SensyTemp TSP300-W WirelessHART
Temperature sensor with Energy Harvester

Measurement made easy

Power and productivity
for a better world™

ABB

Short product description

Temperature sensor with Energy Harvester for the autonomous wireless measurement of the temperature of liquid and gaseous measuring media.

Further information

Additional documentation on SensyTemp TSP300-W WirelessHART is available for download free of charge at www.abb.com/temperature.
Alternatively, scan this code:

Manufacturer
ABB Automation Products GmbH
Process Automation
Schillerstr. 72
32425 Minden
Germany
Tel: +49 571 830-0
Fax: +49 571 830-1806

Customer service center
Tel: +49 180 5 222 580
Mail: automation.service@de.abb.com

Contents

1 Safety

1.1 General information and instructions

These instructions are an important part of the product and must be retained for future reference.

Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator accordingly. The specialist personnel must have read and understood the manual and must comply with its instructions.

For additional information or if specific problems occur that are not discussed in these instructions, contact the manufacturer. The content of these instructions is neither part of nor an amendment to any previous or existing agreement, promise or legal relationship.

Modifications and repairs to the product may only be performed if expressly permitted by these instructions. Information and symbols on the product must be observed. These may not be removed and must be fully legible at all times.

The operating company must strictly observe the applicable national regulations relating to the installation, function testing, repair and maintenance of electrical products.

1.2 Warnings

The warnings in these instructions are structured as follows:

⚠ **DANGER**

The signal word "DANGER" indicates an imminent danger. Failure to observe this information will result in death or severe injury.

⚠ **WARNING**

The signal word "WARNING" indicates an imminent danger. Failure to observe this information may result in death or severe injury.

⚠ **CAUTION**

The signal word "CAUTION" indicates an imminent danger. Failure to observe this information may result in minor or moderate injury.

ⓘ **NOTE**

The signal word "NOTE" indicates useful or important information about the product.
The signal word "NOTE" is not a signal word indicating a danger to personnel. The signal word "NOTE" can also refer to material damage.

1.3 Intended use

This device is intended for the following uses:
— To measure the temperature of fluid, pulpy or pasty substances and gases or resistance/voltage values.

The device has been designed for use exclusively within the values stated on the name plate and within the technical limit values specified on the data sheets.
— The maximum and minimum operating temperature limits must not be exceeded or undershot.
— The permissible ambient temperature must not be exceeded.
— The housing's degree of protection must be observed during operation.

1.4 Improper use

The following are considered to be instances of improper use of the device:
— For operating as a flexible adapter in piping, e.g. for compensating pipe offsets, pipe vibrations, pipe expansions, etc.
— For use as a climbing aid, e.g. for mounting purposes
— For use as a support for external loads, e.g. as a support for piping, etc.
— Material application, e.g. by painting over the name plate or welding/soldering on parts
— Material removal, e.g. by spot drilling the housing

1.5 Handling of lithium ion batteries

Lithium batteries do not pose a danger if handled properly. Please note the following points for the proper handling of lithium batteries:
— Protect the contacts or connection leads of lithium batteries that are not used in the device against short-circuits, e.g. by masking them
— Do not charge lithium batteries

1.5.1 Transport

The device is shipped with a Lithium Battery in shape of a D-Cell. The battery is already installed.

Transport of lithium batteries is subject to regulations. Regulations are based on the United Nations Model Regulations on the Transport of Dangerous Goods.

The most important regulations can be summarized as follows:

— C- and D-size cells as well as larger cells and most battery packs have to be transported under dangerous goods regulations.

— Lithium batteries below 2 g lithium content (corresponding approximately to 3 AA cells) are exempted from dangerous goods regulations but each package requires a special label to indicate that it contains lithium batteries and special procedures shall be followed when a package is damaged during transportation.

— Transport regulations require that lithium cells and batteries of all kinds, exempted or not, be tested according to the UN test methods.

Packing instructions for air transport of lithium batteries worldwide are revised bienially by the International Civil Aviation Organization (ICAO) and distributed in various languages by the International Air Transport Association (IATA).

According to the regulations, Tadiran Lithium Batteries are classified as lithium metal batteries. Different regulations are valid for transport in the USA.

1.5.2 Disposal

The European Battery Directive 2006/66/EC restricts the use of certain hazardous substances in batteries and establishes rules for the collection, treatment, recycling and disposal of waste batteries and accumulators.

It is transposed individually in each EU member state. For example, transposition in the UK is by the Batteries and Accumulators (Placing on the Market) Regulations 2008 and by the Waste Batteries and Accumulators Regulations 2009.

The following information is important for end users of batteries:

— Batteries are marked with the crossed-out wheeled bin symbol (see title bar). The symbol reminds end users that batteries must not be disposed as municipal waste, but collected separately. Used batteries can be returned at the point of sale at no charge.

— The reason for these regulations is that there are a number of environmental concerns which arise when dealing with the waste management of batteries and accumulators. These relate for the most part to the metals contained in these batteries. Mercury, lead and cadmium are by far the most problematic substances in the battery waste stream. Other metals commonly used in batteries, such as zinc, copper, manganese, lithium and nickel, may also constitute environmental hazards. However, the new regulations apply to all batteries and not just to hazardous ones because all batteries contain substances which are more or less harmful to the environment and because experience with previous regulations showed that `all battery' collection schemes are more efficient than separate schemes for certain types of portable batteries.

— Batteries should be recycled because battery recycling helps to save resources by allowing for the recovery of valuable metals such as nickel, cobalt and silver and requires less energy consumption. For example, using recycled cadmium and nickel requires respectively 46 % and 75 % less primary energy than the extraction and refining of virgin metals.

This information is based on the `Q&A on the Batteries Directive 2006/66/EC' document that can be downloaded from the European Commission website.

1.5.3 Battery lifetime

The SensyTemp TSP300-W support battery management by a life time estimation algorithm, there are parameters outside the device's control influencing the battery life time such as operating temperature.

The SensyTemp TSP300-W estimates remaining battery life time based on current consumption and electronics temperature. Anyway it is a calculation based on historical information and does not consider future conditions.

When the battery is changed, the transmitter powers down. Insertion of a new battery has to be notified to the device via EDD, DTM or LC display locally.

2 Use in potentially explosive atmospheres according to ATEX and IECEx

> **ℹ NOTICE**
> — Further information on the approval of devices for use in potentially explosive atmospheres can be found in the explosion protection test certificates (at www.abb.com/temperature).
> — Depending on the design, a specific marking in accordance with ATEX or IECEx applies.

2.1 Ex-marking Transmitter

Model TSP3x1-W-A6..., TSP3x1-W-H6...
(Sensor with transmitter in zone 0, 1, or 2))

ATEX	IECEx
II 1 G Ex ia IIC T4...T1 Ga	Ex ia IIC T4...T1 Ga
Certificate no.:	Certificate no.:
PTB 14 ATEX 2010X	In preperation

— The transmitter and the connected temperature sensor may be used complete in zone 0, zone 1 or zone 2
— The temperature range corresponds to the information in chapter "Temperature data" on page 6

The device is supplied with or without an LCD indicator (order option "Housing / Indicators").
The LCD indicator has been awarded the following certificates:

ATEX	IECEx
Certificate no.:	Certificate no.:
PTB 05 ATEX 2079X	IECEx PTB 12.0028X

2.2 Installation instructions

The installation, commissioning, maintenance and repair of devices in potentially explosive atmospheres must only be carried out by appropriately trained personnel. Works may be carried out only by persons, whose training has included instructions on different types of ignition protection types and installation techniques, concerned rules and regulations as well as general principles of zoning. The person must possess the relevant expertise for the type of works to be executed. When operating with combustible dusts, EN 60079-31 must be complied with.
The safety instructions for electrical apparatus in potentially explosive areas must be complied with, in accordance with the directive 2014/34/EU (ATEX) and e.g. IEC 60079-14 (Installation of equipment in potentially explosive atmospheres).
To ensure safe operation, the respectively applicable requirements must be met for the protection of workers.

When installing in potentially explosive atmospheres, please observe the following points:
— The specifications of IEC 60079-14 must be observed.
— Damaged equipment/components must not be used.
— Installation may only be carried out in atmospheres that are not potentially explosive.
— The device is not suitable for mobile use.
— Adequate cooling or air circulation must be ensured at the installation site in order to comply with the maximum permissible ambient temperature $T_{ambient}$.
— To ensure compliance with the Ex i (intrinsic safety) type of protection, the housing must meet IP rating IP 20 as a minimum after installation.
— Devices, which contain Aluminum (TSP3X1-W with connection heads L2 and L4 or transmitter W3 or sensor mounting Y11), must be protected against mechanical impact, when installed in hazardous areas where devices with equipment protection level EPL Ga are required.

2.3 Temperature data

For all TSP3x1-W versions there are two relevant parts of the Sensor with different temperature ranges:
1. At the enclosure of the transmitter the temperatures must be in the range of -40 °C up to 70 °C (-40 … 158 °F).
2. The process temperature at the measuring point could be different, but the influence of the self-heating from the sensor, the temperature rise in the electronic and the temperature class/zone has to be taken into account.

2.3.1 Model TSP341-W-A6 / H6-Y22 and Y23

The TSP341-W xx Y22 and Y23 (….) can be used at ambient temperatures from -40°C up to 70 °C (-40 … 158 °F) at the transmitter enclosure and the maximum process temperature for each temperature class and each individual setup has to be defined with respect to the maximum of 70 °C (158 °F) at the electronic and the self-heating of the sensor element above.
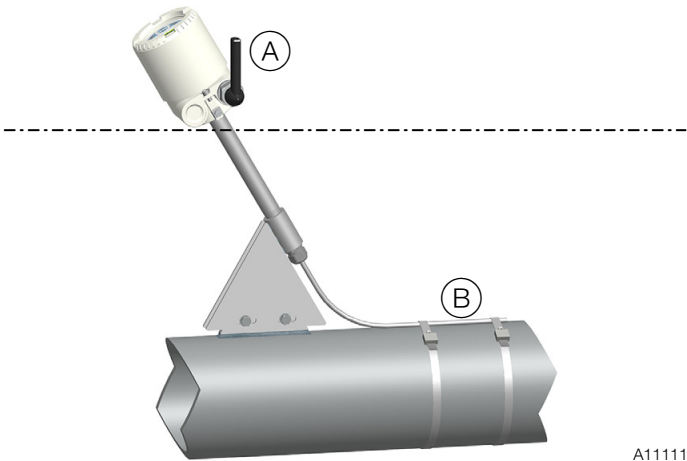

Fig. 1: Sensor mounting alongside the piping

Position	Temperature
Ⓐ	$T_{ambient}$: -40 °C ... 70 °C (-40 … 158 °F)
Ⓑ	Surface temperature: Temperature class reduced by self-heating of the Sensor

2.3.2 TSP3x1-W (X=1-3) and TSP341-W-Y11 with Energy Harvester
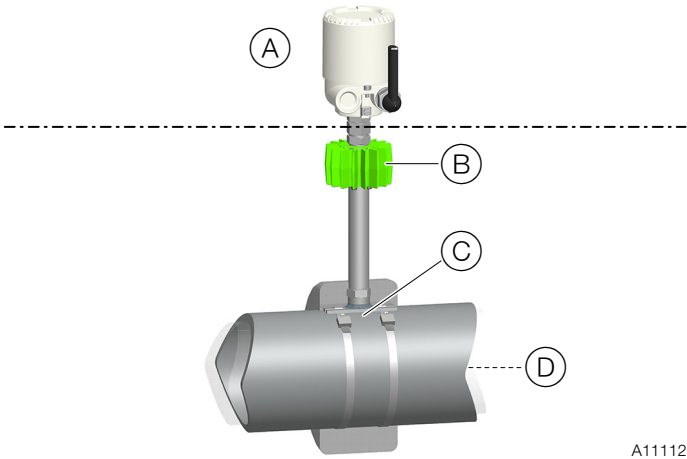
Fig. 2: Sensor mounting 90° to the piping with Energy Harvester

Position	Temperature
Ⓐ	$T_{ambient}$: -40 °C ... 70 °C (-40 … 158 °F)
Ⓑ	— The Energy Harvester can be used in the temperature range of -40 … 150 °C (-40 … 302°F). — For intrinsic safety maximum temperature delta at the Energy Harvester of 150 K is allowed
Ⓒ	TEG unit used: Maximum surface temperature 150 °C (302 °F)
Ⓓ	$T_{process}$: -40 °C ... 150 °C (-40 … 302°F)

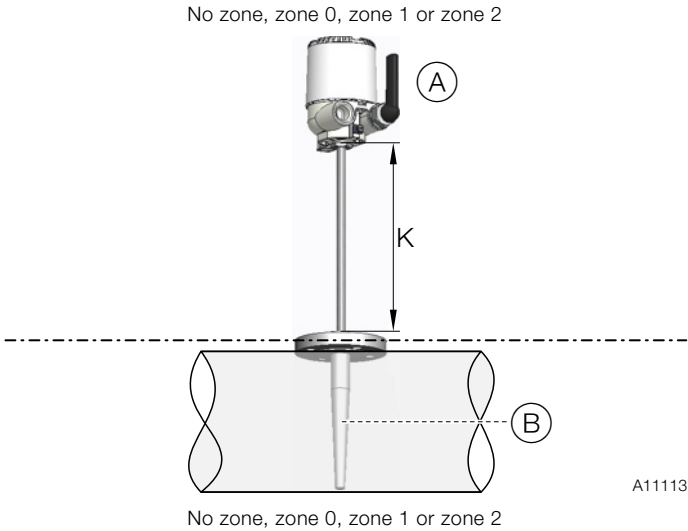### 2.3.3 TSP3x1-W (X=1-3) and TSP341-W-Y11 without Energy Harvester

No zone, zone 0, zone 1 or zone 2

No zone, zone 0, zone 1 or zone 2

Fig. 3: Sensor with extension tube
K Extension tube length

Position	Temperature
Ⓐ	Temperature region for the electronic: -40 °C ... 70 °C (-40 … 158 °F) Maximum $T_{ambient}$: 70 °C (158 °F) – heating due the process temperature
Ⓑ	Maximum $T_{process}$: Temperature class reduced by selfheating of the sensor

For TSP3x1-W (X:1-3) and TSP 341-W-xx-Y11 without Energy Harvester the use for the different temperature classes depends on the process temperature and the zone definition. The transmitter enclosure must not be heating up higher than 70°C (158 °F).

Depending on the extension tube length "K" and the process temperature the enclosure for the transmitter will heat up so the ambient temperature has to be reduces for such cases. The following table shows the $T_{ambient}$ for TSP3x1-W at different process temperature. A protection against radiation heat has to be realized. (For example: isolation with 25mm thickness around the process enclosure.)

$T_{process}$	$T_{ambient}$ for extension tube length K = 150 mm (5.9 in)	$T_{ambient}$ for extension tube length K = 250 mm (9.8 in)
100 °C	max. 65 °C (149 °F)	max. 70 °C (158 °F)
200 °C	max. 60 °C (140 °F)	max. 70 °C (158 °F)
300 °C	max. 60 °C (140 °F)	max. 70 °C (158 °F)
400 °C	max. 55 °C (131 °F)	max. 65 °C (149 °F)

2.3.4 Self heating of the sensor
The self heating of the sensor is generally defined.
The attached tables take these values into account and show the resulting maximum process temperature for the different temperature classes for each configuration of the TSP3x1-W.

Ex-Zone	T4 135 °C (-5 K)	T3 200 °C (-5 K)	T2 (300 °C) (-10 K)	T1 400 °C (-10 K)
Zone 1	123 °C	188 °C	283 °C	383 °C
Zone 0	96 °C	148 °C	223 °C	303 °C

Zone 0 with consideration of EN1127-1.

2.4 Electrical connections
HART maintenance port

	HART maintenance port on TTF300-W	Maximum external connection values
Maximum voltage	U_o = 5.4 V	U_i = 2.6 V
Short-circuit current	I_o = 25 mA	I_i = 18 mA
Maximum power	P_o = 34 mW	—
Inductance	L_i = 0 mH	L_o = 1 mH (IIC)
Capacitance	C_i = 1.2 µF	C_o = 0.4 µF (IIC)

2.5 Commissioning
The commissioning and parameterization of the device may also be carried out in potentially explosive atmospheres using a handheld terminal that has been approved accordingly. The handheld terminal is connected to the internal HART maintenance port of the device (see "Fig. 10" on page 13). The values specified in chapter "Electrical connections" on page 8 must be adhered to.

2.6 Operating instructions
2.6.1 Protection against electrostatic discharges
The painted surface of the housing and the plastic parts inside the device can store electrostatic charges.

⚠ **WARNING**

Risk of explosion!
The device must not be used in areas in which process-related electrostatic charging of the housing may occur. The device must be maintained so that any dangerous electrostatic charge is avoided.

2.6.2 Changing the measuring inset
Changing of the measuring inset may only be carried out in atmospheres that are not potentially explosive.
Carry out the measuring inset change as described in the Operating Instruction.

2.6.3 Changing the battery
When changing the device battery, observe the following points:
— The battery can be replaced in potentially explosive atmospheres because all circuits in the device are intrinsically safe
— The battery must not be short-circuited
— The provisions of the relevant operational safety regulations must be observed
— Take appropriate measures to prevent electrostatic charges on the plastic sleeve of the battery

Carry out the battery change as described in the Operating Instruction.

3 Product identification

3.1 Name plate

> **i NOTE**
>
> The power supply, ambient temperature (T_{amb}) and measuring medium temperature T_{medium}) data indicated on the name plate must be complied with during commissioning.
>
> For detailed information on the data indicated on the name plate, see the associated operating instructions (OI).

4 Transport and storage

4.1 Inspection

Check the devices immediately after unpacking for possible damage that may have occurred from improper transport.
Details of any damage that has occurred in transit must be recorded on the transport documents.
All claims for damages must be submitted to the shipper without delay and before installation.

4.2 Transporting the device

Observe the following instructions:
— Do not expose the device to moisture during transport. Pack the device accordingly.
— Pack the device so that it is protected against vibrations during transport, e.g., by using air-cushioned packaging.

> **⚠ CAUTION**
>
> **Corrosion, fire and explosion hazard if lithium batteries are not properly handled.**
>
> Lithium batteries contain acids and may explode if they are exposed to extreme heat, become mechanically damaged or are electrically overloaded.
> — Never charge or short-circuit lithium batteries
> — Never expose lithium batteries to temperatures > 100 °C (> 212 °F) or to fire
> — Never use damaged lithium batteries

For detailed information about handling lithium batteries, see chapter "Handling of lithium ion batteries" on page 4.

4.3 Storing the device

Bear the following points in mind when storing devices:
— Store the device in its original packaging in a dry and dust-free location.
— Observe the permitted ambient conditions for transport and storage.
— Avoid storing the device in direct sunlight.
— In principle, the devices may be stored for an unlimited period. However, the warranty conditions stipulated in the order confirmation of the supplier apply.

4.3.1 Ambient conditions

The ambient conditions for the transport and storage of the device correspond to the ambient conditions for operation of the device.
Adhere to the device data sheet!

5 Installation

5.1 General Information

As contact thermometers have to be brought to the temperature of the measuring medium, correct installation is particularly important for the quality of the measurement. The best results with regard to accuracy and response time are achieved when the sensor element is located at the point of the greatest medium velocity, i.e. the center of the pipe. To eliminate heat conduction errors to the greatest extent possible, the immersion length must be 10 … 15 times the thermowell diameter. Heat conduction errors arise when the ambient temperature reaches the sensor element via the thermowell.

The sensor built in to the tip of the thermowell should be as evenly bathed in medium as possible.

Installation positions 2 and 3: The thermowells are therefore usually installed at a 90° angle. The thermowell tip, i.e. the sensor, should be in the middle of the pipe.

Installation positions 1 and 5: To meet the requirement for central installation of the sensor, thermowells can also be installed in elbow pipes vertically or at an obtuse angle to the flow direction.

Installation position 4: Indirect measurement of the medium temperature via the pipe surface is a further option in addition to immersion measurement. Indirect measurement is somewhat less accurate than measurement in the pipe. Pipe wall thickness, pipe material and other parameters can influence the measuring result.

For surface measurement, ensure optimum contact between the sensor element and the surface and that the sensor element is insulated against the ambient temperature by means of suitable insulating material.
In conjunction with an Energy Harvester, the temperature sensor is completely location-independent within its range in this measuring method as neither wiring nor difficult to install welded spuds are required.

5.1.1 Recommended insertion depth
To avoid heat dissipation errors.

Medium	Insertion depth [mm]
Fluids	8 … 10 x Ø thermowell tip
Gases	10 … 15 x Ø thermowell tip
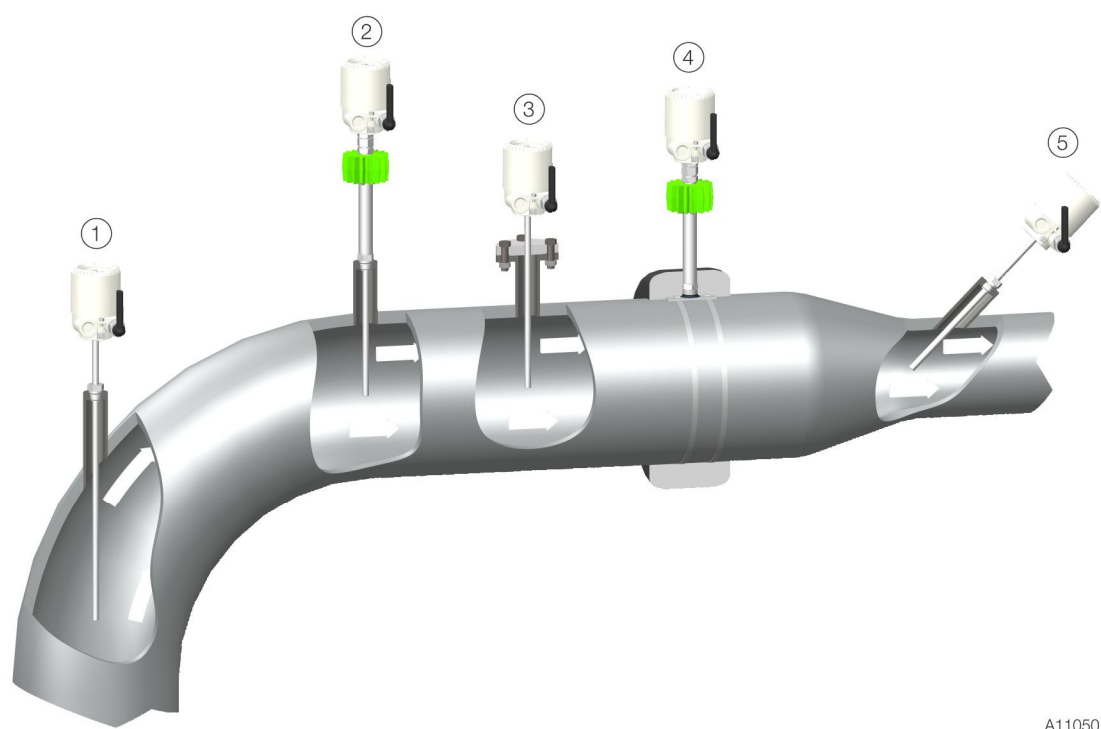
Fig. 4: Installation positions

5.2 Opening and closing the housing
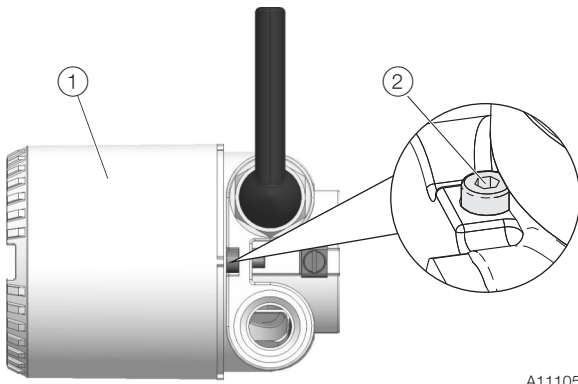
Fig. 5:   Cover safety device (example)

Open the housing
1. Release the cover safety device by screwing in the Allen screw (2).
2. Release the housing cover (1).

Closing the housing

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i NOTE

Impairment of the housing protection class
Check the O-ring gasket for damage and replace it if necessary before closing the housing cover.
Check that the O-ring gasket is properly seated when closing the housing cover.

---

1. Screw the housing cover (1) back on.
2. Lock the housing cover by unscrewing the Allen screw (2).

5.2.1   Rotating the Antenna
Usually the antenna should be rotated after assembly to a vertical position.

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i NOTE

Potential damage to parts!
The Antenna must not be rotated more than 360° in order to not damage the HF wire inside the transmitter.
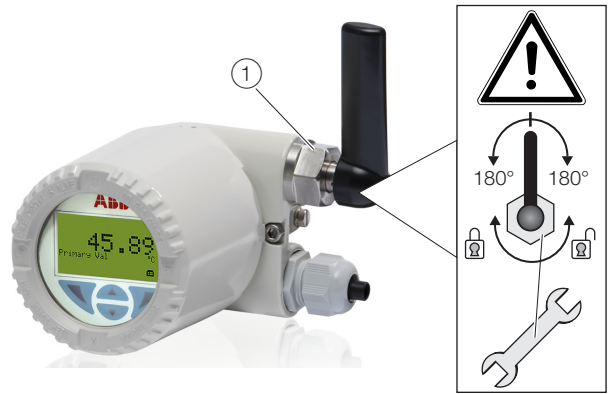
Fig. 6:   Rotate the Antenna
(1) Lock screw

5.2.2   Rotating the LCD indicator
Depending on the mounting position, the LCD indicator can be rotated to enable horizontal readings.
There are 4 possible positions at increments of 90°.
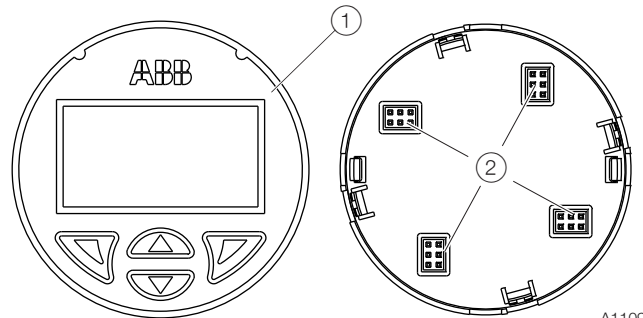
Fig. 7
(1) Front view (2) Rear view of LCD indicator/plug positions

To adjust the position, proceed as follows:
1. Unscrew the housing cover.
2. Carefully pull the LCD indicator to release it from its bracket.
3. Carefully insert the LCD indicator in the required position.
4. Screw the housing cover back on.

---

i NOTE

If the O-ring gasket is seated incorrectly or is damaged, this may have an adverse effect on the IP rating.
Check the O-ring gasket for damage and replace it if necessary before closing the housing cover.
Check that the O-ring gasket is properly seated when closing the housing cover.

5.3 Electrical connections
Resistance thermometers (RTD) / resistors (potentiometers)
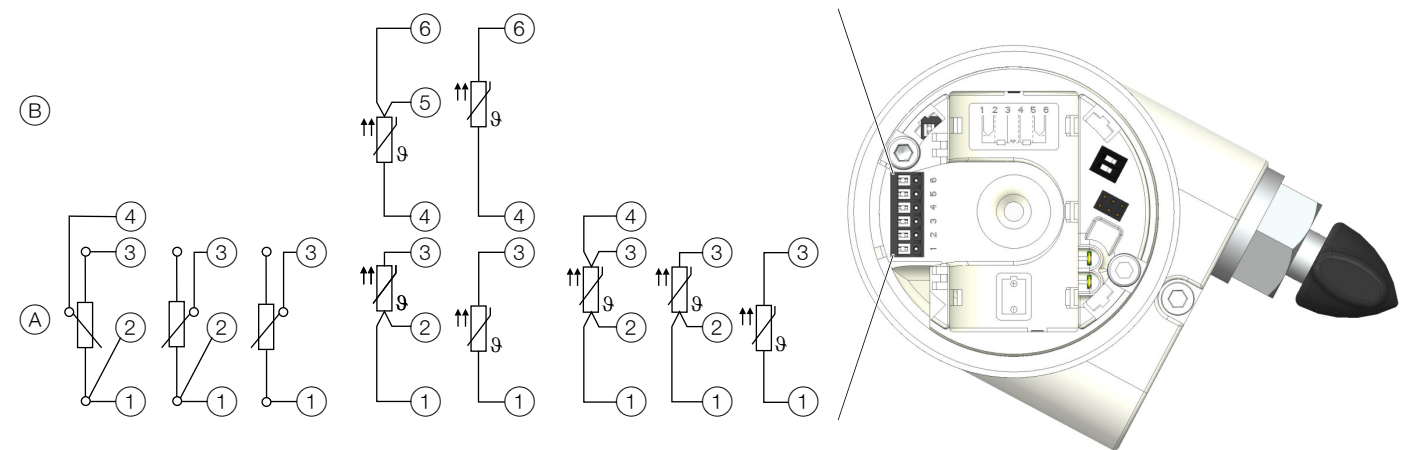
A11106

Fig. 8
① – ⑥ Sensor connection (from measuring inset) Ⓐ Sensor 1 Ⓑ Sensor 2

Thermocouples / voltages and resistance thermometer (RTD) / thermocouple combinations
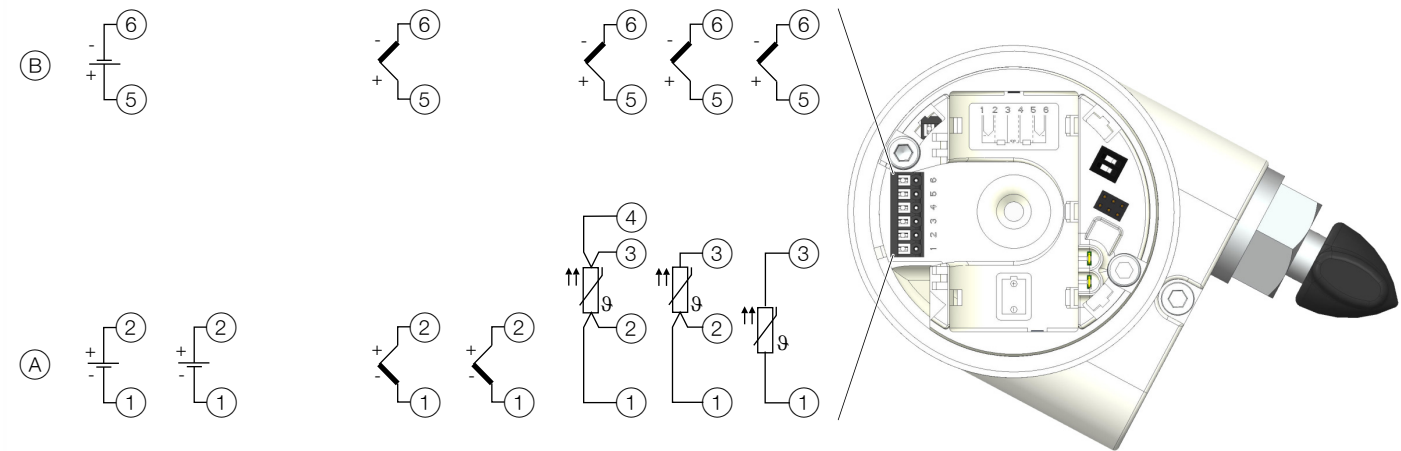
A11107

Fig. 9
① – ⑥ Sensor connection (from measuring inset) Ⓐ Sensor 1 Ⓑ Sensor 2

6 Commissioning

6.1 General remarks

The device is immediately ready for operation after mounting and installation of the connections. Default parameters are set at the factory.

6.2 Checks prior to commissioning

The following points must be checked before commissioning the device:
— The ambient conditions must meet the requirements set out on the name plate and in the Datasheet.

6.3 Switching on the power supply

For initial shipment the device's battery is isolated by plastic tap. With removal of the tap the device gets powered.
To power-off the device insert an isolating tap between the battery and one of the poles or remove the battery.

6.4 Basic Setup

The SensyTemp TSP300-W can be commissioned via the build in LCD indicator (see Chapter "Configuration with the LCD indicator" on page 14).

Additionally the SensyTemp TSP300-W can be commissioned via standard HART tools including:
— ABB HART Handheld terminal DHH805 (TTX300-W EDD).
— ABB Asset Vision Basic (TTX300-W DTM).
— ABB 800xA Control System (TTX300-W DTM)
— Other tools supporting standard HART EDDs or DTMs (FDT1.2)

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i   NOTE

Not all tools and frame applications do support DTMs or EDDs on same level. Particularly optional or extended functions of the EDD/DTM may not be available on all tools. ABB provides frame applications supporting full range of functions and performance.

The connection to these tools can be both, wired or wireless. For first commissioning the wired connection should be preferred. The HART maintenance port is the interface for the wired connection.

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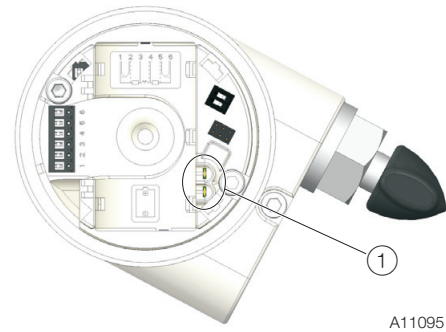
Fig. 10 : Wired connection
① **HART maintenance port (hand-held terminal)**

Usually 3 parameters should be set always during first commissioning to allow a device to join a network.

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i   NOTE

For security reasons it is strongly recommended, to change network-ID and join key during commissioning.

NetworkID

The NetworkID is the identifier of a network and must be the same for all devices within the same network including the gateway.
There might be other networks in parallel but they need to have a different NetworkID.
The NetworkID is a 16 bit wide number.

JoinKey

The JoinKey is important to authorize a device joining the network. It serves for network security. The JoinKey can be the same for different networks.
The JoinKey is a security relevant information and should protected as such. Wireless HART allows individual join keys for the wireless devices in the network what serves for higher security but has also impact on maintenance effort.
Not all gateways may support individual JoinKeys. The JoinKey is a set of four 32 bit wide numbers (128 bit in total).

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i   NOTE

For security reasons the JoinKey cannot read back from the device, also not via the local LC display.

HART Long Tag

This is human readable identifier of the device in the network and is almost used by a gateway to build a device list ("live list") of the network.

The long TAG shall be unique for every device in the network. Some gateways notify when doubled long TAGs are identified. As the long TAG is 32 characters long it is suitable to serve as a unique identifier of a single device in a whole plant / installations and not just within the wireless HART network. By default, the SensyTemp TSP300-W is delivered with a unique long TAG containing part of the devices serial number and therefore there is no need to set the long TAG.

In case NetworkID and JoinKey of SensyTemp TSP300-W already match the settings of the gateway e.g. due to prior configuration or default settings are used, there is no need for any further adjustments. The SensyTemp TSP300-W will join a reachable network automatically.

6.4.1 Configuration with the LCD indicator

Commissioning via LC display does not require any tools connected to the device and is therefore the easiest way to get a SensyTemp TSP300-W into a wireless network. The general operation and menus of the LCD indicator are described in chapter "Menu navigation" on page 19. The relevant parameters for network settings are part of menu "Communication".

Enter the following parameters as described:

1. Activate the LCD indicator.

```
WiTemp


        79.89

PVariable           °C

[1]                        ▤
```
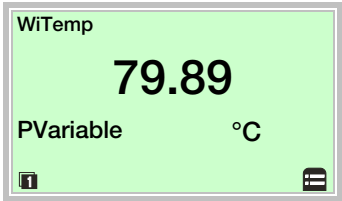
2. Use 🖉 to switch to the configuration level.

```
        Menu
    Communication

        (⊚)ᴍ

Exit                  Select
```
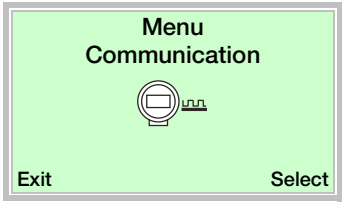
3. Use ▼ or ▲ to select "Communication".
4. Use 🖉 to confirm your selection.

```
    Communication
Device TAG Name
━━━━━━━━━━━━━━━━━
 NetworkID
─────────────────
JoinKey


Back                  Select
```
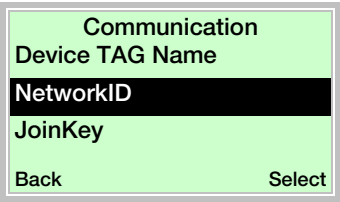
5. Use ▼ or ▲ to select "NetworkID".
6. Use 🖉 to confirm your selection.

```
        NetworkID
Device TAG Name
━━━━━━━━━━━━━━━━━
 NetworkID
─────────────────
JoinKey


Back                    Edit
```
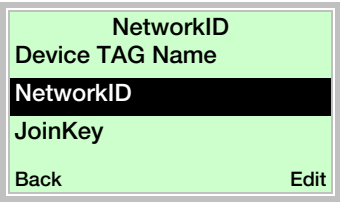
7. Use 🖉 to call up the edit mode.
8. Enter the desired NetworkID.
9. Use 🖉 to confirm your setting.

```
    Communication
NetworkID
━━━━━━━━━━━━━━━━━
 JoinKey
─────────────────
Neighbors


Back                  Select
```
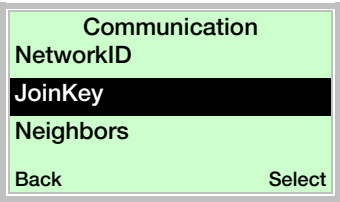
10. Use ▼ or ▲ to select "JoinKey".
11. Use 🖉 to confirm your selection.

```
        JoinKey
 JoinKey1
─────────────────
JoinKey2
─────────────────
JoinKey3

Back                    Edit
```
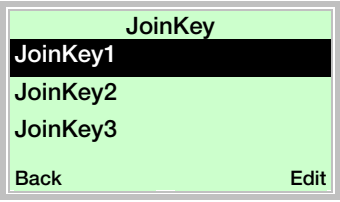
The four numbers of the JoinKey are again separated as 8 single hexadecimal characters 0 ... 9 + A ... F.

The hexadecimal characters are set individually, one by one by using the ▲ and ▼ button to select a hexadecimal character. As the JoinKey can not read back for security reasons the selected character after entering the sub menu is "8" always.

Join key (128 bit)			
JoinKey1 (32 bit)	**JoinKey2 (32 bit)**	**JoinKey3 (32 bit)**	**JoinKey4 (32 bit)**
Num 1 Num 2 Num 3 Num 4 Num 5 Num 6 Num 7 Num 8	Num 1 Num 2 Num 3 Num 4 Num 5 Num 6 Num 7 Num 8	Num 1 Num 2 Num 3 Num 4 Num 5 Num 6 Num 7 Num 8	Num 1 Num 2 Num 3 Num 4 Num 5 Num 6 Num 7 Num 8

A11100

Fig. 11: Structure of the Join Key

12. Use ▽ or △ to select "JoinKey1…4".
13. Use ▽ to confirm your selection.
14. Use ▽ or △ to select "Num1…8".
15. Use ▽ to confirm your selection.
16. Use ▽ or △ to select the desired hexadecimal character (0 ... 9 + A ... F).
17. Use ▽ to confirm your selection.
18. Set the remaining characters Num2 … Num8 and the Numbers JoinKey2 … JoinKey4 according to steps 12. … 13.
19. Use ▽ or △ to select "Write JK".
20. Use ▽ to confirm your selection.
21. Use ▽ to call up the edit mode.
22. Use ▽ or △ to select "Save" and use ▽ to confirm the action. To cancel the operation use ▽ or △ to select "Cancel" and use ▽ to confirm.
23. Use ◁ to select "Back".

```
┌─────────────────────────────┐
│      Communication          │
│ Quality                     │
│ ███████████████████████████ │
│ Join now                    │
│                             │
│                             │
│ Back              Select    │
└─────────────────────────────┘
```

24. Use ▽ or △ to select "Join now".
25. Use ▽ to confirm your selection.
26. Use ▽ to call up the edit mode.
27. Use ▽ or △ to select "Join now" and use ▽ to confirm the action. To cancel the operation use ▽ or △ to select "-" and use ▽ to confirm.
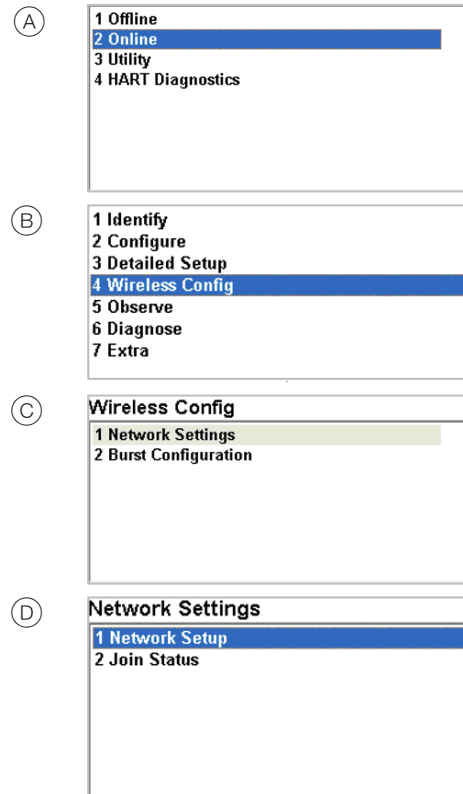
6.4.2 Configuration with the PC / laptop or handheld terminal

An EDD describes structure and type of device parameters but has only a limited influence on how this information is provided to the user.

The following is an example of how the EDD could be represented. Even the parameter names may be slightly different as tools typically use vendor specific libraries.
Refer to the operating instructions for the handheld terminal.

The handheld terminal will allow you to set all the relevant information to let the SensyTemp TSP300-W join a WirelessHART network.

1. Ensure the TTX300-W EDD has been loaded into the HART handheld terminal.
2. Connect the HART handheld configurator to the instrument via the HART maintenance port.
3. Set the handheld terminal to polling (multidrop) mode and scan for devices. The SensyTemp TSP300-W has a default polling address of 0. Once connected you can edit the parameters and configuration data.
4. Configure the SensyTemp TSP300-W according the following steps Ⓐ … Ⓙ:

Ⓐ
```
1 Offline
2 Online
3 Utility
4 HART Diagnostics
```

Ⓑ
```
1 Identify
2 Configure
3 Detailed Setup
4 Wireless Config
5 Observe
6 Diagnose
7 Extra
```

Ⓒ
```
Wireless Config
1 Network Settings
2 Burst Configuration
```

Ⓓ
```
Network Settings
1 Network Setup
2 Join Status
```

A11096

Fig. 12: Connect to the device and enter network setup (example)

(E) Network ID (HEX)
00000ABC
| 00000ABB |

(F) Key 1 (HEX)
****
| 57495245 |

(G) Key 2 (HEX)⇨Key 3 (HEX)⇨Key 4 (HEX)

(H) Join Mode
Attempt to join immediately on powerup

Don't attempt to join
Join now
Attempt to join immediately on powerup or …

(I) Network Setup

1 *Network ID (HEX)	00000ABB
2 *Key 1 (HEX)	57495245
3 *Key 2 (HEX)	4C455353
4 *Key 3 (HEX)	4649454C
5 *Key 4 (HEX)	444B4559
6 *Join Mode	Join now

(J) Join Status

Wireless Signal Found	ON
Wireless Signal Iden…	ON
Wireless Time Synch…	ON
WirelessHart Signal I…	ON
Network Admission R…	ON
Join Retrying	OFF
Join Failed	OFF
Network Security Cle…	ON
Network Joined	ON
Network Bandwidth …	ON
Join Complete	ON

A11097

Fig. 13: Network setup (example)

---

i **NOTE**

Some handheld terminals or computer based tools require the Join Key (Key 1 … Key 4) to be entered in decimal.
The Join Key cannot be read back at the handheld terminal to ensure it remains secure.

6.4.3 Configuration with Device Type Manager (DTM)

The TTX300-W DTM gives access to all parameters and information relevant to communication and device commissioning.

Once the device is taken into the wireless network by the gateway the DTM can be used with the wired but also with the wireless interface, depending of the capabilities of FDT frame application and gateway.

Typically, the connection to the gateway is via Ethernet. This allows a remote access to the WirelessHART network and the SensyTemp TSP300-W over intranet or Ethernet, depending on the network policies.

Components and tools provided or recommended by ABB do not have limitation regarding the communication interface.

6.4.4 Commissioning by Device Type Manager

Usually the NetworkID and JoinKey needs to be set to allow a wireless device to enter an existing network. The JoinKey and the NetworkID are also set in the gateway and must be the same as that entered in the SensyTemp TSP300-W.

The following description assumes the device needs a change of network parameters to join a network.

The DTM will have to be connected via a wired interface to the HART Maintenance Port of the SensyTemp TSP300-W. After searching for the device and getting into online mode, the dialog "Network settings" should be opened:

Fig. 14: DTM Network and Wireless Settings (example)
① NetworkID (decimal) ② JoinKey (hexadecimal) ③ Join mode
④ Join status

Enter the following parameters:

Parameter	Value
NetworkID	Enter the Network ID in decimal notation.
JoinKey	Enter the Join key in hexadecimal notation.
Join Mode	Select "Join now".

The Join Status on the bottom of the dialog gives status information about the process of network join. Whenever a WirelessHART network is in the range of SensyTemp TSP300-W – even it does not match its own network parameters – the "Wireless signal found" flag is set.
This is a pre-condition to join a network. The SensyTemp TSP300-W now tries to join the network and to establish a connection to the WirelessHART gateway. A successful join phase is indicated by the "Join complete" flag at the end. Depending of the network structure, size and performance of WirelessHART gateway and other devices in the network it may take up to 60 minutes.

> **ℹ Note**
> Some gateways need to switch on "Active Advertising" in order to support devices to join the network.

6.4.5 Burst configuration

The burst configuration determines which information is transferred. Up to 3 mutually independent burst messages can be configured. Each message includes
— the burst mode,
— the burst command,
— the refresh rate.

The refresh rate determines the interval at which measurements are executed and then transferred to the WirelessHART network. The refresh rate can be set to between 4 seconds and 60 minutes. The burst command determines which HART command and/or information is transferred. The measurements are transferred every 16 seconds by default.

> **ℹ NOTICE**
> The burst configuration can only be set using an EDD or a DTM. This is not possible using the LCD display on the device itself.

> **ℹ NOTICE**
> The refresh rate that can actually be achieved in a network is largely dependent on the number of network participants and their refresh rates. The WirelessHART gateway and its configuration are key. If there is insufficient bandwidth available, the preferred refresh rate of the device can be refused by the gateway. This is not a device malfunction. Restarting the device or restructuring the network structure are potential remedies.

6.4.6 Network Diagnostics by Device Type Manager

One of the strengths of WirelessHART networks is the capability to automatically build a meshed structure. Therefore, the wireless devices try to connect to neighbors in order to get multiple paths for any telegram. The communication becomes robust by that.

The TTX300-W DTM supports you in checking the network transmission quality to and from the SensyTemp TSP300-W by powerful network diagnostics:
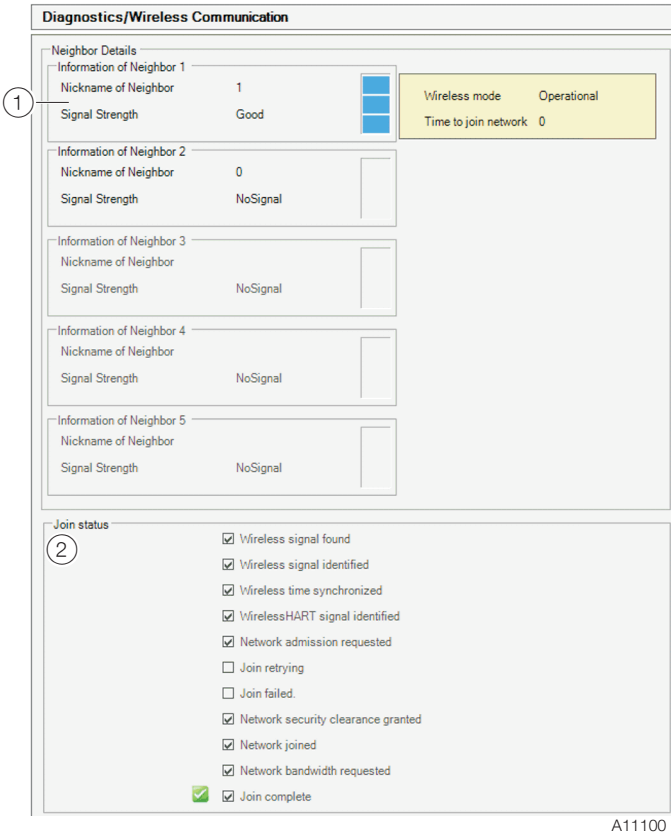

Fig. 15: DTM Network Diagnostics (example)

For a maximum of five neighbors, the signal strength of this specific link is shown. The signal strength is a computed value considering the signal level, retries required etc.
In a proper and robust network, each wireless device should have at least three neighbors.

6.5 Operating instructions

If there is a chance that safe operation is no longer possible, take the device out of operation and secure it against unintended startup.

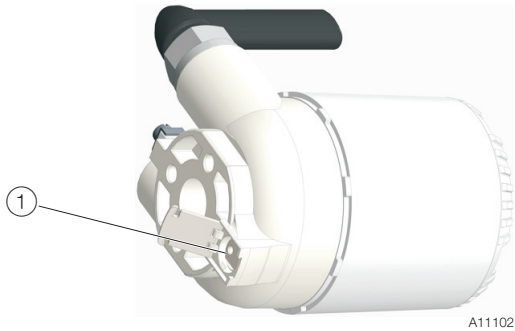# 7 Operation

7.1 Activation of the LC display

Fig. 16: Activation of LCD display
① Button to activate the LCD display

The optional LC display is switched of usually to safe power and extend battery life time.
It is activated (powered) for an adjustable time when pressing a button on the backside of the transmitter.

ℹ NOTE

Permanent operation of the LC display will shorten the battery lifetime by about 50%.
Therefore, the LC display shall be switched off when not in use / needed.
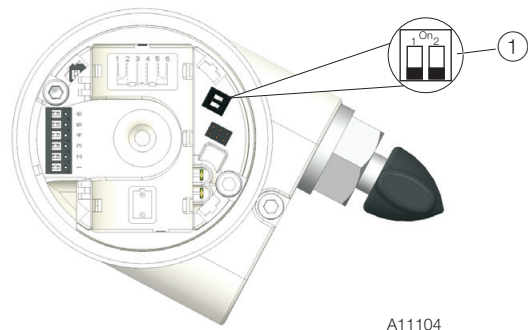
7.2 Hardware settings

Fig. 17
① Dip Switches

Switch	Function
1 Local write protection	Off: Local write access disabled
	On: Local write access enabled
2 Standby mode (no WirelessHART communication)	Off: Normal operation
	On: Standby mode. The device is deactivated.

ℹ NOTE

The standby mode disables the WirelessHART communication of the device and put the electronics into deep sleep mode with a very low power consumption.

7.3 Menu navigation

> **i NOTE**
>
> For detailed information on the operation and parameterization of the device, consult the associated operating instructions (OI)!
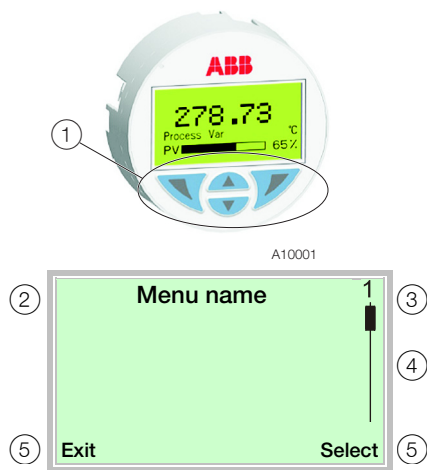

A10001

Fig. 18: LCD Display (example)
① Operating keys to the menu navigation ② Display of menu name ③ Display of menu number ④ Marking for displaying the relevant positions within the menu ⑤ Display of current functions of the operating keys ◺ and ◿

You can use the ◭ or ◮ operating buttons to browse through the menu or select a number or character within a parameter value.
Different functions can be assigned to the ◺ and ◿ operating buttons. The function ⑤ that is currently assigned to them is shown on the LCD display.

Control button functions

◺	Meaning
Exit	Exit menu
Back	Go back one submenu
Cancel	Cancel a parameter entry
Next	Select the next position for entering numerical and alphanumeric values

◿	Meaning
Select	Select submenu / parameter
Edit	Edit parameter
OK	Save parameter entered

8 Maintenance

8.1 Safety instructions

> **⚠ CAUTION**
>
> **Risk of burns due to hot measuring media.**
> The device surface temperature may exceed 70 °C (158 °F), depending on the measuring medium temperature!
> Before starting work on the device, make sure that it has cooled sufficiently.

> **i NOTE**
>
> **Damage to components!**
> The electronic components of the printed circuit board can be damaged by static electricity (observe ESD guidelines). Make sure that the static electricity in your body is discharged before touching electronic components.

> **i NOTE**
>
> For detailed information on the maintenance of the device, consult the associated operating instructions (OI)!

9 Declaration of conformity

> **i NOTICE**
>
> Declarations of conformity of the device are available in the download center of ABB at www.abb.com/temperature. They are additionally enclosed with the device for ATEX certified devices.

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Contact us

ABB Limited
Process Automation
Howard Road, St. Neots
Cambridgeshire, PE19 8EU
UK
Tel: +44 (0)870 600 6122
Fax: +44 (0)1480 213 339
Mail: enquiries.mp.uk@gb.abb.com

ABB Inc.
Process Automation
125 E. County Line Road
Warminster, PA 18974
USA
Tel: +1 215 674 6000
Fax: +1 215 674 7183

ABB Automation Products GmbH
Process Automation
Schillerstr. 72
32425 Minden
Germany
Tel: +49 571 830-0
Fax: +49 571 830-1806

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