EN CE

akytec



CI201-LW

Gas Meter Pulse Reader

User guide

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1 Introduction

This user guide is intended to familiarize the operating personnel with the principle of operation, design, operation and maintenance of the CI201-LW gas meter pulse reader, hereinafter referred to as "device" or "CI201-LW".
Connection, setup and maintenance of the device must be performed only by fully qualified personnel after reading this user guide.

1.1 LoRaWAN device codification

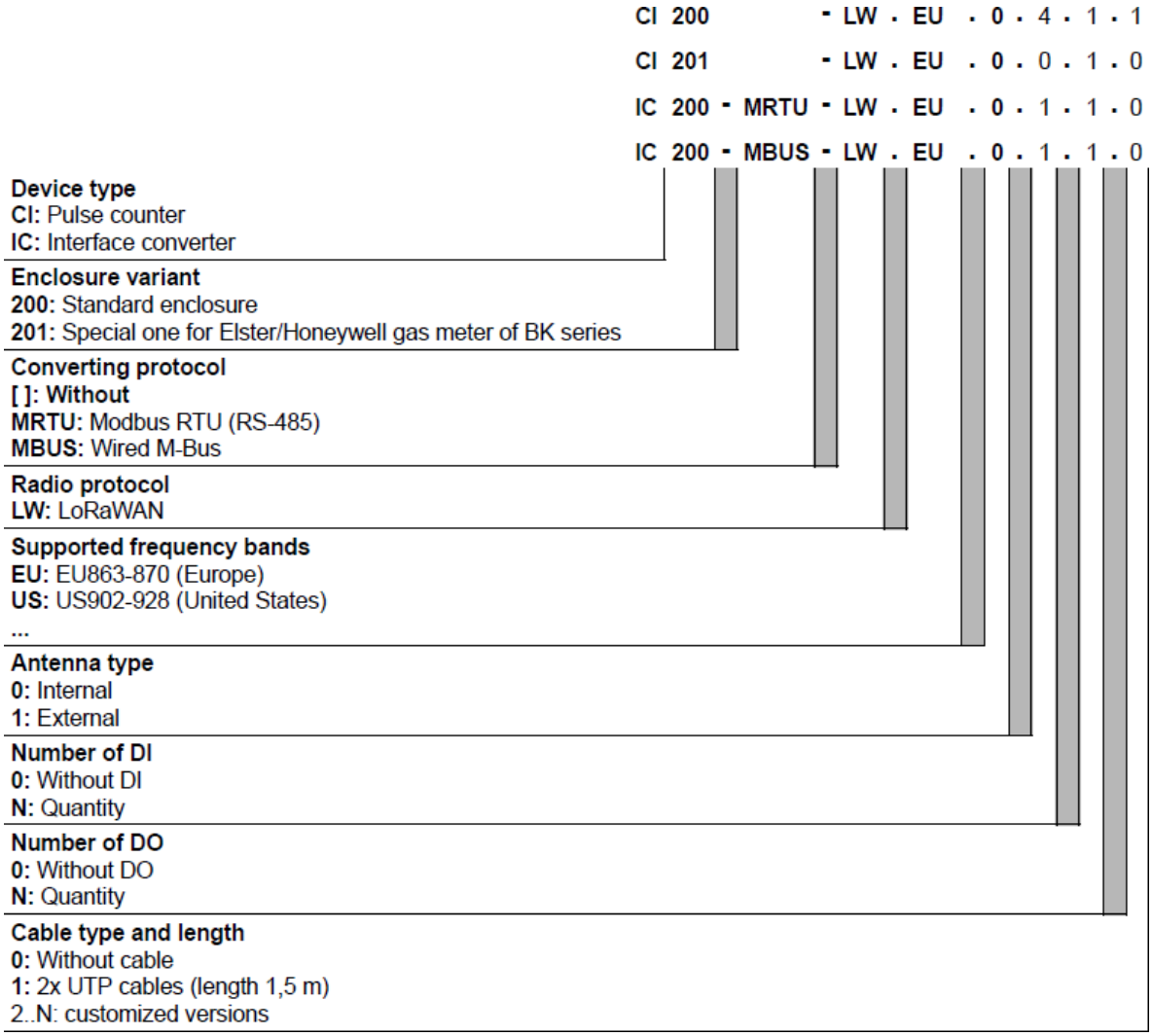


Fig. 1.1 LoRaWAN device codification

1.2 Terms and abbreviations

- **ABP (Activation by Personalization)** – LoRaWAN device activation method
- **ADR** – Adaptive Data Rate
- **AppEUI (Application Extended Unique Identifier)** – Unique application ID
- **AppKey (Application key)** – Server key
- **AppSKey (Application Session Key)** – Unique encryption key
- **Bluetooth** – Short-range wireless communication technology
- **DevAddr (Device address)** – Device address in the LoRaWAN network
- **DevEUI (Device Extended Unique Identifier)** – Unique device ID
- **Downlink message** – Message sent by the Network Server to only one end device
- **FIFO (First In, First Out)** – Data processing method

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- **LoRaWAN (Long Range Wide Area Network)** – Wireless data transmission technology
- **NFC (Near Field Communication)** – Short-range wireless communication technology
- **NwkSKey** – Unique encryption key
- **OTAA (Over-the-Air-Activation)** – LoRaWAN device activation method
- **Hibernation** – Energy-saving device mode
- **Android OS** – Operating system for smartphones and other devices
- **iOS (iPhone OS)** – Operating system for smartphones and other devices
- **Class A LoRaWAN device** – Class A devices support bi-directional communication between the end device and the network. Communication is only initiated by the end device, then a response from the network is awaited within two windows at specified times.
- **DO** – Digital Output
- **MTBF** – Mean Time Between Failures
- **MCU** – Microcontroller Unit

1.3 Symbols and key words

DANGER
WARNING indicates a potentially dangerous situation that could result in death or serious injuries.

CAUTION
CAUTION indicates a potentially dangerous situation that could result in minor injuries.

NOTICE
NOTICE indicates a potentially dangerous situation that could result in damage to property.

NOTE
NOTE indicates helpful tips and recommendations, as well as information for efficient and trouble-free operation.

1.4 Recycling and disposal



The device is considered an electronics device for disposal in terms of European Directive 2012/19/EU and may not be disposed of as domestic garbage.

- Dispose of the device through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

1.5 Intended use

The device has been designed and built solely for the intended use described here, and may only be used accordingly. The technical specifications contained in this document must be observed.
The device may be operated only in a properly installed condition.

Improper use

Any other use is considered improper. Especially to note:

- The device may not be used for medical applications.
- The device may not be used in an explosive environment.
- The device may not be used in an atmosphere in which there are chemically active substances.

1.6 Limitation of liability

Our company does not bear any responsibility with respect to breakdowns or damages caused by using the product in a manner other than described in the manual or in violation of the current regulations and technical standards.

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1.7 Safety



DANGER
Ensure the mains voltage matches the voltage marked on the nameplate.



DANGER
The device terminals may be under a dangerous voltage. De-energize the device before working on it. Switch on the power supply only after completing all work on the device.



NOTICE
Supply voltage must not exceed the specified voltage. Higher voltage can damage the device.



NOTICE
If the device is brought from a cold to a warm environment, condensation may form inside the device. To avoid damage to the device, keep the device in the warm environment for at least 1 hour before powering on.

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2 Overview

CI201-LW is a battery-powered gas meter pulse reader. It is installed in the standard mounting seat for Honeywell Elster Metronica gas meters of BK series, reads the meter, stores the readings, and transmits the results via the LoRaWAN network. CI201-LW detects changing digits on a gas counter via an internal Hall-effect sensor. It's a non-electrically-connected sensing method which doesn't require any wiring.

Basic features

- Data transmission: LoRaWAN 1.0.4 Class A
- Data collection: Wireless reading
- Digital output: one NPN open-collector transistor
- Power: 2 x CR123A
- Enclosure: ABS+PC
- Mounting: Standard mounting seat for Honeywell Elster Metronica gas meters
- Data exchange protocol: akYtec Protocol
- Configuring the device: Via Bluetooth using the application and remote via the LoRaWAN Server by sending downlink messages to the device
- Firmware update: Via Bluetooth using the application

Dimensions

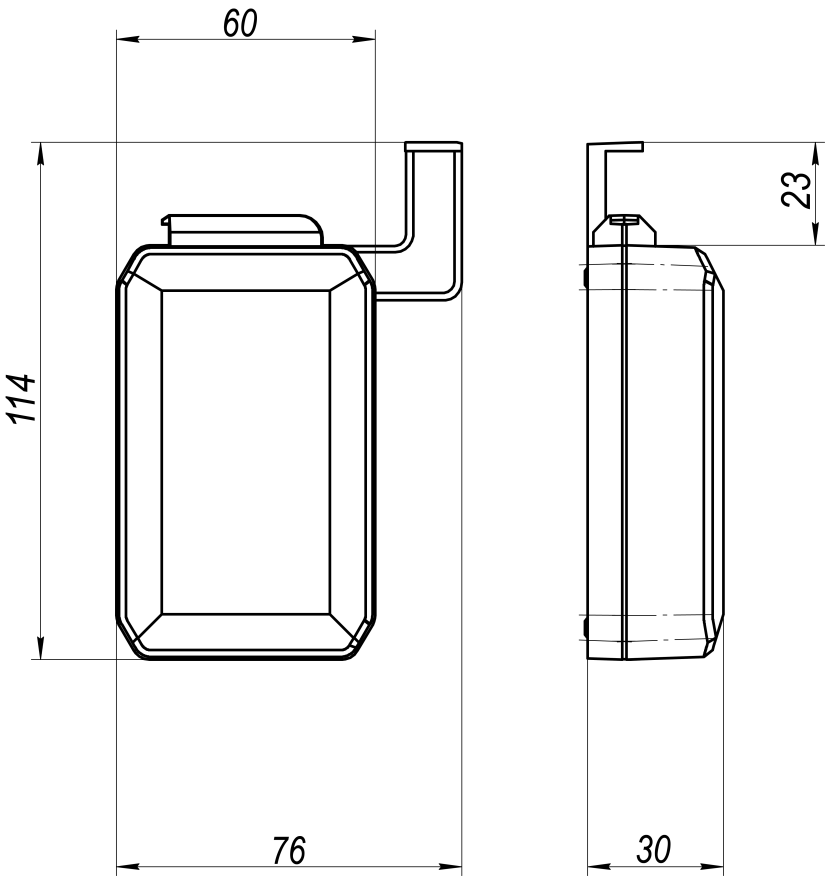


Fig. 2.1 Dimensions

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3 Specifications and environmental conditions

3.1 Specifications

Parameter	Value
Data transmission interface	
Data transmission	LoRaWAN 1.0.4, Class A
LoRaWAN channels	8
Frequency bands	EU868 - default, US915 and others - by request
ADR support	Yes
Transmitter power, max.	+20 dBm, 100 mW
Receiver sensitivity	-137 dBm
Data transmission period	1, 5, 10 or 30 min 1, 4, 6, 12 or 24 hours
Non-volatile memory capacity for storing packets	20 000 packets
Activation method	ABP/OTAA
Antenna type	Internal
Encryption algorithm	Hardware AES-128
Configuration interface	
Device initialization	NFC-A
Device setup	Bluetooth LE 5.1
Configuration software	
Mobile and desktop (Windows) application	akYtec IoT Configurator
Digital output	
Number	1
Type	Open collector
Maximum load current	1 A
Switching voltage	Up to 24 V
Memory	
Type	Flash
Built-in memory size	8 MB
Power supply	
Battery voltage	3 V
Battery type	2 × CR123A
Total capacity	3100 mAh
Battery life	Up to 5 years (depending on settings)
Mechanical	

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Parameter	Value
Color	RAL 7035 (light gray)
Enclosure	ABS+PC plastic
IP code	IP65
Dimensions	114 x 76 x 30 mm
Net/Gross weight (without battery)	99 / 139 g
Net/Gross weight (with batteries)	131 / 171 g
MTBF	50 000 hours

3.2 Environmental conditions

The device is designed for natural convection cooling which should be taken into account when choosing the installation site.
The following environmental conditions must be observed:

– non-hazardous areas, free of corrosive or flammable gases

Table 3.1 Environmental conditions

Condition	Permissible range
Ambient temperature, operation and transportation	-40…+65°C
Ambient temperature, storage	+5…+40°C
Relative humidity, operation	10…95 % (non-condensing)
Relative humidity, storage	up to 85%
Altitude	up to 2000 m ASL
Regulations and certifications	conforms to directives 2014/53/EU and 2011/65/EU with amended by 2015/863/EU

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4 Operation

The device is delivered in an inactive mode (hibernation). The hibernation mode is intended for storage and transportation.

To start up the device:

– Switch on the NFC interface on your smartphone.
– Hold your smartphone close to the NFC mark on the front panel of the device to activate it.
– After device activation, configure it via Bluetooth using an application.

The device is equipped with a sensor that monitors attempts to alter the meter readings using external magnets.
The device has one digital output to control external actuators such as:

– Electromechanical water/gas shut-off valve, etc.
– Signaling device
– Auxiliary relay to control any devices

NOTICE
The digital output uses an NPN open-collector transistor. Maximum load current is 1 A. Switching voltage is up to 24 V.

The device is equipped with a tamper sensor that detects when the enclosure is opened. You can find information about its status in the **Personalization** tab of the application. If the enclosure opening status changes, unscheduled packet transmission may occur (depending on the settings).
The queue can store up to 20 000 untransmitted data packets and operates on a FIFO basis. The oldest data is transmitted first. If the device leaves the network coverage area, all measured data will be stored and transmitted when the device returns to the network.
The counter increases the value up to 4 294 967 295 and then starts again from 0.

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5 Configuration

The device provides two ways to change device configuration parameters:

– Local: Via an application
– Remote: By sending a downlink message to the device from the server using the akYtec Protocol

Mobile and desktop (Windows) application

– Go to the device page on the akYtec website via the QR code and download the application in a convenient way. The full version of the user guide is also available on the website.
– Download the **akYtec IoT Configurator** mobile application to your smartphone or desktop application to your PC.
– Install and connect the device.

Connection to the device

1. Start **akYtec IoT Configurator**.

NOTE
Before launching the application, please ensure that Bluetooth is enabled. The application is currently only available for Android and Windows.

NOTE
For Android smartphones, you also need to enable geolocation, otherwise the mobile application cannot connect to the device. This is a requirement of the Android operating system.

2. Select your device. Please note that it may take 10-15 seconds before your device appears in the list.
3. Enter a password.

NOTE
The default password (factory settings) for the device is **1111**.
Change the default password before device usage.

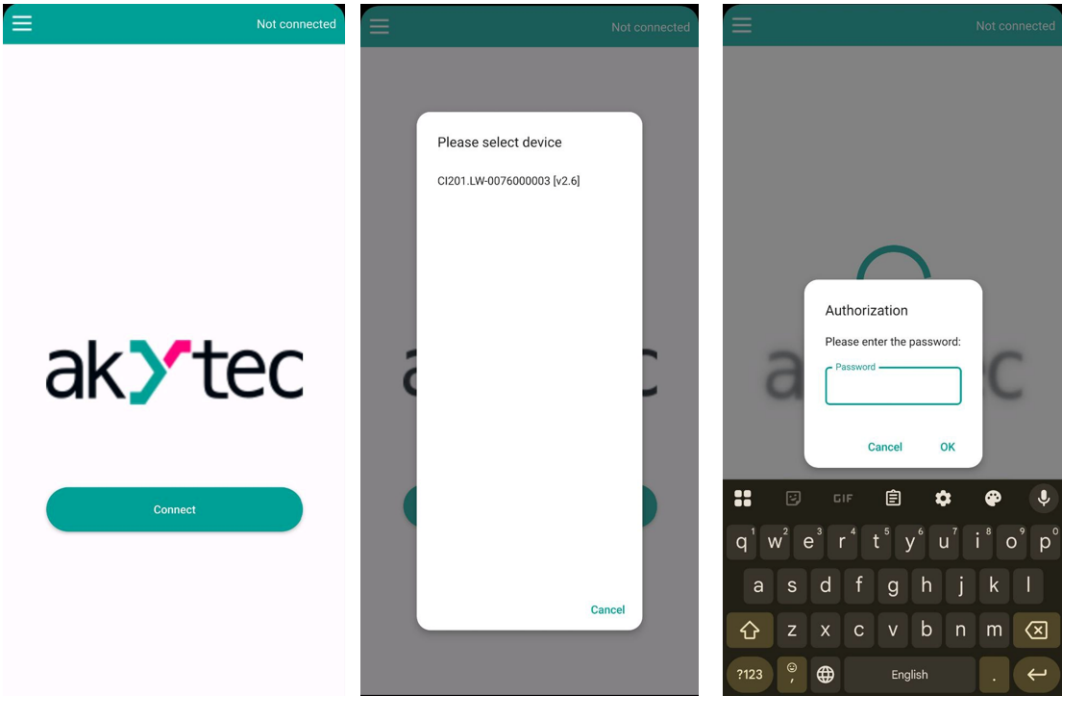


*Fig. 5.1 Device connection using **akYtec IoT Configurator***

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Application features

You can control the device using:
– **Settings**: Device configuration
– **State**: Check the current status of the device
– **Commands**: Send commands to the device
– **Personalization**: Personalization data and tamper status
– **Debug**: Check logs and update firmware

Settings

Open the **Settings** tab to change the device settings.
After editing the settings, click the **Save** button.



Commands

Open the **Commands** tab to perform the following actions.

Table 5.1 Commands

Command	Description
Reboot	Restart the device.
Restore default settings	Reset the factory settings.
Erase flash	Erase flash memory.
Rejoin	Start the network registration.
Run measurement	Start the interface polling procedure.
Send packet	Force the data transmission.
Run QA test	Start automatic device testing (for service staff only).
Turn on DO and switch DO to auto mode after N min.	Enable/Disable the digital output and switch the port to the automatic mode* after N minutes. This command enables/disables the digital output regardless of time (minutes) specified in settings. After the time has elapsed, the digital output returns to the state according to the settings.
Turn off DO and switch DO to auto mode after N min.	
Find device	Enable intense indication.
Reset counters	Reset the stored values of pulse inputs.
Device tamper flag	Reset tamper alarm.

NOTE
*Automatic control mode of the Digital Output:
– State when Alarm mode ON: In case of alarm, the Digital Output (DO) switches to the closed state.
– State when Alarm mode OFF: In case of alarm, the Digital Output (DO) switches to the open state.

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Personalization

General:

– Serial number: Device serial number
– Root password: Password to access the device via the **akYtec IoT Configurator** application with administrator rights (default password: 1111)
– User password: Password to access the device via the **akYtec IoT Configurator** application with user rights (default password: 2222)

OTAA keys:

– DevEUI: Unique device identifier in the LoRaWAN network
– AppEUI: Unique application ID to identify the application provider
– AppKey: Application key used to get NwkSKey and AppSKey session keys

ABP keys:

– DevAddr: Unique device ID in the LoRaWAN network
– AppSKey: Unique encryption key
– NwkSKey: Unique encryption key

Other:

– LoRa session counter: LoRaWAN network session counter
– Successfully sent packets counter: Counter of successfully sent packets
– Time to switch Digital Output (DO) to automode: Time until the digital output (DO) switches to the automatic mode
– Registration of external influence: Status of external magnet influence registration
– Device was opened: Tamper alarm (to reset it, open the ***Commands*** tab)

Debug

Open the **Debug** tab to view the progress of device operation algorithms.
The **Debug** tab allows you to:

– Copy the history of algorithm execution
– Delete the history
– Update the firmware

Firmware update

To update the firmware:

– Download the firmware file to your device and place it in the root directory of your Android smartphone.
– Start the **akYtec IoT Configurator** application

NOTE

Go to the device page on the akYtec website via the QR code and download the application in a convenient way. The full version of the user guide is also available on the website.

– When you start the application, the application window appears. Click the **Connect** button and select the desired device by tapping its name.
– After selecting the device, enter the password to access the device (default password: 1111).

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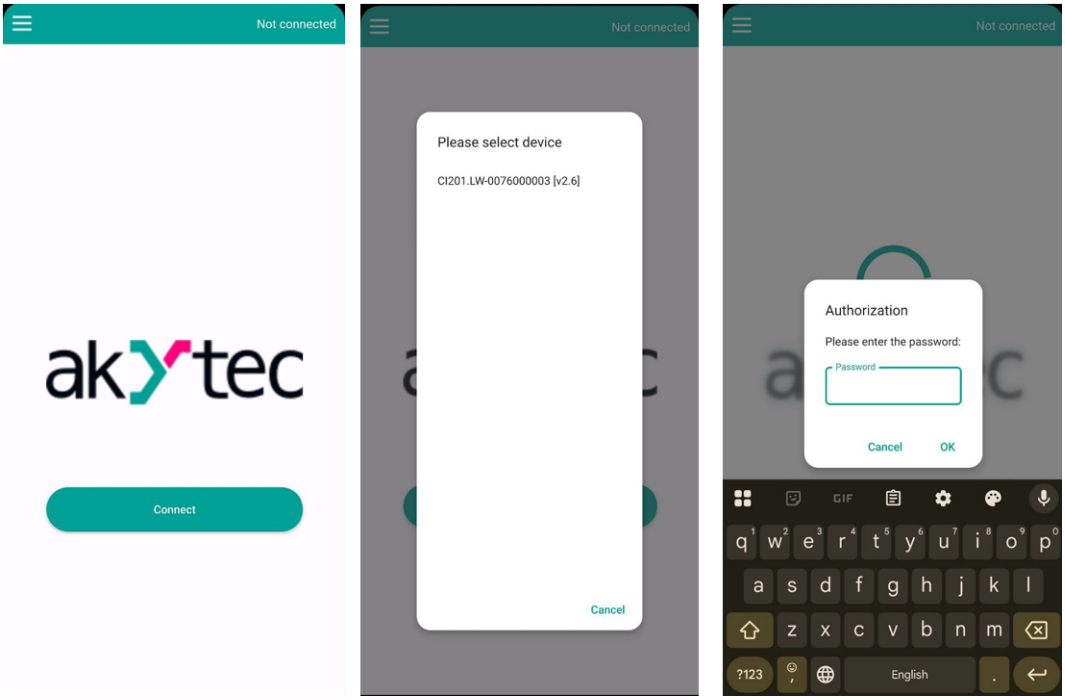


*Fig. 5.2 Device connection using **akYtec IoT Configurator***

– Click the ☰ menu pictogram in the top left corner. In the opened window, click the **Debug** tab. Click the **Update firmware** button at the bottom of the **Debug** tab.

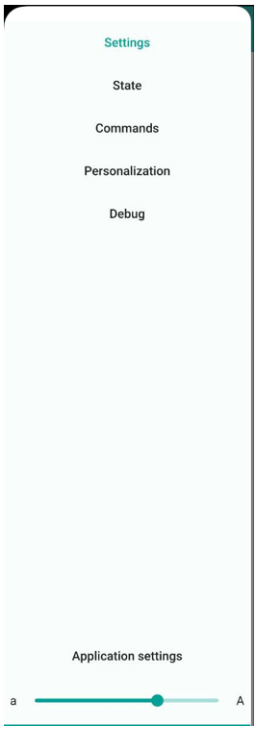


Fig. 5.3 Drop-down menu

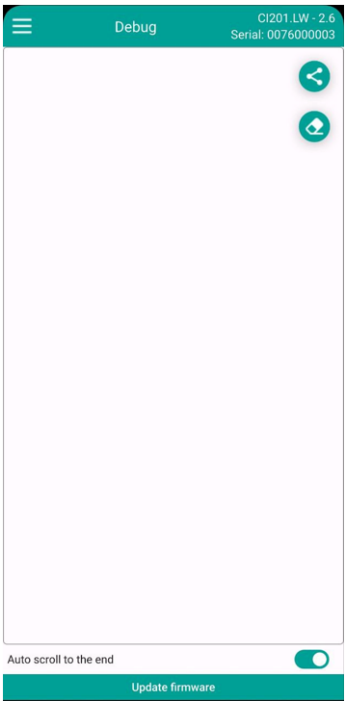


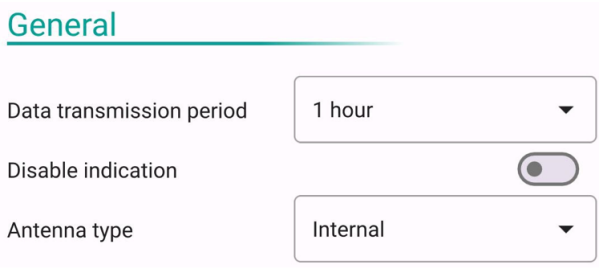
Fig. 5.4 Firmware update

– Select the firmware file with extension *.bin (navigate to the file using your mobile phone's file explorer). After selecting the firmware file, the update will begin. When it is complete, the message “Firmware successfully updated” will appear.

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6 Device settings

General



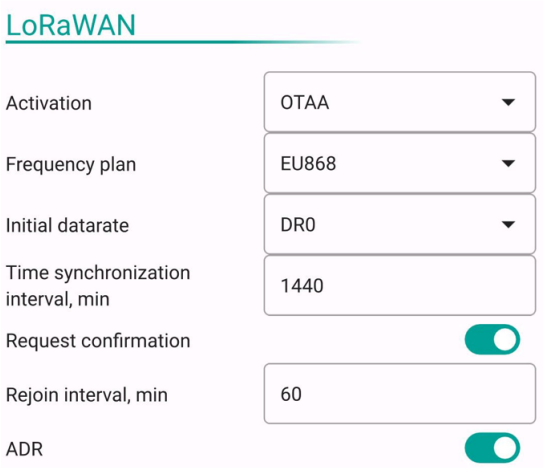
- **Data transmission period**: The period to send accumulated data to the server. If there are no packets in the queue at the time of sending, the communication session will be skipped. You can set the value from the range: 1 minute, 5 minutes, 10 minutes, 30 minutes, 1 hour, 4 hours, 6 hours, 12 hours or 24 hours. The data transmission period may not match the data collection period.
- **Disable indication**: Disable light indication
- **Antenna type**: Select the internal antenna

Hibernation



The device has a hibernation mode that can be enabled/disabled. The device is transported and stored in the hibernation mode. In the hibernation mode, none of the device modules are running, the device remains in the energy-saving mode.

LoRaWAN



The device can regularly send data via the LoRaWAN network. CI201-LW supports LoRaWAN version 1.0.4, activation methods ABP/OTAA.

- **Activation**: Select the activation method in the network (ABP/OTAA)
- **Frequency plan**: Select the region where your device is located. CI201-LW applies the configuration according to the regional settings of the selected region. Please ensure that the selected region matches the device hardware version.
- **Initial datarate**: LoRaWAN data transmission rate
- **Time synchronization interval, min.**: Clock synchronization period

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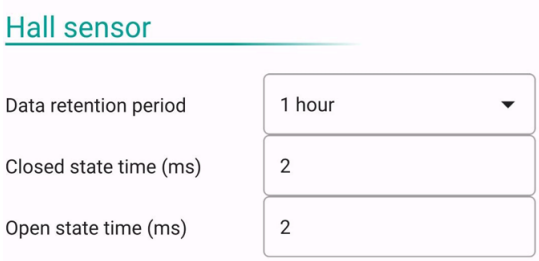
- **Request confirmation**: Enable if you need confirmation that data is successfully received by the server. If enabled, the device doesn't delete packets from the queue until it receives the confirmation about packet delivery from the network. If disabled, the device immediately deletes packets from the queue after transmission, regardless of whether they have been received by the network or not.
- **Rejoin interval, min.**: Interval at which the device will attempt to connect to the network. This option is only used if the device is still not connected to the network.
- **ADR**: Enable the algorithm to adjust the data transmission rate

  LoRaWAN data transmission rate:

  - DR0
  - DR1
  - DR2
  - DR3
  - DR4
  - DR5

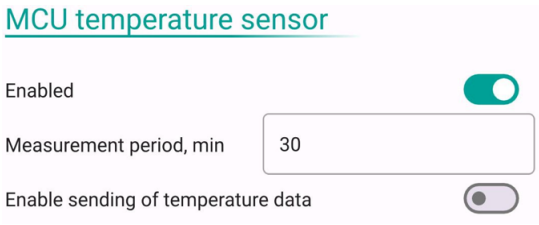
NOTE
Disabled confirmation reduces the load on the LoRaWAN network and increases the network throughput, but may result in packet loss. Please disable this setting if you clearly understand what you are doing.
You can find DevEUI and keys on the **Personalization** tab.
Use **Rejoin** on the **Commands** tab to force the network connection.

Hall sensor



- **Data retention period**: Select the period for data retention. The device continuously monitors the input state and stores measurement packets in a queue for subsequent transmission. Packets are sent to the server according to the set data transmission period. The data collection period is 1 minute, 5 minutes, 10 minutes, 30 minutes, 1 hour, 4 hours, 6 hours, 12 hours or 24 hours.
- **Closed state time (ms)**: Time to detect the pulse presence and eliminate false registration
- **Open state time (ms)**: Time to detect the pulse absence and eliminate false registration

MCU temperature sensor



- **Enabled**: Enable/disable temperature sensor
- **Measurement period, min**: Period of temperature sensor measurement
- **Enable sending of temperature data**: Unscheduled data transmission after temperature sensor measurement

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7 Indication

You can disable/enable indication in ***Setting > General > Disable indication***.

– **Operating mode indication**: Two-color green-blue indicator
– **Data transmission indication**: During data transmission the indicator flashes blue. Upon successful packet transmission, if the confirmation of successful packet transmission is enabled, the green indicator will flash once.
– **Measurement indication**: Series of green flashes

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8 Connection

Digital output
Use the DO and COM contacts to connect an external actuator.

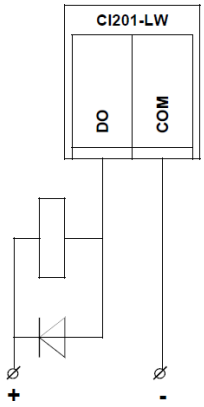
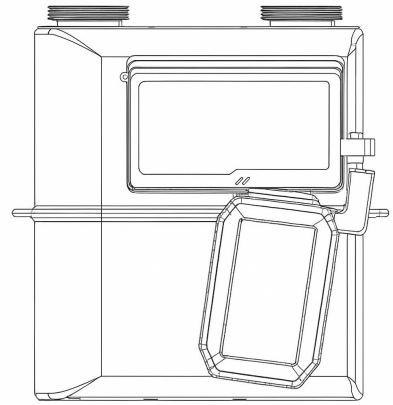
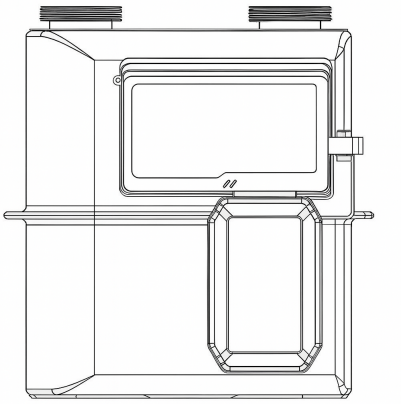


Fig. 8.1 External device connection diagram

Mounting
Install the device in the standard mounting seat and secure it with a screw and nut.





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9 Battery maintenance and replacement

The akYtec CI201-LW is equipped with an internal battery that may require replacement over the operational lifespan of the device. This battery can be replaced by the user. To ensure safe operation and prevent personal injury or damage to the equipment, you must read and follow these safety warnings before proceeding.

CAUTION
Risk of fire or explosion if the battery is replaced with a battery of an incorrect type.

Additional safety instructions (battery handling and disposal):

– **Correct type**: Replace the battery only with a CR123A battery (3 V). Check the battery data sheet to ensure that it is suitable for your operating conditions.
– **Safe disposal**: Dispose of used batteries promptly and in strict accordance with local environmental regulations and the instructions provided. Do not dispose of batteries in household waste.
– **Avoid extreme conditions**: Do not dispose of a battery in a fire or hot oven, or mechanically crush or cut it, as this may cause an explosion. Exposing a battery to extremely high ambient temperatures may cause an explosion or the leakage of flammable liquid or gas.

Replacement procedure:

– Unscrew the four screws and open the device enclosure.
– Carefully remove the depleted battery. Do not use conductive metal tools, as they could short-circuit the contacts.
– Insert a new battery of the specified type, ensuring that its polarity (+/−) matches the markings on the circuit board.
– Close the device enclosure and securely tighten the four screws.

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10 Maintenance

The safety requirements must be observed when the maintenance is carried out.



DANGER
Cut off all power before maintenance.

The maintenance includes:

– cleaning the housing and terminal blocks from dust, dirt and debris
– checking the device fastening
– checking the wiring (connecting wires, terminal connections, absence of mechanical damages).



NOTICE
The device should be cleaned with a dry or slightly damp cloth only. No abrasives or solvent-containing cleaners may be used.

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11 Transportation and storage

The device is transported and stored in the hibernation (inactive) mode.
The original packaging provides optimum protection.
If the device is not taken immediately after delivery into operation, it must be carefully stored at a protected location. The device should not be stored in an atmosphere with chemically active substances.
The environmental conditions must be taken into account during transportation and storage.

NOTICE
The device may have been damaged during transportation.
Check the device for transport damage and completeness!
Report the transport damage immediately to the shipper and akYtec GmbH!

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12 Scope of delivery

– CI201-LW	1 pc.
– Mounting set	1 pc.
– Short guide	1 pc.

NOTE
The manufacturer reserves the right to make changes to the scope of delivery.

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