



**HIRSCHMANN**

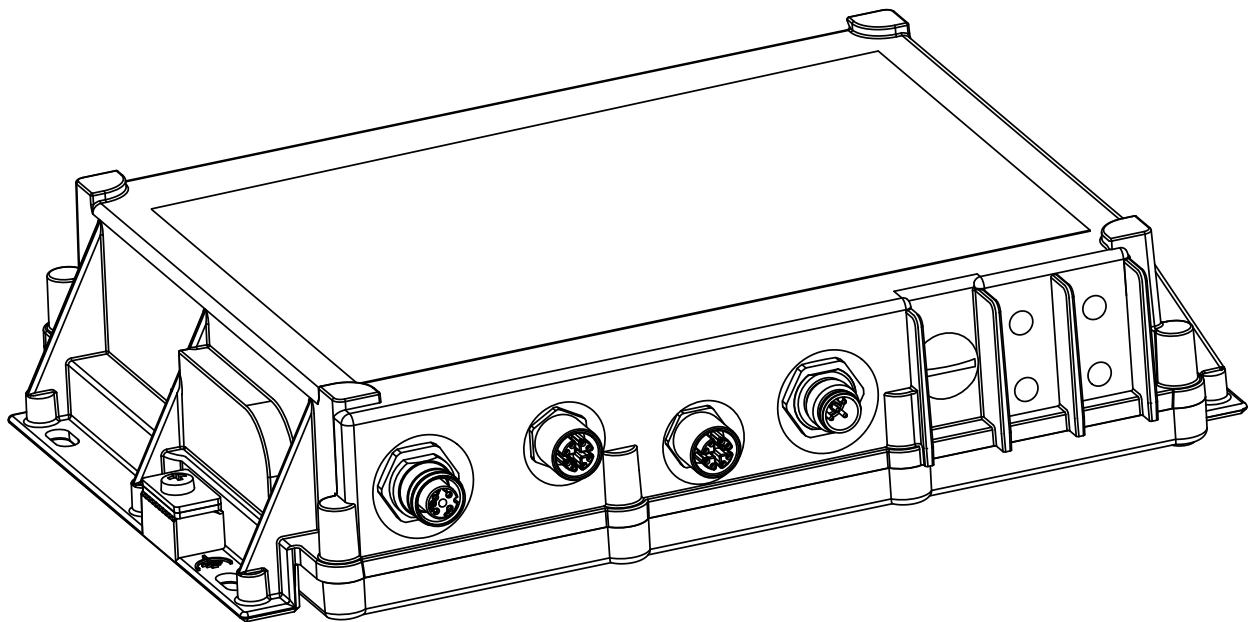
A **BELDEN** BRAND

# User Manual

## Installation

### Industrial Access Point / Client / Access Bridge

### BAT450-F



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# 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 the 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 48.](#)
- Connect to the product only components suitable for the requirements of the specific application case.

## ■ **Installation site requirements**

- 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 14 °F (-10 °C), use cabling designed for minimum temperatures.
- Applies to device variants featuring supply voltage with characteristic value N (110 V DC):

[See “Device name and product code” on page 17.](#)

Install this device solely in an operating site with restricted access, 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.

## ■ **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 > 140 °F (+60 °C):  
The surfaces of the device housing may become hot. Avoid touching the device while it is operating.

## ■ **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 167 °F (75 °C). The power supply cable wires are made of copper.

Table 1: Requirements for connecting electrical wires

## ■ Requirements for connecting the supply voltage

### Prerequisites:

<b>All variants</b>	<b>All</b> of the following requirements are complied with:	
	▶	The supply voltage corresponds to the voltage specified on the type plate of the device.
	▶	The power supply conforms to overvoltage category I or II.
	▶	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.
	▶	The cross-section of the ground conductor is the same size as or bigger than the cross-section of the power supply cables.
	▶	The power supply cable is suitable for the voltage, the current and the physical load. Hirschmann recommends a wire diameter of 0.25 mm <sup>2</sup> (AWG24) to 0.75 mm <sup>2</sup> (AWG19).
Only for device variants featuring supply voltage with characteristic value W (24 V DC):	<b>The following requirements apply alternatively:</b>	
	Alternative 1	The power supply complies with the requirements for a limited power source (LPS) as per EN 60950-1.
	Alternative 2	Relevant for North America: The power supply complies with the requirements according to NEC Class 2.
	Alternative 3	<b>All</b> of the following requirements are complied with: <ul style="list-style-type: none"> <li>▶ The power supply complies with the requirements for a safety extra-low voltage (SELV) as per IEC/EN 60950-1.</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 48.</a></li> </ul>
Only for device variants featuring supply voltage with characteristic value N (110 V DC):	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 48.</a>	

Table 2: Requirements for connecting the supply voltage



## ■ **Lightning protection**

- ▶ The installation of the device occurs in accordance with valid standards (such as VDE 0185 and IEC 62305), 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 and overvoltage protection”.  
You can download the manual from the Internet on the Hirschmann product pages ([www.hirschmann.com](http://www.hirschmann.com)).
- Protect antennas installed outside with lightning protection devices (for example lightning conductors).
- Take lightning protection measures which 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 (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  
[www.hirschmann.com](http://www.hirschmann.com)

The product can be used in living areas (living area, place of business, small business) 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	UK			

- ▶ 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 [“Obtain compliance for operation in the European Union”](#) on page 40.
- ▶ 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), Ireland (IE), and the United Kingdom (UK):

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)
  
- ▶ United Kingdom (UK):  
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:

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 19.7 in (50 cm) (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:

Antennas operating with this device model:	Permitted band of operation		
	2.4 GHz band	5.15 GHz ... 5.25 GHz band	5.725 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 Ω.

## **E WLAN2 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: U99E WLAN2**

**IC: 4019A-E WLAN2**

This equipment complies with FCC and IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 19.7 in (50 cm) (related to a 18 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.

This device has been designed to operate with the antennas listed below having a maximum gain of 18 dBi:

Antennas operating with this device model:	Permitted band of operation		
	2.4 GHz band	5.15 GHz ... 5.25 GHz band	5.725 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
BAT-ANT-N-MiMo-18N-IP65 <sup>a</sup>	No	No	Yes

- a. Note: Connect the BAT-ANT-N-MiMo-18N-IP65 to the WLAN module as follows:
- Connect the antenna port "Ver" with the WLAN-antenna-port 1.
  - Connect the antenna port "+45°" with the WLAN-antenna-port 2.
  - Connect the antenna port "-45°" with the WLAN-antenna-port 3.
  - Connect the BAT-ANT-N-MiMo-18N-IP65 antenna in this way exclusively. Differing connection configurations are illegal.

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.

#### ■ **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 "Installation" user manual that is not supplied with your device in print can be found as PDF download on the Internet at the Hirschmann product pages ([www.hirschmann.com](http://www.hirschmann.com)).

## Legend

The symbols used in this manual have the following meanings:

	Listing
	Work step
	Subheading



# 1 Description

## 1.1 General device description

The devices are wireless LAN access points or clients complying with IEEE 802.11a/b/g/h/n. They provide a high radio output with a data rate of up to 450 Mbit/s. The devices support 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.

You have numerous options of combining the device characteristics. You can determine the possible combinations using the Configurator which is available in the Belden E-Catalog ([www.e-catalog.beldensolutions.com](http://www.e-catalog.beldensolutions.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)
- ▶ Management software (for example Industrial HiVision, LANconfig/LANmonitor)
- ▶ V.24 interface (locally on the device)

The devices work without a fan.

The devices comply 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="http://www.e-catalog.beldensolutions.com">www.e-catalog.beldensolutions.com</a> ).
	Example: Singapore	Example: SG	
11	Slot 1	W	WLAN module
12	Slot 2	W	WLAN module
		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 24 V DC
		N	Rated voltage 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	H	WLAN module version for high-gain antennas
		M	Motor vehicles applications (E type-approval mark, ECE No. 10)
		9	No additional approvals
19	Mounting	A	Standard
20 ... 21	Ethernet port 1	T6	8-pin, "X"-coded M12 plug for 10/100/1000 Mbit/s PoE port
22 ... 23	Optional: Ethernet port 2 or interface	T6	8-pin, "X"-coded M12 socket for 10/100/1000 Mbit/s twisted pair port
		T7	▶ 8-pin, "X"-coded M12 socket for 10/100/1000 Mbit/s twisted pair port ▶ V.24/ACA11
		V4	V.24/ACA11
		99	Not assembled
24	Temperature range	E	Extended with Conformal Coating -40 °F ... +158 °F (-40 °C ... +70 °C)
		T	Extended -40 °F ... +158 °F (-40 °C ... +70 °C)
		M	-22 °F ... +158 °F (-30 °C ... +70 °C)
25	Software option 1	A	VPN-5
		B	VPN-50
		C	VPN-100
		9	Not present
26	Software option 2	9	Not present

Table 3: Device name and product code

Item	Characteristic	Character istic value	Description
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 Non-LTE device variants

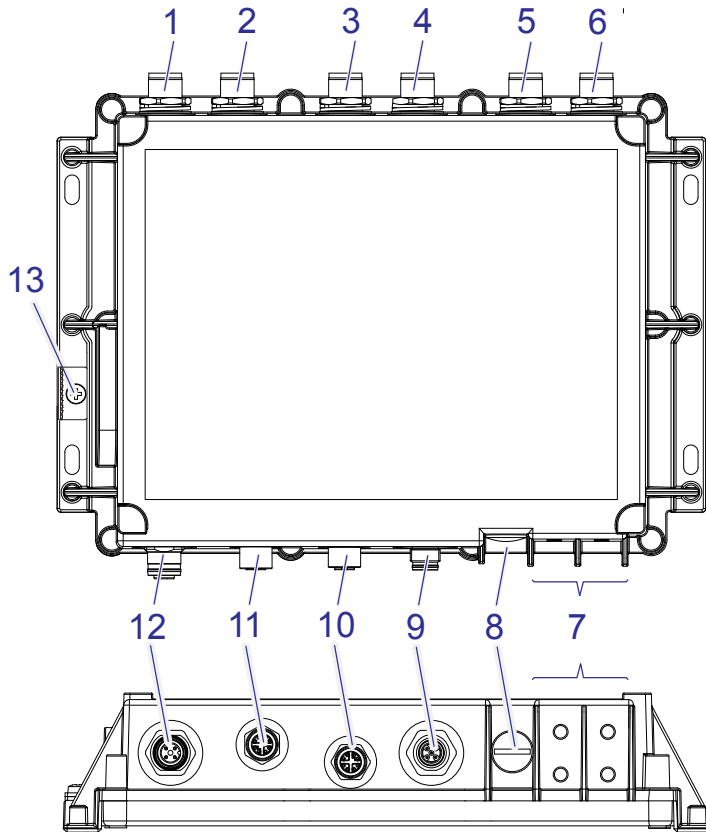


Figure 1: Device view Non-LTE device variants

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	8-pin, “X”-coded M12 plug for 10/100/1000 Mbit/s PoE port
11	Optional: Ethernet port 2	8-pin, “X”-coded M12 socket for 10/100/1000 Mbit/s twisted pair port
12	Optional: V.24/ACA11	4-pin, “A”-coded M12 socket

13	Applies to device variants featuring supply voltage with characteristic value W (24 V DC):	Connection for functional ground
	Applies to device variants featuring supply voltage with characteristic value N (110 V DC):	Connection for protective grounding

## 1.4 Device view LTE device variants

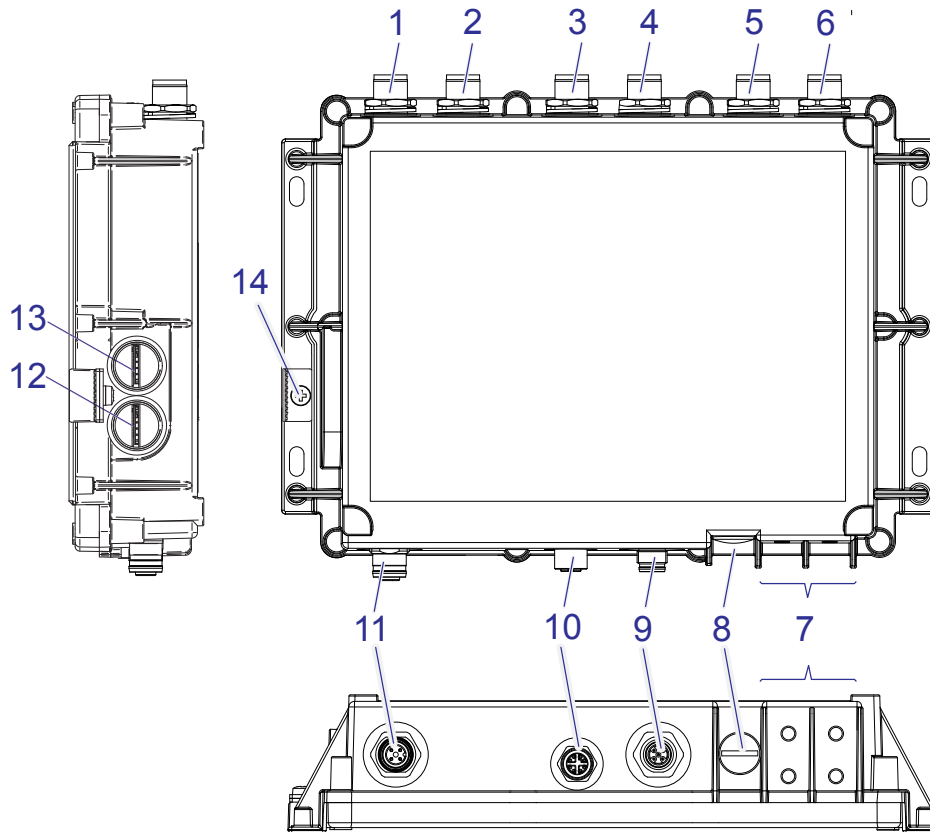


Figure 2: Device view LTE device variants

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

## 1.5 Power supply

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

### 1.5.1 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.

### 1.5.2 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.

## 1.6 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 pin assignments for making patch cables here:

See [“Pin assignments” on page 24](#).

### 1.6.1 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).

### 1.6.2 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.

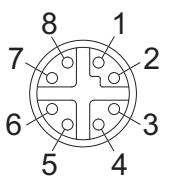
This port supports:

- ▶ 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.

## 1.6.3 Pin assignments

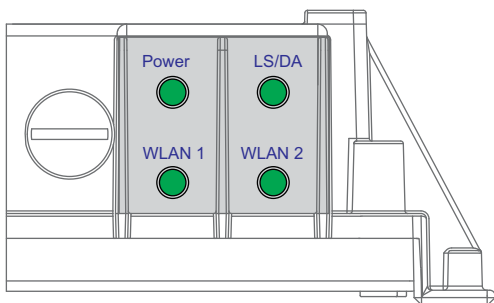
M12 8-pin ("X"-coded)	Pin	10/100 Mbit/s (applies to Twisted Pair port)	1000 Mbit/s	PoE (applies to PoE port)
	1	RX+	BI_DB+	Negative $V_{PSE}$
	2	RX-	BI_DB-	Negative $V_{PSE}$
	3	TX+	BI_DA+	Positive $V_{PSE}$
	4	TX-	BI_DA-	Positive $V_{PSE}$
	5	—	BI_DC+	Negative $V_{PSE}$
	6	—	BI_DC-	Negative $V_{PSE}$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

## 1.7 Display elements Non-LTE device variants

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

### 1.7.1 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>
green	flashing	<ul style="list-style-type: none"> <li>▶ At least one WLAN network defined</li> <li>▶ WLAN module activated</li> </ul>



WLAN 1, WLAN 2		
Color	Activity	Meaning
green	Inverse flashing	Number of flashes corresponds to number of connected WLAN stations and P2P radio lines.
green	flashing	▶ DFS scanning or another scan procedure ▶ Display of signal strength in client or P2P
red	flashing	Device has detected at least one hardware error.

## 1.7.2 LS/DA

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

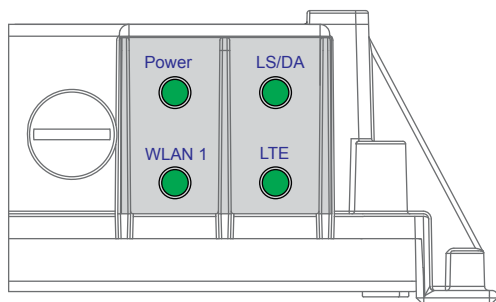
LS/DA		
Color	Activity	Meaning
—	off	No network device connected
green	lights up	1 Ethernet connection active
green/ yellow	flashing	Device is transmitting and/or receiving data
yellow	lights up	2 Ethernet connections active

## 1.8 Display elements LTE device variants

After the supply voltage is set up, the software starts and initializes itself. 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		
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.

## 1.8.2 LS/DA

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

## 1.9 Management interfaces

### 1.9.1 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 isolated 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.

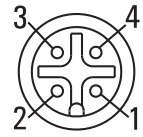
Figure	Pin	Function
	1	TX Transmit Data
	2	RX Receive Data
	3	N.C. Not used
	4	GND Ground

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

## 1.9.2 Reset button

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

The tightening torque is 4.42 lb-in to 8.85 lb-in (0.5 Nm to 1.0 Nm).

**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”.

You can download the manual from the Internet on the Hirschmann product pages ([www.hirschmann.com](http://www.hirschmann.com)).

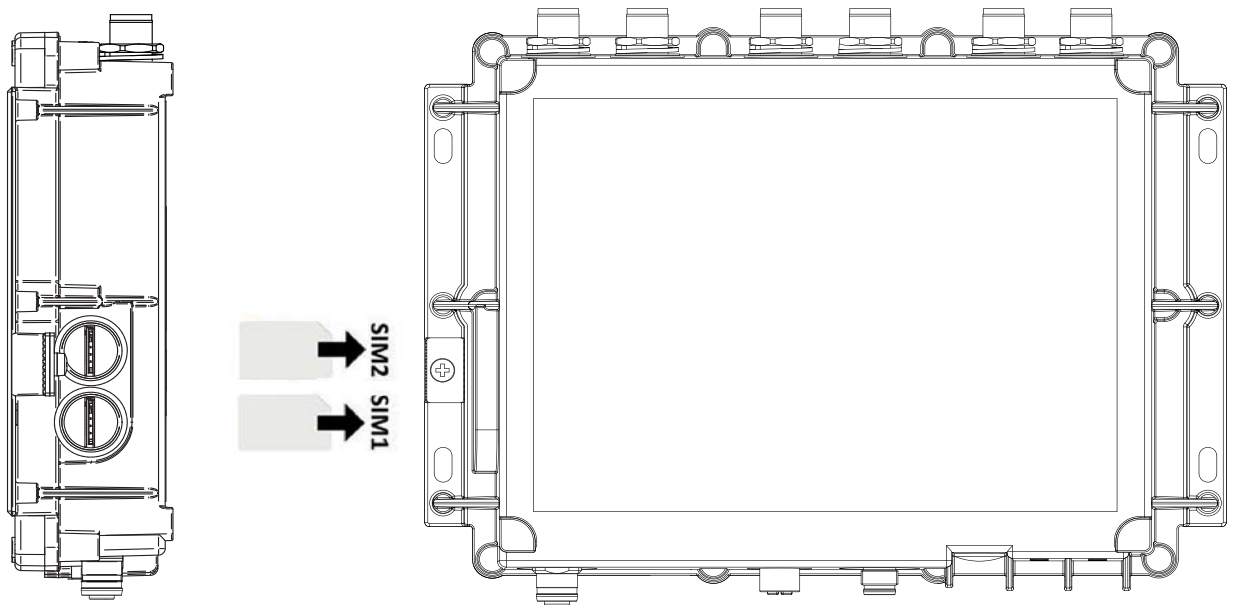
## 1.10 SIM card reader (exclusively for LTE device variants)

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

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 closed with protection caps or protection screws.
- ▶ All protection screws comply with the degrees of protection IP65/67.

To configure a subdomain, follow these 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 section [“Scope of delivery Non-LTE device variants” on page 63](#) or [“Scope of delivery LTE device variants” on page 65](#).
- 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 0.20 in (5 mm).
- ▶ The head diameter is maximum 0.47 in (12 mm).
- ▶ The diameter of a flat washer used is maximum 0.48 in (12 mm).

Proceed as follows:

- Prepare the assembly at the installation site.  
[See “Dimension drawings” on page 50.](#)
- 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 Non-LTE device variants”](#) or [“Accessories LTE device variants”](#)).

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

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

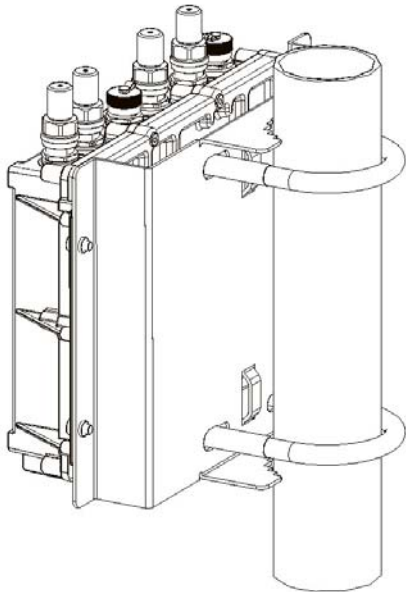


Figure 3: BAT450-F pole mounting set with enclosed U-bolts

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

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



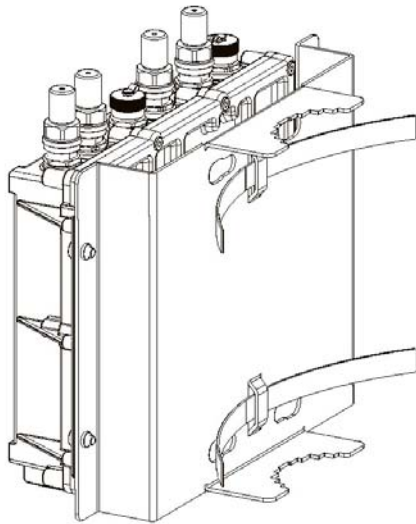


Figure 4: BAT450-F pole mounting set with tightening straps

### 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.**

The device is grounded via the separate ground screw.

The device variants featuring supply voltage with characteristic value N (110 V DC) have a connection for protective ground .

The device variants featuring supply voltage with characteristic value W (24 V DC) have a connection for functional ground .

- 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 26.55 lb-in  $\pm$  4.43 lb-in (3 Nm  $\pm$  0.5 Nm).

## 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 connections are sealed with protection caps.

Proceed as follows:

- Remove the protection caps from the connections to which you want to connect external antennas.
- 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 43](#).

## 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 8.](#)

[See “Requirements for connecting the supply voltage” on page 8.](#)

**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)

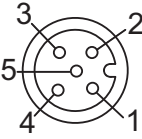

Type and specification of the supply voltage		Pin assignment on the device
Rated voltage 24 V DC		1 +24 V DC
Voltage range incl. maximum tolerances 16.8 V DC ... 32 V DC		2 0 V DC
		3 0 V DC
		4 N.C.
		5 N.C.

Table 5: 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)


WARNING

**ELECTRIC SHOCK**  
Install this device solely in an operating site with restricted access, 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.**


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

## 2.5 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 8.](#)

See [“Requirements for connecting the supply voltage” on page 8.](#)

**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)**

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 48](#)

- 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 48](#)

## 2.6 Connecting data cables

- Connect the data cables according to your requirements.  
You find the prescribed tightening torque of the locking screw in chapter: [“General technical data” on page 48](#)

### **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 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

## **5 Set 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”.

You can download the manual from the Internet on the Hirschmann product pages ([www.hirschmann.com](http://www.hirschmann.com)).

## 6 Obtain compliance for operation in the European Union

For operation in the European Union, the device must comply with the Radio Equipment Directive (RED) 2014/53/EU. 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.

Make the country setting unchangeable using the Command Line Interface (CLI), the graphical user interface or the LANconfig software. You can download the LANconfig software as an ISO image 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. 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 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, type `yes`. This makes the country setting unchangeable. Subsequently, the device restarts.

## ■ **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. 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 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, 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. 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 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**.

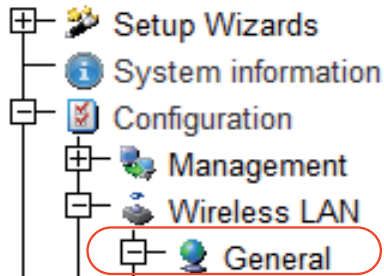
**Note:** To check the country setting and correct it, click the “No” button. Then open the **Configuration > Wireless LAN > General** dialog.

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

## 7 Configuring the transmit power

You have the option to set the transmit power using LANconfig or (error in org) Webconfig.

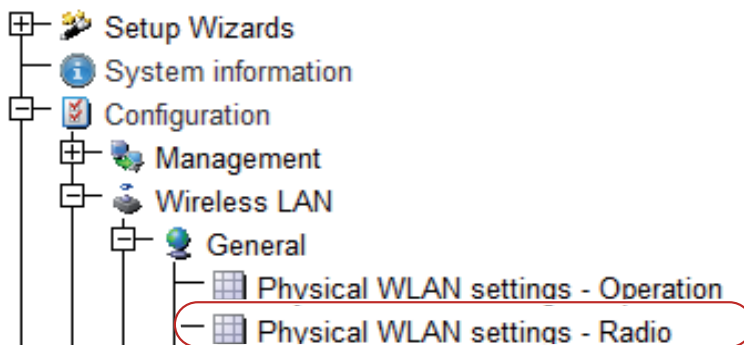
- Use LANconfig or Webconfig to start the configuration of the device.
- In the menu tree, open the **Configuration > Wireless LAN > General** dialog.



- 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 “**Set**” button.

**Note:** For devices that are operated in the European Union perform the work steps described in chapter [“Obtain compliance for operation in the European Union” on page 40](#).

- 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						
<b>Physical WLAN settings - Radio</b>													
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	Background scan

- Subtract the cable and installed overvoltage protector attenuation from the antenna gain. Enter the calculated value in the “Antenna gain” field.
- Click the “Set” 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		

## 8 Monitoring the ambient air temperature

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

See [“General technical data” on page 48](#).

The ambient air temperature is the temperature of the air at a distance of 2 in (5 cm) 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 and the GUI 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.

## 9 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>.

## 10 Disassembly

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

# 11 Technical data

## 11.1 General technical data

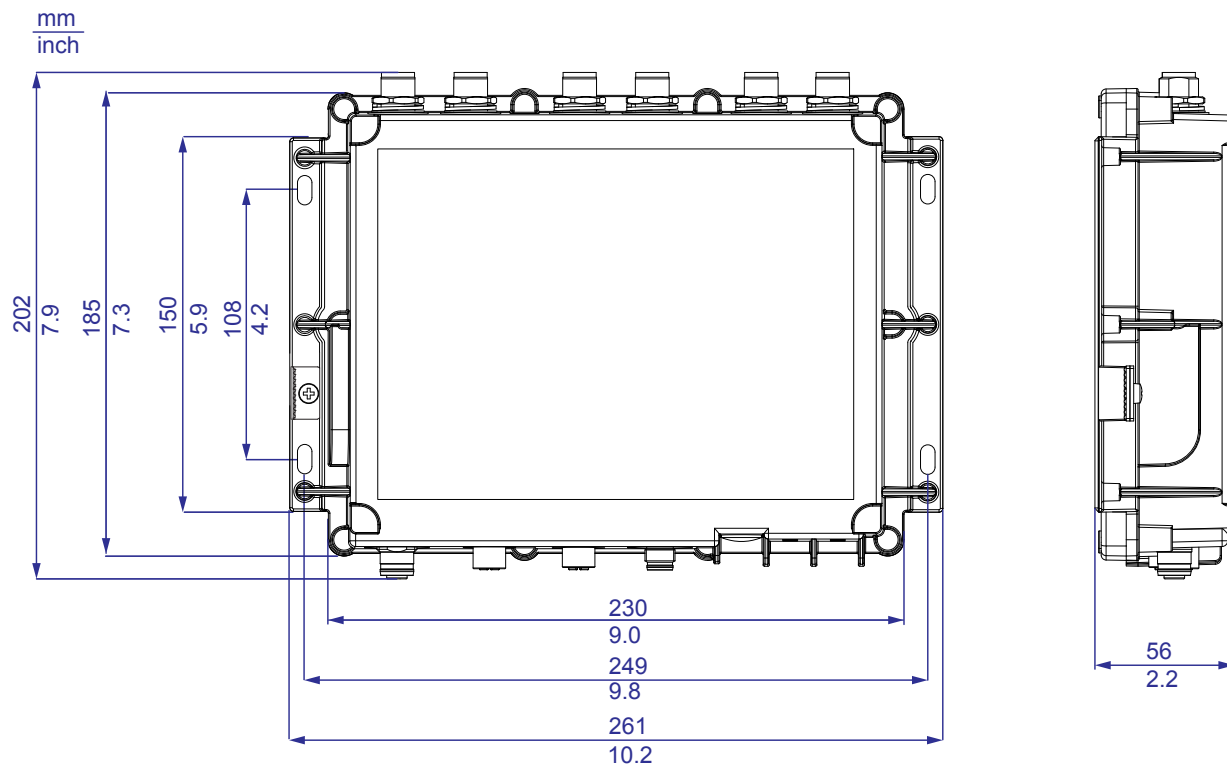
Dimensions W × H × D	BAT450-F	See "Dimension drawings" on page 50.
Weight		≥ 2.0 kg (depending on the device variant)
Supply voltage with the characteristic value W	Connection type	8-pin, "X"-coded M12 socket for PoE port or a 5-pin, "A"-coded M12 plug
		Tightening torque of the locking screw 5.3 lb-in (0.6 Nm)
	Rated voltage	24 V DC
	Voltage range incl. maximum tolerances	16.8 V DC ... 32 V DC
	Power loss buffer	10 ms at 19.2 V DC
	Overload current protection at input	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 the locking screw 5.3 lb-in (0.6 Nm)
	Rated voltage	110 V DC
	Voltage range incl. maximum tolerances	77 V DC ... 138 V DC
	Power loss buffer	10 ms at 77 V DC
	Overload current protection at input	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: 3.94 in (10 cm) Left and right device side: 0.79 in (2 cm)
	Ambient air temperature <sup>a</sup>	Non-LTE device variants -40 °F ... +158 °F (-40 °C ... +70 °C) LTE device variants -22 °F ... +158 °F (-30 °C ... +70 °C)
	Humidity	10 % ... 95 % (non-condensing)
	Air pressure	min. 700 hPa (+9842 ft; +3000 m) max. 1060 hPa (-1312 ft; -400 m)
Climatic conditions during storage	Ambient air temperature <sup>a</sup>	-40 °F ... +185 °F (-40 °C ... +85 °C)
	Humidity	10 % ... 95 % (non-condensing)
	Air pressure	min. 700 hPa (+9842 ft; +3000 m) max. 1060 hPa (-1312 ft; -400 m)



Pollution degree	2	
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 2 in (5 cm) from the device

## 11.2 Dimension drawings



## 11.3 WLAN specifications

### 11.3.1 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	▶ Support of 2.4 GHz and 5 GHz: 2412 MHz to 2472 MHz and 5180 MHz to 5825 MHz
Modulation technology	<ul style="list-style-type: none"><li>▶ OFDM: BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM</li><li>▶ DSSS/CCK</li></ul>
Radio topology	WLAN Access-Point, Bridge-, Router-, Point-to-Point-, Client-, Client-Bridge-Mode

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

### 11.3.2 Roaming

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

### 11.3.3 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		
Data rate	Typical transmit power	Typical receiving sensitivity
1 Mbit/s	19 dBm	-94 dBm
11 Mbit/s	19 dBm	-94 dBm

Table 7: IEEE 802.11b, Frequency range 2.412 GHz to 2.472 GHz

#### ■ IEEE 802.11g

IEEE 802.11g		
Frequency range 2.412 GHz to 2.472 GHz		
Data rate	Typical transmit power	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 8: IEEE 802.11g, Frequency range 2.412 GHz to 2.472 GHz

#### ■ IEEE 802.11a

IEEE 802.11a		
Bandwidth 5.180 GHz to 5.825 GHz		
Data rate	Typical transmit power	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

Table 9: IEEE 802.11a, Frequency range 5.180 GHz to 5.825 GHz

<b>IEEE 802.11a</b>		
<b>Bandwidth 5.180 GHz to 5.825 GHz</b>		
<b>Data rate</b>	<b>Typical transmit power</b>	<b>Typical receiving sensitivity</b>
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 9: IEEE 802.11a, Frequency range 5.180 GHz to 5.825 GHz

## ■ IEEE 802.11n

<b>IEEE 802.11n</b>		
<b>Frequency range 2.412 GHz to 2.472 GHz</b>		
<b>Coding</b>	<b>Typical transmit power</b>	<b>Typical receiving sensitivity</b>
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

Table 10: IEEE 802.11n, Frequency range 2.412 GHz to 2.472 GHz

<b>IEEE 802.11n</b>		
<b>Frequency range 2.412 GHz to 2.472 GHz</b>		
<b>Coding</b>	<b>Typical transmit power</b>	<b>Typical receiving sensitivity</b>
MCS 22	17 dBm	-73 dBm
MCS 23	16 dBm	-72 dBm

*Table 10: IEEE 802.11n, Frequency range 2.412 GHz to 2.472 GHz*

<b>IEEE 802.11n</b>		
<b>Frequency range 5.180 GHz to 5.825 GHz</b>		
<b>Coding</b>	<b>Typical transmit power</b>	<b>Typical receiving sensitivity</b>
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 11: IEEE 802.11n, Frequency range 5.180 GHz to 5.825 GHz*

### 11.3.4 Receiving sensitivity, transmit power, and data rate of the WLAN module version EWLAN2 for high-gain antennas (Approvals 2, characteristic value H)

The values shown in the following tables are the maximum values of the WLAN module version EWLAN2 for high-gain antennas. 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		
Data rate	Typical transmit power	Typical receiving sensitivity
1 Mbit/s	19 dBm	-94 dBm
11 Mbit/s	19 dBm	-94 dBm

Table 12: IEEE 802.11b, Frequency range 2.412 GHz to 2.472 GHz

#### ■ IEEE 802.11g

IEEE 802.11g		
Frequency range 2.412 GHz to 2.472 GHz		
Data rate	Typical transmit power	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 13: IEEE 802.11g, Frequency range 2.412 GHz to 2.472 GHz

#### ■ IEEE 802.11a

IEEE 802.11a		
Frequency range 5.180 GHz to 5.825 GHz		
Data rate	Typical transmit power	Typical receiving sensitivity
6 Mbit/s	10 dBm	-93 dBm
9 Mbit/s	10 dBm	-93 dBm
12 Mbit/s	10 dBm	-93 dBm
18 Mbit/s	10 dBm	-91 dBm

Table 14: IEEE 802.11a, Frequency range 5.180 GHz to 5.825 GHz

<b>IEEE 802.11a</b>		
<b>Frequency range 5.180 GHz to 5.825 GHz</b>		
<b>Data rate</b>	<b>Typical transmit power</b>	<b>Typical receiving sensitivity</b>
24 Mbit/s	10 dBm	-88 dBm
36 Mbit/s	9 dBm	-84 dBm
48 Mbit/s	7 dBm	-80 dBm
54 Mbit/s	6 dBm	-79 dBm

Table 14: IEEE 802.11a, Frequency range 5.180 GHz to 5.825 GHz

## ■ IEEE 802.11n

<b>IEEE 802.11n</b>		
<b>Frequency range 2.412 GHz to 2.472 GHz</b>		
<b>Coding</b>	<b>Typical transmit power</b>	<b>Typical receiving sensitivity</b>
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

Table 15: IEEE 802.11n, Frequency range 2.412 GHz to 2.472 GHz



<b>IEEE 802.11n</b>		
<b>Frequency range 2.412 GHz to 2.472 GHz</b>		
<b>Coding</b>	<b>Typical transmit power</b>	<b>Typical receiving sensitivity</b>
MCS 22	17 dBm	-73 dBm
MCS 23	16 dBm	-72 dBm

*Table 15: IEEE 802.11n, Frequency range 2.412 GHz to 2.472 GHz*

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

*Table 16: IEEE 802.11n, Frequency range 5.180 GHz to 5.825 GHz*

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

### 11.4.1 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
WCDMA parameters	Supported frequencies	Band 1: TX: 1920 MHz ... 1980 MHz RX: 2110 MHz ... 2170 MHz 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
	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 17: Technical parameters of the LTE module

## 11.4.2 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 18: 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.

## 11.4.3 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	-98.7	-97.8	-101.1	-96.3
LTE Band 3	BW: 10 MHz <sup>b</sup>	-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 19: Conducted RX sensitivity (LTE Bands)

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

## 11.4.4 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 20: Conducted RX sensitivity (UMTS Bands)

a. Per 3GPP specification

## 11.4.5 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
		GMSK (CS1)	-112	-104
		EDGE (MCS5)	-104	-98
DCS 1800	2% BER	CS <sup>c</sup>	-109	-102
		GMSK (CS1)	-112	-104
		EDGE (MCS5)	-104	-98

Table 21: Conducted RX sensitivity (GSM/EDGE Bands)

a. Per 3GPP specification

b. CS = Circuit Switched

c. CS = Circuit Switched

## 11.4.6 Conducted TX power tolerances

Parameter	Conducted TX (Transmit) power tolerances	Notes
<b>LTE</b>		
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	
<b>UMTS</b>		
Band 1 (IMT 2100 12.2 kbit/s) Band 8 (UMTS 900 12.2 kbit/s)	+23 dBm ± 1 dB	Connectorized (Class 3)
<b>GSM / EDGE</b>		

Table 22: Conducted TX power tolerances

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

Table 22: Conducted TX power tolerances

## 11.5 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		20 V/m
	3000 ... 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

## 11.6 Stability

Stability	
Vibration	IEC 60068-2-6 Test FC test level according to IEC 61131-2
	IEC 60068-2-64 test level in accordance with EN 50155
Shock	IEC 60068-2-27 Test Ea test level in accordance with IEC 61131-2, EN 50155

## 11.7 Network range

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

Length of a twisted pair segment                      max. 328 ft (100 m) (for Cat5e cable)

Table 23: Network range: 10/100/1000 Mbit/s twisted pair port

## 11.8 Power consumption/power output

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

## 12 Scope of delivery Non-LTE device variants

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

Number	Article	1 × WLAN module	2 × WLAN module
1 ×	Device	X	X
1 ×	General safety instructions	X	X
1 ×	EU Declaration of Conformity	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	Protection cap (M12, plastic) for supply voltage connection	X	X
3 × premounted	Protection cap (plastic) for N socket	X	
6 × premounted	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 ×	General safety instructions	x	x
1 ×	EU Declaration of Conformity	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	Protection cap (M12, plastic) for supply voltage connection	x	x
3 × premounted	Protection cap (plastic) for N socket	x	
6 × premounted	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



# 13 Scope of delivery LTE device variants

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

Number	Article
1 ×	Device
1 ×	General safety instructions
1 ×	EU Declaration of Conformity
1 ×, 2 × or 3 × premounted	Protection cap (M12, plastic) for Ethernet port 1, Ethernet port 2 or V.24 interface
1 × premounted	Protection cap (M12, plastic) for supply voltage connection
6 × premounted	Protection cap (plastic) for N socket

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

Number	Article
1 ×	Device
1 ×	General safety instructions
1 ×	EU Declaration of Conformity
1 ×, 2 × or 3 × premounted	Protection cap (M12, plastic) for Ethernet port 1, Ethernet port 2 or V.24 interface
1 × premounted	Protection cap (M12, plastic) for supply voltage connection
3 × premounted	Protection cap (plastic) for N socket
6 × premounted	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.

## 14 Accessories Non-LTE device variants

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 pcs.)		942 047-001
50 Ω terminating resistors for closing unused antenna connections (10 pcs.)		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 32</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

**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.

## 15 Accessories LTE device variants

Designation		Order number
BAT-ANT-N-3AGN-F for N socket (10 pcs.)		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 pcs.)		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 32</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

**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.

# 16 Underlying technical standards

Name	
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
EN 60950-1	Information technology equipment – Safety – Part 1: General requirements
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
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

<b>Name</b>	
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 60950-1	Information technology equipment – Safety – Part 1: General requirements

The device has an approval based on a specific standard only 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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