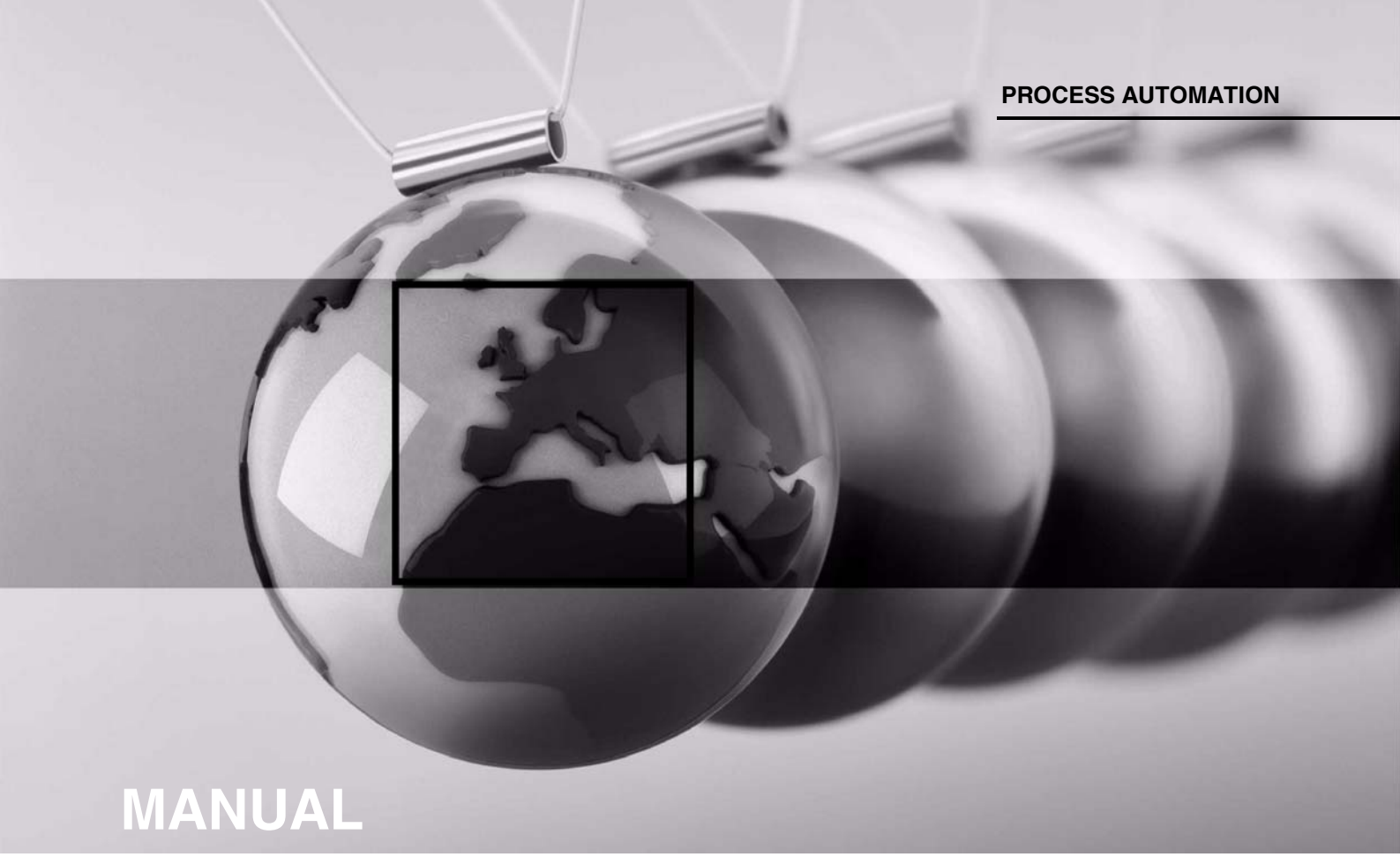


# MANUAL

# WHA-UT-F7B1-0-PP-Z1-Ex2

## *Wireless*HART® Temperature Converter


WirelessHART

PEPPERL+FUCHS
PROTECTING YOUR PROCESS

With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

# 1 Safety

## 1.1 Validity

The chapter “Safety” is valid as instruction manual.

Specific processes and instructions in this document require special precautions to guarantee the safety of the operating personnel.

## 1.2 Symbols used

This document contains information that you must read for your own personal safety and to avoid property damage. Depending on the hazard category, the warning signs are displayed in descending order as follows:

### Safety-relevant symbols


***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 devices and any connected facilities or systems, or result in their complete failure.

### Informative symbols

***Note!***

This symbol brings important information to your attention.

Action

This symbol indicates a paragraph with instructions.

## 1.3 Target Group / Personnel

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

Mounting, installation, commissioning, operation, maintenance and disassembly of any devices may only be carried out by trained, qualified personnel. The instruction manual must be read and understood.

## 1.4 Reference to further documentation

Laws, standards, or directives applicable to the intended use must be observed. In relation to hazardous areas, Directive 1999/92/EC must be observed.

The corresponding data sheets, declarations of conformity, EC-type-examination certificates, certificates and Control Drawings if applicable (see data sheet) are an integral part of this document. You can find this information under www.pepperl-fuchs.com.

Due to constant revisions, documentation is subject to permanent change. Please refer only to the most up-to-date version, which can be found under www.pepperl-fuchs.com.

2014-07

## 1.5 Marking

*Wireless*HART® Temperature Converter
WHA-UT-F7B1-0-PP-Z1-Ex2

Pepperl+Fuchs GmbH

Lilienthalstraße 200, 68307 Mannheim, Germany

EC-Type Examination Certificate: IMQ 09 ATEX 008X

Ex II 2(1)G Ex ia [ia] IIC T4

## 1.6 Intended Use

The devices are only approved for appropriate and intended use. Ignoring these instructions will void any warranty and absolve the manufacturer from any liability.

The device must only be operated in the ambient temperature range and at the relative humidity (non-condensing) specified.

The device is an intelligent *Wireless*HART device designed for the transmission of measured values from connected C&I or HART devices.

The approved usage of the connected device(s) and gateway can be taken from the corresponding parts of their instruction manual.

## 1.7 Improper Use

Protection of the operating personnel and the overall system is not ensured if the product is not being used according to its intended purpose.

## 1.8 Mounting and Installation

Prior to mounting, installation, and commissioning of the device you should make yourself familiar with the device and carefully read the instruction manual.

The device must not be installed at locations where corrosive vapors may be present.

Do not install damaged or polluted devices.

Only use accessories specified by the manufacturer.

Prevent any electrostatic charge that could result in electrostatic discharge while installing or operating the device.

If devices have already been operated in general electrical systems, they may subsequently no longer be installed in electrical systems used in combination with hazardous areas.

The installation instructions in accordance with IEC/EN 60079-14 must be observed.

Connection or disconnection of energized non-intrinsically safe circuits is only permitted in the absence of a hazardous atmosphere.

If "Ex i" protected circuits (intrinsically safe) were operated with non-intrinsically safe circuits, they must no longer be used as "Ex i" protected circuits.

The usage of 2400 MHz equipment is bound to local restrictions. Ensure that local restrictions allow usage of this product before commissioning.

| Country | Guideline |
|---|---|
| Bulgaria | General authorization required for outdoor use and public service. |
| Italy | If used outside of own premises, general authorization is required. |
| Japan | The device is granted pursuant to the Japanese Radio Law and the Japanese Telecommunications Business Law.<br>The device must not be modified (otherwise the granted designation number will become invalid). |
| Latvia | The outdoor usage of the 2.4 GHz band requires an authorization from the Electronic Communications Office. |
| Norway | May be restricted in the geographical area within a radius of 20 km from the center of Ny-Alesund. |
| Rumania | Use on a secondary basis. Individual license required. |

## 1.9 Housing

To ensure the IP degree of protection:

- all seals must be undamaged and correctly fitted
- all screws of the housing and its cover must be tightened with the appropriate torque
- only cable of the appropriate size must be used in the cable glands
- all cable glands must be tightened with the appropriate torque
- all empty cable glands must be sealed or plugged with corresponding plugs

## 1.10 Operation, Maintenance, Repair

The devices must not be repaired, changed or manipulated.

If there is a defect, the product must always be replaced with an original device.

When the device is in operation, a distance of at least 20 cm must be maintained at all times between the device antenna and the body of the user or any other person within the vicinity of the measuring point irrespective of application or use.

The housing when energized may be opened for service in Zone 1.

Only use accessories specified by the manufacturer.

The device uses a battery unit containing non-rechargeable, high-power batteries. Please refer to the separate battery safety instructions before storing, handling, transporting and disposing of the batteries.

Leaking battery acid may cause personal injury and damage to the device.

- Never use batteries that are leaking.
- Never use batteries with external damages such as dents or deep scratches, even if no battery acid is leaking.
- Check the battery compartment for battery acid leakage at regular intervals.

2014-07

## 1.11 Delivery, Transport, Disposal

Check the packaging and contents for damage.

Check if you have received every item and if the items received are the ones you ordered.

Keep the original packaging. Always store and transport the device in the original packaging.

Always store the device in a clean and dry environment. The permitted storage temperature (see data sheet) must be considered.

Disposing of devices, packaging material, and possibly contained batteries must be in compliance with the applicable laws and guidelines of the respective country.

# 2 Product Specifications

## 2.1 Introduction

The HART® (Highway Addressable Remote Transducer) communication protocol is used by many 4 ... 20 mA transmitters to enable digital communication for diagnosis and maintenance purposes. Many device parameters, but also measurement values, can be transmitted digitally to and from the device. Until now, HART® technology has mostly been using the wired 4 ... 20 mA loop as physical layer.

*Wireless*HART® technology now allows for the wireless transmission of HART® data. To be employable worldwide, *Wireless*HART® technology utilizes the 2.4 GHz Band (IEEE 802.15.4 wireless network) as physical layer. All *Wireless*HART devices form a mesh network in which every device is not just a measurement point, but also a repeater. This results in a bigger range of the whole network as well as an increased reliability through redundant communication paths.

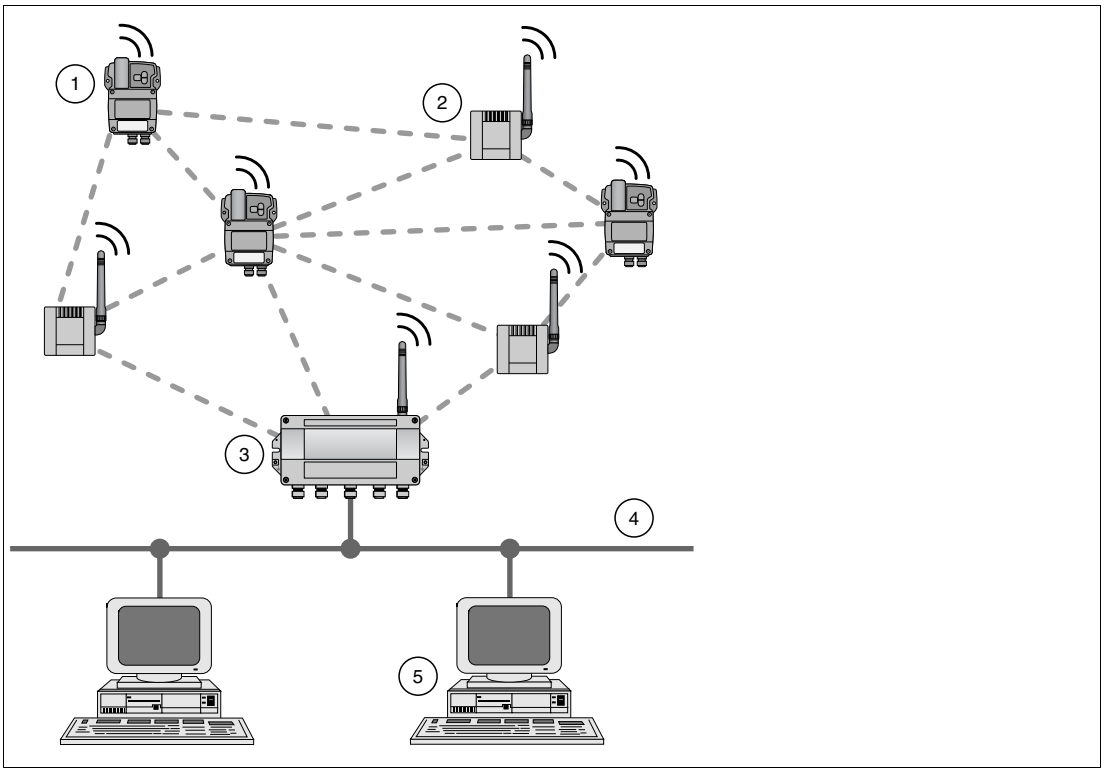



Figure 2.1 *Wireless*HART mesh network

**1** *Wireless*HART Temperature Converter
**2** *Wireless*HART Adapter
**3** *Wireless*HART Gateway
**4** Fieldbus/Ethernet
**5** Host applications

The *Wireless*HART network is built up, organized and maintained by the *Wireless*HART Gateway and is therefore self-organizing and self-healing. The *Wireless*HART Gateway also takes care for connection to different host systems through different industrial protocol bus interfaces.

The *Wireless*HART Gateway supplies *Wireless*HART Temperature Converters and *Wireless*HART Adapters with the necessary information for seamless network operation.

2014-07

## 2.2 Functional Overview

The *Wireless*HART temperature converter transmits temperature data from resistance thermometers (RTD) or thermocouples (TC) to a *Wireless*HART gateway via a wireless connection. You may also connect slide-wire sensors and mV transmitters

**Key Functions**

- Zone 1 servicing/operation: Terminal blocks may be accessed and battery may be changed with opened housing cover in Zone 1. The LEDs may be inspected and the buttons may be pushed while the device is operating in Zone 1.
- Physical interfaces for RTD and TC
- LEDs for supply status, communication status and device status indication
- Battery life estimation and "Low Battery" alarm (DTM functions)

## 2.3 Scope of Delivery

The standard scope of delivery of the *Wireless*HART temperature converter includes:

- *Wireless*HART Temperature Converter WHA-UT-F7B1-0-PP-Z1-Ex2

If ordered, the following accessories:

- Lithium battery W-BAT-B1-Li mandatory for use in connection with hazardous areas
- Mounting set W-ACC-F7MK
- Pt100 sensor for external cold junction compensation W-ACC-CJC

## 2.4 Design

### Controls and Indicators

The buttons and LED indicators can be accessed without opening the housing.

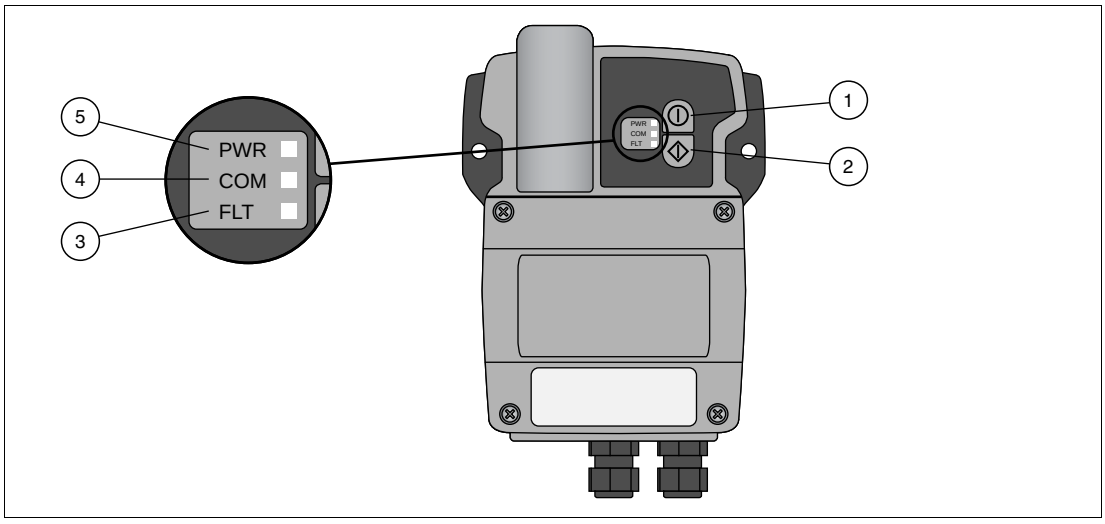



Figure 2.2 Controls and indicators

**1** Button A
**2** Button B
**3** Red FLT LED
**4** Yellow COM LED
**5** Green PWR LED

## Connections and Interfaces

***Caution!***

Loss of intrinsic safety

If Ex i protected circuits have been operated with non-intrinsically safe circuits, they must no longer be used as Ex i protected circuits.

To maintain the Ex i rating of the *Wireless*HART temperature converter, use an Ex i rated HART modem to communicate with the *Wireless*HART temperature converter.

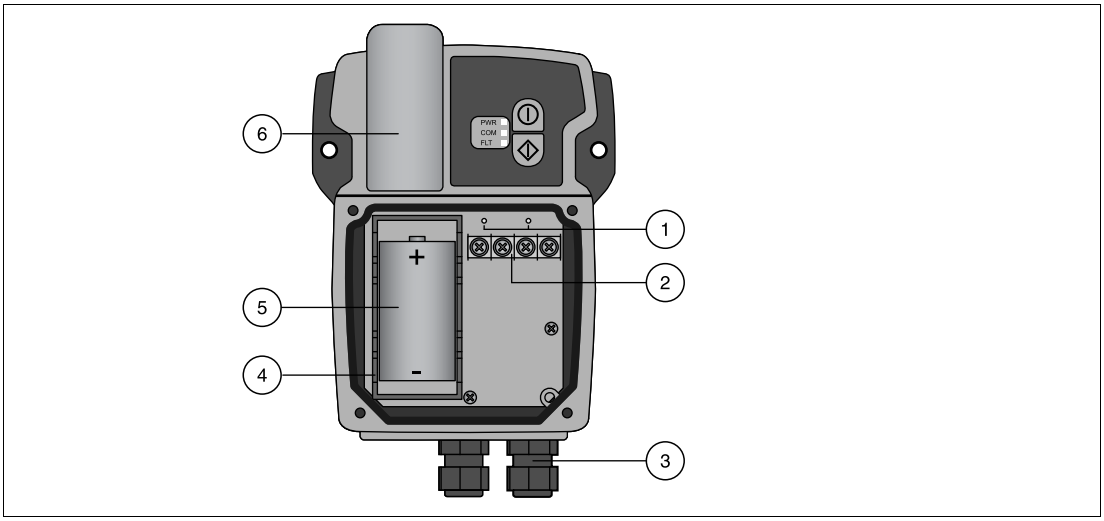



Figure 2.3 Connections and interfaces

**1** Wired HART connectors for Ex ia certified HART modem
**2** Sensor terminals
**3** Cable glands (cable diameter 5.5 ... 10 mm)
**4** Battery holder
**5** Battery
**6** Internal antenna (aligned vertically when device is mounted upright)

# 3 Installation

## 3.1 Mounting Considerations

### 3.1.1 Positioning the Device

We recommend that you install the *Wireless*HART Gateway before installing other *Wireless*HART devices. This way, you can check for proper operation of new devices as they are installed. Please refer to the manual of the *Wireless*HART Gateway for further information.

**Guidelines for Planning a *Wireless*HART Network**

- A line-of-sight between communication partners always is desirable. If a line-of-sight is not possible, the obstacles should not be massive and the partners should be more to the edge of an obstacle to allow the wave to "bend" around it (diffraction effect).
- Consider moving objects that could affect the device's antenna range.
- Install wireless devices at least 1 m above the ground or the floor.
- Make sure that the device's antenna is aligned vertically for best results.
- Make sure that a minimum of 2 other *Wireless*HART devices are well within the antenna range of the device.
- Do not position *Wireless*HART devices directly below or above each other. They would be outside each other's antenna range.
- Install *Wireless*HART devices at least 1 m away from each other.
- Antennas must be at least 6 cm away from any wall or any metallic material running parallel to it.
- Position the device as far away as possible from metal surfaces or walls containing metal. There should be as little metal close to the device as possible.
- Do not position other 2.4 GHz devices like cordless phone bases or WLAN routers near *Wireless*HART devices. Keep in mind other wireless networks using the same frequency spectrum (WLAN, Bluetooth, etc.). Wireless technologies used in an industrial environment must be able to coexist without disrupting each other. If multiple networks operate in one facility, a frequency management should be applied as part of administration.

## 3.1.2 Antenna Characteristics

Before mounting the device, you should consider the devices's antenna characteristics and the propagation of the radio waves. The following diagrams show the antenna gain in two different planes.

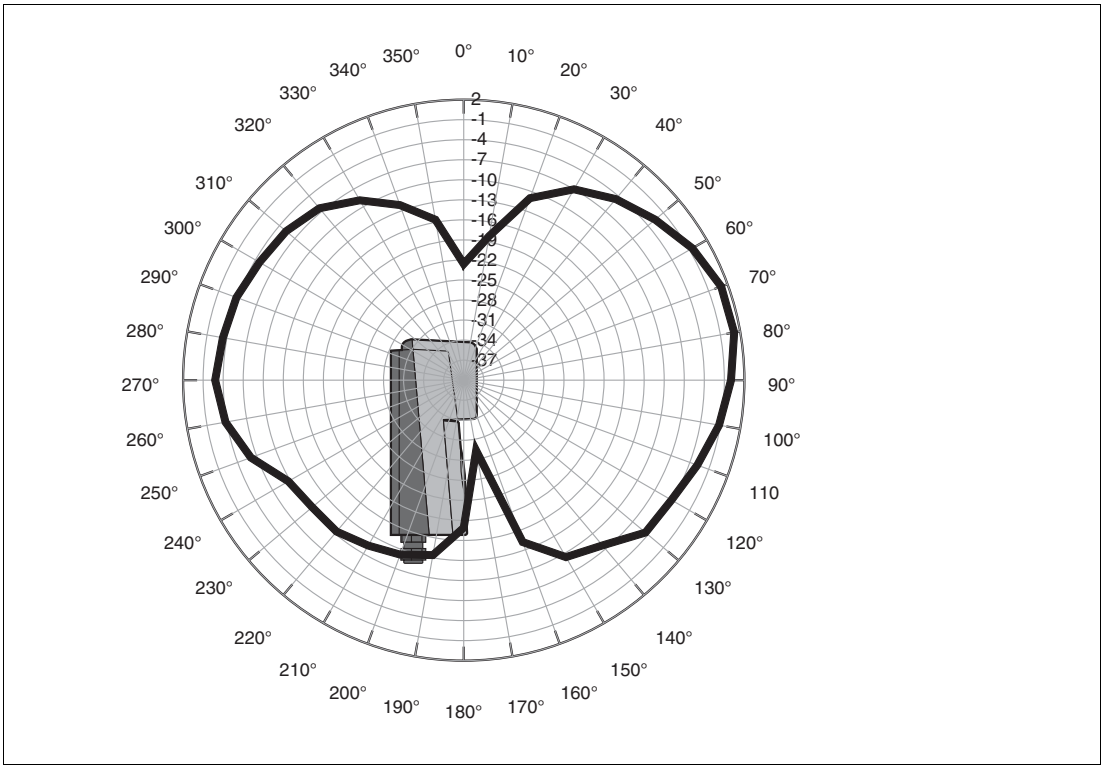



Figure 3.1 Antenna gain (side view, 2450 MHz, dBi)

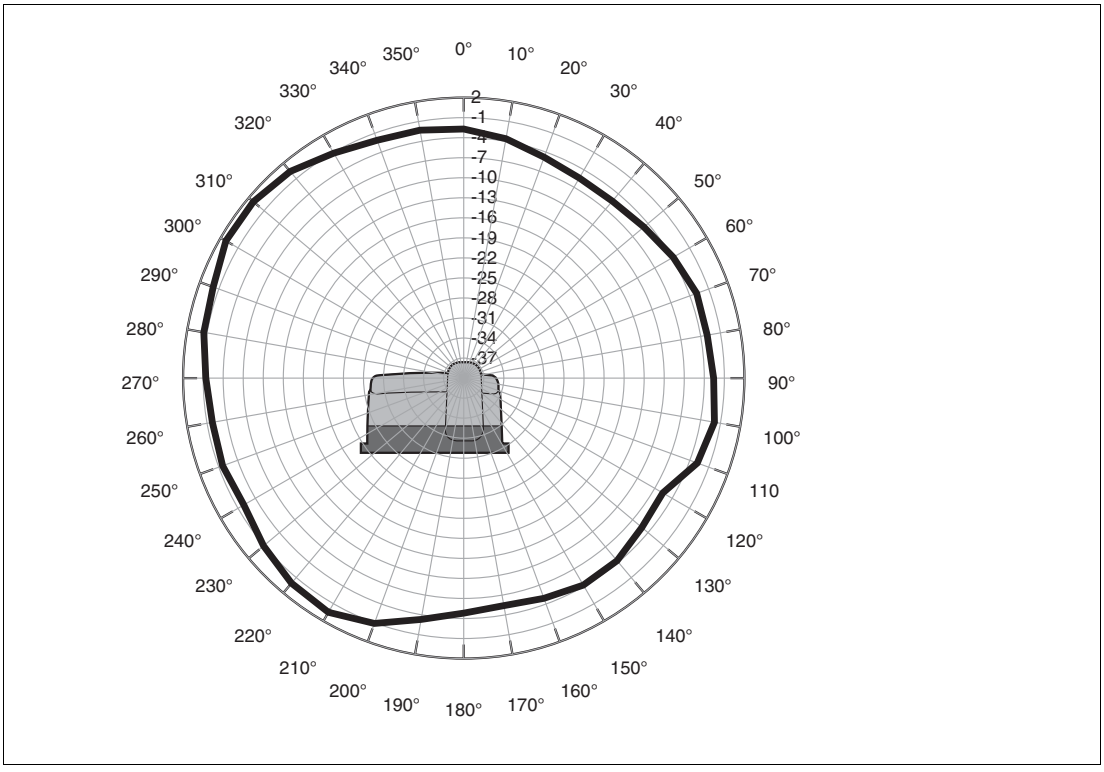



Figure 3.2 Antenna gain (top view, 2450 MHz, dBi)

2014-07

### 3.1.3 Examples for Good and Poor Positioning

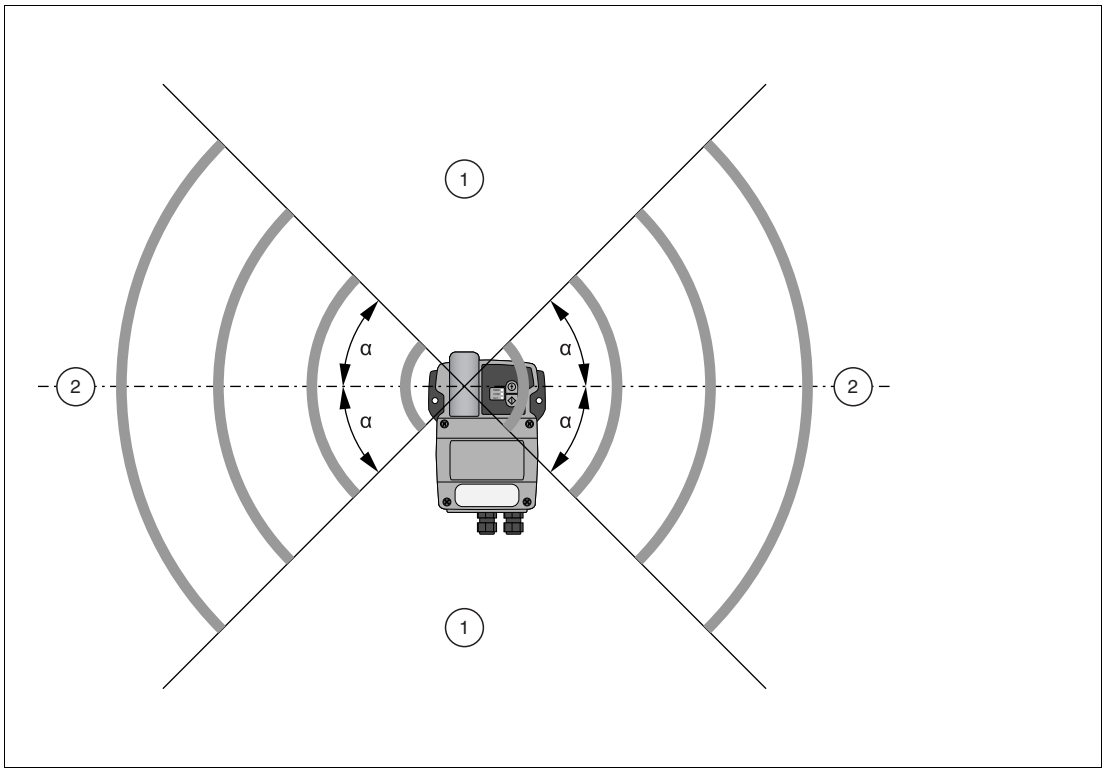



Figure 3.3 Wave propagation, schematic representation (alpha = approx. 45°, may vary considerably)

**1** Weaker signal above and below

**2** Stronger signal sideways

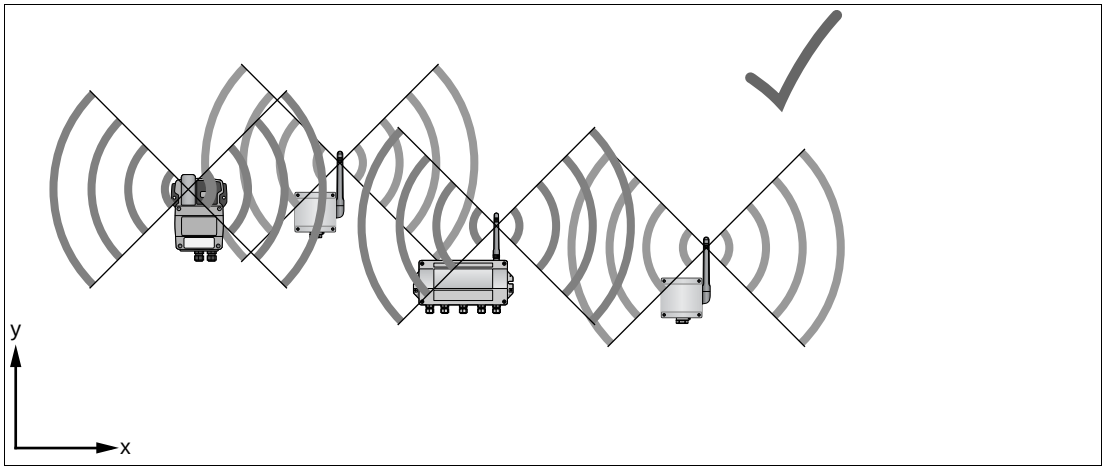



Figure 3.4 Good positioning: Devices are within each others antenna range

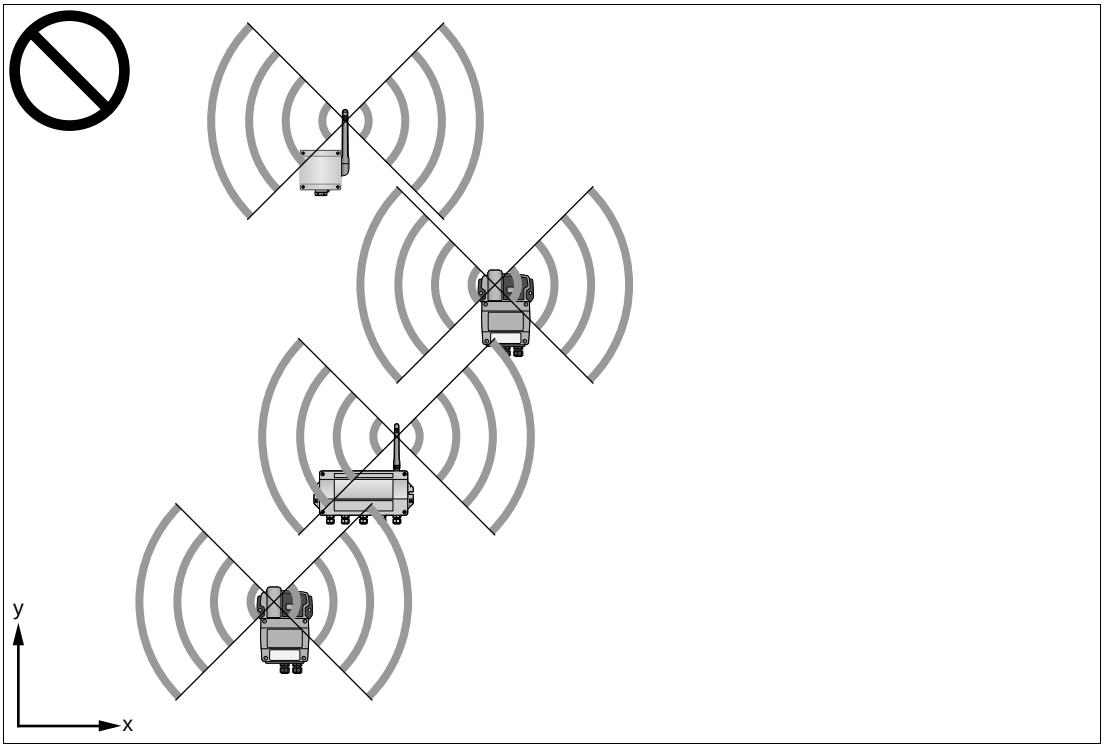



Figure 3.5 Poor positioning: Devices are not within each others antenna range

## 3.2 Mounting the Device

***Danger!***

Mechanical danger hazard

The device must be installed at locations providing low risk of mechanical danger according to IEC/EN 60079-0. Special care must be taken if the mounting location is at the end of the climatic limits specified in the data sheet.

***Danger!***

Explosion hazard

If the cable glands are not fitted correctly, the IP degree of protection cannot be ensured and the electronic components can be exposed to an explosive atmosphere.

**Check cable glands:**

- all screws of the housing / housing cover must be tightened with the appropriate torque
- only cables of the appropriate size must be used in the cable glands
- all cable glands must be tightened with the appropriate torque
- all seals must be undamaged and fitted correctly
- all empty cable glands must be sealed with appropriate plugs

***Note!***

There are two ways to set up the device: You may either mount the device in the field first and configure it afterwards as described in this manual. Or, alternatively, you may configure the device first and mount it afterwards.

The mounting location should be well accessible for mounting and electrical installation. Make sure that there is enough space to open the housing cover and to access the terminals, switches, and cable glands. Choose a mounting location that meets the requirements of the climatic limits specified in the technical data.

The housing has a degree of protection of IP65 and is designed for wall mounting (mounting accessories not included).

**Required tools**

- 2 screws (thread diameter M5)
- Drill
- Screwdriver

### Mounting the Device

1. Drill 2 holes in the mounting surface so that they match the mounting holes of the housin. → see Figure 4.1 on page 21
2. Screw the device to the mounting surface.

## 3.3 Connecting the Sensors

The terminal block of the sensor interface is located inside the housing. The sensor interface has 2 channels. You may connect resistance thermometers (RTDs), slide-wire sensors (Ω), thermocouples (TCs) or mV transmitters. Supported RTDs/TCs are:

- TC types: E/J/K/T
- RTD type: Pt100/Pt1000

***Caution!***

Damage through wrong grounding

Grounded sensors must have equipotential ground, otherwise damage may be inflicted on the device, and sensor accuracy cannot be guaranteed.

***Note!***

***Cold junction compensation for TC sensors***

The Wireless Temperature Converter has a built-in cold junction compensation (CJC) which is sufficient in most cases. If an increased accuracy is required (for example because of unilateral temperature effects such as sunlight), it is recommended to use an external CJC. An external CJC can be obtained as an accessory from P+F (W-ACC-CJC). When using an external CJC, connect the TC sensor to input 1 and the external CJC to input 2.
Enable the internal/external CJC using the device DTM. see chapter 5.6.1

### Connecting the Sensors

1. Unscrew the four screws of the housing cover.
2. Remove the housing cover.
3. Route the cables through the cable glands of the housing. → see Figure 2.3 on page 12
   The permissible cable diameter lies between 5.5 ... 10 mm.
4. Connect the temperature sensors to the corresponding terminals of the sensor interface according to the following figure. → see Figure 3.6 on page 18
5. Screw the housing cover to the housing.

↳ The sensors are connected.

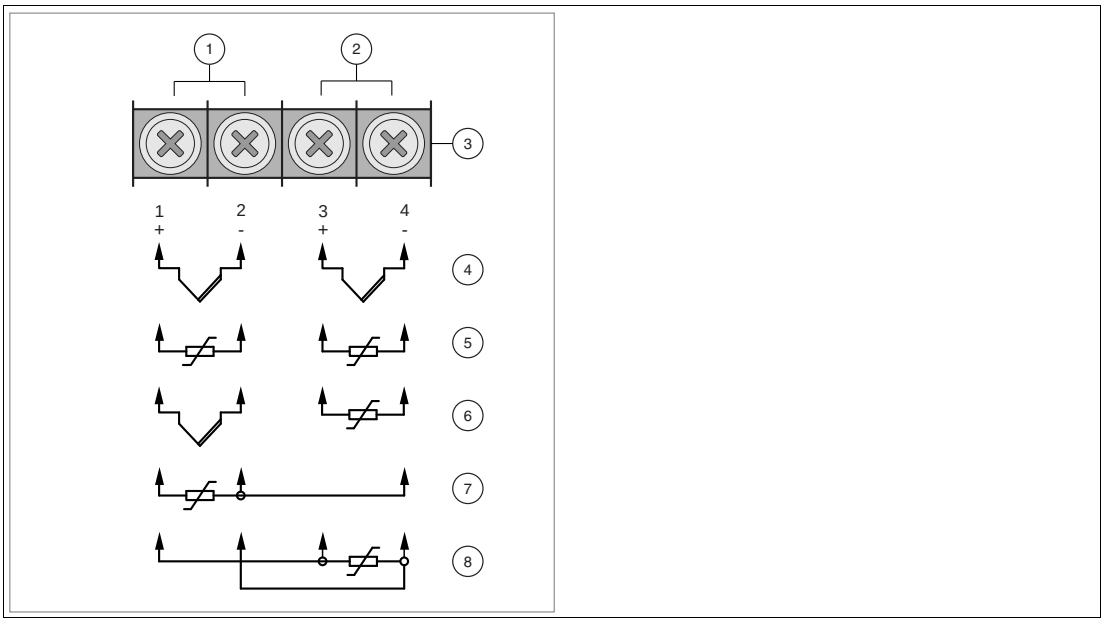



Figure 3.6 Connecting the sensors

2014-07

**1** Input 1
**2** Input 2
**3** Sensor interface
**4** Two TCs
**5** Two RTDs in 2-wire configuration
**6** One TC and one RTD in 2-wire configuration (the two channels are interchangeable)
**7** One RTD in 3-wire configuration
**8** One RTD in 4-wire configuration

**Measuring ranges**

| Sensor type | Measuring Range | Typical Accuracy |
|---|---|---|
| E | -200 ... +1000 °C | ±0,5 °C |
| J | -210 ... +1200 °C | ±1 °C |
| K | -200 ... +1300 °C | ±1 °C |
| T | -200 ... +400 °C | ±1 °C |
| Pt100/Pt1000 | -200 ... +850 °C | ±0,5 °C |
| 100 mV | -100 ... +100 mV | 20 µV |
| 300 mV | 0 ... +300 mV | 40 µV |
| 500 Ω | 0 ... +500 Ω | 0.1 Ω |
| 4000 Ω | 0 ... +4000 Ω | 1 Ω |

The following table shows the measuring accuracy for an extended measuring range with temperatures below -200 °C.

**Extended measuring range accuracy**

| Sensor type | Extended Measuring Range | Typical Accuracy |
|---|---|---|
| E | -270 ... -200 °C | ±2 °C |
| K | -240 ... -200 °C | ±2 °C |
| T | -270 ... -200 °C | ±2 °C |

# 4 Commissioning

## 4.1 Connecting the Battery

***Danger!***

Batteries in hazardous areas

Batteries from Pepperl+Fuchs for this device may be brought into hazardous areas. However, always check if the battery is intact before transporting it into hazardous areas. Always transport batteries enclosed inside their original packages or already installed inside the device.

***Danger!***

Loss of intrinsic safety

The use of batteries other than specified voids the qualification for use in hazardous areas.

Only use batteries of type W-BAT-B1-Li from Pepperl+Fuchs.

***Danger!***

Possible damage because of wrong battery

The use of batteries other than specified may cause damage to the device.

Only use batteries of type W-BAT-B1-Li from Pepperl+Fuchs.

***Warning!***

Caustic battery acid

Leaking battery acid can cause personal injury and damage to the device.

- Never use batteries that are leaking.
- Never use batteries with external damage such dents or deep scratches, even if no battery acid is leaking.

***Danger!***

Electrostatic discharge hazard

The device contains non-conductive plastic parts. Care must be taken when operating the installed device because of possible electrostatic charges. Electrostatic charged surfaces may cause an ignition spark.

Electrostatic charges must be avoided. For example, do not rub the device and never clean plastic surfaces with a dry cloth. Always use a damp cloth instead.

***Note!***

You may open the housing and connect/disconnect the battery in Zone 1.

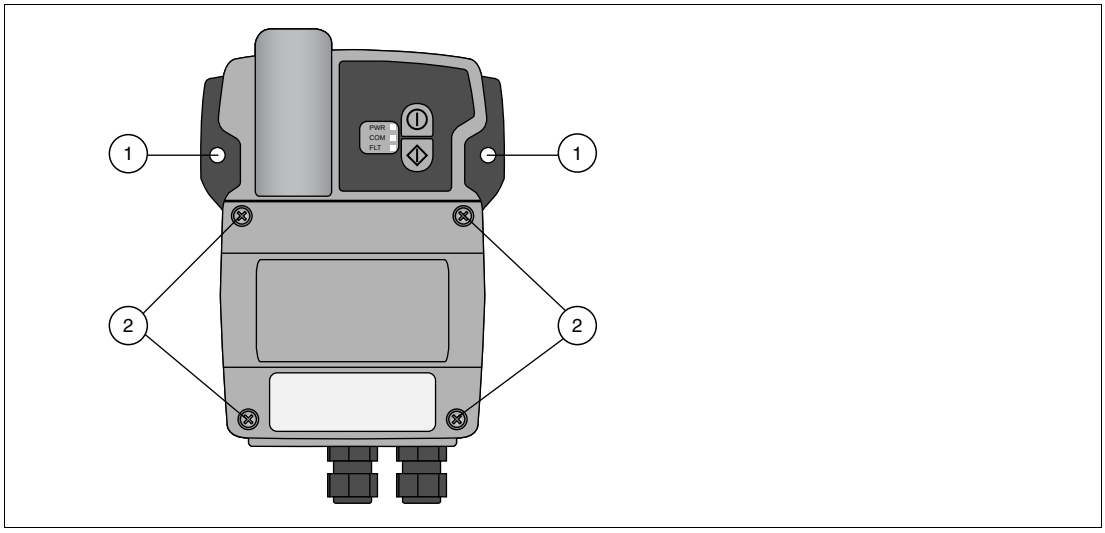



Figure 4.1 Mounting holes and housing screws

**1** Mounting holes

**2** Housing cover screws

### Connecting the Battery

1. Unscrew the four screws of the housing cover.
2. Remove the housing cover.
3. Insert the battery into the battery holder observing the polarity.
4. Screw the housing cover to the housing.

## 4.2 Switching on the Device

### Switching on the Device

1. Switch on the device by pressing button A for 5 seconds. See chapter 6.1

   ↳ All LEDs light up.

2. Release the button.

   ↳ The LEDs go off again. After a short time the green "PWR" LED lights up on for a few seconds if the battery is recognized as a non-exhausted battery. The device is now switched on. To save battery power, all LEDs are off.
   The device attempts to join the network autonomously using the fast join mode. In the fast join mode, the radio is activated more frequently than in the standard join mode. If the device is not able to join the network within 30 minutes, it will end the fast join mode and go into standby mode.

## 4.3 Initial Configuration via HART Modem

For security reasons, the network ID and join key have to be configured through a wired connection before the device can connect itself to a *Wireless*HART network. To do so, you can use an Ex ia certified HART modem that connects to a PC/Laptop using the USB interface or the RS232 interface.

***Caution!***

Loss of intrinsic safety

If Ex i protected circuits have been operated with non-intrinsically safe circuits, they must no longer be used as Ex i protected circuits.

To maintain the Ex i rating of the *Wireless*HART temperature converter, use an Ex i rated HART modem to communicate with the *Wireless*HART temperature converter.

### Connecting the device to a PC/Laptop via HART modem

Install the HART modem drivers on your PC/Laptop according to the instructions given by the manufacturer.

1. Unscrew the four screws of the housing cover.
2. Remove the housing cover.
3. Connect the Ex ia certified HART modem to the wired HART connectors. → see Figure 2.3 on page 12
4. Switch on your PC/Laptop.
5. Plug the HART modem into the USB/RS232 port.

   ↳ In case you are using the USB port, your PC/Laptop should recognize the HART modem automatically.
   If using the RS232 port, proceed with the next step.
6. To find out to which COM port the HART modem is connected, open the Windows® device manager. For example, if using Windows® XP, click **Start > Settings > Control Panel > System > Hardware > Device Manager**, or if using Windows® 7, click **Windows Icon > Control Panel > System > Device Manager**.

   ↳ Under **Ports (COM & LPT)** you see the HART modem and the COM port assigned to it. You will need the COM port number later on.

## 4.4 DTM Software

### 4.4.1 Downloading the Required Software

Required software:

- Microsoft® .NET Framework
- PACTware™ Framework
- *Wireless*HART DTM
  The DTM collection including *Wireless*HART device DTMs and Ethernet communication DTM.
- HART CommDTM
  The HART CommDTM has to be installed separately. It is required for wired communication via HART modem. The HART CommDTM supports both FSK (i.e. HART modem) and RS-485 interfaces.

***Note!***

If one of the software components is already installed on your system, the installation may be omitted.

Where to download the required software?

1. Open your internet browser and visit www.pepperl-fuchs.com.
2. Click **Products**.
3. Click **Software**.
4. Download the software components **Microsoft® .NET Framework**, **PACTware™**, ***Wireless*HART DTM** and **HART CommDTM**. You might need to scroll down the page to find the required component.
5. Unzip the downloaded files and store the data to your local hard drive.

### 4.4.2 Install the DTM Software Components

Your computer must meet the following requirements in order to run PACTware™ and the device DTM:

- Operating system: Windows® 2000 Service Pack 4, Windows® XP Service Pack 1/2/3 or Windows® Vista
- Software: Microsoft® .NET Framework Release 1.1 Service Pack 1
- Processor: 500 MHz or faster
- Memory: 256 MB RAM or more
- Disk space: 200 MB or more
- Graphics resolution: 1024 x 768 or higher
- Administrator privileges to enable software installation

### Install the DTM Software Components

1. Install the Microsoft® .NET Framework by starting the corresponding setup.exe file and following the installation instructions given on the screen.
2. Install PACTware™ by starting the corresponding setup.exe file and following the installation instructions given on the screen.
3. Install the *Wireless*HART DTM collection by starting the corresponding setup.exe file and following the installation instructions given on the screen.
4. Install the HART CommDTM by starting the corresponding setup.exe file and following the installation instructions given on the screen.

   ↳ You have installed the required software.

## 4.4.3 Updating the DTM Catalog

Once you have installed the FDT base application and the Device Type Manager (DTM) on the computer, the FDT base application's DTM catalog must be updated. The PACTware™ DTM catalog is called "Device Catalog" and is normally automatically updated when PACTware™ is launched.

If PACTware™ does not update the device catalog automatically, proceed as follows.

### Updating the Device Catalog

1. Start PACTware™.
2. Select **View > Device Catalog** or press **F3** or click on the **Device Catalog** icon in the icon bar.

   ↳ The **Device Catalog** window opens.
3. Click on the **Update Device Catalog** button to update the device catalog.

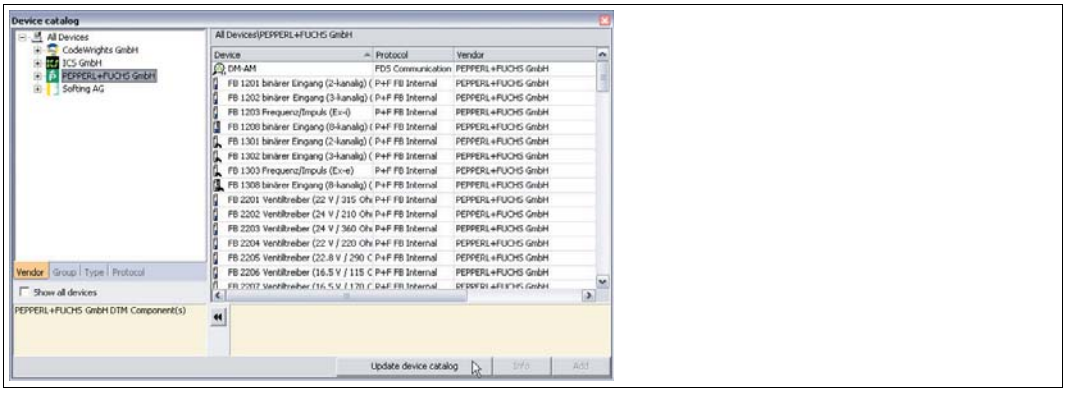



Figure 4.2 PACTware™ device catalog

4. Click on **Yes** to continue.

   ↳ The updated device catalog appears once the search has finished.


Figure 4.3 PACTware™ search for DTM

2014-07

## 4.5 Creating a new Project in PACTware™

### 4.5.1 Creating a New Project

#### Creating a new project in PACTware™?

Select **File > New** or click on the **Create New Project** icon on the toolbar.

↳ A new, unnamed project appears in the main window. The project initially consists of the entry **HOST PC**.

### 4.5.2 Adding the Communication DTM

A communication DTM is an interface between the FDT frame application and the device DTM. The communication DTM enables communication between the device DTM and the device connected to the PC.

For the PC to communicate with the device via the HART modem, a HART communication DTM has to be added to the PACTware project.

#### Adding HART Communication DTM

***Note!***

The HART CommDTM is not included in the *Wireless*HART DTM Collection. It can be downloaded separately from www.pepperl-fuchs.com. see chapter 4.4

1. Select the entry **HOST PC** in the project view of your PACTware™ project.
2. Choose **Device > Add device** or click the **Add device** icon on the toolbar.

↳ The **Device for** window appears.

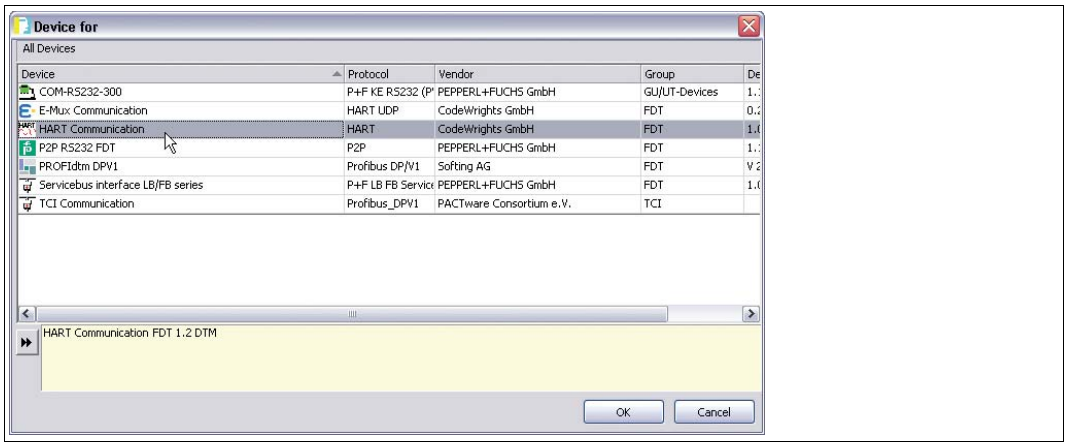



Figure 4.4 **Device for** window

3. Select the entry **HART communication**.
4. Click **OK**.

↳ The HART communication DTM is added to the project.


Figure 4.5 HART communication DTM in the PACTware™ project view

5. To edit the parameters, double-click on the HART communication DTM.

↳ The parameter window appears.

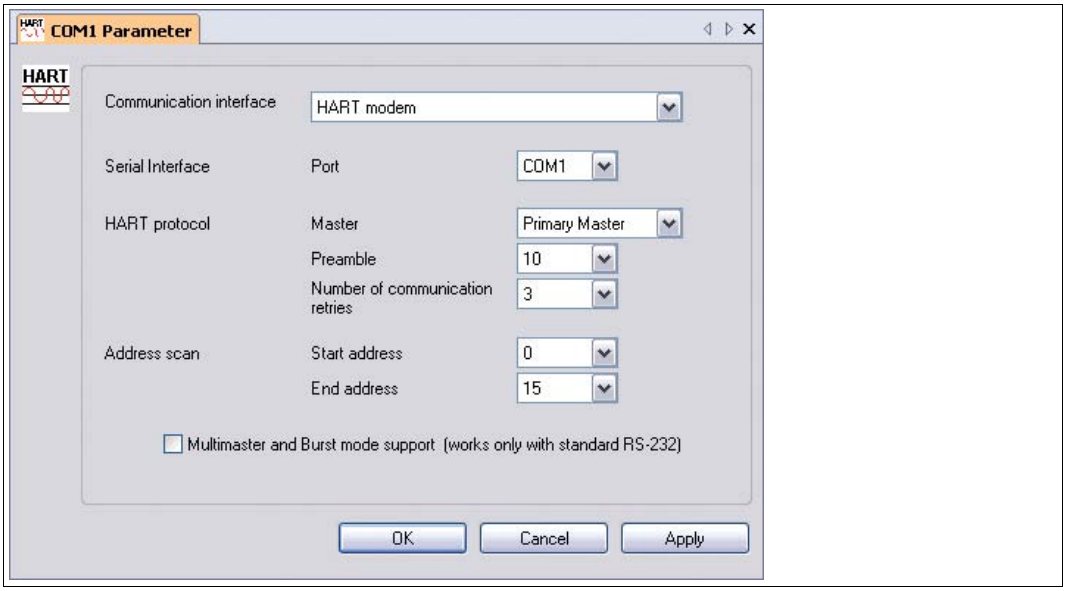



Figure 4.6 Parameter window of HART communication DTM

6. Set the parameters according to the following table.
7. Click **OK** to save the changes and to close the parameter window.

| Parameter | Description | Default |
|---|---|---|
| **Communication interface** | Set this parameter to **HART modem**. | HART modem |
| **Port** | Set this parameter to the COM port your HART modem is connected to (see chapter 4.3). | COM1 |
| **Master** | Set this parameter to **Primary master**. | Primary Master |
| **Preamble** | Number of preambles for HART communication. **Select at least 10 preambles for communication with the WHA-UT**. Otherwise the WHA-UT will not respond. | 5 |
| **Number of communication retries** | The number of retries for HART communication in case of an error. | 3 |
| **Start address** | Here the address range is set, in which the HART Communication DTM is to search for HART devices connected to the HART modem. The default polling address of the WHA-UT is "1". | 0 |
| **End address** | | 15 |
| **Multimaster and Burst mode support** | Leave this checkbox deactivated. | deactivated |

## 4.5.3 Adding Device DTM

### Performing a HART Scan

1. In the project view, right-click on the entry of the communication DTM.
2. Choose **Connect**.
3. Choose **Additional functions > Scan list**.
4. If the scan does not begin automatically, click **Refresh**.

   ↳ The detected field devices are displayed in the **Scan list** window.

### Adding the Device DTM

You may add the temperature converter to your PACTware™ project in various ways (see PACTware™ documentation). One of them is described in the following.

1. In the project view, right-click on the entry of the HART communication DTM.
2. To add the device DTM, choose **Add device**.

   ↳ The **Device for** window opens.

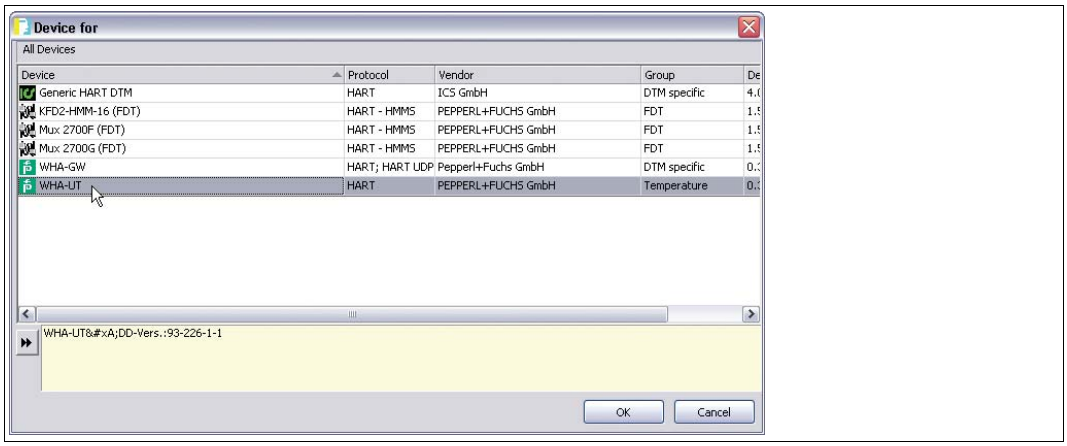



Figure 4.7 **Device for** window

3. Select the entry **WHA-UT**.
4. Click **OK**.

   ↳ The device DTM is added to the project. You may continue with parameterizing the temperature converter as described in the following.

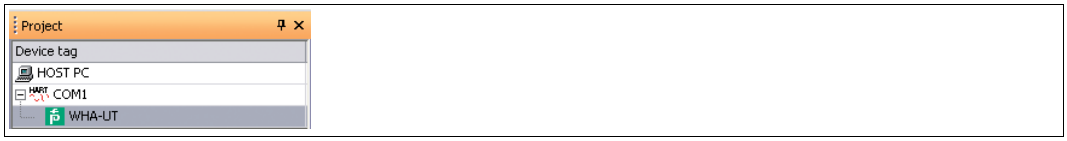



Figure 4.8 DTM of the *Wireless*HART Temperature Converter in the PACTware™ project view

5. Remember to save your PACTware™ project from time to time (**File > Save**).

## 4.6 Joining the Wireless Network

To connect itself to the *Wireless*HART network, the device must carry the correct Network ID and Join Key. The Network ID and Join Key have to be configured using a **wired connection** before the device joins the *Wireless*HART network for the first time.

To enter Network ID and Join Key, the following requirements have to be met.

- A PC/Laptop is connected to the device using a HART modem.
- A PACTware™ project containing the HART communication DTM and the device DTM has been created.

In the joining phase the device sends a join request packet to the network manager. If the new device can be authenticated, the network manager responds with an activation packet and sets up links between the new device and other existing nodes. Furthermore, the new device receives a 128 Bit encryption key.

### Entering Network ID and Join Key

1. In the PACTware™ project, right-click the DTM of the device that shall join the *Wireless*HART network.

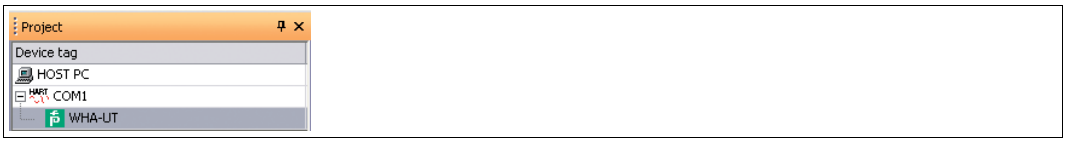



Figure 4.9 DTM of the *Wireless*HART Temperature Converter in the PACTware™ project view

2. Choose **Connect**.

   ↳ A connection is established.

3. To open the online parameterization window, right-click the device DTM and choose **Parameter > Online parameterization**.

   ↳ The online parameterization window appears.

4. In the online parameterization window, choose **Wireless Communication**.

   ↳ The wireless communication parameters are displayed. See chapter 5

5. Enter the Network ID into the **Network Identification** field and press `Enter` to confirm the new value.
6. Enter the Join Key into the 4 **Join Key** fields and press `Enter` to confirm the new value.
7. Click **Execute Join**.

   ↳ The device attempts to join the wireless network. The connection status is indicated by **Join Status**.

### Activating Fast Join Mode

After the device has been switched on, it attempts to join the network autonomously using the fast join mode. In fast join mode, the radio is activated more frequently than in the standard join mode and thus consumes more power. If the device is not able to join the network within 30 minutes, it will go into standby mode.
You may speed up the joining phase anytime by activating the fast join mode manually.

1. Activate the fast join mode by pressing button A for 5 seconds. See chapter 2.4

   ↳ After 5 seconds the yellow LED starts flashing at 3 Hz.

2. Release button A immediately.

   ↳ The yellow LED extinguishes. The device initiates the fast join mode. As soon as the device has joined the network it enters the "Joined" status or the "Connected" status.

2014-07

# 5 Configuration

## 5.1 Configuration Options

We recommend that you configure the device on the shop floor via a **wired connection** using a HART modem. see chapter 4.3

1. Define all basic settings such as wireless communication parameters (Network ID, Join Key, Join Mode) and identification parameters (Long Tag, Polling Address) using a HART modem.
2. Make the device join the *Wireless*HART network.
3. Once the device has joined the *Wireless*HART network, configure the burst mode parameters, event notifications, and other application settings using a HART modem.
4. Disconnect the HART modem and install the device in the field.

Once the device is installed in the field, you can change the configuration of the device via a **wireless connection** using the *Wireless*HART Gateway.

### Wireless Configuration via the *Wireless*HART Gateway

We assume that the *Wireless*HART Gateway is installed and configured correctly according to the manual of the *Wireless*HART Gateway. Furthermore, we assume that the device to be configured has joined the *Wireless*HART network.

1. Start your PACTware™ project containing the device DTM of the *Wireless*HART Gateway.


Figure 5.1 DTM of the *Wireless*HART Gateway in the PACTware™ project view

2. In the project view, right-click on the entry **WHA-GW**.
3. To add the device DTM, choose **Add device** from the context menu.

   ↳ The **Device for** window opens.
4. Select the entry of the *Wireless*HART device you want to add to the PACTware™ project.
5. Click **OK**.

   ↳ The device DTM is added to the project.
   Now you can continue with parameterizing the device as if you had a wired connection. see chapter 5.2

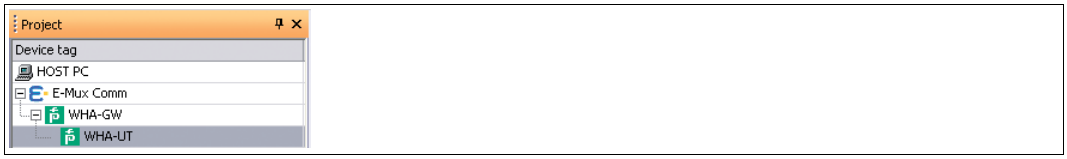



Figure 5.2 DTM of the *Wireless*HART Temperature Converter in the PACTware™ project view

***Note!***

Note that you can accelerate the wireless configuration by establishing a fast pipe connection between the device and the *Wireless*HART Gateway. For more information on fast pipe connections, see the manual of the *Wireless*HART Gateway.

## 5.2 Online and Offline Parameterization (DTM)

***Note!***

The concept of online/offline parameterization applies to the configuration via DTM and PACTware™ only.

The device DTM provides dialogs for offline and online parameterization.

- **Offline Parameterization** (not connected to device)

  If there is no active connection to the device, only the data that is stored locally in the PACTware™ project can be edited and saved. You can store this local copy of the data to the device, as soon as a connection to the device has been established.
  Before editing the data offline, you can load the latest version of the data from the device, to ensure that you edit the latest data.

- **Online Parameterization** (connected to device)

  If there is an active connection to the device. You can directly edit the data that is stored on the device. Parameter changes are immediately stored on the device.

Both online and offline data are updated using the commands **Store to device** and **Load from device**.

***Note!***

Data edited and stored on the device during online parameterization is not automatically synchronized with the offline data record in the PACTware™ project. If you change device parameters in the online mode, the data stored in the PACTware™ project differs from the data stored on the device.
To ensure that the data stored in the PACTware™ project matches the data stored on the device, after online parameterization, load the data from the device into the PACTware™ project.

### Parameterizing Offline

1. Right-click the device entry in the PACTware™ project.

   ↳ A context menu opens.

2. Choose **Parameter > Offline Parameterization**.

   ↳ The window containing the offline data record appears.

3. Modify a parameter by typing in a new value or choosing a new value from the drop-down list.
4. To accept the new value, press **Enter**.
5. After all parameter changes have been made, save your project by choosing **File > Save**.
6. To write the new offline configuration to the device, right-click the device entry in the project view and choose **Connect**.

   ↳ A connection to the device is established.

7. Right-click the device entry again and choose **Store to device**.

   ↳ The new configuration is stored in the device.

### Parameterizing Online

1. Right-click the device entry in the PACTware™ project.

   ↳ A context menu opens.
2. Select **Connect**.

   ↳ A connection to the device is established.
3. Right-click the device entry in the PACTware™ project.
4. Select **Parameter > Online Parameterization**.

   ↳ The window containing the online data opens and the data is read from the device.
5. Modify a parameter by typing in a new value or choosing a new value from the drop-down list.
6. To accept the new value, press **Enter**.

   ↳ The new value is stored in the device immediately.
7. After all parameter changes have been made, you may store the online configuration into the PACTware™ project. To do this, right-click on the device entry in the project view and choose **Load from device**.

   ↳ The device date is stored in the PACTware™ project.
8. Save your project by choosing **File > Save**.

***Note!***

Many device parameters can be edited both online and offline. The parameters that can only be edited online are especially pointed out in the following sections.

## 5.3 Identification Parameters

The identification parameters provide various information about the device and identify the device within the network.

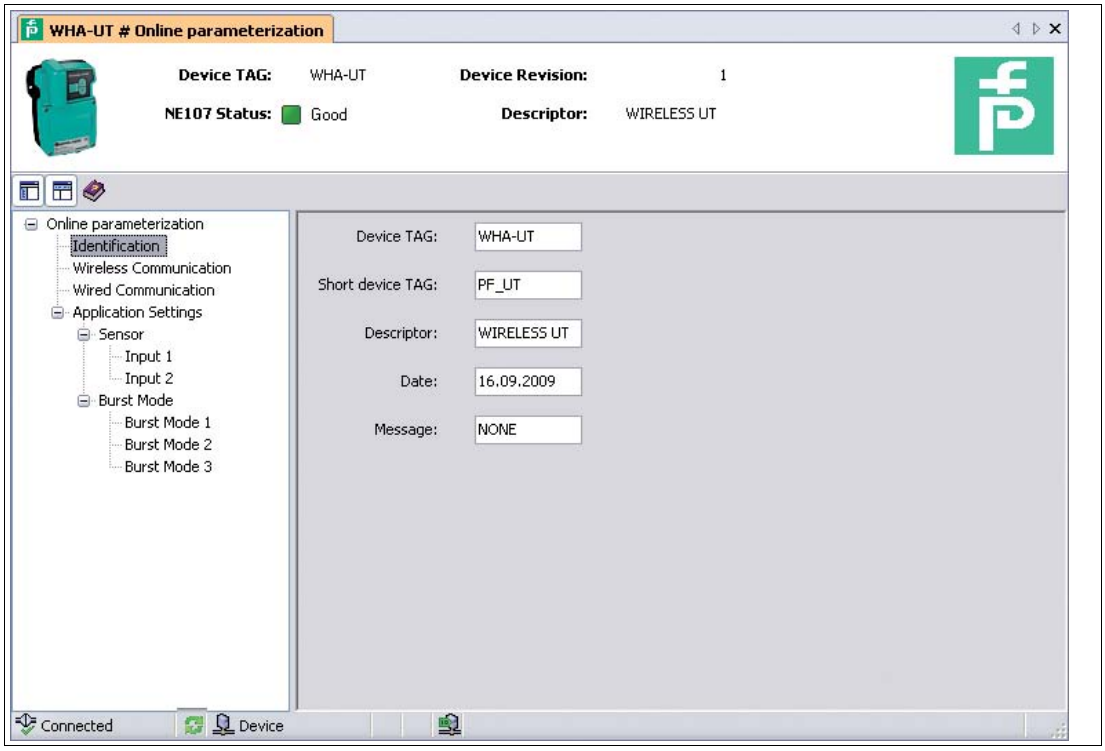



Figure 5.3 Identification parameters

**Identification Parameters**

| Parameter | Description | Default |
|---|---|---|
| **Device TAG** | Identifies the device in a *Wireless*HART network (long tag). Enter up to 32 characters. | – |
| **Short device TAG** | Identifies the field device within the process plant. Enter up to 8 characters. | – |
| **Descriptor** | Further description of the device. Enter up to 16 characters. | – |
| **Date** | User-defined date (e.g. last parameter change). Format: DD.MM.YYYY<br>The **Date** parameter is not modified by the Gateway itself. Instead it has to be set by the user or Host application. | – |
| **Message** | User defined message. Enter up to 32 characters. | – |

Table 5.1 Identification Parameters

## 5.4 Wireless Communication Parameters

The wireless communication parameters apply to the *Wireless*HART network which the device will join.

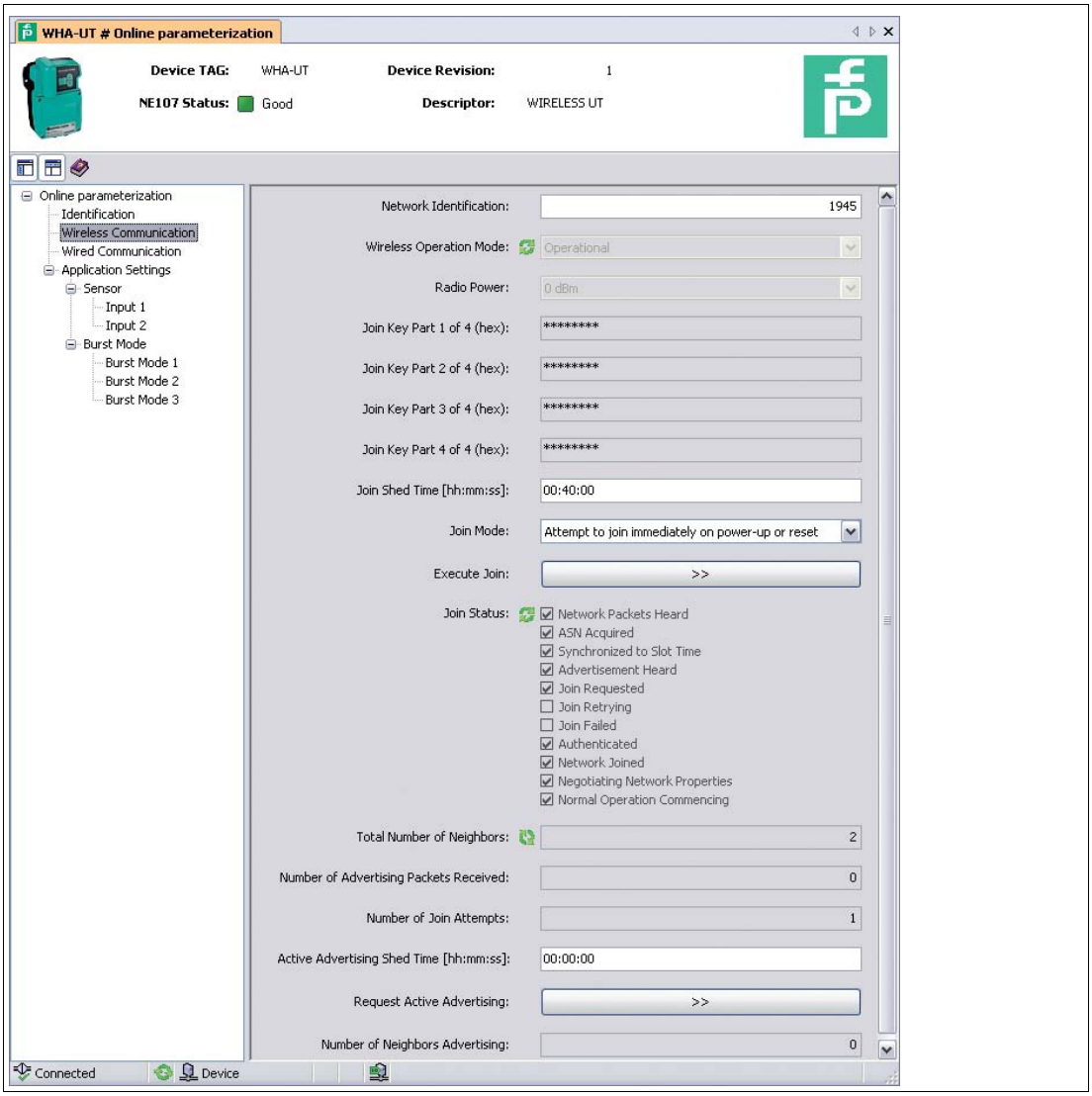



Figure 5.4 Wireless communication parameters

2014-07

***Note!***

The data listed in the following table is available only during online parameterization.

**Wireless Communication Parameters**

| Parameter | Description | Default |
|---|---|---|
| **Network Identification** | Unique network ID of the *Wireless*HART network the device is supposed to join. Enter up to 5 digits (0 ... 65535). | 1945 |
| **Wireless Operation Mode** | Indicates current mode of operation of the device:<br>■ Idle: initializing or not in Join Mode<br>■ Active Search: searching for neighboring *Wireless*HART devices at high duty cycle (100%)<br>■ Negotiating: join requested<br>■ Quarantined: authenticated by the Network Manager<br>■ Operational: device is connected to the network and is using the assigned links<br>■ Suspended: device has been disconnected by the network manager<br>■ Deep Sleep/Ultra-low Power/Passive Search: device is inactive or searching with low duty cycle (< 100%) | – |
| **Radio Power** | Power of the radio signal emitted by the device. The **Radio Power** parameter value may be changed only if the device is not yet connected to the network. | 10 dBm |
| **Join Key Part** x **of 4** | The join key is the password for the network the device is to join. Enter up to 32 hexadecimal characters (0 ... 9, A ... F). There are four text fields which can hold up to eight characters each. | – |
| **Join Shed Time** | Time (hh:mm:ss) that the device is given to join the network after the **Join Mode** condition has been fulfilled. After this time has elapsed, the device will keep on trying to join the network using a low duty-cycle receive mode to reduce energy consumption. This paramter is fixed and set to the default value. | 00:30:00 |
| **Join Mode** | Method by which the device is to join the network.<br>■ Do not attempt to join<br>■ Join now<br>■ Attempt to join immediately on powerup or reset | Attempt to join immediat ely ... |
| **Execute Join** | Press the button to store the **Join Shed Time** and **Join Mode** parameters to the device. The device will attempt to join the network in the way that is specified in **Join Mode**. | – |

| Parameter | Description | Default |
|---|---|---|
| **Join Status** | Indicates the current status when joining the network. Possible messages:<br>■ Network Packets Heard<br>■ ASN Acquired<br>■ Synchronized to time slot<br>■ Advertisement Heard<br>■ Join Requested<br>■ Join Retrying<br>■ Join Failed<br>■ Authenticated<br>■ Network Joined<br>■ Negotiating Network Properties<br>■ Normal Operation Commencing | – |
| **Total number of Neighbors** | Number of *Wireless*HART devices within the antenna range of the device to which a connection has been made. | – |
| **Number of Advertising Packets received** | Number of advertising packages received by the device. | – |
| **Number of Join Attempts** | Number of attempts the device has made to join the network. | – |
| **Active Advertising Shed Time** | Time in hh:mm:ss that the device is given to advertise its presence to its neighbors in order that they can join the network quickly. | 00:40:00 |
| **Request Active Advertising** | Pressing this button will cause the device to advertise its presence for the period **Active Advertising Shed Time**. | – |
| **Number of Neighbors Advertising** | Number of neighbors that are advertising their presence and have been detected by the device. | – |

Table 5.2 Wireless Communication Parameters

## 5.5 Wired Communication Parameters

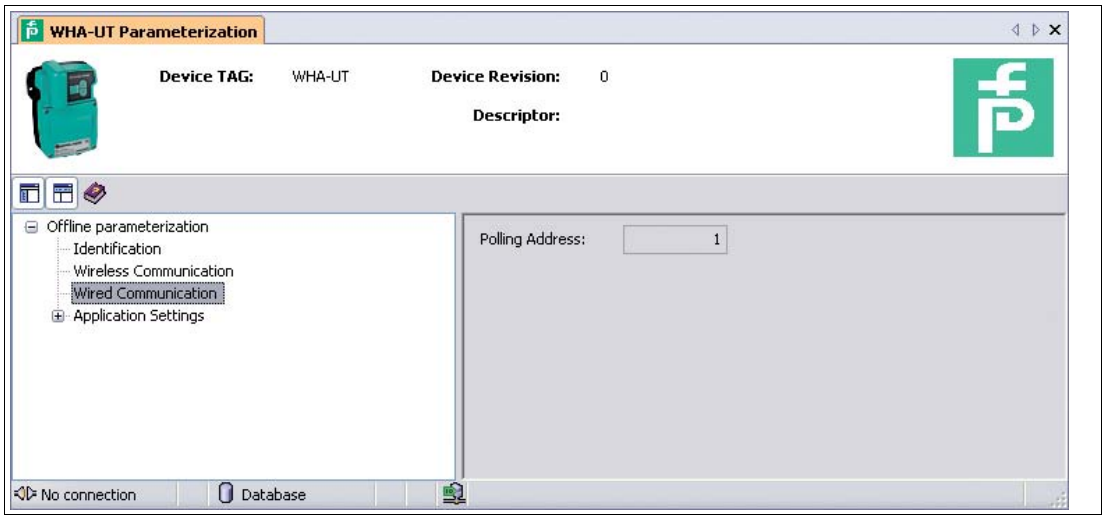



Figure 5.5 Wired communication parameters

**Wired Communication Parameters**

| Parameter | Description | Default |
|---|---|---|
| **Polling Address** | HART address of the temperature converter on the wired interface, valid range 0 ... 63. | 1 |

Table 5.3 Wired Communication Parameters

## 5.6 Application Settings

The **Application Settings** menu and its sub-menus contain the parameters and information relevant for the temperature converter's application.

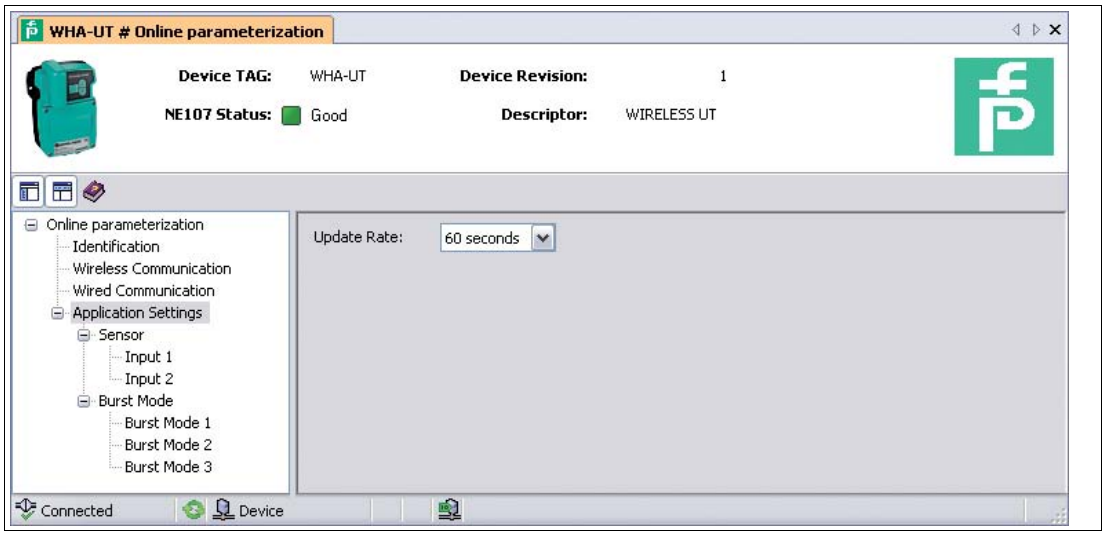



Figure 5.6 Application Settings

**Application Settings**

| Parameter | Description | Default |
|---|---|---|
| **Update Rate** | Update rate of the sensor values. Select a value from the drop-down list. | 60 s |

Table 5.4 Application Settings

## 5.6.1 Sensor Parameters

The 2 sensor inputs of the temperature converter are configured separately with the sub-menus **Input 1** and **Input 2**. Because both sub-menus are identical apart from the parameter **Connection**, only **Input 1** is described in the following.

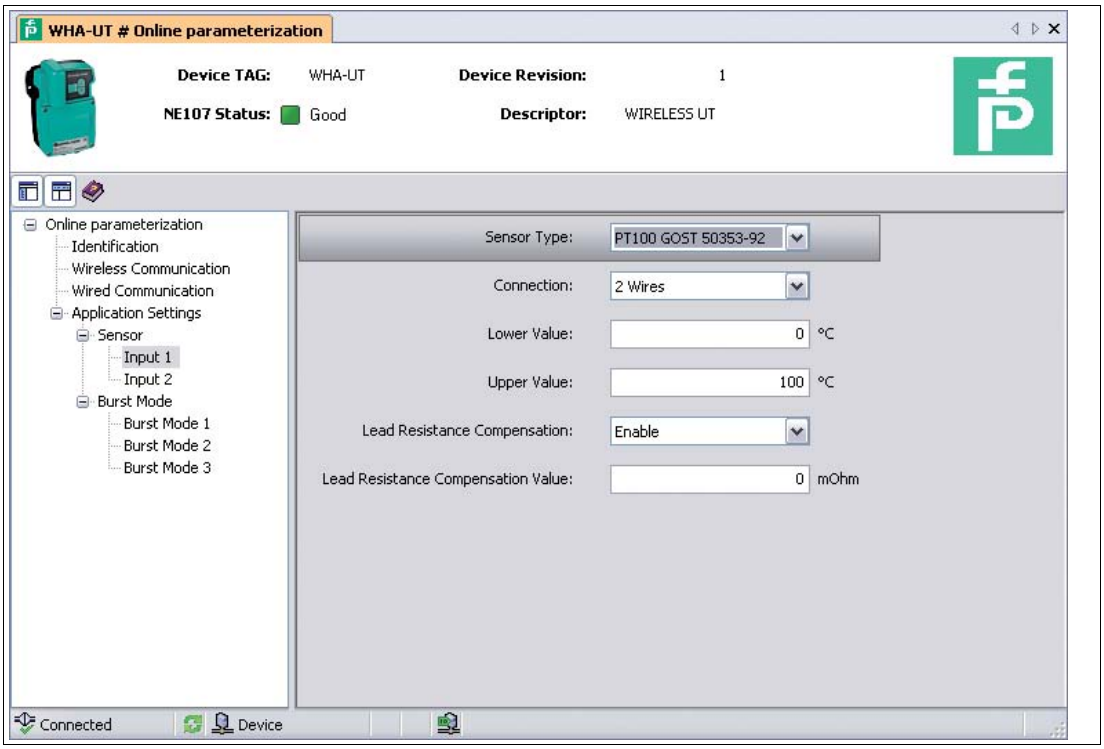



Figure 5.7 Application Settings > Sensor > Input 1 (Selected Sensor Type: RTD)

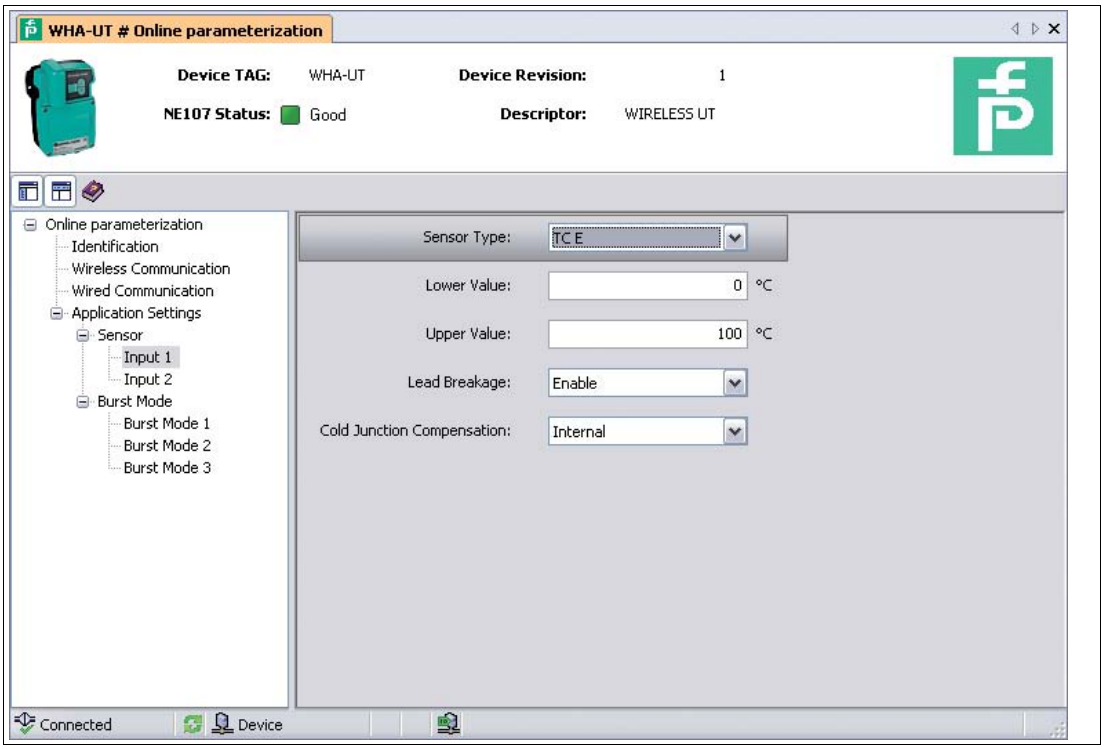



Figure 5.8 Application Settings > Sensor > Input 1 (Selected Sensor Type: TC)

2014-07

***Note!***

If you select an RTD in 3-wire connection or in 4-wire connection in the **Input 1** menu, the **Input 2** menu will not be available anymore. An RTD in 3-wire connection or in 4-wire connection uses both inputs and is configured via **Input 1**.

**Sensor Parameters Input 1/Input 2**

| Parameter | Description | Default |
|---|---|---|
| **Sensor Type** | Selects the type of sensor connected to the respective input. | Pt100 |
| **Connection** | Determines how the resistance thermometer (RTD) selected under **Sensor Type** is connected.<br>The **Connection** parameter is available in the **Input 1** menu only. The parameter is grayed out if **Sensor Type** is a TC or an mV transmitter.<br>If "3-wire" or "4-wire" is selected, the **Input 2** menu is not available. | 2-wire |
| **Lower value** | The temperature that corresponds to 4 mA. This parameter is not available for **Input 2**. | 0 °C |
| **Upper value** | The temperature that corresponds to 20 mA. This parameter is not available for **Input 2**. | 100 °C |
| **Lead Breakage** | Enables or disables the lead breakage detection. **Lead Breakage** is visible only if a TC or mV transmitter is selected under **Sensor Type**. | Enable |
| **Cold Junction Compensation** | Enables or disables the cold junction compensation. The **Cold Junction Compensation** (CJC) parameter is not visible if **Sensor Type** is a RTD or a slide-wire sensor.<br><br>**Input 1**: You may choose between the following values.<br>■ Internal: Uses the internal CJC (built-in).<br>■ External: Uses an external CJC. The external CJC is an accessory which can be obtained from Pepperl+Fuchs (W-ACC-CJC). The external CJC has to be connected to Input 2.<br>■ Disable: No CJC.<br><br>**Input 2**: You may choose between the following values.<br>■ Internal: Uses the internal CJC (built-in).<br>■ Disable: No CJC. | - |
| **Lead Resistance Compensation** | Enables or disables lead resistance compensation. When an RTD is connected in 2-wire connection, the resistance of the measurement lead is in series with the sensor. It is therefore added to the sensor resistance and is included in the measurement result. **Lead Resistance Compensation** compensates for this error.<br>The **Lead Resistance Compensation** parameter is not visible if **Sensor Type** is a TC or an mV transmitter. | Enabled |
| **Lead Resistance Compensation Value** | Specifies the lead resistance value to compensate for measurement errors (only with RTD 2-wire connection). | 0 Ω |

Table 5.5 Sensor Parameters Input 1/Input 2

## 5.6.2 Burst Mode Parameters

Burst mode is a special communication mode in which a HART slave device sends responses to a particular HART command on a predetermined, periodic schedule without being polled by the master. Normally, a HART slave device only responds when being polled by the master. When burst mode is used, a HART slave device can publish data (for example process values) independently in regular time intervals. Data can be sent as scheduled, or only if the value has changed by a significant amount or has not been updated within a default reporting time.

Up to 3 different burst modes can be set in the **Burst Mode** menu.

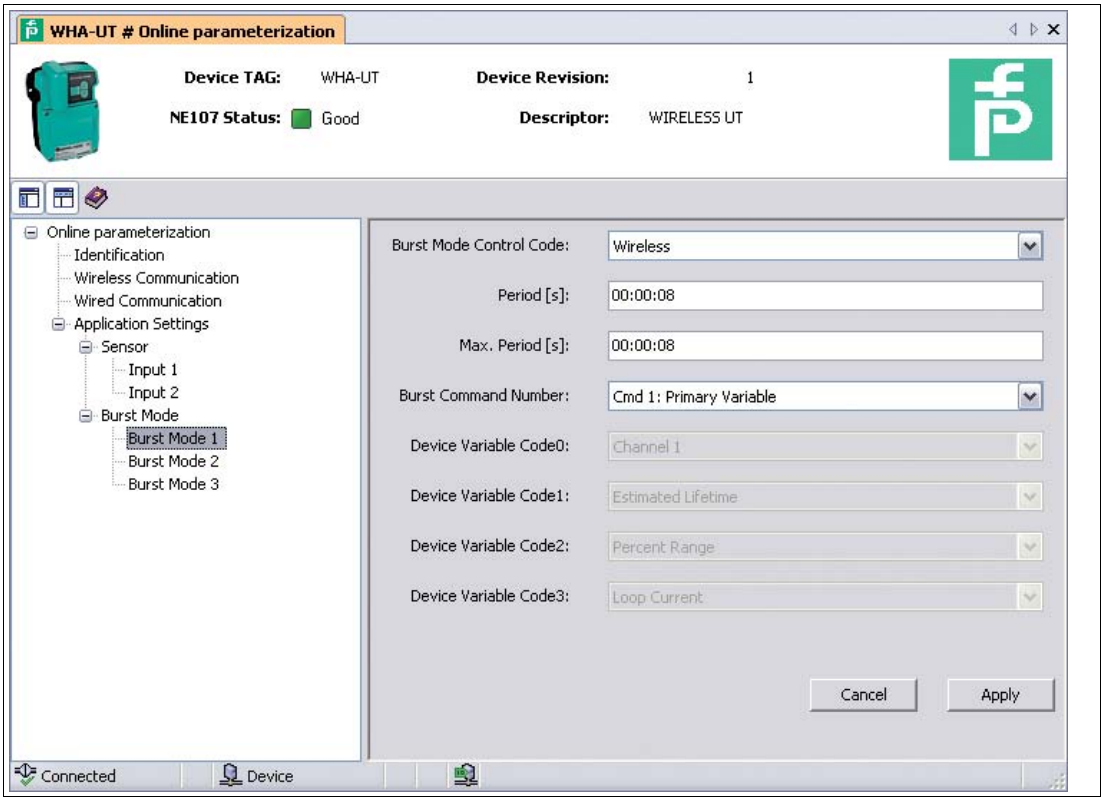



Figure 5.9 Application Settings > Burst Mode > Burst Mode 1

***Note!***

***Battery lifetime***

The more frequently burst messages are sent the more battery power is consumed, thus reducing battery lifetime.

**Burst Mode 1/2/3 Parameters**

| Parameter | Description | Default |
|---|---|---|
| **Burst Mode Control Code** | Switches burst mode on or off ("*Wireless*" = on).<br>The following parameters in this table can only be edited if **Burst Mode Control Code** is set to "*Wireless*". Otherwise they are grayed out. | Off |
| **Period [s]** | Determines the period in hh:mm:ss that elapses between burst messages. | 00:00:32 |
| **Max. Period [s]** | Should be set like the **Period [s]** parameter. This parameter is currently not used. | 00:00:32 |

2014-07



PEPPERL+FUCHS

| Parameter | Description | Default |
|---|---|---|
| **Burst Command Number** | Determines which commands are to be sent in the burst message.<br>■ Primary variable: Returns the primary value and units.<br>■ Loop current and percentage of range: Returns the loop current and its associated percent of range.<br>■ Dynamic variables and loop current: Returns the loop current and up to four predefined dynamic variables and units (PV, SV, TV, QV).<br>■ Device variables: Returns the value of up to 4 device variables.<br>■ Additional device status: Returns the device status information.<br>■ Device variables and additional device status: Returns the value of up to four device variables and the device status information. | Primary variable |
| **Device Variable Code 1 ... 4** | Determines which device variables are to be sent in the burst message (up to 4). Each of the 4 drop-down lists has the same contents:<br>■ Channel 1: Value measured from input 1<br>■ Channel 2: Value measured from input 2<br>■ Internal cold junction temperature: Sends the temperature of the internal cold junction for compensation<br>■ Battery voltage<br>■ Percentage of battery capacity<br>■ Estimated lifetime: Sends remaining battery lifetime<br>■ Percent range: Percent of range of the loop current<br>■ Loop current. Sends the value of the loop current<br>■ Not used: If not all 4 device variables are to be used, deacticate the desired device variable by selecting "Not used".<br>The **Device Variable Code 1 ... 4** parameters are grayed out depending on the value of the parameter **Burst Command Number**. | Not used |

Table 5.6 Burst Mode 1/2/3 Parameters

# 6 Operation

## 6.1 Controls and Indicators

The buttons and LED indicators can be accessed without opening the housing.

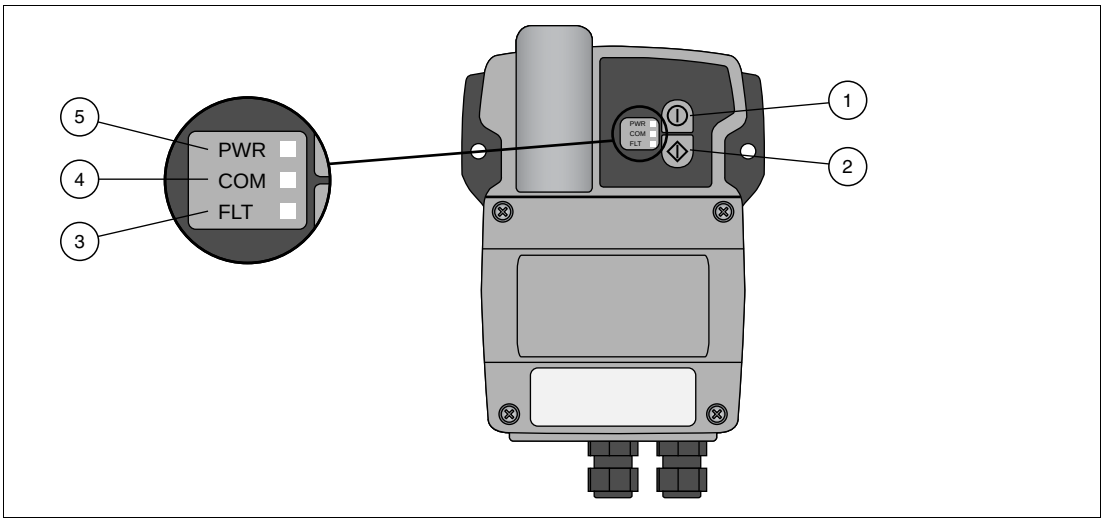



Figure 6.1 Controls and indicators

**1** Button A
**2** Button B
**3** Red FLT LED
**4** Yellow COM LED
**5** Green PWR LED

### 6.1.1 LEDs

***Note!***

To save battery power all LEDs are off during normal operation, even if the device is communicating or joining the network. The LEDs only light up after start up or while pressing the buttons.

When button A is pressed shortly (0.2 s ... 5 s), the three LEDs indicate the status of the device. See chapter 6.1.2

| LED indications | |
|---|---|
| Number of LEDs | 3 (green, yellow, red) |
| **Indications of green "PWR" LED (battery status)** | |
| LED on | Status "Normal": At least three months of battery life are left |
| LED flashes at 1 Hz | Status "Warning": At least one month of battery life is left |
| LED flashes at 3 Hz | Status "Alarm": Less than one month of battery life is left, or the battery is critically low. |
| LED off | Status "Off": The battery is flat or disconnected. |
| **Indications of yellow "COM" LED (communication status)** | |
| LED on | Status "Connected": The device was has full network connection. It is able to communicate with at least 2 wireless nodes. At least one alternative communication path to the gateway is available. |
| LED flashes at 1 Hz | Status "Joined": The device was able to join the network. However, it can communicate with a single wireless node only. There is no alternative communication path to the gateway. |
| LED flashes at 3 Hz | Status "Joining": The device is attempting to join the network. If joining at high-duty cycle has failed, the device keeps on trying to join the network using a low duty-cycle receive mode to reduce energy consumption.<br>The device will try to join the network until the battery is fully discharged. It is advised to switch the device off when not in use. |
| LED off | "Standby" mode: Joining the network cannot be accomplished or join mode is set to "Do not attempt to join". See chapter 5.4 |
| **Indications of red "FLT" LED (error)** | |
| LED on | Internal fault: An internal fault condition has been identified (e.g. A/D converter, microprocessor, CJC, radio); device fault that cannot be remedied by the user. |
| LED flashes at 1 Hz | External fault: An external abnormal condition (e.g. sensor burnout) has been identified; the fault can possibly be remedied by the user. |
| LED flashes at 3 Hz | Information: Device is disconnecting from the network before switching itself off. |
| LED off | There is no error. |

## 6.1.2 Buttons

Depending upon the length of time they are pressed, the buttons A and B call various functions.

**Functions of Button A**

| Time pressed | Function | Procedure |
|---|---|---|
| **Functions of button A (device switched off)** | | |
| > 5 s | Switching on the device | If the device is switched off, switch on the device as described below.<br>■ Keep button A pressed for 5 s. After 5 seconds all 3 LEDs light up for 1 second.<br>■ Release button A.<br>After a short while the green LED lights up for a few seconds if the battery is recognized as a non-exhausted battery. Then, all LEDs are off again. The device attempts to join the network autonomously using the fast join mode. In the fast join mode, the radio is activated more frequently than in the standard join mode. If the device is not able to join the network within 30 minutes, it will end the fast join mode and go into standby mode. |
| **Functions of button A (device already switched on)** | | |
| 0.2 ... 5 s | Status test | ■ Press button A for more than 0.2 s and less than 5 s.<br>■ Release button A.<br>The LEDs display the current device status. see chapter 6.1.1 |
| 5 ... 10 s | Activating fast join mode | The device starts the fast join mode autonomously for 30 minutes after it is has been switched on. However, you may speed up the joining phase anytime by activating the fast join mode manually.<br>■ Keep button A pressed for 5 s.<br>After 5 s the yellow LED starts flashing at 3 Hz.<br>■ Release button A.<br>The yellow LED extinguishes.<br>The device starts joining. |
| > 10 s | Switching off the device | ■ Keep button A pressed for 10 s.<br>After 5 s the yellow LED starts flashing at 3 Hz.<br>After 10 s the red LED starts flashing at 3 Hz.<br>■ Release button A.<br>The red LED stops flashing after a few seconds.<br>The device saves the current configuration and switches itself off. |

2014-07

**Functions of Button B**

| Time pressed | Function | Procedure |
|---|---|---|
| **Functions of button B** | | |
| > 3 s | 2-wire RTD compensation (line resistance) | If a channel has been configured as 2-wire RTD, the line resistance can be compensated with this function.<br>■ Jumper the sensor and keep button B pressed at the same time.<br>After 3 s the green LED starts flashing at 3 Hz.<br>■ If you want to compensate channel 1, release button B immediately.<br>■ If you want to compensate channel 2, keep button B pressed until also the yellow LED starts flashing at 3 Hz.<br>■ Release button B.<br>After releasing button B, the LED(s) start flashing at 1 Hz during the compensation process.<br>As soon as the compensation is finished, the LED(s) remain switched on for another 5 seconds. After this, the line resistance is compensated.<br>If the red "FLT" LED lights up, a fault has occurred during the process (blinking at 1 Hz = no RTD connected or configured; blinking at 3 Hz = sensor burnout; LED permanently on = wire resistance bigger than 10 Ω). |
| > 18 s | Reset of consumed battery charge | The device measures the consumed battery charge. When an old battery is replaced with a new one, this function has to be reset to achieve a correct measurement. After having inserted the new battery, press button B for 18 seconds. As soon as all LEDs light up, release the button. The function has been reset.<br>■ After having inserted the new battery, keep button B pressed for 18 seconds.<br>After 3 s the green LED starts flashing at 3 Hz.<br>After 8s the yellow LED starts flashing at 3 Hz.<br>All LEDs go off again.<br>After 18s all LEDs light up.<br>■ Release button B. The function has been reset. |

## 6.2 Measured Value

The **Measured Value** function displays the currently measured values of the sensors connected to the sensor inputs (PV, SV, TV, QV).

### Accessing the **Measured Value** windows

1. In the PACTware project, right-click on the device.

   ↳ A context menu opens.

2. Select **Measured Value**.

   ↳ The **Measured Value** window appears.

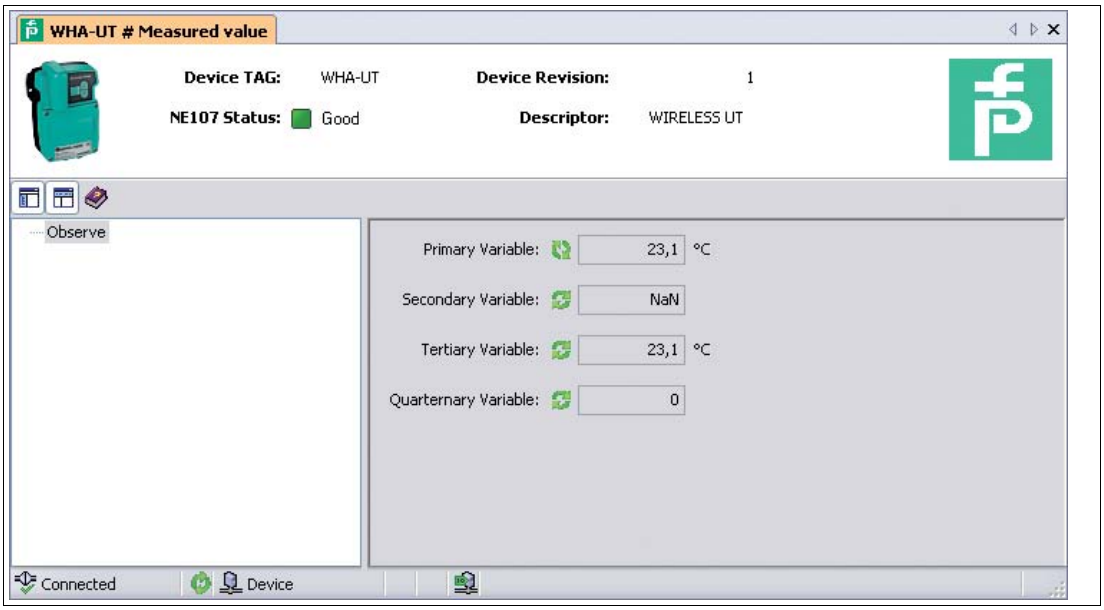



Figure 6.2 Measured value

## 6.3 Diagnostics

The **Diagnostics** function provides detailed information about the device, *wireless*/wired communication and health status.

***Note!***

***Available Only Online (DTM)***

If using the configuration via DTM and PACTware™ the **Diagnostics** function is available only online. see chapter 5.2

### Accessing the Diagnostics Window

1. Right-click the device in the PACTware™ project tree.
2. Select **Diagnostics**.

## 6.3.1 Identification

**Identification** provides information about the hardware and software of the device.

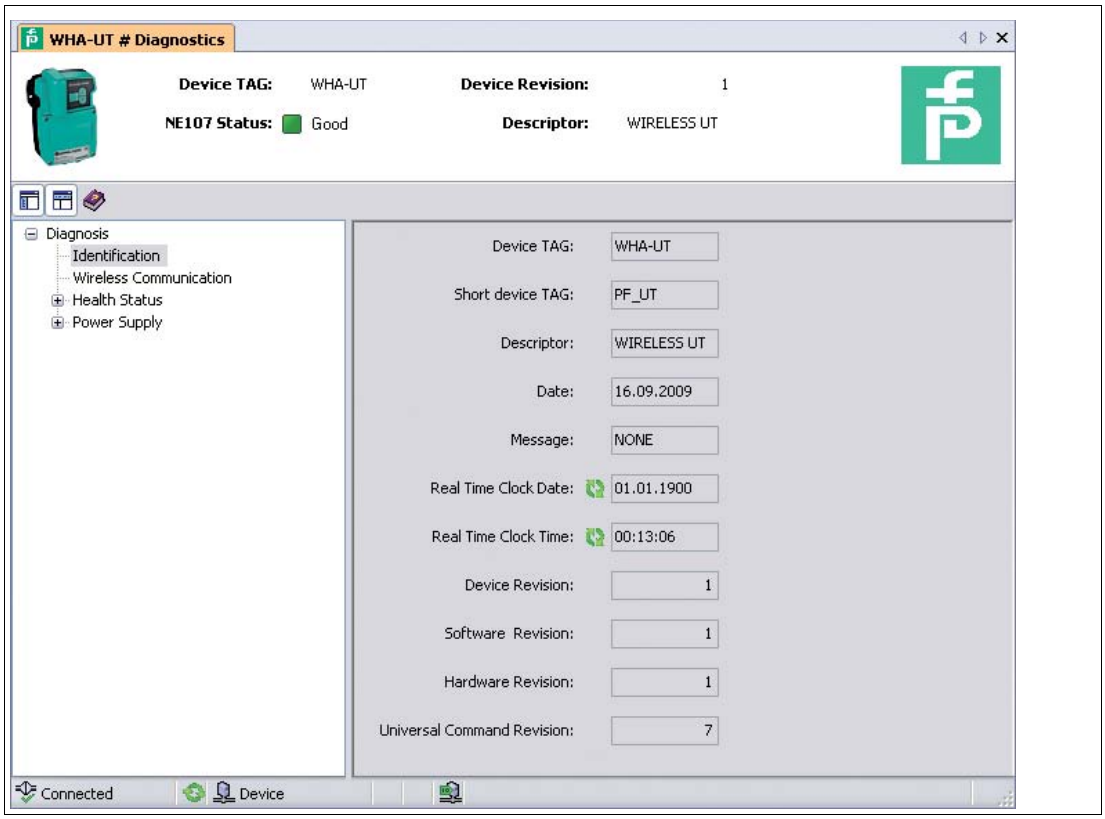



Figure 6.3 Diagnosis > Identification

***Note!***

The data listed in the following table is available only during online parameterization.

**Diagnosis - Identification**

| Parameter | Description |
|---|---|
| **Device Tag** | Identifies the device in a *Wireless*HART network. |
| **Short device Tag** | Identifies the field device within the process plant |
| **Descriptor** | Further description of the device. |
| **Date** | User-defined date (e.g. last parameter change).<br>**Date** is not modified by the Gateway itself. Instead is has to be set by the user or Host application. |
| **Message** | User defined message. |
| **Real time clock date** | Shows the date currently set in the device. |
| **Real time clock time** | Shows the time currently set in the device. |
| **Device Revision** | Software revision of the device. |
| **Software Revision** | Software revision of the device. |
| **Hardware Revision** | Hardware revision of the device. |
| **Universal Command Revision** | Revision of the HART protocol supported by the WHA-UT. |

Table 6.1 Diagnosis - Identification

## 6.3.2 Wireless Communication

**Wireless Communication** provides information about the operation of the device within the *Wireless*HART network.

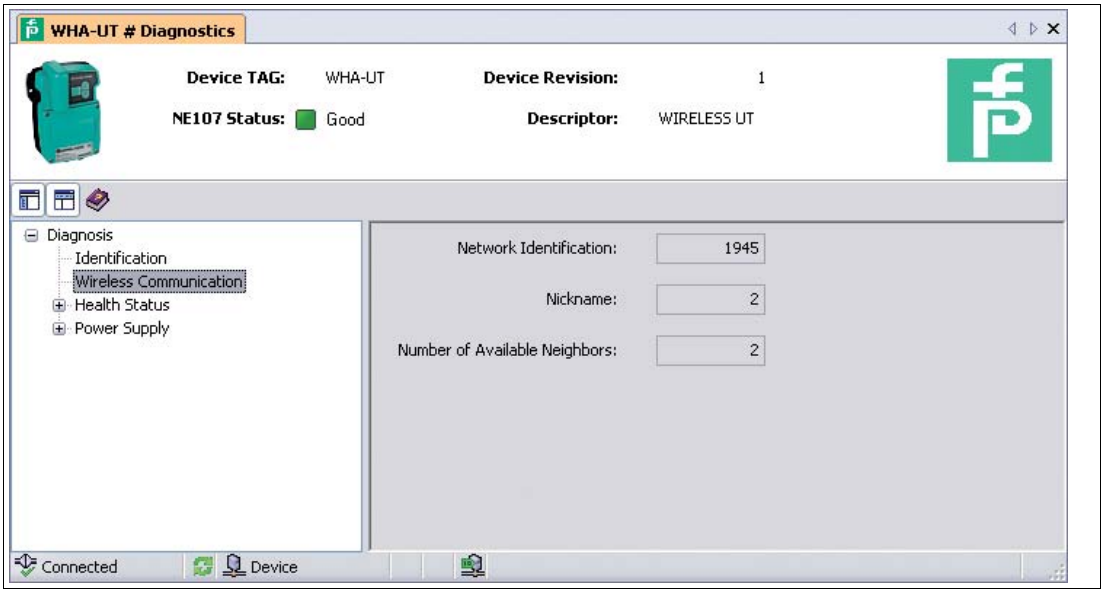



Figure 6.4 Diagnosis > Wireless Communication

***Note!***

The data listed in the following table is available only during online parameterization.

**Diagnosis - Wireless Communication**

| Parameter | Description |
|---|---|
| **Network Identification** | Network ID of the wireless network. |
| **Nickname** | Short destination address of the device. |
| **Number of available Neighbors** | Number of *Wireless*HART devices within the antenna range of the device to which a connection has been made. |

Table 6.2 Diagnosis - Wireless Communication

## 6.3.3 Health Status

The **Health Status** menu contains diagnostic information. The information is displayed in three different ways according to:

- NAMUR NE107 guidelines,
- ASM guidelines,
- HART specification.

Open the corresponding sub-menu to view the respective information.

### NAMUR

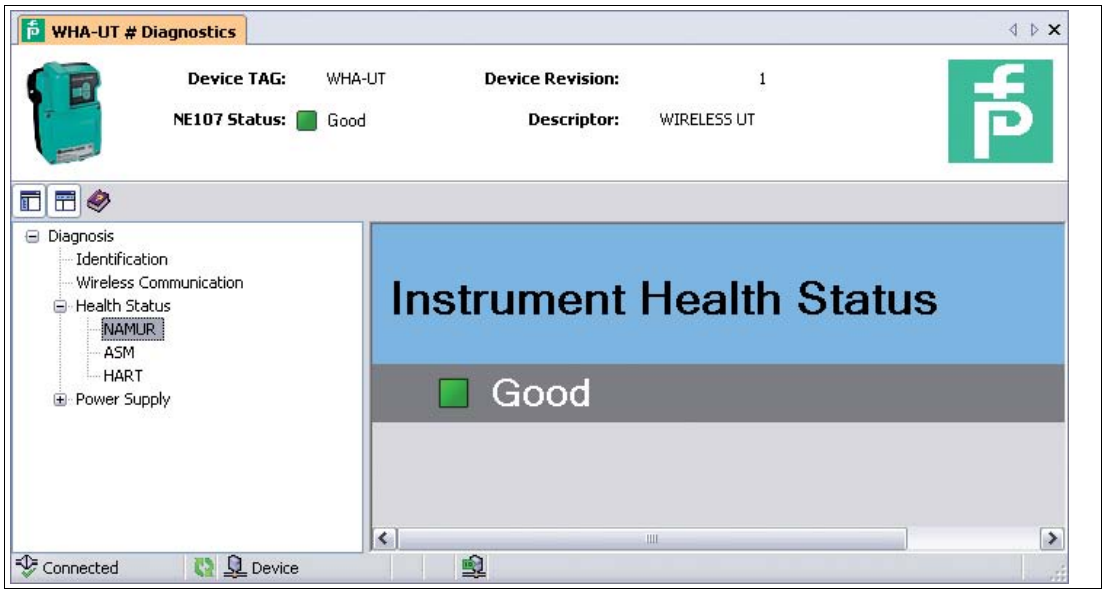



Figure 6.5 Diagnosis > Health Status > NAMUR

The following status messages according to the NAMUR NE107 guidelines can be displayed:

- Good
- Failure (F)
- Maintenance required (M)
- Out of specification (S)
- Function check (C)

## ASM

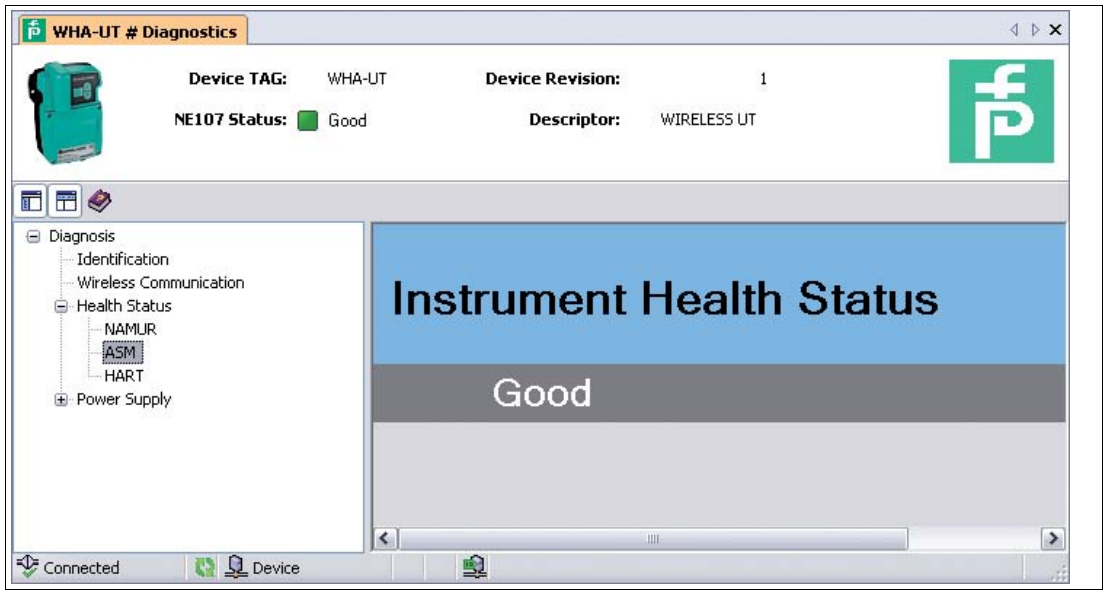



Figure 6.6 Diagnosis > Health Status > ASM

The following status messages according to the ASM guidelines can be displayed:

- Faults in the sensor or actuator
- Faults in the electronics
- Installation or start-up faults
- Out of specification.

## HART

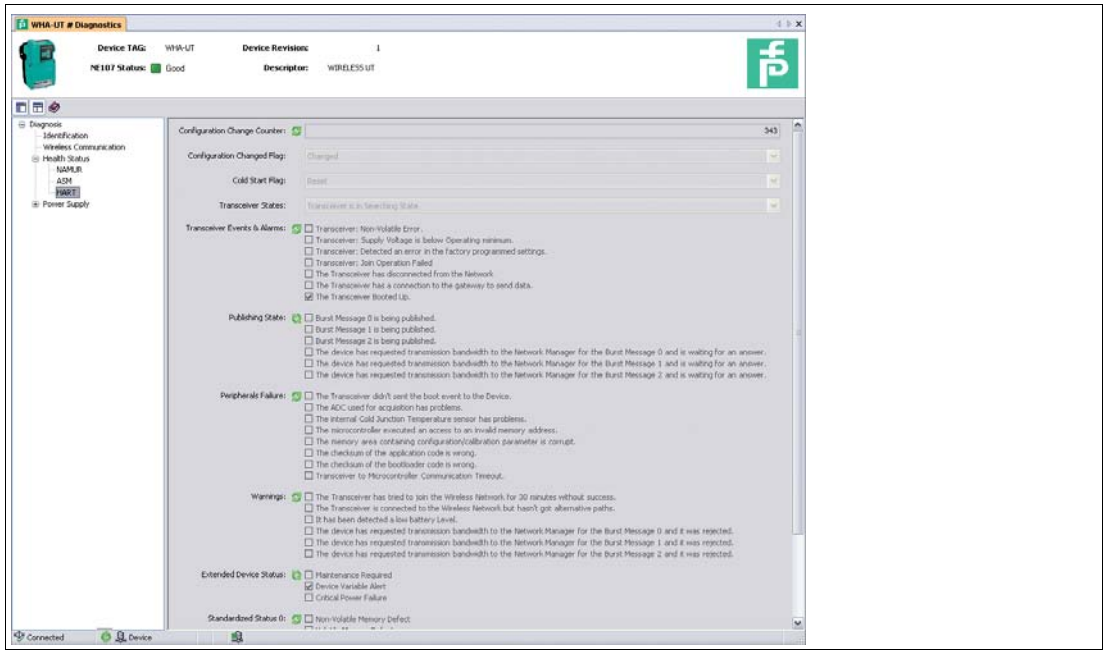


Figure 6.7 Diagnosis > Health Status > HART

The **HART** health status window provides various information, for example about wireless communication, device status and burst messages. The information is self-explanatory and therefore is not further explained in this manual.

2014-07

### 6.3.4 Power Supply

The **Diagnosis > Power Supply > Battery** menu contains information on the battery unit of the device.

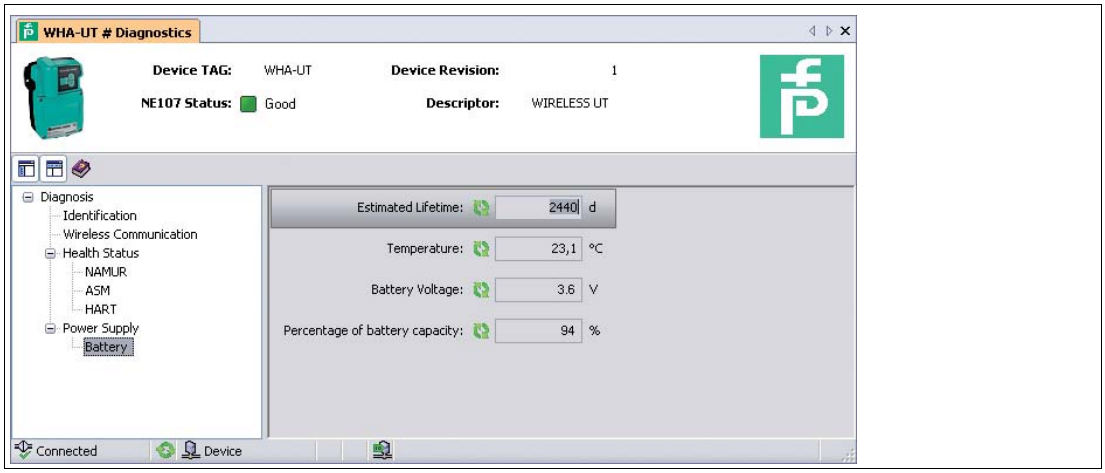



Figure 6.8 Diagnosis > Power Supply > Battery

**Diagnosis - Battery**

| Parameter | Description |
|---|---|
| **Estimated lifetime** | Number of days battery power will last under the current load conditions. |
| **Temperature** | Current device temperatore. |
| **Battery voltage** | Current battery voltage. |
| **Percentage of battery capacity** | Percentage of battery capacity left. |

Table 6.3 Diagnosis - Battery

## 6.4 Additional Functions

### Accessing the Additional Functions Windows

1. Right-click the device in the PACTware™ project tree.
2. Select **Additional functions** and choose the desired function.

### 6.4.1 Reset

**Reset** restarts the device. A device reset is like a power up with the difference that if the module was already connected to the network, it disconnects properly before powering down. No parameters will be reset.
Choose **Additional Functions > Reset** and press the button **Device Reset** to perform a reset.

### 6.4.2 Self Test

After pressing the **Perform Self-Test** button in the **Additional Functions > Self Test** menu the device carries out a self test.

The results of the self test can be seen in the **Diagnostics** menu. see chapter 6.3

### 6.4.3 About

**Additional Functions > About** displays information about the device, its manufacturer, and its firmware version.

# 7 Maintenance and Repair

## 7.1 Exchanging the Battery

Only batteries of type W-BAT-B1-Li can be changed in an area known to be hazardous. You can order these battery units from Pepperl+Fuchs under the part no. 219035.

***Danger!***

Batteries in hazardous areas

Batteries from Pepperl+Fuchs for this device may be brought into hazardous areas. However, always check if the battery is intact before transporting it into hazardous areas. Always transport batteries enclosed inside their original packages or already installed inside the device.

***Danger!***

Loss of intrinsic safety

The use of batteries other than specified voids the qualification for use in hazardous areas.

Only use batteries of type W-BAT-B1-Li from Pepperl+Fuchs.

***Danger!***

Possible damage because of wrong battery

The use of batteries other than specified may cause damage to the device.

Only use batteries of type W-BAT-B1-Li from Pepperl+Fuchs.

***Warning!***

Caustic battery acid

Leaking battery acid can cause personal injury and damage to the device.

- Never use batteries that are leaking.
- Never use batteries with external damage such dents or deep scratches, even if no battery acid is leaking.

***Danger!***

Electrostatic discharge hazard

The device contains non-conductive plastic parts. Care must be taken when operating the installed device because of possible electrostatic charges. Electrostatic charged surfaces may cause an ignition spark.

Electrostatic charges must be avoided. For example, do not rub the device and never clean plastic surfaces with a dry cloth. Always use a damp cloth instead.

***Note!***

You may open the housing and connect/disconnect the battery in Zone 1.

***Note!***

The device has a permanent memory. All device settings are stored if the device is switched off properly before changing the battery. If you change the battery without switching off the device first, the settings cannot be saved.

2014-07

***Note!***

- When operating at ambient conditions different from the conditions specified, battery capacity can be reduced up to 50%.
- The device has internal battery diagnostics that can send a warning when battery conditions are outside the acceptable operating range.

### Changing the Battery

1. Switch off the device by pressing button A for 10 seconds. See chapter 6.1

   ↳ After 5 seconds the yellow LED starts flashing at 3 Hz. After 10 seconds the red LED starts flashing at 3 Hz.
2. Release the button.

   ↳ The red LED stops flashing after a few seconds. The device saves the current configuration and switches itself off.
3. Unscrew the four screws of the housing cover.
4. Remove the housing cover.
5. Extract the fresh battery from its package. Do not throw the empty package away.
6. Remove the the exhausted battery from the device.
7. Place the exhausted battery inside the empty battery package.
8. Insert the new battery of the correct type into the battery holder observing the polarity.
9. Screw the housing cover to the housing.
10. Switch on the device by pressing button A for 5 seconds. See chapter 4.2

    ↳ After 5 seconds all 3 LEDs light up for 1 second.
11. Release the button.

    ↳ After a short while the green LED lights up for a few seconds if the battery is recognized as a non-exhausted battery.
12. Reset the measurement of the consumed battery charge by pressing button B for 18 seconds until all LEDs light up for a short time. See chapter 6.1
13. Release button B.

    ↳ The function has been reset.

## 7.2 Disposal of Batteries

The battery / the battery unit is non-rechargeable. The batteries are non-hazardous when used according to the recommendations of the manufacturer. However, they do contain hazardous substances and therefore must be disposed of in compliance with the applicable laws and guidelines of the corresponding country.

# 8 Troubleshooting

## 8.1 Faults indicated by LEDs

***Note!***

To save battery power all LEDs are off during normal operation, even if the device is communicating or joining the network. The LEDs only light up after start up or while pressing the buttons.

For more information on the LED indications: see chapter 6.1.1.

| Green LED (battery status) | | |
|---|---|---|
| State | Possible cause(s) | Action(s) |
| LED flashes at 1 Hz | Status "Warning": At least one month of battery life is left. | Change battery within a month (see chapter 7.1). |
| LED flashes at 3 Hz | Status "Alarm": Less than one month of battery life is left. | Change battery immediately (see chapter 7.1). |
| LED remains off after pressing button A for more than 0.2 seconds and less than 5 seconds. | Status "Off":<br>■ The battery is flat or disconnected.<br>■ The device has been switched off. | ■ Change battery (see chapter 7.1).<br>■ Switch on the device (see chapter 4.2). |

| Yellow LED (communication status) | | |
|---|---|---|
| State | Possible cause | Action(s) |
| LED flashes at 1 Hz | Status "Joined": The device was able to join the network. However, it can communicate with a single wireless node only. There is no alternative communication path to the gateway. | ■ Add a *Wireless*HART device which is within the antenna range of the affected device.<br>■ Change the position of the affected device. |

| Yellow LED (communication status) | | |
|---|---|---|
| State | Possible cause | Action(s) |
| LED flashes at 3 Hz | Status "Joining": The device is attempting to join the network. If joining at high-duty cycle has failed, the device keeps on trying to join the network using a low duty-cycle receive mode to reduce energy consumption. The device will try to join the network until the battery is fully discharged. It is advised to switch the device off when not in use. If the device is not able to join the network after a reasonable period of time, the following reasons are possible:<br>■ There are no communication paths available.<br>■ No *Wireless*HART network has been set up so far.<br>■ The network ID/join key is not correct. | ■ Add a *Wireless*HART device which is within the antenna range of the affected device and try joining the network again. Change the position of the affected device and try joining the network again.<br>■ Install a *Wireless*HART gateway first. Set up a *Wireless*HART network.<br>■ Check network ID and join key. |
| LED off | "Standby" mode: The receiver is switched off. The join mode is set to "Do not attempt to join" or the receiver is in fault. | ■ If you want the device to try joining the network again, make sure that the Join Mode parameter is not set to "Do not attempt to join" (see chapter 5.4).<br>■ If you think the receiver is damaged, please contact Pepperl+Fuchs. |

| Red LED (device status) | | |
|---|---|---|
| State | Possible cause | Action(s) |
| LED on | Internal Fault: An internal fault condition has been identified (e.g. damaged A/D converter, microprocessor, CJC, radio) | Send the device back to the manufacturer. |
| LED flashes at 1 Hz | External Fault: An sensor burnout has been detected. | Check the sensor and the sensor's wires and connections to the device. |
| LED flashes at 3 Hz while button A is pressed | Information: Device is disconnecting from the network before switching itself off. | Release button A. The device will switch itself off. |
| LED off | There is no error. | none |

## 8.2 Wireless Communication Faults

| Fault | Possible Cause(s) | Corrective Action(s) |
|---|---|---|
| PACTware™ cannot find the device when communicating via *Wireless*HART Gateway. | The device has not yet joined the network. | The joining process may take a while. Check the join status in the gateway's Instrument List. Alternatively, check the wireless communication parameters (join status) of the device via a HART modem connected to the device. If the device does not join, check the next fault. |
| | The device carries the wrong Network ID and/or Join Key. | Check the wireless communication parameters of the device via a HART modem connected to the device. The device and the gateway must have the same Network ID and Join Key. |
| The device does not join the network. | No battery or low battery | Check that a fresh battery of the correct type is inserted. |
| | The device carries the wrong Network ID and/or Join Key. | Check the wireless communication parameters of the device via a HART modem connected to the device. The device and the gateway must have the same Network ID and Join Key. |
| | No neighboring *Wireless*HART devices are within the device's antenna range. | ■ Check the number of neighbors in the device DTM (wireless communication parameters). There should be at least 2 neighbors.<br>■ If there are no reachable neighbors, check the device's mounting position: Are there any obstacles? If yes, change the mounting position.<br>■ If there are no reachable neighbors and you can not change the device's mounting position: Try moving an other *Wireless*HART device in the network, or adding a new one. |
| | Device not mounted correctly | Check that the device has been mounted correctly. See chapter 3.1 |
| | Device not trying to join | Check whether the device is trying to join the network (LEDs): if not, start a new connection attempt by pressing the correct button. See chapter 6 |
| Device disappears sporadically from the network | There are not enough neighboring *Wireless*HART devices within the antenna range of the device. | Check the number of neighbors in the device DTM (wireless communication parameters). There should be at least 2 neighbors. |

2014-07

## 8.3 Wired Communication Faults

| Fault | Possible cause | Corrective action |
|---|---|---|
| PACTware cannot find the device when communicating via a HART modem. | The wrong COM port has been set in the HART communication DTM. | Check to which COM port your HART modem is connected to. See chapter 4.3<br>Then set the correct COM port in the HART communication DTM. See chapter 4.5.2 |
| | For USB HART modems: Maybe you are using a different USB port than during setup. The COM port may be different if the modem is is plugged into a different USB port. | ■ Plug the HART modem into the correct UBS port.<br>■ Alternatively, adjust the COM port setting in the HART communication DTM. See chapter 4.5.2 |
| | The wrong address range has been set in the HART communication DTM | Adjust the address range. See chapter 4.5.2 |

# 9 Technical Specifications

## 9.1 WHA-UT-F7B1-0-PP-Z1-EX2

| | |
|---|---|
| **Supply** | |
| Rated voltage | 3.6 V DC , battery operated |
| Life span | 5 year lithium battery |
| Power loss/power consumption | < 0.09 W |
| **Input** | |
| Number of channels | 2 |
| Connection | terminals 1, 2, 3, 4 |
| RTD | type Pt100, Pt1000 (IEC 751: 1995; GOST: alpha = 0.391) |
| Connection | 2-wire: 2 sensors, 3- or 4-wire: 1 sensor |
| Lead resistance | max. 10 Ω |
| Measuring circuit monitoring | sensor breakage |
| Measurement range | Pt100: -200 ... 850 °C<br>Pt1000: |
| Thermocouples | type E, J, K, T (IEC 584-1) |
| Cold junction compensation | internal , external |
| Measuring circuit monitoring | sensor breakage |
| Measurement range | type K: -270 ... 1370 °C<br>type T: -270 ... 400 °C<br>type E: -270 ... 1000 °C<br>type J: -210 ... 1200 °C |
| Resistor | |
| Measurement range | 0 ... 500 Ω , 0 ... 4000 Ω |
| Voltage | mV Input |
| Measurement range | -100 ... 100 mV , 0 ... 300 mV |
| Input resistance | ≥ 1 MΩ |
| **Output** | |
| Interface | internal antenna |
| Output variables | PV: input 1 (°C, Ω, mV)<br>SV: input 2 (°C, Ω, mV)<br>TV: CJC temperature (°C)<br>estimated battery life (days)<br>battery voltage (volts)<br>residual battery capacity (%) |
| Communication | *Wireless*HART specifications<br>- physical layer: IEEE 802.15.4.2006<br>- frequency band: 2.4 GHz (ISM band, licence free)<br>- transmission rate: 250 kBit/s<br>- max. transmit power: +10 dBm (EIRP)<br>- transmission range: outdoor 250 m, indoor 50 m (under reference conditions)<br>- communication standard: *Wireless*HART |

2014-07

| | |
|---|---|
| **Transfer characteristics** | |
| Temperature measuring range | sensor type:<br>- TC type E: -200 ... 1000 °C, accuracy ± 0,5 °C<br>- TC type J: -200 ... 750 °C, accuracy ± 1 °C<br>- TC type T: -200 ... 400 °C, accuracy ± 1 °C<br>- TC type K: -140 ... 1300 °C, accuracy ± 1 °C<br>- RTD type Pt100: -200 ... 850 °C, accuracy ± 0,5 °C<br>- 100 mV, accuracy ± 20 µV<br>- 300 mV, accuracy ± 40 µV |
| Accuracy | - internal cold junction compensation error ± 1,5 °C (typ. acc. to IEC 61298-3)<br>- external cold junction compensation error ± 1°C (typ.)<br>- resolution error < 0.1 °C<br>- accuracy TC ± 20 µV<br>- accuracy RTD: ± 100 mΩ |
| **Indicators/settings** | |
| Display elements | LED PWR (battery status), one green LED<br>LED COM (communication status), one yellow LED<br>LED FLT (fault signal), one red LED |
| Control elements | 2 push buttons:<br>- power On/Off<br>- Join Trigger<br>- Device Status Trigger<br>- 2-wire RTD Wire Compensation<br>- battery replacement confirmation |
| Configuration | wired interface:<br>- HART 7.1, FSK compatible<br>- transmission rate: 1200 Bit/s<br>- used for device commissioning with an handheld terminal or a configuration tool (DTM) |
| Parameter assignment | - sampling period: 1, 2, 5, 10, 30 seconds or 1, 2, 5, 10, 30, 60 minutes<br>- transmit power: configurable 0 dBm or 10 dBm (EIRP)<br>- sensor type<br>- mapping of input measuring values 1 and 2 into primary variable (PV) and secondary variable (SV)<br>- publishing of up to three messages from the device, transmission rate selectable from 4 seconds to 60 minutes |
| **Directive conformity** | |
| Electromagnetic compatibility | |
| Directive 2004/108/EC | EN 61326-1:2006 |
| Radio and telecommunication terminal equipment | |
| Directive 99/5/EC | ETSI EN 300328: V1.7.1 (2006-10), ETSI EN 301489-17: V1.2.1 (2002-08), EN 60950:2001 |
| FCC CFR47 Part 15 B and C | ANSI C63.4-2003 |
| **Conformity** | |
| Degree of protection | IEC 60529 |
| Shock resistance | EN 60068-2-27 |
| Vibration resistance | EN 60068-2-6 |
| Accuracy | IEC 61298-3 |
| **Ambient conditions** | |
| Ambient temperature | -20 ... 60 °C (-4 ... 140 °F) |
| Storage temperature | -20 ... 70 °C (-4 ... 158 °F) |

| | |
|---|---|
| Relative humidity | 5 ... 95 %, noncondensing |
| Corrosion resistance | acc. to ISA-S71.04-1985, severity level G3<br>test setup and execution acc. to EN 60068-2-60 |
| **Mechanical specifications** | |
| Housing width | 129 mm |
| Housing height | 177 mm |
| Housing depth | 77 mm |
| Degree of protection | IP65 |
| Mass | approx. 1000 g |
| Dimensions | 77 x 129 x 177 mm (3 x 5.08 x 6.97 in) |
| Mounting | panel or pole mounting |
| **Data for application in connection with Ex-areas** | |
| EC-Type Examination Certificate | IMQ 09 ATEX 008X |
| Group, category, type of protection | Ex II 2(1)G Ex ia [ia] IIC T4 |
| Directive conformity | |
| Directive 94/9/EC | EN 60079-0:2006, EN 60079-11:2007, EN 60079-26:2007 |
| **International approvals** | |
| FM approval | CoC 3042534 |
| IECEx approval | IECEx INE 09.0025X |
| Approved for | Ex ia IIC T4 |
| **General information** | |
| Supplementary information | EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity, Attestation of Conformity and instructions have to be observed where applicable. For information see www.pepperl-fuchs.com. |
| **Accessories** | |
| Designation | battery W-BAT-B1-Li mandatory for use in connection with hazardous areas (order separately)<br>Mounting set W-ACC-F7MK<br>External cold junction compensation W-ACC-CJC |

2014-07

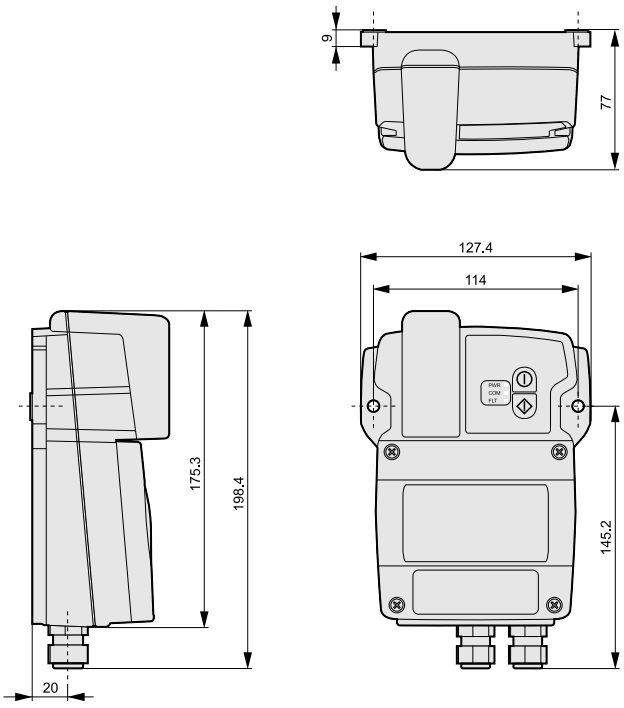
## 9.2 Telecommunication Compliance

- ETSI (R&TTE)
- FCC Part 15.247 for wireless applications in the area of 2.4 GHz
- EN 300 328

The usage of 2400 MHz equipment is bound to local restrictions. Ensure that local restrictions allow usage of this product before commissioning.

| Country | Guideline |
|---|---|
| Bulgaria | General authorization required for outdoor use and public service. |
| Italy | If used outside of own premises, general authorization is required. |
| Japan | The device is granted pursuant to the Japanese Radio Law and the Japanese Telecommunications Business Law.<br>The device must not be modified (otherwise the granted designation number will become invalid). |
| Latvia | The outdoor usage of the 2.4 GHz band requires an authorization from the Electronic Communications Office. |
| Norway | May be restricted in the geographical area within a radius of 20 km from the center of Ny-Alesund. |
| Rumania | Use on a secondary basis. Individual license required. |

## 9.3 Dimensions



# PROCESS AUTOMATION – PROTECTING YOUR PROCESS

**Worldwide Headquarters**
Pepperl+Fuchs GmbH
68307 Mannheim · Germany
Tel. +49 621 776-0
E-mail: info@de.pepperl-fuchs.com

For the Pepperl+Fuchs representative
closest to you check www.pepperl-fuchs.com/contact

**www.pepperl-fuchs.com**

PEPPERL+FUCHS
PROTECTING YOUR PROCESS



/ TDOCT-1899EENG
07/2014