the device.

4.2 Connecting up

4.2.1 Power supply

Power supply

The power supply is connected using a 4-pin plug-in terminal block.

The power supply can be connected redundantly. Both inputs are isolated. There is no distribution of load. When a redundant power supply is used, the power supply unit with the higher output voltage supplies the device alone. The power supply is connected over a high resistance with the enclosure to allow an ungrounded set up. The two power supplies are non-floating.

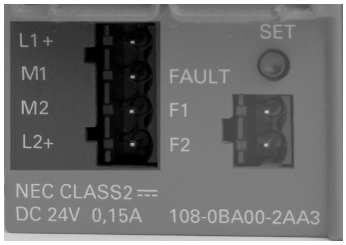

Figure 4-4 Power supply SCALANCE X-100

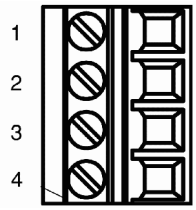

Figure 4-5 Terminal block, four-pin

Table 4- 1 Pin assignment for the power supply

Pin number	Assignment
Pin 1	L1+ 24 V DC
Pin 2	M1
Pin 3	M2
Pin 4	L2+ 24 V DC

⚠ WARNING

The device is designed for operation with safety extra-low voltage. This means that only safety extra-low voltages (SELV) complying with IEC950/EN60950/ VDE0805 can be connected to the power supply terminals.

The power supply unit for the device power supply must meet NEC Class 2, as described by the National Electrical Code(r) (ANSI/NFPA 70).

The power of all connected power supply units must total the equivalent of a power source with limited power (LPS limited power source).

If the device is connected to a redundant power supply (two separate power supplies), both must meet these requirements.

The signaling contact can be subjected to a maximum load of 100 mA (safety extra-low voltage (SELV), 24 V DC).

Never connect the device to AC voltage.
Never operate the device with DC voltage higher than 32 V DC.

4.2.2 Signaling contact

Signaling contact

The signaling contact (relay contact) is a floating switch with which error/fault states can be signaled by breaking the contact.

The signaling contact is connected to a 2-pin plug-in terminal block.

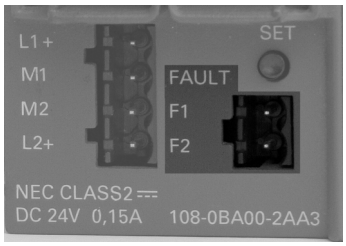

Figure 4-6 Signaling contact SCALANCE X-100

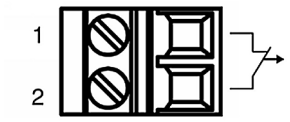

Figure 4-7 Terminal block, two-pin

Table 4- 2 Pin assignment of the signaling contact

SCALANCE X-100	
Pin number	**Assignment**
Pin 1	F1
Pin 2	F2

The following errors/faults can be signaled by the signaling contact:

- The failure of a link at a monitored port.
- The failure of one of the two monitored power supplies.

The connection or disconnection of a communication node on an unmonitored port does not lead to an error message.

The signaling contact remains activated until the error/fault is eliminated or until the current status is applied as the new desired status using the button.

When the device is turned off, the signaling contact is always activated (open).

4.2.3 Grounding

Installation on a DIN rail

The device is grounded over the DIN rail.

S7 standard rail

The device is grounded over its rear panel and the neck of the screw.

Wall mounting

The device is grounded by the securing screw in the unpainted hole.

Please note that the SCALANCE X-100 must be grounded over one securing screw with minimum resistance.

If a device of the SCALANCE X100 product line is mounted on a non-conducting base, a grounding cable must be installed. The grounding cable is not supplied with the device. Connect the paint-free surface of the device to the nearest grounding point using the grounding cable.

4.2.4 Fitting the IE FC RJ-45 Plug 180

Assembly of the IE FC RJ-45 Plug 180 on an IE FC standard cable

For information on assembling an IE FC RJ-45 Plug 180 on a SIMATIC NET Industrial Ethernet FastConnect cable, please refer to the instructions supplied with the IE FC RJ-45 Plug.

Figure 4-8 IE FC RJ-45 Plug 180

Inserting the IE FC RJ-45 Plug 180

1. Insert the IE FC RJ-45 Plug 180 into the devices of the SCALANCE X-100 product line until it locks in place.

Figure 4-9 Inserting the IE FC RJ-45 Plug 180

The flush fit and locking mechanism of the PROFINET-compliant IE FC RJ-45 Plug 180 along with the securing collar on the TP port of the SCALANCE X-100 guarantee a robust node connection suitable for industrial conditions providing tensile and bending strain relief for the twisted pair socket.

Removing the IE FC RJ-45 Plug 180

1. Press on the locking mechanism of the IE FC RJ-45 Plug 180 gently to remove the plug.

Figure 4-10 Releasing the RJ-45 Plug

If there is not enough space to release the lock with your hand, you can also use a 2.5 mm screwdriver. You can then remove the IE FC RJ-45 Plug 180 from the twisted pair socket.

Figure 4-11 Releasing the RJ-45 Plug with a screwdriver

4.3 Possible sources of problems and how to deal with them

Fuses

Note

Some of the Industrial Ethernet switches of the SCALANCE X-100 product line have a resettable fuse / PTC. If the fuse triggers (all LEDs are off despite correctly applied power supply), the device should be disconnected from the power supply for approximately 30 minutes before turning it on again.

Link display on the optical ports

The Industrial Ethernet switches SCALANCE X104-2, SCALANCE X106-1 and SCALANCE X112-2 support "far-end fault" on the optical ports but do not use this for the corresponding link display. This means that if there is only a cable connected in the receive direction on the optical port, a far-end fault is detected and no data is forwarded. The Link LED is already lit.

LED display when voltage drops

If both of the power supplies drop below approximately 14 V, this reduced voltage is indicated by the red fault LED. The L LEDs go off.

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

Approvals and markings

5

Product name

SIMATIC NET	SCALANCE X104-2	6GK5 104-2BB00-2AA3
SIMATIC NET	SCALANCE X106-1	6GK5 106-1BB00-2AA3
SIMATIC NET	SCALANCE X108	6GK5 108-0BA00-2AA3
SIMATIC NET	SCALANCE X108PoE	6GK5 108-0PA00-2AA3
SIMATIC NET	SCALANCE X112-2	6GK5 112-2BB00-2AA3
SIMATIC NET	SCALANCE X116	6GK5 116-0BA00-2AA3
SIMATIC NET	SCALANCE X124	6GK5 124-0BA00-2AA3

EMC Guidelines

89/336/EEC "Electromagnetic Compatibility"

Area of application

The products are designed for use in an industrial environment:

Area of application	Requirements	
	RF interference level	Immunity to interference
Industrial area	EN 61000-6-4: 2001	EN 61000-6-2: 2001

Installation Guidelines

The products meet the requirements if you keep to the installation instructions and safety-related notices as described here and in the manual "SIMATIC NET Industrial Ethernet Twisted Pair and Fiber Optic Networks" /1/ when installing and operating the device.

Conformity Certificates

The EC Declaration of Conformity is available for the responsible authorities according to the above-mentioned EC Directive at the following address:

Siemens Aktiengesellschaft
Industry Sector Industry Automation Division
Industrielle Kommunikation (I IA SC IC)
Postfach 4848
D-90026 Nürnberg

Notes for the Manufacturers of Machines

The products are not machines in the sense of the EC Machinery Directive. There is therefore no declaration of conformity relating to the EC Machinery Directive 98/37/EEC for these products.

If the products are part of the equipment of a machine, they must be included in the procedure for the declaration of conformity by the manufacturer of the machine.

Certifications and approvals

Table 5- 1

Device type SCALANCE	c-UL-us	c-UL-us for hazardous locations[1]	FM[1]	C-TICK	CE	ATEX Zone 2[1]	E1
X104-2	UL 60950-1 CSA C22.2 No. 60950-1	UL 1604, UL 2279Pt.15 CL.1, Div.2 GP. A.B.C.D T.. CL.1, Zone 2, GP, IIC, T..	FM 3611 CL.1, Div.2 GP. A.B.C.D T.. CL.1, Zone 2, GP. IIC, T.. Ta:..	AS/NZS 2064 (Class A).	EN 61000-6-4, EN 61000-6-2	EN60079-0: 2006 EN60079-15: 2005 II 3 G Ex nA II T.. KEMA 07 ATEX 0145 X	-
X106-1	UL 60950-1 CSA C22.2 No. 60950-1	UL 1604, UL 2279Pt.15 CL.1, Div.2 GP. A.B.C.D T.. CL.1, Zone 2, GP, IIC, T..	FM 3611 CL.1, Div.2 GP. A.B.C.D T.. CL.1, Zone 2, GP. IIC, T.. Ta:..	AS/NZS 2064 (Class A).	EN 61000-6-4, EN 61000-6-2	EN60079-0: 2006 EN60079-15: 2005 II 3 G Ex nA II T.. KEMA 07 ATEX 0145 X	-
X108	UL 60950-1 CSA C22.2 No. 60950-1	UL 1604, UL 2279Pt.15 CL.1, Div.2 GP. A.B.C.D T.. CL.1, Zone 2, GP, IIC, T..	FM 3611 CL.1, Div.2 GP. A.B.C.D T.. CL.1, Zone 2, GP. IIC, T.. Ta:..	AS/NZS 2064 (Class A).	EN 61000-6-4, EN 61000-6-2	EN60079-0: 2006 EN60079-15: 2005 II 3 G Ex nA II T.. KEMA 07 ATEX 0145 X	ECE-G 95/54/EEC test number 024734
X108PoE	UL 60950-1 CSA C22.2 No. 60950-1	UL 1604, UL 2279Pt.15 CL.1, Div.2 GP. A.B.C.D T.. CL.1, Zone 2, GP, IIC, T..	FM 3611 CL.1, Div.2 GP. A.B.C.D T.. CL.1, Zone 2, GP. IIC, T.. Ta:..	AS/NZS 2064 (Class A).	EN 61000-6-4, EN 61000-6-2	EN60079-0: 2006 EN60079-15: 2005 II 3 G Ex nA II T.. KEMA 07 ATEX 0145 X	ECE-G 95/54/EEC test number 024734

Device type SCALANCE	c-UL-us	c-UL-us for hazardous locations[1]	FM[1]	C-TICK	CE	ATEX Zone 2[1]	E1
X112-2	UL 60950-1 CSA C22.2 No. 60950-1	UL 1604, UL 2279Pt.15 CL.1, Div.2 GP. A.B.C.D T.. CL.1, Zone 2, GP, IIC, T..	FM 3611 CL.1, Div.2 GP. A.B.C.D T.. CL.1, Zone 2, GP. IIC, T.. Ta:..	AS/NZS 2064 (Class A).	EN 61000-6-4, EN 61000-6-2	EN60079-0: 2006 EN60079-15: 2005 II 3 G Ex nA II T.. KEMA 08 ATEX 0003 X	-
X116	UL 60950-1 CSA C22.2 No. 60950-1	UL 1604, UL 2279Pt.15 CL.1, Div.2 GP. A.B.C.D T.. CL.1, Zone 2, GP, IIC, T..	FM 3611 CL.1, Div.2 GP. A.B.C.D T.. CL.1, Zone 2, GP. IIC, T.. Ta:..	AS/NZS 2064 (Class A).	EN 61000-6-3, EN 61000-6-2	EN60079-0: 2006 EN60079-15: 2005 II 3 G Ex nA II T.. KEMA 08 ATEX 0003 X	-
X124	UL 60950-1 CSA C22.2 No. 60950-1	UL 1604, UL 2279Pt.15 CL.1, Div.2 GP. A.B.C.D T.. CL.1, Zone 2, GP, IIC, T..	FM 3611 CL.1, Div.2 GP. A.B.C.D T.. CL.1, Zone 2, GP. IIC, T.. Ta:..	AS/NZS 2064 (Class A).	EN 61000-6-3, EN 61000-6-2	EN60079-0: 2006 EN60079-15: 2005 II 3 G Ex nA II T.. KEMA 08 ATEX 0003 X	-

[1]For the temperature code "T.." or the maximum ambient temperature "Ta:..", refer to the type plate.

Technical specifications

6

6.1 Technical specifications

Table 6- 1 Connectors

Device type SCALANCE	Attachment of end devices or network components over twisted pair	Connecting end devices or network components over fiber-optic	Connector for power supply	Connector for signaling contact
X104-2	4 x RJ-45 sockets with MDI-X pinning 10/100 Mbps (half/ full duplex)	2 x 2 BFOC sockets (100 Mbps, full duplex to 100BaseFX)	1 x 4-pin plug-in terminal block	1 x 2-pin plug-in terminal block
X106-1	6 x RJ-45 sockets with MDI-X pinning 10/100 Mbps (half/full duplex)	1 x BFOC-sockets (100 Mbps, full duplex to 100BaseFX)	1 x 4-pin plug-in terminal block	1 x 2-pin plug-in terminal block
X108	8 x RJ-45 jacks with MDI-X pinning 10/100 Mbps (half/ full duplex)	-	1 x 4-pin plug-in terminal block	1 x 2-pin plug-in terminal block
X108PoE	8 x RJ-45 jacks with MDI-X pinning 10/100 Mbps (half/ full duplex)	-	1 x 4-pin plug-in terminal block	1 x 2-pin plug-in terminal block
X112-2	12 x RJ-45 jacks with MDI-X pinning 10/100 Mbps (half/full duplex)	2 x BFOC-sockets (100 Mbps, full duplex to 100BaseFX)	1 x 4-pin plug-in terminal block	1 x 2-pin plug-in terminal block
X116	16 x RJ-45 jacks with MDI-X pinning 10/100 Mbps (half/full duplex)	-	1 x 4-pin plug-in terminal block	1 x 2-pin plug-in terminal block
X124	24 x RJ-45 jacks with MDI-X pinning 10/100 Mbps (half/ full duplex)	-	1 x 4-pin plug-in terminal block	1 x 2-pin plug-in terminal block

Table 6- 2 Electrical data

Device type SCALANCE	Power supply 2 x 24 V DC (18-32 V DC) Safety extra-low voltage (SELV)	Power loss at 24 V DC	Current consumption at rated voltage	Overcurrent protection at input PTC resettable fuse (0.6 A / 60 V)
X104-2	+	3.8 W	160 mA	+
X106-1	+	3.6 W	150 mA	+
X108	+	3.36 W	140 mA	+
X108PoE	+	10.0 W	1700 mA	-
X112-2	+	5.16 W	215 mA	-
X116	+	4.40 W	185 mA	-
X124	+	4.80 W	200 mA	-

Table 6- 3 Signaling contact

Device type SCALANCE	Voltage at signaling contact	Current through signaling contact
X104-2	24 V DC	max. 100 mA
X106-1	24 V DC	max. 100 mA
X108	24 V DC	max. 100 mA
X108PoE	24 V DC	max. 100 mA
X112-2	24 V DC	max. 100 mA
X116	24 V DC	max. 100 mA
X124	24 V DC	max. 100 mA

Table 6- 4 Permitted cable lengths (copper)

Device type SCALANCE	0 - 55 m IE TP torsion cable with IE FC RJ-45 Plug 180 or 0 - 45 m IE TP torsion cable with IE outlet RJ-45 + 10 m TP cord	0 - 85 m IE FC TP marine / trailing / flexible / festoon / FRNC / festoon / food cable with IE FC RJ-45 Plug 180 or 0 - 75 m IE FC TP marine / trailing / flexible / festoon / FRNC / food cable + 10 m TP cord over IE FC outlet RJ-45	0 - 100 m IE FC TP standard cable with IE FC RJ-45 plug 180 or over IE FC outlet RJ-45 with 0 - 90 m IE FC TP standard cable + 10 m TP cord
X104-2	+	+	+
X106-1	+	+	+
X108	+	+	+
X108PoE	+	+	+
X112-2	+	+	+
X116	+	+	+
X124	+	+	+

Table 6- 5 Permitted cable lengths (fiber-optic)

Device type SCALANCE	1 - 50 m 980/1000 plastic optical fiber (POF)	1 - 100 m 200/230 polymer cladded fiber (PCF) 6 dB max. permitted FO cable attenuation with 3 dB link power margin	0 - 3,000 m glass FOC 62.5/125 µm or 50/125 µm glass fiber; ≤ 1 dB/km at 1300 nm; ≥ 600 MHz × km; 6 dB max. permitted FO cable attenuation with 3 dB link power margin	0 - 26000 m glass FOC 10/125 µm single mode fiber; 0.5 dB/km at 1300 nm; 13 dB max. permitted FO cable attenuation with 2 dB link power margin
X104-2	-	-	+	-
X106-1	-	-	+	-
X108	-	-	-	-
X108PoE	-	-	-	-
X112-2	-	-	+	-
X116	-	-	-	-
X124	-	-	-	-

Table 6- 6 Aging time / learnable MAC addresses / MTBF

Device type SCALANCE	Aging time	learnable MAC addresses	MTBF
X104-2	30 seconds	2048	134.87 years
X106-1	30 seconds	2048	136.65 years
X108	30 seconds	2048	139.83 years
X108PoE	30 seconds	2048	61.64 years
X112-2	30 seconds	8096	61.3 years
X116	30 seconds	8096	61.3 years
X124	30 seconds	8096	49.3 years

Table 6- 7 Permitted environmental conditions / EMC

Device type SCALANCE	Operating temperature	Storage/transport temperature	Relative humidity in operation	Operating altitude at max. xx°C ambient temperature
X104-2	-10 to +60° C	-40 to +80° C	‹ 95 % (no condensation)	2000 m at max. 56° C 3000 m at max. 50° C
X106-1	-10 to +60° C	-40 to +80° C	‹ 95 % (no condensation)	2000 m at max. 56° C 3000 m at max. 50° C
X108	-20 to +70° C	-40 to +80° C	‹ 95 % (no condensation)	2000 m at max. 56° C 3000 m at max. 50° C

Device type SCALANCE	Operating temperature	Storage/transport temperature	Relative humidity in operation	Operating altitude at max. xx°C ambient temperature
X108PoE	-20 to +60° C at 55° C ambient temperature on both sides 40 mm distance to adjacent devices	-40 to +80° C	‹ 95 % (no condensation)	2000 m at max. 56° C 3000 m at max. 50° C
X112-2	-10 to +70° C	-40 to +80° C	‹ 95 % (no condensation)	2000 m at max. 56° C 3000 m at max. 50° C
X116	-20 to +70° C	-40 to +80° C	‹ 95 % (no condensation)	2000 m at max. 56° C 3000 m at max. 50° C
X124	-20 to +70° C	-40 to +80° C	‹ 95 % (no condensation)	2000 m at max. 56° C 3000 m at max. 50° C

Table 6- 8 Order numbers for accessories

	Order number
"Industrial Ethernet TP and Fiber Optic Networks" manual	6GK1970-1BA10-0AA0
IE FC Stripping Tool	6GK1901-1GA00
IE FC blade cassettes	6GK1901-1GB00
IE FC TP standard cable GP	6XV1840-2AH10
IE FC TP trailing cable	6XV1840-3AH10
IE FC TP marine cable	6XV1840-4AH10
IE FC TP trailing cable GP	6XV1870-2D
IE FC TP flexible cable GP	6XV1870-2B
IE FC TP FRNC cable GP	6XV1871-2F
IE FC TP festoon cable GP	6XV1871-2S
IE FC TP food cable	6XV1871-2L
IE TP torsion cable	6XV1870-2F
FO standard cable GP (50/125)	6XV1873-2A
FO trailing cable (50/125)	6XV1873-2C
FO trailing cable GP (50/125)	6XV1873-2D
FO ground cable (50/125)	6XV1873-2G
FO FRNC cable (50/125)	6XV1873-2B
IE FC RJ-45 Plug 180 pack of 1	6GK1901-1BB10-2AA0
IE FC RJ-45 Plug 180 pack of 10	6GK1901-1BB10-2AB0
IE FC RJ-45 Plug 180 pack of 50	6GK1901-1BB10-2AE0

Note

The number of SCALANCE X Industrial Ethernet Switches connected in a line influences the frame propagation time.

When a frame passes through devices of the SCALANCE X-100 product line, it is delayed by the store and forward function of the switch

- With a 64 byte frame length by approx. 10 microseconds (at 100 Mbps)
- With a 1500 byte frame length by approx. 130 microseconds (at 100 Mbps)

This means that the more devices of the SCALANCE X-100 product line, the frame passes through, the longer the frame delay.

References

7

Sources of information and other documentation

1. SIMATIC NET Industrial Twisted Pair and Fiber-Optic Networks,
   Order numbers:
   6GK1970-1BA10-0AA0 German
   6GK1970-1BA10-0AA1 English
   6GK1970-1BA10-0AA2 French
   6GK1970-1BA10-0AA4 Italian
2. PROFINET Cabling and Interconnection Technology Guideline
   Can be ordered from the PROFIBUS User Organization (PNO)

Dimension drawings

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8.1 Dimension Drawing

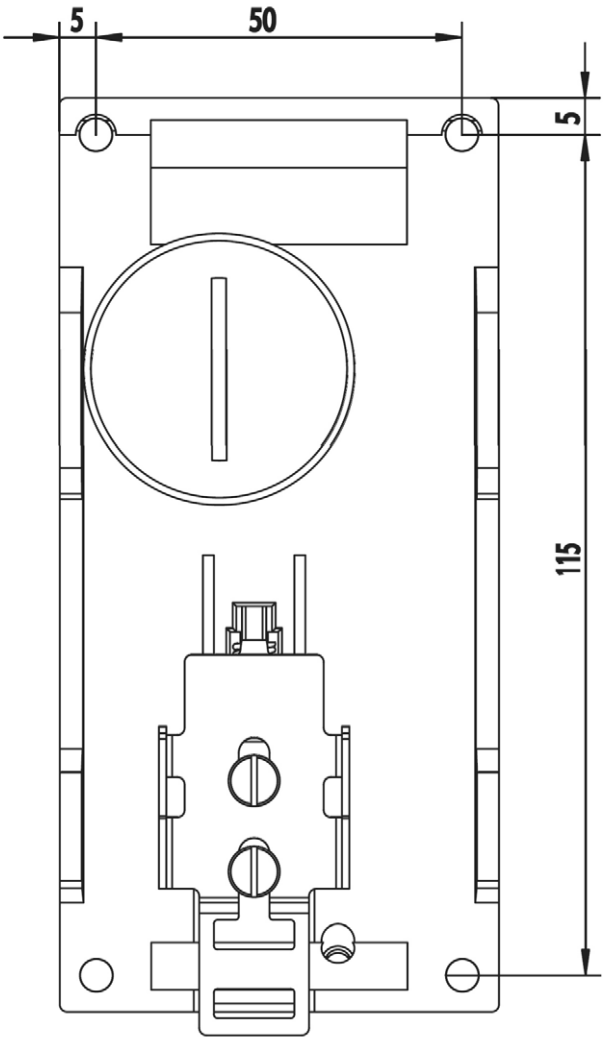

Figure 8-1 Dimension drawing of the SCALANCE X104-2, X106-1, X108, X108PoE

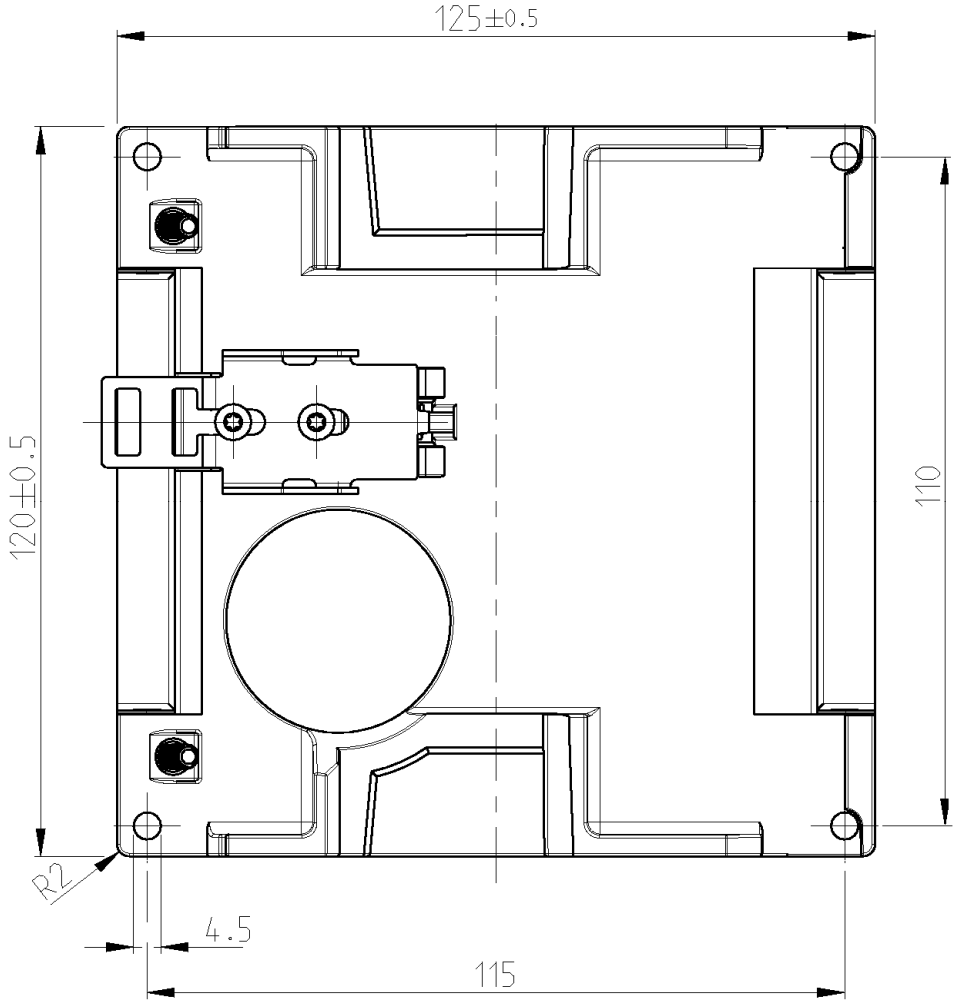

Figure 8-2 Dimension drawing rear view of the SCALANCE X116, X112-2

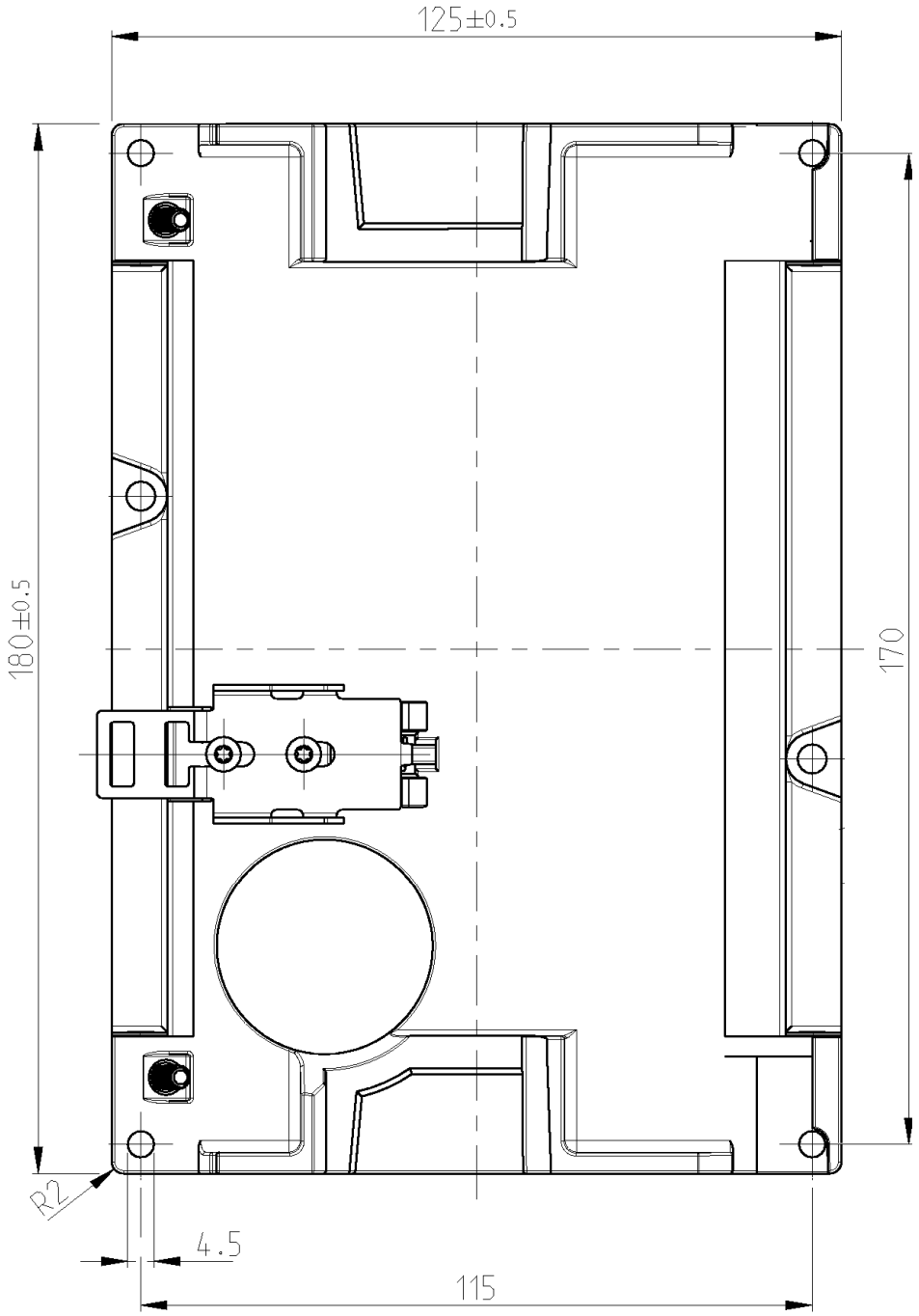

Figure 8-3 Dimension drawing rear view of the SCALANCE X124

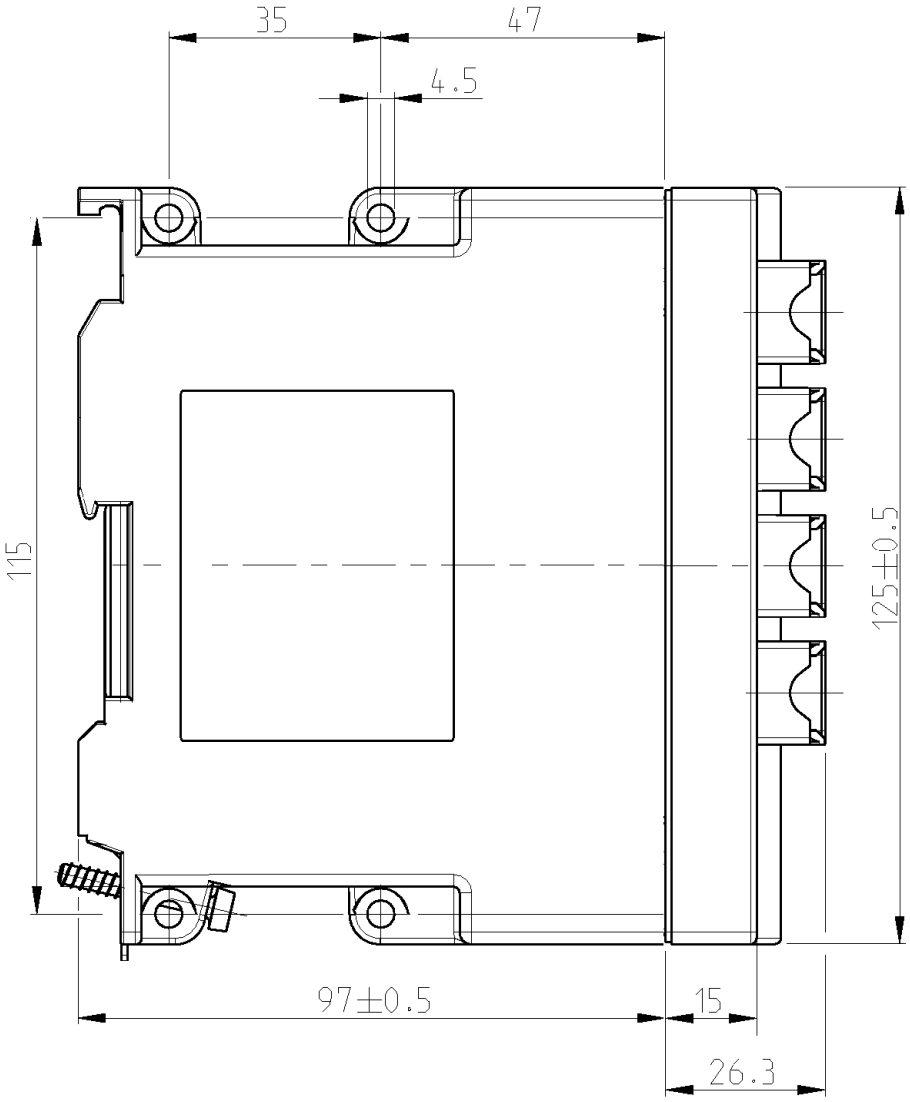

Figure 8-4 Dimension drawing of the X-100 side view

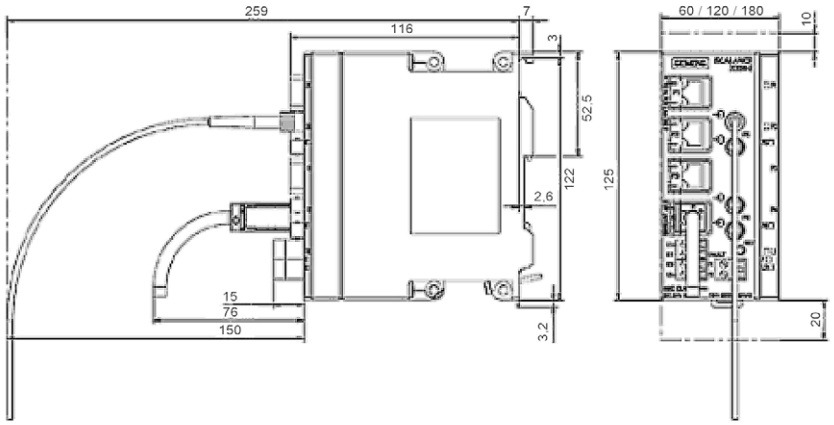

Figure 8-5 Bending radiuses and clearances

Glossary

Aging time

The aging time is the time after which a learned MAC address is discarded if a SCALANCE X-100 has not received frames with this sender address during this time.

Autocrossover

Technique with which a TP port is automatically switched over between MDI and MDI-X assignment to make a connection independent of the port assignment of the device being attached. This means that crossover cables are not required. The autocrossover function can only be used when the port is set to autonegotiation mode.

Autonegotiation

Procedure standardized by IEEE 802.3 in which the transmission parameters (for example 10/100 Mbps, full/half duplex) are negotiated automatically between the devices.

C-PLUG

The C-PLUG (configuration plug) is an exchangeable medium for storage of the configuration and project engineering data. If the device is replaced, the configuration can be adopted by swapping the C-PLUG.

CRC

Cyclic Redundancy Check. A checksum used in transmission protocols to detect errors in frames.

Fault mask

Specifies the desired status (good status). Deviations from this occurring during operation are handled as faults.

FO

Fiber optic; glass fiber cable

IRT

Isochronous Real Time supports applications with extremely high real-time requirements (for example, motion control).

Monomode

See Single mode

Multicast

A frame with a multicast address is received by all nodes prepared to receive this address.

Multimode

In multimode transmission, the pulse is transferred using many modes (waves) that travel along curved paths or are reflected within the core. Attenuation is mainly caused by physical absorption and dispersion as well as by mechanical bending. The amount of attenuation depends among other things on the wavelength of the input light. Multimode fiber-optic cables have an outer diameter of 125 µm and 50 or 62.5 µm core diameter. Due to the larger core diameter the pulse edges degrade more than in single mode transmission resulting in shorter transmission distances.

Power over Ethernet

Complying with the method standardized in IEEE802.2af for supplying power to end devices over Ethernet cables.

Reconfiguration time

The time required to restore a functional configuration if a device fails or a network cable is interrupted.

Redundancy manager

Network node in a ring topology that does not forward any frames between its ring ports if there are functioning connections between all other nodes. As soon as a connection between two nodes is interrupted, the redundancy manager forwards frames so that there is an intact connection between all nodes.

Segment

In the Ethernet bus system, transceivers connected together over the bus cable along with the nodes connected over patch cables form a segment. Several such segments can be connected via repeaters. When using twisted pair and fiber-optic cables, each subsection forms a segment.

Signaling contact

Floating relay contact over which detected fault/error states are signaled.

Single mode

In single mode transmission, (and monomode transmission) the pulse is transmitted by a straight mode (wave). Attenuation is mainly caused by physical absorption and dispersion as well as by mechanical bending. The amount of attenuation depends, among other things, on the wavelength of the input light. The single mode fiber typically has a core diameter of 5 to 9 µm. The outer diameter is, however, once again 125 µm (compare multimode). The smaller core diameter degrades the pulse edges less than multimode transmission and allows greater transmission distances.

SNMP

Simple Network Management Protocol. Standardized protocol for transporting network management information.

Store and forward

An entire frame is received, its validity checked (checksum, length etc.) and then buffered. Invalid frames are discarded, in other words, a frame is forwarded only when it is error-free.

TP

Twisted Pair

TP port

Port with a TP connector (RJ-45 jack)

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