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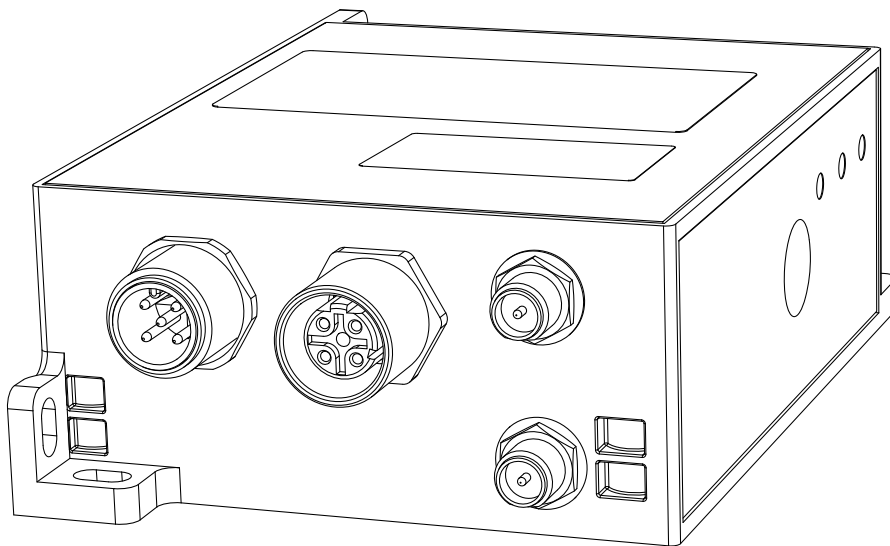
A **BELDEN** BRAND

User Manual

Installation

Industrial Wireless LAN Client

BAT-C2



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You can get the latest version of this manual on the Internet at the Hirschmann product site (www.hirschmann.com).

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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 30.](#)
- Connect to the product only components suitable for the requirements of the specific application case.

■ Installation site requirements

- Use the device only indoors.
- When you are selecting the installation location, make sure you observe the climatic threshold values specified in the technical data.
- Operate the device at the specified ambient temperature (temperature of the ambient air at a distance of 2 in (5 cm) from the device) and at the specified relative humidity exclusively.
- Use the device in an environment with a maximum pollution degree that complies with the specifications in the technical data.

■ **Strain relief**

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

- Relieve the connection points of cables and lines from mechanical stress.
- Design strain relieves in such a way that they prevent any mechanical damage to cables, wires or conductors caused by external influences or their own weight.
- To 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 sharp objects (narrow screwdrivers, wires, etc.) into the contacts for electric conductors and do not touch the contacts.

■ **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.
- When installing antennas, observe the regulations of the country in which you are operating the WLAN device with regard to the general operating permission and the maximum emission levels.
- Install and operate this equipment with a minimum distance of 7.9 in (20 cm) between the antenna and your body.

■ **Grounding the device**

The device is grounded via the power supply connection.

■ **Shielding ground**

The shielding ground of the connectable twisted pair cable is connected to the grounding connector as a conductor.

- Beware of possible short circuits when connecting a cable section with conductive shielding braiding.

■ 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:
Exclusively use 60/75 °C (140/167 °F) or 75 °C (167 °F) copper (Cu) wire.

Table 1: Requirements for connecting electrical wires

■ Requirements for connecting the signal contact

Before connecting the signal contact, **always** verify that the requirements listed are complied with.

All of the following requirements are complied with:

- ▶ The connected voltage complies with the requirements for a safety extra-low voltage (SELV) as per IEC/EN 60950-1 or ES1 as per IEC/EN 62368-1.
- ▶ The connected voltage is limited by a current limitation device or a fuse.
Observe the electrical threshold values for the signal contact.
[See "General technical data" on page 30.](#)

Table 2: Requirements for connecting the signal contact

■ Requirements for connecting the supply voltage

The following requirements apply without restrictions:

All 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 power supply cable is suitable for the voltage, the current and the physical load. Hirschmann recommends a conductor cross section of 0.5 mm² to 0.75 mm² (AWG20 up to AWG18).
- ▶ The cross-section of the ground conductor is the same size as or bigger than the cross-section of the power supply cables.

The following requirements apply alternatively:

Alternative 1	The power supply complies with the requirements for a limited power source (LPS) as per IEC/EN 60950-1 or PS2 as per IEC/EN 62368-1.
Alternative 2	Relevant for North America: The power supply complies with the requirements according to NEC Class 2.
Alternative 3	All of the following requirements are complied with: <ul style="list-style-type: none">▶ The power supply complies with the requirements for a safety extra-low voltage (SELV) as per IEC/EN 60950-1 or ES1 as per IEC/EN 62368-1.▶ A back-up fuse suitable for DC voltage is located in the plus conductor of the power supply. The minus conductor is on ground potential. Otherwise, a back-up fuse is also located in the minus conductor. Regarding the properties of this back-up fuse: See "Technical data" on page 30.

Table 3: Requirements for connecting the supply voltage

The supply voltage is connected to the device casing through protective elements exclusively.

■ **Lightning protection and surge protection**

- ▶ The lightning protection measures 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.

■ **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.

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

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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 the industrial sector.

■ **FCC note (Federal Communication Commission) and IC note (Industry Canada)**

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

BAT-C2

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 and with IC-RSS-247 rules.

Operation is subject to the following 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 A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radiocommunications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by the holder of the certificate could void the user's authority to operate this equipment.

Note for the use in the USA and in Canada

The following section applies to BAT-C2 variants with the characteristic value US (USA/Canada) for country approvals which are labeled as follows:

Contains Transmitter Module

FCC ID: R68PW2050

IC: 3867A-PW2050

This equipment complies with FCC limits and IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. Install and operate this equipment with a minimum distance of 7.9 in (20 cm) 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 5150 MHz to 5250 MHz band to reduce potential for harmful interference to cochannel mobile satellite systems.

The maximum antenna gain permitted for the device in the 5250 MHz to 5350 MHz band and in 5470 MHz to 5725 MHz band shall be such that the equipment still complies with the EIRP limit.

The maximum antenna gain permitted for the device in the 5725 MHz to 5850 MHz band shall be such that the equipment still complies with the EIRP limits specified for point-to-point and non-point-to-point operation as appropriate.

High-power radars are allocated as primary users (i.e. priority users) of the 5250 MHz to 5350 MHz band and of the 5650 MHz to 5850 MHz band. These high-power radars could cause interference and/or damage to the device.

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 ... 5700 MHz
BAT-ANT-RSMA-2AGN-R ^a	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 antenna or an antenna with comparable characteristics. 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 China**

Exclusively applies to device variants with the characteristic value CN (China) for country approvals:

- ▶ Support of 2.4 GHz: 2400 MHz to 2483.5 MHz
- ▶ Support of 5.1 GHz: 5150 MHz to 5350 MHz
- ▶ Support of 5.8 GHz: 5725 MHz to 5850 MHz

■ **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 description

The device allows a cost-effective and energy-saving WLAN installation for applications with limited installation space.

Due to its robust design and compact dimensions, the device is suitable for use in a variety of stationary and mobile WLAN applications in industrial environments. Areas of application are, for example, warehouse logistics or production logistics.

Main device features:

- ▶ WLAN module complying with IEEE 802.11a/b/g/n/ac
- ▶ Support of the following frequency ranges: 2.4 GHz and 5 GHz
- ▶ Encryption functions
- ▶ Smart roaming for uninterrupted connections during transmission from one radio cell to another
- ▶ Proven M12 connection technology for industrial applications
- ▶ Device complies with degree of protection IP65
- ▶ Numerous mounting options
- ▶ Device works without a fan

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

- ▶ Web browser
- ▶ 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 is designed for the special requirements of industrial automation. The device meets the relevant industry standards, provides very high operational reliability, even under extreme conditions, and also long-term reliability and flexibility.

The Hirschmann network components help you ensure continuous communication across all levels of the company.

The device provides you with a large range of functions, which the “User Manual Configuration” informs you about.

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

1.2 Device views

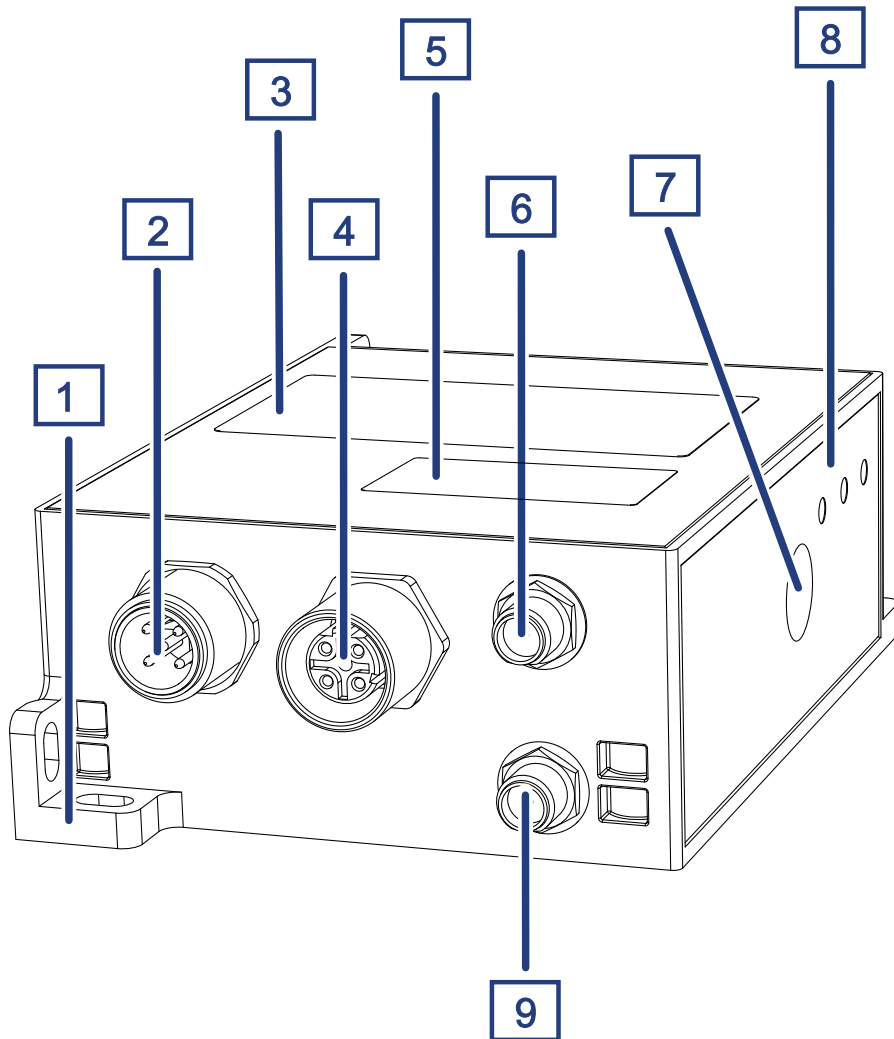


Figure 1: Front, top and side right view of device

1	Mounting flange
2	5-pin, "A"-coded M12 plug for power supply and signal contact
3	Device-specific label
4	4-pin, "D"-coded M12 socket for 10/100 Mbit/s twisted pair connections
5	Label with individual password ("Factory password")
6	Antenna connection "Ant1" (Main)
7	Reset button
8	LED display elements
9	Antenna connection "Ant2" (Diversity)

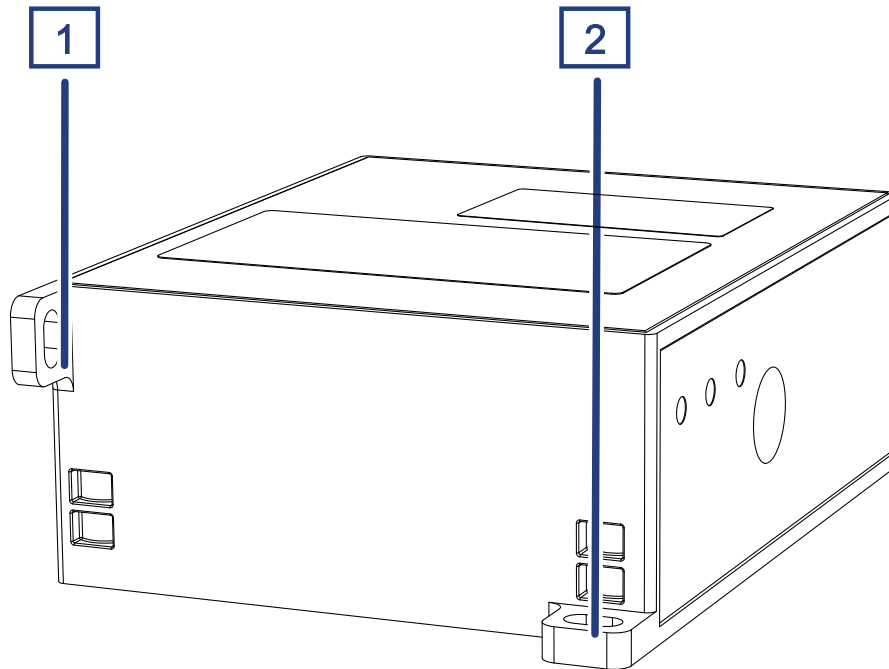


Figure 2: Rear view of device

1	Mounting flange
2	Mounting flange

1.3 Power supply

For the power supply of the device, a 5-pin M12 plug (“A”-coded) is available. Further information:

[See “Connecting the power supply and the signal contact lines” on page 24.](#)

1.4 Ethernet port

This port is a 4-pin, “D”-coded M12 socket.

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

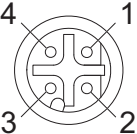
This port supports:

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

Delivery state: Autonegotiation activated

The socket housing is electrically connected with the device housing.

1.4.1 Pin assignments

M12 4-pin ("D"-coded)	Pin	Data
	1	TX+
	2	RX+
	3	TX-
	4	RX-

1.5 Connections for antennas

For the operation of the device you need antennas.

The device has 2 Reverse SMA connectors (1 × Main, 1 × Diversity) for connecting external antennas.

1.6 Display elements

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.

1.6.1 Meaning of the LEDs

- Status
- ETH
- WLAN

Status Color	Activity	Meaning
orange	lights up	Voltage present, device is operational.
orange	flashes 2× long, 2× short (repeat)	No Ethernet link
orange	flashes 2× long, 3× short (repeat)	No IP obtained from Ethernet network
orange	flashes 3× long, 2× short (repeat)	No WLAN link
orange	flashes 3× long, 3× short (repeat)	No WLAN link obtained from Ethernet network

ETH Color	Activity	Meaning
orange	lights up	Ethernet connection active
orange	flashing	Data traffic

WLAN Color	Activity	Meaning
—	off	Device is NOT associated with Access Point
orange	lights up	Device is associated with Access Point on STA interface
orange	short flashing	WPS (Wi-Fi® Protected Setup) triggered
orange	flashes 3× long, 2× short, 2 seconds off (repeat)	WPS (Wi-Fi® Protected Setup) profile error

WLAN Color	Activity	Meaning
orange	flashes 3× long, 4× short, 2 seconds off (repeat)	WPS (Wi-Fi® Protected Setup) timeout error

1.7 Signal contact

The signal contact is a potential-free relay contact. The signal contact is open when the device is not connected to a power supply.

The signal contact allows you to control external devices or monitor device functions.

In the configuration, you specify how the device uses the signal contact.

You will find detailed information on possible applications and the configuration of the signal contact in the software user documentation. You will find the software user documentation as PDF files on the Internet at

<https://www.doc.hirschmann.com>

Further information:

See “General technical data” on page 30.

1.8 Reset button

The device has a reset button.

You will find detailed information regarding the configuration in the “User Manual Configuration”.

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

2 Installation

The devices have been developed for practical application in a harsh industrial environment.

On delivery, the device is ready for operation.

Perform the following steps to install and configure the device:

- ▶ [Checking the package contents](#)
- ▶ [Mounting the device](#)
- ▶ [Installing the antennas](#)
- ▶ [Connecting the power supply and the signal contact lines](#)
- ▶ [Grounding and operating the device](#)
- ▶ [Connecting data cables](#)

2.1 Checking the package contents

- Check whether the package includes all items named in the section [“Scope of delivery” on page 42](#).
- Check the individual parts for transport damage.

2.2 Mounting the device

- Mount the device according to your application case using the mounting flanges:
 - [See “Front, top and side right view of device” on page 18.](#)
 - [See “Rear view of device” on page 19.](#)
 - [See “Dimension drawings” on page 31.](#)

2.3 Installing the antennas

The devices have 2 Reverse SMA connectors for connecting external antennas.

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.

If you mount only 1 antenna, equip the antenna connection “Ant1” (Main). Equip the unused antenna connection “Ant2” (Diversity) with a terminating resistor. You can obtain terminating resistors as accessory. See “Accessories” on page 42.

2.4 Connecting the power supply and the signal contact lines

For the power supply of the device, a 5-pin M12 plug (“A”-coded) is available. You find the prescribed tightening torque in chapter:

See 30 “Technical data”.

The supply voltage is electrically isolated from the casing.

Type and specification of the supply voltage	Pin assignment on the device	
Rated voltage range 12 V DC ... 24 V DC		1 +24 V DC
Voltage range incl. maximum tolerances 9.6 V DC ... 32 V DC		2 Signal contact
		3 0 V DC
		4 Functional ground
		5 Signal contact

Table 4: 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 and the signal contact according to the pin assignment with a suitable socket.

2.5 Grounding and operating the device

The device is grounded via the power supply connection.

By connecting the supply voltage via a connector, you start the operation of the device.

2.5.1 Connecting the power supply via a 5-pin M12 plug (“A”-coded)

You find the prescribed tightening torque of the locking screw in chapter:

See “General technical data” on page 30.

- Insert the socket into the 5-pin M12 plug on the device.
- Enable the supply voltage.

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 port” on page 19.](#)

3 Making basic settings

- Connect the device to the network using the Ethernet port.
- Start your Web browser.
- Write the IP address of the device in the address field of the Web browser:
`https://192.168.1.1`
The Web browser sets up the connection to the device and displays the Login page.
- Type in the user name “admin”.
- Type in the unique password that is located on a label on the device.
[See figure 1 on page 18.](#)
- Click the “Login” button.
The Web browser displays the graphical user interface.
- Use the quick setup to do the first settings. Alternatively, skip the quick setup to do the first settings manually.

You will find detailed information regarding the configuration in the “User Manual Configuration”.

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

4 Monitoring the ambient air temperature

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

See [“General technical data” on page 30](#).

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 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.

5 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.
- ▶ Relays are subject to natural wear. This wear depends on the frequency of the switching operations. Check the resistance of the closed relay contacts and the switching function depending on the frequency of the switching operations.
- ▶ 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>.

6 Disassembly

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

7 Technical data

7.1 General technical data

Dimensions W × H × D	BAT-C2	See “Dimension drawings” on page 31.
Weight		4.41 oz (125 g)
Supply voltage	Rated voltage range	12 V DC ... 24 V DC
	Voltage range incl. maximum tolerances	9.6 V DC ... 32 V DC
	Connection type	M12 connector, 5-pin, (M12 socket, “A”-coded)
	Power loss buffer	10 ms at 24 V DC
	Back-up fuse	Nominal rating: 1 A Characteristic: slow blow
	Peak inrush current (slow voltage increase)	340 mA
	Current integral I ² t	12 V DC: 0.075 A ² s 24 V DC: 0.276 A ² s
Signal contact	Switching current	max. 1 A
	Switching voltage	Same potential as power supply max. 60 V DC max. 25 V AC
		Potential free max. 30 V DC max. 25 V AC
	Connection type	M12 connector, 5-pin, (M12 socket, “A”-coded) Tightening torque 5.3 lb-in (0.6 Nm)
Climatic conditions during operation	Ambient air temperature ^a	-40 °F ... +131 °F (-40 °C ... +55 °C)
	Maximum inner temperature of device (guideline)	+194 °F (+90 °C)
	Humidity	1 % ... 95 % (non-condensing)
	Air pressure	min. 795 hPa (+6562 ft; +2000 m) max. 1060 hPa (-1312 ft; -400 m)
Climatic conditions during storage	Ambient temperature	-40 °F ... +185 °F (-40 °C ... +85 °C)
	Humidity	1 % ... 95 % (non-condensing)
	Air pressure	min. 795 hPa (+6562 ft; +2000 m) max. 1060 hPa (-1312 ft; -400 m)
Pollution degree		2
Protection classes	Degree of protection	IP65

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

7.2 Dimension drawings

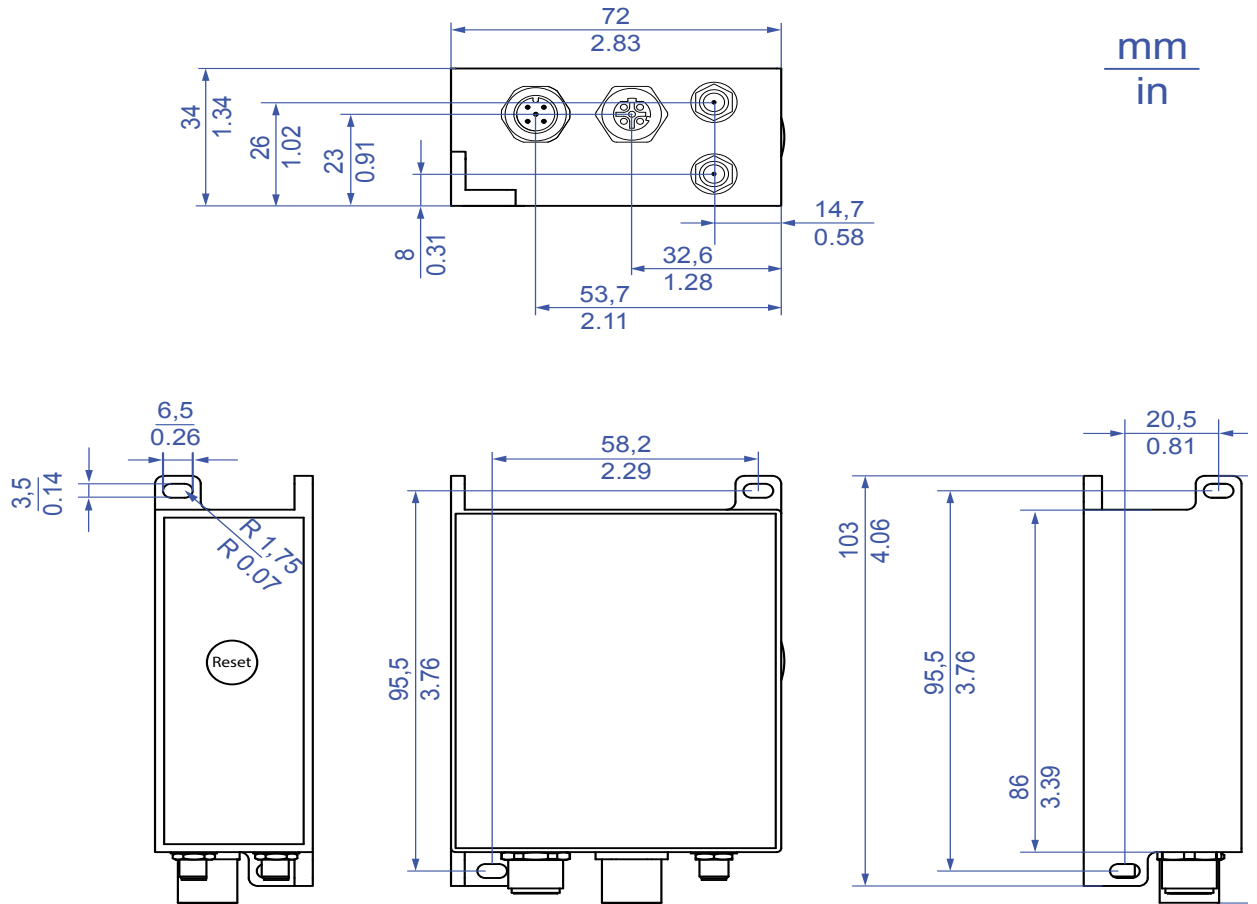


Figure 3: Dimension drawings

7.3 Radio technology

Antenna connection	2 × Reverse SMA connector
Range	Depending on the antenna used, frequency range and data rate
Security	<ul style="list-style-type: none">▶ WEP▶ WPA▶ WPA2▶ 802.1x▶ Protected Management Frames▶ Encryption: AES, TKIP, CKIP
Quality-of-Service	<ul style="list-style-type: none">▶ WMM▶ WMM-PS (UAPSD)▶ WMM-SA
Frequency range	▶ Support of 2.4 GHz and 5 GHz: 2412 MHz to 2484 MHz and 4900 MHz to 5845 MHz
Modulation technology	<ul style="list-style-type: none">▶ OFDM: BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM▶ DSSS/CCK, DSSS/DBPSK, DSSS/DQPSK
Radio topology	WLAN-Access-Point, WLAN-Client, Router-Mode, Host-Bridge, Network-Bridge, Gateway (NAT)

7.4 Receiving sensitivity, transmit power and data rate

The values of the WLAN module shown in the following tables are subject to a tolerance of ± 2 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 transmit power automatically. The reason for this are national standards.

7.4.1 IEEE 802.11b

IEEE 802.11b		
Frequency range 2.412 GHz to 2.472 GHz		
Bandwidth 20 MHz		
Data rate	Transmit power	Receiving sensitivity
1 Mbit/s	16 dBm	-96 dBm
11 Mbit/s	16 dBm	-89 dBm

Table 5: IEEE 802.11b, frequency range 2.412 GHz to 2.472 GHz, bandwidth 20 MHz

7.4.2 IEEE 802.11g

IEEE 802.11g		
Frequency range 2.412 GHz to 2.472 GHz		
Bandwidth 20 MHz		
Data rate	Transmit power	Receiving sensitivity
6 Mbit/s	14 dBm	-93 dBm
54 Mbit/s	14 dBm	-76 dBm

Table 6: IEEE 802.11g, frequency range 2.412 GHz to 2.472 GHz, bandwidth 20 MHz

7.4.3 IEEE 802.11a

IEEE 802.11a		
Frequency range 5.180 GHz to 5.825 GHz		
Bandwidth 20 MHz		
Data rate	Transmit power	Receiving sensitivity
6 Mbit/s	14 dBm	-92 dBm
54 Mbit/s	14 dBm	-76 dBm

Table 7: IEEE 802.11a, frequency range 5.180 GHz to 5.825 GHz, bandwidth 20 MHz

7.4.4 IEEE 802.11n

IEEE 802.11n		
Frequency range 2.412 GHz to 2.472 GHz		
Bandwidth 20 MHz		
Coding	Transmit power	Receiving sensitivity
MCS 0	13 dBm	-93 dBm
MCS 7	13 dBm	-74 dBm

Table 8: *IEEE 802.11n, frequency range 2.412 GHz to 2.472 GHz, bandwidth 20 MHz*

IEEE 802.11n		
Frequency range 2.412 GHz to 2.472 GHz		
Bandwidth 40 MHz		
Coding	Transmit power	Receiving sensitivity
MCS 0	13 dBm	-93 dBm
MCS 7	13 dBm	-74 dBm

Table 9: *IEEE 802.11n, frequency range 2.412 GHz to 2.472 GHz, bandwidth 40 MHz*

IEEE 802.11n		
Frequency range 5.180 GHz to 5.825 GHz		
Bandwidth 20 MHz		
Coding	Transmit power	Receiving sensitivity
MCS 0	13 dBm	-92 dBm
MCS 7	13 dBm	-74 dBm

Table 10: *IEEE 802.11n, frequency range 5.180 GHz to 5.825 GHz, bandwidth 20 MHz*

IEEE 802.11n		
Frequency range 5.180 GHz to 5.825 GHz		
Bandwidth 40 MHz		
Coding	Transmit power	Receiving sensitivity
MCS 0	13 dBm	-92 dBm
MCS 7	13 dBm	-74 dBm

Table 11: *IEEE 802.11n, frequency range 5.180 GHz to 5.825 GHz, bandwidth 40 MHz*

7.4.5 IEEE 802.11ac

IEEE 802.11ac Frequency range 5.180 GHz to 5.825 GHz Bandwidth 20 MHz		
Coding	Transmit power	Receiving sensitivity
MCS 8	13 dBm	-70 dBm

Table 12: IEEE 802.11ac, frequency range 5.180 GHz to 5.825 GHz, bandwidth 20 MHz

IEEE 802.11ac Frequency range 5.180 GHz to 5.825 GHz Bandwidth 40 MHz		
Coding	Transmit power	Receiving sensitivity
MCS 9	11 dBm	-62 dBm

Table 13: IEEE 802.11ac, frequency range 5.180 GHz to 5.825 GHz, bandwidth 40 MHz

IEEE 802.11ac Frequency range 5.180 GHz to 5.825 GHz Bandwidth 80 MHz		
Coding	Transmit power	Receiving sensitivity
MCS 9	11 dBm	-62 dBm

Table 14: IEEE 802.11ac, frequency range 5.180 GHz to 5.825 GHz, bandwidth 80 MHz

7.5 EMC and immunity

EMC interference immunity		
EN 61000-4-2	Electrostatic discharge	
	Contact discharge	4 kV
	Air discharge	8 kV
EN 61000-4-3	Electromagnetic field	
	80 MHz ... 1000 MHz	20 V/m
	1000 MHz ... 3000 MHz	10 V/m
	3000 MHz ... 6000 MHz	10 V/m
EN 61000-4-4	Fast transients (burst)	
	DC power line	2 kV
	Data line	1 kV

EMC interference immunity		
EN 61000-4-5	Voltage surges	
	DC power line	1 kV line/ground; 0.5 kV line/line
	Data line, shielded	1 kV
	Data line, unshielded	1 kV
EN 61000-4-6	Conducted disturbances	
	150 kHz ... 80 MHz	10 V

EMC interference emission	
EN 55032	Class B

Immunity		
IEC 60068-2-6, test Fc	Vibration	5 Hz ... 8.4 Hz with 0.14 in (3.5 mm) amplitude
		8.4 Hz ... 150 Hz with 1 g
IEC 60068-2-27, test Ea	Shock	15 g at 11 ms

7.6 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 15: Network range: 10/100/1000 Mbit/s twisted pair port

7.7 Power consumption/power output

Power consumption	Power output
3.8 W	13 Btu (IT)/h

Table 16: Power consumption/power output

7.8 Exemplary power consumption values depending on modulation type and data throughput

The following tables show exemplary power consumption values depending on data rate and data throughput. Data throughput and power consumption vary depending on your environmental conditions.

- ▶ TCP power consumption values
In order to determine the TCP power consumption values, an unidirectional data transfer with static data rate and modulation was set up from the client (BAT-C2) to the access point using Iperf.
- ▶ UDP power consumption values
In order to determine the UDP power consumption values, an unidirectional data transfer with static data rate and modulation and with fixed data throughput was set up from the client (BAT-C2) to the access point using Iperf.

7.8.1 IEEE 802.11b

IEEE 802.11b Frequency range 2.412 GHz to 2.472 GHz Bandwidth 20 MHz				
Data rate	Power consumption TCP	Data throughput TCP	Power consumption UDP	Data throughput UDP
5.5 Mbit/s	2.8 W	3.2 Mbit/s	2.8 W	4.2 Mbit/s
			2.5 W	2.1 Mbit/s
11 Mbit/s	3 W	5 Mbit/s	3.1 W	6 Mbit/s
			2.6 W	3 Mbit/s

Table 17: IEEE 802.11b, frequency range 2.412 GHz to 2.472 GHz, bandwidth 20 MHz

7.8.2 IEEE 802.11g

IEEE 802.11b				
Frequency range 2.412 GHz to 2.472 GHz				
Bandwidth 20 MHz				
Data rate	Power consumption TCP	Data throughput TCP	Power consumption UDP	Data throughput UDP
6 Mbit/s	3.1 W	4.5 Mbit/s	3.2 W	5 Mbit/s
			2.6 W	2.5 Mbit/s
24 Mbit/s	2.7 W	12 Mbit/s	2.9 W	19 Mbit/s
			2.5 W	9.5 Mbit/s
54 Mbit/s	2.5 W	19 Mbit/s	2.8 W	35 Mbit/s
			2.4 W	17.5 Mbit/s

Table 18: IEEE 802.11g, frequency range 2.412 GHz to 2.472 GHz, bandwidth 20 MHz

7.8.3 IEEE 802.11a

IEEE 802.11a				
Frequency range 5.180 GHz to 5.825 GHz				
Bandwidth 20 MHz				
Data rate	Power consumption TCP	Data throughput TCP	Power consumption UDP	Data throughput UDP
6 Mbit/s	3.5 W	4 Mbit/s	3.6 W	5 Mbit/s
			2.8 W	2.5 Mbit/s
24 Mbit/s	2.9 W	12.5 Mbit/s	3.2 W	19 Mbit/s
			2.7 W	9.5 Mbit/s
54 Mbit/s	2.7 W	19 Mbit/s	3.1 W	35 Mbit/s
			2.6 W	17.5 Mbit/s

Table 19: IEEE 802.11a, frequency range 5.180 GHz to 5.825 GHz, bandwidth 20 MHz

7.8.4 IEEE 802.11n

IEEE 802.11n Frequency range 2.412 GHz to 2.472 GHz Bandwidth 20 MHz				
Data rate	Power consumption TCP	Data throughput TCP	Power consumption UDP	Data throughput UDP
MCS 0	2.8 W	5 Mbit/s	3 W	6 Mbit/s
			2.5 W	3 Mbit/s
MCS 4	2.6 W	19 Mbit/s	3 W	39 Mbit/s
			2.6 W	19.5 Mbit/s
MCS 7	2.5 W	23 Mbit/s	2.9 W	50 Mbit/s
			2.6 W	25 Mbit/s

Table 20: IEEE 802.11n, frequency range 2.412 GHz to 2.472 GHz, bandwidth 20 MHz

IEEE 802.11n Frequency range 5.180 GHz to 5.825 GHz Bandwidth 20 MHz				
Data rate	Power consumption TCP	Data throughput TCP	Power consumption UDP	Data throughput UDP
MCS 0	3.1 W	5 Mbit/s	3.2 W	6.5 Mbit/s
			2.7 W	3.2 Mbit/s
MCS 4	2.8 W	19 Mbit/s	3.3 W	38 Mbit/s
			2.8 W	19 Mbit/s
MCS 7	2.6 W	23 Mbit/s	3.1 W	46 Mbit/s
			2.6 W	23 Mbit/s

Table 21: IEEE 802.11n, frequency range 5.180 GHz to 5.825 GHz, bandwidth 20 MHz

IEEE 802.11n Frequency range 5.180 GHz to 5.825 GHz Bandwidth 40 MHz				
Data rate	Power consumption TCP	Data throughput TCP	Power consumption UDP	Data throughput UDP
MCS 4	2.7 W	24 Mbit/s	3 W	46 Mbit/s
			2.6 W	23 Mbit/s

Table 22: IEEE 802.11n, frequency range 5.180 GHz to 5.825 GHz, bandwidth 40 MHz

IEEE 802.11n				
Frequency range 5.180 GHz to 5.825 GHz				
Bandwidth 40 MHz				
Data rate	Power consumption TCP	Data throughput TCP	Power consumption UDP	Data throughput UDP
MCS 7	2.6 W	26 Mbit/s	2.7 W	47 Mbit/s
			2.5 W	23.5 Mbit/s

Table 22: IEEE 802.11n, frequency range 5.180 GHz to 5.825 GHz, bandwidth 40 MHz

7.8.5 IEEE 802.11ac

IEEE 802.11ac				
Frequency range 5.180 GHz to 5.825 GHz				
Bandwidth 20 MHz				
Data rate	Power consumption TCP	Data throughput TCP	Power consumption UDP	Data throughput UDP
MCS 7	2.7 W	23 Mbit/s	3 W	45 Mbit/s
			2.6 W	22.5 Mbit/s
MCS 9	2.6 W	24 Mbit/s	2.9 W	46 Mbit/s
			2.6 W	23 Mbit/s

Table 23: IEEE 802.11ac, frequency range 5.180 GHz to 5.825 GHz, bandwidth 20 MHz

IEEE 802.11ac				
Frequency range 5.180 GHz to 5.825 GHz				
Bandwidth 40 MHz				
Data rate	Power consumption TCP	Data throughput TCP	Power consumption UDP	Data throughput UDP
MCS 9	2.5 W	26 Mbit/s	2.6 W	47 Mbit/s
			2.4 W	23.5 Mbit/s

Table 24: IEEE 802.11ac, frequency range 5.180 GHz to 5.825 GHz, bandwidth 40 MHz

IEEE 802.11ac				
Frequency range 5.180 GHz to 5.825 GHz				
Bandwidth 80 MHz				
Data rate	Power consumption TCP	Data throughput TCP	Power consumption UDP	Data throughput UDP
MCS 7	2.6 W	27 Mbit/s	2.7 W	50 Mbit/s
			2.6 W	25 Mbit/s
MCS 9	2.6 W	27 Mbit/s	2.6 W	50 Mbit/s
			2.5 W	25 Mbit/s

Table 25: IEEE 802.11ac, frequency range 5.180 GHz to 5.825 GHz, bandwidth 80 MHz

8 Scope of delivery, order numbers and accessories

■ Scope of delivery

Amount	Article
1 ×	Device
1 ×	Safety and general information sheet
1 ×	EU Declaration of Conformity
1 ×	Open Source Information
1 ×	M12 power supply plug ELKA 5012 PG7

■ Accessories

Note that products recommended as accessories may have different characteristics to those of the device, which may limit the application range of the overall system. For example, if you add an accessory with IP20 to a device with IP65, the degree of protection of the overall system is reduced to IP20.

For reliable receive power and transmission power, you require antennas that pertain to your application case.

Other accessories	Order number
M12 power supply plug ELKA 5012 PG7	933 170-100
BAT-ANT-RSMA-2AGN-R (10 pieces)	942 046-001
50 Ω terminating resistors for sealing unused antenna connections, N (10 pieces)	942 117-001

9 Underlying technical standards

Name	
EN 55032	Electromagnetic compatibility of multimedia equipment – Emission Requirements
EN 60529	Degrees of protection provided by housing – IP-Code
IEC/EN 62368-1	Equipment for audio/video, information and communication technology - Part 1: safety requirements
EN 61000-6-1	Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity for residential, commercial and light-industrial environments
EN 61131-2	Programmable controllers – Part 2: Equipment requirements and tests
EN 300 328	Electromagnetic compatibility and radio spectrum matters (ERM) - bandwidth transfer systems - data transmission equipment operating in 2.4 GHz ISM band and using spread spectrum modulation technology
EN 301 893	Broadband radio access networks (BRAN) – 5 GHz high performance Remote Local Area Network (RLAN)
EN 301 489-1	Electromagnetic compatibility for radio equipment and services
EN 301 489-17	Electromagnetic compatibility (EMC) for radio equipment and services - specific conditions for 2.4 GHz broadband transmission systems and 5 GHz high-performance RLAN equipment
FCC 47 CFR Part 15	Code of Federal Regulations
IEEE 802.11a/b/g/n/ac	WLAN
IEEE 802.3	Ethernet
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.

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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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