# Manual
# WILSEN.valve
# WS-VAL-*-F406-B41-01-02

Manual




CE

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**Worldwide**

Pepperl+Fuchs Group

Lilienthalstr. 200

68307 Mannheim

Germany

Phone: +49 621 776 - 0

E-mail: info@de.pepperl-fuchs.com

**North American Headquarters**

Pepperl+Fuchs Inc.

8093 Darrow Road

Twinsburg, Ohio 44087

+1 330 425-3555

sales@us.pepperl-fuchs.com

United States of America

E-mail: sales@us.pepperl-fuchs.com

**Asia Headquarters**

Pepperl+Fuchs Pte. Ltd.

P+F Building

18 Ayer Rajah Crescent

Singapore 139942

Phone: +65 6779-9091

E-mail: sales@sg.pepperl-fuchs.com

https://www.pepperl-fuchs.com

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# 1 Introduction

## 1.1 Content of this Document

This document contains information required to use the product in the relevant phases of the product life cycle. This may include information on the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal

**Note**

For full information on the product, refer to the further documentation on the Internet at www.pepperl-fuchs.com.

**Note**

For specific device information such as the year of construction, scan the QR code on the device. As an alternative, enter the serial number in the serial number search at www.pepperl-fuchs.com/device-information.

The documentation comprises the following parts:

- This document
- Datasheet

In addition, the documentation may comprise the following parts, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Instruction manual
- Functional safety manual
- Other documents

## 1.2 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.

## 1.3 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

### Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:



**Danger!**

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.



**Warning!**

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.



**Caution!**

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

### Informative Symbols



**Note**

This symbol brings important information to your attention.



**Tip**

This symbol brings an useful tip to your attention.



**Example**

This symbol provides an example of the issue described.



### Action

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

## 1.4 Intended Use

The WILSEN.valve wireless sensor node is used for remote monitoring of 90 ° hand lever valves. It is part of the Pepperl+Fuchs WILSEN (wireless sensor) IoT sensor product family, which transmits data wirelessly via a radio interface.

Depending on the version, either two individual inductive sensors or one dual inductive sensor are connected to the WILSEN.valve for each valve to be monitored. Depending on the model, up to two valves can be monitored with a WILSEN.valve.

The WILSEN.valve detects the "open," "closed," or "intermediate position" valve position via the connected sensors at regular intervals and transmits this information via its radio interface. In addition to regular detection and transmission, it is possible to activate a "monitoring interval" in the WILSEN.valve. In this case, the connected front-end sensors are queried at significantly shorter and adjustable time intervals. A message is sent acyclically only if the valve position changes, and the change is reported as quickly as possible. All query and transmission intervals and other parameters can be parameterized via the Bluetooth interface available in the WILSEN device and with the help of the WILSEN app for mobile end devices. It is also possible to access the WILSEN device remotely via the radio interface. This can be used to query and change parameter values.

The wireless sensor also features a GPS geolocation function. Temperature and battery control functions are used to monitor the status of the sensor.

**Note**

The device must not be used in hazardous areas.

Only use recommended original accessories.

## 1.5 General Safety Notes

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Installation and commissioning of all devices may be performed only by trained and qualified personnel.

It is dangerous for the user to make changes and/or repairs. Additionally, doing so voids the warranty and excludes the manufacturer from any liability. In the event of any serious errors, stop using the device. Secure the device against unintended operation. To have the device repaired, return it to your local Pepperl+Fuchs representative or your sales center.

**Warning!**

Risk of fire due to improper use!

Damaged or faulty lithium-ion batteries are a major fire hazard. Ensure that the battery is protected from mechanical damage, short circuits, and excessive heat load during servicing and while the wireless ultrasonic sensor is in operation. The permissible ambient temperatures from -25 °C to +70 °C and the permissible storage temperatures from -40 °C to +85 °C must always be observed. The device enclosure and ultrasonic sensor enclosure comply with flammability class V-0(AO) according to IEC 60695-11-10 and therefore must not be operated in areas with an automatic extinguishing system. Devices with damaged batteries must be removed immediately, taken out of operation, and stored safely in accordance with local fire prevention regulations.

**Warning!**

Risk of injury if the battery is faulty!

This device uses a high-energy cell for its voltage supply. This battery contains lithium and thionyl chloride. If these substances escape, the appropriate protective measures must be observed. Refer to the safety datasheet.

In the event of leakage, contact with the skin or eyes may cause severe irritation and burns. Inhalation of electrolyte vapors may affect the upper respiratory tract and lungs.

**Note**

You can find the safety datasheet for lithium thionyl chloride batteries online at www.pepperl-fuchs.com, on the product detail page for the respective WILSEN device.

**Caution!**

Risk of unauthorized sensor access due to unprotected access data.

To use and operate the WILSEN.valve wireless sensor node safely, access data such as passwords, application key, etc. must be protected. The plant operator is responsible for protecting this data; the operator must document the access data, protect it from unauthorized access, and keep it safe.

**Note**

**Disposal**

Electronic waste is dangerous. When disposing of the equipment, observe the current statutory requirements in the relevant country of use and local regulations.

## 1.6 Declaration of Conformity

This product was developed and manufactured in line with the applicable European standards and directives.

**Note**

A declaration of conformity can be requested from the manufacturer.

The product manufacturer, Pepperl+Fuchs Group, 68307 Mannheim, Germany, has a certified quality assurance system that conforms to ISO 9001.

ISO**9001**

# 2 System Description

The WILSEN.valve wireless sensor node is used for remote monitoring of 90 ° hand lever valves. It is part of the Pepperl+Fuchs WILSEN (wireless sensor) IoT sensor product family, which transmits data wirelessly via a radio interface.

Depending on the version, either two individual inductive sensors or one dual inductive sensor are connected to the WILSEN.valve for each valve to be monitored. Depending on the model, up to two valves can be monitored with a WILSEN.valve.

The WILSEN.valve detects the "open," "closed," or "intermediate position" valve position via the connected sensors at regular intervals and transmits this information via its radio interface. In addition to regular detection and transmission, it is possible to activate a "monitoring interval" in the WILSEN.valve. In this case, the connected front-end sensors are queried at significantly shorter and adjustable time intervals. A message is sent acyclically only if the valve position changes, and the change is reported as quickly as possible. All query and transmission intervals and other parameters can be parameterized via the Bluetooth interface available in the WILSEN device and with the help of the WILSEN app for mobile end devices. It is also possible to access the WILSEN device remotely via the radio interface. This can be used to query and change parameter values.

The wireless sensor also features a GPS geolocation function. Temperature and battery control functions are used to monitor the status of the sensor.

To transfer the measurement data, you must integrate the IoT sensors with LoRaWAN interface into a LoRaWAN network. This requires additional system components such as a LoRa gateway and LoRa network server (LNS).

The following figure illustrates the topology of integrating a WILSEN wireless sensor into a LoRaWAN network.

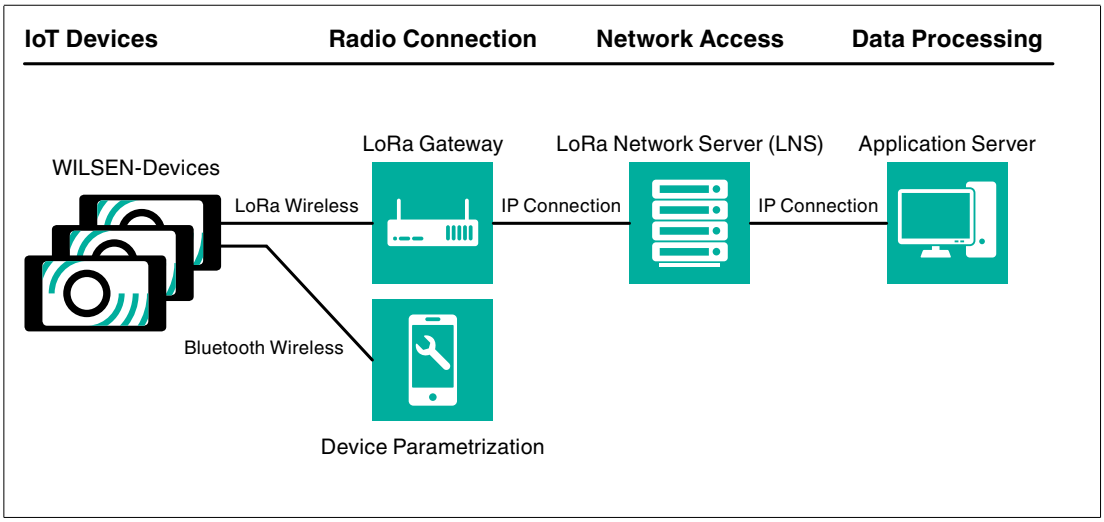



Figure 2.1

**Note**

You can find more information on the LoRaWAN standard at:

https://lora-alliance.org

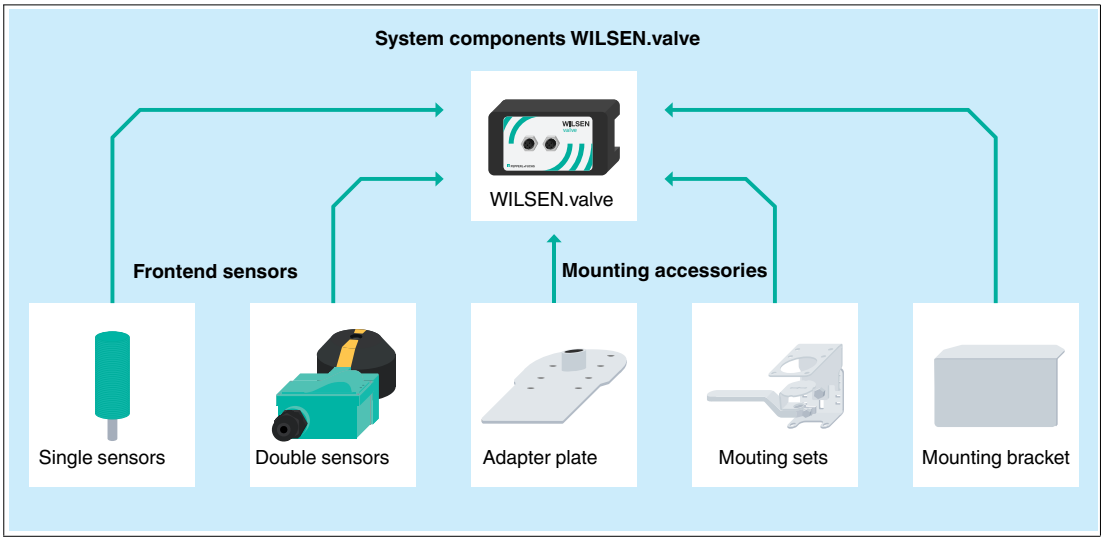
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## 2.1 System Components and Accessories

Additional system accessories are required to monitor hand lever valves via the WILSEN.valve.




The following table provides an overview of the available components and their respective functions:

| Component | Functional Description |
|---|---|
| WILSEN.valve (central unit) | The central unit is the heart of a WILSEN.valve monitoring unit. It supplies the front-end sensors with power, queries their status, determines the valve position, and transmits the recorded data wirelessly via LoRaWAN. |
| Front-end sensor(s) | These valve position is determined using these sensors. Depending on the sensor version, an additional connection cable is still required for connecting the sensor to the WILSEN.valve (central unit). |
| Actuator suitable for the front-end sensor(s) | An actuator is used to transfer the position of the hand lever mechanically to the front-end sensors. |
| Adapter plate | The front-end sensor(s) and the associated actuator are fixed to the adapter plate. |
| Mounting set | The mounting set contains mechanical components for transferring the position of the hand lever to the actuator.<br>The mounting set is used to mount the combination of front-end sensor(s), actuator and adapter plate, and WILSEN.valve central unit on the valve. All these components together form the valve monitoring unit. |
| Mounting bracket (optional) | You can use this mounting bracket to mount the WILSEN.valve central unit directly on the adapter plate of the valve monitoring unit and therefore on the valve. |

## Example of a Complete WILSEN.valve Valve Monitoring Unit

The accessories required in detail and the appropriate version of the WILSEN.valve must be selected and ordered depending on the requirements and conditions in the respective application. You will find further help on this in the following chapters.

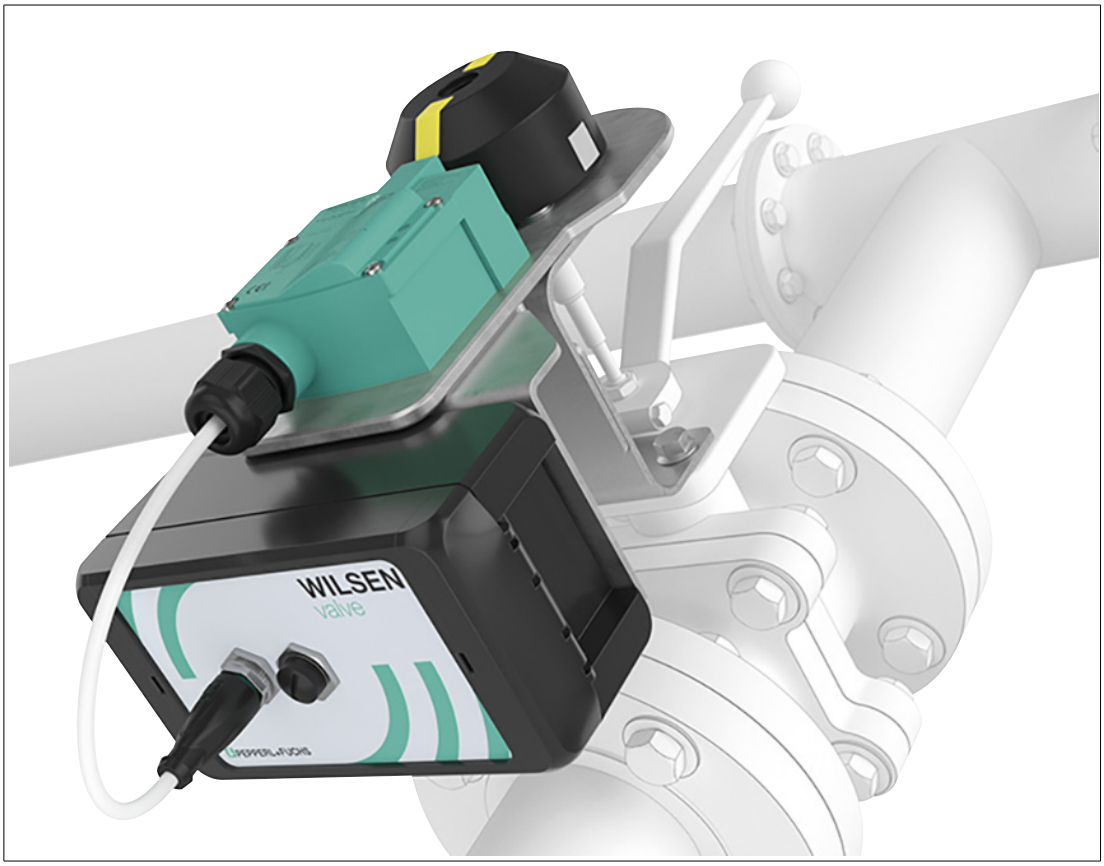



Figure 2.2

**Note**

In addition to the explanations in the following chapters, our blog post provides guidance on selecting the components that are appropriate and required for your application, and the process for assembly and mounting.

https://blog.pepperl-fuchs.com/en/2022/mounting-dual-inductive-sensors-on-manual-valves/

### 2.1.1 WILSEN.valve Central Unit

The sensors for detecting the valve position are connected to the WILSEN.valve central unit. Various WILSEN.valve devices are available for selection depending on the application situation and the sensor types required.

#### Criteria for Sensor Selection

Dual inductive sensors, including actuator and suitable mounting components, are usually used to query the valve position. It is also possible to query the valve position with two individual inductive sensors.

Two different sensor technology options are available for connection to the WILSEN.valve devices:

- NAMUR sensors
  NAMUR sensors are comparatively energy efficient and therefore ideal for operation on a battery-powered wireless sensor node such as the WILSEN.valve. In addition, NAMUR sensors are often already used in cable-guided applications in many plants. They could therefore already be in stock there. NAMUR sensors of any brand can be connected to the WILSEN.valve.
- Low-power DC 2-wire sensors
  The low-power DC 2-wire sensors, or, as they are also known, "two-wire sensors with minimum off-state current" from Pepperl+Fuchs are optimized for the lowest possible energy consumption. This results in an even longer battery life than with the NAMUR sensors at the same query and transmission intervals.

#### WILSEN.valve Device Versions Dependent on the Selected Sensor Type/Technology

Depending on the selected sensor type and technology option, you must use the corresponding device version of the WILSEN.valve.

| Device Version Name | Connection Options | Application Note |
|---|---|---|
| WS-VAL-2N-* | Two individual sensors, NAMUR type | This device version can monitor one valve. |
| WS-VAL-2N4-* | Up to two dual sensors, NAMUR type | This device version can monitor up to two valves, one valve per dual sensor. |
| WS-VAL-2ZL-* | Two individual sensors, low-power DC type | This device version can monitor one valve. |
| WS-VAL-4ZL-* | Up to two dual sensors, low-power DC type | This device version can monitor up to two valves, one valve per dual sensor. |

Table 2.1

**Note**

If you enter the strings listed in the table under "Device Version Name" in the search field on our homepage www.pepperl-fuchs.com, you will find the WILSEN.valve central units that are available in each case.

## 2.1.2 Front-End Sensors and Actuators

The valve position can be detected either with a dual sensor or with two individual sensors.

Inductive dual sensors usually form a unit with a suitable actuator, via which the changes in the valve position are transmitted mechanically to the sensor.

Two designs are typical on the market:

- F31 series inductive dual sensors
- F25 series inductive dual sensors

### F31 Series Inductive Dual Sensors with BT65 Actuator

In the F31 dual sensor series, the two sensor elements are located directly one above the other, using a 65 mm diameter BT65 actuator. This accommodates shaft diameters up to max. 58 mm.

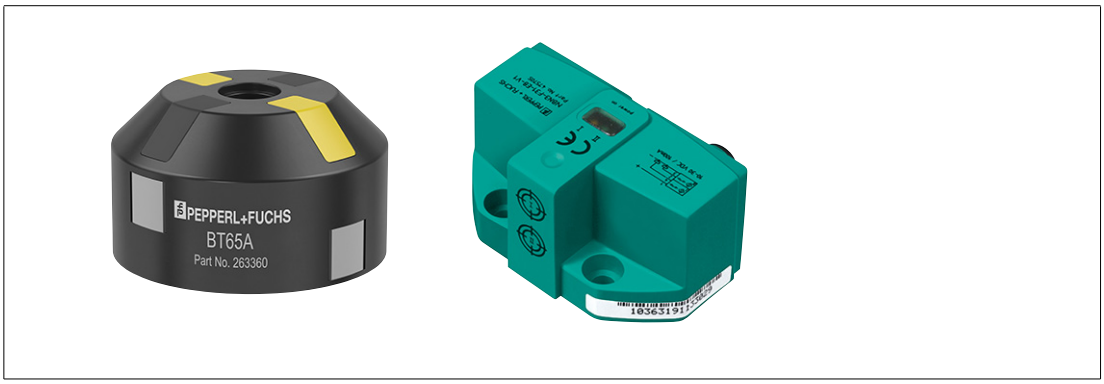



Figure 2.3

For even greater visibility of the valve position over longer distances, it is possible to use an appropriate actuator of type BT65-F31 together with sensors in the F31, F31K, or F31K2 series.

### F25 Series Inductive Dual Sensors with BT32 Actuator

In the F25 dual sensor series, the two sensor elements are located on the outer sides of the sensor and are arranged in a round recess for the actuator. This makes the sensor-plus-actuator unit even more compact than the F31 design. An actuator of type BT32 with a diameter of 32 mm is required for the F25 series. This accommodates shaft diameters up to max. 34 mm.

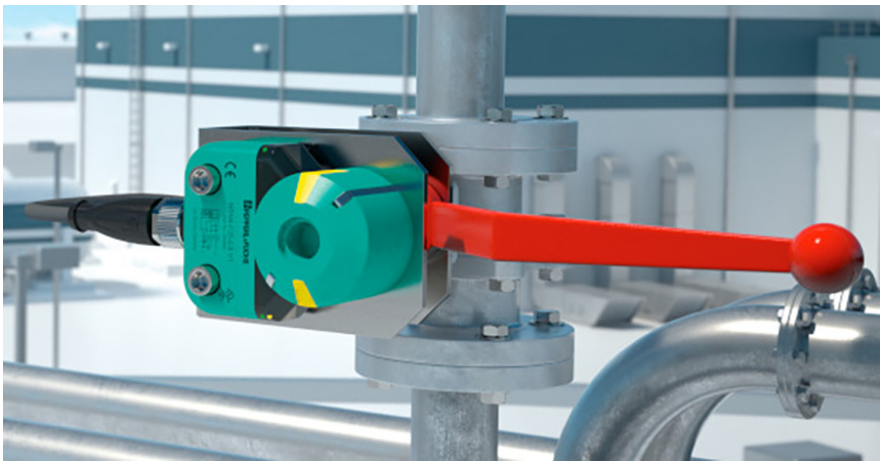


Figure 2.4

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## Selection Criteria for the F25 or F31 Series

From a technical point of view, both series are regarded as equivalent. The main difference lies in the space required for mounting the sensor solution consisting of a sensor plus actuator on the valve:

- For smaller hand valves or in very confined spaces, we recommend the F25 inductive dual sensor series.
- For larger hand valves and/or with more available space, we recommend the F31 inductive dual sensor series.

Both series are available as versions with M12 plug connection, fixed cable, or with terminal compartment and cable gland. The easiest way to connect to the WILSEN.valve is to use a version with an M12 plug connection via an M12 connection cable. However, the other device versions can also be connected with slightly increased wiring effort and, if necessary, additional accessories.

Since the WILSEN.valve cannot be used to control valves, dual sensor types that only have a sensor function and no additional solenoid valve control should be selected. However, you can also connect dual sensors with integrated solenoid valve control to the WILSEN.valve. Valve control remains without function in this case.

## Use of Individual Sensors

If special conditions in the application require this, two individual sensors can be used to detect the valve position, e.g., for

- Very limited installation space,
- Special valves,
- Other valve angles, or
- Mounting in a valve box or similar.

The sensors and the required mounting must be selected individually according to these special conditions and requirements. Individual sensors of any design can be connected to the WILSEN.valve versions provided for this purpose.

They simply need to match the technology suitable for the selected WILSEN.valve version:

- NAMUR or
- "2-wire with minimum off-state current" (Low Power)

If two individual sensors are used, the two standard BT65 or BT32 designs can also be used as actuators. Alternatively, you can also use your own custom actuator elements, or such actuators may even be required.

## Product Overview

**Note**

The following overview table will help you understand and select the right components for your application. You can find the inductive sensors and actuators suitable for the WILSEN.valve versions by entering the search terms listed in the table in the product search on our homepage at www.pepperl-fuchs.com.

Since the WILSEN.valve cannot be used to control valves, you should ideally select inductive dual sensor types that only have a sensor function and no additional solenoid valve control. However, you can also connect inductive dual sensors with integrated solenoid valve control to the WILSEN.valve. Valve control remains without function in this case.

The F31 series inductive dual sensors with low-power DC 2-wire outputs are only available with integrated solenoid valve control.

**F25 Series Inductive Dual Sensors and Actuators**

| Components | Search Terms | Type Often Preferred |
|---|---|---|
| NAMUR versions | NCN*F25*N | NCN3-F25-N4-V1 |
| Low-power DC 2-wire versions | NBN*F25*Z | NBN4-F25-2Z4L-V1 |
| Actuator for F25 sensor series | BT32 | BT32 |

Table 2.2

**F31 Series Inductive Dual Sensors and Actuators**

| Components | Search Terms | Type Often Preferred |
|---|---|---|
| NAMUR versions | NCN*F31*N | NCN3-F31-N4-V1 |
| Low-power DC 2-wire versions | NBN*F31*Z8L | NBN3-F31K2-Z8L-B13-S |
| Standard 2-wire versions | NBN*F31*Z8 | NBN3-F31-Z8-V1 |
| Actuator for F31 sensor series | BT65 | BT65 |
| Actuator for F31 sensor series with very high visibility | BT65-F31 | BT65-F31-RG-EN |

Table 2.3

**Warning!**

Malfunctions may occur if the connection cable is too long!

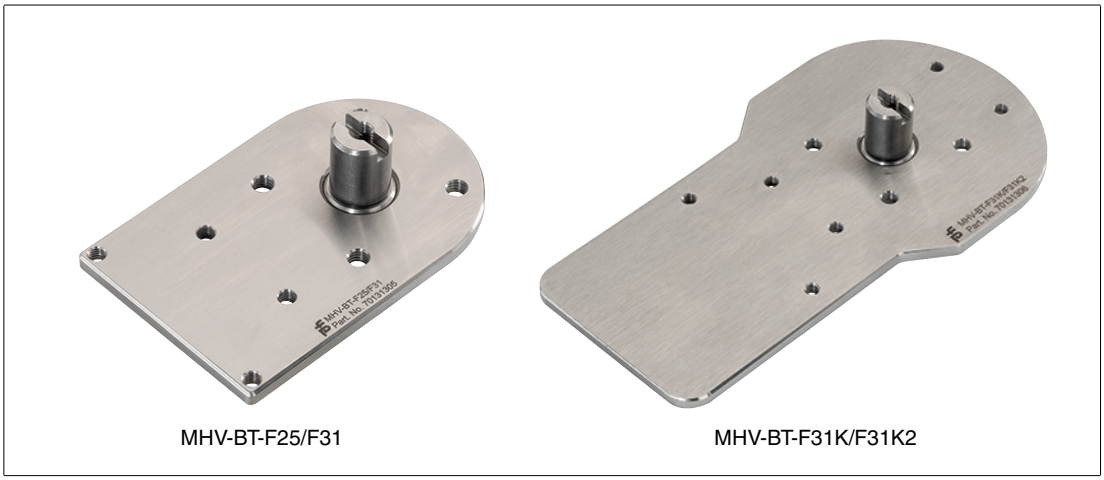
The cable connection for connecting the front-end sensors to the WILSEN.valve central unit must not exceed the maximum cable length of ten meters. An unshielded cable must be used.

## 2.1.3 Adapter Plates

Pepperl+Fuchs offers a wide range of adapter plates and mounting sets for mounting the dual inductive sensors and actuators on the valve. It is therefore possible to attach the sensor solution to many typical hand lever valves on the market.

Use the MHV-BT-F25/F31 adapter plate to mount dual inductive sensors from the F25 series, including the BT32 actuator.

For mounting dual inductive sensors from the F31 series, including the BT65 actuator, you can choose between the smaller MHV-BT-F25/F31 adapter plate or the larger MHV-BT-F31K/F31K2. The smaller one is ideal for F31 sensors with M12 plug connection (F31 series). The larger adapter plate can accommodate any version in the F31, F31K, or F31K2 series.



MHV-BT-F25/F31 MHV-BT-F31K/F31K2

Figure 2.5

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## 2.1.4 Mounting Sets

Pepperl+Fuchs offers suitable mounting sets for mounting the adapter plates with mounted dual sensor and actuator on the hand lever valve, and for mechanically coupling the valve shaft with the actuator.

Numerous mounting sets are available for coupling with valves of many flange dimensions according to ISO5211 and valve shafts with internal thread or square drive.

**Mounting Sets for Valve Shafts with Internal Thread (Example)**

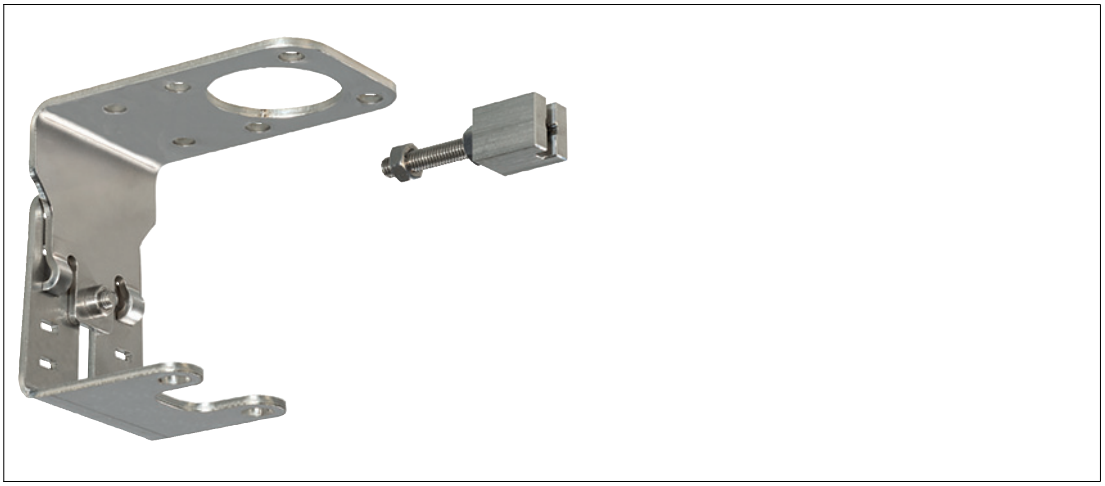


Figure 2.6

**Mounting Sets for Valve Shafts with Square Drive (Example)**

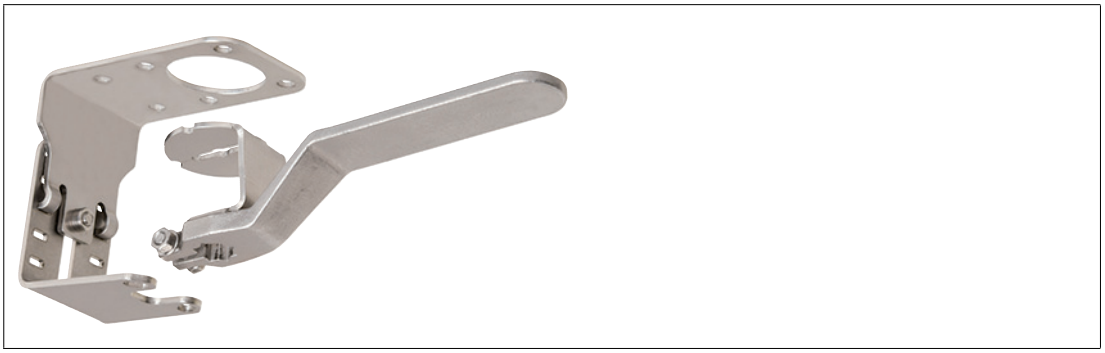


Figure 2.7

**Note**

You can find the available mounting sets using the product search at www.pepperl-fuchs.com:

- Enter "MHV-BT-F*-M*" to find mounting sets for valve shafts with internal thread.
- Enter "MHV-BT-F*-G*" to find mounting sets for valve shafts with square drive.

The adapter plates and mounting sets offered by Pepperl+Fuchs allow adaptation to many commercially available valves according to ISO5211 and others. The scope of this portfolio is constantly growing. If you cannot find the right solution for your valve, do not hesitate to contact us.

Adapting individual sensors to hand lever valves usually requires individual solutions due to special circumstances. Standardized mounting solutions are therefore seldom feasible. For these reasons, Pepperl+Fuchs does not offer ready-made mounting solutions in its range. In these cases, the mechanical adaptation of the sensors to the valve needs to be carried out by the user themselves.

## 2.1.5 Mounting Bracket

You can mount a WILSEN.valve central unit either close to the valve using the preassembled mounting plate on a suitable machine or system part, or directly on the hand lever valve using a mounting bracket and a suitable P+F mounting set.

The optional MHV-WS-F406-F05-M5 mounting bracket allows installation of the WILSEN.valve in two possible positions:

- WILSEN.valve central unit mounted at the rear




- WILSEN.valve central unit mounted on the side




**Note**

There are various options for mounting WILSEN.valve devices with P+F accessories directly to a manual valve to accommodate many application situations. You can find the relevant mounting information in the separate mounting manual on our homepage www.pepperl-fuchs.com, on the product details page for the respective WILSEN.valve device.

# 3 Integration into a LoRa Network

A WILSEN device sends the measurement data to be transmitted in the standardized LoRaWAN protocol via a radio interface. To do this, the WILSEN device must have joined a corresponding LoRaWAN network. The device can join a network once it has been registered with the LoRa network server.

The following figure illustrates the topology of integrating a WILSEN device into a LoRaWAN network.

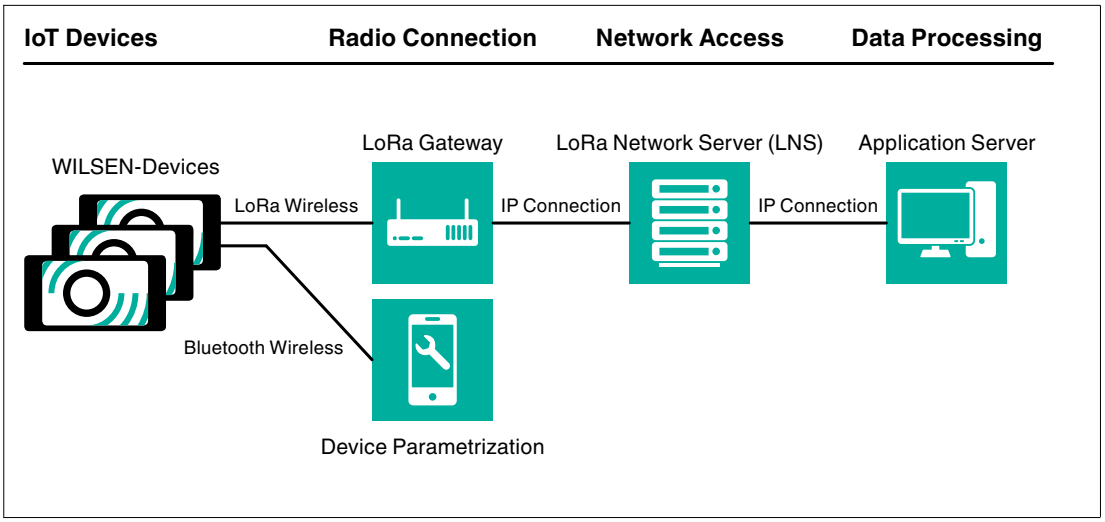



Figure 3.1

### LoRa Wireless Connection

The measurement data collected by the WILSEN device is transmitted to the LoRaWAN network in the form of an encrypted hexadecimal value chain (payload). This payload is received by one or more gateways and translated into the internet protocol (IP format). The gateway transmits the translated payload to the LoRa network server via an Ethernet cable or a wireless connection.

### LoRa Network Server and Application Server

The LoRa network server (LNS) filters the incoming data packets, assigns them to the corresponding IoT devices, and forwards them to an application server. The application server decrypts the data packets and stores the device data (measurement data, states) that they contain. The data user's processing software application can retrieve and display the data from the application server memory at a later time.

## Registering the Sensor with a LoRa Network Server

To register the WILSEN device with a LoRa network server, a customer account with the corresponding software service is required. Services usually make their registration procedure available in dialog form. Familiarize yourself with the details of your network server.

**Note**

In a separate document, Pepperl+Fuchs describes the procedure for registering a WILSEN device using registering with "The Things Network (TTN)" community network as an example.

You can download the document online from the product detail page for the respective WILSEN device at www.pepperl-fuchs.com.

The objective of the registration procedure is to exchange software keys, which contain the unique device authentication and an encryption of the sensor data to be transmitted (measurement data).

## Device Authentication

When using LoRaWAN, the device is uniquely authenticated via the **Device EUI**. This is provided by the device manufacturer and transferred to the LoRa network server (LNS).

With WILSEN devices, you will find this 16-digit number in hexadecimal format by connecting to the device using the WILSEN app. The device-specific **Device EUI** is displayed in the "LoRaWAN Configuration" menu of the app. You can also find the Device EUI on the nameplate and the packaging label of the device, or in the individual serial number credential list in csv format provided by Pepperl+Fuchs on request.

To structure the system, some LNS services use a 16-digit **Application EUI/Join EUI** as an additional identifier to structure the system.

For more information, familiarize yourself with the details in the description supplied by your LNS provider. If the LNS supplies an Application EUI/Join EUI or you create one yourself, you must enter it in the **Application EUI/Join EUI** field in the WILSEN app.

If you want to use the Application EUI/Join EUI provided by the WILSEN device, you will find it in the WILSEN app in the "LoRaWAN Configuration" menu. It is also in the individual serial number credential list in csv format provided by Pepperl+Fuchs on request.

## Encryption of Telemetry Data

With LoRaWAN, device data (measurement data, states) is always transmitted from the sensor to the application server in an encrypted format. The AES128 standard is used for this end-to-end encryption.

WILSEN devices use the 32-digit **application key** to encrypt the measurement data to be transmitted. Select the over-the-air activation (OTAA) registration procedure for your LoRa network server. Some network servers will then provide you with an application key. Alternatively, the application key provided by the WILSEN device can be transferred to the intended LoRa environment.

You can find the application key provided by the WILSEN device via the WILSEN app in the "LoRaWAN Configuration" menu. It is also in the individual serial number credential list in csv format provided by Pepperl+Fuchs on request.

An application key provided by a network server must be transferred to the WILSEN device using the WILSEN app.

Once the credentials have been exchanged between the WILSEN device and the LoRaWAN network server or application server, the data transmission can start.

If the WILSEN device is within range of a LoRa gateway, it immediately starts contacting the LoRa network server.

## Payload

The regularly determined measurement data is transmitted to the LoRa network server on the internet at adjustable transmission intervals. The structure of this usable data is referred to as a payload.

The payload of a transmission packet is a string of up to 51 bytes of hexadecimal numbers—the contents of which must be interpreted on the receiving side using a payload decoder. The structure of the payload for the respective WILSEN device is described in an additional document for the payload.

LoRa network server providers offer various tools for decoding the payload on the receiving side. Some providers make it very easy to create such a decoder using a form template, e.g., in JavaScript. Other providers offer an input field for a finished piece of program code in JavaScript. Please familiarize yourself with the specific details of the payload decoder of your respective provider.

Pepperl+Fuchs provides a downloadable payload decoder in JavaScript format on its homepage. You can open this script using a text editor and copy and paste it into the input field for the payload decoder of the LNS provider.

**Note**

You can download the payload description and the payload decoder for your WILSEN device online from the product details page for the relevant WILSEN device at www.pepperl-fuchs.com. See the Documents and Software areas.

# 4 Cybersecurity Information

This product has been developed according to best practices for cybersecurity.

The operator of the product is responsible for ensuring that suitable cybersecurity measures are implemented in the operating environment of the product.

Pepperl+Fuchs provides information in a suitable manner and updates this information depending on the threat situation.

Refer to cybersecurity documentation for further information.

**Note**

Further information is available on the product detail page of the device on the Internet at www.pepperl-fuchs.com. Enter the order designation in the search field
→ Select the appropriate device → Open the product detail page
→ Open the **Product Documentation** tab.

# 5 Establishing a Connection to the Device

## Prerequisites

A mobile device that meets the following prerequisites is required to connect and subsequently parameterize the WILSEN device via the Bluetooth interface and WILSEN app:

- Operating system compatibility for WILSEN app to WILSEN device as specified in the appropriate App Store
- Bluetooth version 4.0 or higher (Bluetooth Low Energy must be supported)
- Bluetooth is enabled on the mobile device
- Geolocalization is enabled on the mobile device
- Mobile device has an internet connection
- Mobile device has an account set up on Google Play or the Apple App Store

1. Go to the app store on your mobile device and search for the Pepperl+Fuchs "WILSEN" app or scan the following QR code.

Figure 5.1 WILSEN in Google Play

Figure 5.2 WILSEN in the Apple App Store

2. Follow the instructions to download and install the app.

**Note**

On the mobile device, make sure that Bluetooth and geolocalization (GPS) are switched on and that the associated app permissions have not been restricted by the user.

3. Open the app by tapping the app symbol.




Figure 5.3

↳ The WILSEN app Device Discovery will appear. Available devices within detection range will be displayed after a short time.

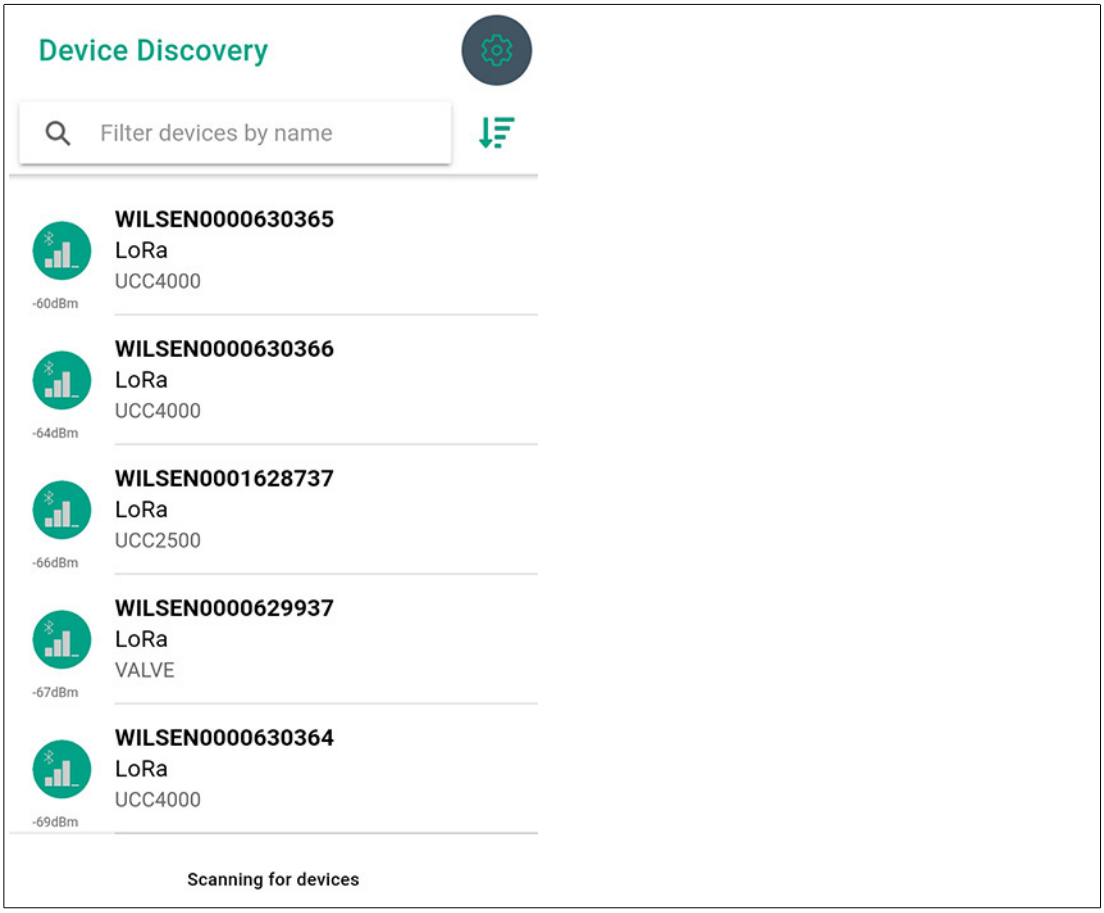



Figure 5.4

**Tip**

Enter the desired device name or part of it to reduce the number of devices in the list in accordance with the search.

The "Sort" symbol to the right of the input field allows you to sort the displayed devices according to various criteria. You can also use this to completely disable a specific sort order. In this case, newly found devices are simply added to the end of the list.

4. Tap on the desired device to connect it to the app.

**Tip**

The system may issue a pairing request during the connection setup process. The user must confirm this.

5. Enter the default password `00000000` when setting up a new device or the valid password for an already known device within 30 seconds and confirm with `OK`.

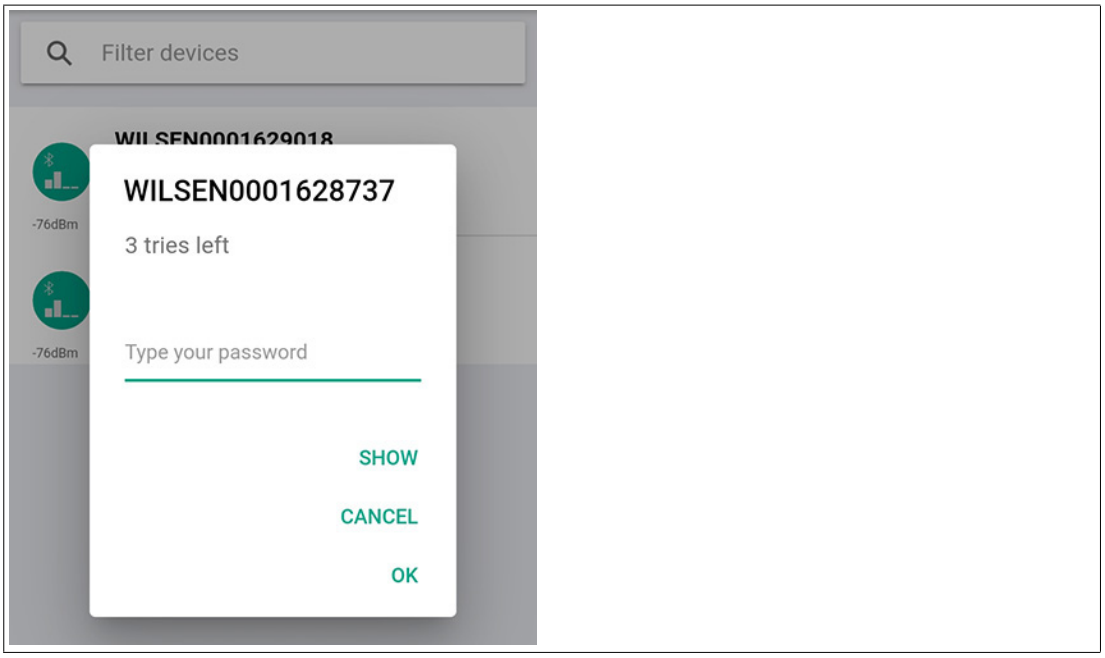



Figure 5.5

↳ The app will switch to the **Sensor Status & Configuration** menu, which displays current sensor values and provides access to sensor settings.

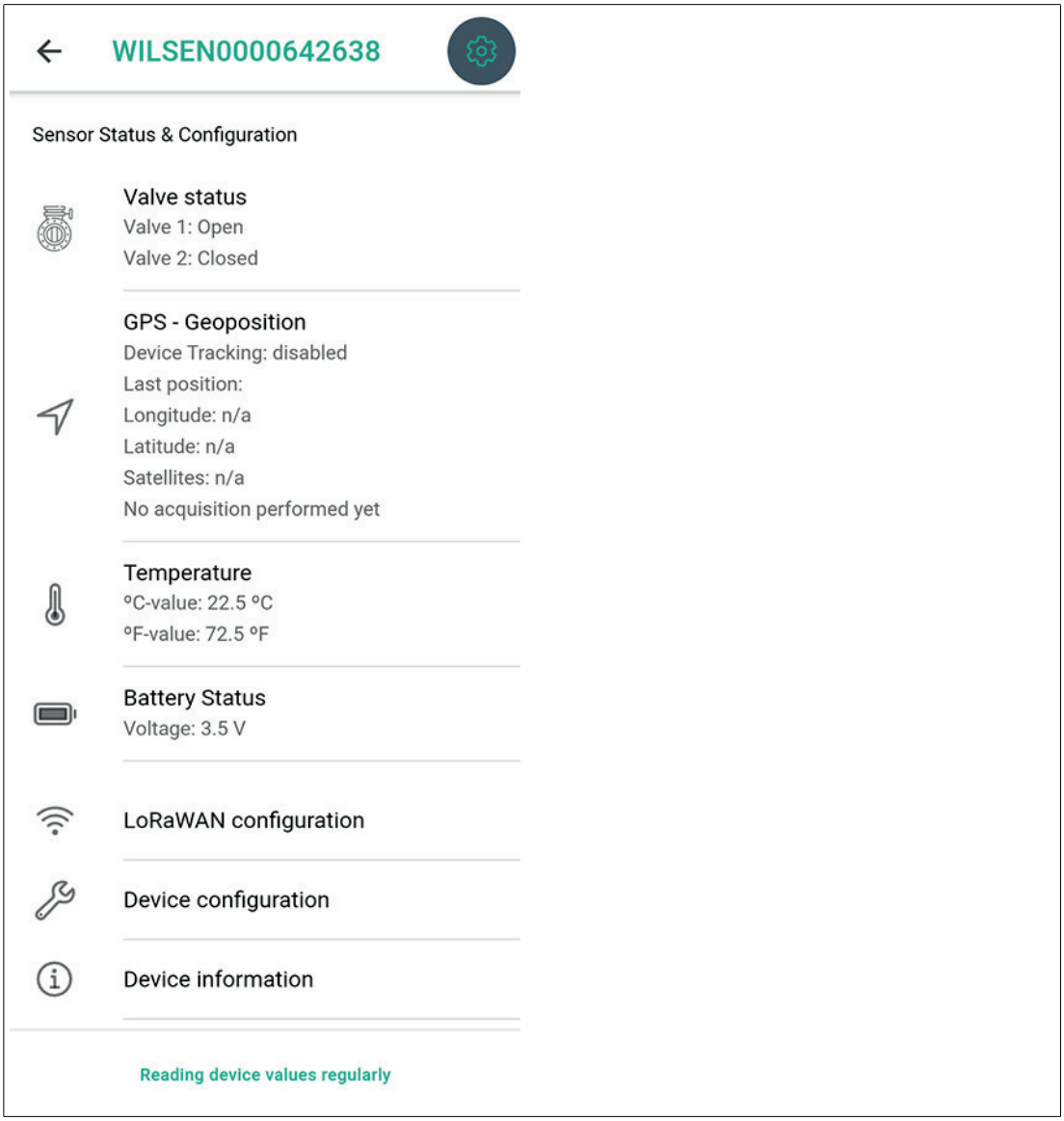



Figure 5.6

**Caution!**

**High Power Consumption during Bluetooth Connection**

To ensure the longest possible battery life, keep the connection time between the mobile device and the WILSEN device via Bluetooth and the app as short as possible.

The Bluetooth connection between the sensor and the app is automatically severed if there is no further user activity for five minutes.

**Note**

**Temporary Block after Three Incorrect Password Entries**

If the password is incorrectly entered three times in a row, the device is blocked from reconnecting via Bluetooth for a specific period of time.

This is indicated by the "Blocked" sign in the device list. There is also a note indicating when the device will be accessible via Bluetooth again. If an incorrect password continues to be entered multiple times once access is restored, the blocking period becomes increasingly longer after every three attempts.

# 6 Mounting

## 6.1 Installation Conditions

To ensure proper functioning, you must observe the following installation conditions when mounting the WILSEN device:

- Installing the WILSEN device in shielded environments made of metal or other conductive components usually has a significant effect on the wireless connection and wireless range. These effects must be taken into account accordingly in such installation situations.
- Where specified, observe the maximum tightening torques for screws and the screw connections on the M12 plug connections.

## 6.2 Mounting Instructions

You can mount the WILSEN.valve wireless sensor node on walls, carriers, or similar near the manual valves to be monitored using the preassembled mounting plate. The mounting plate has various mounting points, which you can see in the following drawings.

The following drawing shows the dimensions and the mounting points of the device.

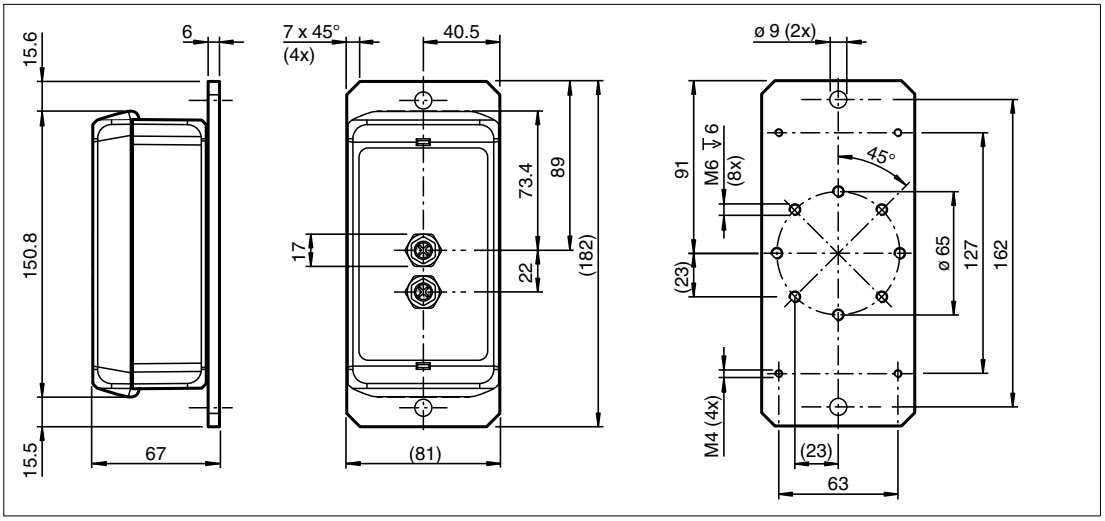



Figure 6.1

You can attach the mounting plate to a mounting location via the following points:

- Via the front sides using two 9 mm thru-holes with M8 screws and flat washers.
- Via the underside of the mounting plate using the eight M6 tapped holes with a maximum screw-in depth of 7 mm and a tightening torque of ≤ 1 Nm.

It is also possible to mount WILSEN.valve devices directly to a manual valve together with the front-end sensors and the actuator using the adapter plates and mounting sets available separately. The central unit of the WILSEN.valve must be fixed to the MHV-WS-F406-F05-M5 mounting bracket.

**Note**

There are various options for mounting WILSEN.valve devices with P+F accessories directly to a manual valve to accommodate many application situations.

You can find the relevant mounting information in the separate mounting manual on our homepage www.pepperl-fuchs.com, on the product details page for the respective WILSEN.valve device.

# 7 Measurement-Data Acquisition and Data Transmission of the WILSEN.valve

The figure below illustrates the process for measurement-data acquisition and for data transmission for the WILSEN.valve in conjunction with the triggers that initiate them.

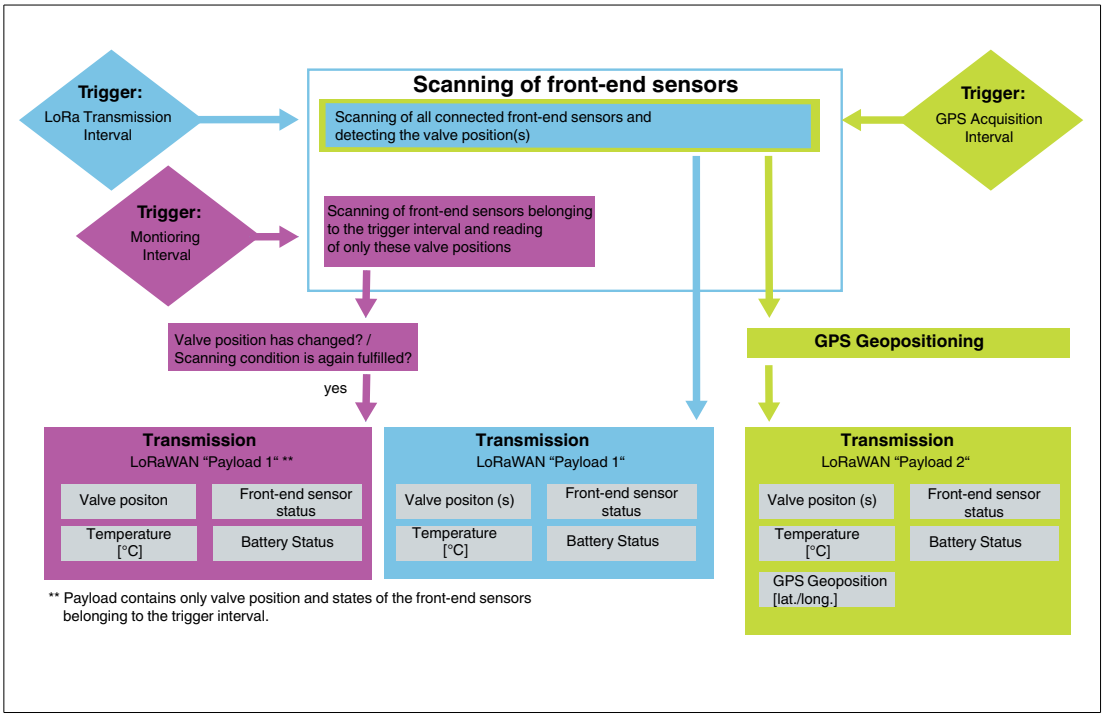



Figure 7.1 Ablaufdiagramm Messdatenerfassung und Datenübertragung

## Triggers for Measurement-Data Acquisition and Transmission

Measurement-data acquisition with the WILSEN.valve is initiated by one of three different triggers.

- **LoRa Transmission Interval**
  First, there is regular measurement-data acquisition, which is initiated via the "LoRa Transmission Interval" trigger. This interval is used to receive notification of the valve position(s) and measurement data at regular intervals to ensure an overview of the system and the availability of the WILSEN.valve including the connected front-end sensors.
- **Monitoring Interval**
  In addition, optional event-driven reporting of valve position and measurement data is possible via the trigger "Monitoring Interval". In this case, the measurement-data acquisition is usually triggered at much shorter time intervals. However, the measurement data is only transmitted if the valve position changes. The "monitoring interval", the respective valid change conditions and data transmission settings can be configured individually for each valve to be monitored.
- **GPS Acquisition Interval**
  The geoposition of the WILSEN.valve unit can also be determined as an option together with the measurement-data acquisition. This is done via the "GPS Acquisition Interval" trigger, which is the 3rd trigger option for measurement-data acquisition.

## Measurement-Data Acquisition Process

For measurement-data acquisition, the connected front-end sensors are briefly supplied with power by the WILSEN.valve andtheir states are recorded. Based on these states and the parameter values set, the WILSEN.valve determines the position of the associated valves.

When measurement-data acquisition is initiated via the "LoRa Transmission Interval" or "GPS Acquisition Interval" trigger, the states of all front-end sensors and the associated valve states are recorded.

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When measurement-data acquisition is initiated via the "Monitoring interval", only the front-end sensors belonging to the respective monitoring interval are queried and the associated valve position is determined.

With the "GPS Acquisition Interval" trigger, the geoposition of the WILSEN.valve unit is additionally determined after measurement-data acquisition.

## Data Transmission

Following measurement-data acquisition initiated by the "LoRa Transmission Interval" trigger, this and other data are transmitted directly in the form of "Payload 1." In addition to the states of the front-end sensors and the resulting valve position(s), "Payload 1" contains the battery status and the temperature of the WILSEN.valve.

If measurement-data acquisition was initiated by the "GPS Acquisition Interval" trigger, data transmission takes place immediately after geolocation is completed in the form of "Payload 2." "Payload 2" contains the same measured variables as "Payload 1" and the recorded geoposition.

If measurement-data acquisition was initiated by the "Monitoring Interval" trigger, data transmission takes place only if the valve position has changed compared with the previous acquisition or the set status change conditions are met. If this is the case, the data is transmitted once in the form of "Payload 1." In addition to the battery status and the temperature, this contains only the valve position and the states of the front-end sensors that are assigned to the triggering monitoring interval.

# 8 Parameterization

You can query and set the WILSEN.valve parameters in the following two ways:

- WILSEN app
- LoRaWAN downlink channel

With the exception of the app-specific parameters, all WILSEN.valve device parameters described below can also be queried and set via the LoRaWAN downlink channel.

For logical reasons, the details of the device parameters are described in this chapter based on the structure and clustering in the WILSEN app.

**Note**

The hexadecimal codes and specific information required for access via the LoRaWAN downlink channel are in a separate document entitled "Downlink Description."

You can find this at www.pepperl-fuchs.com on the product details page for the WILSEN device.

## 8.1 Menu Structures in the WILSEN App

The **Sensor Status & Configuration** menu is the central overview page for further navigation once the user has been successfully authenticated and Bluetooth has been connected.

The menu displays current device information and contains further submenus that allow parameterization of the device.

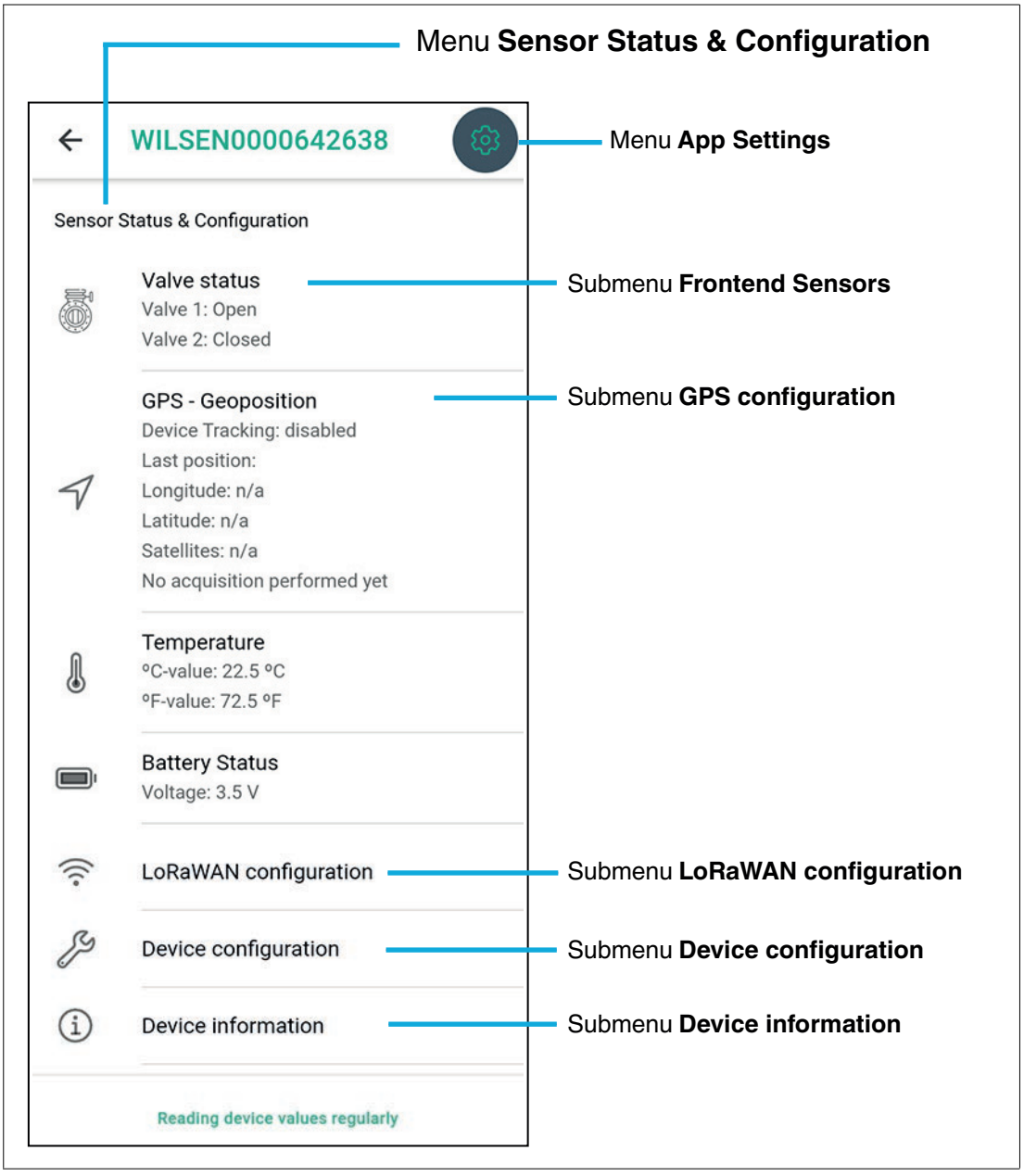



Figure 8.1

The app has the following structure and functions:

| Menu/submenu | Task/content |
|---|---|
| Sensor Status & Configuration | Main menu with submenus and displays for the device |
| App Settings | Changing the language and information about the app version used |
| Frontend Sensor(s) | Setting the parameters for front-end sensor configuration and valve position configuration, and event-driven measurement-data acquisition and measurement-data transmission ("Monitoring interval") |
| GPS Configuration | Setting the parameters for GPS position determination and its transmission interval |
| LoRaWAN Configuration | Setting the LoRaWAN-specific parameters and the transmission interval |
| Device configuration | Setting the displayed device name, changing the device password, various reset options, and deactivating the Bluetooth interface |
| Device Info | Information about the device (device data and counter readings) and the option to update the firmware |

Table 8.1

## 8.2 App Settings Menu

In the **App Settings** menu, you can select the language and color scheme used in the app. In addition, this menu shows legal notices along with the version number of the app installed on your device.

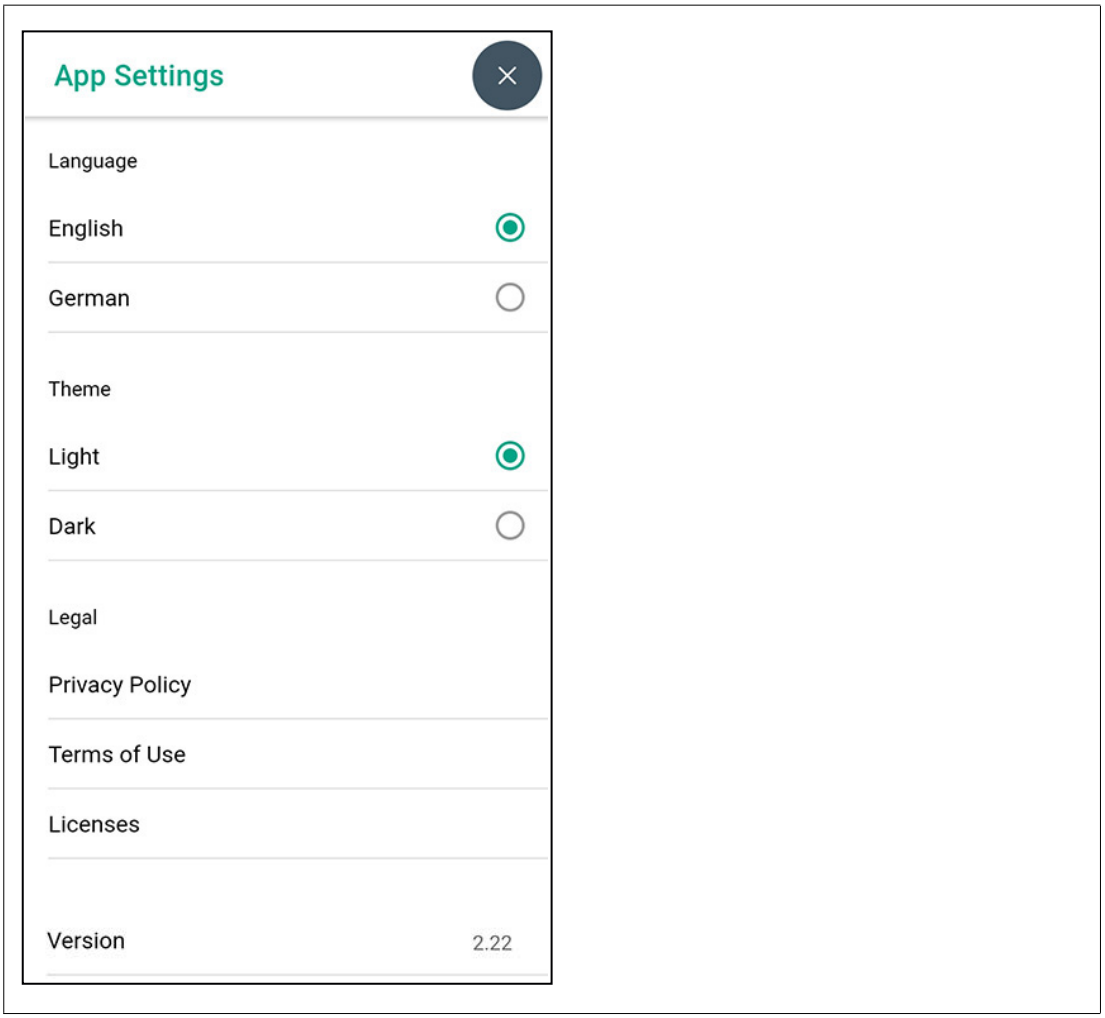



Figure 8.2

## 8.3 Front-End Sensor Configuration

In the **Frontend Sensor(s)** submenu, you can configure the parameters of the connected front-end sensors relevant to the acquisition of the valve position, and event-driven monitoring of the valve(s).

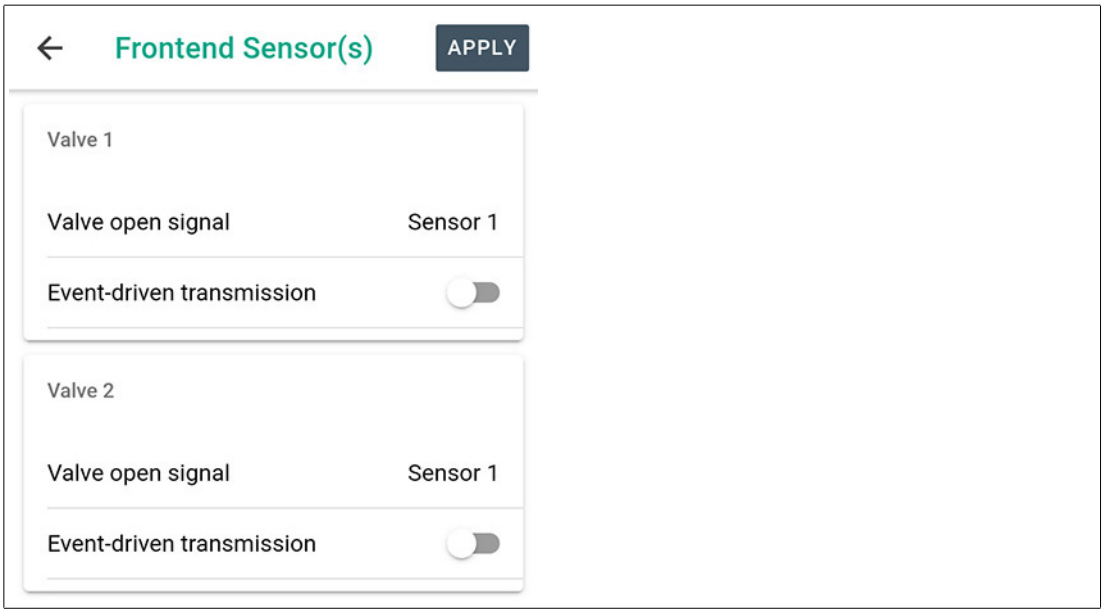



Figure 8.3

When event-driven transmission is enabled for a valve, other parameters associated with this function for that valve are displayed and accessible.

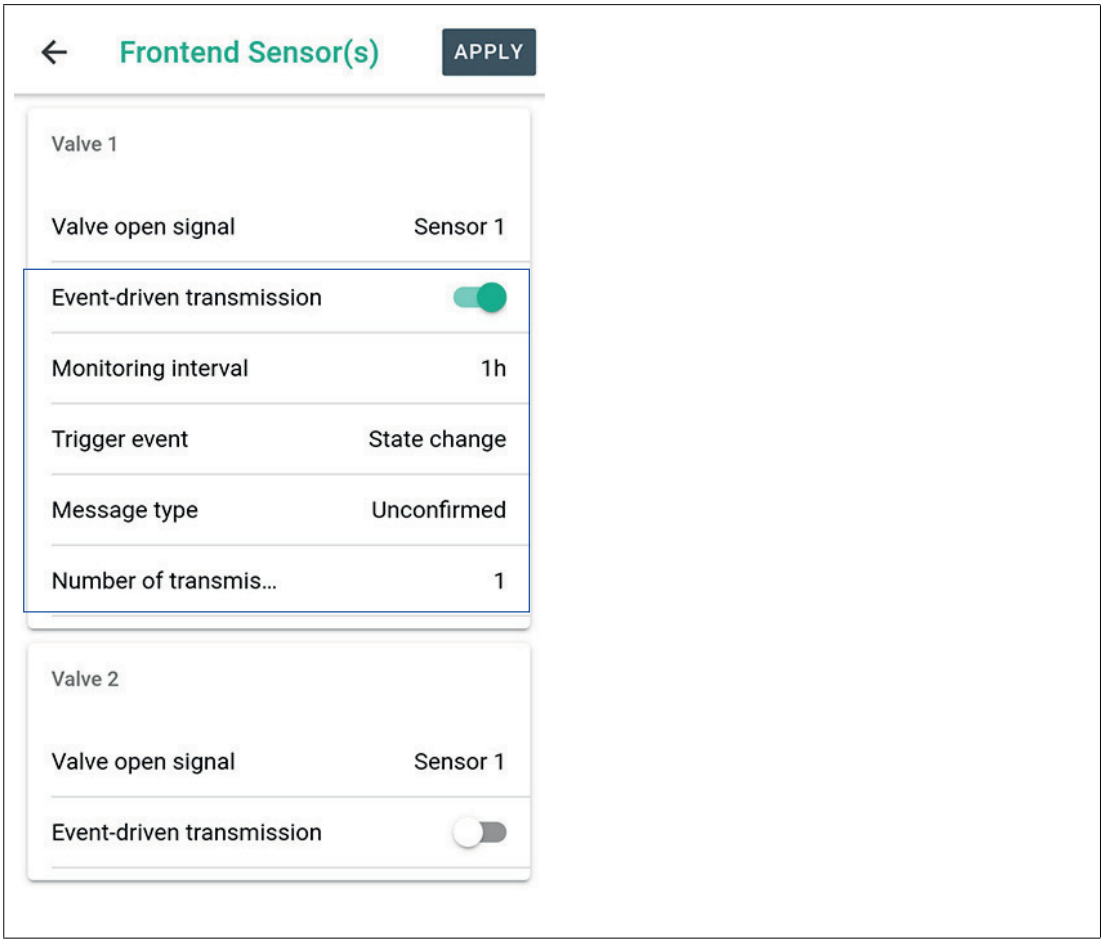



Figure 8.4

**Note**

With WILSEN.valve versions with connection option for two individual sensors, you can monitor only one valve. Consequently, event-driven transmission is only available for this valve (i.e., only once).

**Note**

All the following parameters are available once for each valve that is monitored with the WILSEN.valve.

### 8.3.1 Valve Open Signal

The position of the valve is always determined using two sensor elements. This is independent of whether they are each located in an enclosure as individual sensors or in a common enclosure as a dual sensor. To be able to conclude the "open/closed" valve position correctly, you must use this parameter to set which of the two sensor elements belongs to the "open" valve position.

### 8.3.2 Event-Driven Transmission

Activating this parameter switches on event-driven monitoring for the relevant valve ("Monitoring interval").

Event-driven monitoring means that the position of the valve is detected and checked for changes at the monitoring interval set here, in addition to the regular interval (>> "LoRa transmission interval"). If changes to the valve position are detected during this monitoring that correspond to the notification conditions configured here (>>Trigger event), a message is sent once in accordance with the transmission settings set here.

When this function is activated, the following additional parameters are displayed:

- Monitoring interval
- Trigger event
- Message type
- Number of transmissions

**Note**

Event-driven transmission is disabled by default because this function is not relevant for all valve position applications. This also promotes the longest possible battery life.

Only enable this function if your application actually requires this type of monitoring.

### 8.3.3 Monitoring Interval

If event-driven transmission is activated, this parameter is used to determine the intervals at which the valve position is recorded and checked by querying the front-end sensors.

**Note**

Select this monitoring interval carefully and set it only as short as is actually required for your application. The shorter the selected interval and therefore the more frequently the front-end sensors are queried, the shorter the battery life will be.

It is very easy to estimate the effects of activated event-driven monitoring with appropriately set monitoring intervals on the battery life with the help of our Battery Lifetime Calculator for your application.

You can find this at https://wilsen-services.pepperl-fuchs.com.

### 8.3.4 Trigger Event

This parameter is used to define which change in the valve position leads to a notification being sent as part of event-driven monitoring.

The following options are available:

- State change
- Valve opened
- Valve closed

If "state change" is the set trigger event, a message is sent for each change in the valve position that is detected within the set monitoring interval. A distinction is made between the states "open," "closed," and "undefined".

For "Valve opened", the notification occurs only when the valve position changes to "open." For "Valve closed", the notification occurs only when the valve position changes to "closed."

**Note**

Fulfillment of the trigger condition is evaluated exclusively on the basis of front-end sensor queries from the event-driven monitoring (>> "Monitoring interval").

Only changes detected at the set monitoring interval affect the sending of an event-driven message.

For example:

The monitoring interval of the event-driven monitoring is set to 5min. The valve position in the context of an event-driven query is defined as "open."

One minute later, the valve is moved to an intermediate position (>> "undefined").

Another minute later, the valve is set back to "open."

At the next query set by the monitoring interval after a further three minutes, the valve position is identified as being "open."

The valve position therefore remains unchanged for the WILSEN.valve and it does not respond with a message regarding the "undefined" state that existed briefly in the meantime.

### 8.3.5 Message Type

LoRaWAN offers two possible message types for the transmission of a device payload:

- "Unconfirmed" transmission:
  When you select the message type "Unconfirmed", the WILSEN device sends its message to the gateway according to the set "Number of transmissions" (see following parameter). However, it does not expect a receipt confirmation from the gateway.
- "Confirmed" transmission:
  When you select the message type "Confirmed", the WILSEN device sends its message to the gateway and expects a receipt confirmation. If this is not received within a specified time frame, the sensor sends its message to the gateway a maximum of two more times. The WILSEN device performs a total of three transmission attempts. After the 3rd attempt, if no confirmation is received from the LoRa network server, the WILSEN device discards the current message.

Usually, LoRaWAN sends measurement data from devices to the gateway "Unconfirmed". This minimizes the load on the LoRaWAN network and allows receipt of multiple messages simultaneously on different gateway channels. Receipt of messages is therefore possible in most events. Of course, especially with this type of transmission, messages from one or more devices may not be received by the gateway.

If it is necessary to ensure that a message is received at the gateway, the message type should be "Confirmed". This is especially useful for alarm messages and often for event-driven messages.

**Note**

The message type selected here applies exclusively to event-triggered messages of the respective associated valve. It does not affect regularly transmitted messages triggered by the "LoRa Transmission Interval" or "GPS Acquisition Interval".

Only select a "Confirmed" transmission if it is absolutely necessary for your application. In addition, make sure that the valve position does not change constantly, especially when the query intervals are set very short, in order to prevent overloading the LoRa network due to the large number of confirmed transmissions generated as a result.

### 8.3.6 Number of Transmissions

**Note**

This parameter is only available if the message type is set to "Unconfirmed".

You can choose between the values "1" and "3" as the number of message transmissions (payload).

- With "1", the WILSEN device sends each message (payload) toward the gateway only once.
- With "3", each message is sent a total of three times at short intervals.

Multiple transmissions of the same message increase the probability that each message will actually arrive at the gateway and therefore in the IoT system if the message transmission is "Unconfirmed".

At the same time, however, this also increases the utilization of the LoRa wireless network. In a LoRaWAN network operating near the network capacity limit or with high utilization, there may be an increased likelihood of telegram collisions between different transmitting devices. Messages sent simultaneously from different devices overlap on the wireless transmission path. On the receiving side, this can cause these messages to become inconsistent and therefore be discarded. Multiple transmissions of the same message in LoRaWAN networks with high utilization can therefore counteract the original intention of increasing the probability of receiving the message on the gateway side.

**Note**

The number of transmissions selected here applies exclusively to event-triggered messages of the respective associated valve. It does not affect regularly transmitted messages triggered by the "LoRa Transmission Interval" or "GPS Acquisition Interval".

### 8.3.7 "Apply" Button

The changes made to parameters are only transferred to the device and permanently stored there when the "Apply" button is tapped.

## 8.4 GPS Configuration

In this submenu, you can switch on the GPS function of the WILSEN device and set the GPS accuracy, the position determination frequency, and the transmission settings for the associated messages ("Payload 2").

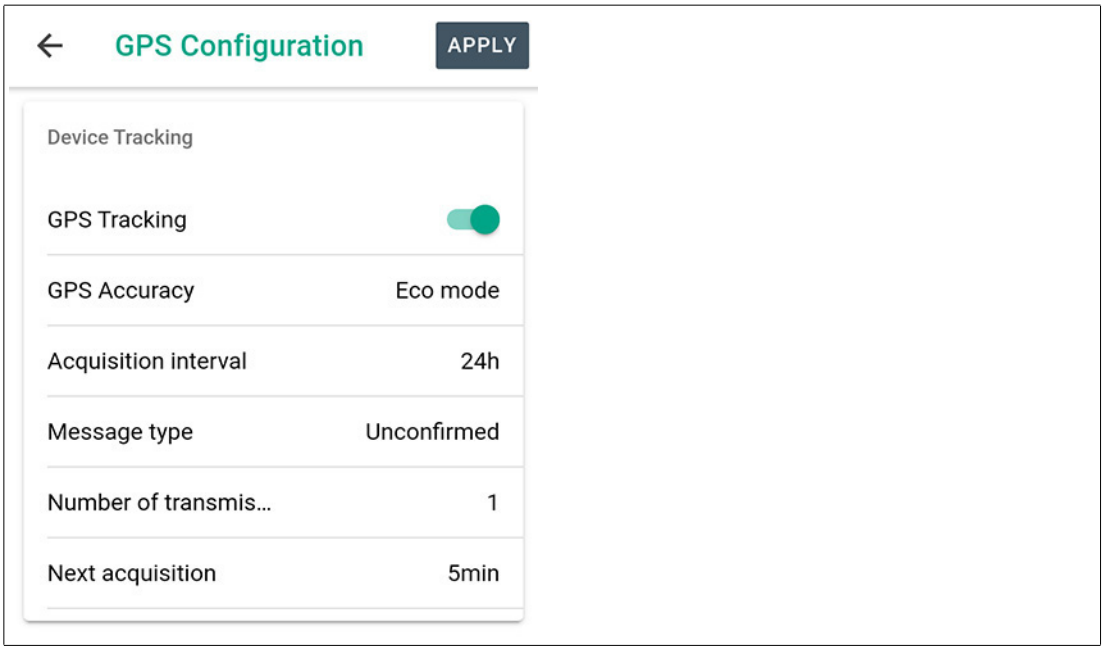



Figure 8.5

**Note**

An initial or newly initiated acquisition of the GPS position will only take place after the time set in the "Next acquisition" parameter has elapsed. Unless another setting has been made for this parameter, the default setting is five minutes. When you tap the "Apply" button, a corresponding countdown timer is displayed at the bottom of the GPS configuration menu. After the 1st successful acquisition of the sensor, this countdown timer in the app will disappear.

### 8.4.1 GPS Tracking

This switch activates the GPS function of the WILSEN device. The following additional parameters will then be displayed in the app.

- GPS Accuracy
- Acquisition interval
- Message type
- Number of transmissions
- Next acquisition

### 8.4.2 GPS Accuracy

WILSEN devices with firmware version 2.5 or later offer the option of defining the positioning accuracy for GPS localization.

Each position acquisition generally requires a relatively large amount of energy and therefore always has a negative impact on the battery life. However, the accuracy of position acquisition is also crucial for the amount of energy required. The more precise the position needs to be, the longer the GPS module has to be in operation to locate it and the higher the energy requirement.

The two selection options for the "GPS Accuracy" parameter are:

- "Eco mode"
  "Eco mode" is suitable for all applications where locating the WILSEN device with an accuracy of about 75–100 meters from the actual position is sufficient. A medium level of energy consumption is sufficient for this accuracy.
- "Precision mode"
  "Precision mode" achieves positioning accuracies of around five to ten meters from the actual position. The energy requirement in "Precision mode" is disproportionately higher and has a greater impact on the battery life than "Eco mode".

**Note**

Select the GPS accuracy that is appropriate for your application and locate the device only as often as necessary to achieve the longest possible battery life.

If the position of the WILSEN device does not have to be tracked permanently, it is possible to switch its GPS localization on and off as required via the LoRaWAN downlink channel using the "GPS Tracking (ON/OFF)" parameter and, if necessary, the additional "Acquisition interval" and "Next acquisition" parameters. Despite the need for temporary device localization, this significantly extends the battery life.

You can easily estimate the impact of GPS localizations of the WILSEN device on the settings required for your application using our battery runtime calculator. You can find this at https://wilsen-services.pepperl-fuchs.com.

### 8.4.3 Acquisition Interval

The "Acquisition interval" parameter determines the frequency of the GPS position determination. At each of these points in time, the front-end sensors are queried in parallel with position acquisition, therefore recording the valve position(s). All data collected is transmitted together in "Payload 2."

**Note**

More information on the structure and content of "Payload 2" can be found in the additional document entitled "Payload Description (Uplink)" on the product details page at www.pepperl-fuchs.com.

The payload decoders suitable for the WILSEN device (uplink and downlink) can be found at the same location in the "Software" section.

**Note**

The collection of GPS data requires relatively high power consumption. To ensure the longest possible battery service life, select the appropriate GPS acquisition interval for your application. However, avoid "unnecessarily frequent" acquisition.

If the position of the WILSEN device does not have to be tracked permanently, it is possible to switch its GPS localization on and off as required via the LoRaWAN downlink channel using the "GPS Tracking (ON/OFF)" parameter and, if necessary, the additional "Acquisition interval" and "Next acquisition" parameters. Despite the need for temporary device localization, this significantly extends the battery life.

You can easily estimate the impact of GPS localizations of the WILSEN device on the settings required for your application using our battery runtime calculator. You can find this at https://wilsen-services.pepperl-fuchs.com.

**Note**

The "GPS Acquisition Interval" works independently of a "LoRa Transmission Interval" that may be activated in parallel in the sensor (see chapter 8.5)

and of an activated event-driven monitoring and transmission of the valve status (see chapter 8.3).

### 8.4.4 Message Type

This parameter can be used to select one of the two typical LoRaWAN message types for transmitting the "Payload 2" sent in connection with GPS localization:

- "Unconfirmed" transmission:
  When you select the message type "Unconfirmed", the WILSEN device sends its message to the gateway according to the set "Number of transmissions" (see following parameter). However, it does not expect a receipt confirmation from the gateway.
- "Confirmed" transmission:
  When you select the message type "Confirmed", the WILSEN device sends its message to the gateway and expects a receipt confirmation. If this is not received within a specified time frame, the device sends its message to the gateway a maximum of two more times. The WILSEN device performs a total of three transmission attempts. After the 3rd attempt, if no confirmation is received from the LoRa network server, the WILSEN device discards the current message.

**Note**

The message type selected here applies exclusively to "Payload 2" transmissions triggered by the "GPS Acquisition Interval". The message type does not affect regularly transmitted messages triggered by the "LoRa Transmission Interval". The transmission of messages due to event-driven monitoring also remains unaffected by this.

### 8.4.5 Number of Transmissions

**Note**

This parameter is only available if the message type is set to "Unconfirmed".

You can choose between the values "1" and "3" as the number of message transmissions (payload).

- With "1", the WILSEN device sends each message (payload) toward the gateway only once.
- With "3", each message is sent a total of three times at short intervals.

Multiple transmissions of the same message increase the probability that each message will actually arrive at the gateway and therefore the IoT system if the message transmission is "Unconfirmed". This also increases the utilization of the LoRa wireless network.

In a LoRaWAN network operating near the network capacity limit or with high utilization, there may be an increased likelihood of telegram collisions between different transmitting devices. Messages sent simultaneously from different devices overlap on the wireless transmission path. On the receiving side, this can cause these messages to become inconsistent and therefore be discarded. Multiple transmissions of the same message in LoRaWAN networks with high utilization can therefore counteract the original intention of increasing the probability of receiving the message on the gateway side.

**Note**

The message type selected here applies exclusively to "Payload 2" transmissions triggered by the "GPS Acquisition Interval". The message type does not affect regularly transmitted messages triggered by the "LoRa Transmission Interval". The transmission of messages due to event-driven monitoring also remains unaffected by this.

### 8.4.6 Next Acquisition

This parameter is used to define when the next GPS acquisition and therefore also when the next transmission of the relevant payload is to take place. In this way, acquisitions and transmissions can also be defined by multiple WILSEN devices at specific times of the day, depending on the application.

This parameter can also be very helpful if the localization function is only activated as required via the LoRaWAN downlink channel, since this can be used to initiate the very timely start of a new localization after the downlink communication.

### 8.4.7 "Apply" Button

The changes made to parameters are only transferred to the device and permanently stored there when the "Apply" button is tapped.

**Note**

An initial or newly initiated acquisition of the GPS position will only take place after the time set in the "Next acquisition" parameter has elapsed. Unless another setting has been made for this parameter, the default setting is five minutes. When you tap the "Apply" button, a corresponding countdown timer is displayed at the bottom of the GPS configuration menu. After the 1st successful acquisition of the sensor, this countdown timer in the app will disappear.

## 8.5 LoRaWAN Configuration

The **LoRaWAN Configuration** submenu is used to set the wireless connection parameters specific to LoRaWAN and to set the transmission interval.

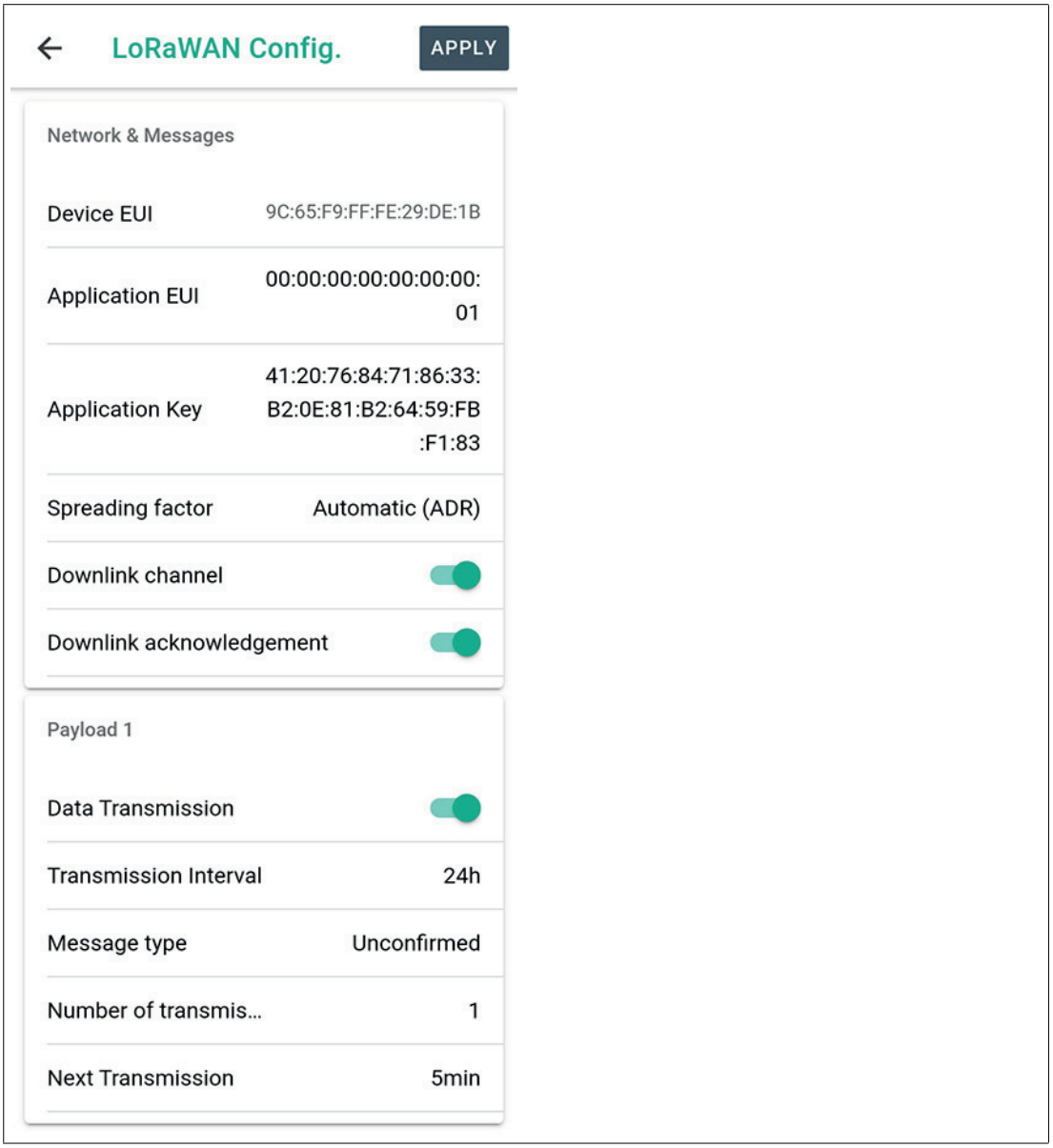



Figure 8.6

### 8.5.1 Device EUI

The "Device EUI" is a device-specific identifier that identifies the device in the LoRa network. It is similar to the MAC address of a node in a computer network.

The device EUI is assigned to every device as a globally unique number according to IEEE rules. For this reason, it is not possible to change the device EUI of your sensor.

### 8.5.2 Application EUI/Join EUI

Application EUI/Join EUI is an identifier optionally assigned by the LoRa network server (LNS) or by you for the relevant application.

The application EUI is preset with a uniform value and is identical for each sensor in the delivery state. This value can be used to establish a connection to a LoRa network. However, it is recommended that this value be adjusted to suit the particular LoRa environment when the sensor is commissioned.

### 8.5.3 Application Key

The application key is used to encrypt the sensor measurement data before it is transmitted.

A random number is assigned at the factory as the application key and this is unique for each sensor unit. This default value only needs to be changed if the LoRa network provider or an existing LoRa environment defines a specific value for the application key. If it is not defined in this way, the application key provided by the sensor unit can be transferred to the intended LoRa environment.

### 8.5.4 Spreading Factor

The spreading factor is a LoRaWAN parameter that is used to set the transmission strength and data rate of the device. These values depend on the individual influences and conditions on the wireless link between the device and the gateway.

The following two relationships apply:

- Device: The higher the spreading factor, the higher the transmitting power and longer the transmission duration and therefore the higher the energy consumption in the transmitting device.
- LoRaWAN network: The higher the spreading factor, the longer the data transmission and therefore the higher the load/occupancy of the LoRaWAN network.

Further details can be found at https://lora-alliance.org/about-lorawan/.

In most applications, "Automatic (ADR)" (adaptive data rate) is the appropriate setting. In this case, the LoRa network server regulates the sensor spreading factor to a degree that is appropriate to the actual conditions of the wireless link. First, the wireless transmission begins after the sensor rejoins/joins (Join / Rejoin) the LoRa network with a high spreading factor. This ensures that the first transmissions are successful even under poor conditions. The spreading factor is gradually reduced depending on the signal strength received and the signal-to-noise ratio. The LoRaWAN network server performs this task.

The "Automatic (ADR)" setting usually represents the optimal compromise between energy consumption for wireless transmission, low load on the LoRaWAN wireless network due to short transmission time, and good reliability of data reception on the server side.

In some applications, there are no stable conditions on the wireless link. Changes in the environmental influences or EMC influences occur. Both can lead to unreliable transmission of the data.

There are also applications in which there is essentially only poor LoRaWAN wireless coverage. For example, this could be in an urban environment with only a few gateways that may be positioned very far away and/or with sensor operating locations that are heavily shielded in terms of wireless technology.

In such circumstances, the "Automatic (ADR)" setting may not work reliably. Either no data can arrive at the gateway or only sporadically, i.e., with dropouts. For these applications, a fixed setting of the spreading factor is usually advantageous—usually a high setting such as SF11 or SF12.

Conversely, there are also applications in which consistently very good LoRa network coverage is ensured. In such a case it can also be advantageous to set the spreading factor to a fixed value. We recommend low settings such as SF7 and SF8. Therefore, even when the sensor joins/rejoins, the spreading factor is directly adapted to the very good conditions, which means a lower energy consumption than with "ADR."

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**Note**

The selected spreading factor applies to the transmission of all payloads of the device.

To ensure the longest possible battery life, select a spreading factor appropriate for your application. Avoid unnecessarily high settings.

### 8.5.5 Downlink Channel

**Note**

The downlink channel in the device is switched on at the factory in the delivery state.

A detailed description of how the downlink channel works and how to use it can be found in the separate document "Downlink Description." You can download this online from the product detail page relating to your WS*F406-B41 WILSEN device at www.pepperl-fuchs.com.

This parameter is used to activate the downlink channel in the WILSEN device. When the downlink channel is switched on, the WILSEN device is able to receive and process messages via the LoRa network. This allows you to query or change parameter settings in the WILSEN device via the LoRa network.

### 8.5.6 Downlink Acknowledgement

**Note**

This parameter is only available if the downlink channel is activated.

If this parameter is activated, the WILSEN device sends a confirmation to the LoRa network server in response to incoming downlink messages after they have been processed. In this way, it is possible to check the correctness of a command and its proper processing in the WILSEN device.

If the downlink acknowledgment is not activated, the device will process incoming downlink messages with changed parameter values, but no acknowledgment will be sent to the LoRa network server.

It is always possible to query the currently set parameter values in the WILSEN device via the downlink channel, regardless of the downlink acknowledgment, even if the acknowledgment is deactivated.

### 8.5.7 Data Transmission

As long as the "Data Transmission" parameter is enabled in the "LoRaWAN Configuration" menu, the sensor sends the data contained in "Payload 1;" see separate document entitled "Payload Description." The frequency of this transmission and the time schedule are defined using the additional parameters "Transmission Interval" and "Next Transmission".

### 8.5.8 Transmission Interval

This parameter determines the time intervals at which data transmission takes place. If "6h" is selected, the sensor sends its data every six hours. The start time of the interval can be controlled using the "Next Transmission" parameter.

**Note**

The transmission interval selected here applies exclusively to regular "Payload 1" transmissions.

It has no effect on Payload 2 transmissions triggered by the set GPS interval.

The transmission of messages due to event-driven monitoring also remains unaffected by this.

**Caution!**

Observe the maximum permissible transmission time per device!

Legal regulations in Europe allow a maximum permissible transmission time (air time/duty cycle) of 1 % per hour for the use of the 868 MHz band per device. If the "Transmission Interval" parameter is set to a value of at least 30 minutes, this requirement is fulfilled regardless of the other influencing factors. A transmission interval of ten minutes may only be set permanently if the GPS function of the sensor is deactivated. A LoRa transmission interval of less than ten minutes may only be set for a short time. If such a setting is configured in the app, a corresponding message is displayed and the parameter is reset to the last non-critical value as soon as the app connection to the sensor is terminated.

The user is responsible for complying with the 1 % requirement. Failure to comply with this requirement may result in criminal penalties.

Please note that in other countries, based on legal requirements or requirements issued by LoRa network operators and other institutions, additional, possibly stricter restrictions may apply, and must be observed.

**Note**

To ensure the longest possible battery life, select a transmission interval appropriate for your application. However, avoid setting an "unnecessarily short" interval and therefore "too frequent" measurement and transmission.

### 8.5.9 Message Type

LoRaWAN offers two possible message types for the transmission of a device payload:

- "Unconfirmed" transmission:
  When you select the message type "Unconfirmed", the sensor sends its message to the gateway according to the set "Number of transmissions" (see following parameter). However, it does not expect a receipt confirmation from the gateway.
- "Confirmed" transmission:
  When you select the message type "Confirmed", the sensor sends its message to the gateway and expects a receipt confirmation. If this is not received within a specified time frame, the sensor sends its message to the gateway a maximum of two more times. The sensor performs a total of three transmission attempts.
  If no confirmation is received from the LoRa network server after the 3rd attempt, the sensor discards the current message. After the set LoRa transmission interval has expired, the sensor rejoins the LoRa network. It then records new data, which are then transmitted again with a request for a receipt confirmation.

Usually, LoRaWAN sends the measurement data from devices to the gateway "Unconfirmed". This minimizes the load on the LoRaWAN network and allows receipt of multiple messages simultaneously on different gateway channels. Receipt of messages is therefore possible in most events. Of course, especially with this type of transmission, messages from one or more devices may not be received by the gateway.

If it is necessary to ensure that a message is received at the gateway, the message type should be "Confirmed". Examples include the alarm message from a smoke detector or when using the WILSEN products as overfill protection or similar. However, it should be noted in this case that for each message from each device set up in this way, a receipt confirmation is requested/required by the gateway. While the gateway is sending this receipt confirmation, the high signal strength means that it is not possible to receive other messages on the gateway at the same time. This quickly overloads the LoRa network, especially in the case of a high number of communications with requested confirmation. It may also be the case that no other messages can be received.

For this reason, there is a general time limit for the downlink transmission capacity for LoRaWAN gateways. This relates to the transmission of data from the gateway toward the devices. LoRaWAN gateways may only use a maximum of 10 % of their total operating time to send downlink messages. In other words: 90 % of the time, the gateway must be available to receive messages.

**Note**

The message type selected here applies exclusively to "Payload 1" transmissions triggered by the "LoRa Transmission Interval". It does not affect regularly transmitted messages triggered by the "GPS Acquisition Interval". The transmission of messages due to event-driven monitoring also remains unaffected by this.

Only select a "Confirmed" transmission of the data if it is absolutely necessary for your application. In this case, the setting for the measurement / transmission interval must also be as long as possible.

### 8.5.10 Number of Transmissions

**Note**

This parameter is only available if the message type is set to "Unconfirmed".

You can choose between the values "1" and "3" as the number of message transmissions (payload).

- With "1", the sensor sends each message (payload) toward the gateway only once.
- With "3", each message is sent a total of three times at short intervals.

Multiple transmissions of the same message increase the probability that each message will actually arrive at the gateway and therefore the IoT system if the message transmission is "Unconfirmed". This also increases the utilization of the LoRa wireless network. In a LoRaWAN network operating near the network capacity limit or with high utilization, there may be an increased likelihood of telegram collisions between different transmitting devices. Messages sent simultaneously from different devices overlap on the wireless transmission path. On the receiving side, this can cause these messages to become inconsistent and therefore be discarded. Multiple transmissions of the same message in LoRaWAN networks with high utilization can therefore counteract the original intention of increasing the probability of receiving the message on the gateway side.

**Note**

The number of transmissions selected here applies exclusively to "Payload 1" transmissions triggered by the "LoRa Transmission Interval". It does not affect regularly transmitted messages triggered by the "GPS Acquisition Interval". The transmission of messages due to event-driven monitoring remains unaffected by this.

Decide on the transmission interval for a message with care and choose an interval that is appropriate for your application.

### 8.5.11 Next Transmission

This parameter determines the start time of the transmission interval. Depending on whether you set the parameter via the WILSEN app or via the LoRaWAN downlink channel, the 1st data transmission takes place at different times.

- Via the WILSEN app:
  For example, if the "Next Transmission" parameter is set to "5min", the 1st data transmission of the set interval takes place five minutes after the changed settings have been transmitted to the sensor by tapping the "Apply" button.
- Via the LoRaWAN downlink channel:
  With this parameterization, the 1st data transmission of the set interval takes place five minutes after the corresponding LoRaWAN downlink message is received by the WILSEN device.

By configuring this parameter, it is also possible to define a transmission time within a specific time frame for a number of sensors, e.g., "always in the first quarter of an hour".

### 8.5.12 "Apply" Button

The changes made to parameters are only transferred to the device and permanently stored there when the "Apply" button is tapped.

A payload transmission according to adjusted LoRaWAN settings first takes place after the time set in the "Next Transmission" parameter has expired. Therefore, when you tap the "Apply" button, a corresponding countdown timer is displayed at the bottom of the LoRaWAN configuration menu. After the first transmission and therefore also during normal operation of the sensor, this countdown counter in the app is hidden again.

## 8.6 Device Configuration

The **Device configuration** submenu displays the device name and allows you to disable the Bluetooth interface of the sensor, change the device password, reset the device to factory settings, and reset the counters.

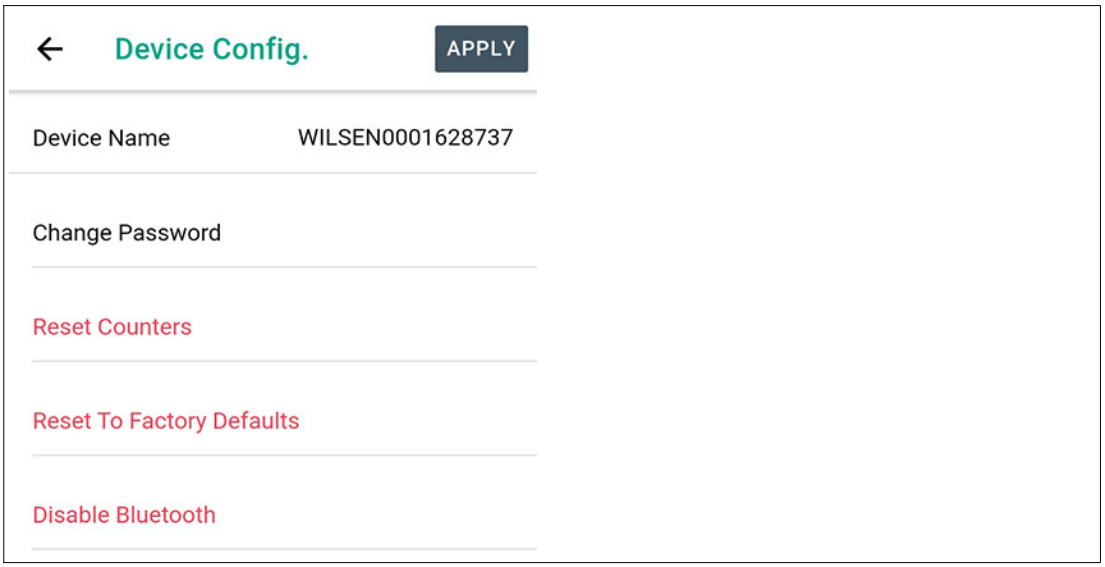



Figure 8.7

### 8.6.1 Device Name

The device name that is currently assigned to the device is displayed here. You can change this by tapping the name and customizing it using the keyboard that appears.

### 8.6.2 Change Password

Here you can change the password for accessing the sensor via the Bluetooth interface. The default value for the password is "00000000".

As a password, you can enter an unlimited number of alphanumeric characters and special characters from the UTF-8 character range.

To ensure a sufficient level of security, we strongly recommend that the sensor password is changed when the device is commissioned so that it differs from the default password. The new password must consist of at least eight characters and must also be changed at regular intervals in the future.

**Caution!**

Note the new password to access the device in the future.

Make a note of the new password in a secure location. Neither the user nor the manufacturer can reset or retrieve a forgotten or lost password.

### 8.6.3 Reset Counters

Use this button to reset the counters that are running in the sensor to monitor the frequency of front-end sensor queries, GPS position acquisition, and LoRa transmissions. This may be useful after a battery change.

**Note**

The current counter readings can be found in the "Sensor Information" menu and are cyclically transmitted in a trimmed-down form with the sensor heartbeat ("Payload 3") via LoRaWAN.

Only the counter readings since last reset can be reset. The total counter readings are continuously incremented from the production of the sensor and cannot be reset.

### 8.6.4 Reset to factory settings

This button takes you to another submenu where three reset options are available.

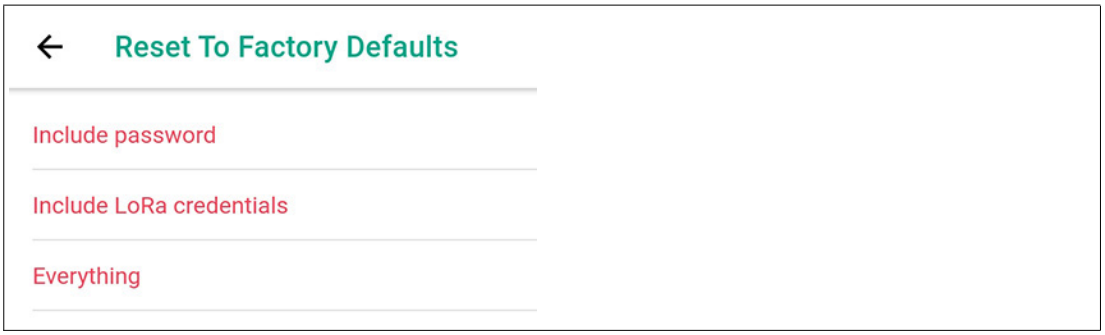



Figure 8.8

**Include password**

If you select this option, all device parameters, including the password, are reset to the factory settings. The LoRa credentials will remain unchanged.

**Include LoRa credentials**

If you select this option, all device parameters, including the LoRa credentials, are reset to the factory settings. The password will not be reset.

**Everything**

If you select this option, all device parameters, including the password and LoRa credentials, are reset to the factory settings. The sensor will completely revert to its delivery state.

### 8.6.5 Disable Bluetooth

This button can be used to deactivate the Bluetooth interface of the sensor. This may be useful after commissioning and parameterizing the sensor to make unauthorized access to the sensor even more difficult.

You can reactivate the Bluetooth interface by disconnecting the battery for approximately ten seconds and reconnecting it. Alternatively, you can use the LoRaWAN downlink channel to switch Bluetooth on again on the respective device using the corresponding command. This requires an activated downlink channel in the device; see chapter 8.5.5.

The Bluetooth interface is then available again as usual.

**Note**

Please note that deactivating the Bluetooth interface will immediately stop contact with the sensor through the app. The sensor can then no longer be found in the device search list of the app.

## 8.7 Device Information

The **Device Information** submenu contains a variety of information about the device, such as device data and counter readings. It also includes the function for over-the-air firmware updates.

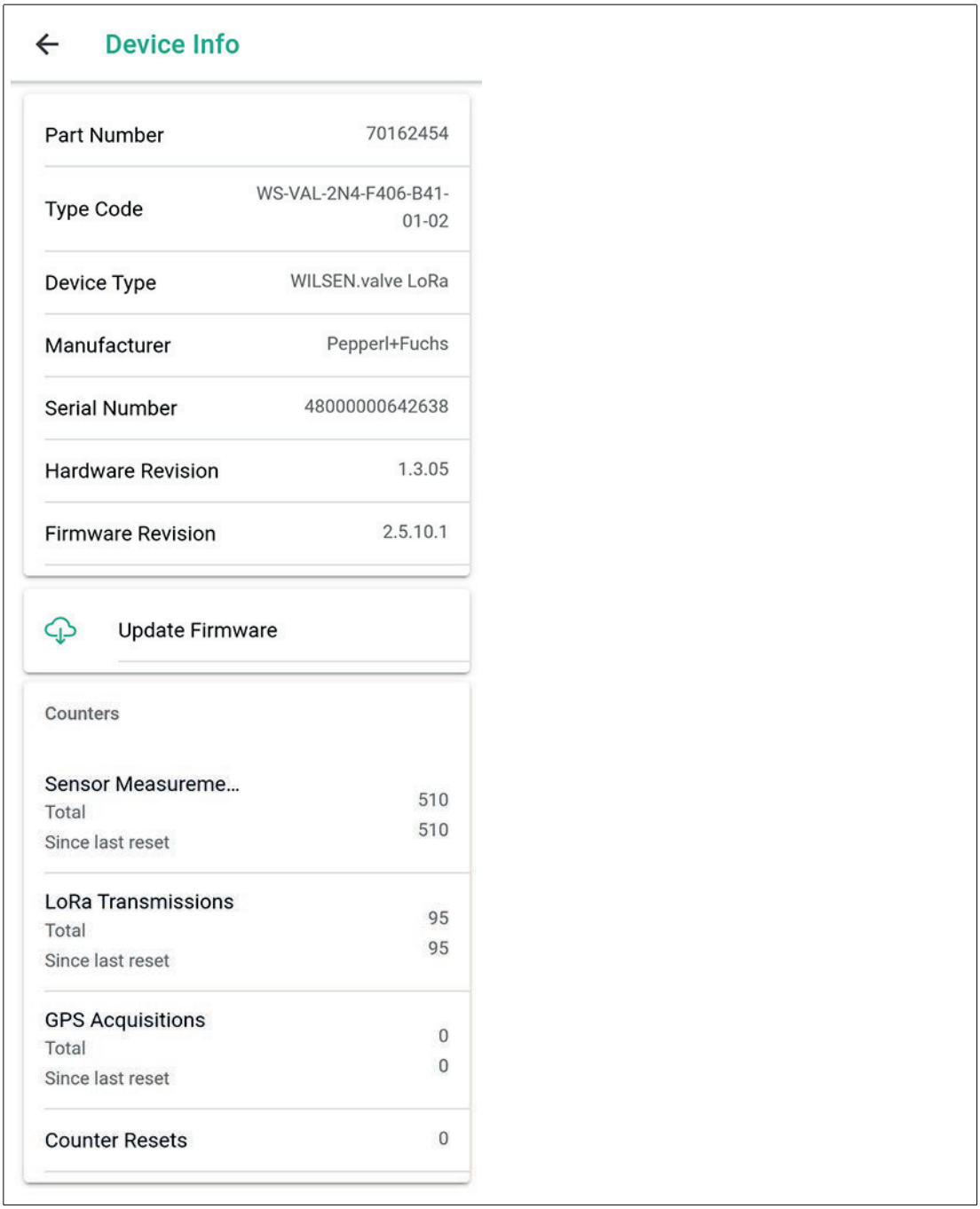



Figure 8.9

### 8.7.1 Firmware Update

**Note**

You can only update the device firmware using the WILSEN app and via the device's Bluetooth interface, not via LoRaWAN.

Pressing this button initiates an over-the-air update of the device firmware after a confirmation prompt. A newer version of the firmware is downloaded and installed on the device via the internet connection of the mobile device you are using.

**Note**

If a more up-to-date version is available, executing this function will overwrite the existing firmware on the device without any further prompt. Some device parameters may be reset to their factory settings.

After updating to a newer firmware version, it is no longer possible to revert to an earlier firmware version.

### 8.7.2 Counters

The device logs the execution frequency of some functions. The collected data is displayed under the heading "Counters". In each case, the frequency since the device was manufactured (= "Total counter readings") and the frequency since the last reset of the counter readings are displayed.

"Counter Resets" also shows how many times the user has reset the counter readings on the current device. This data also provides information about the life status and the history of the device.

**Note**

The full range of counter readings only appears in the WILSEN app.

However, all counter readings since the last reset are also transmitted once a day via LoRaWAN as part of the status payload (payload 3), therefore providing information about the device life status.

# 9 Servicing

The device itself is maintenance-free. For this reason, it is not necessary to carry out regular adjustments or maintenance work on the device itself.

However, check that the device is securely fitted at the installation location within the scope of routine maintenance intervals.

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# 10 Exchanging the Battery

The device battery is exchangeable. Spare batteries are available from Pepperl+Fuchs.

The device battery is designed for a long service life. The energy consumption of the device depends on the device parameterization and the conditions at the operating location, such as the distance between the device and the LoRa gateway, and climatic conditions.

## Safety Notes for Exchanging the Battery

**Warning!**

Risk of injury if the battery is faulty!

This device uses a high-energy cell for its voltage supply. This battery contains lithium and thionyl chloride. If these substances escape, the appropriate protective measures must be observed. Refer to the safety datasheet.

In the event of leakage, contact with the skin or eyes may cause severe irritation and burns. Inhalation of electrolyte vapors may affect the upper respiratory tract and lungs.

**Note**

You can find the safety datasheet for lithium thionyl chloride batteries online at www.pepperl-fuchs.com, on the product detail page for the respective WILSEN device.

**Warning!**

Non-genuine batteries jeopardize operational safety!

Use only genuine spare batteries from Pepperl+Fuchs; otherwise the function and safety of the device cannot be guaranteed. At worst, unapproved batteries can result in personal injury or property damage due to fire. Unapproved batteries may become discharged earlier than genuine batteries.

**Note**

**Observe the following rules when exchanging the battery**

- Before opening the device, make sure that moisture cannot penetrate the device and, if necessary, rub the device dry.
- Before and while opening the device, check that the battery to be exchanged is intact and that no chemicals have leaked out. If they have, stop exchanging the battery immediately and close the enclosure. Observe the information in the safety datasheet for the battery.
- Ensure that the new battery is well-secured in the device by the hook-and-loop tape and ensure that no part of the hook-and-loop tape will be trapped by the closing edge of the enclosure.
- Make sure that the battery connection cable is only routed inside the device and cannot be trapped when the enclosure cover is closed.

## Exchanging the Battery

**Note**

The following steps use a WILSEN.sonic.level device as an example. The procedure is the same for all WILSEN device versions.




Figure 10.1

1. Open the locking mechanism of the enclosure using a screwdriver.
2. Open the enclosure cover.

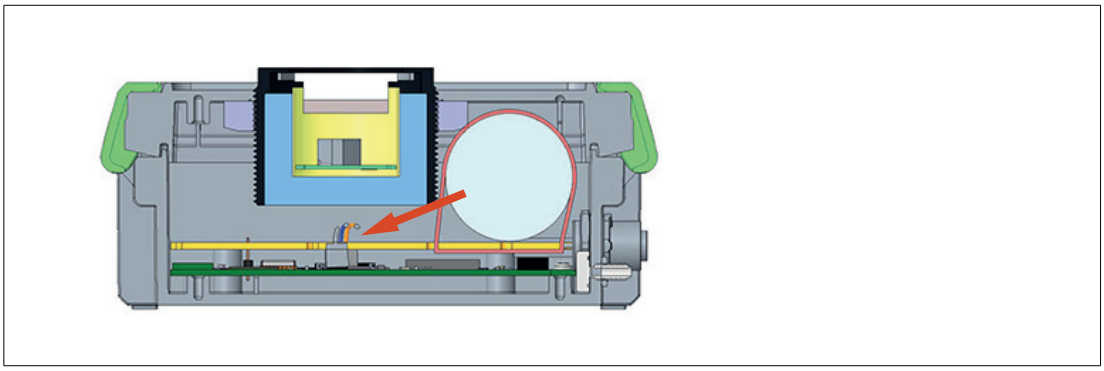


Figure 10.2

3. Carefully pull the plug of the battery connection cable out of the connector.
4. Detach the hook-and-loop tape securing the battery and remove the old battery.

5. Dispose of the battery in accordance with regulations.

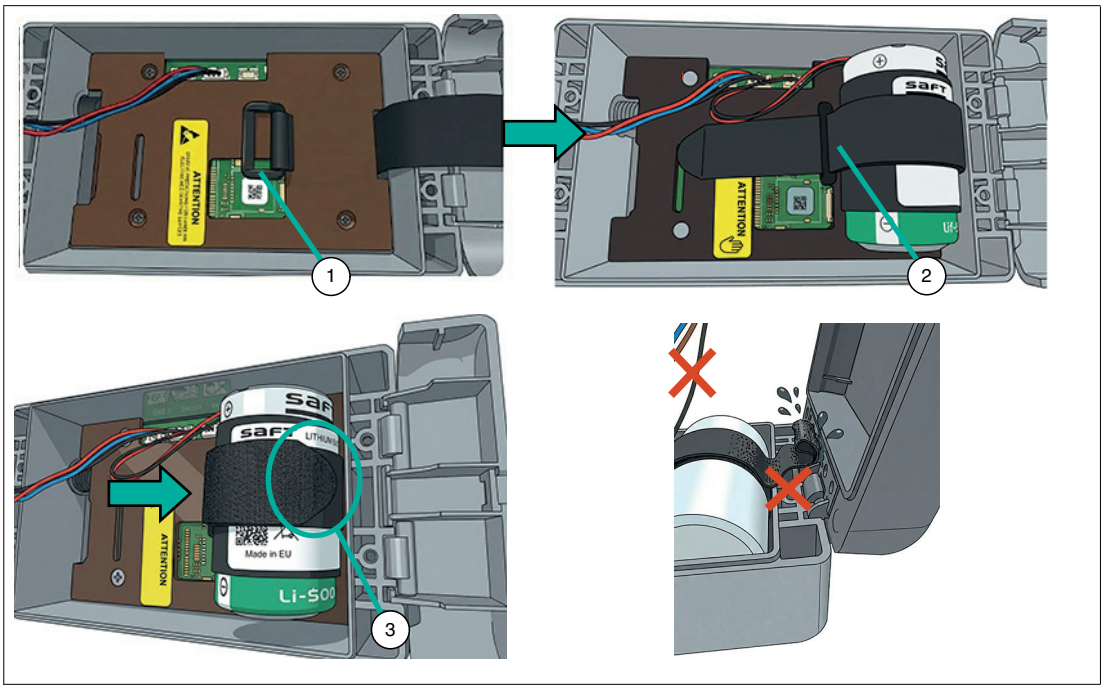



Figure 10.3

6. Before inserting the new battery, make sure that the clasp (1) for the hook-and-loop tape is close to the base plate. If this is not the case, correct the position of the hook-and-loop tape and insert the battery in the intended installation position.
7. Place the hook-and-loop tape around the battery and guide it through the clasp (2).
8. Tighten and secure the hook-and-loop tape so that it fits tightly around the battery and ends near the closing edge of the enclosure (3). No part of the hook-and-loop tape may be outside the enclosure or on the closing edge of the enclosure cover.
9. Plug the battery connection cable on the motherboard into one of the white connectors. Since the cables are connected internally, the plug-in position does not matter.
10. Check that the LED briefly lights up. This indicates that the device is ready for operation.

**Caution!**

Do not trap the battery cable and hook-and-loop tape.

When closing the enclosure cover, take care to ensure that the battery connection cable and hook-and-loop tape are completely in the enclosure and are not trapped by the closing edge. Otherwise, the device may malfunction and the degree of protection can no longer be guaranteed.

11. Close the enclosure cover and snap the device locking mechanism into place.

**Note**

After exchanging the battery, it may be useful to reset the sensor operating counters. If you want to do this, launch the WILSEN app on your mobile device and switch to the "Device configuration" menu. Select the "Reset counters" function.

It is also possible to reset the operation counters by sending the corresponding command via the LoRaWAN downlink channel.

# 11 Cleaning

It is not necessary to clean the device regularly.

If cleaning is required, please observe the following general rules:

- Only with water without chemicals
- Without pressure / high pressure
- Only by using a soft cloth
- No abrasive cleaning, scratching, or scrubbing

# 12 Repair

The device must not be repaired, changed, or manipulated. In case of failure, always replace the device with an original device.

# 13 Disposal

The device, built-in components, packaging, and any batteries contained within must be disposed in compliance with the applicable laws and guidelines of the respective country.

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