
LWT300 series (Modbus)

Quick Start Guide

Unpacking

If you are reading this document, you have already opened the box containing your instrument. While following the basic safety instructions provided below, proceed with unpacking the content of this box.

Basic safety

Personnel



WARNING

Only properly certified and authorized personnel should be charged with instrument installation, electrical connection, commissioning, operation and maintenance.

Depressurize the vessel before opening the instrument connection. Any process media released may cause severe injuries.

Carefully **plan** any installation, modification or repair before actually proceeding.

Electrical



WARNING

Do not make electrical connections unless the electrical code designation stamped on the instrument data plate matches the classification of the area in which you want to install the instrument. Failure to comply with this warning can result in fire or explosion.

Use **only** tools compliant with national insulation standards, e.g., DIN EN 60900.

Use **only** non-sparking tools when installing the instrument in hazardous areas.

Improper use

It is prohibited to use the instrument for any of the following, including but not limited to:

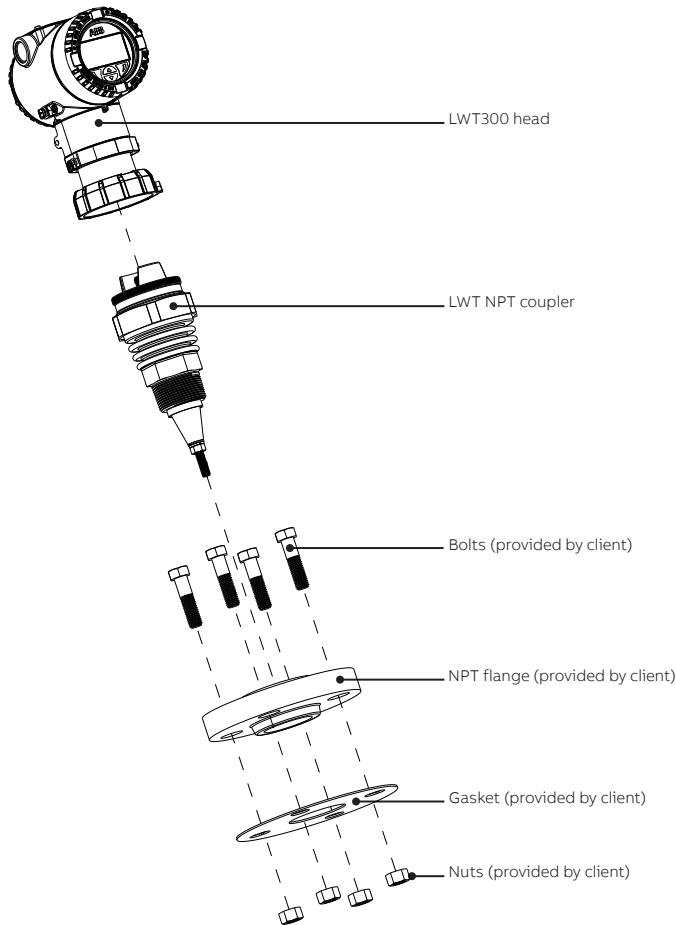
- A climbing aid, e.g., for mounting purposes.
- A support for external loads, e.g., as a support for pipes.
- By adding material, e.g., by painting over the name plate, or welding/soldering on parts.
- By removing material, e.g., by drilling the housing.

What's in the box

- LWT series instrument head
- Instrument coupler
- Probe and probe's hardware, if applicable (not shown in Figure 1)
- Quick Start Guide (this document)
- USB key (with user guide, safety guide, datasheet, customer data package [optional])

Should any part of the package be damaged upon reception, contact ABB customer service as indicated on the back cover of your user guide.

Figure 1 LWT300 series typical installation¹



¹ The instrument head and coupler are delivered already assembled unless the remote head option was ordered.

Basic physical installation

Below is a list of basic steps necessary to properly install LWT series instruments, as recommended by ABB. All installations should be performed by **certified and authorized** personnel in accordance with all applicable local security codes (electrical, engineering, etc.).

Here are the basic installation steps:

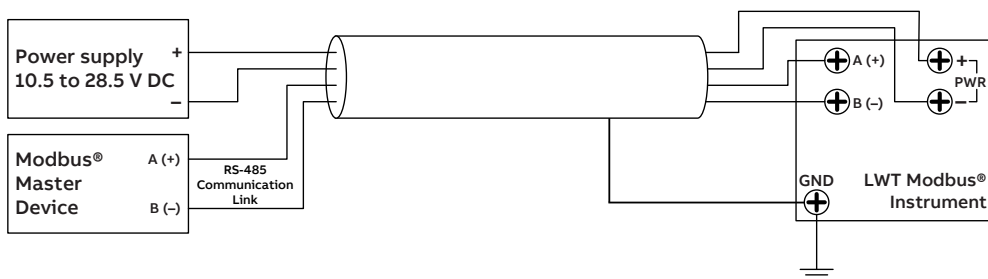
- 1 Access and properly secure the installation site (vessel depressurization and cool down, mains power down, etc.).
- 2 Attach the probe to the head/coupler assembly (once it is attached, handle it carefully to avoid bending the coupler/probe assembly).
- 3 Slide the probe in the vessel and attach the probe/coupler assembly on the flange.
- 4 Connect the mains to the head unit.
- 5 Power up and configure the instrument.

The steps indicated above are explained in more detail in the LWT series User Guide.

Simple connection diagram

Here is a simple power connection diagram for LWT series instruments installed in a non-explosive location.

Figure 2 Modbus connection diagram



NOTICE

Replace the temporary plastic caps with hermetic caps and/or cable glands rated for the environment.

Initial software setup


Initial setup of the instrument is performed via the **Easy Setup** menu. Below you will find menu items, factory-set values (in bold) and lists of all available values when you click **Select** from the **Easy Setup** screen (if you need to configure your instrument for an oil & gas application, see "Configuring instrument for oil & gas applications" on page 7 of this document).

Figure 3 Easy Setup menu



Submenu	Default value	Available values
Application Category (type of measurement performed)	Water-Based (DC>10)	Water-Based (DC>10) Liquid mix. (3<DC<10) Oil Based (DC<3) Solid (organic) Solid(Others) Interface
Set PV (primary value measured)	Level	Level Distance Ullage Interface ¹ Thickness ¹ Interface Distance ¹
PV Unit (measurement unit for the primary value)	in (inch)	m (meter) cm (centimeter) mm (millimeter) ft (feet) in (inch)
↓ Empty/Zero (distance between the process connection and the starting point of the measuring level range; see Figure 5)	Factory-set based on full span of probe length	Customizable
↑ Full/Span (the distance between the minimum level and the maximum level; see Figure 5)	Factory-set based on full span of probe length	Customizable
Max Level Rate (rate at which the vessel should reach its maximum level)	Medium	No Filter Very Slow Slow Medium Fast Very Fast

Submenu	Default value	Available values
Display Line1 View1 (first line of text on the first screen displayed, under the measured value)	Level	Level Ullage PV Percent External Temperature Empty Distance Span Probe Length Media Level

A screenshot of the LWT300 series instrument's LCD display. The screen has a green background. At the top, the word 'Level' is displayed in white. Below it, the measured value '0.59' is shown in large black digits, followed by a small 'm' for meters. Underneath the value is a horizontal bar graph labeled 'PV%' on the left and '100%' on the right. The bar is filled with black, indicating it is at 100%. At the bottom of the screen, there are three small icons: a square, a circle, and a rectangle.

All menus available in your LWT instrument are explained in more detail in the accompanying user's guide.

Oil & gas application-specific considerations

The oil & gas market is the main user of Modbus guided-wave radar level transmitters. As such, specific considerations are in order.

Mounting

- Avoid mounting the instrument's probe too close to the vessel inlet or to internal objects (15 cm [6 in]).
- If you suspect that the probe can come in contact with the nozzle, use a spacer.

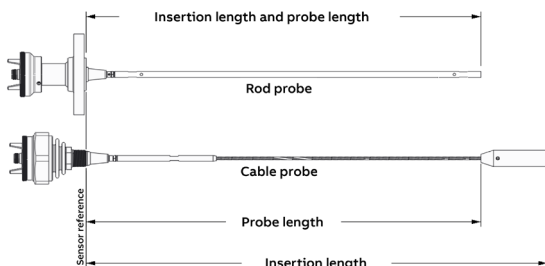
Process

- **Do not stack bushings to connect the coupler to the vessel** (use 3-to- $\frac{3}{4}$ -inch NPT metal bushings (order code A3) and 4-to- $\frac{3}{4}$ -inch NPT metal bushings (order code A4) on vessels with 3 in and 4 in threaded connections).
- Ensure a good electrical connections between coupler and vessel (if metallic). **Rust and corrosion should be avoided.**
 - **Limit the use of PTFE (Teflon™) tape as much as possible** to keep a good electrical connection between coupler, bushing and vessel.
- Avoid long nozzles (>61 cm [24 in]) (You can adjust the nozzle length in the **Device Setup > Application Setup > Nozzle Length** menu).
- Avoid nozzles equipped with reducers (use of a coaxial probe is preferred in such cases).
- Avoid nozzles with a section extending inside the vessel. If it is impossible to avoid, 1) use a blocking distance to account for all the potential ringing caused by the internal section of pipe or 2) check the waveform for signal quality and, if still not acceptable, replace by a coaxial probe.
- For non-metallic vessels, mount the coupler on a metallic flange, a metal sheet (>15 cm [6 in] and thick enough to support the instrument) or a 4-to- $\frac{3}{4}$ -inch bushing.

Changing the probe length

After changing the physical length of the probe, you must change the factory-set probe length configured in the instrument (in the **Device Setup > Application Setup > Probe Length** menu). This procedure is explained in "Changing probe length" in the LWT300 User Guide. Probe length is the distance between the sensor reference point and the top of the weight (see Figure 4 below).

Figure 4 Measuring the probe length



IMPORTANT: The probe length value entered must be accurate to <2.5 cm (1 in).

End of probe

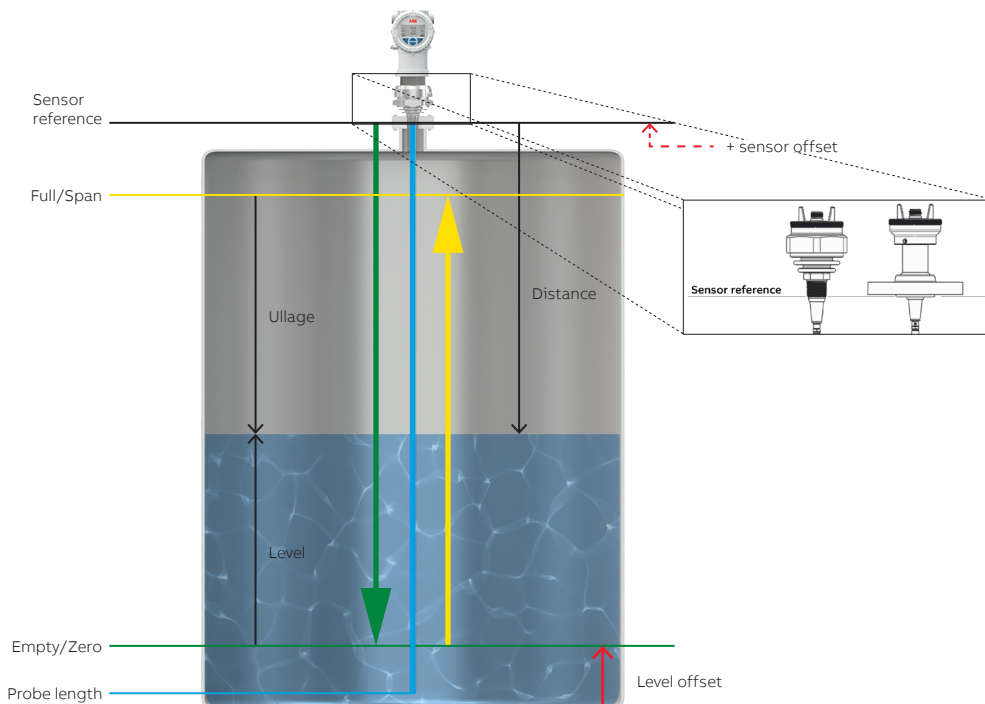
- To improve performance and minimize the size of the dead zone, we recommend using the puck-shaped weight (height: 2.5 cm [1 in], diameter: 7.3 cm [2 7/8 in]) (ABB order code QP6).
- Use "long" weights **ONLY** if the diameter of the vessel top opening does not allow you to use of the puck-shaped version.

Configuring instrument for oil & gas applications

The following parameters need to be configured specifically for oil & gas applications. **Configuration of these parameters is explained in more detail in the LWT300 User Guide:**

- Type of application (in the **Easy Setup > Application Category** menu) (see "Application Category" on page 4 of this document).
 - (If the application category selected is **Interface** (to measure the interface between liquids, e.g., oil on top of water), you must set the dielectric constant (DC) of the first liquid that the pulse will encounter (in this case, oil) in the **Device Setup > Sensor Setup > Upper Media DC** menu (see "Setting the dielectric constant of upper media" in the LWT300 User Guide). (Appendix D of the LWT300 User Guide contains a list of dielectric constants for common substances).
- Calibration parameters (**Empty/Zero, Full/Span, Level Offset**) (in the **Calibrate > Level > Level Calibration** menu) (for details, see Figure 5 below.)

Figure 5 Calibration parameters



- Dynamic variables (in the **Device Setup > Dynamic Variable > Set PV, Set SV, Set TV, Set QV** menu). The LWT instrument can monitor up to four variables. These variables are identified as primary (PV), secondary (SV), tertiary (TV), and quaternary (QV). If you initially configured your LWT instrument with the help of the **Easy Setup** menu, you have already defined the primary variable (PV). You can also monitor three more variables.

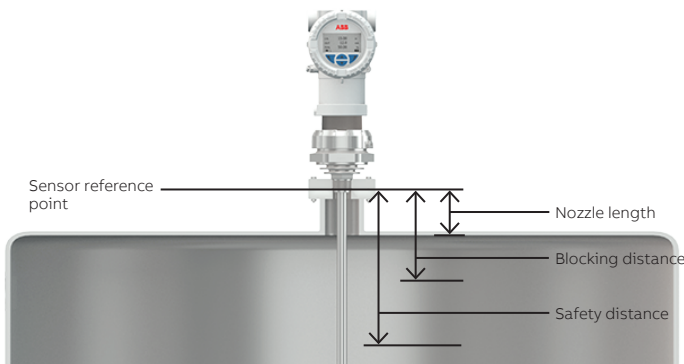


NOTICE

As is commonly accepted practice, the first two variables (PV and SV) relate to variations on distance measurements (Level, Distance, Ullage, Interface, Thickness, Interface Distance) whereas the last two variables (TV and QV) allow for monitoring of additional variables (Amplitude, Electronics Temperature, Interface Amplitude, GPC Dynamic Factor, External Temperature [linked to pt100 external temperature sensors; see Appendix E of the LWT300 User Guide]). Available variables depend on configuration choices made elsewhere (application category, linearization status or output type, etc.)

- Two measurement modes are available (in the **Device Setup > Sensor setup > Measurement mode** menu):
 - **Threshold:** The level detection algorithm is based on a first echo signal after the blocking distance, which crosses the threshold value.
 - **Movement:** The level detection algorithm is based on the movement and displacement of a valid echo after the blocking distance. This mode is particularly useful when large false echoes are present. (For more information about the algo parameters related to the measurement mode, refer to "Setting the Algo Parameters" in the LWT300 User Guide).
- Parameters of application (tank type, nozzle length) (in the **Device Setup > Application Setup** menu) (see "Setting up the application" in the LWT300 User Guide).
- Maximum level rate (in the **Device Setup > Filtering > Max level rate** menu) (see "Max Level Rate" on page 4 of this document).
- Blocking distance (in the **Device Setup > Safety Settings > Blocking Distance** menu) (see Figure 6 below) (for more information on blocking distance, refer to "Setting process safety parameters" in the LWT300 User Guide).

Figure 6 Blocking and safety distances



Finalizing the instrument setup

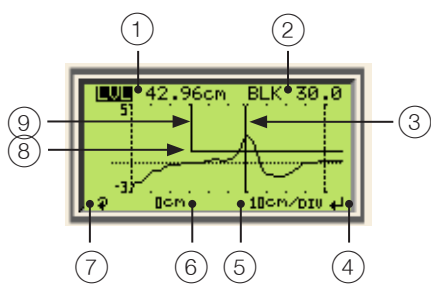
- It is considered good practice to use the **Reset Tracking** command after modifications have been made to an instrument setup. This is performed in the **Device Setup > Sensor Setup > Reset Tracking** menu where you select **OK** to perform the echo tracking reset.
- At the end of the installation, it is also considered good practice to confirm proper installation by taking a look at the generated waveform. Go to the **Diagnostics > Waveform > At sensor Ref. Point** menu and check the quality of the waveform (see Figure 7 below; the waveform section close to the reference point should not show ringing and the pulse at the level or interface distance should be identified by the marker) (refer to "Diagnosing from a waveform" in the LWT300 User Guide).
- If you have emptied the vessel before installing the instrument, you should confirm the probe length status (in the **Diagnostics > Device Status > Probe Length Status** menu) (refer to "Probe length" in the LWT300 User Guide to make sure that the configured probe length is identical to the probe length measured by the sensor).



NOTICE

Probe length confirmation can only be performed if the tank in which the probe is installed is completely empty.

Figure 7 The waveform display



- | | |
|---|--|
| ① | Display of the level (LVL), distance (DIS), ullage (ULL) or interface (INT) value |
| ② | Display of the blocking distance (BLK), safety distance (SFD), level amplitude threshold (LAT) or interface amplitude threshold (IAT)
Note: This is the only highlighted option that is editable (see ④) |
| ③ | Level or interface marker |
| ④ | Exit (↩) or Edit (✎) indicator |
| ⑤ | Zoom information |
| ⑥ | Reference distance |
| ⑦ | Display value selector |
| ⑧ | Level amplitude threshold (or Interface amplitude threshold, if INT is selected in ①) marker |
| ⑨ | Blocking distance (or safety distance, if SFD is selected in ②) marker |

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