SIEMENS

SIMATIC NET

Industrial Ethernet switches
SCALANCE X-000

Operating Instructions

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

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1.1 On the Operating Instructions

Purpose of the Operating Instructions

These operating instructions support you when commissioning the unmanaged Industrial Ethernet entry level switches SCALANCE X-000.

Validity of the Operating Instructions

These operating instructions are valid for the following devices:

Device	Article number
SCALANCE X005	6GK5 005-0BA00-1AA3
	6GK5 005-0BA10-1AA3
SCALANCE X005TS (Transportation System)	6GK5 005-0BA00-1CA3
SCALANCE X005EEC	6GK5 005-0BA10-1CA3

See also

SIMATIC NET Industrial Ethernet Twisted Pair and Fiber Optic Networks (https://support.automation.siemens.com/WW/view/en/1172207)

Siemens SCALANCE (https://siemens.com/scalance)

Further documentation

In the system manuals "Industrial Ethernet / PROFINET Industrial Ethernet" and "Industrial Ethernet / PROFINET passive network components", you will find information on other SIMATIC NET products that you can operate along with the devices of this product line in an Industrial Ethernet network.

There, you will find among other things optical performance data of the communications partner that you require for the installation.

You will find the system manuals here:

- On the data medium that ships with some products:
    - Product CD / product DVD
    - SIMATIC NET Manual Collection
- On the Internet pages of Siemens Industry Online Support:
    - 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)

SIMATIC NET manuals

You will find the SIMATIC NET manuals here:

- On the data medium that ships with some products:
    - Product CD / product DVD
    - SIMATIC NET Manual Collection
- On the Internet pages of Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/15247).

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

1.2   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 (https://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).

Catalogs

You will find the article numbers for the Siemens products of relevance here in the following catalogs:

*   SIMATIC NET Industrial Communication / Industrial Identification, catalog IK PI

*   SIMATIC Products for Totally Integrated Automation and Micro Automation, catalog ST 70

*   Industry Mall - catalog and ordering system for automation and drive technology, Online catalog (https://mall.industry.siemens.com/goos/WelcomePage.aspx?regionUrl=/de&language=en)

You can request the catalogs and additional information from your Siemens representative.

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.

Trademarks

The following and possibly other names not identified by the registered trademark sign ® are registered trademarks of Siemens AG:

SCALANCE, C-PLUG, OLM

Safety notices

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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.

Network topologies

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

Which topologies can be implemented?

Using the SCALANCE X-000 IE switches, you can implement star topologies.

Note

Keep to the maximum permitted cable lengths of the devices you are using. You will find the permitted cable lengths in the section "Technical specifications (Page 37)".
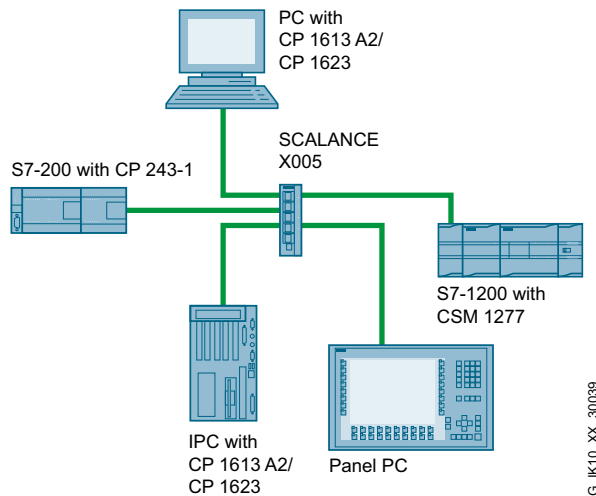

Star topology

Figure 3-1　　Example of a star topology with SCALANCE X-000

Description of the device

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What is possible?

The SCALANCE X-000 IE switches allow the cost-effective installation of small Industrial Ethernet linear bus or star structures with switching functionality. The devices are designed for installation in a cabinet.

Note

It is not possible to use a SCALANCE X-000 in a redundant ring because it does not support redundancy.

Note

If devices 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, due to lightning or switching of large inductive loads.

One of the tests used to attest the immunity of these devices to electromagnetic interference is the "surge immunity test" according to EN 61000-4-5. This test requires overvoltage protection for the power supply lines. A suitable device is, for example, the Dehn Blitzductor BVT AVD 24 V type no. 918 422 or a comparable protective element.

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

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4.1 Product overview

Table 4-1   Overview of the product characteristics

	X005	X005TS	X005EEC
SIMATIC environment	+	+	+
Diagnostics LED	+	+	+
24 V DC	+	+	+
2 x 24 VDC	-	-	-
Compact housing (securing collar, etc.)	+	+	+
Signaling contact + on-site operation	-	-	-
Diagnostics: Web, SNMP, PROFINET	-	-	-
C-PLUG	-	-	-
Ring redundancy with RM	-	-	-
Passive ring redundancy	-	-	-

	X005	X005TS	X005EEC
Standby redundancy	-	-	-
IRT capability	-	-	-
Fast learning	-	-	-
Passive listening	-	-	-
Log table	-	-	-
SNTP + SICLOCK	-	-	-
Cut Through	-	-	-
Coated printed circuit boards	-	-	+

Table 4-2   Overview of the connection options

	X005	X005TS	X005EEC
TP (RJ-45) Fast Ethernet 10 / 100 Mbps	5	5	5

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.

Components of the product

The following components are supplied with a SCALANCE X-000:

• IE switch SCALANCE X-000

• 2-terminal plug-in block (power supply)

• Product information

Accessories

Component	Packaging unit	Article number
IE FC Stripping Tool	1	6GK1 901-1GA00
IE FC blade cassettes	1	6GK1 901-1GB00
IE FC TP standard cable GP	1	6XV1 840 2AH10
IE FC TP trailing cable	1	6XV1 840-3AH10
IE FC TP marine cable	1	6XV1 840-4AH10
IE FC TP trailing cable GP	1	6XV1 870-2D
IE FC TP flexible cable GP	1	6XV1 870-2B
IE FC RJ-45 Plug 180	1	6GK1 901-1BB10-2AA0
IE FC RJ-45 Plug 180	10	6GK1 901-1BB10-2AB0
IE FC RJ-45 Plug 180	50	6GK1 901-1BB10-2AE0

4.2 Product properties and device view

Possible attachments

The SCALANCE X-000 has five RJ-45 jacks for connection of end devices or other network segments.
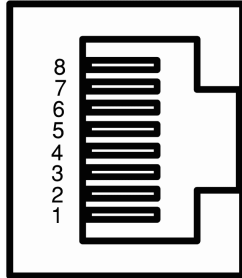

Figure 4-1   SCALANCE X005

Note

The SCALANCE X005 shown above has the same construction as the SCALANCE X005TS and SCALANCE X005EEC.

4.3 TP ports (twisted pair)

RJ-45 connector pinout

With SCALANCE X-000, the twisted-pair ports are designed as RJ-45 jacks with MDI-X pin assignment (Medium Dependent Interface Autocrossover) of a network component.

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+

Note

Permitted cable lengths

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

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

Autonegotiation

With the autonegotiation mechanism, repeaters and end devices can automatically determine the transmission speed and the transmission mode of the partner port. This makes it possible to configure different devices automatically.

Two components connected to a link segment can exchange information about the data transfer and can adapt their settings to each other. The mode with the highest possible speed is set.

Note

Setting ports with a fixed configuration

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

Auto polarity exchange

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

Note

The SCALANCE X-000 IE switches are plug-and-play devices that require no settings during commissioning.

MDI / MDI-X autocrossover function

With the MPI/MDI-X autocrossover function, the send and receive contacts of an Ethernet port are assigned automatically. The assignment depends on the cable with which the communications partner is connected. This means that it does not matter whether the port is connected using a patch cable or crossover cable. This prevents malfunctions resulting from mismatching send and receive lines. This makes installation much easier for the user.

The SCALANCE X-000 devices support the MDI / MDI-X autocrossover function.

Insulation between the TP ports

NOTICE
Formation of loops
Note that the direct connection of two ports or accidental connection over several switches causes an illegal loop that can cause network overload and failure.

Devices with port groups

On the following devices, the ports are divided into port groups.

- SCALANCE X005
  6GK5 005-0BA00-1AA3

- SCALANCE X005TS
  6GK5 005-0BA00-1CA3

There are two TP port groups:
Group 1: P1
Group2: P2 to P5

Between ports of different port groups, an insulation voltage of 1.5 kV is adhered to (corresponds to IEEE802.3, Chapter 33.4.1.1, Environment B), e.g. between P1 and P2.

The requirements for Environment A are met between ports of the same group, e.g. between P2 and P5.

Devices without port groups

The following devices do not have port groups:

* SCALANCE X005
  6GK5 005-0BA10-1AA3

* SCALANCE X005EEC
  6GK5 005-0BA10-1CA3

The requirements for Environment A are met between all ports.

4.4 LEDs

Power LED "L" (green LED)

The power LED shows the status of the power supply.

LED color	LED status	Meaning
Green	Lit	Power supply is connected.
-	Off	Power supply is not connected or <14 V.

Port LEDs "P" (green/yellow LEDs)

The port LEDs indicate the status of the ports.

LED color	LED status	Meaning
Green	Lit	TP link exists, no data reception at port
Yellow	Lit	TP link exists, data reception at port
Yellow	Flashing	Test phase during power on

Installation and disassembly

<div style="text-align: right; font-size: 3em;">5</div>

5.1 Safety notices for installation

Safety notices

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

> ⚠️ **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 cable or conduit entry point 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 75 °C, only use cables with admitted maximum operating temperature of at least 80 °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**
>
> 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:

> ⚠ **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 3836.8.

> ⚠ **WARNING**
>
> If the temperature of the cable or housing socket exceeds 60 ℃ or the temperature at the branching point of the cables exceeds 80 ℃, special precautions must be taken. If the equipment is operated in an air ambient in excess of 60 ℃, only use cables with admitted maximum operating temperature of at least 80 ℃.

5.2 Types of installation

The devices can be installed in the following ways:

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

> ⚠ **WARNING**
>
> If a device is operated in an ambient temperature between 50 ℃ and 75 ℃, the temperature of the device housing may be higher than 70 ℃. 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 of 50 ℃ to 75 ℃.

Installation clearance

Keep to the minimum clearances so that the convection ventilation of the device is not blocked.

- Below at least 10 cm
- Above at least 10 cm

5.3　Installation on a DIN rail

Mounting

To install the device on a 35 mm DIN rail complying with DIN EN 50022, follow the steps below:

1. Place the second housing guide of the device on the top edge of the DIN rail.

2. Press the device down against the DIN rail until the spring catch locks in place.

3. Fit the connectors for the power supply. See also section "Power supply (Page 30)".

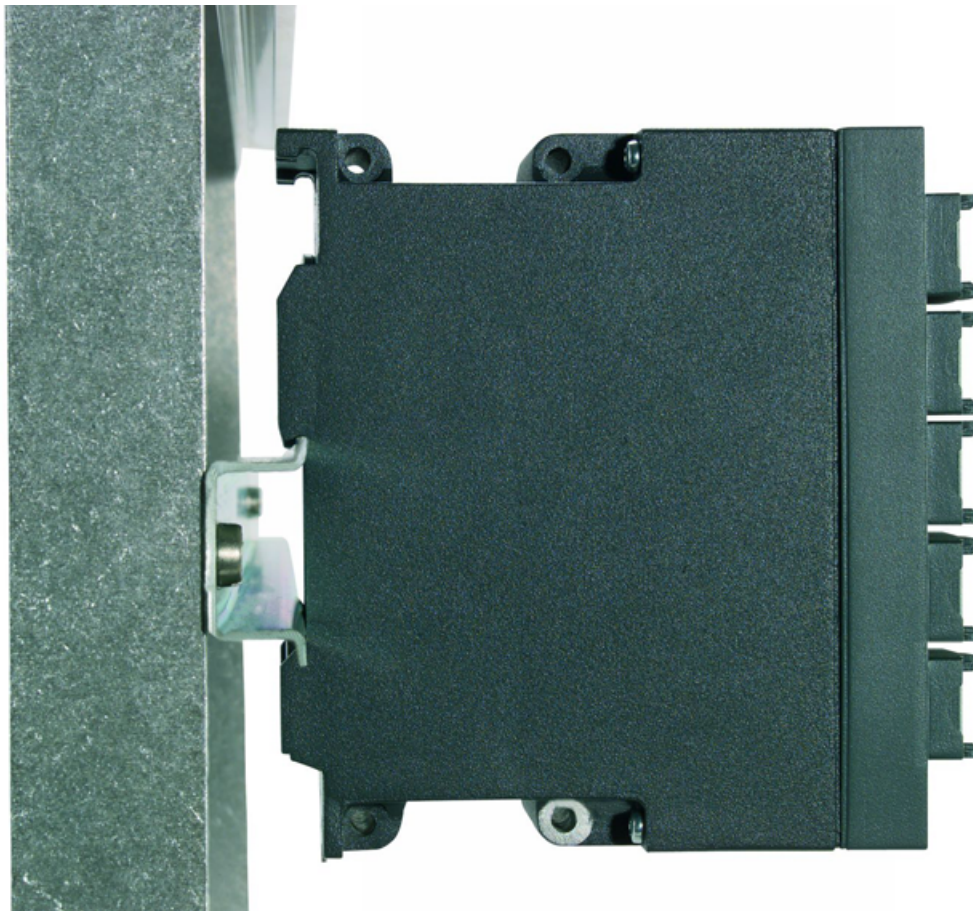4. Insert the terminal block into the sockets on the device.

Figure 5-1　　Installation on a 35 mm DIN rail

Removal

To remove the device from the DIN rail, follow the steps below:

1. Disconnect all connected cables.

2. Pull out the terminal block for the power supply.

3. Release the DIN rail catch on the bottom of the device using a screwdriver.

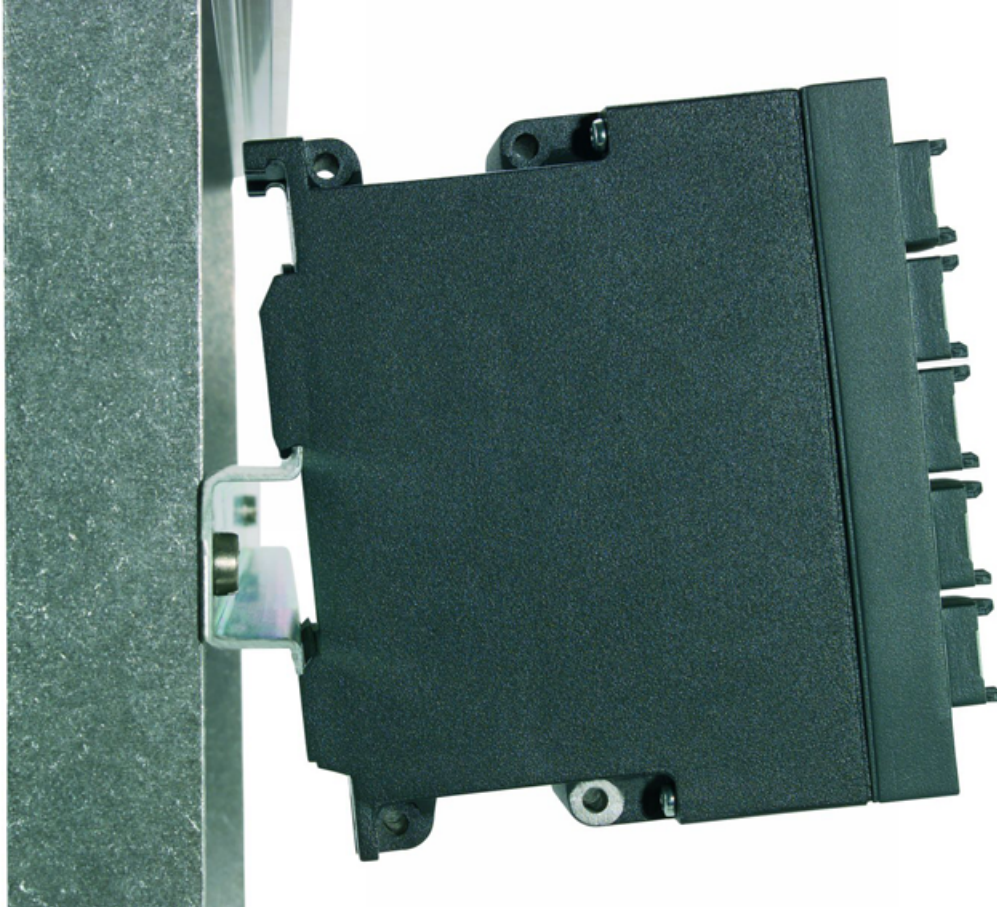4. Pull the lower part of the device away from the DIN rail.

Figure 5-2   Removal from a 35 mm DIN rail

5.4   Installation on a standard rail

Installation on a SIMATIC S7-300 standard rail

To install the device on an S7-300 standard rail, follow the steps below:

1. Place the first housing guide of the device on the top edge of the S7-300 standard rail.

2. Screw the device to the underside of the standard rail (tightening torque 2 Nm).

3. Fit the connectors for the power supply. See also section "Power supply (Page 30)".

4. Insert the terminal block for the power supply into the socket on the device.

Figure 5-3   Installation on a SIMATIC S7-300 standard rail

Removal

To remove the device from the S7-300 standard rail, follow the steps below:

1. Disconnect all connected cables.

2. Release the screw on the bottom of the standard rail.

3. Remove the device from the standard rail.

5.5   Wall mounting

> ⚠ **WARNING**
>
> Wall mounting is only permitted if the requirements for the housing, the installation regulations, the clearance and separating regulations for the control cabinets or housings are adhered to. The control cabinet cover or housing must be secured so that it can only be opened with a tool. An appropriate strain-relief assembly for the cable must be used.

⚠ **WARNING**

Wall mounting outside of the control cabinet or housing does not fulfill the requirements of the FM approval.

Note

You must not install the device on a wall in hazardous areas.

To mount the device on a wall, you require the following:

• 4 wall plugs, 6 mm in diameter and 30 mm long

• 4 screws 3.5 mm in diameter and 40 mm long

To mount the device on a wall, follow the steps below:

1. Prepare the drill holes for wall mounting. For the precise dimensions, refer to the section "Dimension drawings (Page 43)".

2. Fit the connectors for the power supply. See also section "Power supply (Page 30)".

3. Insert the terminal block into the sockets on the device.

4. Screw the device to the wall.

Note

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

5.6 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 up

6

6.1 Safety when connecting up

Safety notices

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

⚠ WARNING

Power supply

The device is designed for operation with a directly connectable safety extra low voltage (SELV) from a limited power source (LPS).

The power supply therefore needs to meet at least one of the following conditions:

• Only safety extra low voltage (SELV) with limited power source (LPS) complying with IEC 60950-1 / EN 60950-1 / VDE 0805-1 or IEC 62368-1 / EN 62368-1 / VDE 62368-1 may be connected to the power supply terminals.

• The power supply unit for the device must meet NEC Class 2 according to the National Electrical Code (r) (ANSI / NFPA 70).

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

Safety notices on use in hazardous areas

General safety notices relating to protection against explosion

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⚠ 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.

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).

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.

⚠ WARNING
Safety notice for connecting with a LAN ID (Local Area Network)
A LAN or LAN segment with all the interconnected devices should be contained completely in a single low voltage power distribution in a building. The LAN is designed either for "Environment A" according to IEEE802.3 or "Environment 0" according to IEC TR 62102.
Do not connect any electrical connectors directly to the telephone network (telephone network voltage) or a WAN (Wide Area Network).

6.2 Wiring rules

When wiring use cables with the following AWG categories or cross sections.

Wiring rules for ...		Screw/spring-loaded terminals
connectable cable cross sections for flexible cables ...	without wire end ferrule	0.25 - 2.5 mm²
		AWG: 24 - 13
	with wire end ferrule with plastic ferrule**	0.25 - 2.5 mm²
		AWG: 24 - 13
	with wire end ferrule without plastic ferrule**	0.25 - 2.5 mm²
		AWG: 24 - 13
	with TWIN wire end ferrule**	0.5 - 1 mm²
		AWG: 20 - 17
Stripped length of the cable		8 - 10 mm
Wire end ferrule according to DIN 46228 with plastic ferrule**		8 - 10 mm

* AWG: American Wire Gauge

** See note "Wire end ferrules"

Note

Wire end ferrules

Use crimp shapes with smooth surfaces, such as provided by square and trapeze shaped crimp cross sections.

Crimp shapes with wave-shaped profile are unsuitable.
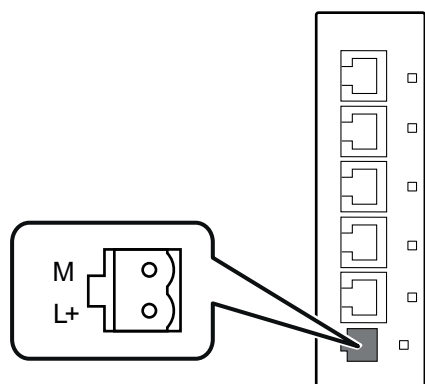

6.3 Power supply

The power supply is connected using a 2-terminal plug-in block. The power supply is connected over a high resistance with the enclosure to allow an ungrounded set up. The power supply is non-floating.

Note

The device can be disconnected from the power supply with the terminal block.

The following figure shows the position of the power supply of the SCALANCE X-000 and the assignment of the terminal block.

Contact	Assignment
M	Ground
L+	L+ 24 VDC

> ⚠ **WARNING**
>
> **Incorrect power supply**
>
> The power supply unit to supply the device must comply with NEC Class 2 (voltage range 18 - 32 V, current requirement 350 mA).
>
> Do not operate the device with an AC voltage.
>
> Never operate the device with DC voltages higher than 32 VDC.

6.4   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.

Note that the device must be grounded over a securing screw with as low a low resistance as possible.

If the device is mounted on a non-conductive base, a grounding cable must be fitted. 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.

6.5 IE FC RJ-45 Plug 180

The rugged node connectors are designed for industry with PROFINET-compliant connectors and provide additional strain and bending relief with a locking mechanism on the casing.

Fitting the IE FC RJ45 Plug 180 to the IE FC Standard Cable

You will find the notes on installation in the instructions that ship with the IE FC RJ45 Plug 180.
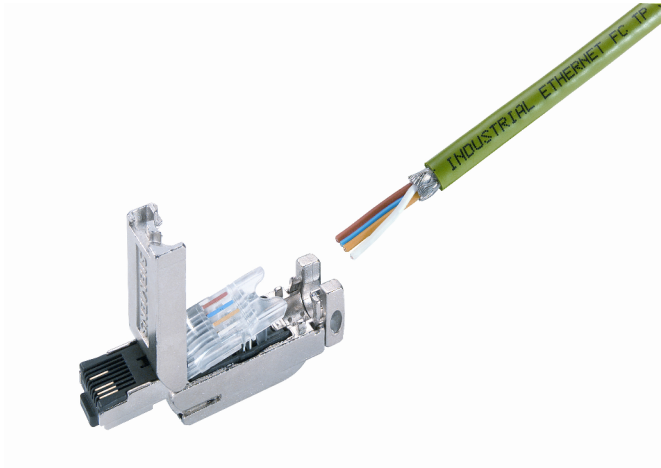

Figure 6-1   IE FC 45 Plug 180

Plugging in the IE FC RJ45 Plug 180

Plug the IE FC RJ45 Plug 180 into the twisted-pair port of the device until it locks in place.

Figure 6-2   Plugging in the IE FC RJ45 Plug 180

With its tight fit and locking mechanism with the PROFINET-compliant male connector
IE FC RJ45 Plug 180, the securing collar on the TP port of the device ensures a rugged node
attachment that provides strain and bending relief for the RJ-45 jack.

Pulling the IE FC RJ45 Plug 180

Press on the locking lever of the IE FC RJ45 Plug 180 gently to remove the 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 RJ45 Plug 180 from the RJ-45 jack.

Maintenance and troubleshooting

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 (Page 13) 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.

Fuses

The SCALANCE X000 IE switches 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.

Device defective

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

Technical specifications

<div style="text-align: right; font-size: 2em;">8</div>

Note

Note the article number in the technical specifications.

The following technical specifications apply to the following devices:

Device	Article number
SCALANCE X005	6GK5 005-0BA00-1AA3
SCALANCE X005TS	6GK5 005-0BA00-1CA3

Note

Unless mentioned otherwise, the technical specifications in the following table relate to the SCALANCE X005 and SCALANCE X005TS.

Technical specifications		
Attachment to Industrial Ethernet		
Quantity	5	
Design	RJ-45 jack with MDI-X pinning	
Properties	Half duplex / full duplex	
Transmission rate	10/100 Mbps	
Permitted cable lengths (Ethernet)	**Alternative combinations per length range**	
0 to 85 m	• Max. 85 m IE FC TP Marine/Trailing Cable with IE FC RJ45 Plug 180	
	• Max. 75 m IE FC TP Marine/Trailing Cable + 10 m TP Cord via IE FC RJ45 Outlet	
0 to 100 m	• Max. 100 m IE FC TP Standard Cable with IE FC RJ45 Plug 180	
	• Max. 90 m IE FC TP Standard Cable + 10 m TP Cord via IE FC RJ45 Outlet	
Electrical data		
Power supply	Rated voltage	24 V DC
	Voltage range	18 to 32 VDC Safe Extra Low Voltage (SELV)
	Design	2-terminal plug-in block
Current consumption	Typical	80 mA
Power loss at 24 V DC	Typical	2 W
Overvoltage protection at input		PTC resettable fuse (0.5 A / 60 V)
Permitted ambient conditions		

Technical specifications			
Ambient temperature	During operation		
	• SCALANCE X005	• 0 ℃ to +65 ℃	
	• SCALANCE X005TS	• -40 ℃ to +75 ℃	
	During storage	-40 ℃ to +80 ℃	
	During transportation	-40 ℃ to +80 ℃	
Relative humidity	During operation	≤ 95 % no condensation	
Operating altitude	During operation	≤ 2,000 m above sea level at max. 46 ℃ ambient temperature	
		≤ 2,000 m above sea level at max. 40 ℃ ambient temperature	
Design, dimensions and weight			
Immunity	EN 61000-6-2 (Class A) EN 61000-6-1 (Class B) with a ferrite core on the cables Manufacturer: Würth Elektronik - Type: 742 711 31		
RF interference level	EN 61000-6-4		
Degree of protection	IP30		
MTBF (EN/IEC 61709, 40 ℃)	167.1 years		
Housing material	Basic housing	Die cast aluminum, powder coated	
	Front cover	Polyphenylene ether + polystyrene (PPE+PS plastic)	
Weight	550 g		
Dimensions (W x H x D)	44 x 125 x 124 mm		
Installation options	• Mounting on a DIN rail		
	• Mounting on an S7-300 standard rail		
	• Wall mounting		
Switching properties			
Aging time	375 seconds		
Max. number of learnable MAC addresses	1024		
Response to LLDP frames	Blocking		
Response to spanning tree BPDU frames	Forwarding		
CoS acc. to IEEE 802.1Q	Yes		
QoS priority queues	2		
IEEE 802.1Q tags (VLAN ID, priority) transparent forwarding	Yes		
Maximum frame size	1536 bytes		
Forwarding of PRP frames (Parallel Redundancy Protocol)	Yes		

Note

The number of connected SCALANCE X Industrial Ethernet Switches influences the frame propagation time.
When a frame passes through the SCALANCE X005 or SCALANCE X005TS, it is delayed by the store and forward function of the switch:

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

This means that the more SCALANCE X005 or SCALANCE X005TS devices the frame passes through, the longer the frame delay.

The following technical specifications apply to the following devices:

Device	Article number
SCALANCE X005	6GK5 005-0BA10-1AA3
SCALANCE X005EEC	6GK5 005-0BA10-1CA3

Note

Unless mentioned otherwise, the technical specifications in the following table relate to the SCALANCE X005 and SCALANCE X005EEC.

Technical specifications		
Attachment to Industrial Ethernet		
Quantity	5	
Design	RJ-45 jack with MDI-X pinning	
Properties	Half duplex / full duplex	
Transmission rate	10/100 Mbps	
Permitted cable lengths (Ethernet)	**Alternative combinations per length range**	
0 to 85 m	• Max. 85 m IE FC TP Marine/Trailing Cable with IE FC RJ45 Plug 180	
	• Max. 75 m IE FC TP Marine/Trailing Cable + 10 m TP Cord via IE FC RJ45 Outlet	
0 to 100 m	• Max. 100 m IE FC TP Standard Cable with IE FC RJ45 Plug 180	
	• Max. 90 m IE FC TP Standard Cable + 10 m TP Cord via IE FC RJ45 Outlet	
Electrical data		
Power supply	Rated voltage	24 V DC
	Voltage range	18 to 32 VDC Safe Extra Low Voltage (SELV)
	Design	2-terminal plug-in block
Current consumption	Typical	60 mA
Power loss at 24 V DC	Typical	1.5 W
Overvoltage protection at input		PTC resettable fuse (0.5 A / 60 V)
Permitted ambient conditions		

Technical specifications		
Ambient temperature	During operation	-40 ℃ to +75 ℃
	During storage	-40 ℃ to +80 ℃
	During transportation	-40 ℃ to +80 ℃
Relative humidity	During operation	≤ 95 % no condensation
Operating altitude	During operation	≤ 2,000 m above sea level at max. 46 ℃ ambient temperature
		≤ 2,000 m above sea level at max. 40 ℃ ambient temperature

Design, dimensions and weight		
Immunity	EN 61000-6-2	
	EN 61000-6-1	
RF interference level	EN 61000-6-4	
Degree of protection	IP30	
MTBF (EN/IEC 61709, 40 ℃)	165 years	
Housing material	Basic housing	Die cast aluminum, powder coated
	Front cover	Polyphenylene ether + polystyrene (PPE+PS plastic)
Weight	550 g	
Dimensions (W x H x D)	44 x 125 x 124 mm	
Installation options	• Mounting on a DIN rail • Mounting on an S7-300 standard rail • Wall mounting	

Switching properties	
Aging time	45 seconds
Max. number of learnable MAC addresses	1024
Response to LLDP frames	Blocking
Response to spanning tree BPDU frames	Forwarding
CoS acc. to IEEE 802.1Q	Yes
QoS priority queues	4
IEEE 802.1Q tags (VLAN ID, priority) transparent forwarding	Yes
Maximum frame size	1536 bytes
Forwarding of PRP frames (Parallel Redundancy Protocol)	Yes

Note

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

When a frame passes through the SCALANCE X005, it is delayed by the store and forward function of the switch:

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

This means that the more SCALANCE X005 the frame passes through, the longer the frame delay.

Dimension drawings

<div style="text-align: right">

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</div>

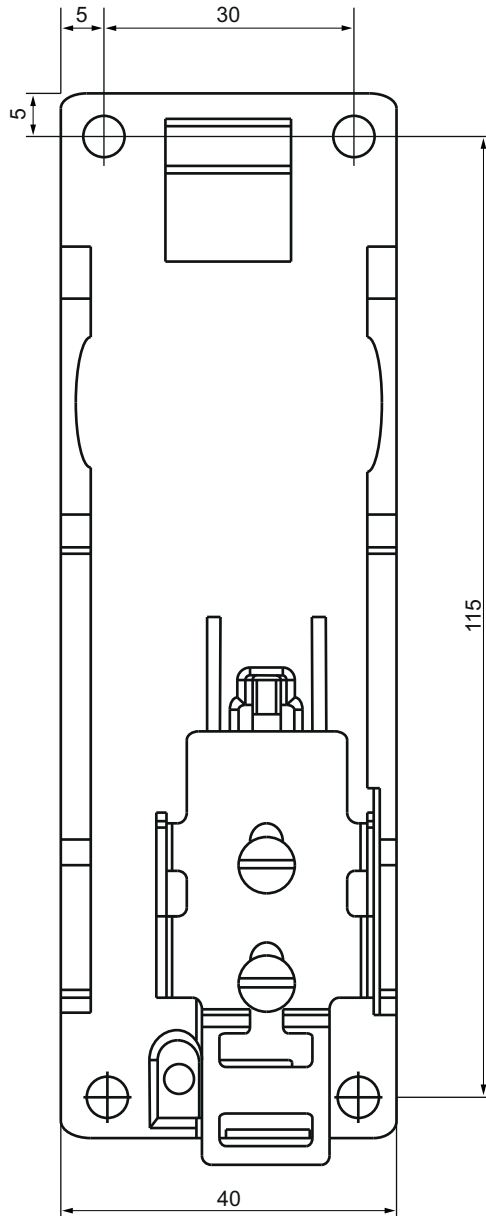Figure 9-1   Dimension drawing, rear of the SCALANCE X-000

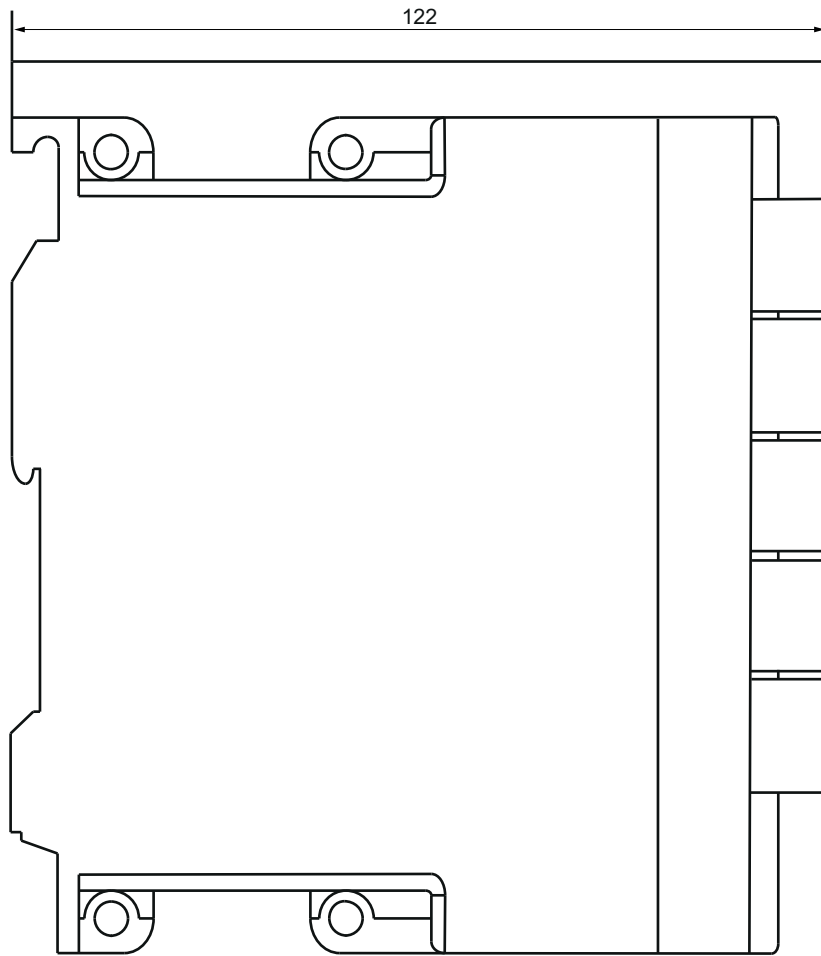Figure 9-2   Dimension drawing, side view of SCALANCE X-000

Approvals

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

Unless mentioned otherwise, the following approvals apply to all variants of the SCALANCE X-000.

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/15273/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).

See also

SIMATIC NET Industrial Ethernet TP and Fiber Optic Networks (http://support.automation.siemens.com/WW/view/en/8763736)

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/15273/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 na IIC T4 Gc, not on the nameplate)
2020322310002626
2020322310002915
2020322310002987

The products meet the requirements of the following standards:

- EN/IEC 60079-7, GB 3836.8

- EN IEC/IEC 60079-0, GB 3836.1

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

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.

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

Ta: -40 ... +75 °C

cULus approval for industrial control equipment

cULus Listed IND. CONT. EQ.

Underwriters Laboratories Inc. complying with

- UL 61010-2-201

- CAN/CSA-IEC 61010-2-201

Report no. E85972

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 for Hazardous Locations

ANSI/ISA 12.12.01-2007, CSA C22.2 No. 213-M1987
CL. 1, Div. 2 GP. A.B.C.D T..
CL. 1, Zone 2, GP, IIC, T..
(T.. = For detailed information on the temperature class, refer to the type plate)

ECE directive

The IE switches SCALANCE X005TS and SCALANCE X005EEC meet the requirements of the directive ECE R10, Rev. 3.

Device	Test number
SCALANCE X005TS	10 R - 024733
SCALANCE X005EEC	10 R - 057923

EC directive

The IE switches SCALANCE X005TS and SCALANCE X005EEC meet the requirements of the directive 72/245/EWG, version 2006/96/EC "Electromagnetic Compatibility".

Railway approval

The IE switches SCALANCE X005TS and SCALANCE X005EEC meet the requirements of the following 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.

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 (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)

MSIP 요구사항 - For Korea only

A급 기기(업무용 방송통신기자재)

이 기기는 업무용(A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정 외의 지역에서 사용하는것을 목적으로 합니다.

Noise test

The IE switches SCALANCE X005TS and SCALANCE X005EEC are tested in accordance with EN60068-2-64.

Testing accuracy:	IEC 60721-3-5
Severity level:	Class 5M2 (for road vehicles)

Overvoltage resistance

The IE switches SCALANCE X005TS and SCALANCE X005EEC have passed advanced overvoltage tests.

Power supply = 24 VDC

Overvoltage test with:

- 36 V/1s

- 100 V/1ms (with a source resistance of 10 ohms)

Mechanical stability (in operation)

Device	DIN EN 60068-2-6 oscillation	DIN EN 60068-2-27 shock
	10 - 58.12 Hz: 0.075 mm 58.12 - 500 Hz: 10 m/s^2 10 cycles	150 m/s^2, 11 ms duration 6 shocks per axis
SCALANCE X005	●	●
SCALANCE X005TS	●	●
SCALANCE X005EEC	●	●

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.

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