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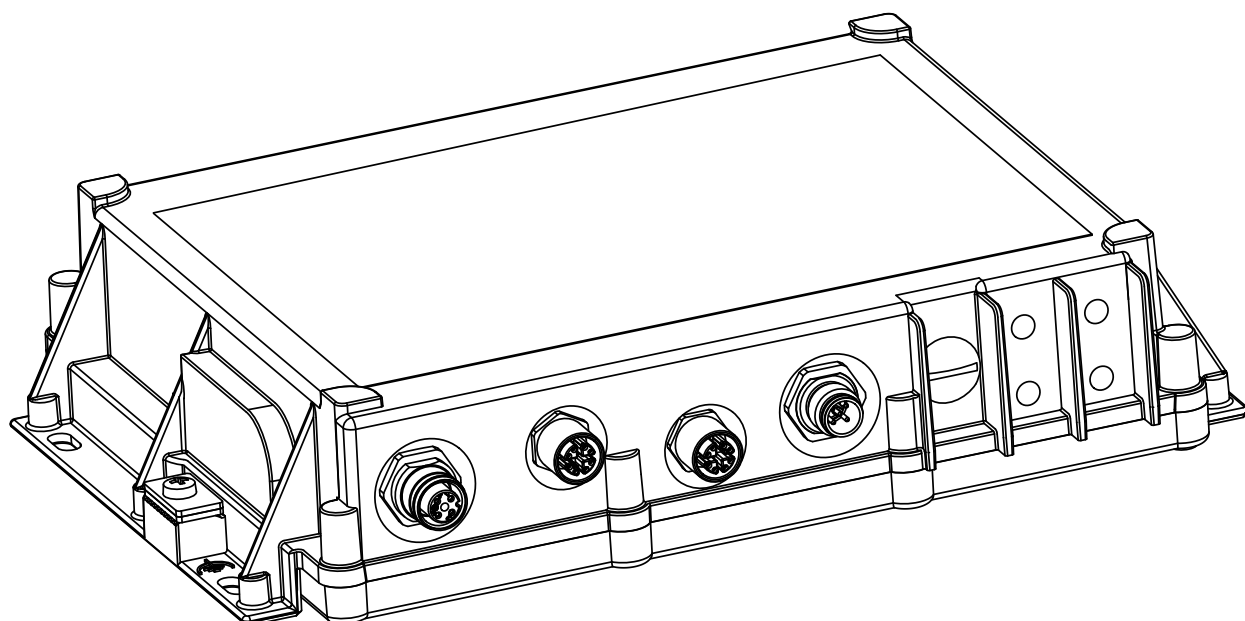
A **BELDEN** BRAND

# User Manual

## Installation

### Industrial Access Point / Client / Access Bridge

### BAT450-F



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# Important information

**Note:** Read these instructions carefully, and familiarize yourself with the device before trying to install, operate, or maintain it. The following notes may appear throughout this documentation or on the device. These notes warn of potential hazards or call attention to information that clarifies or simplifies a procedure.

## ■ Symbol explanation



This is a general warning symbol. This symbol alerts you to potential personal injury hazards. Observe all safety notes that follow this symbol to avoid possible injury or death.



If this symbol is displayed in addition to a safety instruction of the type “Danger” or “Warning”, it means that there is a danger of electric shock and failure to observe the instructions will inevitably result in injury.



This symbol indicates the danger of hot surfaces on the device. In connection with safety instructions, non-observance of the instructions will inevitably result in injuries.



## **DANGER**

**DANGER** draws attention to an immediately dangerous situation, which will **inevitably** result in a serious or fatal accident if not observed.



## **WARNING**

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



## **CAUTION**

**CAUTION** indicates a possible danger which, if not avoided, **may** result in minor injuries.

# NOTICE

**NOTE** provides information about procedures that do not involve the risk of injury.



# Safety instructions



## WARNING

### UNCONTROLLED MACHINE ACTIONS

To avoid uncontrolled machine actions caused by data loss, configure all the data transmission devices individually.

Before you start any machine which is controlled via data transmission, be sure to complete the configuration of all data transmission devices.

**Failure to follow this instruction can result in death, serious injury, or equipment damage.**

### ■ General safety instructions

You operate this device with electricity. Improper usage of the device entails the risk of physical injury or significant property damage. The proper and safe operation of this device depends on proper handling during transportation, proper storage and installation, and careful operation and maintenance procedures.

- ☐ Before connecting any cable, read this document, and the safety instructions and warnings.
- ☐ Operate the device with undamaged components exclusively.
- ☐ The device is free of any service components. In case of a damaged or malfunctioning device, turn off the supply voltage and return the device to Hirschmann for inspection.

### ■ Certified usage

- ☐ Use the product only for the application cases described in the Hirschmann product information, including this manual.
- ☐ Operate the product only according to the technical specifications.  
[See "Technical data" on page 66.](#)
- ☐ Connect to the product only components suitable for the requirements of the specific application case.

## ■ Installation site requirements

“Equipment is intended for installation in Restricted Access Area”

“Les matériels sont destinés à être installés dans des EMBLEMES À ACCÈS RESTREINT”

Restricted access location:

- ▶ The location is outside the operator access area.
- ▶ The location is accessible to the service personnel even when the device is switched on.
- ☐ During the installation, make sure that you adhere to the regulations of the country in which you are operating the device.
- ☐ In ambient temperatures under -10 °C (+14 °F), use the wiring suitable for minimum temperatures.

### Indoor installation

Applies to device variants featuring supply voltage with characteristic value W (24 V DC):

- ▶ You connect the device to a power supply that complies with the requirements for a safety extra-low voltage (SELV) according to IEC 60950-1 or ES1 according to IEC/EN 62368-1.
- ▶ In case of supply via Power over Ethernet (PoE), the PoE data cable and the data cables are laid exclusively inside the building.

Applies to device variants featuring supply voltage with characteristic value N (110 V DC):

- ▶ Install the device in such a way that it is protected against mechanical forces in the area of the power supply.
- ▶ The data cables are laid exclusively inside the building.

### Outdoor installation

Applies to device variants featuring supply voltage with characteristic value W (24 V DC) that comply with **all** of the following requirements:

- ▶ You connect the device to a power supply that complies with the requirements for a safety extra-low voltage (SELV) according to IEC 60950-1 or ES1 according to IEC/EN 62368-1 and with the overvoltage category II (OVC II).
- ▶ In case of supply via Power over Ethernet (PoE), the circuit classification ID 1 according to IEC/EN 62368-1, Table 14 applies (max. transient voltage 1500 V, 10/700 µs).
- ▶ The device variant has been approved for outdoor installation in a pollution degree 3 environment and according to outdoor enclosure type “Raintight” (according to NEMA 3, 3X, 3S, 3SX, 4, 4X, 6, 6P).

## ■ **Strain relief**

**Note:** If the strain relief is insufficient, there is a potential risk of torsion, contact problems and creeping interruptions.

- ☐ Relieve the connection points of cables and lines from mechanical stress.
- ☐ Design strain reliefs in such a way that they help prevent any mechanical damage to cables, wires or conductors caused by external influences or their own weight.
- ☐ To help prevent damage to device connections, connectors and cables, follow the instructions for proper installation in accordance with DIN VDE 0100-520:2013-06, sections 522.6, 522.7 and 522.13.

## ■ **Device casing**

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

- ☐ Never insert pointed objects (narrow screwdrivers, wires, etc.) into the device or into the connection terminals for electric conductors. Do not touch the connection terminals.
- ☐ Install the device in the vertical position, with the antenna connections pointing upwards.
- ☐ At ambient air temperatures  $> +60\text{ }^{\circ}\text{C}$  ( $+140\text{ }^{\circ}\text{F}$ ):  
The surfaces of the device housing may become hot. Avoid touching the device while it is operating.

## ■ **Equipment usage**

Only instructed or skilled person allowed to use the equipment (no ordinary person allowed).

## ■ **Qualification requirements for personnel**

- ☐ Only allow qualified personnel to work on the device.

Qualified personnel have the following characteristics:

- ▶ Qualified personnel are properly trained. Training as well as practical knowledge and experience make up their qualifications. This is the prerequisite for grounding and labeling circuits, devices, and systems in accordance with current standards in safety technology.
- ▶ Qualified personnel are aware of the dangers that exist in their work.
- ▶ Qualified personnel are familiar with appropriate measures against these hazards in order to reduce the risk for themselves and others.
- ▶ Qualified personnel receive training on a regular basis.

## ■ **National and international safety regulations**

- ☐ Verify that the electrical installation meets local or nationally applicable safety regulations.

■ **Grounding the device**

Grounding the device is by means of a separate ground connection on the device.

- ☐ Ground the device before connecting any other cables.
  - ☐ Disconnect the grounding only after disconnecting all other cables.
- The overall shield of a connected shielded twisted pair cable is connected to the ground connection on the metal housing as a conductor.

■ **Requirements for connecting electrical wires**

Before connecting the electrical wires, **always** verify that the requirements listed are complied with.

The following requirements apply without restrictions:	
▶	The electrical wires are voltage-free.
▶	The cables used are permitted for the temperature range of the application case.
▶	Relevant for North America: The power supply cables are suitable for ambient air temperatures of at least +75 °C (+167 °F). The wires of the power supply cables are made of copper.

Table 1: Requirements for connecting electrical wires

■ **Requirements for connecting the supply voltage**

Prerequisites:	
All variants	<p><b>All</b> of the following requirements are complied with:</p> <ul style="list-style-type: none"><li>▶ The supply voltage corresponds to the voltage specified on the type plate of the device.</li><li>▶ The power supply conforms to overvoltage category I or II.</li><li>▶ The power supply has an easily accessible disconnecting device (for example a switch or a plug). This disconnecting device is clearly identified. So in the case of an emergency, it is clear which disconnecting device belongs to which power supply cable.</li><li>▶ The wire diameter of the protective ground conductor is at least 0.75 mm² (AWG19).</li><li>▶ The power supply cable is suitable for the voltage, the current and the physical load. Hirschmann recommends a wire diameter of 0.25 mm² (AWG24) to 0.75 mm² (AWG19).</li></ul>

Table 2: Requirements for connecting the supply voltage

<b>Prerequisites:</b>							
Only for device variants featuring supply voltage with characteristic value W (24 V DC):	<p><b>The following requirements apply alternatively:</b></p> <table> <tr> <td>Alternative 1</td><td>The power supply complies with the requirements for a limited power source (LPS) according to IEC 60950-1 or PS2 according to IEC/EN 62368-1.</td></tr> <tr> <td>Alternative 2</td><td>Relevant for North America: The power supply complies with the requirements according to NEC Class 2.</td></tr> <tr> <td>Alternative 3</td><td> <p><b>All</b> of the following requirements are complied with:</p> <ul style="list-style-type: none"> <li>▶ The power supply complies with the requirements for a safety extra-low voltage (SELV) according to IEC 60950-1 or ES1 according to IEC/EN 62368-1.</li> <li>▶ A suitable fuse is located in the plus conductor of the power supply. Regarding the properties of this fuse: <a href="#">See “General technical data” on page 66.</a></li> </ul> </td></tr> </table>	Alternative 1	The power supply complies with the requirements for a limited power source (LPS) according to IEC 60950-1 or PS2 according to IEC/EN 62368-1.	Alternative 2	Relevant for North America: The power supply complies with the requirements according to NEC Class 2.	Alternative 3	<p><b>All</b> of the following requirements are complied with:</p> <ul style="list-style-type: none"> <li>▶ The power supply complies with the requirements for a safety extra-low voltage (SELV) according to IEC 60950-1 or ES1 according to IEC/EN 62368-1.</li> <li>▶ A suitable fuse is located in the plus conductor of the power supply. Regarding the properties of this fuse: <a href="#">See “General technical data” on page 66.</a></li> </ul>
Alternative 1	The power supply complies with the requirements for a limited power source (LPS) according to IEC 60950-1 or PS2 according to IEC/EN 62368-1.						
Alternative 2	Relevant for North America: The power supply complies with the requirements according to NEC Class 2.						
Alternative 3	<p><b>All</b> of the following requirements are complied with:</p> <ul style="list-style-type: none"> <li>▶ The power supply complies with the requirements for a safety extra-low voltage (SELV) according to IEC 60950-1 or ES1 according to IEC/EN 62368-1.</li> <li>▶ A suitable fuse is located in the plus conductor of the power supply. Regarding the properties of this fuse: <a href="#">See “General technical data” on page 66.</a></li> </ul>						
Only for device variants featuring supply voltage with characteristic value N (110 V DC):	<p>A fuse suitable for DC voltage is located in the plus conductor of the power supply. Regarding the properties of this fuse: <a href="#">See “General technical data” on page 66.</a></p>						

*Table 2: Requirements for connecting the supply voltage*

## ■ Lightning protection and surge protection

Applies exclusively to devices and antennas installed outdoors:

- ▶ The installation of the device must be carried out by a lightning protection professional in accordance with valid standards (such as IEC 62305 / DIN EN 62305 (VDE 0185-305)), and in accordance with the lightning protection procedures recognized and proven for the application and the environment.
- ☐ Refer to the information in the “WLAN Outdoor Guide” on “Lightning protection and surge protection”.  
The manual is available for download on the Internet: <https://www.doc.hirschmann.com>
- ☐ Ensure that the lightning protection professional installs lightning protection devices (for example lightning conductors) to protect antennas installed outdoors.
- ☐ Ensure that the lightning protection professional takes appropriate lightning protection measures that mitigate the effects of lightning strikes.

## ■ **E marking**

The labeled devices comply with the regulations contained in the following European directive(s):

Regulation No. 10 of the Economic Commission for Europe of the United Nations (UN/ECE): **Devices with an approval are labeled with the E type approval mark.**

Devices are not specified for operation during the motor start phase.

## ■ **CE marking**

The labeled devices comply with the regulations contained in the following European directive(s):

2011/65/EU and 2015/863/EU (RoHS)

Directive of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

2014/53/EU (RED)

Directive of the European Parliament and of the council on the harmonization of the laws of the Member States relating to the making available on the market of radio equipment.

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


In accordance with the above-named EU directive(s), the EU conformity declaration will be available to the relevant authorities at the following address:

Hirschmann Automation and Control GmbH  
Stuttgarter Str. 45-51  
72654 Neckartenzlingen  
Germany

You find the EU conformity declaration as PDF file for downloading on the Internet at: <https://www.doc.hirschmann.com/certificates.html>

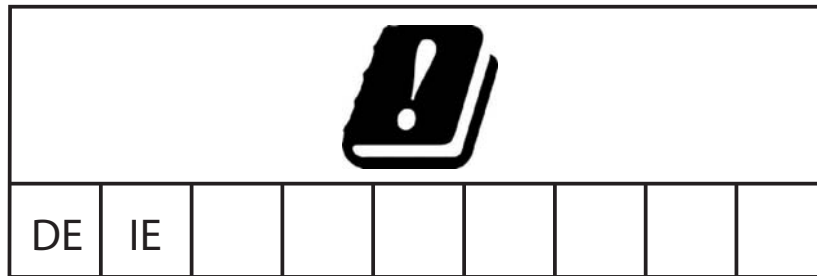
The product can be used in residential areas (residential, commercial and light-industrial environments) and in industrial areas.

## Notes for countries with the following country codes:

								
AT	BE	BG	CH	CY	CZ	DE	DK	EE
EL	ES	FI	FR	HR	HU	IE	IT	LI
LT	LU	LV	MT	NL	NO	PL	PT	RO
RS	SE	SI	SK	TR				

- ▶ The RED compliance requires compliant operation of the device in the 5 GHz band channels. Compliant operation of the device is achieved by an unchangeable determination of the country setting. To obtain RED compliance, perform the work steps described in chapter [“Obtaining compliance for operation in the European Union and in the United Kingdom \(UK\)” on page 56](#).
- ▶ Applies to the operation of devices in the 5.6 to 5.65 GHz band:  
Install an antenna with an antenna gain of at least 3 dBi.

## Notes for Germany (DE) and Ireland (IE):



Operation in the 5.8 GHz band at a radiated power (EIRP) >25 mW is subject to meeting the following conditions:

- ▶ Germany (DE)  
Frequency range: 5725 MHz to 5875 MHz  
Condition: The usage of this band is restricted to commercial public telecommunication services. Registration at the Federal Network Agency is required.  
Name and website of the competent authority:  
Bundesnetzagentur  
[www.bundesnetzagentur.de](http://www.bundesnetzagentur.de)
- ▶ Ireland (IE)  
Frequency range: 5725 MHz to 5875 MHz  
Condition: Registration of operational base stations  
Name and website of the competent authority:  
Commission for Communications Regulation  
[www.comreg.ie](http://www.comreg.ie)



## ■ **UKCA marking**

The labeled devices comply with the following UK regulations:

- ▶ S.I. 2012 No. 3032 Restriction of the Use of Certain Hazardous Substances in Electrical and Electronical Equipment Regulations
- ▶ S.I. 2017 No. 1206 Radio Equipment Regulations



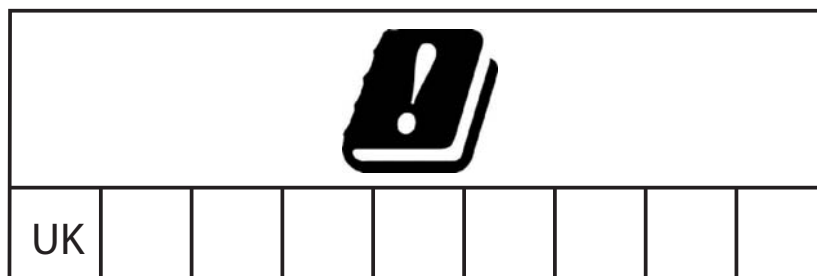
The UKCA conformity declaration will be available to the relevant authorities at the following address:

Belden UK Ltd.

1 The Technology Centre, Station Road  
Framlingham, IP13 9EZ, United Kingdom

You find the UKCA conformity declaration as PDF file for downloading on the Internet at: <https://www.doc.hirschmann.com/certificates.html>

## Notes for the United Kingdom (UK):



- ▶ The Radio Equipment Regulations compliance requires compliant operation of the device in the 5 GHz band channels. Compliant operation of the device is achieved by an unchangeable determination of the country setting. To obtain the Radio Equipment Regulations compliance, perform the work steps described in chapter “[Obtaining compliance for operation in the European Union and in the United Kingdom \(UK\)](#)” on page 56.

- ▶ Applies to the operation of devices in the 5.6 to 5.65 GHz band:  
Install an antenna with an antenna gain of at least 3 dBi.

- ▶ Operation in the 5.8 GHz band at a radiated power (EIRP) >25 mW is subject to meeting the following conditions:

Frequency range: 5725 MHz to 5850 MHz

Condition: Light-licensing regime

Name and website of the competent authority:

Ofcom

[www.ofcom.org.uk](http://www.ofcom.org.uk)

### ■ LED or laser components

LED or LASER components according to IEC 60825-1 (2014):

CLASS 1 LASER PRODUCT

CLASS 1 LED PRODUCT

## ■ **FCC note for 11n device variants**

### **Supplier's Declaration of Conformity 47 CFR § 2.1077 Compliance Information**

BAT450-F

#### **U.S. Contact Information**

Belden – St. Louis  
1 N. Brentwood Blvd. 15th Floor  
St. Louis, Missouri 63105, United States  
Phone: 314.854.8000

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.

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:

- ☐ Reposition the receiver antenna or change the angle of the receiver antenna.
  - ☐ Increase the separation between the device and the receiver.
  - ☐ Connect the device to a different outlet on a different power supply cable from that to which the receiver is connected.
  - ☐ Consult a specialist retailer or an electronic systems engineer for help.
- Changes or modifications not expressly approved by the holder of the certificate could void the user's authority to operate this equipment.

#### **E WLAN1 Module**

##### **Note for the use in the USA and in Canada**

The following section applies to device variants with characteristic value US (USA/Canada) for country approvals, which are labeled as follows:

## Contains Transmitter Module

**FCC ID: U99EWLAN1**

**IC: 4019A-EWLAN1**

This equipment complies with FCC and IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. Install and operate this equipment with a minimum distance of 50 cm (19.7 in) (related to a 9 dBi antenna) between the radiation source 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 to 5.25 GHz band to reduce potential for harmful interference to co-channel mobile satellite systems.

The power of the device was reduced by 6 dB on channel 149 (5745 MHz) for all modulations to be compliant to the band edge limits.

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 (EIRP) 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:

Antenna(s) for operation with this device:	Permitted band of operation		
	2.4 GHz band	5.18 GHz ... 5.24 GHz band	5.745 GHz ... 5.825 GHz band
BAT-ANT-N-3AGN-IP67	Yes	Yes	Yes
BAT-ANT-N-MiMoDB-5N-IP65	Yes	Yes	Yes
BAT-ANT-N-MiMo5-9N-IP65	No	Yes	Yes
BAT-ANT-N-8G-DS-IP65	Yes	No	No

The FCC approval is valid only in conjunction with the listed antennas. If other antennas are used, the approval expires. The responsibility lies with the operator of the system. The required antenna impedance is 50  $\Omega$ .

Applies exclusively to device variants with approval for the 4.9 GHz band (Approvals 2, characteristic value P) according to FCC 47CFR Part 90 Subpart Y:

- ▶ Operation of the device in the 4.9 GHz band requires trained personnel familiar with the regulatory requirements for operation according to FCC 47CFR Part 90 Subpart Y.
- ▶ The 4.9 GHz band is a licensed band. State and local government entities that provide public safety services are eligible to apply for 4.9 GHz licenses. For more information, see the Federal Communications Commission (FCC) regulations. The installer or operator is responsible for obtaining the appropriate site licenses before installing or using the system.
- ▶ The antenna gain of the antenna must not exceed 9 dBi.
- ▶ For antennas with an antenna gain >9 dBi, the transmit power must be reduced accordingly in the device software. You can find step-by-step instructions for reducing the transmit power in the device software in the [“Configuring the transmit power for the 4.9 GHz band” on page 61](#) chapter.

## ■ **FCC note for 11ac device variants**

### **Supplier's Declaration of Conformity 47 CFR § 2.1077 Compliance Information**

BAT450-F

#### **U.S. Contact Information**

Belden – St. Louis  
1 N. Brentwood Blvd. 15th Floor  
St. Louis, Missouri 63105, United States  
Phone: 314.854.8000

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.

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:

- ☐ Reposition the receiver antenna or change the angle of the receiver antenna.
  - ☐ Increase the separation between the device and the receiver.
  - ☐ Connect the device to a different outlet on a different power supply cable from that to which the receiver is connected.
  - ☐ Consult a specialist retailer or an electronic systems engineer for help.
- Changes or modifications not expressly approved by the holder of the certificate could void the user's authority to operate this equipment.

#### **WLE900VX Module**

##### **Note for the use in the USA and in Canada**

The following section applies to BAT450-F variants with the characteristic value US (USA/Canada) for country approvals which are labeled as follows:

## Contains Transmitter Module

**FCC ID: TK4WLE900VX**

**IC: 7849A-WLE900VX**

This equipment complies with FCC and IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. Install and operate this equipment with a minimum distance of 50 cm (19.7 in) (related to a 9 dBi antenna) between the radiation source 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 to 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 (EIRP) is not more than that permitted for successful communication.

Antenna(s) for operation with this device:	Permitted band of operation				
	2.4 GHz band	5 GHz band			
		5180 ... 5240 MHz	5260 ... 5320 MHz	5500 ... 5720 MHz	5745 ... 5825 MHz
BAT-ANT-RSMA-2AGN-R <sup>a</sup>	Yes	Yes	Yes	Yes	Yes
BAT-ANT-N-MiMoDB-5N-IP65	Yes	Yes	Yes	Yes	Yes

- a. Note: When using 2 antennas type BAT-ANT-RSMA-2AGN-R, you must align each antenna in another spatial direction (x-y) so that both antennas are arranged at right angles to each other.

The FCC approval is valid only in conjunction with the listed antennas. If other antennas are used, the approval expires. The responsibility lies with the operator of the system. The required antenna impedance is 50 Ω.

## ■ Notes for the use in Taiwan

The following notes apply to BAT450-F variants with the characteristic value TW (Taiwan) for country approvals:

### NCC Warning Statement

低功率射頻器材技術規範警語

取得審驗證明之低功率射頻器材，非經核准，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前述合法通信，指依電信管理法規定作業之無線電通信。低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

Administrative Regulations on Low Power Radio Waves Radiated Devices warning:

Without permission granted by the NCC, any company, enterprise, or user is not allowed to change frequency, enhance transmitting power or alter original characteristic as well as performance to an approved low power radio-frequency devices.

The low power radio-frequency devices shall not influence aircraft security and interfere legal communications; If found, the user shall cease operating immediately until no interference is achieved.

The said legal communications means radio communications is operated in compliance with the Telecommunications Act.

The low power radio-frequency devices must be susceptible with the interference from legal communications or ISM radio wave radiated devices.

「減少電磁波影響，請妥適使用」

“ For Reducing RF Influence, Use Properly ”



Figure 1: NCC Certification Number



設備名稱： 工業無線存取橋接器，型號（型式）： BAT450-F						
單元 Unit	限用物質及其化學符號					
	鉛Lead (Pb)	汞Mercury (Hg)	鎘Cadmium (Cd)	六價鉻 Hexavalent chromium (Cr <sup>6+</sup> )	多溴聯苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
鐵殼	○	○	○	○	○	○
電路板	○	○	○	○	○	○
內部線材	○	○	○	○	○	○
無線模組	○	○	○	○	○	○
<p>備考1. “超出0.1 wt %”及“超出0.01 wt %”係指限用物質之百分比含量超出百分比含量基準值。  Note 1: “Exceeding 0.1 wt %” and “exceeding 0.01 wt %” indicate that the percentage content of the restricted substance exceeds the reference percentage value of presence condition.</p> <p>備考2. “○”係指該項限用物質之百分比含量未超出百分比含量基準值。  Note 2: “○” indicates that the percentage content of the restricted substance does not exceed the percentage of reference value of presence.</p> <p>備考3. “—”係指該項限用物質為排除項目。  Note 3: The “—” indicates that the restricted substance corresponds to the exemption.</p>						

Figure 2: RoHS table

### ■ Note for the use in Oman

This note applies to BAT450-F variants with the characteristic value OM (Oman) for country approvals:

This telecommunication equipment complies with the technical requirements of the Telecommunications Regulatory Authority (TRA) and is labeled as follows:

OMAN - TRA
R/4116/17
D100428

### ■ Recycling note

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




# About this manual

The “Installation” user manual contains a device description, safety instructions, a description of the display, and the other information that you need to install the device.

Documentation mentioned in the “User Manual Installation” that is not supplied with your device as a printout can be found as PDF files for downloading on the Internet at: <https://www.doc.hirschmann.com>

# Key

The symbols used in this manual have the following meanings:

	Listing
	Work step
	Subheading

# 1 Description

## 1.1 General device description

The device is a wireless LAN access point or wireless LAN client device-dependent complying with IEEE 802.11a/b/g/h/n or with IEEE 802.11ac. The device provides a high radio output with a data rate of up to 450 Mbit/s. The device supports MIMO (Multiple Input Multiple Output) and multipath. The data rate is increased by using the multipath transmission by means of reflections.

Devices with LTE function allow you to establish 3G data communication or 4G data communication via a public cellular network. Devices with LTE function have integrated a GPS receiver and a GLONASS receiver for position determination.

11ac device variants are especially suitable for use in onboard railway applications.

You have numerous options of combining the device characteristics. You can determine the possible combinations using the configurator which is available in the Belden Online Catalog <https://catalog.belden.com> on the web page of the device.

There are convenient options for managing the device. Manage your devices via:

- ▶ Web browser
  - ▶ SSH
  - ▶ Telnet
  - ▶ HiDiscovery (software for putting the device into operation)
  - ▶ V.24 interface (locally on the device)
  - ▶ Network management software (for example Industrial HiVision)
- The Network Management Software Industrial HiVision provides you with options for smooth configuration and monitoring. You find further information on the Internet at the Hirschmann product pages:  
<http://www.hirschmann.com/en/QR/INET-Industrial-HiVision>

The device works without a fan.

The device complies with the degrees of protection IP65/67.

## 1.2 Device name and product code

The device name corresponds to the product code. The product code is made up of characteristics with defined positions. The characteristic values stand for specific product properties.

Item	Characteristic	Characteristic value	Description
1 ... 8	Product	BAT450-F	IP65/67 housing
9 ... 10	Country approvals	XX	You can determine the current country approvals using the configurator ( <a href="https://catalog.belden.com">https://catalog.belden.com</a> )
	Example: Singapore	Example: SG	
11	Slot 1	W	WLAN module 11n
		5	WLAN module 11ac
12	Slot 2	W	WLAN module 11n
		9	Not assembled
13	Slot 3	L	LTE module
		9	Not assembled
14	Access point or client	A	Access Point
		C	Client
15	Supply voltage 1	W	Rated voltage DC: 24 V DC
		N	Rated voltage DC: 110 V DC
16	Supply voltage 2	9	Not assembled
17	Approvals 1	K	Rail applications (EN 50155)
		9	No additional approvals
18	Approvals 2	M	Motor vehicles applications (E type-approval mark, ECE No. 10)
		P	Approval for the 4.9 GHz band
		9	No additional approvals
19	Mounting	A	Standard
20 ... 21	Ethernet port 1	T6	Applies to device variants featuring supply voltage with characteristic value W (24 V DC): 8-pin, "X"-coded M12 socket for 10/100/1000 Mbit/s PoE port
			Applies to device variants featuring supply voltage with characteristic value N (110 V DC): 8-pin, "X"-coded M12 socket for 10/100/1000 Mbit/s twisted pair connections

Table 3: Device name and product code

Item	Characteristic	Characteristic value	Description
22 ... 23	Optional: Ethernet port 2 or interface	T6	8-pin, "X"-coded M12 socket for 10/100/1000 Mbit/s twisted pair connections
		T7	▶ 8-pin, "X"-coded M12 socket for 10/100/1000 Mbit/s twisted pair connections ▶ V.24/ACA11
		V4	V.24/ACA11
		99	Not assembled
24	Temperature range	E	Extended with Conformal Coating -40 °C ... +70 °C (-40 °F ... +158 °F)
		T	Extended -40 °C ... +70 °C (-40 °F ... +158 °F)
		M	with Conformal Coating -30 °C ... +70 °C (-22 °F ... +158 °F)
		A	-25 °C ... +70 °C (-13 °F ... +158 °F)
		N	with Conformal Coating -25 °C ... +70 °C (-13 °F ... +158 °F)
25	Software option 1	A	VPN-5
		B	VPN-50
		C	VPN-100
		9	Not present
26	Software option 2	9	Not present
27	Software option 3	D	Public Spot
		P	PRP
		A	AutoWDS
		9	Not present
28	Configuration	Z	Accessory package
		9	Not present
29	Device model	H	Hirschmann standard

Table 3: Device name and product code

### 1.3 Device view 11n device variants (non-LTE)

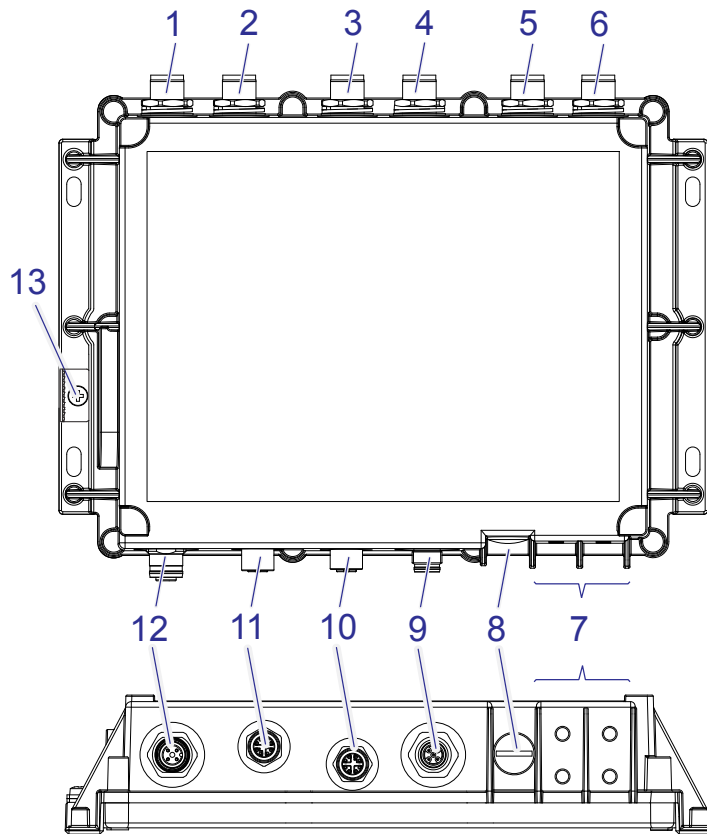


Figure 3: Device view 11n device variants (non-LTE)

1	Optional: WLAN 2	1 × Antenna connection
2	WLAN 1	1 × Antenna connection
3	Optional: WLAN 2	1 × Antenna connection
4	WLAN 1	1 × Antenna connection
5	Optional: WLAN 2	1 × Antenna connection
6	WLAN 1	1 × Antenna connection
7	LED display elements	
8	Reset button behind a screwable IP65/67 protection cap	
9	Supply voltage connection	Applies to device variants featuring supply voltage with characteristic value W (24 V DC): 5-pin, "A"-coded M12 socket
		Applies to device variants featuring supply voltage with characteristic value N (110 V DC): 4-pin, "A"-coded M12 socket

10	Ethernet port 1	Applies to device variants featuring supply voltage with characteristic value W (24 V DC): 8-pin, "X"-coded M12 socket for 10/100/1000 Mbit/s PoE port
		Applies to device variants featuring supply voltage with characteristic value N (110 V DC): 8-pin, "X"-coded M12 socket for 10/100/1000 Mbit/s twisted pair connections
11	Optional: Ethernet port 2	8-pin, "X"-coded M12 socket for 10/100/1000 Mbit/s twisted pair connections
12	Optional: V.24/ACA11	4-pin, "A"-coded M12 socket
13	Connection for protective ground	



## 1.4 Device view 11ac device variants (non-LTE)

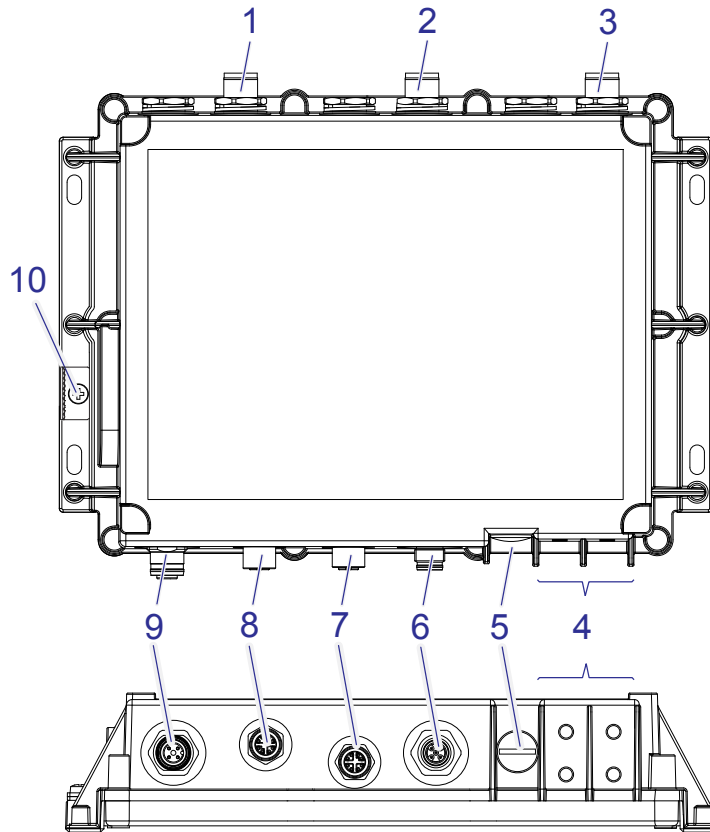


Figure 4: Device view 11ac device variants (non-LTE)

1	WLAN 11ac	1 × Antenna connection
2	WLAN 11ac	1 × Antenna connection
3	WLAN 11ac	1 × Antenna connection
4	LED display elements	
5	Reset button behind a screwable IP65/67 protection cap	
6	Supply voltage connection	Applies to device variants featuring supply voltage with characteristic value W (24 V DC): 5-pin, "A"-coded M12 socket
		Applies to device variants featuring supply voltage with characteristic value N (110 V DC): 4-pin, "A"-coded M12 socket
7	Ethernet port 1	Applies to device variants featuring supply voltage with characteristic value W (24 V DC): 8-pin, "X"-coded M12 socket for 10/100/1000 Mbit/s PoE port
		Applies to device variants featuring supply voltage with characteristic value N (110 V DC): 8-pin, "X"-coded M12 socket for 10/100/1000 Mbit/s twisted pair connections
8	Optional: Ethernet port 2	8-pin, "X"-coded M12 socket for 10/100/1000 Mbit/s twisted pair connections
9	Optional: V.24/ACA11	4-pin, "A"-coded M12 socket

# 1.5 Device view LTE device variants

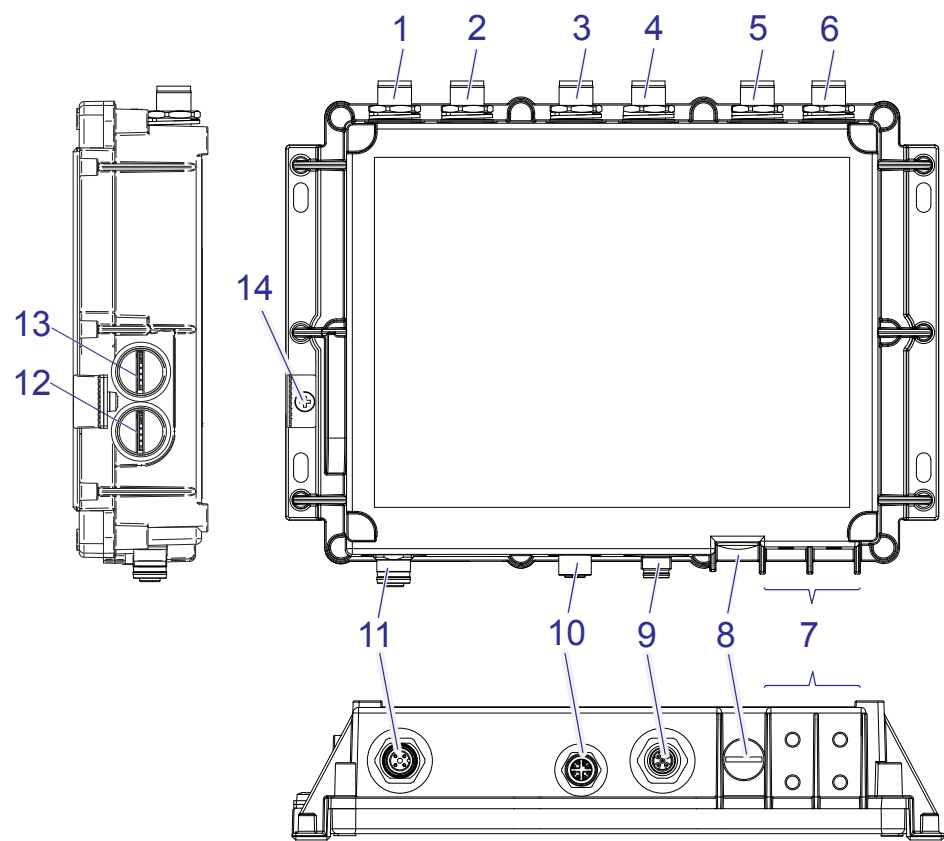


Figure 5: Device view LTE device variants

1	LTE AUX	1 × Antenna connection
2	WLAN 1	1 × Antenna connection
3	LTE GNSS	1 × Antenna connection
4	WLAN 1	1 × Antenna connection
5	LTE MAIN	1 × Antenna connection
6	WLAN 1	1 × Antenna connection
7	LED display elements	
8	Reset button behind a screwable IP65/67 protection cap	
9	Supply voltage connection	Applies to device variants featuring supply voltage with characteristic value W (24 V DC): 5-pin, “A”-coded M12 socket Applies to device variants featuring supply voltage with characteristic value N (110 V DC): 4-pin, “A”-coded M12 socket

10	Ethernet port 1	Applies to device variants featuring supply voltage with characteristic value W (24 V DC): 8-pin, "X"-coded M12 socket for 10/100/1000 Mbit/s PoE port
		Applies to device variants featuring supply voltage with characteristic value N (110 V DC): 8-pin, "X"-coded M12 socket for 10/100/1000 Mbit/s twisted pair connections
11	Optional: V.24/ACA11	4-pin, "A"-coded M12 socket
12	SIM 1	
13	SIM 2	
14	Connection for protective ground	

## 1.6 Power supply

You have the following options to supply your device with voltage:

### 1.6.1 Supply voltage with the characteristic value W (24 V DC)

#### ■ Power supply via an 8-pin, "X"-coded M12 socket for PoE port

Your device is a PD (powered device). PSE (power sourcing equipment) connected via a twisted pair cable on the PoE PD port serves as the PoE power supply voltage. The PoE power supply means that no separate power supply is required for your device.

#### ■ Power supply via a 5-pin, "A"-coded M12 plug

For the power supply of the device, a 5-pin, "A"-coded M12 plug is available.

**Note:** When both power sources are connected, there is a redundant power supply primarily via PoE.

### 1.6.2 Supply voltage with the characteristic value N (110 V DC)

For the power supply of the device, a 4-pin, "A"-coded M12 plug is available.

## 1.7 Ethernet ports

You have the option to connect end devices or other segments to the ports of the device via twisted pair cables.

You find information on the pin assignments for making patch cables here:  
[See “Pin assignments” on page 37.](#)

### 1.7.1 10/100/1000 Mbit/s PoE port

This port is an 8-pin, “X”-coded M12 socket.

The 10/100/1000 Mbit/s PoE port allows you to connect network components as a PoE power source according to standards IEEE 802.3 10BASE-T/100BASE-TX/1000BASE-T and IEEE 802.3af.

This port supports:

- ▶ Autocrossing (if autonegotiation is activated)
- ▶ Autonegotiation
- ▶ Autopolarity
- ▶ 10 Mbit/s half-duplex mode, 10 Mbit/s full duplex mode
- ▶ 100 Mbit/s half-duplex mode, 100 Mbit/s full duplex mode
- ▶ 1000 Mbit/s full duplex
- ▶ Power over Ethernet

The socket housing is electrically connected with the device housing.

Delivery state: Autonegotiation activated

The PoE power is supplied via the wire pairs transmitting the signal (phantom voltage).

### 1.7.2 10/100/1000 Mbit/s twisted pair port

This port is an 8-pin, “X”-coded M12 socket.

The 10/100/1000 Mbit/s twisted pair port allows you to connect network components according to the IEEE 802.3 10BASE-T/100BASE-TX/1000BASE-T standard.

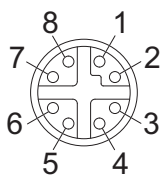
This port supports:

- ▶ Autocrossing (if autonegotiation is activated)
- ▶ Autonegotiation
- ▶ Autopolarity
- ▶ 10 Mbit/s half-duplex mode, 10 Mbit/s full duplex mode
- ▶ 100 Mbit/s half-duplex mode, 100 Mbit/s full duplex mode
- ▶ 1000 Mbit/s full duplex

Delivery state: Autonegotiation activated

The socket housing is electrically connected with the device housing.

### 1.7.3 Pin assignments

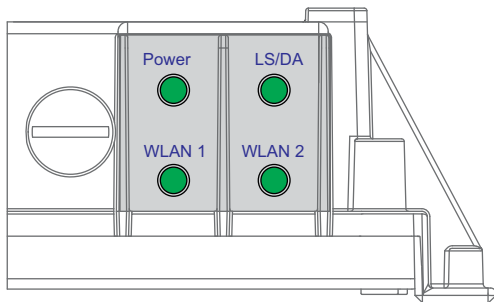
M12 8-pin ("X"-coded)	Pin	10/100 Mbit/s (applies to Twisted Pair port)	1000 Mbit/s	PoE (applies to PoE port)
	1	RX+	BI_DB+	Negative $V_{PSE}$
	2	RX-	BI_DB-	Negative $V_{PSE}$
	3	TX+	BI_DA+	Positive $V_{PSE}$
	4	TX-	BI_DA-	Positive $V_{PSE}$
	5	—	BI_DC+	Negative $V_{PSE}$
	6	—	BI_DC-	Negative $V_{PSE}$
	7	—	BI_DD-	Positive $V_{PSE}$
	8	—	BI_DD+	Positive $V_{PSE}$

## 1.8 Display elements 11n device variants (non-LTE)

After the supply voltage is set up, the Software starts and initializes the device. Afterwards, the device performs a self-test. During this process, various LEDs light up.

### 1.8.1 Device state

These LEDs provide information about conditions which affect the operation of the whole device.



Power		
Color	Activity	Meaning
green	lights up	LED lights up after the configuration
red	flashing	Device has detected at least one hardware error.
green/red	short flashing	No password or the default password is set
green/red	Long flashing	Charge lock active

WLAN 1, WLAN 2		
Color	Activity	Meaning
—	off	<ul style="list-style-type: none"> <li>▶ No WLAN network specified</li> <li>▶ WLAN module deactivated</li> <li>▶ WLAN module does not send any beacons</li> </ul>

WLAN 1, WLAN 2		
Color	Activity	Meaning
green	flashing	<ul style="list-style-type: none"> <li>▶ At least one WLAN network defined</li> <li>▶ WLAN module activated</li> </ul>
green	inverse flashing	Number of flashes corresponds to number of connected WLAN stations and P2P radio lines.
green	flashing	<ul style="list-style-type: none"> <li>▶ DFS scanning or another scan procedure</li> <li>▶ Display of signal strength in client or P2P</li> </ul>
red	flashing	Device has detected at least one hardware error.

### 1.8.2 LS/DA

These LEDs display port-related information. During the boot phase, they indicate the status of the boot process.

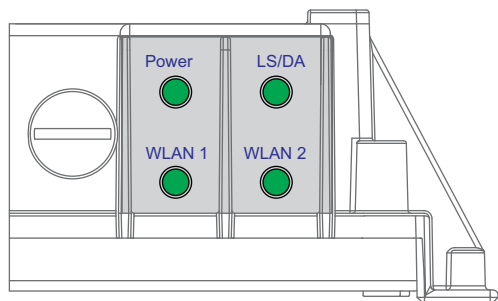
LS/DA		
Color	Activity	Meaning
—	off	No network device connected
green	lights up	1 Ethernet connection active
green/ yellow	flashing	Device is transmitting and/or receiving data
yellow	lights up	2 Ethernet connections active

## 1.9 Display elements 11ac device variants (non-LTE)

After the supply voltage is set up, the Software starts and initializes the device. Afterwards, the device performs a self-test. During this process, various LEDs light up.

### 1.9.1 Device state

These LEDs provide information about conditions which affect the operation of the whole device.



Power		
Color	Activity	Meaning
green	lights up	LED lights up after the configuration
red	flashing	Device has detected at least one hardware error.

<b>Power</b>		
<b>Color</b>	<b>Activity</b>	<b>Meaning</b>
green/red	short flashing	No password or the default password is set
green/red	Long flashing	Charge lock active

<b>WLAN 1</b>		
<b>Color</b>	<b>Activity</b>	<b>Meaning</b>
—	off	<ul style="list-style-type: none"> <li>▶ No WLAN network specified</li> <li>▶ WLAN module deactivated</li> <li>▶ WLAN module does not send any beacons</li> </ul>
green	flashing	<ul style="list-style-type: none"> <li>▶ At least one WLAN network defined</li> <li>▶ WLAN module activated</li> </ul>
green	inverse flashing	Number of flashes corresponds to number of connected WLAN stations and P2P radio lines.
green	flashing	<ul style="list-style-type: none"> <li>▶ DFS scanning or another scan procedure</li> <li>▶ Display of signal strength in client or P2P</li> </ul>
red	flashing	Device has detected at least one hardware error.

<b>WLAN 2</b>		
<b>Color</b>	<b>Activity</b>	<b>Meaning</b>
—	—	No function in the existing device version.

## 1.9.2 LS/DA

These LEDs display port-related information. During the boot phase, they indicate the status of the boot process.

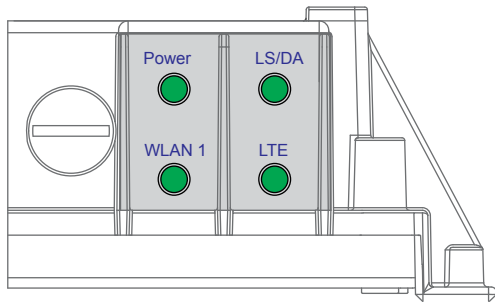
<b>LS/DA</b>		
<b>Color</b>	<b>Activity</b>	<b>Meaning</b>
—	off	No network device connected
green	lights up	1 Ethernet connection active
green/ yellow	flashing	Device is transmitting and/or receiving data
yellow	lights up	2 Ethernet connections active

## 1.10 Display elements LTE device variants

After the supply voltage is set up, the Software starts and initializes the device. Afterwards, the device performs a self-test. During this process, various LEDs light up.

### 1.10.1 Device state

These LEDs provide information about conditions which affect the operation of the whole device.



Power		
Color	Activity	Meaning
green	lights up	LED lights up after the configuration
red	flashing	Device has detected at least one hardware error.
green/red	short flashing	No password or the default password is set
green/red	Long flashing	Charge lock active

WLAN		
Color	Activity	Meaning
—	off	<ul style="list-style-type: none"> <li>▶ No WLAN network specified</li> <li>▶ WLAN module deactivated</li> <li>▶ WLAN module does not send any beacons</li> </ul>
green	flashing	<ul style="list-style-type: none"> <li>▶ At least one WLAN network defined</li> <li>▶ WLAN module activated</li> </ul>
green	inverse flashing	Number of flashes corresponds to number of connected WLAN stations and P2P radio lines.
green	flashing	<ul style="list-style-type: none"> <li>▶ DFS scanning or another scan procedure</li> <li>▶ Display of signal strength in client or P2P</li> </ul>
red	flashing	Device has detected at least one hardware error.

LTE		
Color	Activity	Meaning
—	—	No function in the existing device version.

### 1.10.2 LS/DA

LS/DA		
Color	Activity	Meaning
—	—	No function in the existing device version.



## 1.11 Management interfaces

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

This interface is a 4-pin, “A”-coded M12 socket.

This interface is serial and enables the local connection of an external management station (VT100 terminal or PC with corresponding terminal emulation). This enables you to set up a connection to the Command Line Interface CLI and to the System Monitor.

#### VT100 terminal settings

Speed	115200 bit/s
Data	8 bit
Stopbit	1 bit
Handshake	off
Parity	none

The socket housing is electrically connected to the housing of the device. The V.24 interface is not electrically insulated from the supply voltage.

You can use the V.24 interface to connect the AutoConfiguration Adapter ACA11 storage medium.

The AutoConfiguration Adapter ACA21-M12 and ACA22-M12 storage media are incompatible with the device.


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

Table 4: Pin assignment of the V.24 interface (M12 socket)

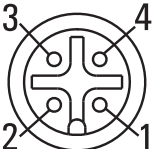
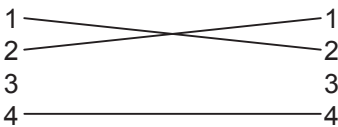
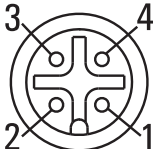
Pins of the M12 socket on the device	Pin assignment for the connection with a cable	Pins of the M12 socket on the device
		

Table 5: Pin assignment for the connection with a cable:  
4-pin, “A”-coded M12 plug to 4-pin, “A”-coded M12 plug (For the automatic configuration of a point-to-point WLAN line by means of a serial connection)

### 1.11.2 Reset button

The device has a reset button. The reset button is located behind a screwable IP65/67 protection cap.

**Prerequisite:** Keep the working area dry and clean when you are carrying out a reset.

After pressing the reset button, replace the protection cap. Degrees of protection IP65/67 are only achieved when the protection cap is closed.

You will find more information in the “User Manual Configuration Guide”, in the chapter “Using the Boot Configurations”.

The manual is available for download on the Internet: <https://www.doc.hirschmann.com>

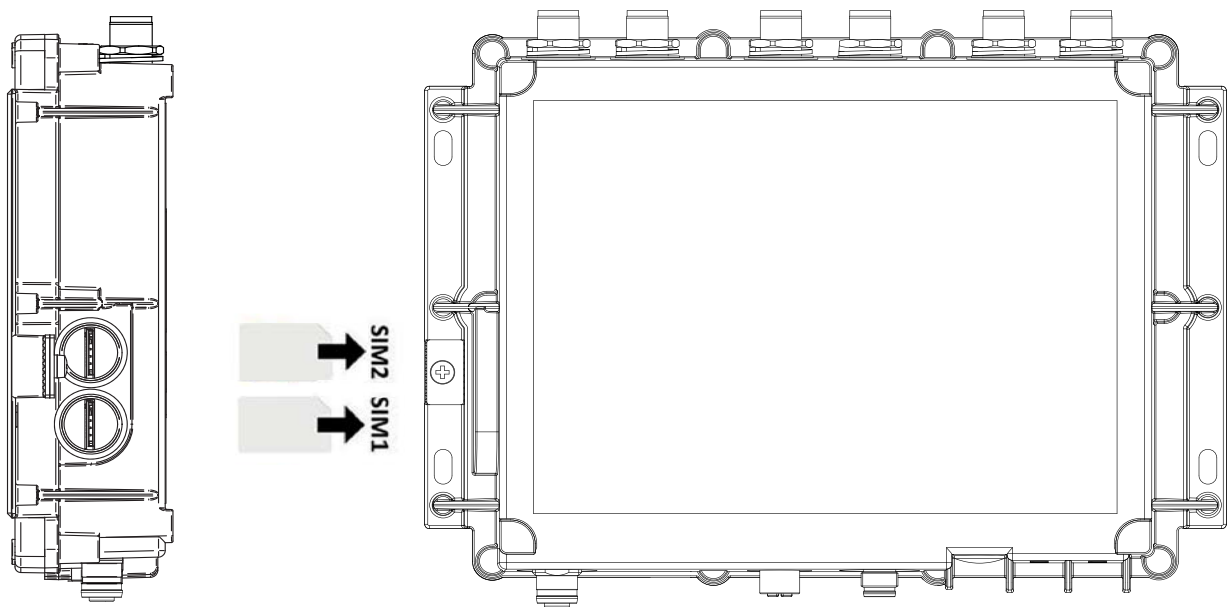
## 1.12 SIM card reader (exclusively for LTE device variants)

There are 2 SIM card readers for 3.3 V SIM cards located on the left side of the casing.

In order for the device to function properly, insert an activated SIM card with the PIN code unblocked into the SIM card holder. Each SIM card can have a different APN (Access Point Name).

**Note:** When changing the SIM Card, pay close attention to the following rules:

- ☐ Disconnect the device from the power supply.
- ☐ Open the locking screws with a slot screwdriver or a coin.
- ☐ Use the flat end of a plastic screwdriver, or your fingernail, to press the SIM card slightly deeper into the slot until you hear a click.
- ☐ After you hear a click, release the SIM card. The SIM card pops out of the slot.
- ☐ Place the SIM card in the slot with the contacts face down.



## 2 Installation



### WARNING

#### ELECTRIC SHOCK

Exclusively install this device in a restricted access location, to which maintenance staff have exclusive access. Install the device in such a way that it is protected against mechanical forces in the area of the power supply.

**Failure to follow this instruction can result in death, serious injury, or equipment damage.**

On delivery, the device is ready for operation.

To protect the exposed uninstalled contacts of the components from dirt, connect the individual system components in a dry and clean working area. The device fulfills the protection class IP65/67 under the following conditions, exclusively:

- ▶ All the connectors and cables connected also fulfill protection class IP65/67.
- ▶ All the unused connections and ports are sealed with the appropriate protection screws.
- ▶ The protection screws that are available as accessories comply with degrees of protection IP65/67.

Applies to device variants featuring supply voltage with characteristic value W (24 V DC):

The device variant has been approved for outdoor installation in a pollution degree 3 environment and according to outdoor enclosure type “Raintight” (according to NEMA 3, 3X, 3S, 3SX, 4, 4X, 6, 6P).

To install the device, perform the following work steps:

- ▶ [Checking the package contents](#)
- ▶ [Installing and grounding the device](#)
- ▶ [Installing the antennas](#)
- ▶ [Connecting the power supply](#)
- ▶ [Operating the device](#)
- ▶ [Connecting data cables](#)

## 2.1 Checking the package contents

- ☐ According to the device variant, check whether the package contains all items listed in the scope of delivery:
  - [“Scope of delivery 11n device variants \(non-LTE\)” on page 87](#)
  - [“Scope of delivery 11ac device variants \(non-LTE\)” on page 89](#)
  - [“Scope of delivery LTE device variants” on page 91](#)
- ☐ Check the individual parts for transport damage.

## 2.2 Installing and grounding the device

### 2.2.1 Installing the device onto or on a flat surface

You have the option of attaching the device with suitable hardware to a vertical flat surface.

- ▶ The diameter of the mounting hardware is maximum 5 mm (0.20 in).
- ▶ The head diameter is maximum 12 mm (0.47 in).
- ▶ The diameter of a flat washer used is maximum 12 mm (0.47 in).

Perform the following work steps:

- ☐ Prepare the assembly at the installation site.
  - [See “Dimension drawings” on page 68.](#)
- ☐ Install the device with suitable fastening components.
- ☐ Seal all unused connections and ports with protection screws.

## 2.2.2 Installing the device on a pole

The devices are suitable for pole mounting with the additional BAT450-F pole mounting set:

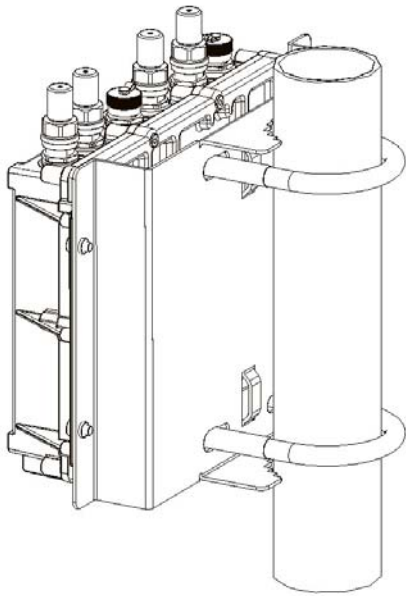
See “Accessories 11n device variants (non-LTE)” on page 93.

See “Accessories 11ac device variants (non-LTE)” on page 94.

See “Accessories LTE device variants” on page 95.

The BAT450-F pole mounting set with enclosed U-bolts is designed for the following pole diameter range:

- 37 mm ... 65 mm (1.46 in ... 2.56 in)



*Figure 6: BAT450-F pole mounting set with enclosed U-bolts*

Tightening straps, available from a specialist dealer, enable you to clamp a larger mast diameter.

- maximum width of the tightening strap: 16 mm (0.63 in)
- maximum thickness of the tightening strap: 1.3 mm (0.05 in)

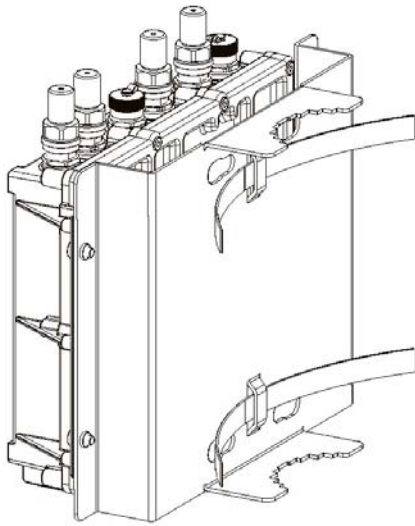


Figure 7: BAT450-F pole mounting set with tightening straps

### 2.2.3 Grounding the device




## WARNING

### ELECTRIC SHOCK

Ground the device before connecting any other cables.

**Failure to follow this instruction can result in death, serious injury, or equipment damage.**

All device variants have a protective ground connection .  
The device is grounded via the separate ground screw.

- ☐ Terminate the ground conductor between the fastening plates.
- ☐ Make sure the fastening plates cover the stripped part of the ground conductor completely.
- ☐ Tighten the grounding screw with a tightening torque of  $3 \text{ Nm} \pm 0.5 \text{ Nm}$  ( $26.55 \text{ lb-in} \pm 4.43 \text{ lb-in}$ ).

## 2.3 Installing the antennas

The device has connections for external antennas. These connections are N sockets.

**Note:** Applies exclusively to LTE device variants with the antenna WWAN-A-I-41-S-O:

You need the adapter WWAN-N-O-N-S (N plug to SMA socket). The adapter is included in the scope of delivery for device variants with the Configuration characteristic value "Z" and available as accessory.

On delivery, the antenna connections are sealed with transport protection caps.

Perform the following work steps:

- ☐ Remove the premounted transport protection caps from the antenna connections.
- ☐ Install at least one antenna on the radio module that you would like to use.
- ☐ Use the provided terminating resistors to seal unused sockets to avoid radio signals from one radio module being received by another radio module. The terminating resistors are included in the scope of delivery for device variants with the Configuration characteristic value "Z" and available as accessory.
- You will find information on setting the transmit power in chapter [“Configuring the transmit power” on page 59](#).

## 2.4 Connecting the power supply



### WARNING

#### ELECTRIC SHOCK

Before connecting the electrical wires, **always** verify that the requirements listed are complied with.

[See “Requirements for connecting electrical wires” on page 12.](#)

[See “Requirements for connecting the supply voltage” on page 12.](#)

**Failure to follow this instruction can result in death, serious injury, or equipment damage.**

The supply voltage is electrically isolated from the casing.



### 2.4.1 Supply voltage with the characteristic value W (24 V DC)

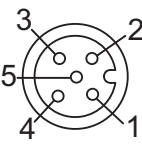
Type and specification of the supply voltage		Pin assignment on the device
Rated voltage DC: 24 V DC		1 +24 V DC
Voltage range DC incl. maximum tolerances: 16.8 V DC ... 32 V DC		2 0 V DC
		3 0 V DC
		4 N.C.
		5 N.C.

Table 6: Type and specification of the supply voltage

For **every** supply voltage to be connected, perform the following steps:

- ☐ Connect the wires for the supply voltage according to the pin assignment with a suitable socket.

### 2.4.2 Supply voltage with the characteristic value N (110 V DC)


Type and specification of the supply voltage		Pin assignment on the device
Rated voltage DC: 110 V DC		1 N.C.
Voltage range DC incl. maximum tolerances: 77 V DC ... 138 V DC		2 +110 V DC
		3 0 V DC
		4 N.C.

Table 7: Type and specification of the supply voltage

For **every** supply voltage to be connected, perform the following steps:

- ☐ Connect the wires for the supply voltage according to the pin assignment with a suitable socket.

## 2.5 Operating the device



### WARNING

#### ELECTRIC SHOCK

Before connecting the electrical wires, **always** verify that the requirements listed are complied with.

See [“Requirements for connecting electrical wires” on page 12.](#)

See [“Requirements for connecting the supply voltage” on page 12.](#)

**Failure to follow this instruction can result in death, serious injury, or equipment damage.**

### 2.5.1 Connecting the power supply

#### ■ Supply voltage with the characteristic value **W (24 V DC)**

### NOTICE

#### MATERIAL DAMAGE

In a PoE installation, use only devices that comply with the IEEE 802.3af/at standard.

**Failure to follow this instruction can lead to equipment damage.**

You start up the device by connecting the power supply via the 8-pin, “X”-coded M12 socket for PoE port or via a 5-pin, “A”-coded M12 socket.

You find the prescribed tightening torque of the locking screw in chapter: [“General technical data” on page 66](#)

- ☐ Only connect the device to a PoE network indoors.
- ☐ Only run data links indoors (IEEE 802.3 area A).

#### ■ Supply voltage with the characteristic value **N (110 V DC)**

You start up the device by connecting the power supply via the 4-pin, “A”-coded M12 socket.

You find the prescribed tightening torque of the locking screw in chapter: [“General technical data” on page 66](#)

## 2.6 Connecting data cables

Note the following general recommendations for data cable connections in environments with high electrical interference levels:

- ☐ Keep the length of the data cables as short as possible.
- ☐ Use optical data cables for the data transmission between the buildings.
- ☐ When using copper cables, provide a sufficient separation between the power supply cables and the data cables. Ideally, install the cables in separate cable channels.
- ☐ Verify that power supply cables and data cables do not run parallel over longer distances. To reduce inductive coupling, verify that the power supply cables and data cables cross at a 90° angle.
- ☐ Use shielded data cables for gigabit transmission via copper cables, for example SF/UTP cables according to ISO/IEC 11801. Exclusively use shielded data cables to meet EMC requirements according to EN 50121-4 and marine applications.
- ☐ Connect the data cables according to your requirements.  
[See “Ethernet ports” on page 36.](#)
- ☐ You find the prescribed tightening torque of the locking screw in chapter: [“General technical data” on page 66](#)

### **3 Defining IP parameters**

The IP parameters must be entered when the device is installed for the first time. The device offers the following options for assigning the IP parameters:

- ▶ via DHCP (Option 82)
- ▶ via BOOTP
- ▶ via the HiDiscovery or Industrial HiVision application
- ▶ via the V.24 interface
- ▶ via the AutoConfiguration Adapter

## 4 First login (Password change)

Applies to devices with the following software release and later:  
HiLCOS 10.12-RU2

To help prevent undesired access to the device, it is imperative that you change the default password during initial setup.

Perform the following steps:

- ☐ Open the graphical user interface WEBconfig, the Command Line Interface or LANconfig the first time you log on to the device.
- ☐ Log on to the device with the default password "private".  
The device prompts you to type in a new password.  
**Note:** When you log on with LANconfig, the device prompts you to type in a new password before your first configuration change.
- ☐ Type in your new password.  
Choose a password that contains at least 8 characters which includes upper-case characters, lower-case characters, numerical digits and special characters.
- ☐ Confirm your new password.

For further information see:

<https://hirschmann-support.belden.com/en/kb/required-password-change-new-procedure-for-first-time-login>

## 5 Defining WLAN basic settings

You have the following options to define the WLAN basic settings:

- ▶ via the wired local network (LAN)
- ▶ via the wireless network (WLAN), if the WLAN encryption (for example WPA2) is set accordingly in a device with a wireless interface and in the configuration computer.
- ▶ via the V.24 interface

## **6 Defining WWAN basic settings (exclusively for LTE device variants)**

You will find more information in the “User Manual Configuration Guide”, in the chapter “Configuring WWAN access”.

The manual is available for download on the Internet: [https://  
www.doc.hirschmann.com](https://www.doc.hirschmann.com)

## 7 Obtaining compliance for operation in the European Union and in the United Kingdom (UK)

For operation in the European Union, the device must comply with the Radio Equipment Directive (RED) 2014/53/EU. For operation in the United Kingdom (UK), the device must comply with the Radio Equipment Regulations. The RED compliance and the Radio Equipment Regulations compliance require compliant operation of the device in the 5 GHz band channels. Compliant operation of the device is achieved by an unchangeable determination of the country setting.

Make the country setting unchangeable using the Command Line Interface (CLI), the graphical user interface WEBconfig or the LANconfig software. You can download the LANconfig software from the Hirschmann product pages ([www.hirschmann.com](http://www.hirschmann.com)).

Perform the following work steps:

### ■ Command Line Interface (CLI)

- ☐ To access the possible country settings, execute the following command:

```
set Setup/WLAN/Country ?
```

**Note:** The country setting “Europe” is valid for all European countries and the United Kingdom (UK). Specific country settings such as “France” or “Germany” include additional country specific channels in comparison to the “Europe” country setting.

The device ignores specific country settings and uses the country setting “Europe” until the RED compliance or the Radio Equipment Regulations compliance has been obtained.

- ☐ Select the desired country setting with the following command:

```
set Setup/WLAN/Country [Country]
```

Example:

```
set Setup/WLAN/Country France
```

- ☐ Execute the following command:

```
> REDcompliance
```



**Note:** To check the country setting and correct it, type `no`. Then check the country setting with the following command: `ls Setup/WLAN/Country`.

- ☐ To obtain RED compliance or Radio Equipment Regulations compliance, type `yes`. This makes the country setting unchangeable. Subsequently, the device restarts.

## ■ **WEBconfig (graphical user interface)**

- ☐ Open the **Configuration > Wireless LAN > General** dialog and select the desired country setting.

**Note:** The country setting “Europe” is valid for all European countries and the United Kingdom (UK). Specific country settings such as “France” or “Germany” include additional country specific channels in comparison to the “Europe” country setting.

The device ignores specific country settings and uses the country setting “Europe” until the RED compliance or the Radio Equipment Regulations compliance has been obtained.

- ☐ To confirm your choice, click the “Send” button.
- ☐ Open the **Extras > RED compliance** dialog.

**Note:** To check the country setting and correct it, open the **Configuration > Wireless LAN > General** dialog.

- ☐ To obtain RED compliance or Radio Equipment Regulations compliance, click the “Confirm RED compliance” button. This makes the country setting unchangeable. Subsequently, the device restarts.

## ■ **LANconfig**

- ☐ In the LANconfig device overview, highlight the row containing the desired device.
- ☐ In the menu bar, select **Device > Configure**.
- ☐ Open the **Configuration > Wireless LAN > General** dialog and select the desired country setting.

**Note:** The country setting “Europe” is valid for all European countries and the United Kingdom (UK). Specific country settings such as “France” or “Germany” include additional country specific channels in comparison to the “Europe” country setting.

The device ignores specific country settings and uses the country setting “Europe” until the RED compliance or the Radio Equipment Regulations compliance has been obtained.

- ☐ To confirm your choice, click the “OK” button.
- ☐ In the LANconfig device overview, highlight the row containing the desired device.
- ☐ In the menu bar, select **Device > RED compliance**.

**Note:** To check the country setting and correct it, click the “No” button. Then open the **Configuration > Wireless LAN > General** dialog.

- ☐ To obtain RED compliance or Radio Equipment Regulations compliance, click the “Yes” button. This makes the country setting unchangeable. Subsequently, the device restarts.

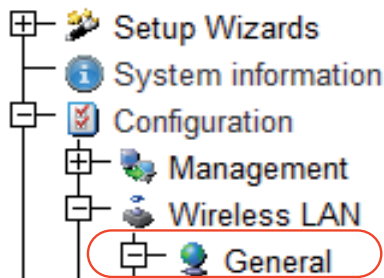
## 8 Configuring the transmit power

**Note:** This chapter does **NOT** apply to device variants with approval for the 4.9 GHz band (Approvals 2, characteristic value P). For device variants with approval for the 4.9 GHz band see [“Configuring the transmit power for the 4.9 GHz band” on page 61](#).

Use the graphical user interface WEBconfig or the LANconfig software. You can download the LANconfig software from the Hirschmann product pages ([www.hirschmann.com](http://www.hirschmann.com)).

In WEBconfig, perform the following work steps:

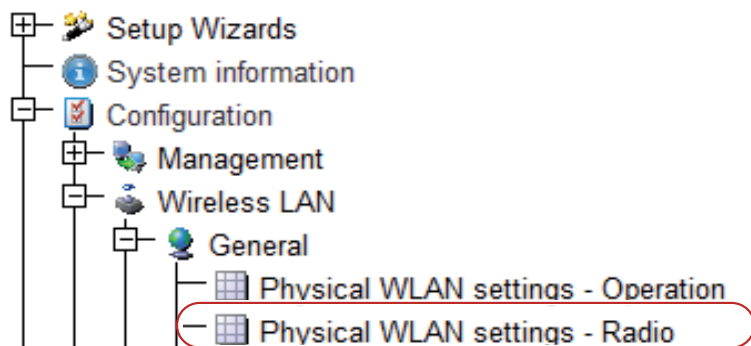
- ☐ In the menu tree, open the **Configuration > Wireless LAN > General** dialog.



- ☐ In the **“General”** tab, specify in the **“General”** frame the country in which you are installing the device.  
If you are using an E-certified device in a vehicle and are driving the vehicle within the EU, set the country profile for Germany. This country profile is identical to all the country profiles for EU.
- ☐ Click the **“Send”** button.

**Note:** For devices that are operated in the European Union perform the work steps described in chapter [“Obtaining compliance for operation in the European Union and in the United Kingdom \(UK\)” on page 56](#).

- ☐ In the menu tree, open the **Configuration > Wireless LAN > General > Physical WLAN settings - Radio** dialog.



- ☐ In the “**General**” tab, click in the “**Interface**” column the physical WLAN interface to which you connect the antenna.

General	Band Steering	Security	Stations	802.11i/WEP	802.1X	WLC	AutoWDS						
Physical WLAN settings - Radio													
Interface	Frequency band	Sub-bands	Channel number	2.4 GHz mode	5 GHz mode	Max. channel bandwidth	Antenna grouping	Antenna gain	TX power reduction	Access point density	Maximum distance	Channel list	Back scan

- ☐ Subtract the cable and installed overvoltage protector attenuation from the antenna gain. Enter the calculated value in the “Antenna gain” field.
- ☐ Click the “Send” button to save the value.

Physical WLAN settings - Radio

Interface	WLAN interface 1
Frequency band	2.4 GHz (802.11g/b/n)
Sub-bands	1
Channel number	Channel 11 (2.462 GHz)
2.4 GHz mode	802.11g/b/n (mixed)
5 GHz mode	802.11a/n (mixed)
Max. channel bandwidth	Auto
Antenna grouping	Auto
Antenna gain	3 dBi (possible values: -128 - 127)
TX power reduction	0 dB (possible values: 0 - 255)
Access point density	Low
Maximum distance	0 km (possible values: 0 - 65535)
Channel list	(max. 48 characters)
Background scan	0 (possible values: 0 - 2147483647)
Background scan unit	seconds
Time of DFS rescan	(max. 19 characters)
Number of channels to scan	2 (possible values: 0 - 1410065407)
Rescan free channels	No
Adaptive Noise Immunity	On

## 9 Configuring the transmit power for the 4.9 GHz band

**Note:** This chapter exclusively applies to device variants with approval for the 4.9 GHz band (Approvals 2, characteristic value P).

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

Use the graphical user interface WEBconfig or the LANconfig software. You can download the LANconfig software from the Hirschmann product pages ([www.hirschmann.com](http://www.hirschmann.com)).

In WEBconfig, perform the following work steps:

- ☐ Open the **Configuration > Wireless LAN > General** dialog.
- ☐ In the “General” frame in the “Restrict to 4.9GHz operation mode” row, choose the “Enabled” option in the drop-down list.

**Note:** For devices operating in the 4,9 GHz band according to FCC 47CFR Part 90 Subpart Y the following applies:

For antennas with an antenna gain >9 dBi, the transmit power must be reduced accordingly in the device software. For more detailed information see the following step-by-step instructions.

- ☐ Open the **HiLCOS Menu Tree > Setup > Interfaces > WLAN > Radio-Settings** dialog.
- ☐ In the “Ifc” column, click the physical WLAN interface to which you connect the antenna.
- ☐ In the “Radio-Band” row, choose the “5GHz” option in the drop-down list.
- ☐ Subtract the cable and installed overvoltage protector attenuation from the antenna gain. If the value after subtracting the attenuation is ≤9 dBi, you do not need to do anything else.

**If the value is >9 dBi, proceed as follows:**

- ☐ Calculate the difference to the maximum permitted antenna gain of 9 dBi. Example calculation for an antenna gain of 14 dBi and an attenuation of 2 dBi:
  - ▶ Step 1 (antenna gain minus attenuation):  
 $14 \text{ dBi} - 2 \text{ dBi} = 12 \text{ dBi}$   
As the value is >9 dBi, the difference to the maximum permitted 9 dBi must be calculated in Step 2.
  - ▶ Step 2:  $12 \text{ dBi} - 9 \text{ dBi} = 3 \text{ dBi}$
- ☐ Enter the difference you have calculated in the “Tx-Power-Reduction” field.

HiLCOS Menu Tree

- Setup
  - Interfaces
    - WLAN

### Radio-Settings

Ifc: WLAN-1

Radio-Band	5GHz	
Subbands	Band-1	
Radio-Channel	11	(max. 3 characters)
Channel-List		(max. 48 characters)
2.4GHz-Mode	Auto	
5GHz-Mode	Auto	
Max.-Channel-Bandwidth	Auto	
Force-40MHz	No	
Channel-Pairing	11n-compliant	
Antenna-Mask	Auto	
Tx-Power-Reduction	0	(max. 3 characters)
Maximum-Distance	0	(max. 5 characters)
AP-Density	Low	
Background-Scan	0	(max. 10 characters)
Background-Scan-Unit	Seconds	
Adaptive-Noise-Immunity	Yes	
Allow-PHY-Restarts	Yes	
DFS-Rescan-Hours	2	(max. 30 characters)
DFS-Rescan-Flush-Clear-Channels	No	
DFS-Rescan-Num-Channels	2	(max. 10 characters)
CAC-Duration	60	(max. 10 characters)
Preferred-DFS-Scheme	EN301893-V1.7	
Passive-Scan-Duration	400	(max. 10 characters)

Send Reset

☐ To save the value, click the “Send” button.

## 10 Monitoring the ambient air temperature

Operate the device below the specified maximum ambient air temperature exclusively.

See [“General technical data” on page 66](#).

The ambient air temperature is the temperature of the air at a distance of 5 cm (2 in) from the device. It depends on the installation conditions of the device, for example the distance from other devices or other objects, and the output of neighboring devices.

The temperature displayed in the CLI (Command Line Interface) and the GUI (Graphical User Interface) is the internal temperature of the device. It is higher than the ambient air temperature. The maximum internal temperature of the device named in the technical data is a guideline that indicates to you that the maximum ambient air temperature has possibly been exceeded.

# 11 Maintenance and service

- ☐ When designing this device, Hirschmann largely avoided using high-wear parts. The parts subject to wear and tear are dimensioned to last longer than the lifetime of the product when it is operated normally. Operate this device according to the specifications.
- ☐ Hirschmann is continually working on improving and developing their software. Check regularly whether there is an updated version of the software that provides you with additional benefits. You find information and software downloads on the Hirschmann product pages on the Internet (<http://www.hirschmann.com>).

**Note:** You find information on settling complaints on the Internet at <http://www.beldensolutions.com/en/Service/Repairs/index.phtml>.



## 12 Disassembly

- ☐ Disconnect the data cables.
- ☐ Disable the supply voltage.
- ☐ Disconnect the power supply cable.
- ☐ Remove the antennas.
- ☐ Disconnect the grounding.

# 13 Technical data

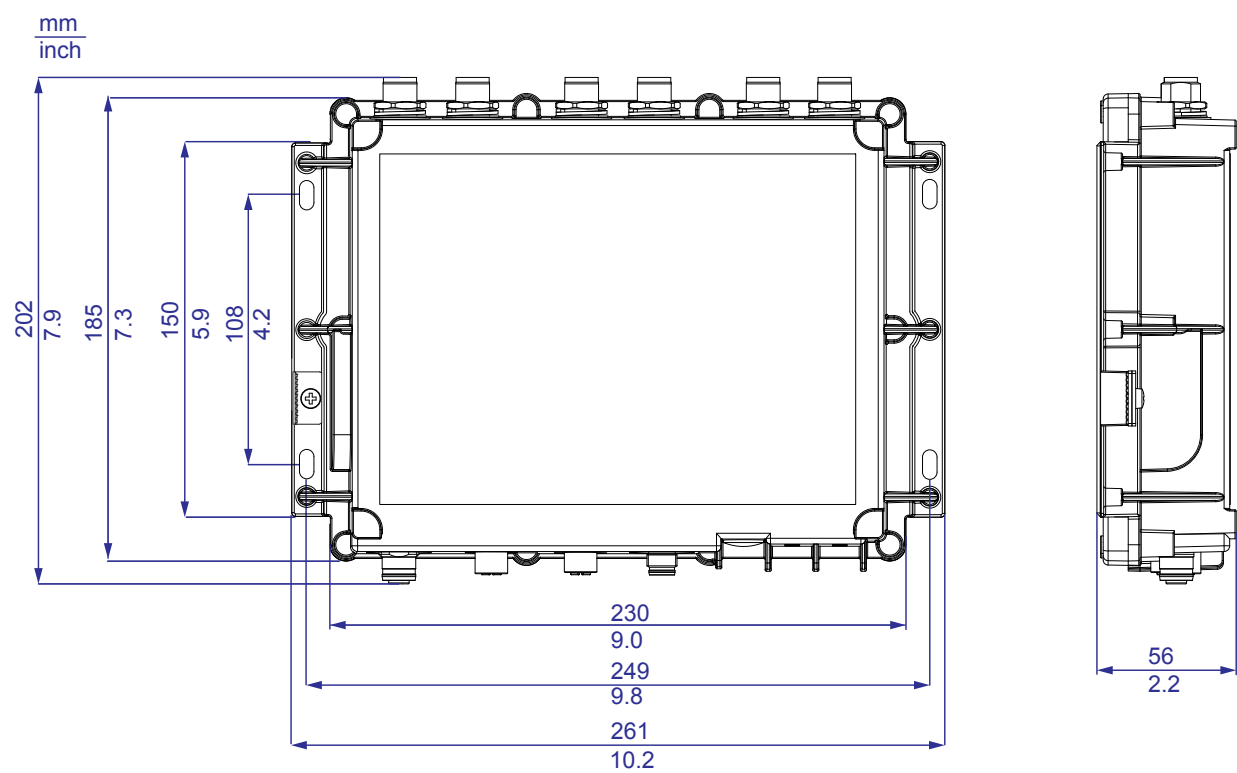
## 13.1 General technical data

Dimensions W × H × D	BAT450-F	See "Dimension drawings" on page 68.	
Weight		≥2.0 kg (4.41 lb) (depending on the device variant)	
Supply voltage with the characteristic value W	Connection type	8-pin, "X"-coded M12 socket for PoE port or a 5-pin, "A"-coded M12 plug Tightening torque of 0.6 Nm (5.3 lb-in) the locking screw	
	Rated voltage	24 V DC	
	Voltage range incl. maximum tolerances	16.8 V DC ... 32 V DC	
	Rated voltage for rail applications according to EN 50155	24 V DC	
	Voltage range including maximum tolerances for rail applications according to EN 50155 (permanent)	16.8 V DC ... 30 V DC	
	Voltage range including maximum tolerances for rail applications according to EN 50155 (0.6 × U <sub>N</sub> for 0.1 s; 1.4 × U <sub>N</sub> for 1 s)	14.4 V DC ... 33.6 V DC	
	Power loss buffer	10 ms at 19.2 V DC	
	Overload current protection on the device	Non-replaceable fuse	
	Back-up fuse	Nominal rating:	3.5 A
		Characteristic:	slow blow
	Peak inrush current	14 A	

Supply voltage with characteristic value N	Connection type	4-pin, "A"-coded M12 plug
		Tightening torque of 0.6 Nm (5.3 lb-in) the locking screw
	Rated voltage	110 V DC
	Voltage range incl. maximum tolerances	77 V DC ... 138 V DC
	Rated voltage for rail applications according to EN 50155	110 V DC
	Voltage range including maximum tolerances for rail applications according to EN 50155 (permanent)	77 V DC ... 138 V DC
	Voltage range including maximum tolerances for rail applications according to EN 50155 ( $0.6 \times U_N$ for 0.1 s; $1.4 \times U_N$ for 1 s)	66 V DC ... 154 V DC
	Power loss buffer	10 ms at 77 V DC
	Overload current protection on the device	Non-replaceable fuse
	Back-up fuse	Nominal rating: 3.5 A Characteristic: slow blow
	Peak inrush current	4 A
Climatic conditions during operation	Minimum clearance around the device	Top and bottom device side: 10 cm (3.94 in) Left and right device side: 2 cm (0.79 in)
	Ambient air temperature <sup>a</sup>	11n device variants (non-LTE) -40 °C ... +70 °C (-40 °F ... +158 °F)
		11ac device variants (non-LTE) -25 °C ... +70 °C (-13 °F ... +158 °F)
		LTE device variants -30 °C ... +70 °C (-22 °F ... +158 °F)
	Humidity	10 % ... 95 % (non-condensing)
	Air pressure	min. 700 hPa (+3000 m ASL; +9842 ft ASL) max. 1060 hPa (-400 m ASL; -1312 ft ASL)
Climatic conditions during storage	Ambient air temperature <sup>a</sup>	-40 °C ... +85 °C (-40 °F ... +185 °F)
	Humidity	10 % ... 95 % (non-condensing)
	Air pressure	min. 700 hPa (+3000 m ASL; +9842 ft ASL) max. 1060 hPa (-400 m ASL; -1312 ft ASL)
Pollution degree		Applies to device variants featuring supply voltage with characteristic value N (110 V DC): 2 Applies to device variants featuring supply voltage with characteristic value W (24 V DC): 3
Protection classes	Laser protection	Class 1 in compliance with IEC 60825-1
	Degree of protection	IP65/67

a. Temperature of the ambient air at a distance of 5 cm (2 in) from the device

# 13.2 Dimension drawings



## 13.3 11n WLAN module specifications

### 13.3.1 Radio technology

Antenna connection	For each WLAN module: 3 × N socket
Range	Depending on the antenna used, frequency range and data rate
Encryption	<ul style="list-style-type: none"><li>▶ IEEE 802.11i/WPA2 with passphrase or IEEE 802.1x and hardware-accelerated AES</li><li>▶ Closed Network</li><li>▶ WEP 64<sup>a</sup></li><li>▶ WEP 128<sup>b</sup></li><li>▶ WEP 152<sup>c</sup></li><li>▶ User authentication</li><li>▶ 802.1x/EAP</li><li>▶ LEPS</li><li>▶ WPA1/TKIP<sup>d</sup></li><li>▶ For more information, see the HiLCOS data sheet.</li></ul>
Frequency range	<ul style="list-style-type: none"><li>▶ Support of 2.4 GHz: 2412 MHz to 2472 MHz (for FCC: 2412 MHz to 2462 MHz)</li><li>▶ Support of 5 GHz: 5180 MHz to 5825 MHz (for FCC: 5180 MHz to 5240 MHz and 5745 MHz to 5825 MHz)</li><li>▶ Support of 4.9 GHz (for FCC only): 4940 MHz to 4990 MHz</li></ul>
Modulation technology	<ul style="list-style-type: none"><li>▶ OFDM: BPSK, QPSK, 16-QAM, 64-QAM</li><li>▶ DSSS/CCK, DSSS/DBPSK, DSSS/DQPSK</li></ul>
Radio topology	WLAN Access-Point, Bridge-, Router-, Point-to-Point-, Client-, Client-Bridge-Mode

- With encryptions of the type TKIP and WEP, the device falls back on IEEE 802.11b/g or IEEE 802.11a.
- With encryptions of the type TKIP and WEP, the device falls back on IEEE 802.11b/g or IEEE 802.11a.
- With encryptions of the type TKIP and WEP, the device falls back on IEEE 802.11b/g or IEEE 802.11a.
- With encryptions of the type TKIP and WEP, the device falls back on IEEE 802.11b/g or IEEE 802.11a.

### 13.3.2 Roaming

- ▶ IEEE 802.11F (Inter-Access Point Protocol)
- ▶ IEEE 802.11r (Fast Roaming)
- ▶ PMK caching
- ▶ Pre authentication
- ▶ OKC (Opportunistic key caching)

### 13.3.3 Receiving sensitivity, transmit power, and data rate of the WLAN module version EWLAN1 (Approvals 2, characteristic value M or 9)

The values shown in the following tables are the maximum values of the WLAN module version EWLAN1. The values are in no case to be perceived as a guaranteed property of the overall product. For some country profiles, the module reduces data rate and transmit power automatically. The reason for this are national standards.

#### ■ IEEE 802.11b

##### IEEE 802.11b

Frequency range 2.412 GHz to 2.472 GHz (for FCC: 2.412 GHz to 2.462 GHz)

Data rate	Typical transmit power <sup>a</sup>	Typical receiving sensitivity
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1 Mbit/s	19 dBm	-94 dBm
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11 Mbit/s	19 dBm	-94 dBm
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Table 8: IEEE 802.11b, Frequency range 2.412 GHz to 2.472 GHz (for FCC: 2.412 GHz to 2.462 GHz)

- a. The typical transmit power was reduced as follows to be compliant with FCC regulations for all modulations:
- Channels 4, 7 and 8: Reduction by 3 dB
  - Channels 2, 3, 5, 6 and 9: Reduction by 4 dB
  - Channel 10: Reduction by 5 dB
  - Channel 1: Reduction by 6 dB
  - Channel 11: Reduction by 8 dB

## ■ IEEE 802.11g

### IEEE 802.11g

Frequency range 2.412 GHz to 2.472 GHz (for FCC: 2.412 GHz to 2.462 GHz)

Data rate	Typical transmit power <sup>a</sup>	Typical receiving sensitivity
6 Mbit/s	22 dBm	-94 dBm
9 Mbit/s	22 dBm	-94 dBm
12 Mbit/s	22 dBm	-90 dBm
18 Mbit/s	22 dBm	-89 dBm
24 Mbit/s	22 dBm	-85 dBm
36 Mbit/s	21 dBm	-82 dBm
48 Mbit/s	20 dBm	-78 dBm
54 Mbit/s	19 dBm	-77 dBm

*Table 9: IEEE 802.11g, Frequency range 2.412 GHz to 2.472 GHz (for FCC: 2.412 GHz to 2.462 GHz)*

- a. The typical transmit power was reduced as follows to be compliant with FCC regulations for all modulations:
- Channels 4, 7 and 8: Reduction by 3 dB
  - Channels 2, 3, 5, 6 and 9: Reduction by 4 dB
  - Channel 10: Reduction by 5 dB
  - Channel 1: Reduction by 6 dB
  - Channel 11: Reduction by 8 dB

## ■ IEEE 802.11a

### IEEE 802.11a

Frequency range 5.180 GHz to 5.825 GHz (for FCC: 5.180 GHz to 5.240 GHz and 5.745 GHz to 5.825 GHz)

Data rate	Typical transmit power <sup>a</sup>	Typical receiving sensitivity
6 Mbit/s	16 dBm	-93 dBm
9 Mbit/s	16 dBm	-93 dBm
12 Mbit/s	16 dBm	-93 dBm
18 Mbit/s	16 dBm	-91 dBm
24 Mbit/s	16 dBm	-88 dBm
36 Mbit/s	15 dBm	-84 dBm
48 Mbit/s	13 dBm	-80 dBm
54 Mbit/s	12 dBm	-79 dBm

*Table 10: IEEE 802.11a, Frequency range 5.180 GHz to 5.825 GHz (for FCC: 5.180 GHz to 5.240 GHz and 5.745 GHz to 5.825 GHz)*

- a. The typical transmit power was reduced by 6 dB on channels 36, 40, 44, 48 and 149 to be compliant with FCC regulations for all modulations.

## ■ IEEE 802.11n

IEEE 802.11n Frequency range 2.412 GHz to 2.472 GHz (for FCC: 2.412 GHz to 2.462 GHz)		
Coding	Typical transmit power <sup>a</sup>	Typical receiving sensitivity
MCS 0	18 dBm	-87 dBm
MCS 1	18 dBm	-90 dBm
MCS 2	18 dBm	-86 dBm
MCS 3	18 dBm	-82 dBm
MCS 4	18 dBm	-79 dBm
MCS 5	16 dBm	-75 dBm
MCS 6	16 dBm	-73 dBm
MCS 7	15 dBm	-72 dBm
MCS 8	22 dBm	-87 dBm
MCS 9	21 dBm	-90 dBm
MCS 10	22 dBm	-86 dBm
MCS 11	21 dBm	-82 dBm
MCS 12	16 dBm	-79 dBm
MCS 13	16 dBm	-75 dBm
MCS 14	15 dBm	-73 dBm
MCS 15	15 dBm	-72 dBm
MCS 16	23 dBm	-87 dBm
MCS 17	23 dBm	-90 dBm
MCS 18	23 dBm	-86 dBm
MCS 19	23 dBm	-82 dBm
MCS 20	16 dBm	-79 dBm
MCS 21	17 dBm	-75 dBm
MCS 22	17 dBm	-73 dBm
MCS 23	16 dBm	-72 dBm

**Table 11: IEEE 802.11n, Frequency range 2.412 GHz to 2.472 GHz (for FCC: 2.412 GHz to 2.462 GHz)**

- a. The typical transmit power was reduced as follows to be compliant with FCC regulations for all modulations:
- Channels 4, 7 and 8: Reduction by 3 dB
  - Channels 2, 3, 5, 6 and 9: Reduction by 4 dB
  - Channel 10: Reduction by 5 dB
  - Channel 1: Reduction by 6 dB
  - Channel 11: Reduction by 8 dB



IEEE 802.11n Frequency range 5.180 GHz to 5.825 GHz (for FCC: 5.180 GHz to 5.240 GHz and 5.745 GHz to 5.825 GHz)		
Coding	Typical transmit power <sup>a</sup>	Typical receiving sensitivity
MCS 0	17 dBm	-92 dBm
MCS 1	17 dBm	-91 dBm
MCS 2	17 dBm	-89 dBm
MCS 3	17 dBm	-84 dBm
MCS 4	17 dBm	-81 dBm
MCS 5	15 dBm	-77 dBm
MCS 6	14 dBm	-75 dBm
MCS 7	14 dBm	-73 dBm
MCS 8	20 dBm	-92 dBm
MCS 9	20 dBm	-91 dBm
MCS 10	19 dBm	-89 dBm
MCS 11	20 dBm	-84 dBm
MCS 12	18 dBm	-81 dBm
MCS 13	15 dBm	-77 dBm
MCS 14	15 dBm	-75 dBm
MCS 15	14 dBm	-73 dBm
MCS 16	21 dBm	-92 dBm
MCS 17	21 dBm	-91 dBm
MCS 18	21 dBm	-89 dBm
MCS 19	21 dBm	-84 dBm
MCS 20	16 dBm	-81 dBm
MCS 21	15 dBm	-77 dBm
MCS 22	14 dBm	-75 dBm
MCS 23	14 dBm	-73 dBm

**Table 12: IEEE 802.11n, Frequency range 5.180 GHz to 5.825 GHz (for FCC: 5.180 GHz to 5.240 GHz and 5.745 GHz to 5.825 GHz)**

- a. The typical transmit power was reduced by 6 dB on channels 36, 40, 44, 48 and 149 to be compliant with FCC regulations for all modulations.

### 13.3.4 Receiving sensitivity, transmit power, and data rate of the WLAN module version EWLAN1 for device variants with approval for the 4.9 GHz band (Approvals 2, characteristic value P)

Applies exclusively to WLAN module version EWLAN1 for device variants with approval for the 4.9 GHz band (Approvals 2, characteristic value P) according to FCC 47CFR Part 90 Subpart Y.

The values shown in the following tables show measured maximum values in the lowest channel of the respective bandwidth with 1 active antenna. The values are in no case to be perceived as a guaranteed property of the overall product. Depending on the settings, the module automatically reduces the data rate and transmit power according to FCC 47CFR Part 90 Subpart Y.

#### ■ IEEE 802.11a, Bandwidth 5 MHz

IEEE 802.11a Frequency range 4.940 GHz to 4.990 GHz Bandwidth 5 MHz	
Data rate	Typical transmit power
1.5 Mbit/s	13 dBm
2.25 Mbit/s	13 dBm
3 Mbit/s	13 dBm
4.5 Mbit/s	13 dBm
6 Mbit/s	13 dBm
9 Mbit/s	12 dBm
12 Mbit/s	12 dBm
13.5 Mbit/s	11 dBm

Table 13: IEEE 802.11a, Frequency range 4.940 GHz to 4.990 GHz, Bandwidth 5 MHz, Channels 218-227

#### ■ IEEE 802.11a, Bandwidth 10 MHz

IEEE 802.11a Frequency range 4.940 GHz to 4.990 GHz Bandwidth 10 MHz	
Data rate	Typical transmit power
3 Mbit/s	14 dBm
4.5 Mbit/s	14 dBm
6 Mbit/s	14 dBm
9 Mbit/s	14 dBm
12 Mbit/s	14 dBm

Table 14: IEEE 802.11a, Frequency range 4.940 GHz to 4.990 GHz, Bandwidth 10 MHz, Channels 19-27

IEEE 802.11a Frequency range 4.940 GHz to 4.990 GHz Bandwidth 10 MHz	
Data rate	Typical transmit power
18 Mbit/s	13 dBm
24 Mbit/s	12 dBm
27 Mbit/s	11 dBm

*Table 14: IEEE 802.11a, Frequency range 4.940 GHz to 4.990 GHz, Bandwidth 10 MHz, Channels 19-27*

## ■ IEEE 802.11a, Bandwidth 20 MHz

IEEE 802.11a Frequency range 4.940 GHz to 4.990 GHz Bandwidth 20 MHz	
Data rate	Typical transmit power
6 Mbit/s	14 dBm
9 Mbit/s	14 dBm
12 Mbit/s	14 dBm
18 Mbit/s	13 dBm
24 Mbit/s	14 dBm
36 Mbit/s	13 dBm
48 Mbit/s	13 dBm
54 Mbit/s	12 dBm

*Table 15: IEEE 802.11a, Frequency range 4.940 GHz to 4.990 GHz, Bandwidth 20 MHz, Channels 20-26*

## 13.4 11ac WLAN module specifications (exclusively for 11ac device variants)

### 13.4.1 Radio technology

Antenna connection	3 × N sockets for WLAN module
Range	Depending on the antenna used, frequency range and data rate
Encryption	<ul style="list-style-type: none"><li>▶ IEEE 802.11i/WPA2 with passphrase or IEEE 802.1x and hardware-accelerated AES</li><li>▶ Closed Network</li><li>▶ WEP 64</li><li>▶ WEP 128</li><li>▶ WEP 152</li><li>▶ User authentication</li><li>▶ 802.1x/EAP</li><li>▶ LEPS</li><li>▶ WPA1/TKIP</li><li>▶ For more information, see the HiLCOS data sheet.</li></ul>
Frequency range	<ul style="list-style-type: none"><li>▶ Support of 2.4 GHz: 2412 MHz to 2472 MHz (for FCC: 2412 MHz to 2462 MHz)</li><li>▶ Support of 5 GHz: 5180 MHz to 5825 MHz (for FCC: 5180 MHz to 5240 MHz, 5260 MHz to 5320 MHz, 5500 MHz to 5720 MHz, 5745 MHz to 5825 MHz)</li></ul>
Modulation technology	<ul style="list-style-type: none"><li>▶ OFDM: BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM</li><li>▶ DSSS/CCK, DSSS/DBPSK, DSSS/DQPSK</li></ul>
Radio topology	WLAN Access-Point, Bridge-, Router-, Point-to-Point-, Client-, Client-Bridge-Mode

### 13.4.2 Roaming

- ▶ IEEE 802.11F (Inter-Access Point Protocol)
- ▶ IEEE 802.11r (Fast Roaming)
- ▶ PMK caching
- ▶ Pre authentication
- ▶ OKC (Opportunistic key caching)

### 13.4.3 Receiving sensitivity, transmit power and data rate

The values of the WLAN module shown in the following tables are subject to a tolerance of  $\pm 2$  dB. If you use only 1 antenna, the transmit power is reduced by 5 dB. The values are in no case to be perceived as a guaranteed property of the overall product. For some country profiles, the module reduces data rate and transmission power automatically. The reason for this are national standards.

#### ■ IEEE 802.11b

##### IEEE 802.11b

Frequency range 2.412 GHz to 2.472 GHz (for FCC: 2.412 GHz to 2.462 GHz)

Bandwidth 20 MHz

Data rate	Transmit power	Receiving sensitivity
1 Mbit/s	25 dBm	-95 dBm
2 Mbit/s	25 dBm	-94 dBm
5.5 Mbit/s	25 dBm	-92 dBm
11 Mbit/s	25 dBm	-90 dBm

Table 16: IEEE 802.11b, Frequency range 2.412 GHz to 2.472 GHz (for FCC: 2.412 GHz to 2.462 GHz), Bandwidth 20 MHz

#### ■ IEEE 802.11g

##### IEEE 802.11g

Frequency range 2.412 GHz to 2.472 GHz (for FCC: 2.412 GHz to 2.462 GHz)

Bandwidth 20 MHz

Data rate	Transmit power	Receiving sensitivity
6 Mbit/s	26 dBm	-94 dBm
9 Mbit/s	26 dBm	-93 dBm
12 Mbit/s	26 dBm	-92 dBm
18 Mbit/s	26 dBm	-90 dBm
24 Mbit/s	26 dBm	-88 dBm
36 Mbit/s	25 dBm	-85 dBm
48 Mbit/s	24 dBm	-81 dBm
54 Mbit/s	23 dBm	-80 dBm

Table 17: IEEE 802.11g, Frequency range 2.412 GHz to 2.472 GHz (for FCC: 2.412 GHz to 2.462 GHz), Bandwidth 20 MHz

## ■ IEEE 802.11a

### IEEE 802.11a

Frequency range 5.180 GHz to 5.825 GHz (for FCC: 5.180 GHz to 5.240 GHz / 5.260 GHz to 5.320 GHz / 5.500 GHz to 5.720 GHz / 5.745 GHz to 5.825 GHz)

Bandwidth 20 MHz

Data rate	Transmit power	Receiving sensitivity
6 Mbit/s	23 dBm	-94 dBm
9 Mbit/s	23 dBm	-94 dBm
12 Mbit/s	23 dBm	-92 dBm
18 Mbit/s	23 dBm	-90 dBm
24 Mbit/s	23 dBm	-86 dBm
36 Mbit/s	23 dBm	-84 dBm
48 Mbit/s	21 dBm	-81 dBm
54 Mbit/s	20 dBm	-80 dBm

Table 18: IEEE 802.11a, Frequency range 5.180 GHz to 5.825 GHz (for FCC: 5.180 GHz to 5.240 GHz / 5.260 GHz to 5.320 GHz / 5.500 GHz to 5.720 GHz / 5.745 GHz to 5.825 GHz), Bandwidth 20 MHz

## ■ IEEE 802.11n

### IEEE 802.11n

Frequency range 2.412 GHz to 2.472 GHz (for FCC: 2.412 GHz to 2.462 GHz)

Bandwidth 20 MHz

Coding	Transmit power	Receiving sensitivity
MCS 0 / 8 / 16	26 dBm	-94 dBm
MCS 1 / 9 / 17	26 dBm	-91 dBm
MCS 2 / 10 / 18	26 dBm	-89 dBm
MCS 3 / 11 / 19	25 dBm	-84 dBm
MCS 4 / 12 / 20	25 dBm	-83 dBm
MCS 5 / 13 / 21	25 dBm	-78 dBm
MCS 6 / 14 / 22	23 dBm	-78 dBm
MCS 7 / 15 / 23	21 dBm	-76 dBm

Table 19: IEEE 802.11n, Frequency range 2.412 GHz to 2.472 GHz (for FCC: 2.412 GHz to 2.462 GHz), Bandwidth 20 MHz

IEEE 802.11n Frequency range 2.412 GHz to 2.472 GHz (for FCC: 2.412 GHz to 2.462 GHz) Bandwidth 40 MHz		
Coding	Transmit power	Receiving sensitivity
MCS 0 / 8 / 16	25 dBm	-92 dBm
MCS 1 / 9 / 17	25 dBm	-88 dBm
MCS 2 / 10 / 18	25 dBm	-85 dBm
MCS 3 / 11 / 19	24 dBm	-82 dBm
MCS 4 / 12 / 20	24 dBm	-79 dBm
MCS 5 / 13 / 21	24 dBm	-75 dBm
MCS 6 / 14 / 22	23 dBm	-75 dBm
MCS 7 / 15 / 23	21 dBm	-73 dBm

*Table 20: IEEE 802.11n, Frequency range 2.412 GHz to 2.472 GHz (for FCC: 2.412 GHz to 2.462 GHz), Bandwidth 40 MHz*

IEEE 802.11n Frequency range 5.180 GHz to 5.825 GHz (for FCC: 5.180 GHz to 5.240 GHz / 5.260 GHz to 5.320 GHz / 5.500 GHz to 5.720 GHz / 5.745 GHz to 5.825 GHz) Bandwidth 20 MHz		
Coding	Transmit power	Receiving sensitivity
MCS 0 / 8 / 16	23 dBm	-93 dBm
MCS 1 / 9 / 17	23 dBm	-90 dBm
MCS 2 / 10 / 18	23 dBm	-87 dBm
MCS 3 / 11 / 19	23 dBm	-83 dBm
MCS 4 / 12 / 20	23 dBm	-80 dBm
MCS 5 / 13 / 21	22 dBm	-77 dBm
MCS 6 / 14 / 22	21 dBm	-74 dBm
MCS 7 / 15 / 23	19 dBm	-73 dBm

*Table 21: IEEE 802.11n, Frequency range 5.180 GHz to 5.825 GHz (for FCC: 5.180 GHz to 5.240 GHz / 5.260 GHz to 5.320 GHz / 5.500 GHz to 5.720 GHz / 5.745 GHz to 5.825 GHz), Bandwidth 20 MHz*

IEEE 802.11n Frequency range 5.180 GHz to 5.825 GHz (for FCC: 5.180 GHz to 5.240 GHz / 5.260 GHz to 5.320 GHz / 5.500 GHz to 5.720 GHz / 5.745 GHz to 5.825 GHz) Bandwidth 40 MHz		
Coding	Transmit power	Receiving sensitivity
MCS 0 / 8 / 16	23 dBm	-90 dBm
MCS 1 / 9 / 17	23 dBm	-88 dBm
MCS 2 / 10 / 18	23 dBm	-85 dBm
MCS 3 / 11 / 19	22 dBm	-82 dBm
MCS 4 / 12 / 20	22 dBm	-79 dBm
MCS 5 / 13 / 21	21 dBm	-75 dBm
MCS 6 / 14 / 22	20 dBm	-73 dBm
MCS 7 / 15 / 23	19 dBm	-73 dBm

*Table 22: IEEE 802.11n, Frequency range 5.180 GHz to 5.825 GHz (for FCC: 5.180 GHz to 5.240 GHz / 5.260 GHz to 5.320 GHz / 5.500 GHz to 5.720 GHz / 5.745 GHz to 5.825 GHz), Bandwidth 40 MHz*

## ■ IEEE 802.11ac

IEEE 802.11ac Frequency range 5.180 GHz to 5.825 GHz (for FCC: 5.180 GHz to 5.240 GHz / 5.260 GHz to 5.320 GHz / 5.500 GHz to 5.720 GHz / 5.745 GHz to 5.825 GHz) Bandwidth 20 MHz		
Coding	Transmit power	Receiving sensitivity
MCS 0	23 dBm	-93 dBm
MCS 1	23 dBm	-90 dBm
MCS 2	23 dBm	-87 dBm
MCS 3	23 dBm	-83 dBm
MCS 4	23 dBm	-80 dBm
MCS 5	22 dBm	-77 dBm
MCS 6	21 dBm	-74 dBm
MCS 7	19 dBm	-73 dBm
MCS 8	18 dBm	-71 dBm

*Table 23: IEEE 802.11ac, Frequency range 5.180 GHz to 5.825 GHz (for FCC: 5.180 GHz to 5.240 GHz / 5.260 GHz to 5.320 GHz / 5.500 GHz to 5.720 GHz / 5.745 GHz to 5.825 GHz), Bandwidth 20 MHz*



IEEE 802.11ac Frequency range 5.180 GHz to 5.825 GHz (for FCC: 5.180 GHz to 5.240 GHz / 5.260 GHz to 5.320 GHz / 5.500 GHz to 5.720 GHz / 5.745 GHz to 5.825 GHz) Bandwidth 40 MHz		
Coding	Transmit power	Receiving sensitivity
MCS 0	23 dBm	-90 dBm
MCS 1	23 dBm	-88 dBm
MCS 2	23 dBm	-85 dBm
MCS 3	22 dBm	-82 dBm
MCS 4	22 dBm	-79 dBm
MCS 5	21 dBm	-75 dBm
MCS 6	20 dBm	-73 dBm
MCS 7	19 dBm	-73 dBm
MCS 8	18 dBm	-69 dBm
MCS 9	18 dBm	-67 dBm

*Table 24: IEEE 802.11ac, Frequency range 5.180 GHz to 5.825 GHz (for FCC: 5.180 GHz to 5.240 GHz / 5.260 GHz to 5.320 GHz / 5.500 GHz to 5.720 GHz / 5.745 GHz to 5.825 GHz), Bandwidth 40 MHz*

IEEE 802.11ac Frequency range 5.180 GHz to 5.825 GHz (for FCC: 5.180 GHz to 5.240 GHz / 5.260 GHz to 5.320 GHz / 5.500 GHz to 5.720 GHz / 5.745 GHz to 5.825 GHz) Bandwidth 80 MHz		
Coding	Transmit power	Receiving sensitivity
MCS 0	23 dBm	-88 dBm
MCS 1	23 dBm	-86 dBm
MCS 2	23 dBm	-84 dBm
MCS 3	22 dBm	-81 dBm
MCS 4	22 dBm	-77 dBm
MCS 5	21 dBm	-74 dBm
MCS 6	20 dBm	-73 dBm
MCS 7	19 dBm	-70 dBm
MCS 8	18 dBm	-67 dBm
MCS 9	18 dBm	-66 dBm

*Table 25: IEEE 802.11ac, Frequency range 5.180 GHz to 5.825 GHz (for FCC: 5.180 GHz to 5.240 GHz / 5.260 GHz to 5.320 GHz / 5.500 GHz to 5.720 GHz / 5.745 GHz to 5.825 GHz), Bandwidth 80 MHz*

## 13.5 LTE specifications (exclusively for LTE device variants)

### 13.5.1 LTE module

Parameter	Description	
LTE parameters	Data rate	100 Mbit/s (DL) 50 Mbit/s (UL) 3GPP Release 9
	Supported bandwidths	Band 1: 5 MHz, 10 MHz, 15 MHz, 20 MHz
		Band 3: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz
		Band 7: 5 MHz, 10 MHz, 15 MHz, 20 MHz
		Band 8: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz
		Band 20: 5 MHz, 10 MHz, 15 MHz, 20 MHz
		Supported frequencies
	Band 3: TX: 1710 MHz ... 1785 MHz RX: 1805 MHz ... 1880 MHz	
	Band 7: TX: 2500 MHz ... 2570 MHz RX: 2620 MHz ... 2690 MHz	
	Band 8: TX: 880 MHz ... 915 MHz RX: 925 MHz ... 960 MHz	
	Band 20: TX: 832 MHz ... 862 MHz RX: 791 MHz ... 821 MHz	
WCDMA parameters	Supported frequencies	Band 1 WCDMA 2100: TX: 1920 MHz ... 1980 MHz RX: 2110 MHz ... 2170 MHz
		Band 8 WCDMA 900: TX: 880 MHz ... 915 MHz RX: 925 MHz ... 960 MHz
GSM parameters	Supported frequencies	EGSM 900: TX: 880 MHz ... 915 MHz RX: 925 MHz ... 960 MHz
		DCS 1800: TX: 1710 MHz ... 1785 MHz RX: 1805 MHz ... 1880 MHz

Table 26: Technical parameters of the LTE module

### 13.5.2 GNSS (Global Navigation Satellite System)

Parameter	Description
Satellite channels	12 channels, continuous tracking
Frequency	Narrow-band GPS: 1575.42 MHz Wide-band GPS and GLONASS: 1565 MHz ... 1606 MHz recommended
Protocols	NMEA 0183 V3.0
Acquisition time	Hot start: 1 s Warm start: 29 s Cold start: 32 s
Accuracy	Horizontal: <2 m (50 %); <5 m (90 %) Altitude: <4 m (50 %); <8 m (90 %) Velocity: <0.2 m/s
Sensitivity	Tracking <sup>a</sup> : -161 dBm Acquisition <sup>b</sup> (Assisted, non-LTE): -158 dBm Acquisition (Assisted, LTE): -153 dBm Acquisition (Standalone): -145 dBm
Operational limits	Altitude <6000 m or velocity <100 m/s (Either limit may be exceeded, but not both.)

Table 27: Technical parameters of the GNSS

- Tracking sensitivity is the lowest GNSS signal level for which the device can still detect an in-view satellite 50 % of the time when in sequential tracking mode.
- Acquisition sensitivity is the lowest GNSS signal level for which the device can still detect an in-view satellite 50 % of the time.

### 13.5.3 Conducted RX sensitivity (LTE Bands)

LTE Bands		Conducted RX (Receive) sensitivity (dBm)			
		Primary (Typical)	Secondary (Typical)	SIMO (Typical)	SIMO <sup>a</sup> (Worst Case)
LTE Band 1	Full RB BW: 10 MHz <sup>b</sup>	-98.7	-97.8	-101.1	-96.3
LTE Band 3		-99.5	-97.3	-101.6	-93.3
LTE Band 7		-98.0	-97.5	-100.5	-94.3
LTE Band 8		-99.3	-98.5	-102.0	-93.3
LTE Band 20		-99.6	-98.4	-99.8	-93.3

Table 28: Conducted RX sensitivity (LTE Bands)

- Per 3GPP specification
- Sensitivity values scale with bandwidth:  $x\_MHz\_Sensitivity = 10\_MHz\_Sensitivity - 10 \cdot \log(10 \text{ MHz}/x\_MHz)$

### 13.5.4 Conducted RX sensitivity (UMTS Bands)

UMTS Bands		Conducted RX (Receive) sensitivity (dBm)		
		Primary (Typical)	Secondary (Typical)	Primary / Secondary <sup>a</sup> (Worst Case)
Band 1 (UMTS 2100)	0.1% BER 12.2 kbit/s	-111.4	-109.8	-106.7
Band 8 (UMTS 900)	0.1 % BER 12.2 kbit/s	-111.8	-111.0	-103.7

Table 29: Conducted RX sensitivity (UMTS Bands)

a. Per 3GPP specification

### 13.5.5 Conducted RX sensitivity (GSM/EDGE Bands)

GSM/EDGE Bands			Conducted RX (Receive) sensitivity (dBm)	
			Typical	Worst case <sup>a</sup>
EGSM 900	2 % BER	CS <sup>b</sup>	-109	-102
	10 % BLER	GMSK (CS1)	-112	-104
		EDGE (MCS5)	-104	-98
DCS 1800	2 % BER	CS <sup>c</sup>	-109	-102
	10 % BLER	GMSK (CS1)	-112	-104
		EDGE (MCS5)	-104	-98

Table 30: Conducted RX sensitivity (GSM/EDGE Bands)

a. Per 3GPP specification

b. CS = Circuit Switched

c. CS = Circuit Switched

### 13.5.6 Conducted TX power tolerances

Parameter	Conducted TX (Transmit) power tolerances	Notes
LTE		
LTE Band 1, 3, 8, 20	+23 dBm ±1 dB	Can vary as per the MPR (Maximum Power Reduction) table in the 3GPP TS_136101 specification
LTE Band 7	+22 dBm ±1 dB	
UMTS		
Band 1 (IMT 2100 12.2 kbit/s) Band 8 (UMTS 900 12.2 kbit/s)	+23 dBm ±1 dB	Connectorized (Class 3)
GSM / EDGE		

Table 31: Conducted TX power tolerances

Parameter	Conducted TX (Transmit) power tolerances	Notes
EGSM 900 CS	+32 dBm $\pm$ 1 dB	GMSK mode, connectorized (Class 4; 2 W, 33 dBm)
	+27 dBm $\pm$ 1 dB	8PSK mode, connectorized (Class E2; 0.5 W, 27 dBm)

Table 31: Conducted TX power tolerances

## 13.6 EMC

EMC interference immunity			
EN 61000-4-2	Electrostatic discharge		
	Contact discharge, test level 3		6 kV
	Air discharge, test level 3		8 kV
EN 61000-4-3	Electromagnetic field		
	80 MHz ... 3000 MHz		max. 20 V/m
	3000 MHz ... 6000 MHz		3 V/m
EN 61000-4-4	Fast transients (burst), test level 4		
	Power line		2 kV
	Data line		4 kV
EN 61000-4-5	Voltage surges		
	Power line	line/line	1 kV
	Power line	line/ground	2 kV
	Data line: test level 3		2 kV
EN 61000-4-6	Conducted interference voltages, test level 3		
	150 kHz ... 80 MHz		10 V
EMC interference emission			
EN 55032	Class B		
FCC 47 CFR Part 15	Class B		

## 13.7 Immunity

Immunity	
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
Shock	IEC 60068-2-27 Test Ea test level in accordance with IEC 61131-2, EN 50155

## 13.8 Network range

### 10/100/1000 Mbit/s twisted pair port

Length of a twisted pair segment	max. 100 m (328 ft) (for Cat5e cable)
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Table 32: Network range: 10/100/1000 Mbit/s twisted pair port

## 13.9 Power consumption/power output

Device		Power consumption	Power output
BAT450-F	1 × WLAN module 11n	10 W	34.12 Btu (IT)/h
	2 × WLAN module 11n	13 W	44.36 Btu (IT)/h
	1 × WLAN module 11ac	10 W	34.12 Btu (IT)/h
	1 × WLAN module 11n	13 W	44.36 Btu (IT)/h
	1 × LTE module		

## 14 Scope of delivery 11n device variants (non-LTE)

### ■ Scope of delivery device variants featuring Configuration with characteristic value “9”

Number	Article	1 × WLAN module	2 × WLAN module
1 ×	Device	X	X
1 ×	Safety and general information sheet	X	X
1 ×	Sheet with the conformity declarations for the European Union and the United Kingdom (UK)	X	X
1 ×	IEC/EN/UL 62368-1 sheet	X	X
1 ×, 2 × or 3 × premounted	Protection cap (M12, plastic) for Ethernet port 1, Ethernet port 2 or V.24 interface	X	X
1 × premounted	Transport protection cap (M12, plastic) for supply voltage connection	X	X
3 × premounted	Transport protection cap (plastic) for N socket	X	
6 × premounted	Transport protection cap (plastic) for N socket		X

## ■ Scope of delivery device variants featuring Configuration with characteristic value “Z”

Number	Article	1 × WLAN module	2 × WLAN module
1 ×	Device	X	X
1 ×	Safety and general information sheet	X	X
1 ×	Sheet with the conformity declarations for the European Union and the United Kingdom (UK)	X	X
1 ×	IEC/EN/UL 62368-1 sheet	X	X
1 ×, 2 × or 3 × premounted	Protection cap (M12, plastic) for Ethernet port 1, Ethernet port 2 or V.24 interface	X	X
1 × premounted	Transport protection cap (M12, plastic) for supply voltage connection	X	X
3 × premounted	Transport protection cap (plastic) for N socket	X	
6 × premounted	Transport protection cap (plastic) for N socket		X
3 × included	BAT-ANT-N-3AGN-IP67 for N socket	X	
6 × included	BAT-ANT-N-3AGN-IP67 for N socket		X
2 × included	50 Ω terminating resistor for sealing unused antenna connections	X	
4 × included	50 Ω terminating resistor for sealing unused antenna connections		X
1 × or 2 × included	“X”-coded M12 plug for Ethernet port 1 and /or Ethernet port 2	X	X
1 × included	Applies to device variants featuring supply voltage with characteristic value W (24 V DC): M12 power supply plug ELKA 5012 PG7	X	X
	Applies to device variants featuring supply voltage with characteristic value N (110 V DC): M12 power supply plug ELKA 4012 PG7	X	X
0 × or 1 × included	Terminal cable: M12 plug, 4-Pin, “A”-coded Applies to device variants with V.24 interface.	X	X



# 15 Scope of delivery 11ac device variants (non-LTE)

## ■ Scope of delivery device variants featuring Configuration with characteristic value “9”

Number	Article
1 ×	Device
1 ×	Safety and general information sheet
1 ×	Sheet with the conformity declarations for the European Union and the United Kingdom (UK)
1 ×	IEC/EN/UL 62368-1 sheet
1 ×, 2 × or 3 × premounted	Protection cap (M12, plastic) for Ethernet port 1, Ethernet port 2 or V.24 interface
1 × premounted	Transport protection cap (M12, plastic) for supply voltage connection
3 × premounted	Transport protection cap (plastic) for N socket

## ■ Scope of delivery device variants featuring Configuration with characteristic value “Z”

Number	Article
1 ×	Device
1 ×	Safety and general information sheet
1 ×	Sheet with the conformity declarations for the European Union and the United Kingdom (UK)
1 ×	IEC/EN/UL 62368-1 sheet
1 ×, 2 × or 3 × premounted	Protection cap (M12, plastic) for Ethernet port 1, Ethernet port 2 or V.24 interface
1 × premounted	Transport protection cap (M12, plastic) for supply voltage connection
3 × premounted	Transport protection cap (plastic) for N socket
3 × included	BAT-ANT-N-3AGN-IP67 for N socket
2 × included	50 Ω terminating resistor for sealing unused antenna connections
1 × or 2 × included	“X”-coded M12 plug for Ethernet port 1 and /or Ethernet port 2
1 × included	Applies to device variants featuring supply voltage with characteristic value W (24 V DC): M12 power supply plug ELKA 5012 PG7
	Applies to device variants featuring supply voltage with characteristic value N (110 V DC): M12 power supply plug ELKA 4012 PG7
0 × or 1 × included	Terminal cable: M12 plug, 4-Pin, “A”-coded Applies to device variants with V.24 interface.

## 16 Scope of delivery LTE device variants

### ■ Scope of delivery device variants featuring Configuration with characteristic value “9”

Number	Article
1 ×	Device
1 ×	Safety and general information sheet
1 ×	Sheet with the conformity declarations for the European Union and the United Kingdom (UK)
1 ×	IEC/EN/UL 62368-1 sheet
1 ×, 2 × or 3 × premounted	Protection cap (M12, plastic) for Ethernet port 1, Ethernet port 2 or V.24 interface
1 × premounted	Transport protection cap (M12, plastic) for supply voltage connection
6 × premounted	Transport protection cap (plastic) for N socket

## ■ Scope of delivery device variants featuring Configuration with characteristic value “Z”

Number	Article
1 ×	Device
1 ×	Safety and general information sheet
1 ×	Sheet with the conformity declarations for the European Union and the United Kingdom (UK)
1 ×	IEC/EN/UL 62368-1 sheet
1 ×, 2 × or 3 × premounted	Protection cap (M12, plastic) for Ethernet port 1, Ethernet port 2 or V.24 interface
1 × premounted	Transport protection cap (M12, plastic) for supply voltage connection
3 × premounted	Transport protection cap (plastic) for N socket
6 × premounted	Transport protection cap (plastic) for N socket
3 × included	BAT-ANT-N-3AGN-F for N socket
2 × included	WWAN-A-I-41-S-O
1 × included	GNSS antenna (GNSS-A-O-90-S-P)
3 × included	N to SMA adapter (WWAN-N-O-N-S)
4 × included	50 Ω terminating resistor for sealing unused antenna connections
1 × or 2 × included	“X”-coded M12 plug for Ethernet port 1 and /or Ethernet port 2
1 × included	Applies to device variants featuring supply voltage with characteristic value W (24 V DC): M12 power supply plug ELKA 5012 PG7
	Applies to device variants featuring supply voltage with characteristic value N (110 V DC): M12 power supply plug ELKA 4012 PG7
0 × or 1 × included	Terminal cable: M12 plug, 4-Pin, “A”-coded Applies to device variants with V.24 interface.

## 17 Accessories 11n device variants (non-LTE)

Designation		Order number
BAT-ANT-N-3AGN-IP67 for N socket (10 pieces)		942 110-001
BAT-ANT-N-3AGN-F for N socket (10 pieces)		942 047-001
50 $\Omega$ terminating resistors for closing unused antenna connections (10 pieces)		942 118-001
BAT450-F pole mounting set	For fastening the device to a pole. Details for installing the device on a pole and for the pole diameter range: <a href="#">"Installing the device on a pole" on page 46</a>	943 966-001
Applies to device variants featuring supply voltage with characteristic value W (24 V DC): M12 power supply plug ELKA 5012 PG7		933 170-100
Applies to device variants featuring supply voltage with characteristic value N (110 V DC): M12 power supply plug ELKA 4012 PG7		933 139-100
Other accessories		Order number
BAT-ANT-Protector m-f		943 903-373
Protection screw for M12 socket, metal, IP65/67 (25 pieces)		942 057-001
Protection screw for M12 plug, metal, IP65/67 (10 pieces)		942 115-001

**Note:** Products recommended as accessories may have characteristics that do not fully correspond to those of the corresponding product. This may limit their possible usage in the overall system.

## 18 Accessories 11ac device variants (non-LTE)

Designation		Order number
BAT-ANT-N-3AGN-IP67 for N socket (10 pieces)		942 110-001
BAT-ANT-N-3AGN-F for N socket (10 pieces)		942 047-001
50 $\Omega$ terminating resistors for closing unused antenna connections (10 pieces)		942 118-001
BAT450-F pole mounting set	For fastening the device to a pole. Details for installing the device on a pole and for the pole diameter range: <a href="#">"Installing the device on a pole" on page 46</a>	943 966-001
Applies to device variants featuring supply voltage with characteristic value W (24 V DC): M12 power supply plug ELKA 5012 PG7		933 170-100
Applies to device variants featuring supply voltage with characteristic value N (110 V DC): M12 power supply plug ELKA 4012 PG7		933 139-100
Other accessories		Order number
BAT-ANT-Protector m-f		943 903-373
Protection screw for M12 socket, metal, IP65/67 (25 pieces)		942 057-001
Protection screw for M12 plug, metal, IP65/67 (10 pieces)		942 115-001

**Note:** Products recommended as accessories may have characteristics that do not fully correspond to those of the corresponding product. This may limit their possible usage in the overall system.

## 19 Accessories LTE device variants

Designation	Order number
BAT-ANT-N-3AGN-F for N socket (10 pieces)	942 047-001
LTE antenna WWAN-A-I-41-S-O	942 042-105
GNSS antenna GNSS-A-O-90-S-P	942 042-108
N to SMA adapter WWAN-N-O-N-S	942 042-106
50 $\Omega$ terminating resistors for closing unused antenna connections (10 pieces)	942 118-001
BAT450-F pole mounting set	For fastening the device to a pole. Details for installing the device on a pole and for the pole diameter range: <a href="#">"Installing the device on a pole" on page 46</a>
Applies to device variants featuring supply voltage with characteristic value W (24 V DC): M12 power supply plug ELKA 5012 PG7	933 170-100
Applies to device variants featuring supply voltage with characteristic value N (110 V DC): M12 power supply plug ELKA 4012 PG7	933 139-100
Other accessories	Order number
BAT-ANT-Protector m-f	943 903-373
Protection screw for M12 socket, metal, IP65/67 (25 pieces)	942 057-001
Protection screw for M12 plug, metal, IP65/67 (10 pieces)	942 115-001

**Note:** Products recommended as accessories may have characteristics that do not fully correspond to those of the corresponding product. This may limit their possible usage in the overall system.

## 20 Underlying technical standards

Name	
CAN/CSA 22.2 No. 62368-1	Information Technology Equipment – Safety – Part 1: General Requirements
ECE No. 10	E type approval for use in vehicles
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 301 489-7	Electromagnetic compatibility (EMC) standard for radio equipment and services – Part 7: Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio telecommunications systems (GSM and DCS)
EN 301 489-17	Electromagnetic compatibility (EMC) for radio equipment and services - specific conditions for 2.4 GHz broadband transmission systems and 5 GHz high-performance RLAN equipment
EN 301 489-24	Electromagnetic compatibility (EMC) standard for radio equipment and services – Part 24: Specific conditions for IMT-2000 CDMA Direct Spread (UTRA and E-UTRA) for Mobile and portable (UE) radio and ancillary equipment
EN 301 511	Global System for Mobile communications (GSM); Harmonized Standards for mobile stations in the GSM 900 and GSM 1800 bands.
EN 301 908-1	IMT cellular networks – Part 1: Introduction and common requirements
EN 301 908-2	IMT cellular networks – Part 2: CDMA Direct Spread (UTRA FDD) User Equipment.
EN 301 908-13	IMT cellular networks – Part 13: Evolved Universal Terrestrial Radio Access (E-UTRA)
EN 302 502	Broadband radio access networks (BRAN) – permanently installed broadband data transmission systems with 5.8 GHz band
EN 45545-2	Railway applications - Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components.
EN 50121-4	Railway applications – EMC – Emission and immunity of the signaling and telecommunications apparatus (Rail Trackside)
EN 50155	Railway applications – Electronic equipment used on rolling stock
EN 55032	Electromagnetic compatibility of multimedia equipment – Emission Requirements
IEC/EN 62368-1	Equipment for audio/video, information and communication technology - Part 1: safety requirements
EN 60950-22	Installations of IT equipment – Security – Part 22: Outdoor equipments
EN 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments
EN 61131-2	Programmable controllers – Part 2: Equipment requirements and tests
FCC 47 CFR Part 15	Code of Federal Regulations



Name	
IEC/EN 60079-15	Explosive atmospheres – Part 15: Equipment protection by type of protection “n”
IEEE 802.3af	Power over Ethernet
IEEE 802.1D	Switching, GARP, GMRP, Spanning Tree
IEEE 802.1D	Media access control (MAC) bridges (includes IEEE 802.1p Priority and Dynamic Multicast Filtering, GARP, GMRP)
IEEE 802.1Q	Virtual LANs (VLANs, MRP, Spanning Tree)
IEEE 802.1Q	Virtual Bridged Local Area Networks (VLAN Tagging, GVRP)
IEEE 802.1w	Rapid Reconfiguration
IEEE 802.3	Ethernet
IEEE 802.11a/b/g/h/i/n	WLAN
UL 62368-1	Audio/video, information and communication technology equipment - Part 1: Safety requirements

The device has an approval based on a specific standard exclusively if the approval indicator appears on the device casing.  
The device generally fulfills the technical standards named in their current versions.

# A Further support

## Technical questions

For technical questions, please contact any Hirschmann dealer in your area or Hirschmann directly.

You find the addresses of our partners on the Internet at <http://www.hirschmann.com>.

A list of local telephone numbers and email addresses for technical support directly from Hirschmann is available at <https://hirschmann-support.belden.com>.

This site also includes a free of charge knowledge base and a software download section.

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