

# ConneXium WiFi

TCSG, TCSN

User Installation Manual

TCSGWA272, TCSNWA271, TCSNWA2A1, TCSNWA271F,  
TCSGWA242, TCSGWC241, TCSGWA242F, TCSNWA241,  
TCSNWA241F

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# About this Manual

## Validity Note

The data and illustrations found in this book are not binding. We reserve the right to modify our products in line with our policy of continuous product development. The information in this document is subject to change without notice and should not be construed as a commitment by Schneider Electric.

## Product Related Information

Schneider Electric assumes no responsibility for any errors that may appear in this document. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, please follow the relevant instructions.

Failure to use Schneider Electric software or approved software with our hardware products may result in improper operating results.

Failure to observe this product related warning can result in injury or equipment damage.

## User Comments

We welcome your comments about this document. You can reach us by e-mail at [techpub@schneider-electric.com](mailto:techpub@schneider-electric.com)

## Related Documents

Title of Documentation	Reference-Number
ConneXium WiFi TCSG,TCSN Configuration and Administration Guide	S1A31559
ConneXium WiFi TCSG,TCSN Operation and Maintenance Guide	S1A31553
ConneXium WiFi TCSG,TCSN Quick Start Guide	S1A31547
ConneXium WiFi TCSG, TCSN User Installation Guide	S1A31526
ConneXium WiFi TCSG,TCSN Command Line Interface	S1A31521
ConneXium WiFi TCSG, TCSN Outdoor Installation Guide	S1A31531
ConneXium WiFi TCSG, TCSN Antenna Guide	S1A56438
ConneXium WiFi 2.4 GHz Omni Directional Antenna - TCSWAB2O Mounting Instructions	S1A50472
ConneXium WiFi 5 GHz Omni Directional Antenna - TCSWAB5O Mounting Instructions	S1A50473
ConneXium WiFi Dual band Hemispherical Antenna - TCSWABDH Mounting Instructions	S1A50474
ConneXium WiFi 2.4 GHz Directional Antenna - TCSWAB2D Mounting Instructions	S1A50475
ConneXium WiFi 5 GHz Medium & Very Directional Antennas - TCSWAB5x Mounting Instructions	S1A50476
ConneXium WiFi 2.4 GHz, 5 GHz Dual Slant , MiMo 11n Antennas - TCSWABxS, TCSAB5DN Mounting Instructions	S1A50480
ConneXium WiFi Dual band Omni Directional 11n Antenna - TCSWABDON Mounting Instruction	S1A50481
ConneXium WiFi Over Voltage Protector - Antenna - TCSWABP Mounting Instructions	S1A50482
ConneXium WiFi Over Voltage Protector - LAN/PoE - TCSWABP68 Mounting Instructions	S1A50483
ConneXium WiFi Memory Card IP40,IP67 and ATEX Modules - TCSWAMCD, TCSWAMC67	S1A50484

**Note:** The Glossary is located in the TCSG, TCSN Configuration and Administration Guide.

## **TCSG,TCSN Configuration and Administration Guide**

The "TCSG,TCSN Configuration and Administration Guide" contains information about creating basic configurations for specific use cases and detailed information regarding all the configurable parameters.

## **TCSG,TCSN Operation and Maintenance Guide**

The "TCSG,TCSN Operation and Maintenance Guide" contains information about using the LANConfig, Webconfig and local area LANmonitor software tools to operate and maintain ConneXium WiFi Devices.

## **TCSG,TCSN Quick Start Guide**

The "TCSG,TCSN Quick Start Guide" contains information about how to get started with a new out of the box Connexium WiFi Device.

## **TCSG,TCSN User Installation Guide**

The "TCSG, TCSN User Installation Guide" contains a device description, safety instructions, a description of the display, and the other information that you need to install the device.

## **TCSG,TCSN Command Line Interface Reference Manual**

The "TCSG, TCSN Command Line Interface Reference Manual" contains detailed information on using the Command Line Interface to operate the individual functions of the device.

## **TCSG, TCSN Outdoor Installation Guide**

The "TCSG, TCSN Outdoor Installation Guide" contains basic information about planing, mounting and installing wireless LAN systems in an outdoor environment.

## **Antenna Mounting Instruction**

The antenna mounting instructions contain information you need to mount the antennas/accessories.

## **TCSG, TCSN Antenna Guide**

The "TCSG, TCSN Antenna Guide" contains an overview of the available antennas, over voltage protectors, adaptor cable and antenna cables. This guide helps you to find the suitable accessories for your wireless LAN application.



# Key

The symbols used in this manual have the following meanings:

---

▶	Listing
□	Work step
■	Subheading

---

# Safety instructions

## ■ Important Information

**Notice:** Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.



## **DANGER**

**DANGER** indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.



## **WARNING**

**WARNING** indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

**PLEASE NOTE:** Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

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## ■ Usage

The device may only be employed for the purposes described in the catalog, technical description, and manuals.

## ■ Supply voltage

- Apply supply voltage to the device if terminal blocks are wired and installed correctly as described in chapter [“Connecting the supply voltage”](#) on [page 47](#).

The devices are designed for operation with extra-low voltage (SELV). Accordingly, SELV circuits with voltage restrictions in accordance with IEC/EN 60950-1 may be connected to the supply voltage connectors.

- Use undamaged parts.
- For TCSNWA241 and TCSNWA241F: The DC power supply line should not exceed 3 meters (118.11 inches).

## **WARNING**

### **LOSS OF CONTROL**

Berücksichtigen Sie bei der Planung der Steuerungsschemata mögliche Ausfälle der Steuerungspfade. Stellen Sie dabei für bestimmte kritische Steuerungsfunktionen entsprechende Mittel bereit, um während und nach einem Pfadausfall einen sicheren Zustand zu gewährleisten. Beispiele für kritische Steuerungsfunktionen sind Notfall-Stopp, Überfahr-Stopp, Stromausfall und Neustart.

Für kritische Steuerungsfunktionen müssen getrennte oder redundante Steuerungspfade verfügbar sein.

Systemsteuerungspfade können Datenlinks enthalten. Berücksichtigen Sie deshalb die Auswirkungen von unvorhergesehenen Übertragungsverzögerungen oder -ausfällen der Links.

Beachten Sie die Unfallverhütungsvorschriften und die lokalen Sicherheitsrichtlinien. <sup>a</sup>

Überprüfen Sie jede Implementierung dieser Anlage einzeln gründlich auf Funktionsfähigkeit und Betriebssicherheit, bevor Sie sie in Betrieb nehmen.

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

- a. Weitere Informationen finden Sie in den Richtlinien NEMA ICS 1.1 (neueste Ausgabe), „Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control“, sowie NEMA ICS 7.1 (neueste Ausgabe), „Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems“, bzw. in den entsprechenden vor Ort geltenden Bestimmungen.
- Use a cable cross-section of at least 1.0 mm<sup>2</sup> (for North America, AWG 16) for the current conductor at the voltage input.
  - Relevant for North America: For use in Class 2 circuits. Only use copper wire/conductors of class 1, 75 °C (167 °F).
  - Relevant for North America: For use in Class 2 circuits. The device may only be connected to a supply voltage of class 2 that fulfills the requirements of the National Electrical Code, Table 11(b). If the voltage is being supplied redundantly (two different voltage sources), the combined supply voltages must fulfill the requirements of the National Electrical Code, Table 11(b).

## ■ Shielding ground

The shield of the connectable twisted pair cables is connected to the metal casing of the device as a conductor.

## ■ Housing

Relevant for Rail-/IP40 types:



# CAUTION

## EQUIPMENT OVERHEATING

When installing the device, make sure any ventilation slots remain free. Maintain a clearance of at least 10 cm (3.94 in).

**Failure to follow these instructions can result in injury or equipment damage.**

Only technicians authorized by the manufacturer are permitted to open the housing.

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

### IP67 types:

A separate screw connector on the housing is provided for the functional ground (FE). This is indicated by the functional ground symbol (⊕). The functional ground is electrically connected to the switching ground and the metal housing of the device.

### Rail / IP40 types:

The lower panel of the device housing is grounded by means of the DIN rail.

## ■ Environment

Refer to Chapter 4 “[Technical data](#)” for environmental considerations.

### Relevant for use in Ex zone 2 according to ATEX 95 (ATEX 100a):

Only products labeled accordingly may be operated in Ex zone 2. When operating the TCSNWA2A1 types in Ex zone 2, the following applies:



II 3G  
Ex nA II T4 -20°C ... +55°C  
KEMA 10 ATEX 0133 X

Temperature Code T4	Ambient -20 °C ... +55 °C
List of Standards	EN 60079-0: 2006
	EN 60079-15: 2005
	CLC/TR 50427: Dez. 2004

DO NOT OPEN THE DEVICE WHEN IT IS ELECTRICALLY CHARGED.  
DO NOT DETACH ANY CONNECTORS WHEN THE DEVICE IS  
ELECTRICALLY CHARGED.  
DO NOT REMOVE THE LABELED HOUSING COVER.



## **DANGER**

### **EXPLOSIVE ENVIRONMENT**

Do not open this device or detach any connectors when the device is electrically charged.

Do not remove the labeled housing cover.

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

- The TCSNWA2A1 modules are delivered with the housing cover installed. Remove the cover to make connections, then replace the cover prior to operation.

### **Special conditions for safe use**

- Provisions shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 40 %.
- When the temperature under rated conditions exceeds 70 °C at the cable or conduit entry point, or 80 °C at the branching point of the conductors, the temperature specification of the selected cable shall be in compliance with the actual measured temperature values.

### **■ Lightning protection**

When you mount devices and / or antennas outdoors, there is a risk of them being struck by lightning. Additionally, there is the risk of voltage surges being transmitted into the interior of the building. It is your responsibility to take appropriate measures to mitigate the effects of lightning strikes. Make sure the equipment is installed by a licensed electrician in accordance with local, regional and national regulations for codes and standards (such as VDE 0182 and IEC 62305) and according to best practices for your application and environment.



## DANGER

### LIGHTNING STRIKE AND VOLTAGE SURGES

Protect devices or antennas installed outdoors using lightning arrester devices, such as lightning rods.

Install over voltage protector devices on every cable.

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

#### ■ CE marking

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

1999/5/EC

Directive of the European Parliament and the council for radio installations and telecommunication systems and for the mutual recognition of their conformity.

This directive also contains the goals of directive 2004/108/EC of the European Parliament and the council for standardizing the regulations of member states relating to electromagnetic compatibility, and directive 2006/95/EC of the European Parliament and the council for standardizing the regulations of member states relating to electrical equipment to be used within specific voltage ranges, but without applying the lower voltage threshold.

**CE** This product may be operated in all EU states (EU = European Union) under the condition that it has been configured correctly.

In accordance with the above-named EC directive (EC = European Community), the EC conformity declaration will be at the disposal of the relevant authorities at the following address:

Schneider Electric  
35 rue Josep Monier  
CS 30323  
92506 Rueil-Malmaison  
France

This product can be used in living areas (living area, place of business, small business) and in industrial areas.

#### ■ Information on using devices in motor vehicles (E1)

Some variants of the devices are E1-certified. Only operate suitably labeled products in motor vehicles.



## DANGER

### HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Remove the Ethernet cable that provides PoE to disconnect power before installing or removing any hardware and cables.

Always use a properly rated voltage sensing device to confirm that power is off.

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



## CAUTION

### EQUIPMENT DAMAGE

In a PoE installation, use only devices that adhere to the 802.3af standard.

**Failure to follow these instructions can result in injury or equipment damage.**

**Note:** To meet the requirements of directive 1999/5/EG (R&TTE directive) when operating the device in a motor vehicle, do one of the following:

- ▶ Supply the power to the device via a Power over Ethernet (PoE) Switch or via a power unit that conforms to IEEE 802.3af. You will find information on PoE-compatible Switches from Schneider Electric at [www.schneider-electric.com](http://www.schneider-electric.com)
- ▶ Install an upstream filter on the 24V DC power supply. You will find information on suitable filters at [www.schneider-electric.com](http://www.schneider-electric.com).

**Note:** If you are using an E1-certified device in a vehicle and want to be able to drive the vehicle freely within the EU, set the country profile for Germany. This country profile is identical to all the country profiles for EU countries. Do not, however, use any special frequencies, such as BFWA.

### ■ FCC note:

This device complies with part 15 of the FCC rules.

Operation is subject to the following two conditions:

- ▶ This device may not cause harmful interference, and
- ▶ This device must accept any interference received, including interference that may cause undesired operation.

**Note:** 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.

**Important note:**

This equipment complies with FCC and IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 40 cm (15.8 in) between the radiator and your body.

The antenna used for this transmitter must not be co-located with any other transmitters within a host device, except in accordance with FCC multi-transmitter product procedures.

This transmitter is restricted to indoor use only within the 5.15-5.25 GHz band to reduce potential for harmful interference to co-channel mobile satellite systems.

This Class B digital apparatus complies with Canadian ICES-003.  
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

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.

This device has been designed to operate with the antennas listed below in point-to-multipoint systems, and having a maximum gain of 9 dBi:



Device model	Antennas operating with this device model
TCSGWA242F	TCSWAB2O TCSWAB5O TCSWABDH TCSWAB2S TCSWAB5S TCSWABC5 TCSWABC10

*Table 1: Antennas for use in point-to-multipoint systems*

The antennas listed below have been designed for use exclusively in fixed point-to-point systems operating in the 2400 MHz to 2483 MHz band:

Device model	Antennas operating with this device model
TCSGWA242F	TCSWAB2D

*Table 2: Antennas for use in fixed point-to-point systems*

Antennas not included in this list are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

■ **Recycling note**

After usage, this product must be disposed of properly as electronic waste, in accordance with the current disposal regulations of your county, state and country.

# 1 System Planning

## 1.1 WiFi devices

### 1.1.1 WiFi access points

Within the ConneXium WiFi offer are several access point devices, providing a choice of:

- ▶ 1 or 2 radios inside the device
- ▶ throughput
- ▶ environmental ruggedness/ingress protection
- ▶ conformance to government-mandated bandwidth restrictions

Access Point Model	Number of Radios	Nominal Throughput	Environmental Ruggedness	Country Restrictions
TCSNWA241	1	up to 300 Mb/s	rated for IP40 <sup>a</sup>	outside U.S. and Canada
TCSGWA242	2	up to 54 Mb/s	rated for IP40	
TCSNWA241F	1	up to 300 Mb/s	rated for IP40	in U.S. and Canada
TCSGWA242F	2	up to 54 Mb/s	rated for IP40	
TCSGWA271	1	up to 300 Mb/s	rated for IP67 <sup>b</sup>	outside U.S. and Canada
TCSGWA272	2	up to 54 Mb/s	rated for IP67	
TCSGWA271F	1	up to 300 Mb/s	rated for IP67	in U.S. and Canada
TCSNWA2A1	1	up to 300 Mb/s	rated for IP67 and ATEX <sup>c</sup>	outside U.S. and Canada

Table 3: ConneXium WiFi Access Point Characteristics

- IP40 indicates that the module has ingress protection against solid particles with a diameter greater than 1 mm (.04 inch). No special protection against ingress of liquids.
- IP67 indicates that the module has ingress protection against dust and immersion in water up to 1 m (3.3 ft).
- ATEX indicates that the device is designed to operate in potentially explosive atmospheres.

Devices rated for IP67 are often used for outdoor installations because of their ability to withstand rain, snow and dust storms. IP40 devices are designed primarily for indoor use, but they can be used outdoors when they are installed inside weather-resistant IP67 enclosures.

Effective throughput for a WiFi device is heavily affected by overhead considerations, particularly power loss due to the distance between the access point and its power source. Often the real throughput over a WiFi link is only half of the specified nominal throughput.

Each radio that operates in an access point requires an antenna.

## 1.1.2 WiFi clients

A client is a radio device that resides in or is connected to a station. The client allows the station to communicate wirelessly with an access point. The PCMCIA card in a laptop that enables the computer to operate wirelessly is a client, and the laptop is the station. Other types of stations might be moving vehicles such as forklifts or I/O modules used in a machine such as a conveyor belt. A client enables its station to operate wirelessly and may enable the station to roam through a Wireless Local Area Network (WLAN) environment without losing its network connection by switching to the next, strongest signal in the access point array.

Any of the ConneXium WiFi access points can be configured as a client. Also offered is two pure limited-functionality client devices, the TCSGWC241 and the TCSGWC241F. These module each have 1 radio, a nominal throughput of 54 Mb/s, and an IP40 rating. The TCSGWC241 is designed for use outside the U.S. and Canada; the TCSGWC241F can be used in the U.S. and Canada.

Each radio in a client device also requires an antenna. Laptop computers frequently have an antenna built into the screen. If you are using a ConneXium WiFi device as a client, you need to select the appropriate ConneXium WiFi antenna(s) for the station. For example, a TCSWABDH hemispherical antenna is designed to mount onto a moving station, e.g., on the roof of a vehicle such as a forklift.

## 1.2 Frequency Bands

ConneXium WiFi devices communicate in the radio spectrum. They operate in defined bandwidths, and they often share that bandwidth space with other devices. The requirements of your application will determine the frequency band in which you choose to operate and the types of ConneXium WiFi devices to select.

### 1.2.1 The ISM Bands

The IEEE manages a series of specifications for local area networking called the 802 family. WiFi devices fall under four 802.11 standards:

Standard	Frequency Band	Transmission Rate
802.11a	5 GHz	up to 54 Mb/s
802.11b	2.4 GHz	5.5 Mb/s 11 Mb/s
802.11g	2.4 GHz	up to 54 Mb/s
802.11n	2.4 and 5 GHz	up to 300 Mb/s

*Table 4: WiFi Frequencies and Speeds*

The 2.4 GHz and 5 GHz bands are reserved for industrial, scientific and medical (ISM) equipment, which uses the radio spectrum for transmitting and receiving data. They are called the ISM bands. Devices operating within the bandwidths shared by ConneXium WiFi devices are usually unlicensed.

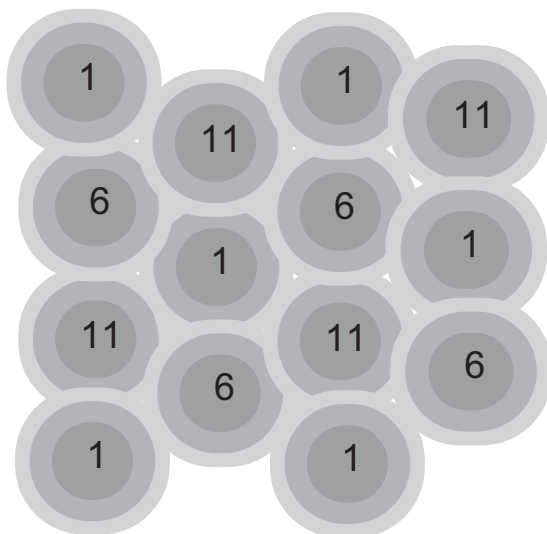
### ■ Working in the 2.4 GHz Band

Signals in the lower-frequency 2.4 GHz band (802.11b, 802.11g, and sometimes 802.11n) can propagate through obstacles such as wood, untempered glass and drywall better than 5 GHz signals. Therefore lower frequency transmissions can travel longer distances and are sometimes needed in locations where clients are separated from access points by walls, windows, high shelves, etc.

The 2.4 MHz bandwidth is such that network throughput often suffers because of device density in the band. Other ISM devices, such as microwave ovens and cordless phones, operate in the band and can take space in the band away from the ConneXium WiFi network.

Another consideration that can make communications slow, particularly when a WLAN requires many access points for coverage, is the limited channel capacity of the 2.4 GHz band. Each access point in the WLAN operates on a channel that you assign it in the configuration process. As a roaming client traverses the WLAN from access point to access point, it should maintain uninterrupted communication.

The 2.4 GHz band provides only 13 channels (only 11 are available in North America), To reduce interference from channel overlap, adjacent channels in the WLAN should be separated by at least 25 MHz. Most users choose to run 3 channels, channels 1, 6, and 11. The illustration below shows an ideal coverage plan where a series of ConneXium WiFi access points broadcasting with omnidirectional antennas are arranged by channel to limit the channel overlap.



This coverage illustration is considered an ideal WLAN layout, but quite often it cannot be installed so cleanly. Walls inside a building or geographical barriers outdoors often deflect the radio wave transmission. The floor plan in your building, the terrain and landscape in an outdoor application, and the presence of other non-WiFi noise in the band need to be anticipated as part of a network plan before your equipment is purchased, then tested thoroughly as part of the installation process. Schneider Electric recommends that you commission a professional site survey (an independent study of your site requirements) to prepare for the installation of a WLAN (see page 37).

### ■ Working in the 5 MHz Band

One clear advantage that a signal in the higher-frequency 5 GHz band (802.11a and sometimes 802.11n) has is the availability of multiple channels that do not overlap. In this radio spectrum, at least 8 channels can be supported cleanly. Another advantage is that the band is not populated by legacy ISM devices, so interference is much less likely.

There are some disadvantages though. Signals in the 5 MHz band operate well when there is a clear and unobstructed line of sight. They do not propagate well through physical obstacles such as interior walls and doors and outdoor traffic and terrain. Also, some client devices, such as the built-in wireless adapters in many laptops, operate only in the 2.4 GHz band.

All of the ConneXium WiFi access point devices are dual-band, i.e., they operate in both the 2.4 MHz and 5 MHz frequency bands. However, you need to be aware of any bandwidth restrictions at your site when you select your antennas because several of them are band-specific.

Here is how the access points perform in terms of transmission rate:

AP Device	802.11a	802.11b	802.11g	802.11n	
TCSNWA241	Yes	Yes	Yes	Yes	(up to 300 Mb/s)
TCSNWA241F					
TCSGWA242	Yes	Yes	Yes	No	(up to 54 Mb/s)
TCSGWA242F					
TCSGWA271	Yes	Yes	Yes	Yes	(up to 300 Mb/s)
TCSGWA271F					
TCSGWA272	Yes	Yes	Yes	No	(up to 54 Mb/s)
TCSGWA2A1	Yes	Yes	Yes	Yes	(up to 300 Mb/s)

Table 5: ConneXium WiFi access point transmission rates

## 1.2.2 Government Regulation of the ISM Bands

Governments control and regulate the allotment of radio spectrum in their airspace. In Europe, for example, band allocation is managed by the European Radiocommunications Office (ERO), and in the United States and Canada by the Federal Communications Commission (FCC).

If your ConneXium WiFi network is being designed to operate in the United States or Canada, different access point modules are needed than if your network is located in Europe, Asia, or Australia:

AP Device	U.S./Canada	Other Countries	IP67 <sup>a</sup>	ATEX <sup>b</sup>
TCSNWA241	No	Yes	No	No
TCSGWA242				
TCSNWA241F	Yes	No	No	No
TCSGWA242F				
TCSGWA271	No	Yes	Yes	No
TCSGWA272				
TCSGWA271F	Yes	No	Yes	No
TCSGWA2A1	No	Yes	Yes	Yes

Table 6: ConneXium WiFi access points by country and application environment

- IP67 indicates that the module has ingress protection against dust and immersion in water up to 1 m.
- ATEX indicates that the device is designed to operate in potentially explosive atmospheres.

## 1.2.3 Anticipating Radio Wave Behavior

Because WiFi relies on radio bands for data transmission and reception, you need to expect some network behaviors that differ from those on the wired network. These behaviors include:

- ▶ the ways that the transmissions propagate through physical impediments and the atmosphere
- ▶ the unbounded nature of radio signals
- ▶ the inherent half-duplex nature of radio transmission and reception

Propagation can be hindered by both visible and invisible impediments.

### ■ Visible impediments

Visible impediments include walls, doors, windows and stacked material inside a building. If you have chosen to operate at 2.4 GHz in order to get the signal to propagate through a wall, you also need to know what is behind the wall. A steel reinforcing beam or a mortar and cement fireblock (a physical wall, not a network firewall) will deflect (or block) the radio signal more severely than you might have expected if you assumed you were passing through drywall.

If you intend to propagate the signal through windows, you need to be aware of the characteristics of the glass. 2.4 GHz signals can pass through standard window glass relatively cleanly, but tempered or bullet-proof glass severely deflects the signal.

If you are planning an outdoor implementation of WiFi, you need to consider the existing terrain over which the signal will pass. If you need to send a signal over a hill or over another building, you need to use an access point and antenna as a bridge. If you are traversing an area that has an unobstructed line of sight between the two points in your link, make sure that the line will remain unobstructed as long as you need your network. A signal may work well in the winter when the trees are bare, but it may suffer significant degradation when the leaves bloom. If you are traversing an open field, you need to know whether a new building will be constructed between the two ends of the link.

You also need to know that some form of power supply is near each ConneXium WiFi access point. If the power is to be delivered over the Ethernet (PoE), remember that the access point must be within 100 m (109 yd) of the Ethernet cabinet.

#### ■ **Invisible impediments**

Invisible impediments are the radio signals that compete with your WLAN in the same bandwidth. This competition is more common in the 2.4 MHz band because so many other ISM equipment uses the frequency band. Realize that if your business is involved in microwave work, for example, a 2.4 GHz WLAN will need to compete for bandwidth in the same frequency band. This is also true for Bluetooth and some other unlicensed radio devices.

#### ■ **Boundless nature of radio transmissions**

Another key difference between a wired and a wireless network is the fact that wireless radio transmissions will not be contained by the walls of your building. Unlike a wired network where signals travel over a defined path, radio signals bounce off obstacles and penetrate through the boundaries of your facility to the outside world.

ConneXium WiFi devices are equipped with powerful authentication and encryption features that can help protect your data from unauthorized listeners and traffic. Refer to the ConneXium WiFi Configuration and Administration Guide for details.

## ■ **Half duplex communication**

Communications between a ConneXium WiFi access point and its clients or between multiple access points is half-duplex. One end of the link must wait while the other transmits, resulting in slower communications.

Wireless should not be used as the sole or primary means of control in a time-critical application.

Because communications are via broadcast, messages are sent to all participants in the network. The overall transmission capacity of the ConneXium WiFi access point is therefore shared by all the participants.



## 2 Device description

### 2.1 Properties and functions

The devices of the ConneXium WiFi family let you set up WLANs (Wireless Local Area Networks) in order to connect individual devices (PCs and mobile computers) to a local network. In contrast to a conventional network connection via copper or fiber optic cables, the communication is by means of a radio link.

The devices of the ConneXium WiFi family can be used for both new installations and for expanding an existing LAN. Because of their high level of flexibility, you can combine large, small, mobile and non-mobile locations. Anywhere that high bandwidths, stable operation and network security are required, wireless LAN using the devices of the ConneXium WiFi family provides a solution.

The devices of the ConneXium WiFi family can be installed quickly using wizards, via the Windows configuration software or the Web interface.

The devices are designed for the special requirements of industrial automation. They meet relevant industry standards. The devices operate without fans and have a redundant power supply.

The devices differ with regard to their design, the standards they support and their certifications, as shown in the table below:

		Design		
		Rail-/IP40 types	IP67 types	Ex zone (ATEX)
Radio standards	801.11 a/b/g/h/i types	TCSGWC241 TCSGWA242 TCSGWW242F	TCSGWA272	
	802.11 a/b/g/h/i/n types	TCSNWA241 TCSNWA241F	TCSNWA271 TCSNWA271F	TCSNWA2A1

Table 7: Range of applications for TCSG, TCSN device types

### **2.1.1 IP67 types**

The TCSGWA272, TCSNWA271, TCSNWA2A1 and TCSNWA271F devices belong to protection class IP67. The devices are particularly suitable for field use. You can mount the devices on a flat surface or a pole.

#### **■ TCSNWA2A1 types**

TCSNWA2A1 devices are suitable for use in hazardous environments (Ex zone 2 areas according to ATEX 95 / ATEX 100a).

### **2.1.2 Rail / IP40 types**

TCSGWC241, TCSGWA242, TCSGWA242F, TCSNWA241 and TCSNWA241F devices are suitable for use on DIN rails and on machines in the production area, as well as on vehicles. They are mounted by snapping them onto the DIN rail. With 5-way redundant power supply (4-way for the TCSGWC241) and a vibration-resistant metal housing, these devices provide high operational reliability.

### **2.1.3 802.11 a/b/g/h/i types**

The TCSGWC241, TCSGWA242, TCSGWW242F and TCSGWA272 are dual-band industrial wireless LAN access point/access clients with two independent WLAN modules, in accordance with IEEE 802.11a/b/g/h and IEEE 802.11i. In particular, the devices support the security mechanisms, authentication procedures and data encryptions defined in the IEEE 802.11i standard.

### **2.1.4 802.11 a/b/g/h/i/n types**

The TCSNWA241, TCSNWA241F, TCSNWA271, TCSNWA2A1 and TCSNWA271F are dual-band industrial high-performance wireless LAN access point/access clients in accordance with IEEE 802.11a/b/g/h and 802.11n (draft 2.0). These devices provide a higher radio output with a bandwidth of up to 300 Mbit/s. They support MIMO (Multiple Input Multiple Output) and Multipath. The bandwidth is increased by using the multipath transmission by means of reflections. Three antennas for sending and receiving provide more stable network coverage with fewer shadow areas, as shown in the following figure:

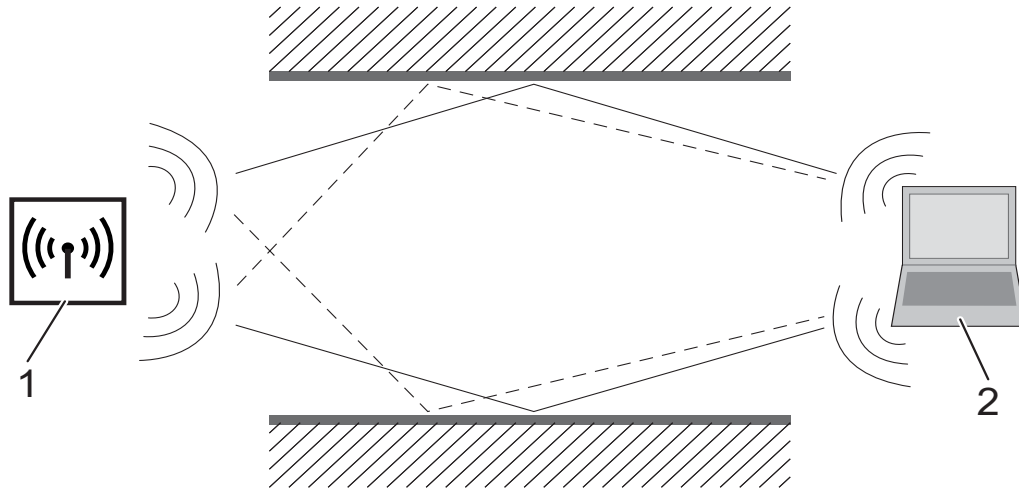
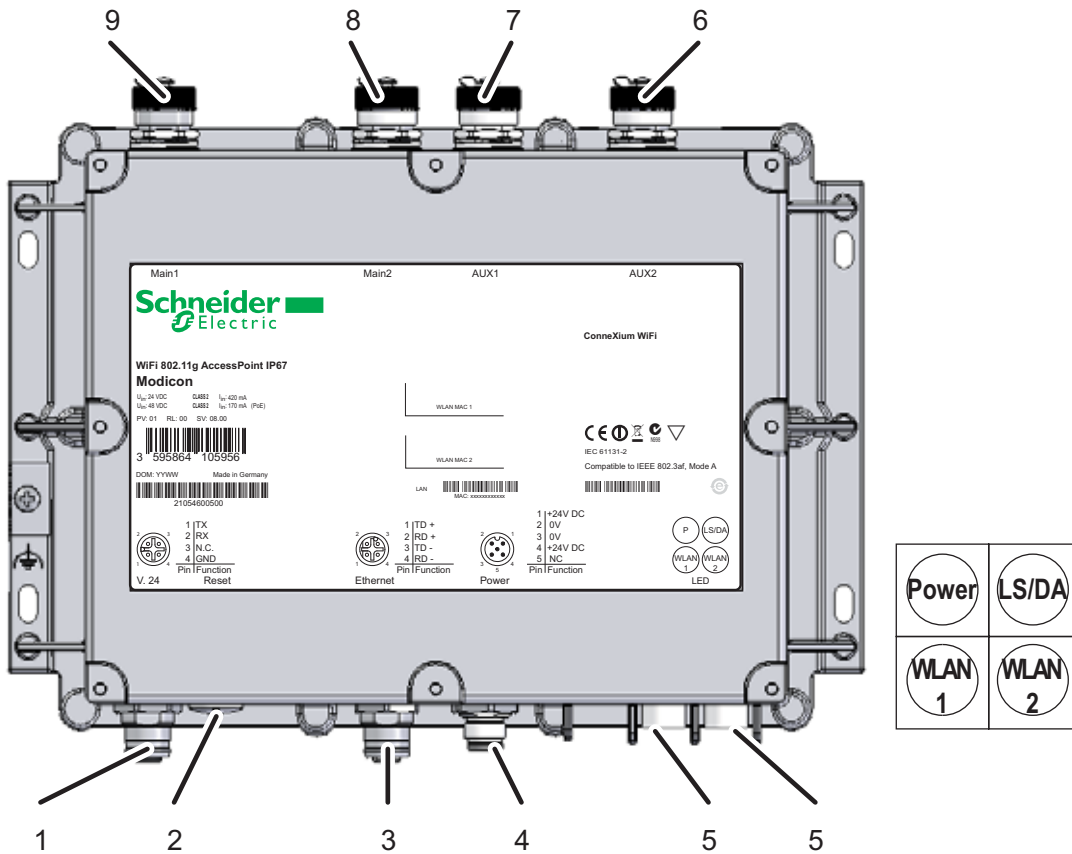


Figure 1: Schematic representation of MIMO (Multiple Input Multiple Output)  
1 - MIMO Access Point 802.11n (TCSNWA241, TCSNWA241F)  
2 - MIMO Client 802.11n

## 2.2 Interfaces and control elements

### 2.2.1 TCSGWA272

The device is equipped with the following connectors and operation elements:

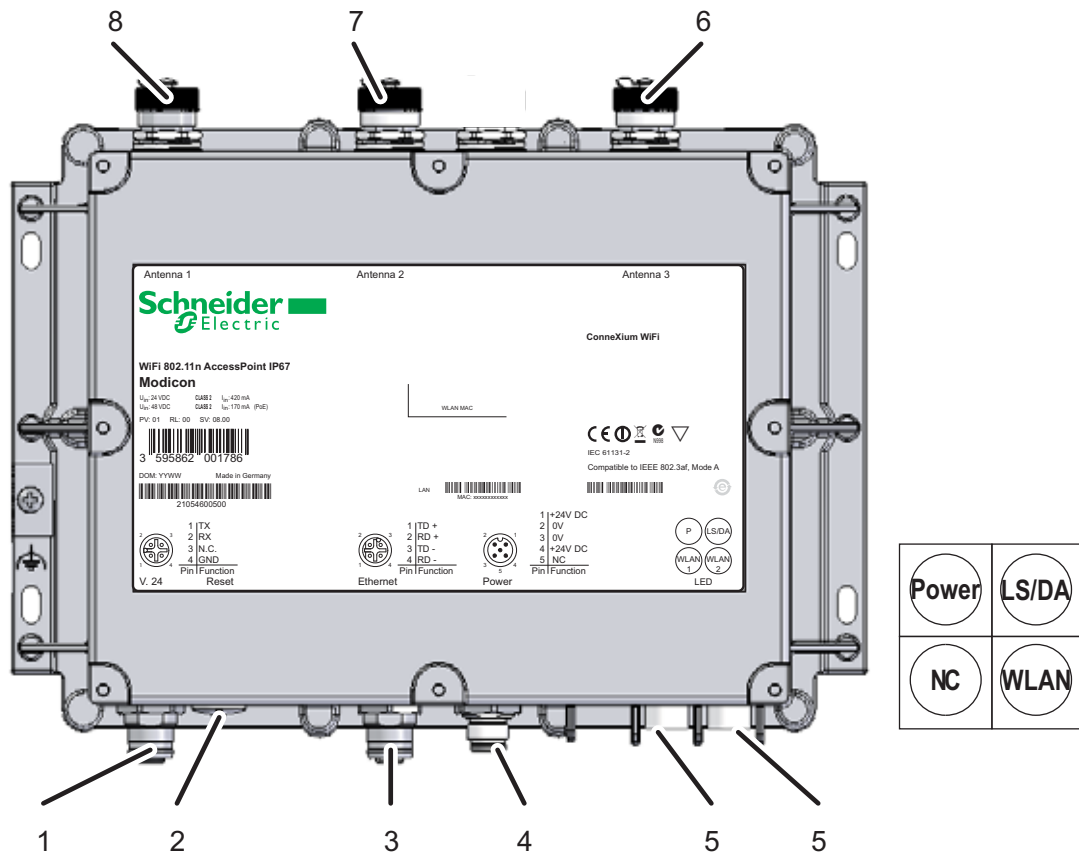


#### Interfaces and display and control elements

1	V.24	Serial interface, 4-pin M12 socket with A coding, data rate min. 19.2 kbit/s, max. 115 kbit/s, connector for serial configuration cable
2	Reset	Reset button behind a removable IP67 cap restarts the device or resets the configuration
3	Ethernet	Ethernet port: 4-pin M12 socket with D coding, 10/100BASE-TX, Autosensing, Power over Ethernet (PoE), automatic MDI/MDIX recognition (no crossover cable required)
4	Power	Power supply connector for safety extra-low voltage (SELV/PELV), 5-pin M12 plug
5	LED	4 display elements (power, LS/DA, WLAN1, WLAN2)
6	AUX 2	Auxiliary connector for the second WLAN module for connecting external antennas
7	AUX 1	Auxiliary connector for the first WLAN module for connecting external antennas
8	Main 2	Main connector for the second WLAN module for connecting external antennas
9	Main 1	Main connector for the first WLAN module for connecting external antennas

## 2.2.2 TCSNWA271, TCSNWA271F and TCSNWA2A1

The device is equipped with the following connectors and operation elements:

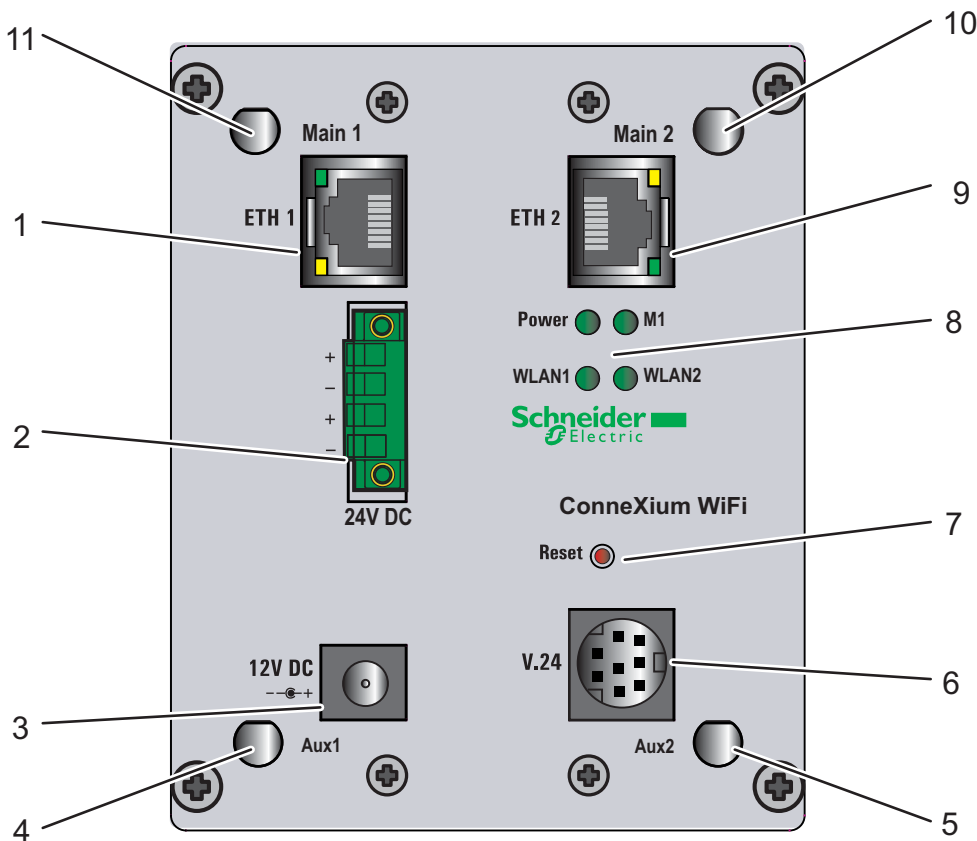


### Interfaces and display and control elements

1	V.24	Serial interface, 4-pin M12 socket with A coding, data rate min. 19.2 kbit/s, max. 115 kbit/s, connector for serial configuration cable
2	Reset	Reset button behind a removable IP67 cap restarts the device or resets the configuration
3	Ethernet	Ethernet port: 4-pin M12 socket with D coding, 10/100BASE-TX, Autosensing, Power over Ethernet (PoE), automatic MDI/MDIX recognition (no crossover cable required)
4	Power	Power supply connector for safety extra-low voltage (SELV/PELV), 5-pin M12 plug
5	LED	4 display elements (power, LS/DA, WLAN, NC)
6	Antenna 3	Main connector for the WLAN module for connecting the third external antenna
7	Antenna 2	Main connector for the WLAN module for connecting the second external antenna
8	Antenna 1	Main connector for the WLAN module for connecting the first external antenna

## 2.2.3 TCSGWA242 and TCSGWA242F

The device is equipped with the following connectors and operation elements:

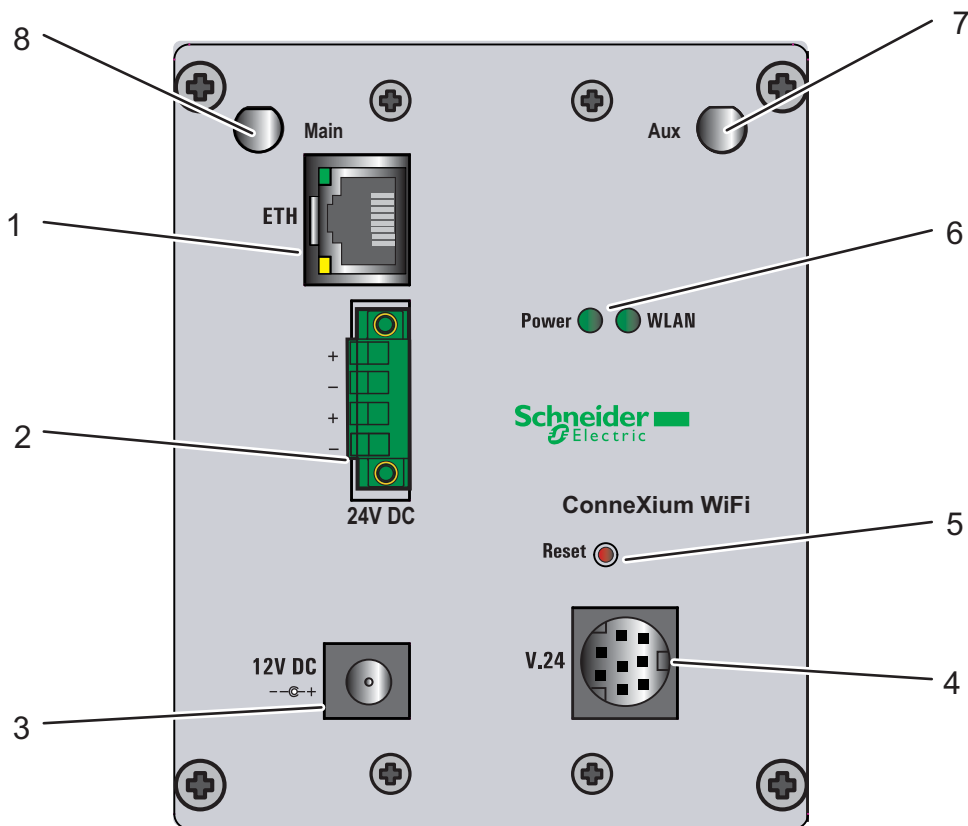


### Interfaces and display and control elements

1	ETH1	First Ethernet port 10/100BASE-TX, Autosensing, Power over Ethernet (PoE), automatic MDI/MDIX recognition (no crossover cable required)
2	+24V 0V	Power, power supply connector for safety extra-low voltage (SELV/PELV)
3	12V DC	Power, power supply connector for safety extra-low voltage (SELV/PELV)
4	AUX 1	Auxiliary connector for the first WLAN module for connecting external antennas
5	AUX 2	Auxiliary connector for the second WLAN module for connecting external antennas
6	V.24	MiniDin serial interface, data rate min. 19.2 kbit/s, max. 115 kbit/s, connector for serial configuration cable
7	Reset	Reset button to restart device or reset the configuration
8	LED	4 display elements (power, M1, WLAN1, WLAN2)
9	ETH2	Second Ethernet port 10/100BASE-TX, Autosensing, Power over Ethernet (PoE), automatic MDI/MDIX recognition (no crossover cable required)
10	Main 2	Main connector for the second WLAN module for connecting external antennas
11	Main 1	Main connector for the first WLAN module for connecting external antennas

## 2.2.4 TCSGWC241

The device is equipped with the following connectors and operation elements:

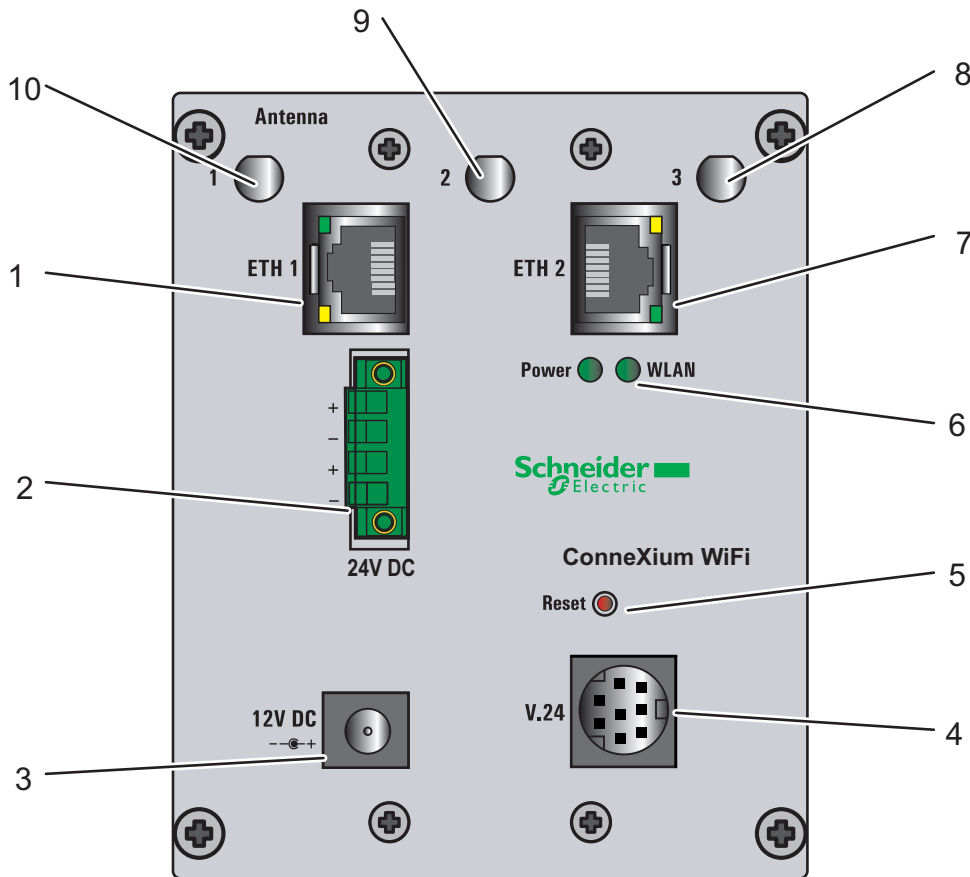


### Interfaces and display and control elements

1	ETH	Ethernet port: 10/100BASE-TX, Autosensing, Power over Ethernet (PoE), automatic MDI/MDIX recognition (no crossover cable required)
2	+24V 0V	Power, power supply connector for safety extra-low voltage (SELV/PELV)
3	12V DC	Power, power supply connector for safety extra-low voltage (SELV/PELV)
4	V.24	MiniDin serial interface, data rate min. 19.2 kbit/s, max. 115 kbit/s, connector for serial configuration cable
5	Reset	Reset button to restart device or reset the configuration
6	LED	2 display elements (power, WLAN)
7	AUX	Auxiliary connector for the WLAN module for connecting external antennas
8	Main	Main connector for the WLAN module for connecting external antennas

## 2.2.5 TCSNWA241 and TCSNWA241F

The device is equipped with the following connectors and operation elements:



### Interfaces and display and control elements

1	ETH1	First Ethernet port 10/100BASE-TX, Autosensing, Power over Ethernet (PoE), automatic MDI/MDIX recognition (no crossover cable required)
2	+24V 0V	Power, power supply connector for safety extra-low voltage (SELV/PELV)
3	12V DC	Power, power supply connector for safety extra-low voltage (SELV/PELV)
4	V.24	MiniDin serial interface, data rate min. 19.2 kbit/s, max. 115 kbit/s, connector for serial configuration cable
5	Reset	Reset button to restart device or reset the configuration
6	LED	2 display elements (power, WLAN)
7	ETH2	Second Ethernet port 10/100BASE-TX, Autosensing, Power over Ethernet (PoE), automatic MDI/MDIX recognition (no crossover cable required)
8	Antenna 3	Main connector for the WLAN module for connecting the third external antenna
9	Antenna 2	Main connector for the WLAN module for connecting the second external antenna
10	Antenna 1	Main connector for the WLAN module for connecting the first external antenna



## 2.3 Device models

### 2.3.1 TCSGWA272 devices

Device	Area of application
TCSGWA272	Outdoors, also hazardous environments
TCSNWA2A1	Outdoors, also hazardous environments



Figure 2: TCSGWA272 type device variants



Figure 3: Device models with housing cover: TCSNWA2A1 types

### 2.3.2 TCSGWA242.../TCSGWC241 devices

Device	Area of application
TCSGWA242	DIN rail and flat surface mounting
TCSGWA242F	DIN rail and flat surface mounting
TCSGWC241	DIN rail and flat surface mounting

### 2.3.3 TCSNWA271... and TCSNWA241... devices

Device	Area of application
TCSNWA271	DIN rail mounting Higher radio output and more stable network coverage through MIMO with 3 antennas
TCSNWA2A1	Outdoors, also hazardous environments Higher radio output and more stable network coverage through MIMO with 3 antennas
TCSNWA271F	DIN rail mounting Higher radio output and more stable network coverage through MIMO with 3 antennas
TCSNWA241	DIN rail mounting Higher radio output and more stable network coverage through MIMO with 3 antennas
TCSNWA241F	DIN rail mounting Higher radio output and more stable network coverage through MIMO with 3 antennas

## 3 Assembly and start-up

### 3.1 Safety instructions

#### ■ Staff qualification requirements

Only appropriately qualified staff should work on or near this equipment. Such staff must be thoroughly acquainted with all the warnings and maintenance measures contained in these operating instructions. The proper and safe operation of this equipment assumes proper transport, appropriate storage and assembly, and careful operation and maintenance.

Qualified staff are persons familiar with setting up, assembling, installation, starting up, and operating this product, and who have appropriate qualifications to cover their activities, such as:

- ▶ knowledge of how to switch circuits and equipment/systems on and off, ground them, and identify them in accordance with current safety standards
- ▶ training or instruction in accordance with current safety standards of using and maintaining appropriate safety equipment
- ▶ first aid training

### 3.2 Overview of installation

Two or more devices configured with the same IP address can cause unpredictable operation of your network.

#### **WARNING**

##### **UNINTENDED EQUIPMENT OPERATION**

Establish and maintain a process for assigning unique IP addresses to all devices on the network.

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

Information on the basic settings of the device can be found in the "ConneXium WiFi TCSG, TSCN Configuration and Administration Guide" on the CD ROM.

The following steps should be performed to install and configure a ConneXium WiFi device:

- ▶ Unpacking and checking
- ▶ Assembling components (IP67 types)
- ▶ Selecting the location for mounting/setting up
- ▶ Mounting outdoors (IP67 types)
- ▶ DIN rail mounting (Rail-/IP40 types)
- ▶ Flat surface mounting
- ▶ Mounting/connecting external antennas
- ▶ Connecting LAN and WLAN connectors
- ▶ Grounding
- ▶ Connecting the supply voltage
- ▶ Installing the data lines
- ▶ Starting up
- ▶ Finding and configuring devices
- ▶ Installing external antennas
- ▶ Establishing basic settings

### 3.3 Unpacking and checking

- Check that the contents of the package are complete (see page 70 “Scope of delivery”).
- Check the individual parts for transport damage.

### 3.4 Assembling components (IP67 types)

To protect the exposed contacts of the components from dirt, the individual system components must be connected in a dry and clean area. Seal unused ports with the cover caps supplied.

**Note:** Connectors are not electrical isolating devices.

Therefore, first plug the connector into the power supply plug, then switch on the power supply.

**Note:** Protection class IP67 is only achieved if all the connected components also fulfill protection class IP67.

- Cover unused connectors with the cover caps supplied.
- Only connect plugs and other components that fulfill protection class IP 67, and that are certified for a temperature range from -30 °C to +55 °C (-22 °F to +131 °F).

### **3.5 Selecting the location for mounting/ setting up**

The role of the WiFi equipment in your application will be a determining factor in how the devices are installed. For applications with even a moderate level of complexity (e.g., multiple access point dispersion throughout a facility or point-to-point connections between remote sites), the many and often unique architectural, geographic, seasonal, and environmental conditions specific to your application and your location must be seriously considered before the installation plan is finalized. Unless you are implementing a very simple task via WiFi, you should seriously consider commissioning a professional site survey before you purchase and install your equipment.

Determining the requirements and expenditures for a successful WiFi implementation are more complicated those of a typical wired solution. Your choices are often based on trade-offs, for example:

- ▶ The distance that your network must cover vs the required level of throughput
- ▶ The number of clients that may want to share the capacity of the network vs the scope of the original implementation. (i.e., Is there a growth plan?)
- ▶ The physical character of the space where the network will operate (the architecture of a building for an indoor application, the terrain and weather for an outdoor application) vs the amount of coverage you want to provide
- ▶ The kinds and levels of signal interference that can be present in the work environment vs acceptable performance

Factors that need to be carefully decided upon prior to installation include frequency choices (especially for the antennas, but frequency can also be an issue with some clients), throughput (which is more limited in a wireless application than in a wired application), and level of coverage (which is often a cost/benefit trade-off).

For more information about commissioning a WiFi site survey, contact your local Schneider Electric Sales Representative.

### **3.6 Mounting outdoors (IP67 types)**

**Note:** Set up the antenna close to the device. Use the shortest antenna cable possible to minimize attenuation.

**Note:** Cable connections are subject to corrosion in outdoor installations. Seal the outdoor cable connectors with water- and weather-resistant tape.

### 3.6.1 Lightning protection

When you mount devices and / or antennas outdoors, there is a risk of them being struck by lightning. Additionally, there is the risk of voltage surges being transmitted into the interior of the building. It is your responsibility to take appropriate measures to mitigate the effects of lightning strikes. Make sure the equipment is installed by a licensed electrician in accordance with local, regional and national regulations for codes and standards (such as VDE 0182 and IEC 62305) and according to best practices for your application and environment.



#### **TRANSIENT OR ELECTROSTATIC DISCHARGES**

- Protect devices or antennas installed outdoors using lightning arrester devices, such as lightning rods
- Install over voltage protector devices on every cable

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

### 3.6.2 Pole mounting

The IP67 types are suitable for pole mounting with the additional TCSWABMK pole mounting set ([see page 70](#)).

The TCSWABMK pole mounting set is designed for:

- ▶ Pole diameter: 37 mm to 60 mm (1.46 in to 2.36 in)
- ▶ Maximum permitted wind speed: 220 km/h (136 mph).

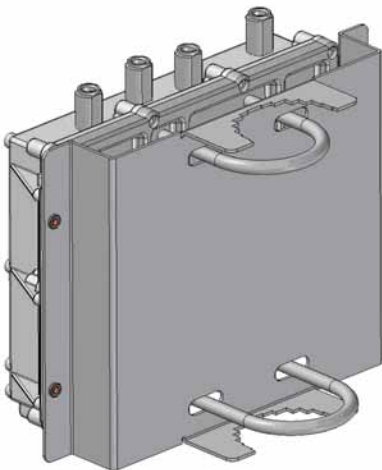


Figure 4: TCSWABMK pole mounting set

### 3.7 DIN rail mounting (Rail-/IP40 types)

- Mount the device on a 35 mm DIN rail in accordance with DIN EN 60175.
- Attach the upper snap-in guide of the device into the DIN rail and press it down against the DIN rail until it snaps into place.

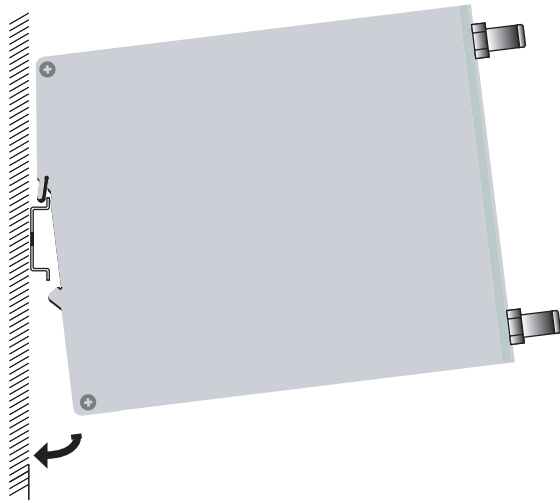


Figure 5: Mounting on the DIN rail

### 3.8 Flat surface mounting

#### 3.8.1 IP67 types

- Drill holes at the installation point.
- Mount the device on a flat surface with four M5 screws.

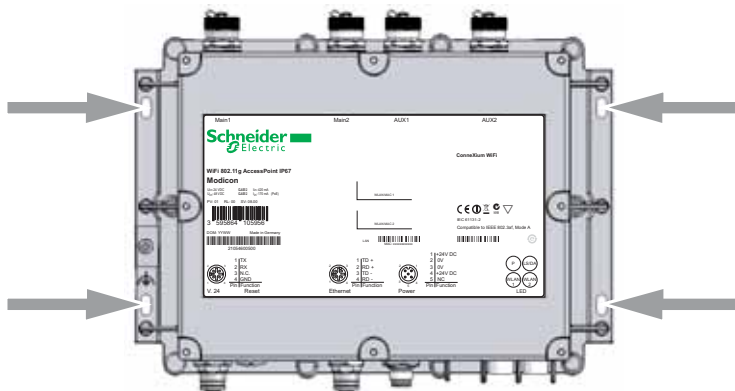


Figure 6: IP67 types flat surface mounting

## **3.9 Selecting the Right Antenna**

### **3.9.1 Antenna Characteristics**

Antennas provide gain (i.e., signal enhancement in the desired directions) to the radio signals transmitted by access point and client devices. The ConneXium WiFi offer provides a selection of customized antennas to meet the specific coverage, directional, and frequency band requirements of your application.

Schneider Electric recommends that you always use ConneXium WiFi antennas with ConneXium WiFi access points and clients.

In order to calculate the possible range and distance of a WLAN installation, Schneider Electric provides a tool called the Antenna Distance Calculator. The Excel-based calculator is available on the ConneXium WiFi CD, which is supplied in the box with each ConneXium WiFi device.

**Note:** ConneXium WiFi access points and clients are shipped with small paddle antennas for each radio. These antennas are primarily for test purposes, not for most industrial applications. They could be used in a very simple indoor application only.

ConneXium WiFi antennas fall into 2 main categories, omnidirectional and directional. A third possibility is available in the form of a radiating (or leaky) cable antenna.

### **3.9.2 Omnidirectional Antennas**

Omnidirectional antennas radiate the signal out from the center of the transmitting radio (an access point or a client) in all directions across the horizontal plane, with a limited vertical range.

They are best deployed in open areas. Often they are distributed around large open areas to provide continuous coverage for stationary and mobile clients on the WLAN. ConneXium WiFi offers several omnidirectional antennas that operate in different bandwidths and suit different application scenarios:



Model	Frequency Band	Gain	Usage
TCSWAB2O	2.4 GHz	6 dBi	indoor and outdoor use possible
TCSWAB5O	5 GHz	5 dBi	indoor and outdoor use possible
TCSWABDON	2.4 GHz	3.5 dBi	indoor and outdoor use possible
	5 GHz	5.5 dBi	supports mixed band client stations supports the 802.11n MIMO function <sup>a</sup>
TCSWABDH	2.4 GHz	6 dBi	to be placed on mobile client stations, e.g., forklifts
	5 GHz	8 dBi	

Table 8: Omnidirectional Antenna Characteristics

- a. MIMO is a multiple-input/multiple-output antenna configuration using more than one transmitter antenna and more than one receiver antenna for multiple data streams. It takes advantage of the higher transmission rate (300 Mb/s) of 802.11n to improve wireless throughput.

### 3.9.3 Directional Antennas

Directional antennas are moderate- to high-gain antennas that transmit in one direction. They are usually the preferred antennas for point-to-point WLAN links in outdoor applications. When used in this kind of application, the key to success is to align them properly.

Directional antennas can also be used to transmit and receive through corridors, aisles lined with stocking shelves, and hallways. ConneXium WiFi offers several directional antennas that operate in different bandwidths and suit different application scenarios:

Model	Frequency Band/Range	Gain	Usage
TCSWAB2D	2.4 GHz	14 dBi	
TCSWAB2S	2.4 GHz	8 dBi	dual linear, $\pm 45^\circ$ slant polarization
TCSWAB5D	5150 - 5250 MHz	18 dBi	medium-distance, partly sectoral 5 GHz coverage
	5250 - 5350 MHz	19 dBi	
	5350 - 5725 MHz	18.5 dBi	
	5725 - 5875 MHz	18 dBi	
TCSWAB5V	5150 - 5350 MHz	23 dBi	long-distance 5 GHz coverage IP67-compliant for outdoor use
	5470 - 5875 MHz		
TCSWAB5VN	5150 MHz - 5875 MHz	23 dBi	the suggested antenna for use in long-distance, high-transmission-rate (300 Mb/s) 802.11n applications in the 5 GHz frequency band
TCSWAB5S	5150 - 5925 MHz	9 dBi	dual linear, $\pm 45^\circ$ slant polarization
TCSWAB5DN	5150 - 5875 MHz	9 dBi	medium-distance P2P connections supports MIMO indoor and outdoor use possible

Table 9: Directional Antenna Characteristics

Refer to the "TCSG, TCSN Antenna Guide" for more distance details.

### 3.9.4 Leaky Cable

A leaky cable is a coaxial cable with small slots in the shield that operate as antennas. They allow you to radiate radio signals along the cable path, e.g., around corners, through conduits in walls, etc. Signals can be transmitted from both ends of the cable.

These antenna are rated for IP65 and are for indoor and outdoor use.

Leaky cables are available in 2 lengths (cable only):

- ▶ 50 m (54.7 yd), model TCSWABC5
- ▶ 100 m (109.4 yd), model TCSWABC10

These antennas support radio transmissions in the 2.4 MHz frequency band.

## 3.10 Mounting/connecting external antennas

### 3.10.1 Connectors for external antennas on IP67 types

The IP67 types have two to four connectors for connecting external antennas. These connectors are N sockets.

The housing of the N socket and the signal connection are electrically connected to the switching ground, the functional ground (FE) (⊥) and the metal housing of the device.

On delivery, the connectors are sealed with cover caps.

- Unscrew the cover caps from the connectors to which you want to connect external antennas.

**Note:** Insert the terminators supplied into unused sockets in order to avoid radio signals from one WLAN module being received by the other WLAN module.

## ■ TCSGWA272

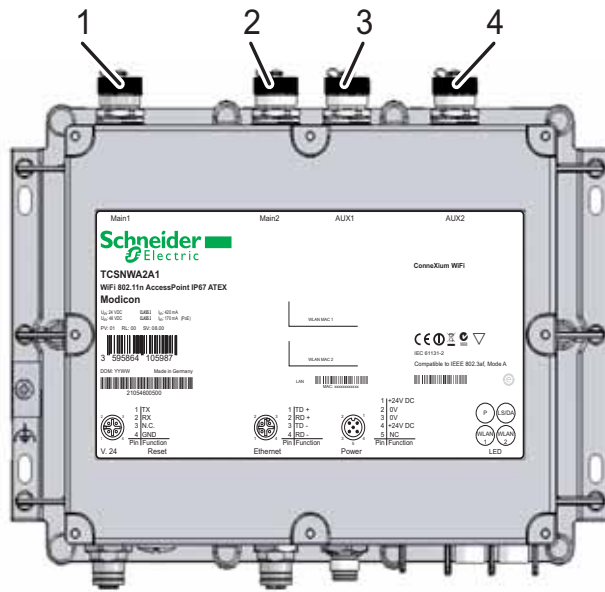


Figure 7: Connectors for external antennas on TCSGWA272

- 1 - Main 1
- 2 - Main 2
- 3 - AUX 1
- 4 - AUX 2

## ■ TCSNWA271, TCSNWA271F and TCSNWA2A1

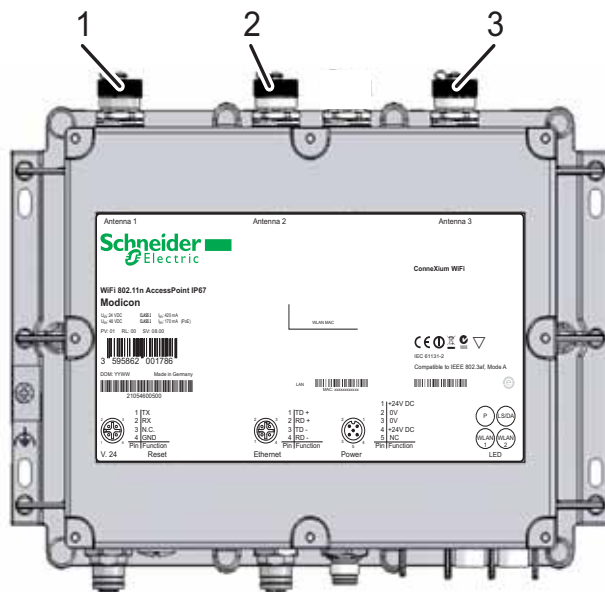


Figure 8: Connectors for external antennas on TCSNWA271 and TCSNWA2A1

- 1 - Antenna 1
- 2 - Antenna 2
- 3 - Antenna 3

### 3.10.2 Connectors for external antennas on Rail/IP40 types

#### ■ TCSGWA242 and TCSGWA242F

The devices have four Reverse satellite master antenna (SMA) connectors for connecting external antennas.

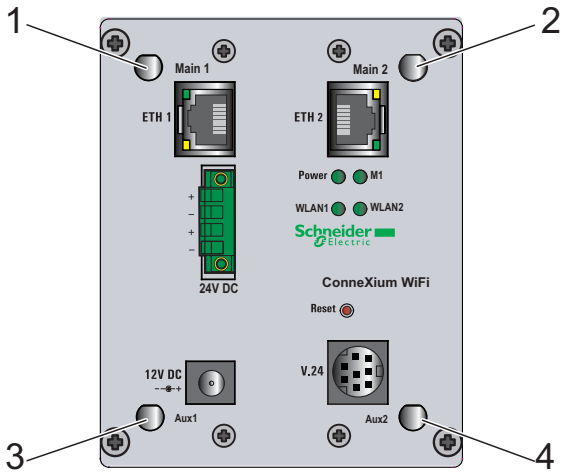


Figure 9: Connectors for external antennas on TCSGWA242

- 1 - Antenna 1
- 2 - Antenna 2
- 3 - Aux1
- 4 - Aux2

#### ■ TCSGWC241

The devices have two Reverse SMA connectors for connecting external antennas.

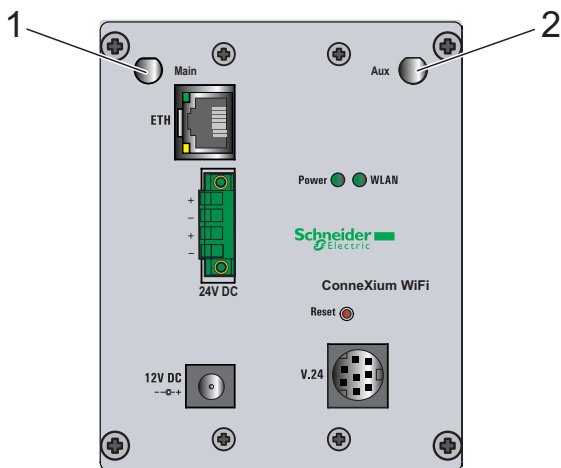


Figure 10: Connectors for external antennas on TCSGWC241

- 1 - Main
- 2 - Aux

## ■ TCSNWA241 and TCSNWA241F

The devices have three Reverse SMA connectors for connecting external antennas.

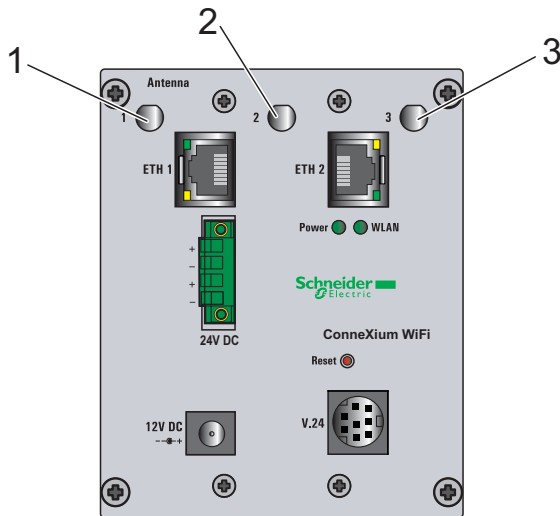


Figure 11: Connectors for external antennas on TCSNWA241

- 1 - Antenna 1
- 2 - Antenna 2
- 3 - Antenna 3

### 3.10.3 Mounting external antennas

- Connect the external antenna to the corresponding Antenna Main connector.
- If you want to connect one antenna with only one connector for each radio module, use the main connector.
- a/b/g/h/i types: Use the respective main connector of the two radio modules to connect antennas that have only one antenna connector, without diversity.
- Use the main and auxiliary connectors of one radio module if you want to use the diversity function. The diversity function increases the connection quality by always sending or receiving via the antenna providing the better signal to the client. Also set this option for the respective radio module.

## 3.11 Connecting LAN and WLAN connectors

### 3.11.1 IP67 types

- Connect the access point to your LAN for configuration.
- Assemble the network cable with the M12 plug supplied.


- Plug the network cable into the LAN connector of the device, and into a free network connection port on your local network (or into a free port on a hub/switch). Alternatively, you can connect the device to a separate PC. The port auto-negotiates upon connection; either a straight or a crossover cable can be used.

### **3.11.2 Rail / IP40 types**

- Connect the access point to your LAN for configuration.
- Plug the network cable into the LAN connector of the device, and into a free network connection port on your local network (or into a free port on a hub/switch). Alternatively, you can connect the device to a separate PC. The port auto-negotiates upon connection; either a straight or a crossover cable can be used.

## **3.12 Grounding**

### **3.12.1 IP67 types**

A separate anti-torsion screw connector on the housing is provided for the functional ground (FE) . It is indicated by the functional ground symbol (  ). The functional ground is electrically connected to the switching ground and to the metal housing of the device.

- For the ground wire, use a copper wire with a minimum cross section of 4 mm<sup>2</sup> to 6 mm<sup>2</sup> (for North America: AWG 11 to AWG 9) (including any terminal sleeve used), and implement the grounding of the device via the screw connector.
- Clamp the ground wire between the two rectangular fastening plates - as shown in the figure below - and fasten the screw.
- Make sure that the ground wire is not in direct contact with the aluminum housing of the device.

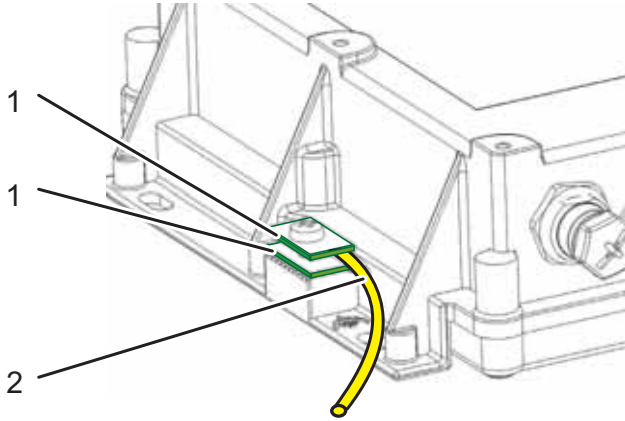


Figure 12: IP67 types ground connector  
1 - Fastening plates for ground wire  
2 - Ground wire

### 3.12.2 Rail / IP40 types

The lower panel of the device housing is grounded by means of the DIN rail.

## 3.13 Connecting the supply voltage



**DANGER**

### HAZARD OF ELECTRIC SHOCK OR BURN

When the module is operated with direct plug-in power units, use only:

- SELV supply units that comply with IEC 60950/EN 60950 and
- (in USA and Canada) Class 2 power units that comply with applicable national or regional electrical codes

Connect the ground wire to the PE terminal (where applicable) before you establish any further connections. When you remove connections, disconnect the ground wire last.

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

For redundant and outfall-resistant power, you can connect multiple power sources in any combination at the same time. The device automatically selects the power supply.

**Note:** Switch over to a redundant power supply may not be seamless. If the power supply currently active is interrupted and another power supply takes over, the device may reboot to activate the redundant power supply.

### 3.13.1 5-pin M12 connector (IP67 types)

A 5-pin M12 connector (A coding, supplied) is used to connect the power supply.

On delivery, the connectors are sealed with cover caps.

The housing of the M12 frame connector is electrically connected to the functional ground (FE) ( $\ominus$ ) and to the metal housing of the device. The supply voltage is electrically isolated from the housing.

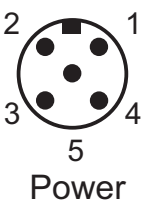
Figure	Pin	Function
	1	+ 24 V DC
	2	0 V
	3	0 V
	4	+ 24 V DC
	5	N.C. (not used)

Table 10: Pin assignment of the 5-pin M12 connector on the IP67 types

### 3.13.2 4-pin terminal block (Rail-/IP40 types)

The supply voltage is connected via a 4-pin terminal block with a snap lock. Redundant power supplies can be used. Both inputs are uncoupled. There is no distributed load. With redundant supply, the power supply unit supplies the device only with the higher output voltage. The supply voltage is electrically isolated from the housing.

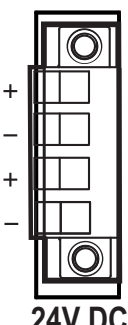
Figure	Pin	Function
	1	+24 + 24 V DC
	2	0 0 V
	3	+24 + 24 V DC
	4	0 0 V

Table 11: Pin assignment of the 4-pin terminal block on the Rail-/IP40 types



### **3.13.3 Power over Ethernet (PoE) - power supply via the LAN cable**



## **DANGER**

### **HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH**

Remove the Ethernet cable that provides PoE to disconnect power before installing or removing any hardware and cables.

Always use a properly rated voltage sensing device to confirm that power is off.

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



## **CAUTION**

### **EQUIPMENT DAMAGE**

In a PoE installation, use only devices that adhere to the 802.3af standard.

**Failure to follow these instructions can result in injury or equipment damage.**

Schneider Electric Wireless Routers are prepared for the PoE (Power over Ethernet) procedure and conform to the 802.3af standard. PoE-capable network devices can be supplied with power via the LAN cable. This makes it unnecessary to have a separate power supply for every base station, thus considerably reducing the work involved in the installation.

In the IP67 types, the voltage is input via the wire pairs transmitting the signal (IEEE 802.3af, mode A).

In the Rail-/IP40 types it is also possible to supply the voltage via the free wire pairs.

The power supply to the LAN is input centrally, or via a PoE injector or a power hub/power switch.

## **3.14 Connecting the data lines**

### **3.14.1 10/100 Mbit/s twisted pair connection**

In the IP67 types, the 10/100 Mbit/s twisted pair connectors are M12 sockets.

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

These ports support:

- ▶ Autonegotiation
- ▶ Autopolarity
- ▶ Autocrossing (if autonegotiation is activated)
- ▶ 100 Mbit/s half-duplex mode, 100 Mbit/s full duplex mode
- ▶ 10 Mbit/s half-duplex mode, 10 Mbit/s full duplex mode

State on delivery: autonegotiation activated.

The TP connector is a 4-pin M12 female connector with D coding.

On delivery, the connectors are sealed with cover caps.

The housing of the M12 socket is electrically connected to the functional ground (FE) (⊕) and to the metal housing of the device. The connector pins are electrically separated from the functional ground and the metal housing.


Figure	Pin	Function	PoE voltage input
	1	TD+ Transmit Data +	V-
	2	RD+ Receive Data +	V+
	3	TD- Transmit Data -	V-
	4	RD- Receive Data -	V+
Housing: shield			

Table 12: Pin assignment of a TP/TX interface (M12 socket)

- Use a shielded CAT5 cable.
- Use a shielded 4-pin M12 plug.
- Connect the cable shield to the connector housing.

The patch cables for operating the device are shown in the following figure:

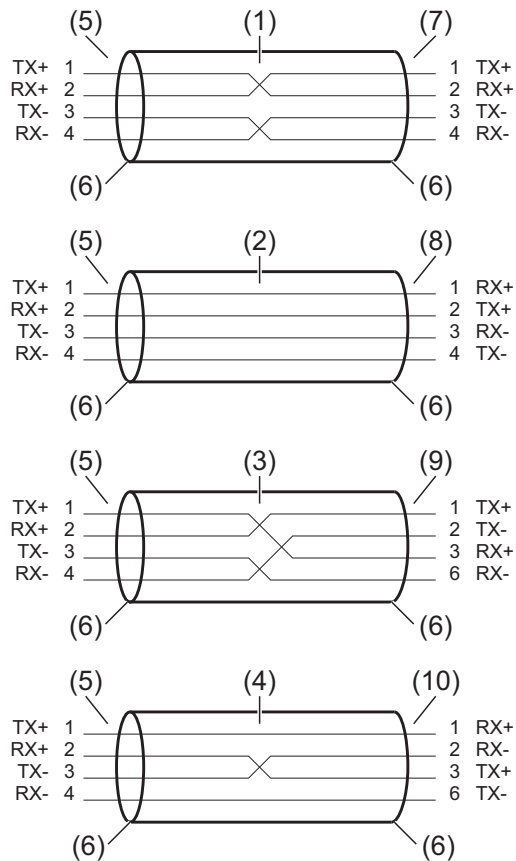


Figure 13: Patch cables for operating the device

- (1) - Connection cables M12-4 on M12-4, crossed
- (2) - Connection cables M12-4 on M12-4, 1 to 1
- (3) - Connection cables M12-4 on RJ45, crossed
- (4) - Connection cables M12-4 on RJ45, 1 to 1
- (5) - M12 (MDI)
- (6) - Shield
- (7) - M12 (MDI)
- (8) - M12 (MDI-X via autocrossing port)
- (9) - RJ45, MDI (terminal device)
- (10) - RJ45, MDI-X (Switch)

### 3.14.2 10/100 Mbit/s twisted pair connection

In the Rail-/IP40 types, the 10/100 Mbit/s twisted pair connectors are RJ45 sockets.

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

These ports support:

- ▶ Autonegotiation
- ▶ Autopolarity
- ▶ Autocrossing (if autonegotiation is activated)
- ▶ 100 Mbit/s half-duplex mode, 100 Mbit/s full duplex mode
- ▶ 10 Mbit/s half-duplex mode, 10 Mbit/s full duplex mode

State on delivery: autonegotiation activated.

The socket housing is electrically connected to the bottom panel.

Figure	Pin	Data	PoE voltage input
	1	RD+ Receive Data +	V+
	2	RD- Receive Data -	V+
	3	TD+ Transmit Data +	V-
	6	TD- Transmit Data -	V-
	4,5,7,8	Not used	

Table 13: Pin assignment of a TP/TX interface in MDI-X mode, RJ45 socket. PoE voltage input via the wire pairs transmitting the signal (phantom voltage).

Figure	Pin	Data	PoE voltage input
	1	RD+ Receive Data +	—
	2	RD- Receive Data -	—
	3	TD+ Transmit Data +	—
	4	—	V-
	5	—	V-
	6	TD- Transmit Data -	—
	7	—	V+
	8	—	V+

Table 14: Pin assignment of a TP/TX interface in MDI-X mode, RJ45 socket. PoE voltage input via the free line pairs (spare pairs).

### 3.15 Installing the TCSNWA2A1 housing cover

## ! DANGER

### EXPLOSIVE ENVIRONMENT

Do not open this device or detach any connectors when the device is electrically charged.

Do not remove the labeled housing cover.

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

For use in hazardous environments, the TCSNWA2A1 device models have an additional housing cover made of stainless sheet steel. On delivery, the housing cover is pre-mounted.

Perform the installation in the following steps:

- Remove the upper part of the housing cover on the device, as shown in the following figure (point 1).  
Do not remove the lower panel of the housing cover from the device.
- Screw the device, including the lower panel of the housing cover, to the mounting surface.
- Set up the connections to the device.
- Close the housing cover by replacing the upper part of the housing cover.
- Fasten the housing cover with four screws, as shown in the following figure (point 2).

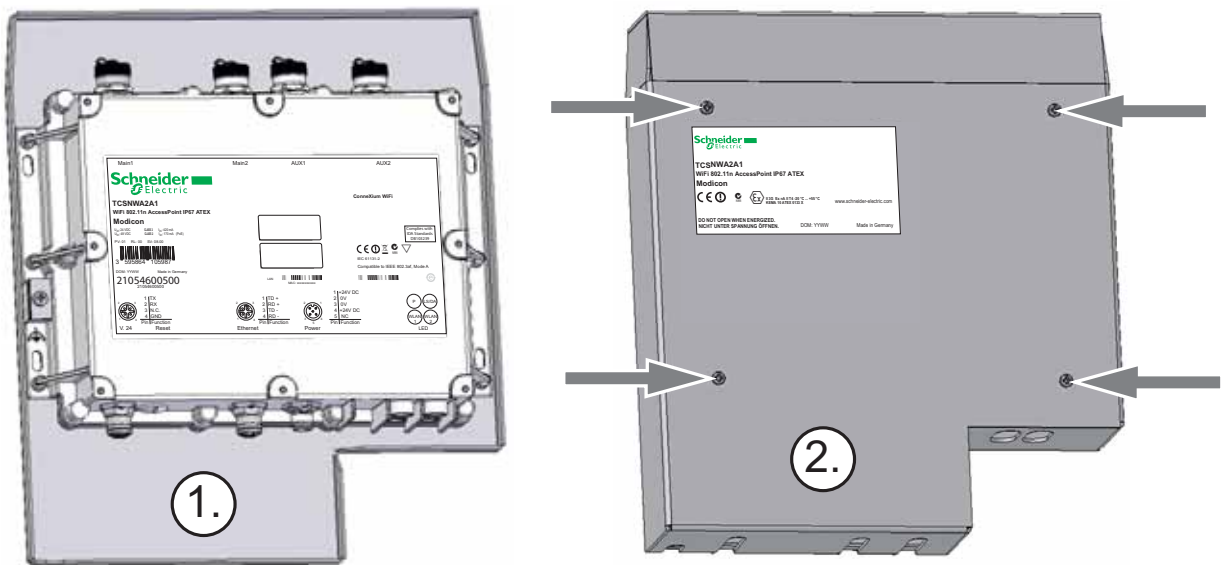


Figure 14: Mounting the housing cover for TCSNWA2A1 device models with Ex certification in accordance with ATEX 95 (ATEX 100a)

## 3.16 Startup procedure

### 3.16.1 IP67 types

Connecting the voltage supply via the 5-pin M12 connector or via the LAN cable (Power over Ethernet) starts the operation of the device.

### 3.16.2 Rail / IP40 types

At a minimum, every access point/client requires at least 1 wired connection – for power. Power can be connected in 3 ways:

- ▶ From one or two 24 V DC power supplies mounted near the access point to the 4-pin 24 V DC terminal block on the WiFi device.
- ▶ From a 12 V DC power source to the 12V DC connector on the bottom left of the WiFi device.
- ▶ Via power over Ethernet (PoE) from an Ethernet cable connected to one of the ETH ports on the access point/client.



## DANGER

### HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Remove the Ethernet cable that provides PoE to disconnect power before installing or removing any hardware and cables.

Always use a properly rated voltage sensing device to confirm that power is off.

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

The power connections are redundant. You can use more than one connection scheme. For example, if you are powering an unmanned remote station with 24 V DC power supplies, you could additionally connect a battery to the 12V DC pin connector as a back up the system in the event of a power failure.

- When you are planning the placement of access points/clients at your site, make sure that you consider the availability of power sources and their proximity to the access points/clients as part of your plan.
  - ▶ If you plan to use 12 or 24 VDC power supplies, you need to install your access points/clients in areas where electrical power outlets are available.
  - ▶ If you decide to use PoE, placing the access points/clients close to the Ethernet cabinet will reduce voltage loss in the cable run.

**Note:** Whenever an access point/client is making a wired Ethernet connection, the maximum distance between the access point/client and the Ethernet cabinet is 100 m (328 ft). If you plan to use PoE, the distance should be much shorter; a significant amount of power will be lost over a 100 m (328 ft) cable run.

### **3.17 Finding and configuring devices**

Apply power to the device before starting the computer for the configuration.

ConneXium WiFi devices can be configured in the following ways (if the model is equipped with the corresponding interface):

- ▶ Via the local network (LAN).
- ▶ Via the radio network (WLAN), if the WLAN encryption (e.g. WPA2) in a device with a wireless interface and in the configuration computer is set or deactivated respectively.
- ▶ Via the serial configuration interface.

Refer to "ConneXium WiFi TCSG, TSCN Configuration and Administration Guide" on the CD ROM for more details.

### **3.18 Installing external antennas**

External antennas are required to operate the access point.

You will find an overview of the antennas that are supported and can be connected, along with the corresponding technical data, at [www.schneider-electric.com](http://www.schneider-electric.com).

- When installing external antennas, adhere to the regulations of the country in which you are operating the WLAN device, and to the general operating permission and the maximum emission levels.

#### **■ Transmission power**

The operator of a WLAN radio installation must adhere to the applicable transmission threshold values.

- Use the LANconfig or the Webconfig to start the configuration of the device. (This software is located on the CD provided.)
- Go to the settings for Wireless LAN.
- Enter the country in which you are installing the device (see the following figure):

Wireless LAN

**Schneider Electric**

Logout

General Security Stations 802.11/WEP IEEE 802.1X WLC

**General**

This is where you can program common settings for all wireless LAN interfaces.

Country

ARP handling

Broken LAN link detection disables WLAN interface

Indoor only mode activated

Email address for WLAN events  (max. 254 characters)

**Interfaces**

This is where you can program further settings for your physical wireless LAN interface.

[Physical WLAN settings - Operation](#)

[Physical WLAN settings - Radio](#)

[Physical WLAN settings - Performance](#)

[Physical WLAN settings - Point-to-Point](#)

[Physical WLAN settings - Client mode](#)

[Point-to-Point partners - Point-to-Point](#)

This is where you can program further settings for each logical wireless LAN network (MultiSSID).

[Logical WLAN settings - Network](#)

[Logical WLAN settings - Transmission](#)

- Open the configuration for the physical interface to which you are connecting the antenna. On the Radio tab you will find an entry field for the antenna gain (see the following figure):



### Physical WLAN settings - Radio

Interface	<input type="text" value="WLAN interface"/>	
Frequency band	<input type="text" value="5 GHz (802.11a)"/>	
Sub-bands	<input type="text" value="2"/>	
Channel number	<input type="text" value="Automatic selection"/>	
2.4 GHz mode	<input type="text" value="802.11g/b (mixed)"/>	
5 GHz mode	<input type="text" value="802.11a only"/>	
Antenna gain	<input type="text" value="3"/>	dBi (possible values: 0 - 255)
TX power reduction	<input type="text" value="0"/>	dB (possible values: 0 - 255)
Access point density	<input type="text" value="Low"/>	
Maximum distance	<input type="text" value="0"/>	km (possible values: 0 - 65535)
Channel list	<input type="text"/>	(max. 48 characters)
Background scan	<input type="text" value="0"/>	(max. 12 characters)
Background scan unit	<input type="text" value="milliseconds"/>	

- Subtract the cable attenuation and any losses due to over voltage protector installed devices from the antenna gain, and enter the result in dB in the antenna gain field.

## 3.19 Display elements

After the operating voltage is applied, the software starts and initializes itself. The device then performs a self-test. During this process, the LEDs light up. The process takes a number of seconds.

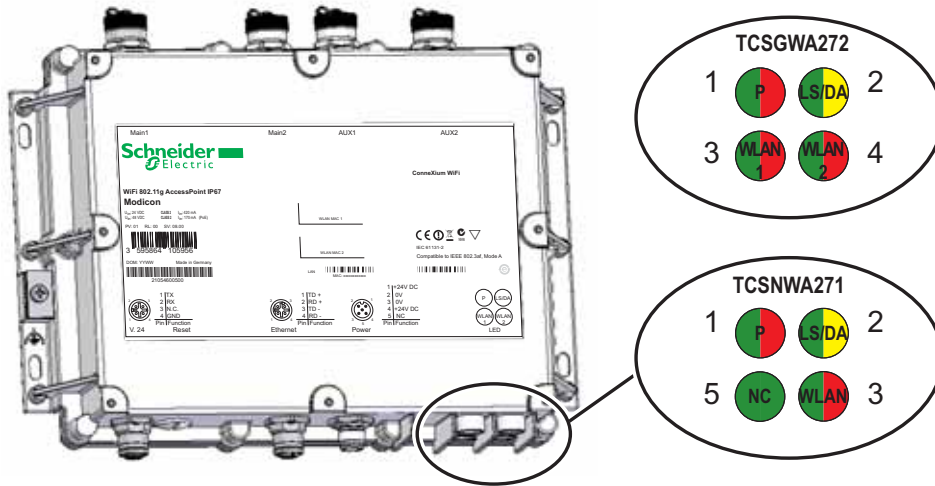


Figure 15: Display elements for the TCSGWA272, TCSNWA271 and TCSNWA2A1

- 1 - P (Power)
- 2 - LS/DA (Ethernet port link status/data)
- 3 - WLAN 1
- 4 - WLAN 2
- 5 - NC

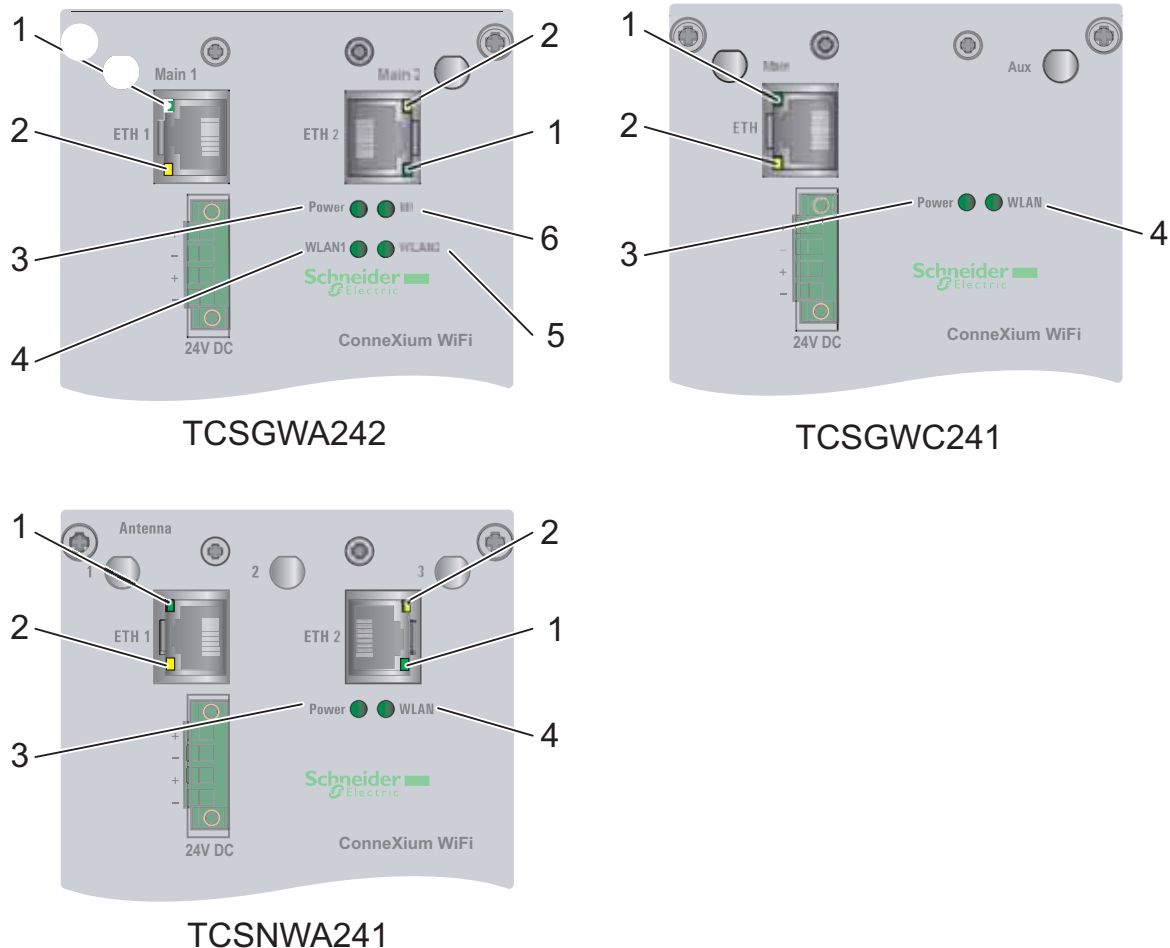


Figure 16: Display elements for TCSGWA242, TCSGWC241, TCSNWA241 and TCSNWA241F

- 1 - Ethernet port link status (LS)
- 2 - Ethernet port data (DA)
- 3 - Power (P)
- 4 - WLAN1
- 5 - WLAN2
- 6 - M1

### ■ Meaning of the LEDs

The behavior of the LEDs is described below:

- ▶ **Blinking** means that the LED switches on and off at regular intervals in the color specified.
- ▶ **Flashing** means that the LED lights up very briefly in the color specified, then is switched off for a much longer time (about 10x as long).
- ▶ **Flashing inversely** means the reverse. Here the LED is on for a long period in the color specified and is only briefly interrupted.
- ▶ **Flickering** means that the LED switches on and off at irregular intervals.

## ■ Device status

The LEDs shown in the table below provide information about conditions which affect the operation of the entire device.

P (green/red LED)		Power
Green	on continuously	Device is ready for operation.
Red	blinking (slowly)	Charge lock active (see „Dual-Band Industrial Access Point / Access Client / Access Bridge TCSGWA242” user manual).
Green/red	blinking (quickly)	Unprotected configuration (no password set).
Red	blinking (quickly)	Hardware error detected.
WLAN 1, WLAN 2 (green/red LEDs)		WLAN connection and WLAN data traffic of internal WLAN modules
Off		No WLAN network defined or WLAN module deactivated. No beacons sent from the WLAN module.
Green		At least one WLAN network defined and WLAN module activated. Beacons sent from the WLAN module.
Green	flashing inversely	Number of flashes = number of connected WLAN stations and P2P radio lines, followed by a break in connection.
Green	blinking	DFS scanning or another scan procedure.
Green	flickering	TX data traffic.
Red	flickering	Error detected in WLAN (e.g. transmission lost due to bad connection).
Red	blinking	Hardware error detected in WLAN module.

## ■ Port Status - Ethernet Port

These LEDs display port-related information.

LS/DA (green/yellow LED)		Data, link status Status of the LAN interfaces
Off		No network device connected
Green	on continuously	Ethernet connection active
Yellow	flickering	Data traffic

## 3.20 Operation element (reset button)

In the ConneXium WiFi family devices, the operating elements include a reset button.



### WARNING

#### LOSS OF CONFIGURATION DATA

Do not push the reset button while the access point is in operation.

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

### 3.20.1 Functions

The reset button has two different functions, which are triggered by pressing the button for different lengths of time:

- ▶ **Resetting the configuration** (hard reset) – the button is pressed for more than 5 seconds but less than 10 seconds. All LEDs on the device light up continuously. When the reset button is released, the device restarts with the factory settings.

The hard reset can be used, for example, if you have to reconfigure the device independently of any existing settings, or if no connection to the device configuration can be made.

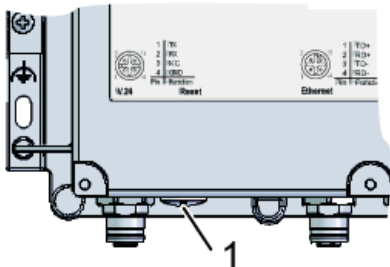
**Note:** Save the current configuration of the device before the reset. After a hard reset, the device restarts in the unconfigured state, and all the settings are lost.

- ▶ **Device restart** (soft reset) – the button is pressed for less than 5 seconds or more than 10 seconds. The device restarts.

### 3.20.2 IP67 types

In the IP67 types, the reset button (see #1 in the following figure) can be accessed from outside the housing cover via a locking screw.

On delivery, the reset button is closed off with a screwed-on cover cap (protection class IP67).



- When you want to use the reset button, remove the cover cap.

**Note:** After pressing the reset button, replace the cover cap. Protection class IP67 is only achieved when the cover cap is closed.

### 3.20.3 Rail / IP40 types

In the Rail-/IP40 types, the reset button (see #1 in the following figure) is located on the front plate of the device.

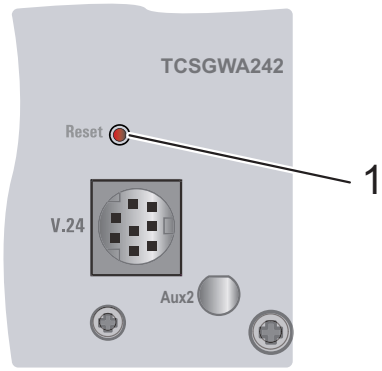


Figure 17: Reset button on Rail-/IP40 types

## 3.21 Basic set-up

Information on the basic settings of the device can be found in the "ConneXium WiFi TCSG, TSCN Configuration and Administration Guide" on the CD ROM.

### ■ Default settings

You will find information on the delivery state of the device in the "ConneXium WiFi TCSG, TSCN Configuration and Administration Guide" on the CD ROM.

### ■ V.24 interface (external management)

At the V.24 connector, a serial interface is provided for the local connection of an external management station (VT100 terminal or PC with corresponding terminal emulation) or a Memory Back-up Adapter TCSWAMCD (M12) or TCSWAMC67 (miniDin). This enables you to set up a connection to the Command Line Interface (CLI) and to the system monitor.

VT 100 terminal settings	
Data	8 bit
Stopbit	1 bit
Handshake	off
Parity	none

The connector is a 4-pin M12 female connector with A coding.

On delivery, the connector is sealed with a cover cap.

The housing of the M12 socket and the signal connectors are electrically connected to the functional ground (FE) (⊕) and to the metal housing of the device.

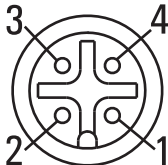
Figure	Pin	Function
	1	TX Transmit data
	2	RX Receive data
	3	N.C. Not connected
	4	GND Ground

Table 15: Pin assignment of the V.24 interface for IP67 types (M12 socket)

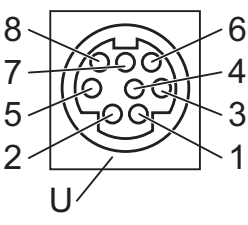
Figure	Pin	Function
	1	CTS Clear to send
	2	RTS Request to send
	3	RxD Receive data
	4	RI Ring indicator
	5	TxD Transmit data
	6	DSR Dataset ready
	7	DCD Data carrier detect
	8	DTR Data terminal ready
	U	GND Ground

Table 16: Pin assignment of the V.24 interface for Rail-/IP40 types (miniDin socket)

**Note:** You will find the order number for the terminal cable, which is ordered separately, in the "Technical Data" chapter (see on page 65 "Technical data").

### 3.22 Disassembly

- To remove the device from the DIN rail, press the device downwards and pull it out from under the DIN rail.

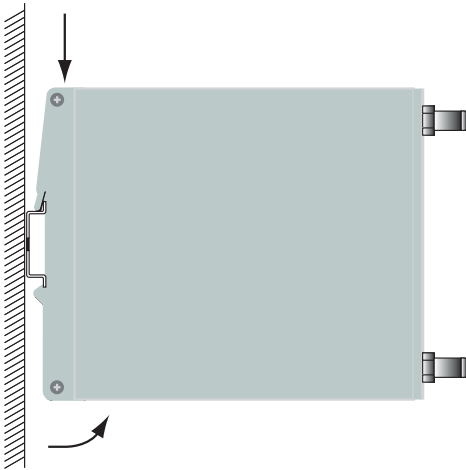


Figure 18: Removal from the DIN rail



## 4 Technical data

### ■ General technical data

Description	TCSGWA242 TCSGWC241 TCSGWA242F TCSGWA272	Dual-band ConneXium WiFi access point/client in accordance with IEEE 802.11a/b/g/h and IEEE 802.11i	
	TCSNWA241 TCSNWA241F TCSNWA271 TCSNWA271F	Dual-band industrial high-performance wireless LAN access point/client in accordance with IEEE 802.11a/b/g/h and 802.11n (draft 2.0)	
	TCSGWA242 TCSGWC241 TCSGWA242F TCSNWA241 TCSNWA241F	Used on DIN rail, 5-way (4-way for TCSGWC241) redundant power supply, vibration-resistant metal housing	
	TCSGWA272 TCSNWA271 TCSNWA271F	Mounted on pole or flat surface, protection class IP67	
	TCSNWA2A1	Dual-band industrial high-performance wireless LAN access point/client in accordance with IEEE 802.11a/b/g/h and 802.11n (draft 2.0) Mounted on pole or flat surface, protection class IP67 and ATEX (not FCC-compliant)	
	Port type and number	TCSGWA272	2 x WLAN interfaces, up to 8 SSIDs per WLAN interface, 1 x LAN port 10/100BASE-TX, Autosensing
		TCSNWA271 TCSNWA2A1 TCSNWA271F	1 x WLAN interface, up to 8 SSIDs per WLAN interface, 1 x LAN port 10/100BASE-TX, Autosensing
		TCSGWA242 TCSGWA242F	2 x WLAN interfaces, up to 8 SSIDs per WLAN interface, 2 x LAN ports 10/100BASE-TX, Autosensing
		TCSGWC241	1 x WLAN interface, 1 x LAN port 10/100BASE-TX, Autosensing
TCSNWA241 TCSNWA241F		1 x WLAN interface, up to 8 SSIDs per WLAN interface, 2 x LAN ports 10/100BASE-TX, Autosensing	
Dimensions W x H x D		TCSGWA272, TCSNWA271, TCSNWA271F, TCSGWA242,	261 mm x 56 mm x 212 mm (10.28 in x 2.20 in x 8.35 in)
	TCSNWA2A1	273 mm x 59 mm x 310 mm (10.75 in x 2.32 in x 12.21 in)	
	TCSGWC241, TCSGWA242F, TCSNWA241, TCSNWA241F	80 mm x 100 mm x 135 mm (3.15 in x 3.94 in x 5.32 in)	
	Weight	TCSGWA272, TCSNWA271, TCSNWA271F, TCSGWA242, TCSNWA2A1	approx. 2000 g (4.41 lb) approx. 5200 g (11.47 lb)
TCSGWC241, TCSGWA242F, TCSNWA241, TCSNWA241F		approx. 770 g (1.70 lb)	

Mounting	TCSGWA272, TCSNWA271, TCSNWA2A1, TCSNWA271F, TCSGWA242, TCSGWC241, TCSGWA242F, TCSNWA241, TCSNWA241F	Flat surface and pole mounting  DIN rail and flat surface mounting
Power supply	TCSGWA272	2 x 24 VDC -20% to + 25%
Operating voltage	TCSNWA271 TCSNWA2A1 TCSNWA271F	at 5-pin power plug Power over Ethernet according to IEEE802.3af, Mode A, Class 0: + 36 VDC to 57 VDC / max. 8.2 W at Ethernet socket All power supplies redundant
	TCSGWA242	2 x 24 V DC; 12 V DC with suitable external AC power supply
	TCSGWC241 TCSGWA242F TCSNWA241 TCSNWA241F	2 x (1 x for TCSGWC241) Power over Ethernet according to IEEE 802.3af All power supplies redundant
Overload current protection at input		Non-replaceable fuse
Insulation voltage between operating voltage connectors and housing		800 V DC Protective elements limit the insulation voltage to 45 V DC.
Environment	Storage temperature (ambient air temperature) Humidity Atmospheric pressure	-30 °C to +70 °C ( -22 °F to +158 °F)  10% to 95% (non-condensing) up to 2,000 m (795 hPa)
Operating temperature	TCSGWA242 TCSGWC241 TCSGWA242F TCSNWA241 TCSNWA241F	Ambient air -30 °C to +50 °C (-22 °F to +122 °F) (temporarily up to +70 °C (+158 °F) according to EN50155)
	TCSGWA272 TCSNWA271 TCSNWA2A1 TCSNWA271F	Ambient air -30 °C to +55 °C (-22 °F to +131 °F) (temporarily up to +70 °C (+158 °F) according to EN50155)
Pollution degree	TCSGWA242 TCSGWC241 TCSGWA242F TCSNWA241 TCSNWA241F	2
Protection class	TCSGWA272 TCSNWA271 TCSNWA2A1 TCSNWA271F	IP 67 Sturdy metal housing, designed for flat surface and pole mounting
	TCSGWA242 TCSGWC241 TCSGWA242F TCSNWA241 TCSNWA241F	IP 40 Sturdy metal housing, designed for DIN rail and flat surface mounting

## ■ Radio technology

Antenna connector	TCSGWA272	Four antenna connectors (2 main and 2 aux.)
	TCSNWA271	Three antenna connectors
	TCSNWA2A1	
	TCSNWA271F	
	TCSGWA242	Four Reverse SMA connectors (sockets)
	TCSGWA242F	
	TCSGWC241	Two Reverse SMA connectors (sockets)
	TCSNWA241	Three Reverse SMA connectors (sockets)
	TCSNWA241F	
Range	ConneXium WiFi device	Up to 20 km (12.4 miles) with external antennas (depending on antenna used, frequency range and data rate)
Encryption	ConneXium WiFi device	IEEE802.11i/WPA2 with passphrase or 802.1x and hardware-accelerated AES, user authentication with 802.1x/EAP or LEPS, IEEE 802.1x supplicant in client mode, WPA/TKIP, WEP, access control lists, WLAN port and protocol filters, RADIUS client and server, built-in firewall with QoS, port filter, protocol filter, IDS and DoS protection, PMK caching and pre-authentication for fast roaming with IEEE802.1x
Frequency range	TCSGWA242	2 x (1 x for BAT-Client types) independent radio modules, each 2.4 GHz and 5 GHz: 2400-2483.5 MHz (ISM) and 5170-5810 MHz
	TCSGWC241	
	TCSGWA242F	
	TCSGWA272	
	TCSNWA...	1 x radio module, supported by 2.4 GHz and 5 GHz: 2400-2483.5 MHz (ISM) and 5170-5850 MHz
Modulation technology	ConneXium WiFi device	22M0F7D (DSSS/OFDM) at 2.4 GHz 20M0G7D (OFDM) at 5 GHz
Radio topology	TCSGWA272	WLAN access point, bridge, router, point-to-point, client, client-bridge mode, fixed mesh with RSTP
	TCSNWA271	
	TCSNWA2A1	
	TCSNWA271F	
	TCSGWA242	
	TCSGWA242F	
	TCSNWA241	
	TCSNWA241F	
	TCSGWC241	WLAN client, client-bridge mode
Roaming	ConneXium WiFi device	Seamless handover, IAPP support, IEEE802.11d support, background scanning for rogue AP detection and fast roaming

Transmission power	TCSGWA242	2.4 GHz 802.11b: +19 dBm @1 and 2 Mbit/s, +19 dBm @
	TCSGWC241	5.5 and 11 Mbit/s, 2.4 GHz 802.11g: +19 dBm @ 6 Mbit/s,
	TCSGWA242F	+14 dBm @ 54 Mbit/s,
	TCSGWA272	5 GHz 802.11a/h:+18 dBm @ 6 Mbit/s, +12 dBm @ 54 Mbit/s with TPC and DFS, transmission power reduction in 1 dB steps to minimum 0.5 dBm
	TCSNWA...	max. 2.4 GHz 802.11b: +19 dBm @ 1 and 2 MBit/s, +19 dBm @ 5.5 and 11 MBit/s (power output at antenna input); max. 2.4 GHz power output at antenna input 802.11g: +18 dBm @ 6 to 36 MBit/s, +17 dBm @ 48 MBit/s, +16 dBm @ 54 MBit/s; 802.11n: +19 dBm @ 6.5/13 MBit/s (MCS0/8, 20 MHz), +10 dBm @ 65/130 MBit/s (MCS7/15, 20 MHz), +17 dBm @ 15/30 MBit/ s (MCS0/8, 40 MHz), +10 dBm @ 150/300 MBit/s (MCS7/15, 40 MHz); max. 5 GHz power output at antenna input 802.11a/h: +18 dBm @ 6 to 24 MBit/s, +17 dBm @ 36 MBit/s, +16 dBm @ 48 MBit/s, +15 dBm @ 54 MBit/s; 802.11n: +18 dBm @ 6.5/13 MBit/s (MCS0/8, 20 MHz), +10 dBm @ 65/130 MBit/s (MCS7/15, 20 MHz), +17 dBm @ 15/30 MBit/s (MCS0/8, 40 MHz), +10 dBm @ 150/300 MBit/s (MCS7/15, 40 MHz); min. transmission power reduction via software in 1 dB steps to min. 0.5 dBm

## ■ EMC

EMC interference immunity		BAT... TCSG, TCSN except for TCSNW A241	BAT30 0-Rail TCSN WA241
EN 61000-4-2	Electrostatic discharge Contact discharge: test level 3 Air discharge: test level 3	6 kV 8 kV	4 kV 8 kV
EN 61000-4-3	Electromagnetic field, test level 3 (80 - 2000 MHz)	10 V/m	3 V/m
EN 61000-4-4	Fast transients (burst), test level 3 - Power line - Data line	2 kV 1 kV	0,5 kV
EN 61000-4-5	Voltage surges - Power line, line/line: test level 2 - Power line, line/earth: test level 3 - Data line: test level 3	0,5 kV 1 kV 1 kV	1 kV
EN 61000-4-6	Conducted interference voltages, test level 3 150 kHz - 80 MHz	10 V	3 V
EMC emitted interference			
EN 55022	Class A		
FCC 47 CFR Part 15 Class A			

## ■ Stability

Stability	
Vibration	IEC 60068-2-6 Test FC test level according to IEC 61131-2 IEC 60068-2-64 test level in accordance with EN 50155:2001+A1:2002
Shock	IEC 60068-2-27 Test Ea test level in accordance with IEC 61131-2, EN 50155:2001+A1:2002
Shock resistance TCSNWA2A1	IEC 60079-0 chap. 6.2 Shock resistance test with 1kg mass dropped from 0.7 m Housing cover only removeable with tool

## ■ Radio standards

EN 300 328	Electromagnetic compatibility and radio spectrum matters (ERM) - bandwidth transfer systems - data transmission equipment operating in 2.4 GHz ISM band and using spread spectrum modulation technology
EN 301 893	Broadband radio access networks (BRAN) - 5 GHz high-performance Remote Local Area Network (RLAN)
EN 301 489-1	Electromagnetic compatibility for radio equipment and services
EN 301 489-17	Electromagnetic compatibility (EMC) for radio equipment and services - specific conditions for 2.4 GHz wideband transmission systems and 5 GHz high-performance RLAN equipment

## ■ Network range

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

## ■ Power consumption/power output

Device	Power consumption	Power output
TCSGWA272	10.0 W	34.1 Btu (IT)/h
TCSGWA242	10.0 W	34.1 Btu (IT)/h
TCSGWA242F	10.0 W	34.1 Btu (IT)/h
TCSGWC241	10.0 W	34.1 Btu (IT)/h
TCSNWA241	10.0 W	34.1 Btu (IT)/h
TCSNWA241F	10.0 W	34.1 Btu (IT)/h
TCSNWA271	10.0 W	34.1 Btu (IT)/h
TCSNWA271F	10.0 W	34.1 Btu (IT)/h
TCSNWA2A1	10.0 W	34.1 Btu (IT)/h

## ■ Scope of delivery

Device	Scope of delivery
ConneXium WiFi	Device Quick start guide in German and English CD ROM 50 Ohm connector
TCSGWA272, TCSNWA271, TCSNWA2A1, TCSNWA271F additionally	Adapter cable for serial interface, M12, 4-pin, plug -> SubD 9, socket M12 plug shielded for Ethernet interface M12 plug unshielded for power supply connection
TCSGWA242, TCSGWC241, TCSGWA242F, TCSNWA241, TCSNWA241F additionally	Adapter cable for serial interface, miniDin, socket -> SubD 9, socket Two 3 dBi dipole – dual-band antennas
TCSNWA... additionally	Three 3 dBi dipole – dual-band antennas

## ■ Accessories

Designation	
TCSWAMCD	Memory Back-up Adapter for M12 connection
TCSWAMC67	Memory Back-up Adapter for miniDin connection
TCSWABMK	Set for fastening TCSGWA272, TCSNWA271, TCSNWA2A1, TCSNWA271F devices to pole, maximum permitted wind speed 220 km/h (136 mph), permitted pole diameter 39 mm to 60 mm (1.54 in to 2.36 in)
Adapter	
TCSWABP	Lightning protection adapter m-f
Terminal cable	Adapter cable for serial interface, M12, 4-pin, plug -> SubD 9, socket

**Note:** Products recommended as accessories may not have the same environmental and performance characteristics as the ConneXium WiFi devices.

## ■ Underlying norms and standards

Name	
72/245/EEG, 2006/28/EG	Directive on radio interference (electromagnetic tolerance) for motor vehicles. Certified devices are marked with an e1 type approval indicator.
EN 50155:2007	Railway applications - electronic systems in railway vehicles
EN 55022:2006 + A1:2007	IT equipment – radio interference characteristics

*Table 17: List of norms and standards.*

*Certified devices are marked with a certification indicator.*

EN 60079-15	Electrical equipment for explosive gas atmospheres – part 15: Construction, testing and marking of protection type "n" electrical apparatus.
EN 61000-6-2:2005	Generic norm – immunity in industrial environments
EN 61131-2:2003	Programmable logic controllers
FCC 47 CFR Part 15:2009	Code of Federal Regulations
IEC/EN 60950-1:2006	Safety for the installation of IT equipment
IEEE802.3af	Power over Ethernet
IEEE 802.1 D	Switching, GARP, GMRP, Spanning Tree
IEEE 802.1 D-1998	Media access control (MAC) bridges (includes IEEE 802.1p Priority and Dynamic Multicast Filtering, GARP, GMRP)
IEEE 802.1 Q	Tagging
IEEE 802.1 Q-1998	Virtual Bridged Local Area Networks (VLAN Tagging, GVRP)
IEEE 802.1 w.2001	Rapid Reconfiguration
IEEE 802.3-2002	Ethernet
IEEE 802.11a/b/g/h/i/n	WLAN