

# SIEMENS

## SIMATIC NET

**Betriebsanleitung (kompakt)**  
**Operating Instructions (Compact)**

A5E01048819-01

Ausgabe/Release 03/2007

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**SCALANCE W786-1PRO**  
**SCALANCE W786-2PRO**  
**SCALANCE W786-3PRO**

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Deutsch/English

**A5E01048819-01**  
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<http://www4.ad.siemens.de/view/cs/gr/18690255>

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: ( )  
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## Safety Guidelines

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.



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### Danger

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

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### Warning

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

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### Caution

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

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### Caution

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

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### Notice

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

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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 device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

## Prescribed Usage

Note the following:



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### Warning

This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

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## Introduction

### 1.1 Information on the Operating Instructions (compact) SCALANCE W786

#### Validity of the Operating Instructions (compact)

These Operating Instructions (compact) cover the following products:

- SCALANCE W786-1PRO
- SCALANCE W786-2PRO
- SCALANCE W786-3PRO

These Operating Instructions (compact) apply to the following software version:

- SCALANCE W786 firmware as of Version 3.2

#### Purpose of the Operating Instructions (compact)

Based on the Operating Instructions (compact), you will be able to install and connect up the SCALANCE W786 correctly. Configuring the SCALANCE W786 and integrating the SCALANCE W786 in a WLAN are not dealt with in this manual.

#### Documentation on the accompanying CD

You will find detailed information on configuration in the Operating Instructions SCALANCE W786 on the accompanying CD in the file  
BA\_SCALANCE-W786\_76.pdf



## Description

### 2.1 Scope of delivery

The following components are supplied with the SCALANCE W786:

- SCALANCE W786
- 5 caps for the cover screws
- Depending on the version, up to 8 plugs for sealing the housing.
- Depending on the version, up to 8 strain relief clamps
- 1 connector for the 48 V DC power supply
- 2 sealing sleeves for FO cables (not for devices with RJ-45 port)
- 1 SIMATIC NET Industrial Wireless LAN CD with these Operating Instructions for the SCALANCE W78x
- 1 Operating Instructions (compact) SCALANCE W786

Please check that the consignment you have received is complete. If it is not complete, please contact your supplier or your local Siemens office.

## 2.2 Product properties

### Possible applications of the SCALANCE W786

The SCALANCE W786 is equipped with an Ethernet port and up to three wireless LAN ports. This makes the device suitable for the following applications:

- The SCALANCE W786 forwards data within its transmission range from one node to another without a connection to wired Ethernet being necessary.
- The SCALANCE W786 can be used as a gateway from a wired to a wireless network.
- The SCALANCE W786 can be used as a wireless bridge between two networks.
- The SCALANCE W786 can be used as a bridge between two cells operating at different frequencies.

With a SCALANCE W786 with more than one WLAN port, you can also implement a redundant wireless connection to a SCALANCE W78x with at least two WLAN ports.

### Properties of the SCALANCE W786

- The Ethernet interface supports 10 Mbps and 100 Mbps, both in full and half duplex as well as autocrossing and autopolarity.
- Operating the wireless interface in the frequency bands 2.4 GHz and 5 GHz.
- The wireless interface is compatible with the standards IEEE 802.11a, IEEE 802.11h, IEEE 802.11b and IEEE 802.11g. In the 802.11a, 802.11h and 802.11g mode, the gross transmission rate is up to 54 Mbps. In turbo mode, the transmission rate is up to 108 Mbps (not permitted in all countries and modes).
- As an expansion of the 802.11a mode, it is also possible to operate according to the IEEE 802.11h standard. In 802.11h mode, the procedures Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS) are used in the range 5.25 - 5.35 and 5.47 - 5.75 GHz. In some countries, this allows the frequency subband of 5.47 - 5.725 GHz to be used outdoors even with a higher transmit power. TPC is a technique of controlling the transmit power by reducing it to the strength actually required. With dynamic frequency selection (DFS), the access point searches for primary users (for example radar) on a randomly selected channel before starting communication. If signals are found on the channel, this channel is disabled for 30 minutes and the availability check is repeated on another channel.
- Support of the authentication standards WPA, WPA-PSK, WPA2, WPA2-PSK and IEEE 802.1x and the encryption methods WEP, AES and TKIP.
- Suitable for inclusion of a RADIUS server for authentication.
- Device-related and application-related monitoring of the wireless connection.
- The interoperability of SCALANCE W786 devices with Wi-Fi devices of other vendors was tested thoroughly.

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#### Note

In client mode, you can use a SCALANCE W786-xPRO with the functionality of a SCALANCE W746-1PRO.

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The following table illustrates the differences between the various variants of the SCALANCE W786:

Type	Number of WLAN ports	Number and type of Ethernet ports	Number of internal antennas	Number of R-SMA sockets for external antennas	Order no.
W786-1PRO	1	1 RJ-45	1 (diversity <sup>(2)</sup> )	—	6GK5786-1BA60-2AA0 6GK5786-1BA60-2AB0 (1)
W786-1PRO	1	1 RJ-45	—	2	6GK5786-1AA60-2AA0 6GK5786-1AA60-2AB0 (1)
W786-1 PRO	1	1 ST duplex multimode FO cable	1 (diversity <sup>(2)</sup> )	—	6GK5786-1BB60-2AA0 6GK5786-1BB60-2AB0 (1)
W786-1 PRO	1	1 ST duplex multimode FO cable	—	2	6GK5786-1AB60-2AA0 6GK5786-1AB60-2AB0 (1)
W786-2PRO	2	1 RJ-45	2 (diversity <sup>(2)</sup> )	—	6GK5786-2BA60-2AA0 6GK5786-2BA60-2AB0 (1)
W786-2PRO	2	1 RJ-45	—	4	6GK5786-2AA60-2AA0 6GK5786-2AA60-2AB0 (1)
W786-2 PRO	2	1 ST duplex multimode FO cable	2 (diversity <sup>(2)</sup> )	—	6GK5786-2BB60-2AA0 6GK5786-2BB60-2AB0 (1)
W786-2 PRO	2	1 ST duplex multimode FO cable	—	4	6GK5786-2AB60-2AA0 6GK5786-2AB60-2AB0 (1)



Type	Number of WLAN ports	Number and type of Ethernet ports	Number of internal antennas	Number of R-SMA sockets for external antennas	Order no.
W786-3PRO	3	1 RJ-45	—	6	6GK5786-3AA60-2AA0 6GK5786-3AA60-2AB0 (1)
W786-3 PRO	3	1 ST duplex multimode FO cable	—	6	6GK5786-3AB60-2AA0 6GK5786-3AB60-2AB0 (1)

(1) US variant

(2) There are two internal antennas per WLAN port. The antenna used is always the one that provides the best possible data transmission (diversity).

You will find more information on the configuration parameters of the particular device in the SCALANCE W786 online help of Web Based Management.

### Requirements for installation and operation

A PG/PC with a network attachment must be available to configure the SCALANCE W786. If no DHCP server is available, a PC on which the Primary Setup Tool (PST) is installed is necessary for the initial assignment of an IP address to the SCALANCE W786. For the other configuration settings, a computer with Telnet or an Internet browser is necessary.

## 2.3 LED display

### Information on operating status and data transfer

On the front of the housing, several LEDs provide information on the operating status of the SCALANCE W786:

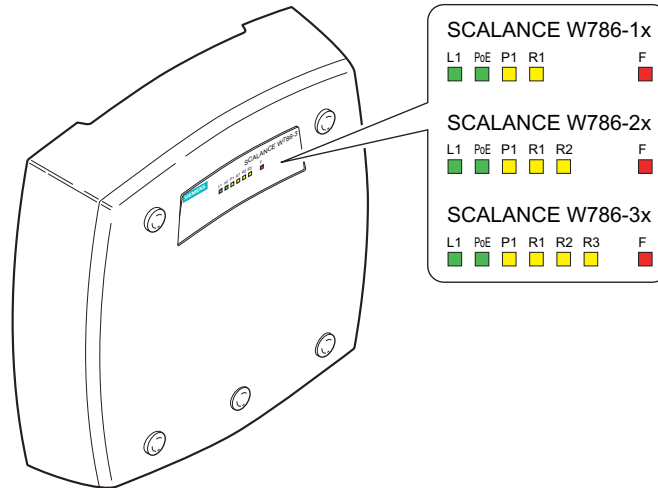


Figure 2-1 The LED display of the SCALANCE W786

#### Note

The "PoE" LED does not exist on devices with a port for FO cable.

LED	Color	Description
L1	Green	Power supply over a power supply adapter or the 48 V DC energy contacts of devices with a port for FO cable.
PoE	Green	Power over Ethernet or power over the 48 V DC energy contacts of devices with an RJ-45 port.
P1	Yellow	Data transfer over the Ethernet interface (traffic).
	Green	There is a connection over the Ethernet port. (Link).
	Flashing yellow	PRESET-PLUG detected.
	Yellow/green	PRESET function completed successfully.
	Flashing green	"Flashing" enabled over PST.
R1	Yellow	Data transfer over the first WLAN interface.
	Green	<i>Access Point Mode:</i> The WLAN interface is initialized and ready for operation. <i>Client Mode:</i> There is a connection over the first WLAN port.
	Flashing green	<i>Access Point Mode:</i> The channels are being scanned. <i>Client Mode:</i> The client is searching for a connection to an access point or ad hoc network.
	Green flashing quickly	<i>Access Point Mode:</i> With 802.11h, the channel is scanned for one minute for primary users before the channel can be used for data traffic. <i>Client Mode:</i> The client waits for the adopt MAC address due to the setting <Auto Find Adopt MAC> and is connected to no access point.
	Green 3x fast, 1x long flashing	<i>Client Mode:</i> The client waits for the adopt MAC address due to the setting <Auto Find Adopt MAC> and is connected to an access point.
	Flashing yellow	PRESET-PLUG detected.
	Yellow/green	PRESET function completed successfully.
R2	Yellow	<i>Access Point Mode:</i> Data transfer over the second WLAN port. <i>Client Mode:</i> The LED is always off because the 2nd port is not available in client mode.
	Green	<i>Access Point Mode:</i> The WLAN interface is initialized and ready for operation. <i>Client Mode:</i> The LED is always off because the 2nd port is not available in client mode.
	Flashing green	<i>Access Point Mode:</i> The channels are being scanned. <i>Client Mode:</i> The LED is always off because the 2nd port is not available in client mode.

LED	Color	Description
	Green flashing quickly	<i>Access Point Mode:</i> With 802.11h, the channel is scanned for one minute for primary users before the channel can be used for data traffic. <i>Client Mode:</i> The LED is always off because the 2nd port is not available in client mode.
	Flashing yellow	PRESET-PLUG detected.
	Yellow/green	PRESET function completed successfully.
R3	Yellow	<i>Access Point Mode:</i> Data transfer over the third WLAN port. <i>Client Mode:</i> The LED is always off because the 3rd port is not available in client mode.
	Green	<i>Access Point Mode:</i> The WLAN interface is initialized and ready for operation. <i>Client Mode:</i> The LED is always off because the 3rd port is not available in client mode.
	Flashing green	<i>Access Point Mode:</i> The channels are being scanned. <i>Client Mode:</i> The LED is always off because the 3rd port is not available in client mode.
	Green flashing quickly	<i>Access Point Mode:</i> With 802.11h, the channel is scanned for one minute for primary users before the channel can be used for data traffic. <i>Client Mode:</i> The LED is always off because the 3rd port is not available in client mode.
	Flashing yellow	PRESET-PLUG detected.
	Yellow/green	PRESET function completed successfully.
F	Red	An error occurred during operation with the SCALANCE W786.
	Flashing red	Ready to load firmware. The device was either stopped with the reset button or there is incorrect firmware on the device.

**Note**

If the LED for the WLAN port is not green when the device starts up, although it is activated, the port is not ready for operation (interface not initialized).

The main reason for this is usually that during commissioning of the SCALANCE W78x products, a waiting time of up to 15 minutes can occur when the ambient temperature is below zero. The device is ready for operation at the specified ambient temperature as soon as the LED for the WLAN interface is lit green.

## 2.4 C-PLUG

### Configuration information on the C-PLUG

The C-PLUG is used to transfer the configuration of the old device to the new device when a device is replaced. When the new device starts up with the C-PLUG, it then continues automatically with exactly the same configuration as the old device. One exception to this can be the IP configuration if it is set over DHCP and the DHCP server has not been reconfigured accordingly.

Reconfiguration is necessary if you use WDS or redundancy and use the MAC addresses and not the sysNames. These functions are then based on the MAC address that inevitably changes if a device is replaced.

---

#### **Note**

As soon as the device is started with a C-PLUG inserted, the SCALANCE W-700 starts up with the configuration data on the C-PLUG.

---

## 2.5 Reset button

### Functions of the reset button

The reset button is located below the housing cover beside the sockets for external antennas.

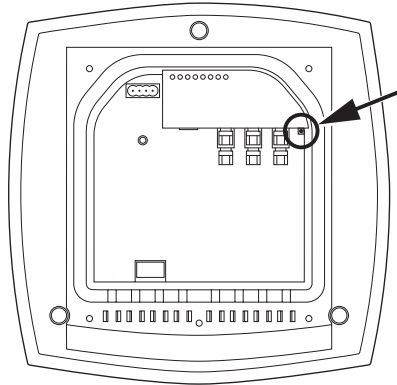


Figure 2-2 Position of the reset button with the housing cover removed

#### The reset button has the following functions:

- **Restart of the device**  
To restart the device, press the reset button.
- **Loading new firmware**  
If the normal procedure with the Load & Save menu of Web Based Management was completed successfully, the reset button can be used to load new firmware. This situation can occur if there was a power outage during the normal firmware update.
- **Restoring the default parameters (factory defaults)**
- **Adopting the configuration data from the PRESET PLUG.**

## 2.6 Biological compatibility

### Electromagnetic fields and health

With regard to the question of whether electromagnetic fields (for example in association with industrial wireless LANs) can put human health at risk, we refer to a publication of BITKOM (German Association for information Technology, Telecommunication and New Media e. V.), dated December 2003:

"The same health guidelines apply to WLAN devices as to all other radio applications. These regulations are based on the protection concept of ICNIRP<sup>1</sup> or the corresponding recommendation of the European Council.

The independent German radiation protection commission (SSK) was commissioned by the federal German ministry of the environment to investigate the possible dangers - thermal and non-thermal - resulting from electromagnetic fields and came to the following conclusions<sup>2</sup>:

'The German Commission on Radiological Protection concludes that according to the latest scientific literature no new scientific research is available with respect to proven health hazards which would throw doubt upon the scientific evaluation which serves as the basis for the ICNIRP safety concepts and the recommendations of the EU commission.'

The SSK also concludes that below the current limit values, there is also no scientific suspicion of health risks.

This assessment agrees with those of other national and international scientific commissions and of the WHO ([www.who.int/emf](http://www.who.int/emf)).

Accordingly and in view of the fact that WLAN devices are significantly below the scientifically established limit values, there are no health risks from the electromagnetic fields of WLAN products.

<sup>1</sup> International Council on Non-Ionizing Radiation Protection

<sup>2</sup> 'Limit Values and Precautionary Measures to Protect the General Public from Electromagnetic Fields' Recommendation of the Radiation Protection Commission (SSK) with scientific justification, Issue 29, 2001."

You will find further information on this topic under the following URL:

[www.bitkom.org](http://www.bitkom.org)

## Assembling

# 3

### 3.1 Removing / fitting the housing cover

#### When does the housing cover need to be removed?

You can only perform the following activities when the cover is removed.

- You want to screw the SCALANCE W786 to a wall or onto the optional mounting plate.
- You want to connect cables to the SCALANCE W786 for the power supply, for Ethernet or for external antennas.
- You want to insert a C-PLUG in the device or replace an existing C-PLUG.
- You want to use the reset button.



### Removing the housing cover

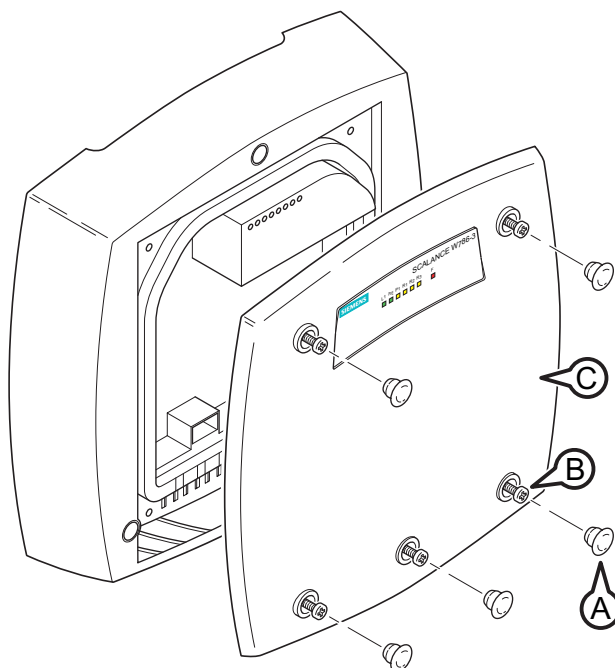


Figure 3-1 Removing the cover  
A Sealing cap  
B Cover screw  
C Housing cover

Follow the steps below to remove the housing cover:

1. Remove the sealing caps from the housing cover (position **A** in the figure above)
2. Loosen the screws in the cover (position **B** in the figure above).

---

**Note**

These screws remain in the cover after they have been loosened (prevents them being lost). Never attempt to remove these screws from the housing cover using force, otherwise the housing cover will be damaged!

---

3. Remove the housing cover with the captive screws (position **C** in the figure above).

### Fitting the housing cover

Fitting the housing cover is carried out in the reverse order. Tightening torque for the cover screws 1.8 Nm.

## 3.2 Connecting up cables

### Connecting up cables prior to mounting

Before you screw a SCALANCE W786 to a wall or to the optional mounting plate, the cables for the power supply, for Ethernet, and, when necessary, for the external antennas must be connected up first. The available options are as follows:

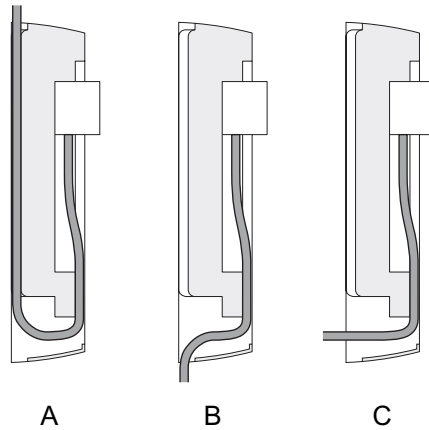


Figure 3-2 Side view of a SCALANCE W786 with cables entering from different directions

- The cables are inserted from above (position **A** in the previous schematic). The housing of the SCALANCE W786 has an opening at the top for this purpose.
- The cables are inserted from below (position **B** in the previous schematic). There is also an opening at the bottom for this purpose.
- Cables inserted through a wall behind the SCALANCE W786 (position **C** in the previous schematic). In this case, you will need to mount the SCALANCE W786 so that the opening in the wall is located above the lower edge of the device.

### Connecting up FO cables

Fiber-optic cables have a minimum bending radius. The cable must not be bent tighter than this bending radius during installation or operation, otherwise the FO cable will be irreparably damaged.

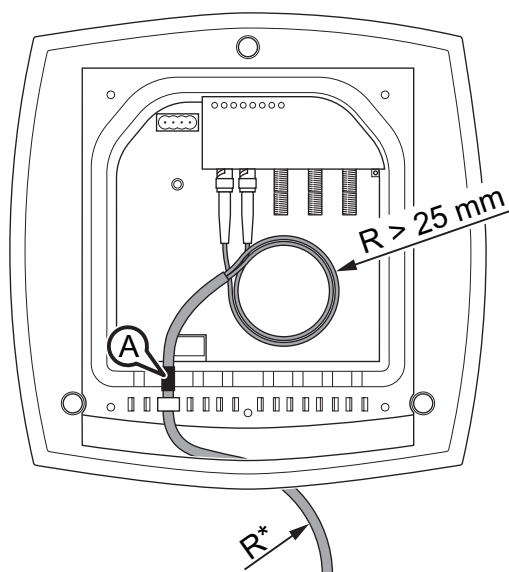


Figure 3-3 Connecting up an FO cable

For the FO cable, use the second opening from the left in the seal. Cable routing is illustrated in the figure above. For individual cores immediately following the connector, the minimum bending radius is 25 mm. Refer to the specification of the cable you are using for the minimum permitted bending radius of the cable within the jacket. Make sure that the FO cable is not sharply kinked after passing through the housing.

A sealing sleeve must be used in the housing sealing with FO cables (position **A** in the figure above). For more detailed information, refer to the section "Connecting the cables".

### Grounding terminal



#### Warning

To operate the SCALANCE W786 safely, the chassis ground connector must have a suitable cable connected. Do not use the SCALANCE W786 without a ground cable connected.

The chassis ground connector is located on the rear of the device (M4 thread). Connect the ground cable before you mount the SCALANCE W786 on a wall or on the optional mounting plate. Once the SCALANCE W786 is mounted, the connector is no longer accessible.

Place the supplied toothed washer directly on the rear of the device before screwing on the ground cable. Only then can you be sure that there is ideal contact with the screwed-on cable.

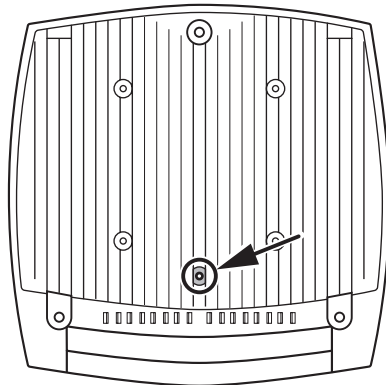


Figure 3-4 Chassis ground connector on the rear of the SCALANCE W786

### 3.3 Mounting without an adapter (wall mounting only)

#### Drilling template

The location of the holes for mounting the SCALANCE W786 on a wall is shown in the following figure:

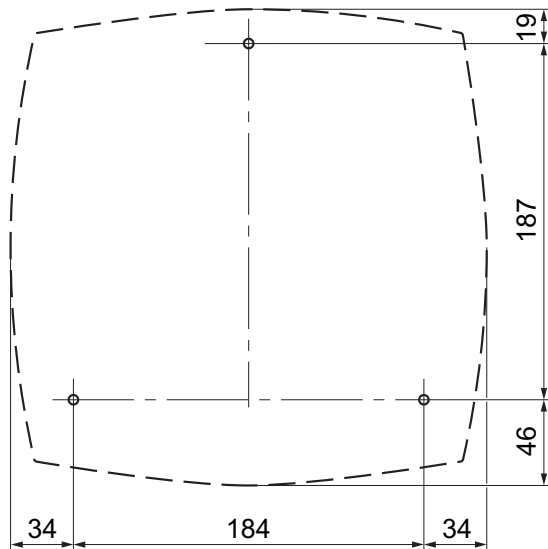


Figure 3-5 Drilling template for wall mounting of the SCALANCE W786

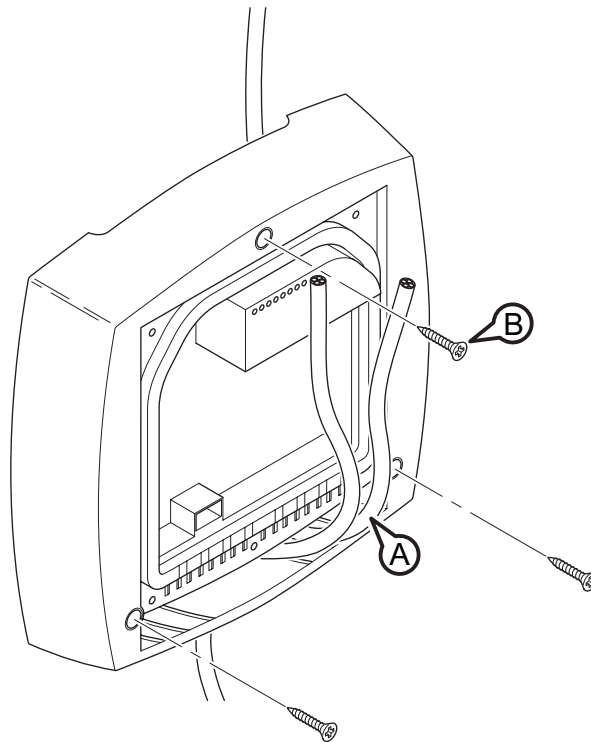
**Procedure**

Figure 3-6 SCALANCE W786 wall mounting

Follow the steps below to screw a SCALANCE W786 to a wall:

1. Lead the cables into the housing of the SCALANCE W786 (position **A** in the figure above). Note the information in the section "Connecting up cables".
2. Secure the SCALANCE W786 to the wall with three screws (position **B** in the figure above). The screws are not supplied with the device. The type and length of the screws depend on the type of wall.

**Option: Threaded holes on rear of housing**

When a wall is extremely thin, it is often not possible to use wall plugs for the screws. To allow wall mounting even in this situation, there are four M4 threaded holes on the rear of the SCALANCE W786. The drilling template is a square with sides 100 mm long. The device can therefore be mounted on a wall with bolts through the wall.

### 3.4 Mounting with mounting plate

#### 3.4.1 Fitting the mounting plate to a wall

##### Drilling template

The location of the holes for fitting the mounting plate to a wall is shown in the following figure:

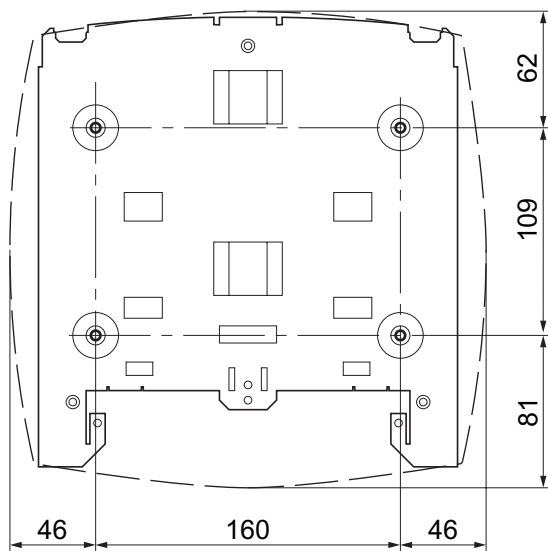


Figure 3-7 Drilling template for fitting the mounting plate to a wall

**Procedure**

Secure the mounting plate to the wall with four screws. The screws are not supplied with the device. The type and length of the screws depend on the type of wall.

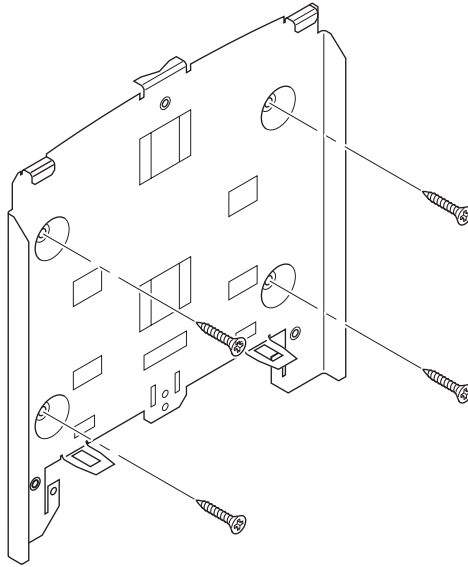


Figure 3-8 Fitting the mounting plate for the SCALANCE W786 to a wall



### 3.4.2 Fitting the mounting plate to an S7 standard rail

#### Procedure

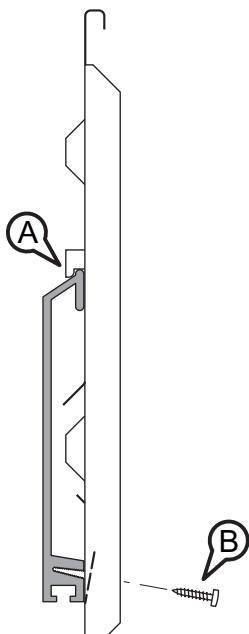


Figure 3-9 Side view of a mounting plate on an S7 standard rail

Follow the steps below to fit the mounting plate to an S7 standard rail:

1. Place the mounting plate with the two protruding catches on the top edge of the S7 standard rail (position **A** in the figure above).
2. At the bottom, the mounting plate has two lugs with holes. Screw the lugs to the S7 standard rail (position **B** in the figure above). The required screws are supplied with the mounting plate.

### 3.4.3 Fitting the mounting plate to a DIN rail

#### Procedure

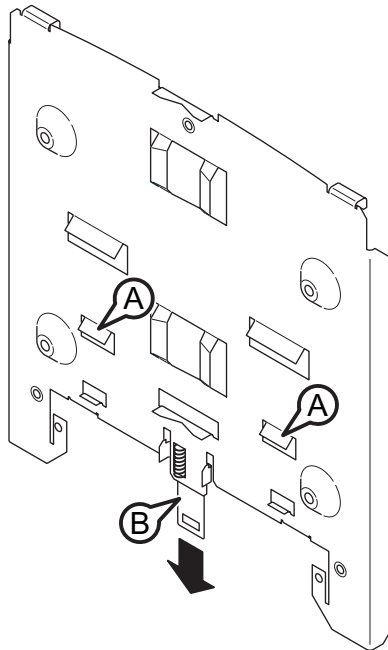


Figure 3-10 Mounting plate with fittings for DIN rail mounting

Follow the steps below to fit the mounting plate to a DIN rail:

1. Place the mounting plate with the two catches (position A in the figure above) on the upper edge of the DIN rail.
2. Pull down the DIN rail sliding catch (position B in the figure above) and press the mounting plate against the DIN rail until the sliding catch engages.

### 3.4.4 Fitting the mounting plate to a mast

#### Procedure

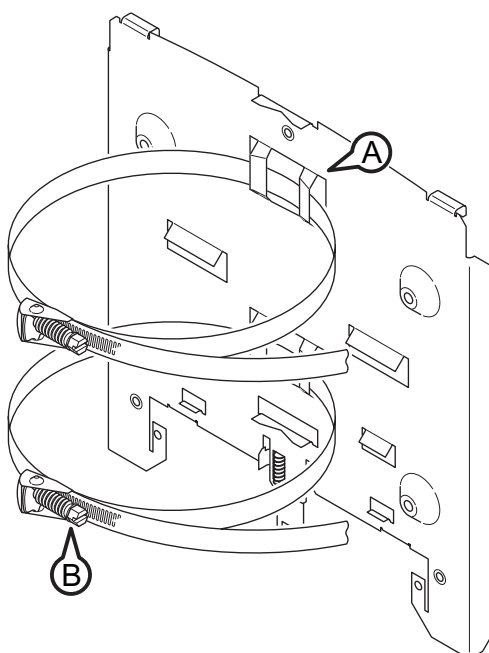


Figure 3-11 Mounting plate with fittings for mast mounting

Follow the steps below to fit the mounting plate to a mast:

1. Feed the fastening straps through the openings in the mounting plate (position **A** in the figure above).
2. Place the fastening straps around the mast at the required position.
3. Feed the free end of the strap through the quick-release fastener. You can twist the tensioning screw (position **B** in the figure above) to the side to adapt a fastening strap to the diameter of the mast.
4. Press the tensioning screw against the fastening strap and tighten the tensioning screw, tightening torque 4.5 Nm.

### 3.4.5 Fitting the SCALANCE W786 to a mounting plate

#### Procedure

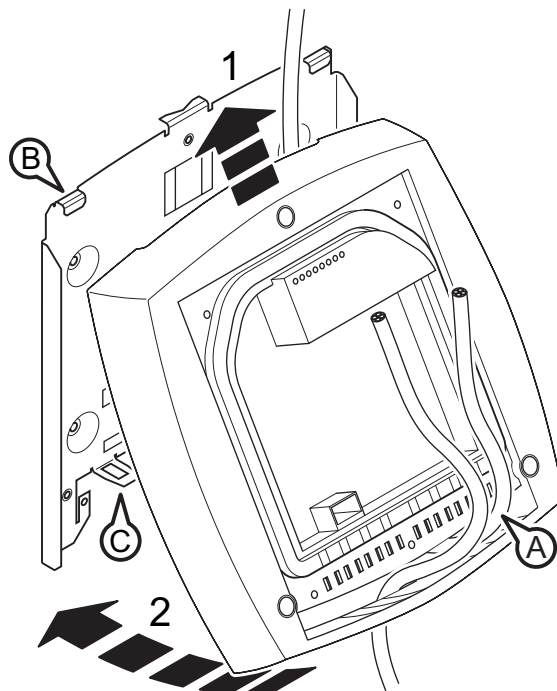


Figure 3-12 Fitting the SCALANCE W786 to a mounting plate

Follow the steps below to fit a SCALANCE W786 to a mounting plate:

1. Lead the cables into the housing of the SCALANCE W786 (position **A** in the figure above). Note the information in the section "Connecting up cables".
2. Fit the SCALANCE W786 so that the upper edge of the rear of the housing is below the two catches of the mounting plate (position **B** in the figure above).
3. Push in the SCALANCE W786 until it engages in the notches at the lower edge of the mounting plate (position **C** in the figure above).

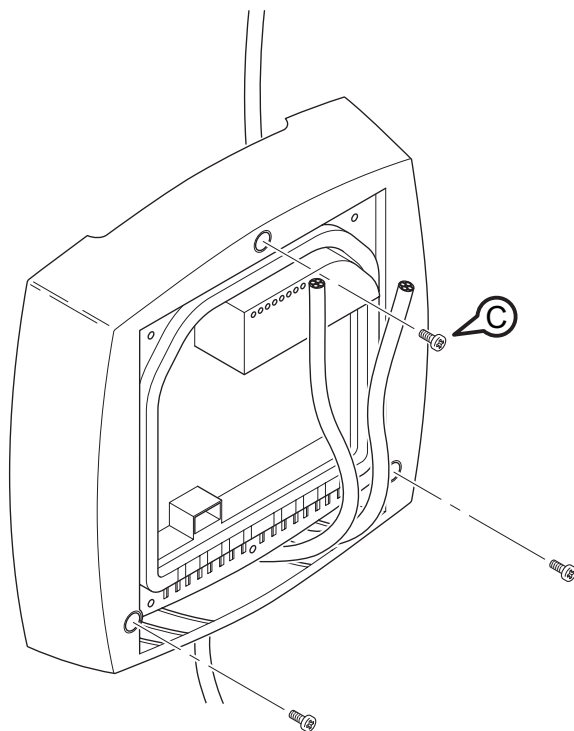


Figure 3-13 Screwing a SCALANCE W786 to a mounting plate

4. Screw the SCALANCE W786 using the three M4 screws supplied with the mounting plate (position **D** in the figure above), tightening torque 1.8 Nm.

## 4.1 Lightning protection, power supply, and grounding

### Notes on lightning protection



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**Warning**

Antennas installed outdoors must be within the area covered by a lightning protection system. Make sure that all conducting systems entering from outdoors can be protected by a lightning protection potential equalization system.

When implementing your lightning protection concept, make sure you adhere to the VDE 0182 or IEC 62305 standard.

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A suitable lightning conductor is available in the range of accessories of SIMATIC NET Industrial WLAN:

Lightning Protector LP798-1PRO (order no. 6GK5798-1LP00-0AA6)

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**Warning**

Installing this lightning protector between an antenna and a SCALANCE W7xx is not adequate protection against a lightning strike. The LP798-1PRO lightning protector only works within the framework of a comprehensive lightning protection concept. If you have questions, ask a qualified specialist company.

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**Note**

The requirements of EN61000-4-5, surge immunity tests on power supply lines, are met only when a Blitzductor is used with 24 V DC and 48 V DC:

24 V DC: VT AD 24V type no. 918 402

48 V DC: Type no. 919 545 and 919 506 (holder)

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

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### Safety extra low voltage



#### Warning

SCALANCE W78x devices are designed for operation with a directly connectable safety extra-low voltage or with the power supply adapters available as accessories. Therefore only safety extra-low voltage (SELV) with limited power source (LPS) complying with IEC950/EN60950/VDE0805 may be connected to the power supply terminals (exception: Power supply adapter for 110 - 230 V AC).

The power supply unit to supply the SCALANCE W788 / W74x must comply with NEC Class 2 (voltage range 18 - 32 V DC, current requirement 1 A)

The power supply unit to supply the SCALANCE W786 must comply with NEC Class 2 (voltage 48 V DC, current requirement 0.3 A)

The device may only be supplied by a power supply unit that meets the requirements of class 2 power sources of the "National Electrical Code, table 11 (b)". If the power supply is designed redundantly (two separate power supplies), both must meet these requirements.

Exceptions:

- Power supply with PELV (according to VDE 0100-410) is also possible if the generated rated voltage does not exceed the voltage limits 25 V AC or 60 V DC.
- Power supply by a SELV power source (according to IEC 60950) or PELV power source (according to VDE 0100-410) without limited power is also permitted if suitable fire protection measures are taken by:
  - Installation in a cabinet or suitable enclosure
  - Installation in an appropriately equipped and closed operating area

### Earthing

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#### Caution

There must be no potential difference between the following parts otherwise there is a risk that the device will be destroyed:

- Ground potential of the power supply and ground potential of the antenna ground.
- Ground potential of the power supply and a grounded housing.
- Ground potential of the power supply and the ground potential of the device connected to Industrial Ethernet (for example PC, AS-300, AS-400 etc.)

Connect both grounds to the same foundation earth or use an equipotential bonding cable.

---

## 4.2 Suitable cables for the SCALANCE W786

### Cable specification

The following table lists the requirements for a cable depending on the use case.

Application	Specification
Direct 48 V DC supply	<ul style="list-style-type: none"> <li>Round cable cross-section with 6 to 8 mm diameter.</li> <li>Permitted tensile load at least 100 N.</li> </ul>
Power supply adapter 12 - 24 V DC	<ul style="list-style-type: none"> <li>Round cable cross-section with 6 to 8 mm diameter.</li> <li>Permitted tensile load at least 100 N.</li> </ul>
Power supply adapter 110 - 230 V AC	<ul style="list-style-type: none"> <li>Round cable cross-section with 6 to 8 mm diameter.</li> <li>Three-core cable with 0.5 - 2.5 mm<sup>2</sup> cross section of the individual cores.</li> <li>Permitted tensile load at least 100 N.</li> </ul>
Ethernet	IE FC TP Standard Cable GP 2 x 2 (type A) Order no. 6XV1 840-2AH10 IE TP Torsion Cable 2 x 2 (type C) Order no. 6XV1 870-2F IE FC TP Trailing Cable 2 x 2 (type C) Order no. 6XV1 840 3AH10
Multimode FO cable	FO Standard Cable GP Order no. 6XV1 873-2A Minimum bending radius 65 mm. You will find detailed information on preassembled cable lengths and connectors in the catalog "IK PI".
Antenna connector	IWLAN antenna extension cable FRNC Length 5 m Order no. 6XV1 875-3FH50 Length 15 m Order no. 6XV1 875-3FN15



## 4.3 Connecting the cables

### Procedure



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#### Warning

##### Danger from line voltage

If the housing is not perfectly sealed, there is a danger to life due to the line voltage if the SCALANCE W786 is subjected to spray water or dampness. Make sure that you keep to the following safety rules.

- Before connecting up, turn off the power supply.
  - The sealing of the cable feedthroughs of the SCALANCE W786 is only assured when the cable has a suitable diameter and adequate tensile strength. Only use cables that meet the specifications in the section "Cables for the SCALANCE W786". When connecting up a FO cable, make sure that you use the sealing sleeve supplied with the SCALANCE W786.
  - Never wrap insulating tape, adhesive tape or other materials around thinner cables to achieve the required diameter. In this case, neither the housing seal nor the strain relief clamps can fulfill their function.
  - Close all unused openings in the housing seal with the sealing plugs supplied with the SCALANCE W786. Do not use fillers or any other material under any circumstances.
-

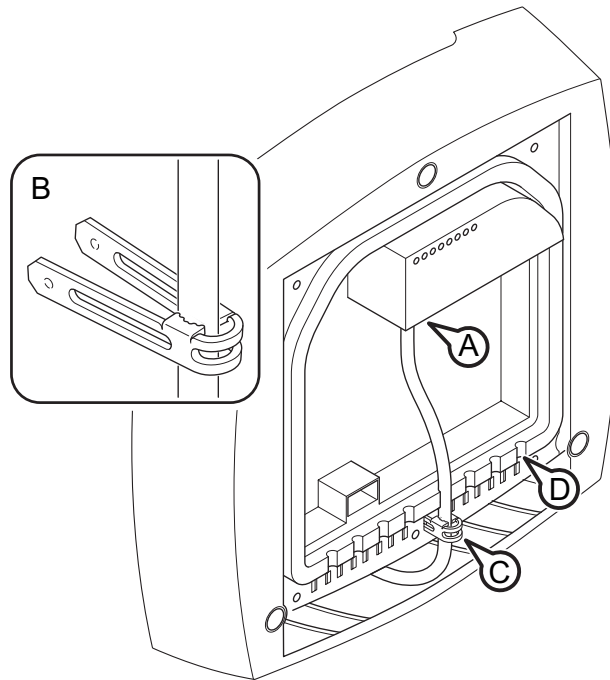


Figure 4-1 Connecting a cable and fitting the strain relief clamps

Follow the steps below to connect cables to the SCALANCE W786.

1. Connect the cables to the appropriate contacts. (Position **A** in the figure above) You have the following options:
  - Connect cables preassembled with a connector (Ethernet, antennas) by inserting the connector into the appropriate socket. Secure antenna cables by tightening the sleeve nut of the connector (key size SW8). You will find more information on this topic in the sections "Connection for Industrial Ethernet" and "Connections for external antennas".
  - 48 V DC power supply. Use the connector supplied with the SCALANCE W786. For details of the terminal assignment, refer to the section "Connectors for the power supply".
  - 12 - 24 V DC or 110 - 230 V AC power supply. With these power supplies, you require a power supply adapter (do not ship with the SCALANCE W786). You will find more information in the section "Connecting a power supply adapter".
2. Fit a strain relief clamp to the connected cable. The toothed part of the clamp must enclose the cable completely (as shown by position **B** in the figure above).
3. Press the strain relief clamp into the housing until the cable is located completely in the opening in the housing seal (position **C** in the figure above).

4. Seal all openings not required for cables with sealing plugs (position **D** in the figure above). There are two versions of sealing plug:

**Short type**

The upper end face of a dummy plug must be located below the cover plate (position **E** in the figure below).

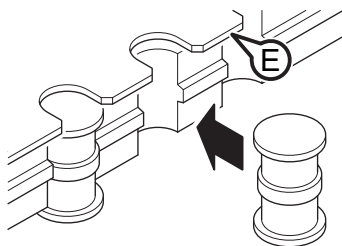


Figure 4-2 Location of the sealing plugs below the cover plate

**Long design**

Fit these sealing plugs in a strain relief clamp. The lower surrounding notch must be enclosed by the tothing of the strain relief clamp (as shown in the figure below). Press the strain relief clamp into the housing until the dummy plug is located completely in the opening of the housing seal.

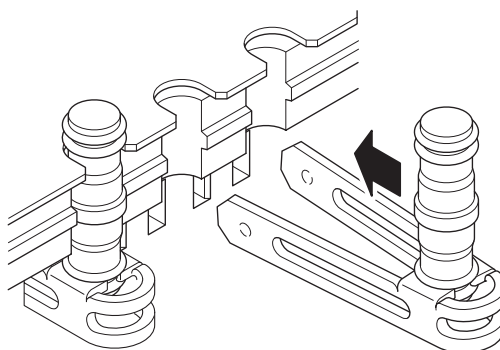


Figure 4-3 Securing a long sealing plug with a strain relief clamp

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**Note**

Keep unused sealing plugs and strain relief clamps for later use.

---

### Points to note when connecting an FO cable

The FO cable specified for use with the SCALANCE W786 does not have a circular cross section. As a result, remember the following points when connecting up such cables.

### Sealing sleeve

Fit the sealing sleeve at the point where the cable goes through the housing seal. Only then will you achieve perfect sealing of the housing. Follow the steps outlined below:

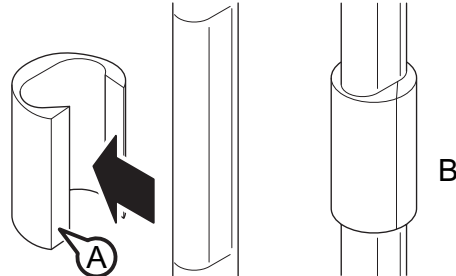


Figure 4-4 Fitting a sealing sleeve to an FO cable

1. Open the sealing sleeve as shown in the figure above and place the FO cable in it.
2. Remove the protective foil (position **A** in the figure above) and join the sealing sleeve together (position **B** in the figure above).

### Strain relief clamp

When you fit the strain relief clamp, make sure that the FO cable is in the correct position. The shorter sides of the cable must make contact with the toothing of the strain relief clamp.

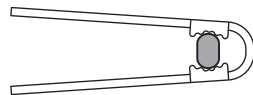


Figure 4-5 View from above with an FO cable inserted in the strain relief clamp

## 4.4 Connectors for the power supply of the SCALANCE W786

### Possible power supplies

The following power supplies are suitable for the SCALANCE W786:

- 48 V DC direct voltage  
Use the two-pin connector supplied with the SCALANCE W786.
- 12 - 24 V DC direct voltage  
Use the power supply adapter 12 - 24 V DC available as an accessory.
- 110 - 230 V DC direct voltage  
Use the power supply adapter 110 - 230 V DC available as an accessory.
- Power over Ethernet (PoE)  
PoE is possible only when voltage is modulated on the data lines (one of the two options named in IEEE 802.3af "phantom power") because all Ethernet cables specified for the SCALANCE W786 have four cores.

### Procedure for connecting the supplied connector for 48 V DC

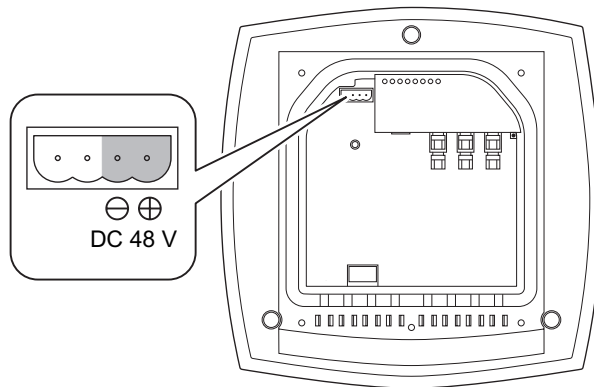


Figure 4-6 Position of the opening in the housing for the power supply with the housing cover removed

Perform the following steps to connect a 48 V DC cable to a SCALANCE W786:

1. Connect the supplied connector to the 48 V DC cable. The figure above shows the location of the socket in the housing and the contact assignment. The connector is safe against polarity reversal and can only be inserted in the right-hand half of the housing. When connecting the cores, you should therefore make sure that the connector is oriented as shown in the following figure.

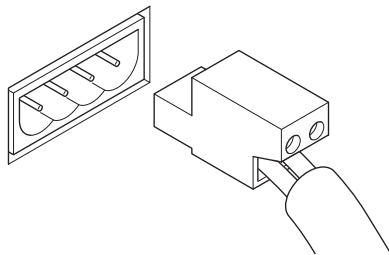


Figure 4-7 Position of the connector when inserted in the socket of the housing

2. Press the connector into the socket in the housing until it engages.
3. Secure the power cable with a strain relief clamp. For more detailed information on this topic, refer to the section "Connecting the cables".

## 4.5 Connecting a power supply adapter

### Input voltage options

The optional power supply adapter is available in two versions:

- Power supply adapter for 24 V DC direct voltage
- Power supply adapter for 110 - 230 V AC alternating voltage

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#### Note

If a SCALANCE W786-3PRO is operated with diversity for three antenna pairs, the power for 24 V DC cannot be supplied redundantly. In this case, there is no further opening in the housing for a second power cable.

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### How to fit the power supply adapter

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#### Warning

##### Danger from line voltage

Power supply cables may only be connected when the power is turned off!  
Start up the SCALANCE W786 only after screwing the housing cover in place again so that protection from touching live parts is restored!

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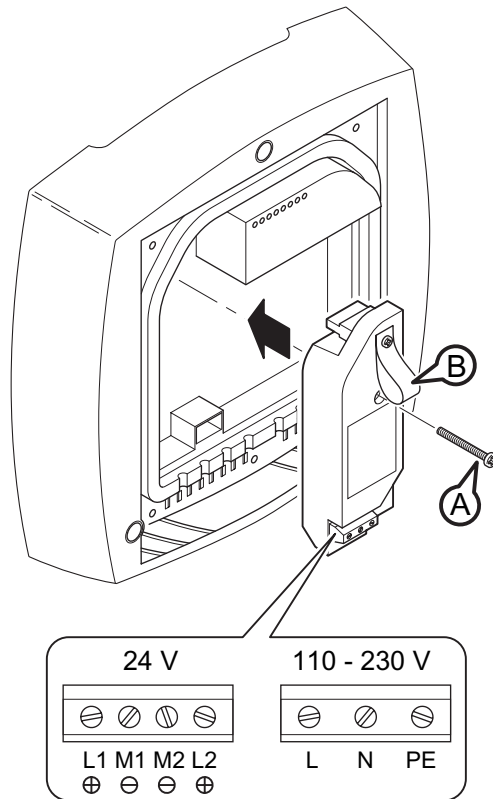


Figure 4-8 Using a power supply adapter in a SCALANCE W786

Follow the steps below to fit and connect a power supply adapter:

1. Fit the power supply adapter in the SCALANCE W786 as shown in the figure above. The connector on the rear of the power supply adapter must engage fully in the socket of the housing. The entire rear surface of the power supply adapter must make contact with the inner surface of the SCALANCE W786.

---

**Caution**

Only use the loop (position **B** in the figure above) to remove the power supply adapter from the SCALANCE W786! This prevents the connector skewing on the back of the power supply adapter and breaking off.

---

2. Connect the power supply adapter and the SCALANCE W786 with the screw supplied with the power supply adapter (position **A** in the figure above).



3. Connect the cable for the power supply. The assignment of the contacts is illustrated in the figure above.
4. Secure the power supply cable with a strain relief clamp. For more detailed information on this topic, refer to the section "Connecting the cables".

#### How to remove the power supply adapter

Follow the steps below to remove a power supply adapter from a SCALANCE W786:



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##### Warning

##### Danger from line voltage

Disconnect power supply cables only when the power to the power supply adapter is turned off!

---

1. Disconnect the power supply cable from the power supply adapter.
2. Loosen the securing screw of the power supply adapter (position **A** in the figure above).
3. Pull the loop (position **B** in the figure above) to remove the connector on the rear of the power supply adapter from the socket in the housing and remove the power supply adapter.

## 4.6 Connection for Industrial Ethernet

### Device variants

With a SCALANCE W786, you have the choice of two Ethernet ports:

- RJ-45 jack
- ST duplex socket for multimode FO cables 1310 nm and a maximum cable length of 3000 m

### Procedure for connecting an Ethernet cable

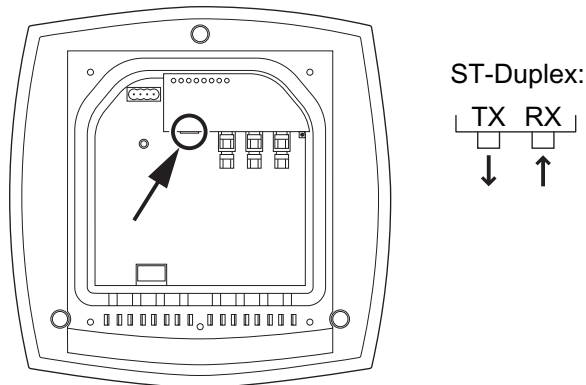


Figure 4-9 Position of the Ethernet port with the housing cover removed

Perform the following steps to connect an Ethernet cable to a SCALANCE W786:

1. Insert the connector of the Ethernet cable in the corresponding socket of the SCALANCE W786. If you use FO cables, make sure that the transmit and receive lines are correctly connected. The location of the socket for RX and TX is shown in the figure above.
2. Secure the Ethernet cable with a strain relief clamp. For more detailed information on this topic, refer to the section "Connecting the cables".

## 4.7 Connectors for external antennas

### How to connect external antennas

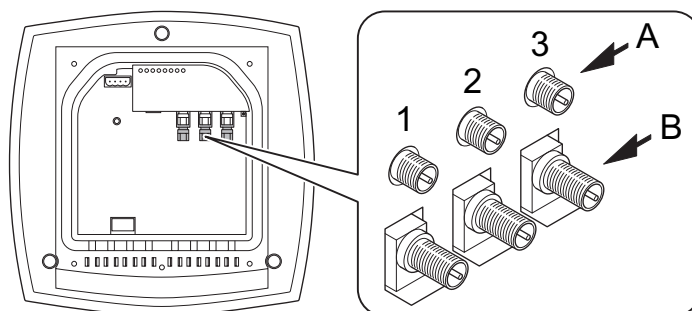


Figure 4-10 Position of the ports for external antennas with the housing cover removed

For each WLAN port, there are two R-SMA sockets on a SCALANCE W786 to connect external antennas. The figure above shows how the R-SMA sockets are assigned to the WLAN ports. With a SCALANCE W786-1PRO, only the socket pair labeled "1" exists; with a SCALANCE W786-2PRO the sockets labeled "1" and "2" exist.

Perform the following steps to connect a cable for an external antenna to a SCALANCE W786:

1. Insert the connector on the antenna cable into the R-SMA socket and tighten the sleeve nut on the socket (key size SW8), tightening torque 0.6 Nm. If you want to use a port for two antennas, connect the line for antenna "B" first. After connecting the cable for antenna "A", the socket for "B" is not easy to reach.
2. Screw a terminating resistor to the unused socket if you use only one antenna on a port.
3. Secure the antenna cable(s) with a strain relief clamp. For more detailed information on this topic, refer to the section "Connecting the cables".

## 4.8 Inserting / removing the C-PLUG

### Inserting the C-PLUG

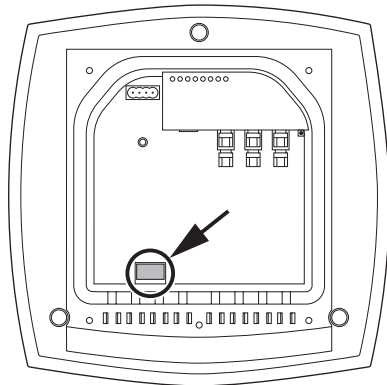


Figure 4-11 Location of the C-PLUG with the housing cover removed

The housing of the C-PLUG has a protruding ridge on the long side. The C-PLUG can only be inserted when this ridge is at the top right. The slot in the SCALANCE W786 has a corresponding groove at this position. Make sure that the C-PLUG is inserted completely into the slot.

### Removing the C-PLUG

Insert a screwdriver between the right-hand front edge of the C-PLUG and the slot and release the C-PLUG.



## Technical data

### 5.1 SCALANCE W786 technical specifications

#### Data transfer

Ethernet transfer rate	10/100 Mbps
Wireless transmission rate	1 ... 54 Mbps (108 Mbps)
Wireless standards supported	802.1x 802.11a 802.11b 802.11e 802.11g 802.11h 802.11i
Power supply standards supported	802.3af (Power over Ethernet)

#### interfaces

Power	<ul style="list-style-type: none"> <li>• 48 V DC supply via supplied connector</li> <li>• RJ-45 jack Power over Ethernet (48 V DC)</li> <li>• 2 x 24 V DC supplies with optional power supply adapter (available as accessory)</li> <li>• 110 - 230 V AC with optional power supply adapter (available as accessory)</li> </ul>
Data	<ul style="list-style-type: none"> <li>• RJ-45 jack for Ethernet or on devices for FO cable: 1 x 2 BFOC sockets</li> <li>• depending on version, up to six R-SMA antenna sockets</li> </ul>

**Electrical data**

Power consumption depending on power supply	PoE	12.9 W
	48 V DC	12.9 W
	24 V DC (adapter)	15 W
	110 - 230 V AC (adapter)	15 W

**Construction**

Dimensions (W x H x D)	251 mm x 251 mm x 72 mm	
Weight (version with three IWLAN ports)	Without power supply adapter	2241 g
	With power supply adapter 24 V DC	2428 g
	With power supply adapter 110 - 230 V AC	2433 g

**Permitted ambient conditions**

Operating temperature	-40°C ... 70°C
	Devices with fiber optic cable: -25°C ... 70°C
Transport/storage temperature	-40°C ... 85°C
Degree of protection	Tested to IP65

**MTBF information (mean time between failure)**

SCALANCE W786	MTBF 61 years
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## 5.2 Permitted antennas

### Accessories for SCALANCE W-700

**Note**

When you select an antenna, keep in mind the national approvals for your SCALANCE W7xx.

Characteristics	Type	Frequency / GHz	Antenna gain / dBi	Impedance / $\Omega$	Order No.
Omni	ANT795-6MN	2,4	6	50	6GK5795-6MN00-0AA6
		5	8		
Omni	ANT792-6MN	2,4	6	50	6GK5792-6MN00-0AA6
Omni	ANT793-6MN	5	6	50	6GK5793-6MN00-0AA6
Patch	ANT795-6DN	2,4	9	50	6GK5795-6DN00-0AA6
		5	9		
Directional antenna	ANT792-8DN	2,4	14	50	6GK5792-8DN00-0AA6
Directional antenna	ANT793-8DN	5	18	50	6GK5793-8DN00-0AA6
Helix (for RCoax)	ANT792-4DN	2,4	4	50	6GK5792-4DN00-0AA6
$\lambda/8$ (for RCoax)	ANT793-4MN	5	6		6GK5793-4MN00-0AA6
RCoax	IWLAN RCoax PE 1/2" 2.4 GHz	2,4	0	50	6XV1875-2A
RCoax	IWLAN RCoax PE 1/2" 5 GHz	5	0	50	6XV1875-2D





## Certification

### 6.1 Approvals for SCALANCE W786

#### CE conformity

The products

SIMATIC NET SCALANCE W786-1PRO  
SIMATIC NET SCALANCE W786-2PRO  
SIMATIC NET SCALANCE W786-3PRO

in the version put into circulation by Siemens A&D meets the regulations of the following European directives:

- 99/5/EC  
Directive of the European Parliament and of the Council on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity. Conformity with the basic requirement of the directive is attested by adherence to the following standards:
- EN 60950  
Safety of information technology equipment
- EN 301489-1  
Electromagnetic compatibility for radio equipment and services
- EN 301489-17  
Specific requirements for broadband data transmission systems and for equipment in local high-performance wireless networks (HIPERLAN)
- EN 300328  
Electromagnetic compatibility and radio spectrum issues
- EN 301893  
Broadband radio access networks (BRAN) – 5 GHz high-performance RLAN
- EN 50371  
Compliance of low power electronic and electrical apparatus with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)
- 1999/519/EC  
Council recommendation on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)

Devices connected to the system must meet the relevant safety regulations.

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

Siemens Aktiengesellschaft  
Automation and Drives  
Industrielle Kommunikation  
Postfach 4848  
D-90327 Nürnberg

This declaration certifies compliance with the directives named above, but does not guarantee any specific properties.

## Declaration of Conformity

SCALANCE W786

[Bescheinigung steht noch aus]

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### **Note**

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

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### FCC approval

This device complies with Part 15 of the FCC Rules

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

IEEE802.11b or g operation of this product in the USA is firmware-limited to channels 1 through 11.

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#### Notice

Changes or modifications made to this equipment not expressly approved by SIEMENS may void the FCC authorization to operate this equipment.

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This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

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#### Notice

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body.

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### **This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.**

Professional Installation Notice:

To comply with FCC part 15 rules in the United States, the system must be professionally installed to ensure compliance with the Part 15 certification. It is the responsibility of the operator and professional installer to ensure that only certified systems are deployed in the United States. The use of the system in any other combination (such as co-located antennas transmitting the same information) is expressly forbidden.

**RSS-210 of Industry Canada**

"Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device."

"This device has been designed to operate with the antennas listed below, and having a maximum gain of 18 dBi. Antennas not included in this list or having a gain greater than 18 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms."

"To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication."

"That the device for the band 5150-5250 MHz is only for indoor usage to reduce potential for harmful interference to co-channel mobile satellite systems."

"Users should also be cautioned to take note that high power radars are allocated as primary users (meaning they have priority) of 5250-5350 MHz and 5650-5850 MHz and these radars could cause interference and/or damage to LE-LAN devices."

## 6.2 SCALANCE W786 national approvals

### National approvals


Below, you will find the channels approved by the Institute of Electrical and Electronics Engineers, Inc. (IEEE) that can be used by SCALANCE W-786 devices for 802.11h mode.



The channels approved for the standards 802.11a/b/g are not listed and are enabled for operation in specific countries based on the configuration.


Countries in which there is no approval according to the IEEE 802.11h standard are not listed.

Column	Description
Country	Country
Mode	IEEE 802.11 standard and the TPC and / or DFS functionality, where required
CH	Channel
MHz	Frequency
PWR (EIRP)	Maximum permitted effective isotropic radiated power
Use	Permitted use indoors and / or outdoors

The SCALANCE W786 products are approved in the following countries:

Country	Mode	CH	MHz	PWR (EIRP)	Use	
Belgium 	11b 11g g-Turbo	1	2412	100 mW	Indoor only	
		-	-			
	11a	13	2472	60 mW	Indoor only	
		36	5180			
	TPC	-	-	200 mW	Indoor only	
		48	5240			
	11h	DFS+TPC	36	5180	1000 mW	Indoor + outdoor
			-	-		
	DFS+TPC	64	5320	1000 mW	Indoor + outdoor	
		100	5500			
		-	-			
		140	5700			

Country	Mode	CH	MHz	PWR (EIRP)	Use	
Denmark	11b 11g	1	2412	100 mW	Indoor + outdoor	
Germany	g-Turbo	-	-			
Finland		13	2472			
Great Britain	11a				Indoor only	
Italy	TPC	36	5180	60 mW		
The Netherlands		-	-			
Austria		48	5240			
Sweden	11h					
Switzerland	DFS+TPC	36	5180	200 mW	Indoor only	
Spain		-	-			
	DFS+TPC	100	5500	1000 mW	Indoor + outdoor	
		-	-			
		140	5700			
France 	11b 11g	1	2412	100 mW	Indoor + outdoor	
	g-Turbo	-	-			
		7	2442		100 mW	
		8	2447			
		-	-			
		13	2472			
	11a				60 mW	
	TPC	36	5180			
		-	-			
		48	5240			
	11h				200 mW	
	DFS+TPC	36	5180			
		-	-			
	64	5320				
	DFS+TPC	100	5500	1000 mW	Indoor + outdoor	
		-	-			
		140	5700			
Canada	11b 11g	1	2412	1000 mW	Indoor + outdoor	
	g-Turbo	-	-			
		11	2462			
	11a				200 mW	
	TPC	36	5180			
		-	-			
		48	5240			
		TPC	149	5745	1000 mW	Indoor + outdoor
			-	-		
			165	5825		
	11a-Turbo				200 mW	
TPC	42	5210				
	-	-				
	TPC	152	5760	1000 mW	Indoor + outdoor	
	TPC	160	5800	1000 mW		

Country	Mode	CH	MHz	PWR (EIRP)	Use	
United States of America 	11b 11g g-Turbo	1	2412	1000 mW	Indoor + outdoor	
		-	-			
	11a	TPC	11	2462	200 mW	Indoor only
			36	5180		
	TPC	-	-	1000 mW	Indoor + outdoor	
		48	5240			
	11a-Turbo	TCP	149	5745	1000 mW	Indoor + outdoor
			-	-		
	TCP	TPC	165	5825	1000 mW	Indoor + outdoor
			42	5210		
152			5760			
	TPC	160	5800	1000 mW	Indoor + outdoor	





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