Parameter reference

8

Note

- Parameter names and menu structure are almost identical for SIMATIC PDM and the local user interface (LUI).
- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- **Mode** toggles between **PROGRAM** and **Measurement** Modes.
- For Quick Access to parameters via the handheld programmer, press **Home**, then enter the menu number, for example: **2.2.1.**
- In Navigation mode**, ARROW keys (**) navigate the menu in the direction of the arrow.
- Press **RIGHT arrow** to open **Edit** Mode, or to save a modification.

Parameters are identified by name and organized into function groups. See LCD menu structure (Page 247) for a chart. For AMS Device Manager the structure varies slightly.

Parameters accessible via the handheld programmer are followed by the device menu number in parenthesis. Parameters not followed by a number are accessible only via remote operation.

For more details see:

- Operating via SIMATIC PDM (Page 61)
- Operating via AMS Device Manager (Page 88)

Quick Start (1.)

Wizards provide step-by-step procedures to configure the device, filter out false echoes, and upload and download parameters and firmware to the optional display for easy configuration of multiple devices.

Quick Start Wizard (1.1.)

From measurement screen, press **RIGHT arrow** twice to open the Quick Start Wizard menu. Select a wizard, press **RIGHT arrow** to open the first step, and follow the instructions.

Note

Do not use the Quick Start Wizard to modify individual parameters. (Perform customization only after the Quick Start has been completed.)

- See Quick Start Wizard via the handheld programmer (Page 46).
- See Quick Start Wizard via SIMATIC PDM (Page 61).
- See Quick Start Wizard via AMS Device Manager (Page 92).

Setup (2.)

Note

Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

Device (2.1.)

Hardware Revision (2.1.1.)

Corresponds to the electronics hardware of the SITRANS LR250.

Firmware Revision (2.1.2.)

Corresponds to the firmware that is embedded in the SITRANS LR250.

Loader Revision (2.1.3.)

Corresponds to the software used to update the SITRANS LR250.

Order Option (2.1.4.)

Read only. Displays the device type: standard or NAMUR NE 43-compliant.

Menu Timeout (2.1.5.)

Time menu stays visible before switching back to Measurement view if no key is pressed.

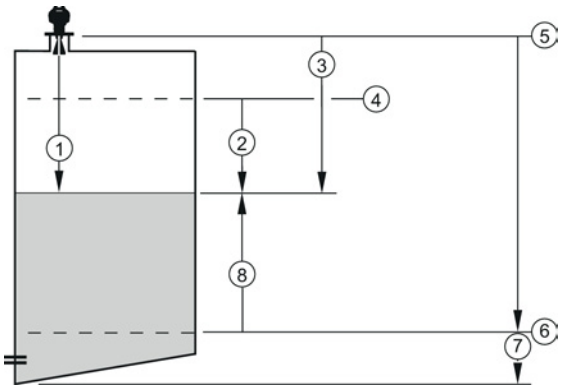
Sensor (2.2.)

Units (2.2.1.)

PV (Primary Value) and SV (Secondary Sensor measurement units). Used in setting High/Low Calibration Point, and displayed on LCD and in PDM.

Values	m, cm, mm, ft, in
	Default: m

Sensor Mode (2.2.2.)



① Sensor value
② Space
③ Distance
④ High Calibration Point
⑤ Sensor reference point [see Dimension drawings] (Page 191)
⑥ Low Calibration Point
⑦ Far range
⑧ Level

Mode		Description	Reference point
NO SERVICE		Measurement and associated loop current are not updated, and the device defaults to Fail-safe mode [a].	n/a
LEVEL	*	Distance to material surface	Low Calibration Point (process empty level)
SPACE		Distance to material surface	High Calibration Point (process full level)
DISTANCE		Distance to material surface	Sensor reference point

[a] See **Material Level (2.5.1.)** for more detail.

Material (2.2.3.)

Automatically configures the device to operate in the chosen application type, by changing one or more of the following parameters: **Propagation Factor (2.8.3.)**, **Position Detect (2.8.4.2.)**, and/or **CLEF Range (2.8.4.4.)**.

Options	*	LIQUID
		LIQUID LOW DK [a] (low dielectric liquid - CLEF algorithm enabled)
Related parameters	Propagation Factor (2.8.3.) Position Detect (2.8.4.2.) CLEF Range (2.8.4.4.)	

[a] dK < 3.0

You can configure each of the related parameters to suit your particular application.

Damping Filter (2.2.4.)

The time constant for the damping filter. The damping filter smooths out the response to a sudden change in level. This is an exponential filter and the engineering unit is always in seconds [see Damping (Page 224) for more detail].

Values	Range: **0** to **100.000** s
	Default: 10.000 s

Calibration (2.3.)

Note

We recommend using the Quick Start wizard to configure the device.

Low Calibration Pt. (2.3.1.)

Distance from sensor reference point[1] to Low Calibration Point. Units are defined in **Units (2.2.1.)**

Values	Range: **0** to **20** m. Default: 20.00 m
Related parameters	Units (2.2.1.) Far Range (2.8.2.)

[1] The point from which level measurement is referenced, see Threaded Horn Antenna with extension (Page 191), Flanged Horn with extension (Page 196), and Flanged encapsulated antenna (3"/DN80/80A sizes and larger) (Page 202).

High Calibration Pt. (2.3.2.)

Distance from sensor reference point [1] to High Calibration Point. Units are defined in **Units (2.2.1.)**.

Values	Range: **0** to **20** m. Default 0.00 m
Related parameters	Units (2.2.1.) Near Range (2.8.1.)

When setting the High Calibration Point value, note that echoes are ignored within **Near Range (2.8.1.)**.

[1] The value produced by the echo processing which represents the distance from sensor reference point to the target. [see Threaded Horn Antenna with extension (Page 191), Flanged Horn with extension (Page 196), and Flanged encapsulated antenna (3"/DN80/80A sizes and larger) (Page 202)].

Sensor Offset (2.3.3.)

A constant offset that can be added to or subtracted from the sensor value[1] to compensate for a shifted sensor reference point. (For example, when adding a thicker gasket or reducing the standoff/nozzle height.) The units are defined in **Units (2.2.1.)**.

Values	Range: -100 to 100 m. Default: 0.00 m
Related parameters	Units (2.2.1.)

[1] The value produced by the echo processing which represents the distance from sensor reference point to the target, see **Sensor Mode (2.2.2.)**.

Rate (2.4.)

Response Rate (2.4.1.)

Note

Changing Response Rate resets **Fill Rate per Minute (2.4.2.)**, **Empty Rate per Minute (2.4.3.)**, and **Damping Filter (2.2.4.)**.

Sets the reaction speed of the device to measurement changes.

Response Rate (2.4.1.)		**Fill Rate per Minute (2.4.2.)**	**Empty Rate per Minute (2.4.3.)**	**Damping Filter (2.2.4.)**
*	Slow	0.1 m/min (0.32 ft/min)		10 s
	Medium	1.0 m/min (3.28 ft/min)		10 s
	Fast	10.0 m/min (32.8 ft/min)		0 s

Use a setting just faster than the maximum filling or emptying rate (whichever is faster).

Fill Rate per Minute (2.4.2.)

Defines the maximum rate at which the reported sensor value is allowed to decrease. Allows you to adjust the SITRANS LR250 response to decreases in the actual material level. Fill Rate is automatically updated whenever Response Rate is altered.

Options	Range: **0 to 99999** m / min.		
	Response Rate (2.4.1.)		**Fill Rate per Minute (2.4.2.)**
	*	Slow	0.1 m/min (0.32 ft/min)
		Medium	1.0 m/min (3.28 ft/min)
		Fast	10.0 m/min (32.8 ft/min)
Altered by:	Response Rate (2.4.1.)		
Related parameters	Units (2.2.1.)		

Enter a value slightly greater than the maximum vessel-filling rate, in units per minute.

Sensor value is the value produced by the echo processing which represents the distance from sensor reference point to the target. See **Sensor Mode (2.2.2.)** for an illustration.

Empty Rate per Minute (2.4.3.)

Defines the maximum rate at which the reported sensor value is allowed to increase. Adjusts the SITRANS LR250 response to increases in the actual material level. Empty Rate is automatically updated whenever Response Rate is altered.

Options	Range: **0 to 99999** m / min.		
	Response Rate (2.4.1.)		**Empty Rate per Minute (2.4.3.)**
	*	Slow	0.1 m/min (0.32 ft/min)
		Medium	1.0 m/min (3.28 ft/min)
		Fast	10.0 m/min (32.8 ft/min)
Altered by:	Response Rate (2.4.1.)		
Related parameters	Units (2.2.1.)		

Enter a value slightly greater than the vessel's maximum emptying rate, in units per minute.

Sensor value is the value produced by the echo processing which represents the distance from sensor reference point to the target. See **Sensor Mode (2.2.2.)** for an illustration.

Fail-safe (2.5.)

Note

Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

Material Level (2.5.1.)

Note

The default setting depends whether your device is a standard or NAMUR NE 43-compliant device.

Defines the mA output to use when the Fail-safe timer expires.

STANDARD DEVICE			
Options		HI	**20.5** mA (max. mA Limit)
		LO	**3.8** mA (min. mA Limit)
	*	HOLD	Last valid reading (default 22.6 mA)
		VALUE	User-selected value [defined in **Fail-Safe mA Value (2.5.3.)**]

NAMUR NE 43-COMPLIANT DEVICE[1)]			
Options		HI	**20.5** mA (max. mA Limit)
		LO	**3.8** mA (min. mA Limit)
		HOLD	Last valid reading
	*	VALUE	User-selected value [defined in **Fail-Safe mA Value (2.5.3.)**: default 3.58 mA]

1) Orderable option

LOE Timer (2.5.2.)

Note

When a Loss of Echo occurs **Material Level (2.5.1.)** determines the material level to be reported when the Fail-safe timer expires. See Loss of Echo (LOE) (Page 226) for more detail.

Sets the time to elapse since the last valid reading, before the Fail-safe Level is reported.

Values	Range: **0.00** to **7200** seconds
	Default: 100 s

Fail-Safe mA Value (2.5.3.)

Note

- The default settings are dependent on standard or NAMUR NE 43-compliant device.
- **Material Level (2.5.1.)** must be set to **VALUE** to enable the Fail-Safe mA Value to be reported.

Allows the user to define the mA value to be reported when the Fail-safe timer expires.

Device Type		STANDARD	NAMUR NE43- COMPLIANT
Values	Range	3.56 mA to 22.6 mA	
	Default	22.60 mA	3.58 mA

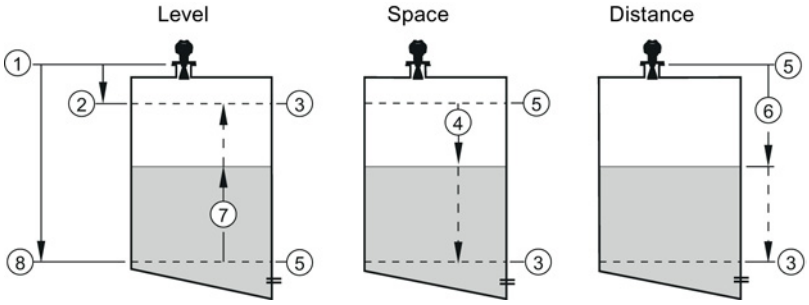
Analog Output Scaling (2.6.)

Current Output Function (2.6.1.)

Note

- **Level**, **space**, and **distance**, have different reference points.
- Use caution when changing Current Output Function while the device is connected to a HART network. Current Output Function controls the primary value and the loop current for the device.
- Current Output Function also affects the secondary, tertiary and quaternary variables in a HART network.

Can be set to either **Level, Space, Distance,** or **Volume**. (The device can carry out a volume calculation only after a vessel shape has been specified.)



① Sensor reference point
② High calibration point
③ 20 mA 100%
④ Space
⑤ 4 mA 0%
⑥ Distance
⑦ Level
⑧ Low calibration point

Options		Reference point	Description
*	**Level**	Low Calibration Point	measured as a percentage of the difference between High Calibration Point and Low Calibration Point
	Space	High Calibration Point	
	Distance	Sensor reference point	measured as a percentage of Low Calibration Point
	Volume	converts a level measurement to a volume output	
	Manual [a] (LUI only)	allows **mA Output Value (2.6.6.)** to be set to a user-defined value	

[a] Current Output Function must be set to **Manual** before modifying **mA Output Value (2.6.6.).** Remember to restore the previous Current Output Function setting after modifying mA Output Value.

To view the mA reading in the secondary region of the LCD, press 5 on the handheld programmer.

To modify Current Output Function via SIMATIC PDM:

- Open the menu **Device – Select Analog Output**. See Select Analog Output via SIMATIC PDM (Page 81) for more detail.

4 mA Setpoint (2.6.2.)

Sets the process level corresponding to the 4 mA value. 4 mA always defaults to **0**, and **Current Output Function (2.6.1.)** determines whether this is a Level, Space, Distance, or Volume measurement. (See **Current Output Function (2.6.1.)** for an illustration.)

Values	Range: **–999999** to **+999999** (limits vary with current function and units)
	Default: **0.00** m (set to value corresponding to 0% as defined by Current Output Function)
Related Parameters	Units (2.2.1.)
	Current Output Function (2.6.1.)

- Enter the reading that is to correspond to a 4 mA output.
- Units are defined in **Units (2.2.1.)** for Level, Space, or Distance. Units are unspecified for Volume.

20 mA Setpoint (2.6.3.)

Sets the process level corresponding to the 20 mA value. 20 mA always defaults to 100%, and **Current Output Function (2.6.1.)** determines whether this is a Level, Space, or Distance measurement. (See **Current Output Function (2.6.1.)** for an illustration.)

Values	Range: **–999999** to **+999999** (limits vary with current function and units)
	Default: **20.00** m (set to value corresponding to 100% as defined by Current Output Function)
Related Parameters	Units (2.2.1.) Current Output Function (2.6.1.)

- Enter the reading that is to correspond to a 20 mA output.
- Units are defined in **Units (2.2.1.)** for Level, Space, or Distance. Units are unspecified for Volume.

Minimum mA limit (2.6.4.)

Prevents the mA output from dropping below this minimum level for a measurement value. This does not restrict the Fail-safe or Manual settings.

Values	Range: **3.8** to **20.5** (mA)
	Default: **3.8** (mA)

Maximum mA limit (2.6.5.)

Prevents the mA output from rising above this maximum level for a measurement value. This does not restrict the Fail-safe or Manual settings.

Values	Range: **3.8** to **20.50** (mA)
	Default: **20.50** (mA)

mA Output Value (2.6.6.)

Allows you to use a simulated value to test the functioning of the loop. You can enter 4 mA, 20 mA, or any other user-defined value within the range.

Values	Range: **3.56** mA to **22.6** mA
	Read Only unless Current Output Function (2.6.1.) is set to Manual.
Related parameter	Current Output Function (2.6.1.)

1. First set **Current Output Function (2.6.1.)** to **Manual.**
2. Enter the desired mA value in mA Output Value.
3. After completing the test, remember to reset **Current Output Function (2.6.1.)** to the previous setting.

Via SIMATIC PDM:

Open the menu Device – Loop Test. For more detail, see Loop Test (Page 82).

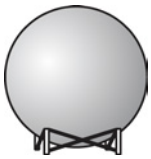
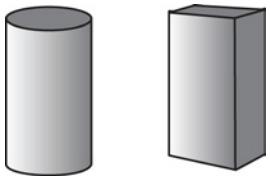
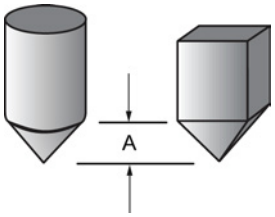
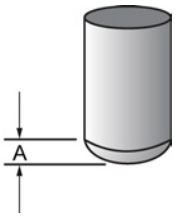
Linearization (2.7.)

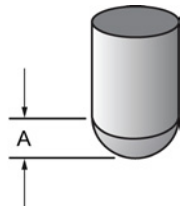
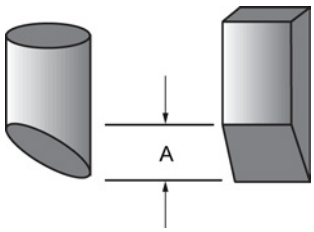
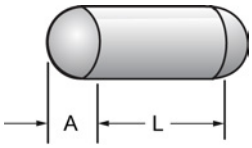
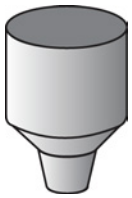
Volume (2.7.1.)

Carries out a volume conversion from a level value.

Vessel Shape (2.7.1.1.)

Defines the vessel shape and allows the LR250 to calculate volume instead of level. If **None** is selected, no volume conversion is performed. Select the vessel shape matching the monitored vessel or reservoir.

	Vessel Shape	LCD DISPLAY/ Description	Also required
*	None	NONE/ No volume calculation required	N/A
		CYLINDER/ Flat end horizontal cylinder	Maximum volume
		SPHERE/ Sphere	Maximum volume
		LINEAR/ Upright, linear (flat bottom)	Maximum volume
		CONICAL BOT/ Conical or pyramidal bottom	Maximum volume, dimension A
		PARABOLIC BOT/Parabolic bottom	Maximum volume, dimension A

	Vessel Shape	LCD DISPLAY/ Description	Also required
		HALF SPHERE BOT/ Half-sphere bottom	Maximum volume, dimension A
		FLAT SLOPED BOT/ Flat sloped bottom	Maximum volume, dimension A
		PARABOLIC ENDS/ Parabolic end horizontal cylinder	Maximum volume, dimension A, dimension L
		LINEAR TABLE [a] / Linearization table (level/volume breakpoints)	Maximum volume, tables 1-32 level and volume breakpoints

[a] Linearization Table must be selected in order for level/volume values [see **Table 1-8 (2.7.2.)**] to be transferred.

Maximum Volume (2.7.1.2.)

The maximum volume of the vessel. Enter the vessel volume corresponding to High Calibration Point. For example, if your maximum vessel volume is 8000 L, enter a value of 8000. Volume units are defined by the user but are not explicitly stated or shown in the SITRANS LR250.

Values	Range: **0.0** to **99999** m
	Default: 100.0
Related Parameters	Low Calibration Pt. (2.3.1.) High Calibration Pt. (2.3.2.) Vessel Shape (2.7.1.1.)

Vessel Dimension A (2.7.1.3.)

The height of the vessel bottom when the bottom is conical, pyramidal, parabolic, spherical, or flat -sloped. If the vessel is horizontal with parabolic ends, the depth of the end. See **Vessel Shape (2.7.1.1.)** for an illustration.

Values	Range: **0.0** to **99.999** m
	Default: 0.0
Related Parameters	Units (2.2.1.) Vessel Shape (2.7.1.1.)

Vessel Dimension L (2.7.1.4.)

Length of the cylindrical section of a horizontal parabolic end vessel. See **Vessel Shape (2.7.1.1.)** for an illustration.

Values	Range: **0.0** to **99.99** m
	Default: 0.0
Related Parameters	Units (2.2.1.) Vessel Shape (2.7.1.1.)

Table 1-8 (2.7.2.)

Note

Linearization Table must be selected in **Vessel Shape (2.7.1.1.)** in order for level/volume values to be transferred.

If your vessel shape is more complex than any of the preconfigured shapes, you can define the shape as a series of segments. A value is assigned to each level breakpoint and a corresponding value is assigned to each volume breakpoint. Level values are defined in **Units (2.2.1.).** Volume units are defined by the user but are not explicitly stated in the SITRANS LR250.

Level Values	Range: **0.0** to **span** Span = **High Calibration Pt. (2.3.2.)** - **Low Calibration Pt. (2.3.1.)**
	Default: 0.0
Volume Values	Range: **0.0** to **Maximum Volume (2.7.1.2.)**
	Default: 0.0

Enter up to 32 level breakpoints, where the corresponding volume is known. The values corresponding to 100% and 0% levels must be entered. The breakpoints can be ordered from top to bottom, or the reverse.

Breakpoints are grouped into four tables: Table 1-8, Table 9-16, Table 17-24, and Table 25-32.

Entering breakpoints via the handheld programmer:

1. The default unit for level values is **m:** to change it navigate to **Setup (2.) > Sensor (2.2.) > Units(2.2.1.)**, and select the desired unit.
2. Navigate to **Setup (2.) > Linearization (2.7.) > Maximum Volume (2.7.1.2.)**, and enter the value.
3. Go to the appropriate table for the particular breakpoint you wish to adjust: for example, go to Table 1-8 for breakpoint 1.
4. Under Table 1-8, go to **Level 1 (2.7.2.1.)** to enter the level value for the breakpoint 1.
5. Under Table 1-8, go to **Volume 1 (2.7.2.2.)** to enter the volume value for the breakpoint 1.
6. Repeat steps 3 to 5, until values have been entered for all required breakpoints.

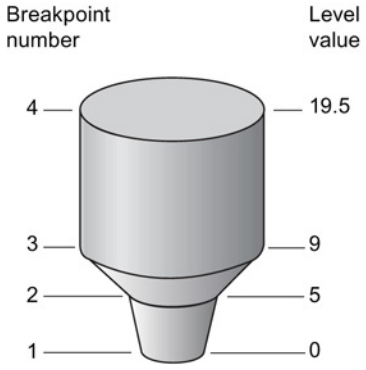
Level 1 (2.7.2.1.)

1. Press **RIGHT arrow** to open Edit mode.
2. Enter level value and press **RIGHT arrow** to except it.
3. Press **DOWN arrow** to move to corresponding volume breakpoint.

Volume 1 (2.7.2.2.)

1. Press **RIGHT arrow** to open Edit mode.
2. Enter volume value and press **RIGHT arrow** to accept it.
3. Press **DOWN arrow** to move to next level breakpoint.

Example **(values are for example purposes only)**



Breakpoint Number	Level value (m)	Volume value (l)
1	0	0
2	5	500
3	9	3000
4	19.5	8000

Table 9-16 (2.7.3.)

Table 17-24 (2.7.4.)

Table 25-32 (2.7.5.)

Signal Processing (2.8.)

Note

Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

Near Range (2.8.1.)

The range in front of the device (measured from the sensor reference point) within which any echoes will be ignored. This is sometimes referred to as blanking or a dead zone. The factory setting is 50 mm (2") past the end of the antenna, and the default is dependent on the antenna type and process connection. [See Dimension drawings (Page 191) for antenna heights.]

Values	Range: **0** to **20** m (0 to 65.6 ft)
	Default depends on antenna type and process connection:
Related parameters	Units (2.2.1.)

Far Range (2.8.2.)

Note

Far Range can extend beyond the bottom of the vessel.

Allows the material level to drop below Low Calibration Point without generating a Loss of Echo (LOE) state. See **Sensor Mode (2.2.2.)** for an illustration.

Values	Range: Min. = **Low Calibration Pt.** Max. = **23** m (75.45 ft) Default: Value for Low Calibration Pt. + 1 m (3.28 ft)
Related parameters	Units (2.2.1.)

Use this feature if the measured surface can drop below the Low Cal. Point in normal operation.

Propogation Factor (2.8.3.)

Note

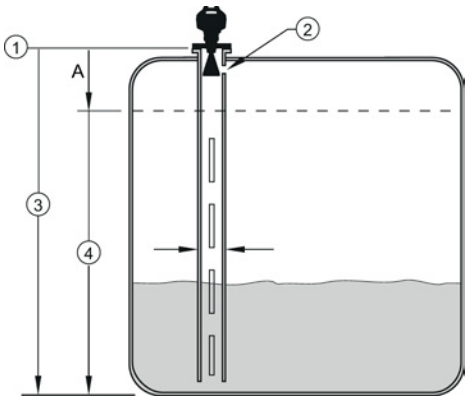
- When operating in a stillpipe, values for **CLEF Range (2.8.4.4.)**, and for the propagation factor, should be set according to the pipe size. See the table below.
- For reliable results the antenna size must be close to the pipe size.

Compensates for the change in microwave velocity due to propagation within a metal stillpipe instead of in free space.

Values	Range	0.3 to 1.0 depending on pipe size		
	Default	1.0000		
Nominal Pipe Size [a]	40 mm (1.5")	50 mm (2")	80 mm (3")	100 mm (4")
Propagation Factor	0.9844	0.988	0.9935	0.9965
CLEF Range (2.8.4.4.) settings	Low calibration point - 700 mm (2.29 ft)[b]	Low calibration point - 700 mm (2.29 ft)[b]	Low calibration point -1000 mm (3.28 ft)[b]	Low calibration point -1000 mm (3.28 ft)[b]

[a] Since pipe dimensions may vary slightly, the propagation factor may also vary.

[b] CLEF range covers the whole measurement range except first 700 or 1000 mm from unit reference point (see A in graphic below)



① sensor reference point
② air gap
A 700 or 1000 mm
③ low calibration point
④ CLEF range 2.8.4.4.

Note

Flanged encapsulated antenna

For Flanged encapsulated antenna (7ML5432) match the process connection size to the pipe diameter whenever possible (for example, mount a DN80/3" flange on DN80/3" pipe).

Echo Select (2.8.4.)

Algorithm (2.8.4.1.)

Selects the algorithm to be applied to the echo profile to extract the true echo.

Options	*	**tF**	**T**rue **F**irst echo
		L	**L**argest echo
		BLF	**B**est of **L**argest and **F**irst echo

Position Detect (2.8.4.2.)

Defines where on the echo the distance measurement is determined.

Options		Center
	*	Hybrid (Center and CLEF)
		CLEF (Constrained Leading Edge Fit)
Related parameters		CLEF Range (2.8.4.4.)

If the vessel bottom is being reported as the level instead of the actual material level (at low level conditions), or if the dielectric constant of the liquid to be monitored is less than 3, we recommend setting Position Detect to Hybrid and **CLEF Range (2.8.4.4.)** to 0.5 m (1.64 ft).

Echo Threshold (2.8.4.3.)

Sets the minimum echo confidence that the echo must meet in order to prevent a Loss of Echo condition and the expiration of the Fail-safe (LOE) timer. When **Confidence (2.8.6.1.)** exceeds **Echo Threshold (2.8.4.3.)**, the echo is accepted as a valid echo and is evaluated.

Values	Range: **0** to **99**
	Default: 5
Related Parameters	LOE Timer (2.5.2.)

CLEF Range (2.8.4.4.)

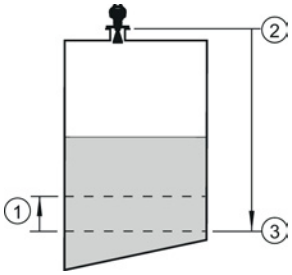
Note

CLEF Range is referenced from Far range.

The CLEF algorithm is used mainly to allow correct level reporting for low dK materials which may otherwise cause an incorrect reading in an empty or almost empty vessel.

It is used from Low Calibration Point (process empty level) up to the level defined by CLEF Range (see illustration below). Above that point the Center algorithm is used. For more detail see CLEF Range (Page 220).

Values	Range: **0** to **20** m (0 to 65.6 ft)
	Default: 0.0 m
Related parameters	Position Detect (2.8.4.2.)



① CLEF Range
② Sensor reference point
③ Low Calibration Point (process empty level)

In applications with low dK materials we recommend setting CLEF Range to 0.5 m (1.64 ft) and **Position Detect (2.8.4.2.)** to Hybrid.

Sampling (2.8.5.)

Provides a method of checking the reliability of a new echo before accepting it as the valid reading, based on numbers of samples above or below the currently selected echo.

Echo Lock (2.8.5.1.)

Note

Ensure the agitator is always running while SITRANS LR250 is monitoring the vessel, to avoid stationary blade detection.

Selects the measurement verification process.

Options		Lock Off
		Maximum Verification (not recommended for radar)
	*	Material Agitator
		Total Lock (not recommended for radar)
Related parameters		Fill Rate per Minute (2.4.2.) Empty rate per Minute (2.4.3.) Sampling Up (2.8.5.2.) Sampling Down (2.8.5.3.)

For radar applications, Material Agitator is the most often-used setting, to avoid agitator blade detection.

Sampling Up (2.8.5.2.)

Specifies the number of consecutive echoes that must appear above the echo currently selected, before the measurement is accepted as valid.

Values	Range: **1** to **50**
	Default: 5

Sampling Down (2.8.5.3.)

Specifies the number of consecutive echoes that must appear below the echo currently selected, before the measurement is accepted as valid.

Values	Range: **1** to **50**
	Default: **2**

Echo Quality (2.8.6.)

Confidence (2.8.6.1.)

Indicates echo reliability: higher values represent better echo quality. The display shows the echo confidence of the last measurement. **Echo Threshold (2.8.4.3.)** defines the minimum criterion for echo confidence.

Values (view only)	**0** to **99**	
	----	Shot not used
Related Parameters	Echo Threshold (2.8.4.3.)	

Open the menu **Device – Echo Profile Utilities** and click on the tab **Echo Profile**.

Echo Strength (2.8.6.2.)

Displays the absolute strength (in dB above 1 µV rms) of the echo selected as the measurement echo.

Values (view only)	**-20** to **99**	
	----	Shot not used

Open the menu **Device – Echo Profile Utilities** and click on the tab **Echo Profile**.

Noise Average (2.8.6.3.)

Displays the average ambient noise (in dB above 1 µV rms) of a noise profile. Noise level is a combination of transient noise and receiving circuitry. After a measurement, the values from the previous noise shot will be displayed.

TVT Setup (2.8.7.)

Note

Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

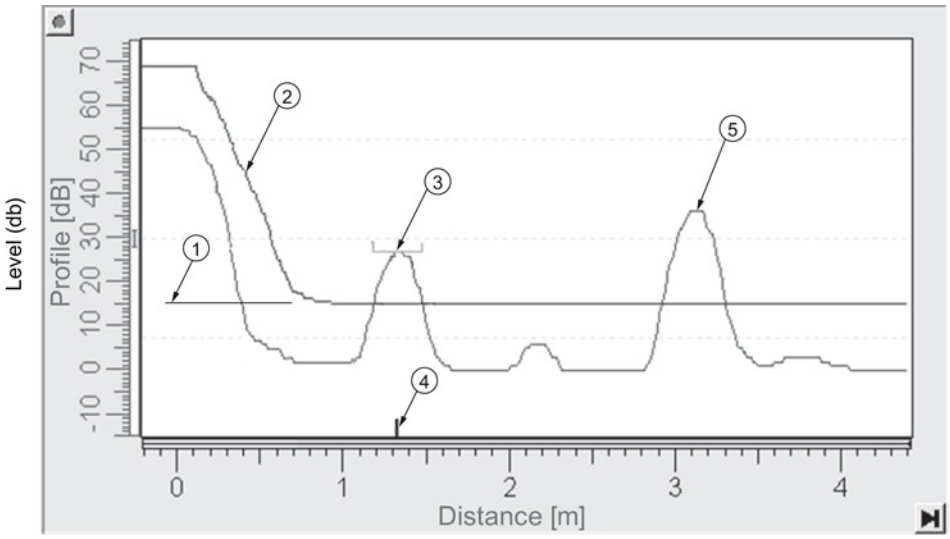
Auto False Echo Suppression (2.8.7.1.)

Used together with **Auto False Echo Suppression Range (2.8.7.2.)** to screen out false echoes in a vessel with known obstructions. A 'learned TVT' (time varying threshold) replaces the default TVT over a specified range. See Auto False Echo Suppression (Page 221) for a more detailed explanation.

Note

- Make sure material level is below all known obstructions when Auto False Echo Suppression is used to learn the echo profile. (An empty or almost empty vessel is recommended.)
- Note the distance to material level when Auto False Echo learns the environment. Set Auto False Echo Suppression Range to a shorter distance to avoid the material echo being screened out.
- Set Auto False Echo Suppression and Auto False Echo Suppression Range during startup, if possible.
- If the vessel contains an agitator it should be running.
- Before adjusting these parameters, rotate the instrument for best signal (lower false-echo amplitude).

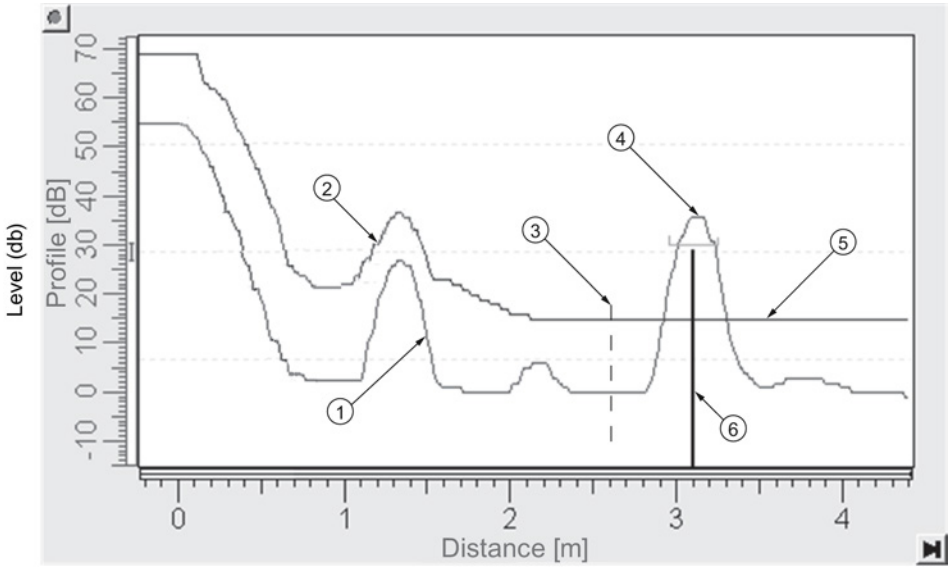
Before Auto False Echo Suppression



① TVT Hover Level
② default TVT
③ false echo
④ echo marker
⑤ material level

1. Determine Auto False Echo Suppression Range. Measure the actual distance from the sensor reference point to the material surface using a rope or tape measure.
2. Subtract 0.5 m (20") from this distance, and use the resulting value.
3. Go to **Auto False Echo Suppression Range (2.8.7.2.)** and enter the value calculated in step 2.
4. Go to **Auto False Echo Suppression (2.8.7.1.)** and press RIGHT arrow to open Edit Mode.
5. Select **Learn**. The device will automatically revert to **On** (Use Learned TVT) after a few seconds.

After Auto False Echo Suppression



①	false echo	④	material level
②	learned TVT	⑤	default TVT
③	Auto False Echo Suppression Range	⑥	echo marker

To set Auto False Echo Suppression via SIMATIC PDM:

Open the menu **Device – Echo Profile Utilities** and click on the tab **Auto False Echo Suppression**. For more detailed instructions see Auto False Echo Suppression via SIMATIC PDM (Page 76).

To set Auto False Echo Suppression via the handheld programmer:

Options		OFF	Default TVT will be used.
	*	ON	'Learned' TVT will be used.
		LEARN	'Learn' the TVT[a].

[a] The learned TVT takes effect only at the next measurement.

Auto False Echo Suppression Range (2.8.7.2.)

Note

Changes take effect only at the next measurement. "Master reset" does not clear the learned/stored TVT, select "Off" to turn it off or "learn" for a new TVT. See **Master Reset (4.1.)**

Specifies the range within which Learned TVT is used [see **Auto False Echo Suppression (2.8.7.1.)** for more detail].

Values	Range: **0.00** to **20.00** m
	Default: 1.00 m
Related parameters	Units (2.2.1.)

1. Calculate range according to **Auto False Echo Suppression (2.8.7.1.)** steps 1 and 2.
2. Press **RIGHT arrow** to open Edit mode.
3. Enter the new value and press **RIGHT arrow** to accept it.
4. Set **Auto False Echo Suppression (2.8.7.1.)**.

Hover Level (2.8.7.3.)

Note

Changes take effect only at the next measurement.

Defines how high the TVT (Time Varying Threshold) is placed above the noise floor of the echo profile, as a percentage of the difference between the peak of the largest echo in the profile and the noise floor. See **Auto False Echo Suppression (2.8.7.1.)** for an illustration.

Values	Range: **0** to **100**%
	Default: 40%

When the device is located in the center of the vessel, the TVT hover level may be lowered to increase the confidence level of the largest echo.

Shaper Mode (2.8.7.4.)

Enables/disables the TVT shaper.

Options		ON
	*	OFF

TVT shaper (2.8.8.)

Note

- The range is –100 to 100 bits. With 2 bits per dB this gives a range of –50 to 50 dB.
- **Shaper Mode (2.8.7.4.)** must be turned ON in order for TVT shaper points to be transferred.

Adjusts the TVT (Time Varying Threshold) at a specified range (breakpoint on the TVT). This allows you to reshape the TVT to avoid unwanted echoes. There are 40 breakpoints arranged in 5 groups. (We recommend using SIMATIC PDM to access this feature.)

To use TVT shaper via SIMATIC PDM:

1. Go to **Level Meter > Setup > Signal Processing > TVT setup > Shaper Mode** and select **On**.
2. Open the menu **Device – Echo Profile Utilities** and click on **TVT Shaper**. For more detail see TVT shaper via SIMATIC PDM (Page 75).

To use TVT shaper via LUI (local user interface):

1. Go to **Shaper Mode (2.8.7.4.)** and select **On**.
2. Go to Breakpoint **1-9 (2.8.8.1.)**.
3. Open Shaper 1 and enter the TVT Offset value (between –50 and 50).
4. Go to the next Shaper point and repeat steps 3 and 4 until all desired breakpoint values have been entered.

Breakpoint 1-9 (2.8.8.1.)

Values	Range: **–50 to 50 dB**
	Default: **0 dB**

Breakpoint 10-18 (2.8.8.2.)

Values	Range: **–50 to 50 dB**
	Default: **0 dB**

Breakpoint 19-27 (2.8.8.3.)

Values	Range: **–50 to 50 dB**
	Default: **0 dB**

Breakpoint 28-36 (2.8.8.4.)

Values	Range: **–50 to 50 dB**
	Default: **0 dB**

Breakpoint 37-40 (2.8.8.5.)

Values	Range: **–50 to 50 dB**
	Default: **0 dB**

Measured Values (2.8.9.)

Read only. Allows you to view measured values for diagnostic purposes.

To access measured values via SIMATIC PDM:

Open the menu **View – Process Variables**.

Level Measurement (2.8.9.1.)

The value for level.

Space Measurement (2.8.9.2.)

The value for space.

Distance Measurement (2.8.9.3.)

The value for distance.

Volume Measurement (2.8.9.4.)

The value for volume.

Diagnostics (3.)

Echo Profile (3.1.)

Allows you to request the current echo profile either locally via the handheld programmer, or remotely via SIMATIC PDM, or AMS Device Manager. [For more detail see Echo Processing (Page 216)].

To request a profile via SIMATIC PDM:

Open the menu **Device – Echo Profile Utilities**. [For more detail see Echo Profile Utilities via SIMATIC PDM (Page 72)].

To request a profile via the handheld programmer:

1. In **PROGRAM** mode, navigate to **Level Meter > Diagnostics (3.) > Echo Profile (3.1.)**
2. Press **RIGHT arrow** to request a profile.

[For more detail see Requesting an Echo Profile (Page 51)].

Electronics Temperature (3.2.)

Current Internal Temperature (3.2.1.)

Read only. Displays (in degrees C) the current temperature on the circuit board recorded by the internal electronics.

For access via SIMATIC PDM open the menu **View – Process Variables** and check the field **Electronics Temperature**.

Highest Value (3.2.2.)

Read only. Displays (in degrees C) the maximum temperature recorded by the internal electronics. The high and low values are maintained over a power cycle.

Via SIMATIC PDM navigate to **Maintenance and Diagnostics > Electronics Temperature**.

Lowest Value (3.2.3.)

Read only. Displays (in degrees C) the minimum temperature recorded by the internal electronics. The high and low values are maintained over a power cycle.

Via SIMATIC PDM navigate to **Maintenance and Diagnostics > Electronics Temperature**.

Service (4.)

Note

Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

Master Reset (4.1.)

Note

Following a reset to **Factory Defaults**, complete reprogramming is required.

Resets all parameter to factory defaults, with the following exceptions:

- **Device Address (5.1.)** remains unchanged if the reset command is sent remotely (via AMS, PDM, DTM, FC375) but is reset to 0 if the reset command is sent via LUI.
- **Write Protect (6.2.1.)** and **PIN to Unlock (6.2.2.)** values are not reset.
- **Auto False Echo Suppression (2.8.7.1.)** learned TVT and **Auto False Echo Suppression Range (2.8.7.2.)** are not lost.

Options	*	Idle or Done (Return to previous menu)
		Factory Defaults

To perform a reset to factory defaults via SIMATIC PDM, open the menu **Device – Master Reset** and click on **Factory Defaults.**

Remaining Device Lifetime (4.2.)

Note

- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- Four sets of parameters allow you to monitor the Device/Sensor Lifetimes and set up Maintenance/Service schedules, based on operating hours instead of a calendar-based schedule. See also **Remaining Sensor Lifetime (4.3.)**, **Service Schedule (4.4.)**, and **Calibration Schedule (4.5.)**.
- Performing a reset to **Factory Defaults** will reset all the Maintenance Schedule parameters to their factory defaults.
- The device operates in years. To view Remaining Device Lifetime parameters in hours or days (via SIMATIC PDM only) see **Lifetime (Expected) (4.2.1.)**.

The device tracks itself based on operating hours and monitors its predicted lifetime. You can modify the expected device lifetime, set up schedules for maintenance reminders, and acknowledge them.

The maintenance warnings and reminders are available through HART communications. This information can be integrated into an Asset Management system. For optimal use, we recommend that you use SIMATIC PCS7 Asset Management Software in conjunction with SIMATIC PDM.

To access these parameters via SIMATIC PDM:

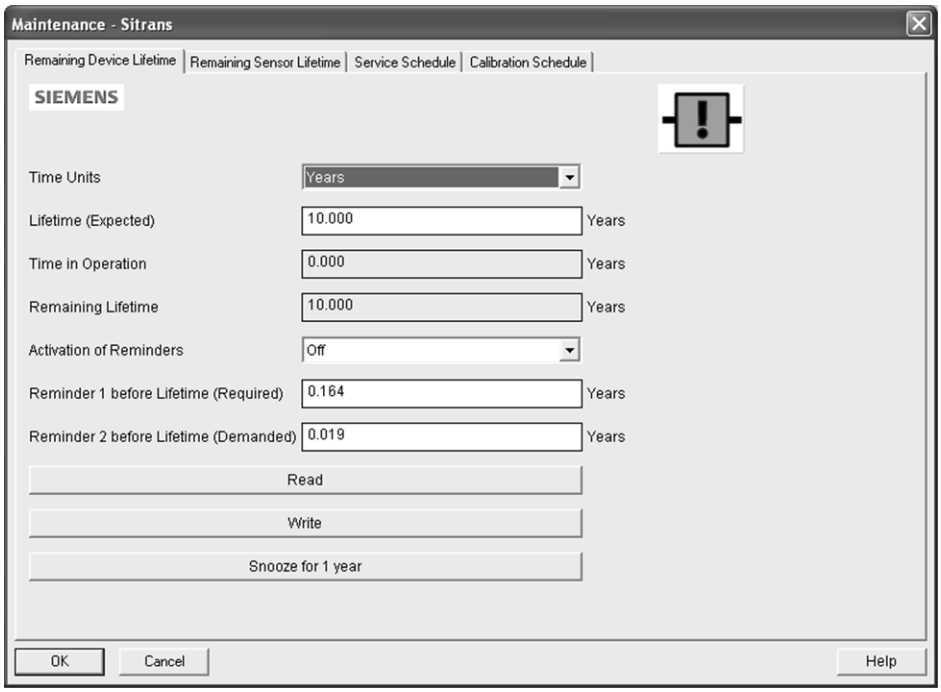
- Open the menu **Device – Maintenance** and select the **Remaining Device Lifetime** tab.
- After modifying values/units as required, click on **Write** to accept the change, and **Read** to view the effect of the change.
- Click on **Snooze** to add a year to the Total Expected Device Life.

Time Units

Options [a]	Hours; days; years
	Default: years

[a] Selectable only via SIMATIC PDM.

Lifetime (Expected) (4.2.1.)



Note

The device always operates in years. Changing the units affects only the parameter view of the Service Interval parameters in SIMATIC PDM.

User-configurable recommended time between product inspections.

Values	Units [a]: hours, days, years
	Range: **0** to **20** years
	Default: 10 years

[a] Units are selectable only via SIMATIC PDM.

Time in Operation (4.2.2.)

Read only. The amount of time the device has been operating.

Remaining Lifetime (4.2.3.)

Read only. **Lifetime (Expected) (4.2.1.)** less **Time in Operation (4.2.2.).**

Activation of Reminders (4.2.4.)

Note

To modify this parameter via SIMATIC PDM it must be accessed via the pull-down menu **Device – Maintenance**.

Allows you to enable a maintenance reminder.

Values	*	Timer OFF
		ON - no reminders checked
		ON - Reminder 1 (Maintenance Required) checked
		ON - Reminders 1 and 2 checked
		ON - Reminder 2 (Maintenance Demanded) checked

1. First set the values in **Reminder 1 before Lifetime (Required) (4.2.5.)**/ **Reminder 2 before Lifetime (Demanded) (4.2.6.)**.
2. Select the desired **Activation of Reminders** option.

Reminder 1 before Lifetime (Required) (4.2.5.)

If **Remaining Lifetime (4.2.3.)** is equal to or less than this value, the device generates a Maintenance Required reminder.

Values	Range: **0** to **Lifetime (Expected) (4.2.1.)**
	Default: 0.164 years

1. Modify values as required.
2. Set **Activation of Reminders (4.2.4.)** to the desired option.

Reminder 2 before Lifetime (Demanded) (4.2.6.)

If **Remaining Lifetime (4.2.3.)** is equal to or less than this value, the device generates a Maintenance Demanded reminder.

Values	Range: **0** to **Lifetime (Expected) (4.2.1.)**
	Default: 0.019 years

1. Modify values as required.
2. Set **Activation of Reminders (4.2.4.)** to the desired option.

Maintenance Status (4.2.7.)

Indicates which level of maintenance reminder is active.

In SIMATIC PDM, open the menu **View – Device Status**, click on the **Maintenance** tab, and check the **Device Lifetime Status** window.

Acknowledge Status (4.2.8.)

Indicates which level of maintenance reminder has been acknowledged.

In SIMATIC PDM, open the menu **View – Device Status**, click on the **Maintenance** tab, and check the **Device Lifetime Status** window.

Acknowledge (4.2.9.)

Acknowledges the current maintenance reminder.

To acknowledge a reminder via SIMATIC PDM:

1. Open the menu **View – Device Status** and click on the **Maintenance** tab.
2. In the **Device Lifetime** section, click on **Acknowledge Warnings**.

To acknowledge a reminder via the handheld programmer:

1. Press **RIGHT arrow** twice to open parameter view and activate Edit Mode.
2. Press **RIGHT arrow** to acknowledge the reminder.

Remaining Sensor Lifetime (4.3.)

Note

- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- Four sets of parameters allow you to monitor the Device/Sensor Lifetimes and set up Maintenance/Service schedules, based on operating hours instead of a calendar-based schedule. See also **Remaining Device Lifetime (4.2.), Service Schedule (4.4.)**, and **Calibration Schedule (4.5.)**.
- Performing a reset to Factory Defaults will reset all the Maintenance Schedule parameters to their factory defaults.
- The device operates in years. To view Remaining Sensor Lifetime parameters in hours or days (via SIMATIC PDM only) see **Lifetime Expected (4.3.1.)**.

The device monitors the predicted lifetime of the sensor (the components exposed to the vessel environment). You can modify the expected sensor lifetime, set up schedules for maintenance reminders, and acknowledge them.

To access these parameters via SIMATIC PDM:

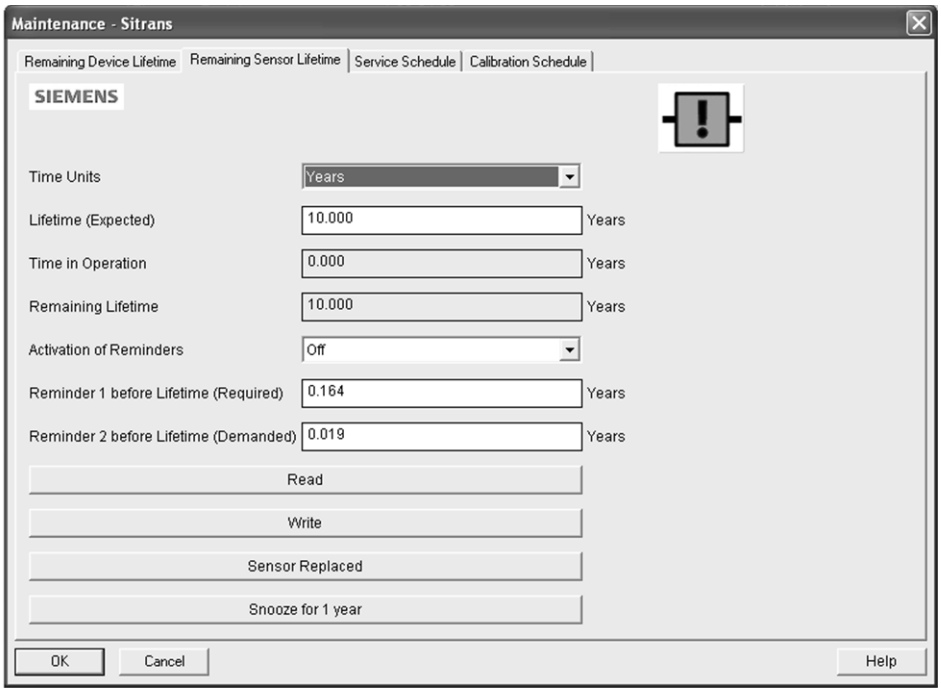
- Open the menu **Device – Maintenance** and select the **Remaining Sensor Lifetime** tab.
- After modifying values/units as required, click on **Write** to accept the change, and **Read** to view the effect of the change.
- Click on **Snooze** to add a year to the Total Expected Sensor Life.
- Click on **Sensor Replaced** to restart the timer and clear any fault messages.

Time Units

Options [a]	Hours; days; years
	Default: years

[a] Selectable only via SIMATIC PDM.

Lifetime (Expected) (4.3.1.)



Note

The device always operates in years. Changing the units affects only the parameter view of Remaining Sensor Life parameters in SIMATIC PDM.

Allows you to override the factory default.

Values	Units [a]: hours, days, years
	Range: **0** to **20** years
	Default: 10.00 years

[a] Units are selectable only via SIMATIC PDM.

Time in Operation (4.3.2.)

The amount of time the sensor has been operating. Can be reset to zero after performing a service or replacing the sensor.

To reset to zero:

- In SIMATIC PDM, open the menu **Device – Maintenance**, click on the **Remaining Sensor Lifetime** tab, and click on **Sensor Replaced** to restart the timer and clear any fault messages.
- Via the handheld programmer, manually reset **Time in Operation (4.3.2.)** to zero.

Remaining Lifetime (4.3.3.)

Read only. **Lifetime (Expected) (4.3.1.)** less **Time in Operation (4.3.2.)**.

Activation of Reminders (4.3.4.)

Note

To modify this parameter via SIMATIC PDM it must be accessed via the pull-down menu **Device – Maintenance**.

Allows you to enable a maintenance reminder.

Options		Reminder 1 (Maintenance Required)
		Reminder 2 (Maintenance Demanded)
		Reminders 1 and 2
	*	OFF

1. First set the values in **Reminder 1 before Lifetime (Required) (4.3.5.)**/**Reminder 2 before Lifetime (Demanded) (4.3.6.)**.
2. Select the desired **Activation of Reminders** option.

Reminder 1 before Lifetime (Required) (4.3.5.)

If **Remaining Lifetime (4.3.3.)** is equal to or less than this value, the device generates a **Maintenance Required** reminder.

Values	Range: **0** to **Lifetime (Expected) (4.3.1.)**
	Default: 0.164 years

1. Modify values as required.
2. Set **Activation of Reminders (4.3.4.)** to the desired option.

Reminder 2 before Lifetime (Demanded) (4.3.6.)

If **Remaining Lifetime (4.3.3.)** is equal to or less than this value, the device generates a **Maintenance Demanded** reminder.

Values	Range: **0** to **Lifetime (Expected) (4.3.1.)**
	Default: 0.019 years

1. Modify values as required.
2. Set **Activation of Reminders (4.3.4.)** to the desired option.

Maintenance Status (4.3.7.)

Indicates which level of maintenance reminder is active.

In SIMATIC PDM, open the menu **View – Device Status**, click on the **Maintenance** tab, and check the **Sensor Lifetime Status** window.

Acknowledge Status (4.3.8.)

Indicates which level of maintenance reminder has been acknowledged.

In SIMATIC PDM, open the menu **View – Device Status**, click on the **Maintenance** tab, and check the **Sensor Lifetime Status** window.

Acknowledge (4.3.9.)

Acknowledges the current maintenance reminder.

To acknowledge a reminder via SIMATIC PDM:

1. Open the menu **View – Device Status** and click on the **Maintenance** tab.
2. In the **Sensor Lifetime** section, click on **Acknowledge Warnings**.

To acknowledge a reminder via the handheld programmer:

1. Press **RIGHT arrow** twice to open parameter view and activate **Edit** Mode.
2. Press **RIGHT arrow** to acknowledge the reminder.

Service Schedule (4.4.)

Note

- Four sets of parameters allow you to monitor the Device/Sensor Lifetimes and set up Maintenance/Service schedules, based on operating hours instead of a calendar-based schedule. See also **Remaining Device Lifetime (4.2.)**, **Remaining Sensor Lifetime (4.3.)**, and **Calibration Schedule (4.5.)**.
- Performing a reset to **Factory Defaults** will reset all the Maintenance Schedule parameters to their factory defaults.
- The device operates in years. To view Service Interval parameters in hours or days (via SIMATIC PDM only) see **Service interval (4.4.1.)**.

The device tracks service intervals based on operating hours and monitors the predicted lifetime to the next service. You can modify the Total Service Interval, set schedules for maintenance reminders, and acknowledge them.

The maintenance warnings and reminders are communicated to the end user through status information. This information can be integrated into any Asset Management system. For optimal use, we recommend that you use SIMATIC PCS7 Asset Management Software in conjunction with SIMATIC PDM.

To access these parameters via SIMATIC PDM:

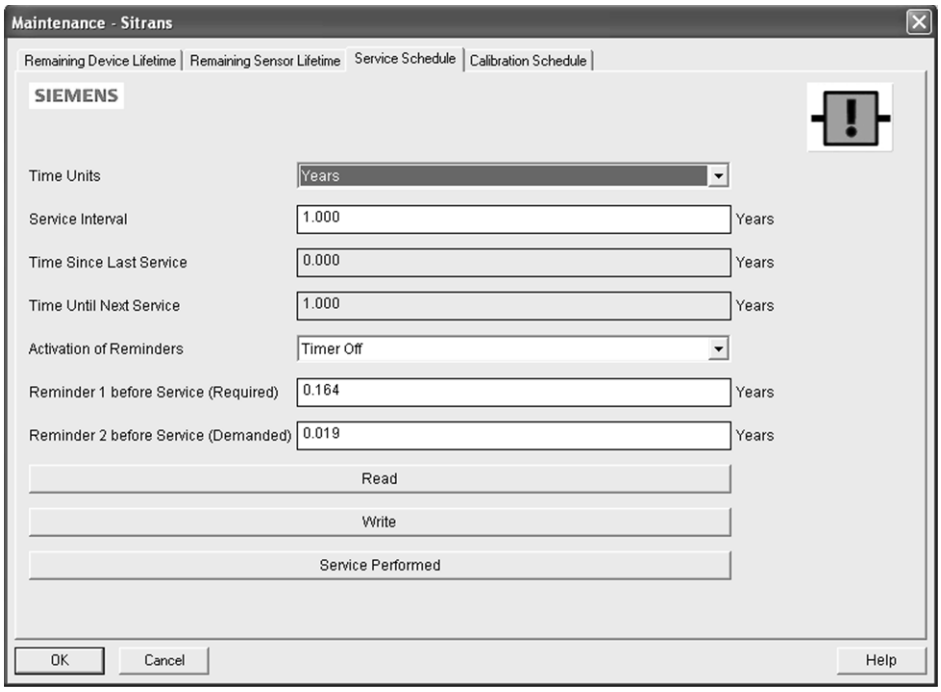
- Open the menu **Device – Maintenance** and select the **Service Schedule** tab.
- After modifying values/units as required, click on **Write** to accept the change, and **Read** to view the effect of the change.
- Click on **Service Performed** to restart the timer and clear any fault messages.

Time Units

Options [a]	Hours; days; years
	Default: years

[a] Selectable only via SIMATIC PDM.

Service Interval (4.4.1.)



Note

The device always operates in years. Changing the units affects only the parameter view of the Service Interval parameters in SIMATIC PDM.

User-configurable recommended time between product inspections.

Values	Units [a]: hours, days, years
	Range: **0 to 20 years**
	Default: **1.0** year

[a] Units are selectable only via SIMATIC PDM.

Time Since Last Service (4.4.2.)

Time elapsed since last service. Can be reset to zero after performing a service.

To reset to zero:

- In SIMATIC PDM, open the menu **Device – Maintenance**, click on the **Service Schedule** tab, and click on **Service Performed** to restart the timer and clear any fault messages.
- Via the handheld programmer, manually reset **Time since Last Service (4.4.2.)** to zero.

Time Until Next Service (4.4.3.)

Read only. **Service Interval (4.4.1.)** less **Time Since Last Service (4.4.2.)**.

Activation of Reminders (4.4.4.)

Note

To modify this parameter via SIMATIC PDM it must be accessed via the pull-down menu **Device – Maintenance**.

Allows you to enable a maintenance reminder.

Options	*	Timer OFF
		ON - no reminders checked
		ON - Reminder 1 (Maintenance Required) checked
		ON - Reminders 1 and 2 checked
		ON - Reminder 2 (Maintenance Demanded) checked

1. First set the values in **Reminder 1 before Service (Required) (4.4.5.)**/**Reminder 2 before Service (Demanded) (4.4.6.)**.
2. Select the desired **Reminder Activation** option.

Reminder 1 before Service (Required) (4.4.5.)

If **Time Until Next Service (4.4.3.)** is equal to or less than this value, the device generates a **Maintenance Required** reminder.

Values	Range: **0** to **Service Interval (4.4.1.)**
	Default: 0.164 years

1. Modify values as required.
2. Set **Activation of Reminders (4.4.4.)** to the desired option.

Reminder 2 before Service (Demanded) (4.4.6.)

If **Time Until Next Service (4.4.3.)** is equal to or less than this value, the device generates a **Maintenance Required** reminder.

Values	Range: **0** to **Service Interval (4.4.1.)**
	Default: 0.019 years

1. Modify values as required
2. Set **Activation of Reminders (4.4.4.)** to the desired option.

Maintenance Status (4.4.7.)

Indicates which level of maintenance reminder is active.

Open the menu **View – Device Status**, click on the **Maintenance** tab and check the **Service Schedule Status** window.

Acknowledge Status (4.4.8.)

Indicates which level of maintenance reminder has been acknowledged.

Open the menu **View – Device Status**, click on the **Maintenance** tab and check the **Service Schedule Status** window.

Acknowledge (4.4.9.)

Acknowledges the current maintenance reminder.

To acknowledge a reminder via SIMATIC PDM:

1. Open the menu **View – Device Status** and click on the **Maintenance** tab.
2. In the **Service Schedule Status** section, click on **Acknowledge Warnings**.

To acknowledge a reminder via the handheld programmer:

1. Press **RIGHT**  **arrow** twice to open parameter view and activate **Edit** Mode.
2. Press **RIGHT** **arrow** to acknowledge the reminder.

Calibration Schedule (4.5.)

Note

- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- Four sets of parameters allow you to monitor the Device/Sensor Lifetimes and set up Maintenance/Service schedules, based on operating hours instead of a calendar-based schedule. See also **Remaining Device Lifetime (4.2.)**, **Remaining Sensor Lifetime (4.3.)**, and **Service Schedule (4.4.)**.
- Performing a reset to **Factory Defaults** will reset all the Maintenance Schedule parameters to their factory defaults.
- The device operates in years. To view Calibration Interval parameters in hours or days (via SIMATIC PDM only) see **Calibration Interval (4.5.1.)**.

The device tracks calibration intervals based on operating hours and monitors the predicted lifetime to the next calibration. You can modify the Total Calibration Interval, set schedules for maintenance reminders, and acknowledge them.

To access these parameters via SIMATIC PDM:

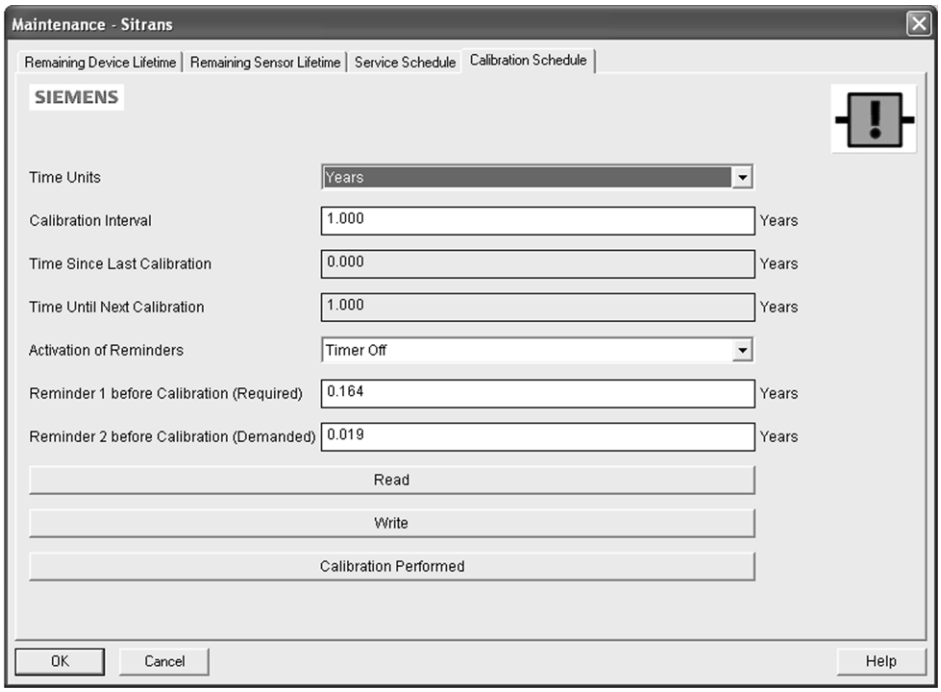
- Open the menu **Device – Maintenance** and select the **Calibration Schedule** tab.
- After modifying values/units as required, click on **Write** to accept the change, and **Read** to view the effect of the change.
- Click on **Calibration Performed** to restart the timer and clear any fault messages.

Time Units

Options [a]	Hours; days; years
	Default: years

[a] Selectable only via SIMATIC PDM.

Calibration Interval (4.5.1.)



Note

The device always operates in years. Changing the units affects only the parameter view of Remaining Sensor Life parameters in SIMATIC PDM.

User-configurable recommended time between product calibrations.

Values	Units [a]: hours, days, years
	Range: **0 to 20 years**
	Default: **1.0** year

[a] Units are selectable only via SIMATIC PDM.

Time Since Last Calibration (4.5.2.)

Time elapsed since last calibration. Can be reset to zero after performing a calibration.

To reset to zero:

- In SIMATIC PDM, open the menu **Device – Maintenance**, click on the **Calibration Schedule** tab, and click on **Calibration Performed** to restart the timer and clear any fault messages.
- Via the handheld programmer, manually reset **Time Since Last Calibration (4.5.2.)** to zero.

Time Until Next Calibration (4.5.3.)

Read only. **Calibration Interval (4.5.1.)** less **Time Since Last Calibration (4.5.2.)**.

Activation of Reminders (4.5.4.)

Note

To modify this parameter via SIMATIC PDM it must be accessed via the pull-down menu Device – Maintenance.

Allows you to enable a maintenance reminder.

Options		Timer OFF
		ON - no reminders checked
		ON - Reminder 1 (Maintenance Required) checked
	*	ON - Reminders 1 and 2 checked
		ON—Reminder 2 (Maintenance Demanded) checked

1. First set the values in **Reminder 1 before Calibration (Required) (4.5.5.)**/**Reminder 2 before Calibration (Demanded) (4.5.6.)**.
2. Select the desired **Activation of Reminders** option.

Reminder 1 before Calibration (Required) (4.5.5.)

If **Time Until Next Calibration (4.5.3.)** is equal to or less than this value, the device generates a **Maintenance Required** reminder.

Values	Range: **0** to **Calibration Interval (4.5.1.)**
	Default: 0.164 years

1. Modify values as required.
2. Set **Activation of Reminders (4.5.4.)** to the desired option.

Reminder 2 before Calibration (Demanded) (4.5.6.)

If **Time Until Next Calibration (4.5.3.)** is equal to or less than this value, the device generates a **Maintenance Demanded** reminder.

Values	Range: **0** to **Calibration Interval (4.5.1.)**
	Default: 0.164 years

1. Modify values as required.
2. Set Activation of Reminders (4.5.4.) to the desired option.

Maintenance Status (4.5.7.)

Indicates which level of maintenance reminder is active.

In SIMATIC PDM, open the menu **View – Device Status**, click on the **Maintenance** tab and check the **Calibration Schedule Status** window.

Acknowledge Status (4.5.8.)

Indicates which level of maintenance reminder has been acknowledged.

In SIMATIC PDM, open the menu **View – Device Status**, click on the **Maintenance** tab and check the **Calibration Schedule Status** window.

Acknowledge (4.5.9.)

Acknowledges the current maintenance reminder.

To acknowledge a reminder via SIMATIC PDM:

1. Open the menu **View – Device Status** and click on the **Maintenance** tab.
2. In the **Service Schedule Status** section, click on **Acknowledge Warnings**.

To acknowledge a reminder via the handheld programmer:

1. Press **RIGHT**  **arrow** twice to open parameter view and activate **Edit** Mode.
2. Press **RIGHT**  **arrow** to acknowledge the reminder.

Manufacture Date (4.6.)

Read only. The date of manufacture of the SITRANS LR250 (yy mm dd).

Powered Hours (4.7.)

Read only. Displays the number of hours the unit has been powered up since manufacture.

In SIMATIC PDM, open the menu **Device – Wear**.

Power-on Resets (4.8.)

Read only. The number of power cycles that have occurred since manufacture.

In SIMATIC PDM, open the menu **Device – Wear**.

LCD Fast Mode (4.9.)

Note

- LCD Fast Mode takes effect only after 30 minutes of inactivity. (Each time the device is powered up, a further 30 minutes of inactivity is required.)
- LCD Fast Mode affects Measurement mode only; it has no effect on Navigation mode.

Enables a faster rate of measurement from the device by disabling most of the display area. Only the bar graph will be refreshed when LCD Fast Mode is set to ON.

Values	ON or OFF
	Default: OFF

LCD Contrast (4.10.)

The factory setting is for optimum visibility at room temperature and in average light conditions. Extremes of temperature will lessen the contrast.

Values	Range: **0 (High contrast)** to **20 (Low contrast)**. Default: 10

Adjust the value to improve visibility at room temperature and in average light conditions. Change the value in small steps to ensure you can continue to read the display.

Secondary Value (4.11.)

Use the secondary value to capture the menu navigation path to any viewable parameter. Once the navigation path is stored, the value of that parameter will be displayed in **Measurement** mode as the secondary value.

While in Parameter view of the current parameter, press the decimal point key. This stores the path to the current parameter in the Secondary Value, and displays the value for that parameter on the LCD display when in **Measurement** mode. See The LCD Display (Page 36) for an illustration.

Memory Test (4.12.)

Allows verification of the RAM, EEPROM, and Flash memory of the SITRANS LR250.

LCD Display	IDLE	No test in progress.
	BUSY	Test in progress.
	PASS	Memory test successful.
	FAIL	Test failed.
	Err1	Test returned unexpected results.
	P Oxcafe	Test passed with result data.
	F Oxcafe	Test failed with result data.
Handheld programmer entry	1 to 9	Any numeric key from 1 to 9 activates test.

- Press **RIGHT** **arrow** to edit then press any numeric key from 1 to 9 to activate the test.
- The reading will display BUS and then the test result text.

Communication (5.)

Note

Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

Device Address (5.1.)

Sets the device address or poll ID on a HART network. Any address other than 0 will cause the output current to be a fixed value, and the current will not indicate the reading.

Values	Range: **0** to **15**
	Default: 0

To set Device Address via SIMATIC PDM:

- Open the project in **Process Device Network View** then right-click on the device.
- Go to **Object Properties > Connection** to access the field **Short Address.**

Security (6.)

Note

Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

Remote Access (6.1.)

Access Control (6.1.1.)

Note

If access control is changed to limit remote access, it can only be reset via the handheld programmer.

Enables/disables the read/write access to parameters via remote communications.

Options		Read only	No changes are permitted via remote communications.
	*	Read Write	Changes are permitted.
		Restricted	Sets the status to Read only, with the potential for another HART device to change this parameter only, via remote communications.

Local Access (6.2.)

Write Protect (6.2.1.)

Note

This lock affects only the handheld programmer. A remote master can change configuration if **Access Control (6.1.1.)** is set to allow this.

Prevents any changes to parameters via the handheld programmer.

Options		Range: **0** to **9999**	
	*	Unlock value [stored in **PIN to Unlock (6.2.2.)**]	Lock Off
		Any other value	Lock On

- To turn Lock On, key in any value other than the Unlock Value stored in **PIN to Unlock (6.2.2.)**.
- To turn Lock Off, key in the Unlock Value stored in **PIN to Unlock (6.2.2.)**.

PIN to Unlock (6.2.2.)

Note

- Do not lose your Unlock Value: it cannot be displayed once **Write Protect (6.2.1.)** has been set to a different value.
- Valid only for operation via the handheld programmer.
- A reset to **Factory Defaults** will not restore the unlock value at time of shipping.

Stores the value to be entered in **Write Protect (6.2.1.)** to unlock programming. If **Write Protect (6.2.1.)** is set to a different value, **PIN to Unlock (6.2.2.)** does not display the Unlock value.

Handheld Programmer Values	Range: **0** to **9999**	
	Value when shipped: 1954. Not restored by a reset to Factory Defaults.	
	– – – –	Display when Lock is on

Language (7.)

Selects the language to be used on the LCD.

Options	*	English
		Deutsch
		Français
		Español

8.1 Alphabetical parameter list

Note

For a detailed list of parameters see Parameter Reference (Page 113). Maintenance Parameters are not listed below. See **Remaining Device Lifetime (4.2.)**, **Remaining Sensor Lifetime (4.3.)**, **Service Schedule (4.4.)** and **Calibration Schedule (4.5.)** for those parameters.

20 mA Setpoint (2.6.3.)

4 mA Setpoint (2.6.2.)

Access Control (6.1.1.)

Algorithm (2.8.4.1.)

Analog Output Scaling (2.6.)

Auto False Echo Suppression (2.8.7.1.)

Auto False Echo Suppression Range (2.8.7.2.)

Breakpoint 1-9 (2.8.8.1.)

Breakpoint 10-18 (2.8.8.2.)

Breakpoint 19-27 (2.8.8.3.)

Breakpoint 28-36 (2.8.8.4.)

Breakpoint 37-40 (2.8.8.5.)

Calibration (2.3.)

CLEF Range (2.8.4.4.)

Communication (5.)

Confidence (2.8.6.1.)

Current Internal Temperature (3.2.1.)

Current Output Function (2.6.1.)

Damping Filter (2.2.4.)

Device (2.1.)

Device Address (5.1.)

Diagnostics (3.)

Distance Measurement (2.8.9.3.)

Echo Lock (2.8.5.1.)

Echo Profile (3.1.)

Echo Quality (2.8.6.)

Measured Values (2.8.9.)
Memory Test (4.12.)
Menu Timeout (2.1.5.)
Minimum mA limit (2.6.4.)
Near Range (2.8.1.)
Noise Average (2.8.6.3.)
Order Option (2.1.4.)
PIN to Unlock (6.2.2.)
Position Detect (2.8.4.2.)
Power-on Resets (4.8.)
Powered Hours (4.7.)
Propagation Factor (2.8.3.)
Quick Start (1.)
Quick Start Wizard (1.1.)
Rate (2.4.)
Remote Access (6.1.)
Response Rate (2.4.1.)
Sampling (2.8.5.)
Sampling Down (2.8.5.3.)
Sampling Up (2.8.5.2.)
Shaper Mode (2.8.7.4.)
Signal Processing (2.8.)
Secondary Value (4.11.)
Security (6.)
Sensor (2.2.)
Sensor Mode (2.2.2.)
Sensor Offset (2.3.3.)
Service (4.)
Setup (2.)
Space Measurement (2.8.9.2.)
Table 1-8 (2.7.2.)
Table 9-16 (2.7.3.)

Table 17-24 (2.7.4.)

Table 25-32 (2.7.5.)

TVT Setup (2.8.7.)

TVT Shaper (2.8.8.)

Units (2.2.1.)

Vessel Dimension A (2.7.1.3.)

Vessel Dimension L (2.7.1.4.)

Vessel Shape (2.7.1.1.)

Volume (2.7.1.)

Volume 1 (2.7.2.2.)

Volume Measurement (2.8.9.4.)

Write Protect (6.2.1.)

Service and maintenance

9

The radar device requires no maintenance or cleaning under normal operating conditions, although periodic inspection and retightening of the attachment hardware may be required as the gasket material will relax over time (dependant upon process conditions).

Under severe operating conditions, the antenna may require periodic cleaning. If cleaning becomes necessary:

- Note the antenna material and the process medium, and select a cleaning solution that will not react adversely with either.
- Remove the device from service and wipe the antenna clean using a cloth and suitable cleaning solution.

9.1 Unit repair and excluded liability

All changes and repairs must be done by qualified personnel, and applicable safety regulations must be followed. Please note the following:

- The user is responsible for all changes and repairs made to the device.
- All new components must be provided by Siemens Milltronics Process Instruments.
- Restrict repair to faulty components only.
- Do not re-use faulty components.

9.2 Part replacement

If the antenna, lens, secondary o-ring, and spring washers require replacement due to damage or failure, they may be replaced without the need for re-calibration if of the same type and size.

Replacing the antenna

Changing to a different antenna type may be performed by a Siemens authorized repair center or personnel.

If the electronics or enclosure require replacement due to damage or failure, please ensure the correct antenna version is used, otherwise a re-calibration will need to be performed by Siemens authorized personnel.

Replacing the lens

1. Remove existing lens by turning it counter-clockwise until it separates from the unit.
2. Replace the O-ring between the lens and process connection with a new one.
3. Carefully thread the replacement lens, and turn it clockwise until resistance is encountered. Do not over-tighten the lens, as this will permanently damage it.
4. For flange installation instructions, see Flange bolting, Flanged encapsulated antenna only (Page 22).

Note

After installation, some lenses may not appear to lie flush on the device, but this will not impact performance.

Raised-Face flange kits

Description	Process connection size	Part number
Replacement TFM™ 1600 PTFE Lens and Spring Washer Kit for ASME B16.5 Class 150 raised faced	2"	A5E32462817
	3"	A5E32462819
	4"	A5E32462820
	6"	A5E32462821
Replacement TFM™ 1600 PTFE Lens and Spring Washer Kit for JIS B 2220 10K raised Face	50A	A5E32462822
	80A	A5E32462823
	100A	A5E32462824
	150A	A5E32462825
Replacement TFM™ 1600 PTFE Lens and Spring Washer Kit for EN 1092-1 PN10/16 type B1 raised face	DN50	A5E32462826
	DN80	A5E32462827
	DN100	A5E32462828
	DN150	A5E32462829

Diagnosing and troubleshooting 10

10.1 Communication troubleshooting

1. Check the following:
   - There is power at the device.
   - The LCD shows the relevant data.
   - The device can be programmed using the handheld programmer.
   - If any fault codes are being displayed see General Fault Codes (Page 174) for a detailed list.
2. Verify that the wiring connections are correct.
3. See the table below for specific symptoms.

Symptom	Corrective action
The device cannot be programmed via the handheld programmer.	• Ensure **Write Protect (6.2.1.)** is set to the unlock value.
You try to set a SITRANS LR250 parameter via remote communications but the parameter remains unchanged.	• Ensure **Write Protect (6.2.1.)** is set to the unlock value, then try setting the parameter via the handheld programmer. • Ensure **Access Control (6.1.1.)** is set to Read/ Write. • Some parameters can be changed only when the device is not scanning. Try pressing Mode to put the device into PROGRAM mode.

If you continue to experience problems go to our website and check the FAQs for SITRANS LR250:

Product page (http://www.siemens.com/LR250), or contact your Siemens representative.

10.2 Device status icons

Icon	Priority Level	Meaning
	1	• Maintenance alarm • Measurement values are not valid
	2	• Maintenance warning: maintenance demanded immediately • Measured signal still valid
	3	• Maintenance required • Measured signal still valid
	1	• Process value has reached an alarm limit
	2	• Process value has reached a warning limit
	3	• Process value has reached a tolerance limit
	1	• Configuration error • Device will not work because one or more parameters/components is incorrectly configured
	2	• Configuration warning • Device can work but one or more parameters/components is incorrectly configured
	3	• Configuration changed • Device parameterization not consistent with parameterization in project. Look for info text.
	1	• Manual operation (local override) • Communication is good; device is in manual mode.
	2	• Simulation or substitute value • Communication is good; device is in simulation mode or works with substitute values.
	3	• Out of operation • Communication is good; device is out of action.
		• Data exchanged
		• No data exchange

Icon	Priority Level	Meaning
		• Write access enabled
		• Write access disabled

10.3 General fault codes

Note

- If more than one fault is present, the device status indicator and text for each fault alternate at 2 second intervals.
- Some faults cause the device to go to Fail-safe mode (Fault 52). These are indicated with an asterisk (*).

Code/ Icon		Meaning	Corrective Action
S: 0 	*	The device was unable to get a measurement within the Fail-safe LOE Timer period. Possible causes: faulty installation, antenna material buildup, foaming/other adverse process conditions, invalid configuration range.	• Ensure installation details are correct. • Ensure no antenna material buildup. Clean if necessary. • Adjust process conditions to minimize foam or other adverse conditions. • Correct configuration range. • If fault persists, contact your local Siemens representative.
S: 2 	*	Unable to collect profile because of a power condition that is outside the operating range of the device.	Repair required: contact your local Siemens representative.
S: 3 		Device is nearing its lifetime limit according to the value set in Maintenance Required Limit.	Replacement is recommended
S: 4 		Device is nearing its lifetime limit according to the value set in Maintenance Demanded Limit.	Replacement is recommended.
S: 6 		Sensor is nearing its lifetime limit according to the value set in Maintenance Required Limit.	Replacement is recommended.
S: 7 		Sensor is nearing its lifetime limit according to the value set in Maintenance Demanded Limit.	Replacement is recommended.
S: 8 		Service interval as defined in Maintenance Required Limit has expired.	Perform service.

Code/ Icon		Meaning	Corrective Action
S: 9		Service interval as defined in Maintenance Demanded Limit has expired.	Perform service.
S: 11		Internal temperature sensor failure.	Repair required: contact your local Siemens representative.
S: 12		Internal temperature of device has exceeded specifications: it is operating outside its temperature range.	• Relocate device and/or lower process temperature enough to cool device. • Inspect for heat-related damage and contact your local Siemens representative if repair is required. • Fault code will persist until a manual reset is performed using SIMATIC PDM or the LCD interface.
S: 17		Calibration interval as defined in Maintenance Required Limit has expired.	Perform calibration.
S: 18		Calibration interval as defined in Maintenance Demanded Limit has expired.	Perform calibration.
S: 28	*	Internal device failure caused by a RAM memory error.	Repair required: contact your local Siemens representative.
S: 29	*	EEPROM damaged.	Repair required: contact your local Siemens representative
S: 31	*	Flash error.	Repair required: contact your local Siemens representative
S: 33	*	Factory calibration for the internal temperature sensor has been lost.	Repair required: contact your local Siemens representative
S: 34	*	Factory calibration for the device has been lost.	Repair required: contact your local Siemens representative
S: 35	*	Factory calibration for the device has been lost.	Repair required: contact your local Siemens representative

Code/ Icon		Meaning	Corrective Action
S: 36 	*	Unable to start microwave module.	Cycle power. If fault persists, contact your local Siemens representative.
S: 37 	*	Measurement hardware problem.	Cycle power. If fault persists, contact your local Siemens representative.
S: 38 	*	Failure in the device electronics.	Cycle power. If fault persists, contact your local Siemens representative: repair required.
S: 43 	*	Factory calibration for the radar receiver has been lost.	Repair required: contact your local Siemens representative.
S: 45 	*	No valid boot program detected: firmware corrupt	Repair required: contact your local Siemens representative.
S: 48 	*	User configuration is invalid. One or more of parameters: Low Calibration Point, High Calibration Point, Volume breakpoints, and/or Auto False-Echo Suppression, are set to invalid values.	• Reconfigure the unit. • Ensure the difference between High Calibration Point and Low Calibration Point is not less than or equal to zero; do a Master Reset.
S: 49 	*	EEPROM corrupt.	Repair required: contact your local Siemens representative.
S: 50 	*	EEPROM corrupt.	Repair required: contact your local Siemens representative.
S: 51 	*	EEPROM corrupt.	Repair required: contact your local Siemens representative.

Code/ Icon		Meaning	Corrective Action
S: 52 		Fail-safe is activated. Possible causes: 1. hardware failure 2. memory failure 3. Fail-safe LOE timer expired– possible causes: faulty installation, antenna material buildup, foaming/other adverse process conditions, invalid calibration range.	For 3: • Correct configuration; ensure installation is correct; • no antenna buildup; • adjust process conditions to minimize foaming/other adverse conditions; • correct calibration range. If fault persists, or for 1 and 2, contact your local Siemens representative.
S: 53 	*	Configuration lost: one or more parameter settings have been lost. This may occur after a firmware upgrade causes user parameters to be reset.	Restore user parameters using SIMATIC PDM.

10.4 Operation troubleshooting

Operating symptoms, probable causes, and resolutions.

Symptom	Cause	Action
Display shows  S: 0 LOE	level or target is out of range	• check specifications • check **Low Calibration Pt. (2.3.1.)** • increase **Confidence (2.8.6.1.)**
Display shows  S: 0 LOE	material build-up on antenna	• clean the antenna • re-locate SITRANS LR250
Display shows  S: 0 LOE	location or aiming: • poor installation • flange not level • Auto False Echo Suppression may be incorrectly applied	• check to ensure nozzle is vertical • ensure end of antenna protrudes from end of nozzle • review Auto False Echo Suppression (Page 221). • ensure Auto False Echo Suppression Range is set correctly
Display shows  S: 0 LOE	antenna malfunction: • temperature too high • physical damage • excessive foam • multiple echoes	• check **Current Internal Temperature (3.2.1.)** • use foam deflector or stillpipe • relocate • use a defoamer • set **Algorithm (2.8.4.1.)** to **F** (First echo)
Reading does not change, but the level does	SITRANS LR250 processing wrong echo, for example, vessel wall, or structural member	• re-locate SITRANS LR250 • check nozzle for internal burrs or welds • rotate device 90° • use **Auto False Echo Suppression (2.8.7.1.)** • if necessary: see Auto False Echo Suppression (Page 221).
Measurement is consistently off by a constant amount	• setting for **Low Calibration Pt. (2.3.1.)** not correct • setting for **Sensor Offset (2.3.3.)** not correct	• check distance from sensor reference point to **Low Calibration Pt. (2.3.1.)** • check **Sensor Offset (2.3.3.)**
Screen blank	power error	• check nameplate rating against voltage supply • check power wiring or source
	too much load resistance	• change barrier type, or • remove something from the loop, or • increase supply voltage

Symptom	Cause	Action
Reading erratic	echo confidence weak	• refer to **Confidence (2.8.6.1.)** • use **Auto False Echo Suppression (2.8.7.1.)** and **Auto False Echo Suppression Range (2.8.7.2.)** • use foam deflector or stillpipe
	liquid surface vortexed	• decrease **Fill Rate per Minute (2.4.2.)** • relocate device to side pipe • increase confidence threshold in **Echo Threshold (2.8.4.3.)**
	material filling	• Re-locate SITRANS LR250
Reading response slow	**Fill Rate per Minute (2.4.2.)** setting incorrect	• increase measurement response if possible
Reads correctly but occasionally reads high when vessel is not full	• detecting close range echo • build up near top of vessel or nozzle • nozzle problem	• clean the antenna • use **Auto False Echo Suppression (2.8.7.1.)** and **Auto False Echo Suppression Range (2.8.7.2.)**
Level reading lower than actual material level	• material is within Near Range zone • multiple echoes processed	• decrease **Near Range (2.8.1.)** (minimum value depends on antenna type) • raise SITRANS LR250 • ensure **Algorithm (2.8.4.1.)** is set to F (First echo)
	• vessel near empty and low dK material	• ensure **Material (2.2.3.)** selection is LIQUID LOW DK • set **Position Detect (2.8.4.2.)** to Hybrid • set **CLEF Range (2.8.4.4.)** to 0.5 m

Technical data

11

Note

- Siemens Milltronics makes every attempt to ensure the accuracy of these specifications but reserves the right to change them at any time.

11.1 Power

⚠	General Purpose Intrinsically Safe Non-Sparking Non-incendive (FM/CSA US/Canada only)	Nominal 24 V DC at 550 Ohm
⚠	Flameproof Increased Safety Explosion-proof (FM/CSA US/Canada only)	Nominal 24 V DC at 250 Ohm

- Maximum 30 V DC
- 4 to 20 mA
- Max. startup current see Startup Behaviour (Page 238).

11.2 Performance

Reference operating conditions according to IEC 60770-1

Ambient temperature	15 to 25 °C (59 to 77 °F)
Humidity	45 to 75% relative humidity
Ambient pressure	860 to 1060 mbar a (86000 to 106000 N/m^2 a)

Measurement Accuracy (measured in accordance with IEC 60770-1)

Maximum measured error	= 3 mm (0.12")[1) 2) 3)] including hysteresis and non-repeatability	
Frequency	K-band	
Maximum measurement range[4)]	1.5" antenna, 2" threaded PVDF antenna, and 2"/DN50/50A Flanged encapsulated antenna (FEA)	10 m (32.8 ft)[5)]
	all other versions	20 m (65.6 ft)
Minimum detectable distance	50 mm (2") from end of antenna[6)]	
Update time[7)]	minimum 1 second, depending on settings for **Response Rate (2.4.1.)** and **LCD Fast Mode (4.9.)**	
Influence of ambient temperature	< 0.003%/K (average over full temperature range, referenced to maximum range)	
Dielectric constant of material measured	dK > 1.6 [antenna and application dependent[8)]]	
Memory	non-volatile EEPROM	
	no battery required	

1) The statistical accuracy is typically 3 mm (0.12") 90% of the time, when tested in accordance with IEC 60770-1.

2) Under severe EMI/EMC environments per IEC 61326-1 or NAMUR NE21, the device error may increase to a maximum of 10 mm (0.4").

3) For 2" threaded PVDF and Flanged encapsulated antennas, the maximum measured error <500 mm from the sensor reference point =25 mm (1").

4) From sensor reference point: see Dimensions (Page 191).

5) 20 m (65.6 ft) possible in a stillpipe/bypass

6) Minimum range is antenna length + 50 mm (2"). See Dimension drawings (Page 191).

7) Reference conditions: **Response Rate (2.4.1.)** set to **FAST, LCD Fast Mode (4.9.)** set to **ON**.

8) For 1.5" (40 mm) antenna, 2" (50 mm) threaded PVDF antenna, and 2"/DN50/50A flanged encapsulated antenna the dK is limited to 3 unless a stillpipe is used.

See Flanged horn antenna (Page 196).

See Flanged encapsulated antenna (3"/DN80/80A sizes and larger) (Page 202).

11.3 Interface

Analog output	Signal range	4 to 20 mA (± 0.02 mA accuracy) upper limit 20 to 23 mA adjustable
	Fail signal	3.6 mA to 23 mA [For more details, see Fail-safe Mode] (Page 227)
Communication: HART[1)]	Load	230 to 600 Ω, 230 to 500 Ω when connecting a coupling module
	Max. line length	multi-wire: ≤ 1500 m (4921 ft)
	Protocol	HART, Version 5.1
Configuration	Remote	Siemens SIMATIC PDM or AMS Device Manager (PC)
	Local	Siemens infrared handheld programmer, or HART handheld communicator
	Display (local)[2)]	graphic LCD, with bar graph representing level

1) See A.6.3 for details on version exclusions

2) Display quality will be degraded in temperatures below –25 °C (–13 °F) and above +65 °C (+149 °F).

Curve 2 (Flameproof, Increased Safety, Explosion-proof) (Page 238)

11.4 Mechanical

Process connection:	Threaded connection	1.5" NPT (ASME B1.20.1), R (BSPT, EN 10226-1) [a] or G (BSPP, EN ISO 228-1) or 2" NPT (ASME B1.20.1), R (BSPT, EN 10226-1) or G (BSPP, EN ISO 228-1) or 3" NPT (ASME B1.20.1), R (BSPT, EN 10226-1) or G (BSPP, EN ISO 228-1)
	Flange connection (flat-face) Materials	2", 3", 4" (ASME 150 lb, 300 lb) DN50, DN80, DN100 (PN 10/16, PN 25/40) 50A, 80A, 100A (JIS 10K) 316L /1.4404 or 316L /1.4435 stainless steel
	Flange connection (raised face) Materials	DN50, DN80, DN100, DN150 (PN 10/16, PN 25/40) 1.4404 or 1.4435 stainless steel, optional Alloy N06022/2.4602 (Hastelloy®C-22 or equivalent)
	Flanged encapsulated antenna connection (raised face) Materials	2, 3, 4, 6" (ASME 150 lb); DN50, DN80, DN100, DN150 (PN10/16); 50A, 80A, 100A, 150A (JIS 10K) 316L /1.4404 or 316L /1.4435 stainless steel
Antenna:	Horn Materials	standard 1.5" (40 mm), 2" (50 mm), 3" (80 mm), and 4" (100 mm) horn, optional 100 mm (4") horn extension 316L stainless steel with PTFE emitter optional Alloy N06022/2.4602 (Hastelloy®C-22 or equivalent) with PTFE emitter
	Threaded PVDF antenna Wetted materials	2" (50 mm) PVDF (Polyvinylidene fluoride)
	Flanged encapsulated antenna Wetted materials	316L /1.4404 or 316L /1.4435 stainless steel TFM™ 1600 PTFE lens
Enclosure	Construction	aluminum, polyester powder-coated
	Conduit entry	2 x M20x1.5, or 2 x ½" NPT
	Ingress protection	Type 4X/NEMA 4X, Type 6/NEMA 6, IP67, IP68
Weight (excluding extensions):	1.5" threaded connection with 1.5" horn antenna	approximately 5.1kg (11.2 lb)
	2" threaded connection with 2" horn antenna	approximately 5.5 kg (12.1 lb)
	3" threaded connection with 3" horn antenna	approximately 7.0 kg (15.4 lb)
	2" threaded PVDF antenna	approximately 3.3 kg (7.27 lb)

	DN50 PN 10/16 or 2" 150 lb flat-face flange with 2" horn antenna	approximately 8 kg (17.6 lb)
	DN100 PN 25/40 or 4" ASME 300 lb flat-face flange with 4" horn antenna	approximately 17.4 kg (38.3 lb)
	DN50 PN 10/16 raised-face flange with 2" horn antenna	approximately 6 kg (13.2 lb)
	DN100 PN 25/40 raised-face flange with 4" horn antenna	approximately 11.3 kg (24.9 lb)
	2" ASME 150 lb flanged encapsulated antenna	approximately 7.0 kg (15.4 lb)
	3" ASME 150 lb flanged encapsulated antenna	approximately 10.7 kg
	4" ASME 150 lb flanged encapsulated antenna	approximately 13.1 kg
	6" ASME 150 lb flanged encapsulated antenna	approximately 17.7 kg
	DN50 PN 10/16 flanged encapsulated antenna	approximately 7.1 kg
	DN80 PN 10/16 flanged encapsulated antenna	approximately 10.1 kg
	DN100 PN 10/16 flanged encapsulated antenna	approximately 11.1 kg
	DN150 PN 10/16 flanged encapsulated antenna	approximately 15.9 kg
	50 A JIS 10K flanged encapsulated antenna	approximately 6.5 kg
	80 A JIS 10K flanged encapsulated antenna	approximately 9 kg
	100 A JIS 10K flanged encapsulated antenna	approximately 10.1 kg
	150 A JIS 10K flanged encapsulated antenna	approximately 16.3 kg

[a] For use with 1.5" (40 mm) horn antennas only.

11.5 Environmental

Note

- For the specific configuration you are about to use or install, check transmitter nameplate and see Approvals (Page 187).
- Use appropriate conduit seals to maintain IP or NEMA rating.

Location	indoor/ outdoor
Altitude	5000 m (16,404 ft) max.
Ambient temperature	−40 to +80 °C (−40 to +176 °F)
Relative humidity	suitable for outdoor Type 4X/NEMA 4X, Type 6/NEMA 6, IP67, IP68 enclosure (see note above)
Installation category	I
Pollution degree	4

11.6 Process

Note

The maximum temperature is dependent on the process connection, antenna materials, and vessel pressure. For more detailed information see Maximum Process Temperature Chart (Page 228) and Process Pressure/Temperature derating curves (Page 229).

Temperature at process connection	Standard Horn antenna (Threaded or Flanged):	with FKM O-ring	−40 to +200 °C (−40 to +392 °F)
		with FFKM O-ring	−20 to +200 °C (−4 to +392 °F)
	2" NPT / BSPT / G Threaded PVDF antenna:		−40 to +80 °C (−40 to +176 °F)
	Flanged encapsulated antenna (FEA)		-40 to +170 °C (−40 to +338 °F)
Pressure (vessel)			Refer to process connection tag and Process Pressure/Temperature derating curves (Page 231).

11.7 Approvals

Note

The device nameplate lists the approvals that apply to your device.

Application type	LR250 version	Approval rating	Valid for:
Non-hazardous	General purpose	$CSA_{US/C}$, FM, CE, C-TICK	N. America, Europe
	Radio	Europe (R&TTE), FCC, Industry Canada	
Hazardous	Intrinsically safe (Page 28)	ATEX II 1G, Ex ia IIC T4 Ga ATEX II 1D, Ex ia ta IIIC T100 °C Da	Europe
		IECEx SIR 05.0031X, Ex ia IIC T4 Ga Ex ia ta IIIC T100 °C Da	International
		FM/CSA Class I, Div. 1, Groups A, B, C, D Class II, Div. 1, Groups E, F, G Class III T4	US/Canada
		INMETRO: DNV 12.0087 X Ex ia IIC T4 Ga Ex ia ta IIIC T100 °C Da IP65/IP67 -40 °C ≤ Ta ≤ +80 °C DNV #OCP 0017 ABNT NBR IEC 60079-0:2008, ABNT NBR IEC 60079-11:2009, ABNT NBR IEC 60079-26:2008, ABNT NBR IEC 60079-31:2011	Brazil
		NEPSI Ex ia IIC T4 Ga Ex iaD 20 T90 IP67 DIP A20 T_A 90 ºC	China
	Non-Sparking (Page 30)	ATEX II 3 G, Ex nA IIC T4 Gc	Europe
		NEPSI Ex nA IIC T4 Gc	China
	Non-incendive (Page 30)	FM/CSA Class I, Div. 2, Groups A, B, C, D T5	US/Canada
	Flameproof (Page 31)	ATEX II 1/2 GD, 1D, 2D IECEx SIR 08.0107X Ex d mb ia IIC T4 Ga/Gb Ex ia ta IIIC T100 °C Da	Europe and International

Application type	LR250 version	Approval rating	Valid for:
		INMETRO: DNV 12.0088 X Ex d ia mb IIC T4 Ga/Gb Ex ia ta IIIC T100 °C Da IP67 -40 °C ≤ Ta ≤ +80 °C U_m = 250 V DNV #OCP 0017 ABNT NBR IEC 60079-0:2008, ABNT NBR IEC 60079-1:2009, ABNT NBR IEC 60079-11:2009, ABNT NBR IEC 60079-18:2010, ABNT NBR IEC 60079-26:2008, ABNT NBR IEC 60079-31:2011	Brazil
	Increased safety (Page 32)	ATEX II 1/2 GD, 1D, 2D IECEx SIR 08.0107X Ex e mb ia IIC T4 Ga/Gb Ex ia ta IIIC T100 °C Da	Europe and International
		INMETRO: DNV 12.0088 X Ex e ia mb IIC T4 Ga/Gb Ex ia ta IIIC T100 °C Da IP67 -40 °C ≤ Ta ≤ +80 °C U_m = 250 V DNV #OCP 0017 ABNT NBR IEC 60079-0:2008, ABNT NBR IEC 60079-7:2008, ABNT NBR IEC 60079-11:2009, ABNT NBR IEC 60079-18:2010, ABNT NBR IEC 60079-26:2008, ABNT NBR IEC 60079-31:2011	Brazil
	Flameproof (Page 31)/ Increased safety (Page 32)	NEPSI Ex d ia mb IIC T4 Ga/Gb / Ex e ia mb IIC T4 Ga/Gb Ex iaD 20 T90 IP67 DIP A20 T_A 90 ºC	China
	Explosion proof (Page 32)	FM/CSA Class I, Div. 1, Groups A, B, C, D Class II, Div. 1, Groups E, F, G Class III T4	US/Canada
	Marine	Lloyd's Register of Shipping ABS Type Approval BV Type Approval	

11.8 Programmer (infrared keypad)

Note

Battery is non-replaceable with a lifetime expectancy of 10 years in normal use.
To estimate the lifetime expectancy, check the nameplate on the back for the serial number. The first six numbers show the production date (mmddyy), for example, serial number 032608101V was produced on March 26, 2008.

Siemens Milltronics Infrared IS (Intrinsically Safe) Handheld Programmer for hazardous and all other locations (battery is non-replaceable).

Approvals	CE FM/CSA Class I, II, III, Div. 1, Gr. A to G T6 ATEX II 1GD Ex ia IIC T4 Ga Ex iaD 20 T135 °C IECEx Ex ia IIC T4 Ga Ex iaD 20 T135 °C INMETRO Ex ia IIC T4 Ga Ex ia IIIC T135 °C Da
Ambient temperature	−20 to +50 °C (−5 to +122 °F)
Interface	proprietary infrared pulse signal
Power	3 V non-replaceable lithium battery
Weight	150 g (0.3 lb)
Color	black
Part number	7ML1930-1BK

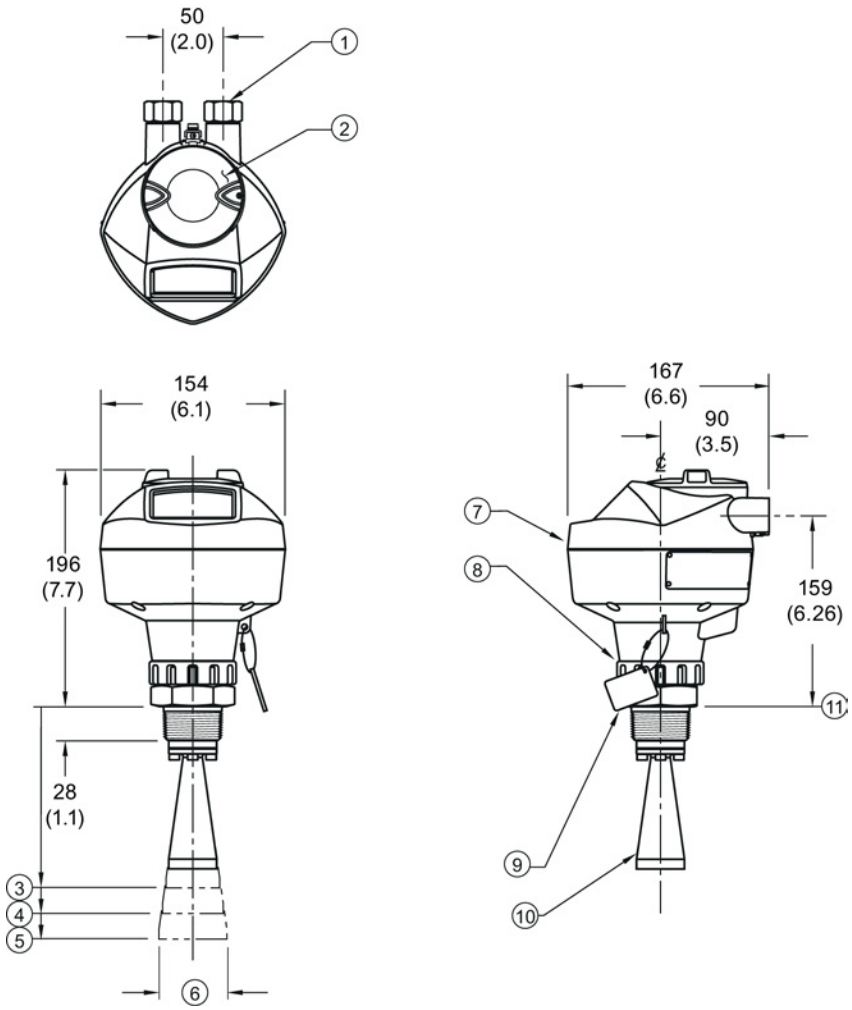
Dimension drawings

12

12.1 Threaded horn antenna

Note

- Process temperature and pressure capabilities are dependent upon information on the process connection tag. Reference drawing listed on the tag is available for download from our website under **Support/Installation drawings/Level Measurement/Continuous - Radar/LR250**:
  Product page (http://www.siemens.com/LR250)
- Process connection drawings are also available for download from the **Installation Drawings page**.
- Signal amplitude increases with horn diameter, so use the largest practical size.
- Optional extensions can be installed below the threads.



①	½" NPT cable entry, or M20 cable gland	⑦	enclosure/electronics
②	threaded cover	⑧	retaining collar
③	2" horn	⑨	process connection tag
④	3" horn	⑩	horn
⑤	4" horn	⑪	sensor reference point
⑥	horn O.D.		

Dimensions in mm (inch)

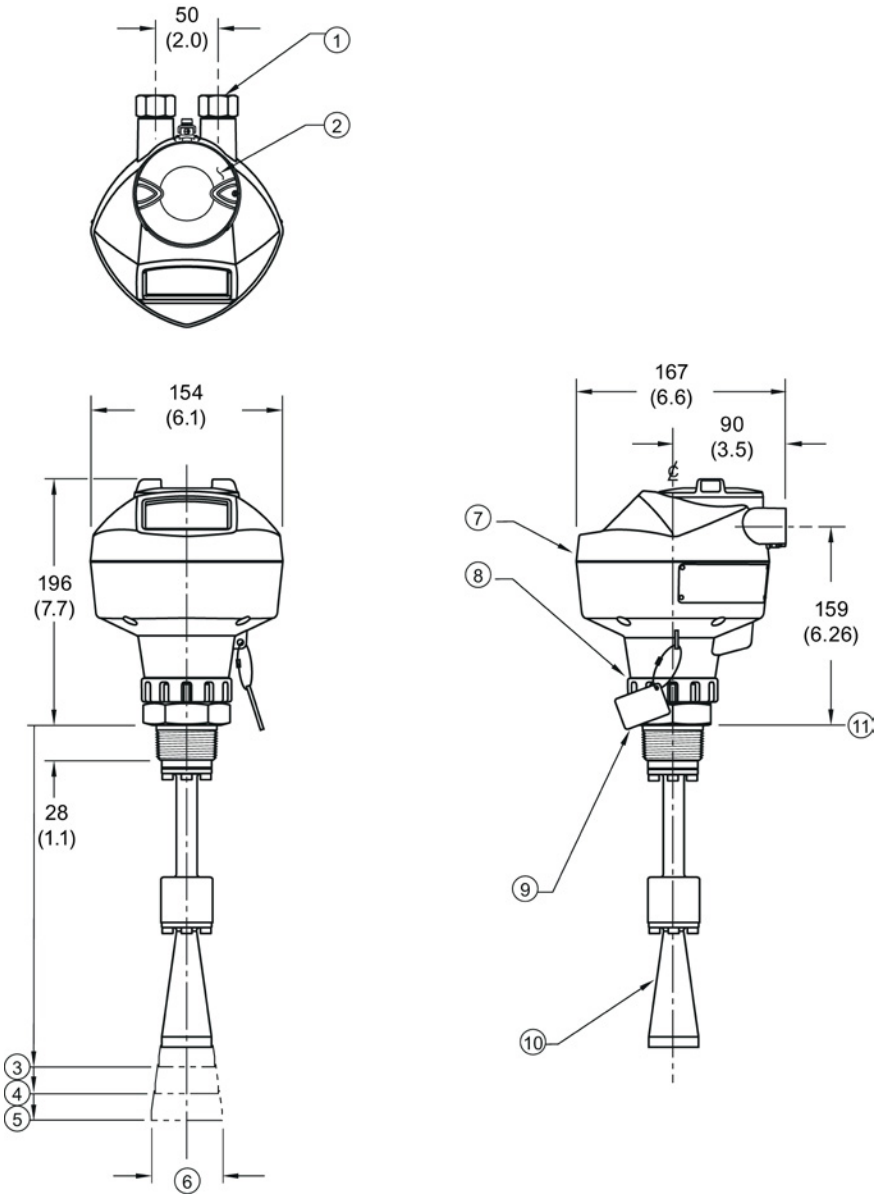
Threaded horn dimensions

Antenna Type	Antenna O.D. in mm (inch)	Height to sensor reference point, in mm (inch) [a]			Beam Angle (°)[b]	Measurement range, in m (ft)
		1-1/2" threaded connection	2" threaded connection	3" threaded connection		
1.5"	39.8 (1.57)	135 (5.3)	N/A	N/A	19	10 (32.8)
2"	47.8 (1.88)	N/A	166 (6.55)	180 (7.09)	15	20 (65.6)
3"	74.8 (2.94)	N/A	199 (7.85)	213 (8.39)	10	20 (65.6)
4"	94.8 (3.73)	N/A	254 (10)	268 (10.55)	8	20 (65.6)

[a] Height from bottom of horn to sensor reference point as shown: see dimension drawing.

[b] -3dB in the direction of the polarization axis. For an illustration, see Polarization reference point (Page 20).

12.2 Threaded horn antenna with extension



①	½" NPT cable entry, or M20 cable gland	⑦	enclosure/electronics
②	threaded cover	⑧	retaining collar
③	2" horn	⑨	process connection tag
④	3" horn	⑩	horn
⑤	4" horn	⑪	sensor reference point
⑥	horn O.D.		

Dimensions in mm (inch)

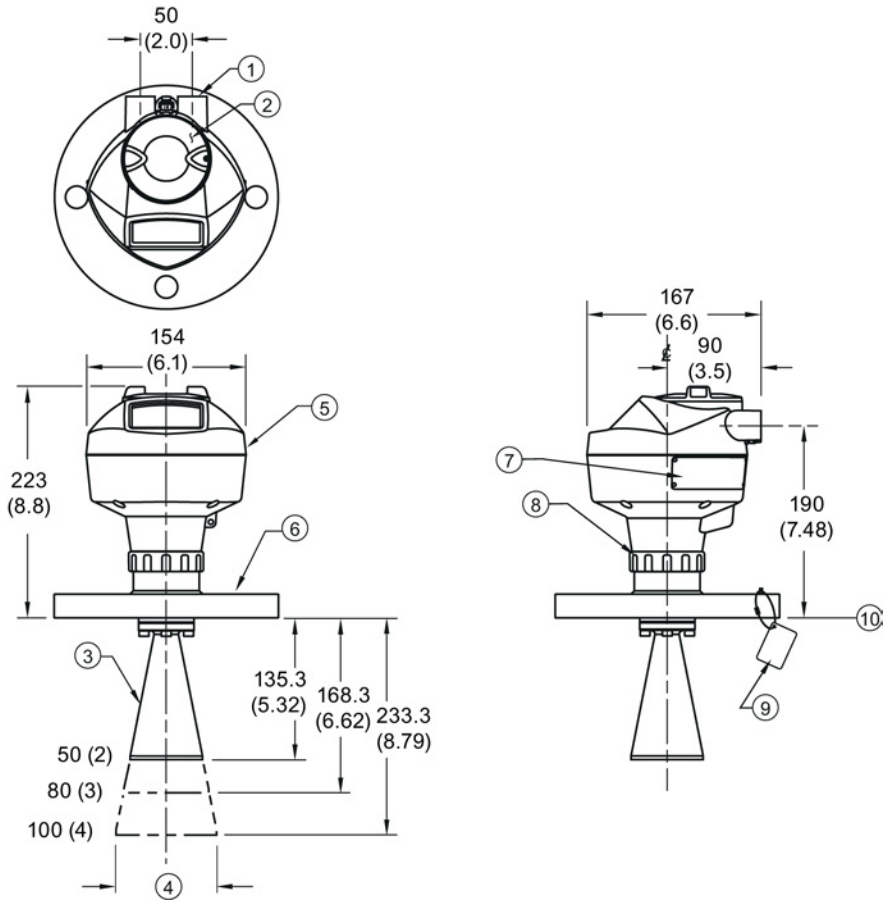
Threaded horn with extension dimensions

Antenna Type	Antenna O.D. in mm (inch)	Height to sensor reference point, in mm (inch) [a]			Beam Angle (°) [b]	Measurement range in m (ft)
		1-1/2" threaded connection	2" threaded connection	3" threaded connection		
1.5"	39.8 (1.57)	235 (9.25)	N/A	N/A	19	10 (32.8)
2"	47.8 (1.88)	N/A	266 (10.47)	280 (11.02)	15	20 (65.6)
3"	74.8 (2.94)	N/A	299 (11.77)	313 (12.32)	10	20 (65.6)
4"	94.8 (3.73)	N/A	354 (13.94)	368 (14.49)	8	20 (65.6)

[a] Height from bottom of horn to sensor reference point as shown: see dimension drawing.

[b] -3dB in the direction of the polarization axis. For an illustration, see Polarization reference point (Page 20).

12.3 Flanged horn antenna



①	½" NPT cable entry, or M20 cable gland	⑥	flange
②	threaded cover	⑦	name-plate
③	horn	⑧	retaining collar
④	horn O.D.	⑨	process connection tag
⑤	enclosure/electronics	⑩	sensor reference point

Dimensions in mm (inch)

Flanged Horn dimensions

Nominal horn size in mm (inch)	Horn O.D. in mm (inch)	Height to sensor reference point, in mm (inch)[a]		Beam angle (°)[b]	Measurement range, in m (ft)
		Stainless steel flange: raised or flat-face	Optional alloy flange [c]		
50 (2)	47.8 (1.88)	135.3 (5.32)	138.3 (5.44)	15	20 (65.6)
80 (3)	74.8 (2.94)	168.3 (6.62)	171.3 (6. 74)	10	
100 (4)	94.8 (3.73)	223.3 (8.79)	226.3 (8.90)	8	

[a] Height from bottom of horn to sensor reference point as shown: see Flanged horn antenna with extension (Page 198). See also Raised-Face flange per EN 1092-1 for flanged horn antenna (Page 206), or Flat-Face flange (Page 211).

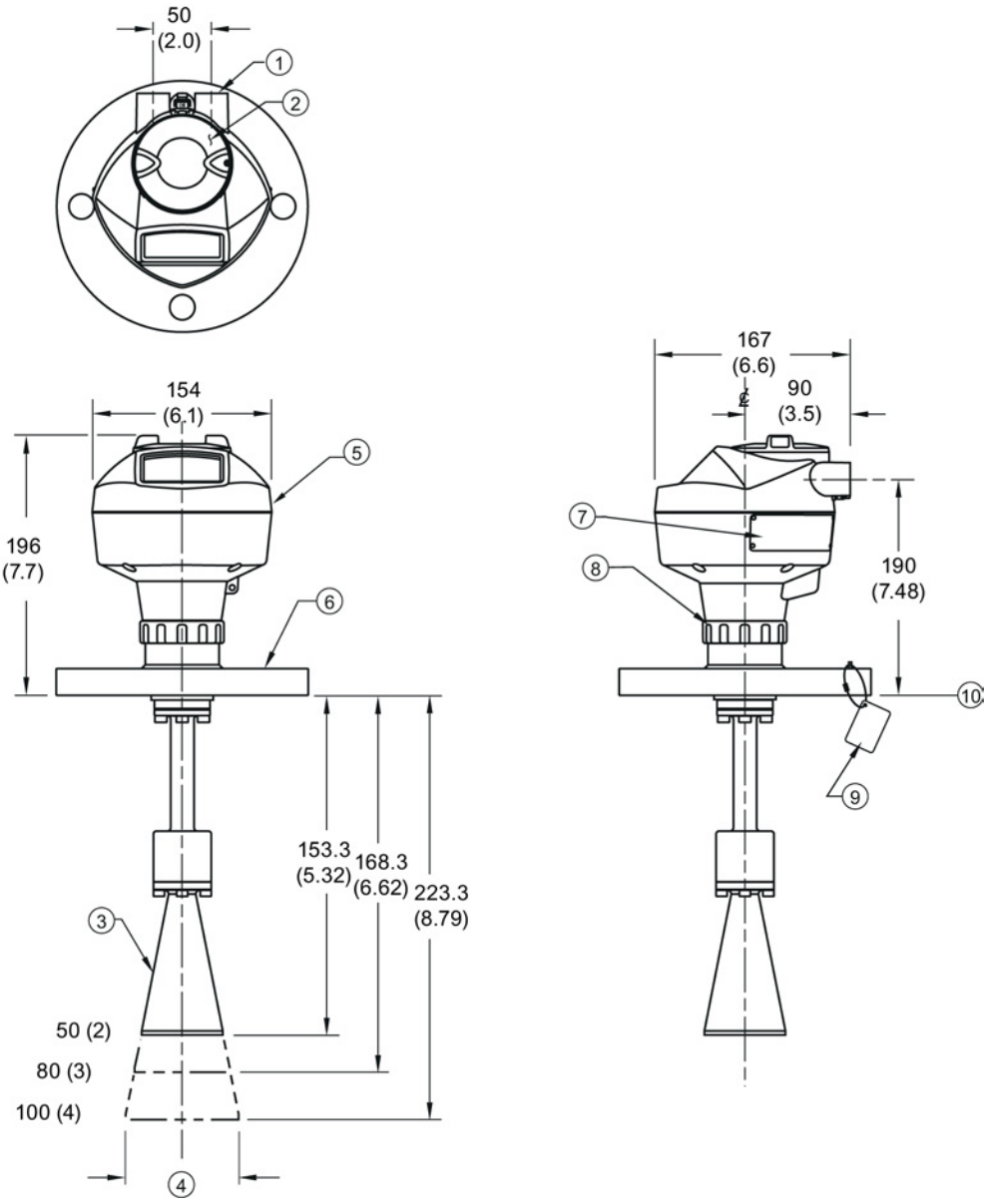
[b] -3dB in the direction of the polarization axis (see Polarization reference point (Page 20) for an illustration).

[c] Optional alloy N06022/2.4602 (Hastelloy® C-22 or equivalent). See Raised-Face Flange Dimensions (Page 206).

Note

Heights to sensor reference point are for stainless steel flanges. For optional alloy N06022/2.4602 (Hastelloy© C-22 or equivalent) see Flanged Horn dimensions above.

12.4 Flanged horn antenna with extension



①	½" NPT cable entry, or M20 cable gland	⑥	flange
②	threaded cover	⑦	name-plate
③	horn	⑧	retaining collar
④	horn O.D.	⑨	process connection tag
⑤	enclosure/electronics	⑩	sensor reference point

Dimensions in mm (inch)

Flanged horn with extension dimensions

Nominal horn size in mm (inch)	Horn O.D. in mm (inch)	Height to sensor reference point, in mm (inch) [a]		Beam angle (°)[b]	Measurement range, in m (ft)
		Stainless steel flange: raised or flat-face	Optional alloy flange [c]		
50 (2)	47.8 (1.88)	235.3 (9.26)	238.3 (9.38)	15	20 (65.6)
80 (3)	74.8 (2.94)	268.3 (10.56)	271.3 (10.68)	10	
100 (4)	94.8 (3.73)	323.3 (12.73)	326.3 (12.85)	8	

[a] Height from bottom of horn to sensor reference point as shown: See also Raised-Face flange per EN 1092-1 for flanged horn antenna (Page 206) or Flat-Face Flange. (Page 211)

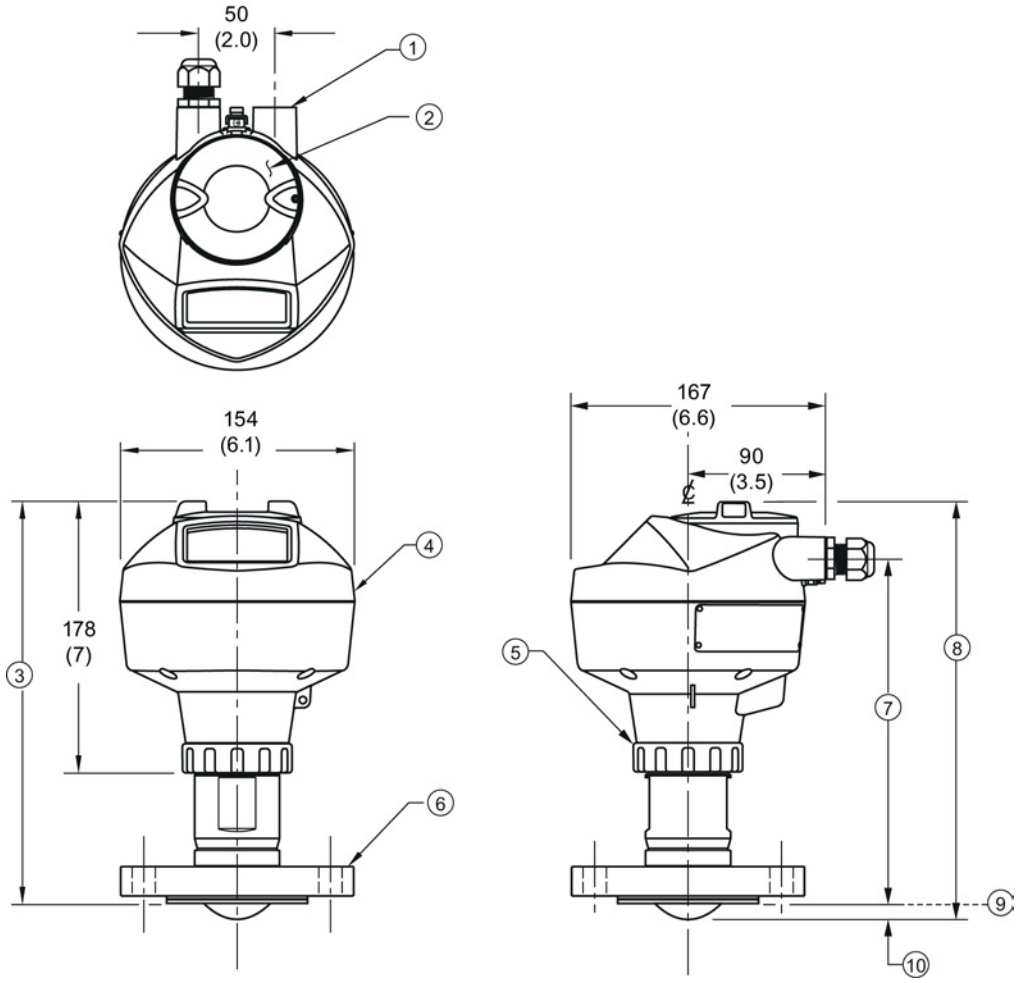
[b] -3dB in the direction of the polarization axis (see Polarization reference point (Page 20) for an illustration).

[c] Optional alloy N06022/2.4602 (Hastelloy® C-22 or equivalent). See Raised-Face flange per EN 1092-1 for flanged horn antenna (Page 206).

Note

Heights to sensor reference point are for stainless steel flanges. For optional alloy N06022/2.4602 (Hastelloy© C-22 or equivalent) see Flanged Horn dimensions above.

12.5 Flanged encapsulated antenna (2"/DN50/50A sizes only)



①	½" NPT cable entry, or M20 cable gland	⑥	flange
②	threaded cover	⑦	see table below
③	see table below	⑧	see table below
④	enclosure	⑨	sensor reference point
⑤	retaining collar	⑩	see table below

Dimensions in mm (inch)

Flanged encapsulated antenna (2"/DN50/50A) dimensions

	③ mm (inch)	⑦ mm (inch)	⑧ mm (inch)	⑩ mm (inch)[1]
2"/DN50/50A	263 (10.35)	223 (8.78)	274 (10.79)	11 (0.43)

[1] Height from tip of lens to sensor reference point as shown.

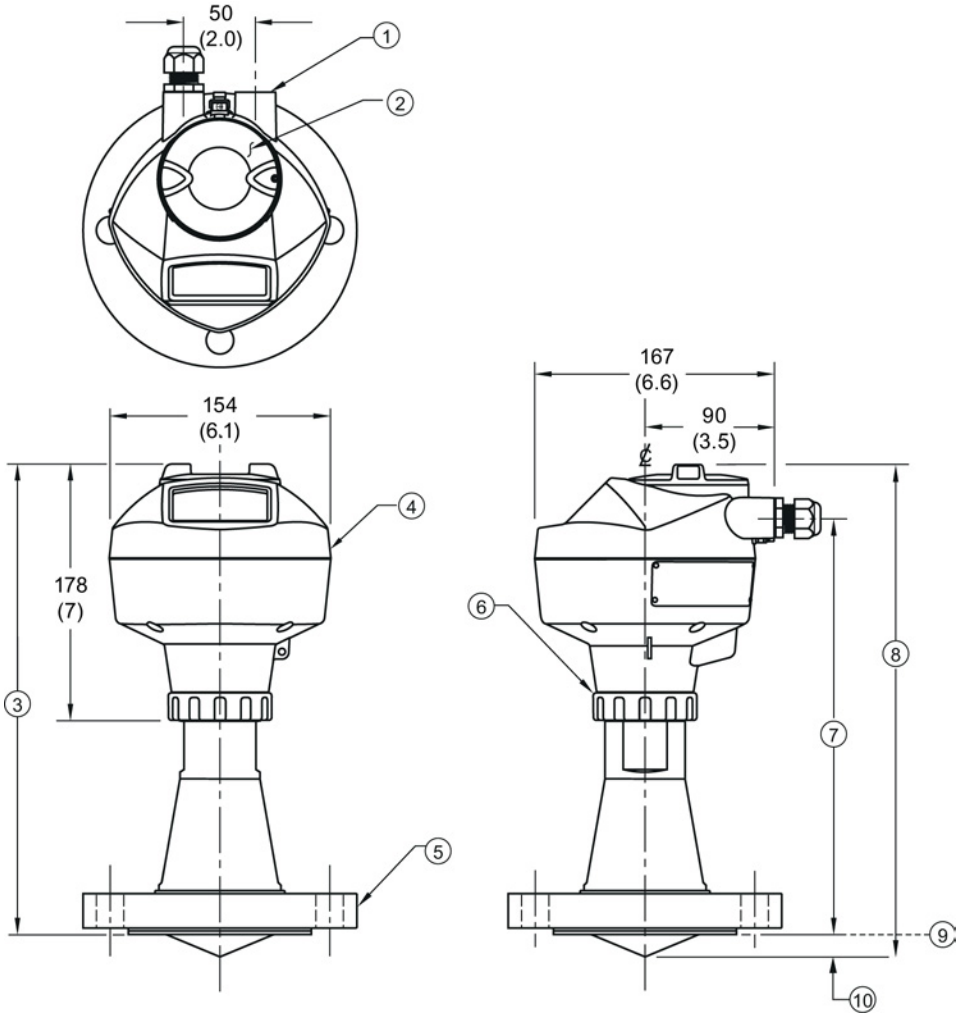
Flange size	Flange class	Flange O.D. [mm (inch)]	Antenna aperture size [mm (inch)]	Beam angle (°)[1]	Measurement range [m (ft)]
2"	150 LB	152 (5.98)	50 (1.97)	12.8	10 (32.8)[2]
DN50	PN10/16	165 (6.50)			
50A	10K	155 (6.10)			

[1] -3 dB in the direction of the polarization axis.

[2] 20m if installed in stillpipe

See Raised-Face Flange per EN 1092-1, (Page 208)and Polarization reference point (Page 20).

12.6 Flanged encapsulated antenna (3"/DN80/80A sizes and larger)



①	½" NPT cable entry, or M20 cable gland	⑥	retaining collar
②	threaded cover	⑦	see table below
③	see table below	⑧	see table below
④	enclosure	⑨	sensor reference point
⑤	flange	⑩	see table below

Dimensions in mm (inch)

Flanged encapsulated antenna (3"/DN80/80A and larger) dimensions

	③ mm (inch)	⑦ mm (inch)	⑧ mm (inch)	⑩ mm (inch)[1]
3"/DN80/80A	328 (12.91)	288 (11.34)	343 (13.50)	15 (0.59)
4"/DN100/100A	328 (12.91)	288 (11.34)	343 (13.50)	13 (0.51)
6"/DN150/150A	333 (13.11)	293 (11.54)	348 (13.70)	15 (0.59)

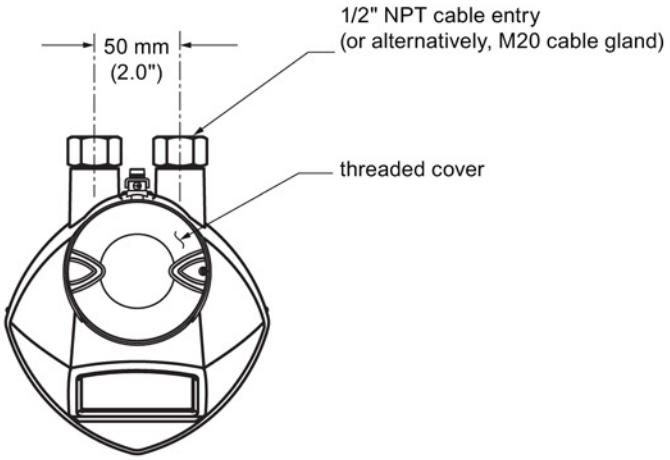
1) Height from tip of lens to sensor reference point as shown. See also Raised-Face Flange per EN 1092-1.

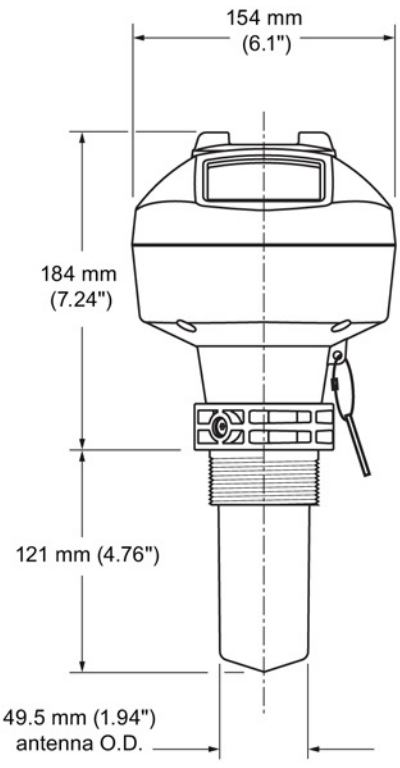
Flange size	Flange class	Flange O.D. [mm (inch)]	Antenna aperture size [mm (inch)]	Beam angle (°)[1]	Measurement range [m (ft)]
3"	150 LB	190 (7.48)	75 (2.95)	9.6	20 (65.6)
DN80	PN10/16	200 (7.87)			
80A	10K	185 (7.28)			
4"	150 LB	230 (9.06)	75 (2.95)	9.6	20 (65.6)
DN100	PN10/16	220 (8.66)			
100A	10K	210 (8.27)			
6"	150 LB	280 (11.02)	75 (2.95)	9.6	20 (65.6)
DN150	PN10/16	285 (11.22)			
150A	10K	280 (11.02)			

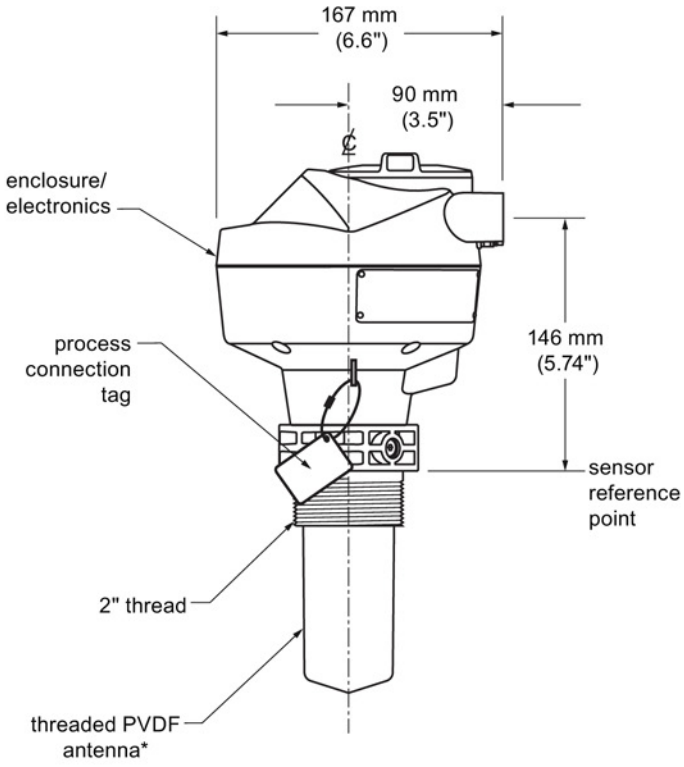
1) -3 dB in the direction of the polarization axis.

See Raised-Face Flange per EN 1092-1 (Page 208), and Polarization reference point (Page 20).

12.7 Threaded PVDF antenna







*The color of the antenna may vary.

Threaded PVDF antenna dimensions

Nominal antenna size	Antenna O.D.	Height to sensor reference point [a]	Beam angle [b]	Measurement range
50 mm (2")	49.5 mm (1.94")	121 mm (4.76")	19 degrees	10 m (32.8 ft)[c]

[a] Height from bottom of antenna to sensor reference point as shown: see dimension drawing.

[b] -3dB in the direction of the polarization axis. See Polarization reference point (Page 20) for an illustration.

[c] 20m when installed in stillpipe.

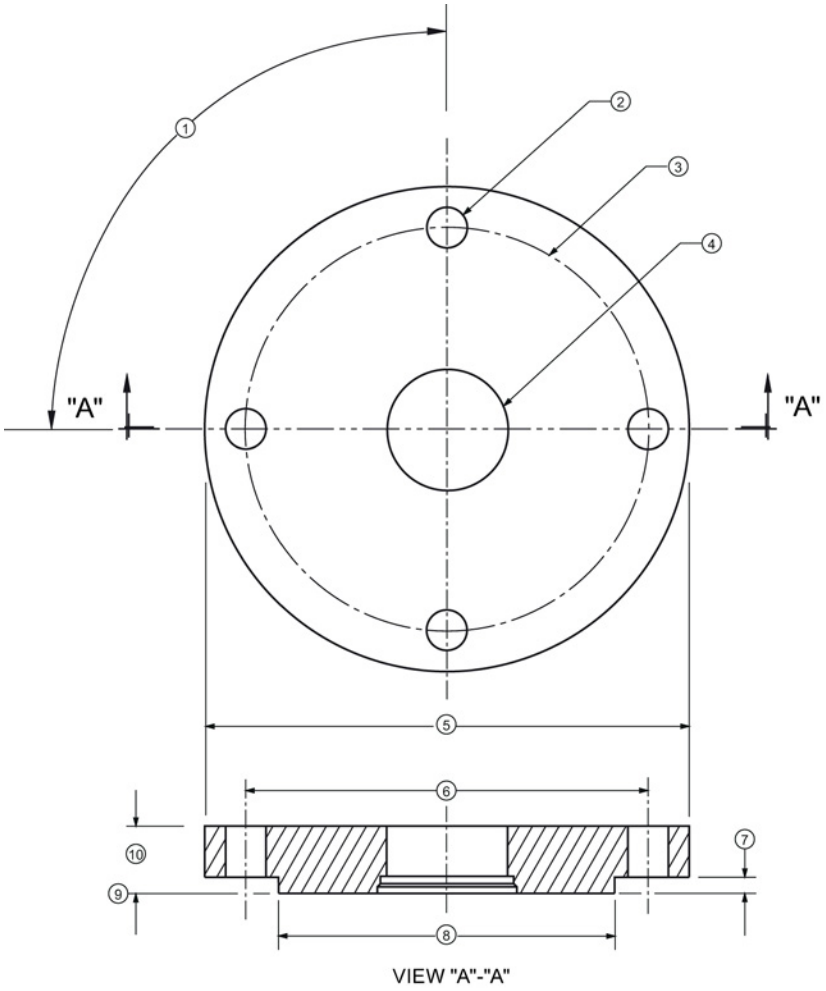
12.8 Threaded connection markings

With the exception of the threaded PVDF antenna, threaded connection markings are found on the flat face/faces of the process connection.

Serial number: a unique number allotted to each process connection, including the date of manufacture (MMDDYY) followed by a number from 001 to 999, (indicating the sequential unit produced).

12.9 Raised-Face flange per EN 1092-1 for flanged horn antenna

Stainless steel or optional alloy N06022/2.4602 (Hastelloy® C-22)



①	angle of adjacent bolt holes	⑥	bolt hole circle diameter
②	bolt hole diameter	⑦	facing height
③	bolt hole circle diameter	⑧	facing diameter
④	waveguide mounting hole	⑨	sensor reference point
⑤	Flange O.D.	⑩	thickness

Raised-Face flange dimensions

Pipe size	Flange bolt hole pattern	⑤ Flange O.D. (mm)	③ Bolt hole circle Ø (mm)	② Bolt hole Ø (mm)	No. of bolts	① Angle of adjacent bolt holes	⑧ Facing Ø (mm)	⑩ Thickness (mm)
DN 50	PN 10/PN 16	165	125	18	4	90	102	18
DN 80	PN 10/PN 16	200	160	18	8	45	138	20
DN 100	PN 10/PN 16	220	180	18	8	45	158	20
DN 150	PN 10/PN 16	285	240	22	8	45	212	22
DN 50	PN 25/PN 40	165	160	18	4	90	138	20
DN 80	PN 25/PN 40	200	160	18	8	45	138	24
DN 100	PN 25/PN 40	235	190	22	8	45	162	24
DN 150	PN 25/PN 40	300	250	26	8	45	218	28

Raised-Face flange markings

Blind Flange Markings (Optional Manufacturer's Logo [optional]; Flange Standard; Nominal Size; Material; Heat Code)	Machining Identification			Welded Assembly Identification [a]		
	Serial no.	Logo	Flange series	Flange series	Heat Code no.	Facing
Manufacturer's logo; EN 1092-1 05 'B1'; 'DN50' 'PN16' '1.4404 or 1.4435' A1B2C3	mmddyyx xx		xxxxx	xxxxx	A1B2C3	RF

[a] When flange material is alloy N06022/2.4602, additional material and heat code identification is provided.

The flange markings are located around the outside edge of the flange.

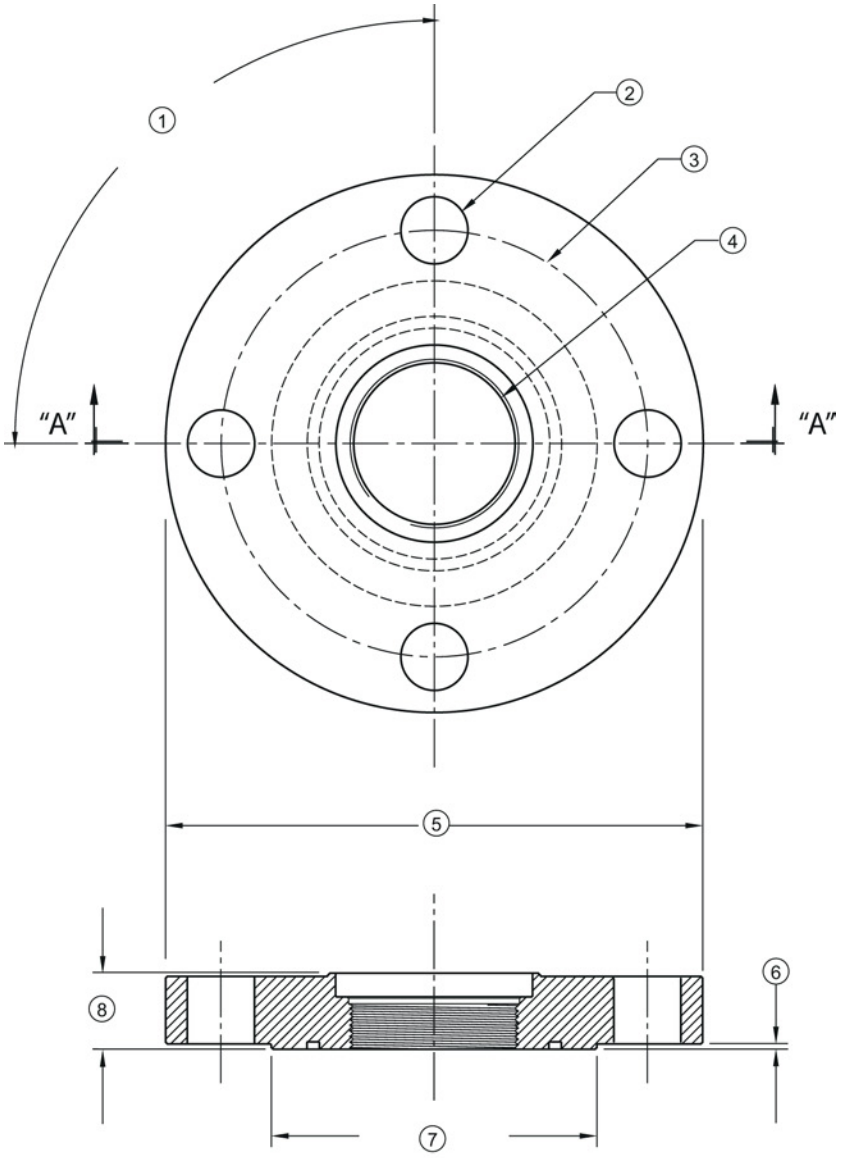
Serial number: a unique number allotted to each flange, including the date of manufacture (MMDDYY) followed by a number from 001 to 999 (indicating the sequential unit produced).

Flange series: the Siemens Milltronics drawing identification.

Heat code: a flange material batch code identification.

12.10 Raised-Face flange per EN 1092-1 for flanged encapsulated antenna

Stainless steel



VIEW "A"-"A"

①	angle of adjacent bolt holes	⑤	flange O.D.
②	bolt hole diameter	⑥	facing height
③	bolt hole circle diameter	⑦	facing diameter
④	antenna	⑧	flange thickness

Raised-Face flange dimensions

Pipe size	Flange class	⑤ Flange O.D. [mm (inch)]	③ Bolt hole circle Ø [mm (inch)]	② Bolt hole Ø [mm (inch)]	No. of bolt holes	① Angle of adjacent bolt holes	⑦ Facing Ø [mm (inch)]	⑨ Flange thickness [mm (inch)]	⑥ Flange facing thickness [mm (inch)]
2"	150 LB	152 (5.98)	120.7 (4.75)	19 (0.75)	4	90	92.1 (3.63)	20.6 (0.81)	1.5 (0.06)
3"		190 (7.48)	152.4 (6.00)				127 (5.00)	25.9 (1.02)	2 (0.08)
4"		230 (9.06)	190.5 (7.50)		8	45	157.2 (6.19)		2 (0.08)
6"		280 (11.02)	241.3 (9.50)	22.2 (0.87)			215.9 (8.50)	26.9 (1.06)	1.5 (0.06)
DN50	PN 10/16	155 (6.10)	125 (4.92)	18 (0.71)	4	90	102 (4.02)	18 (0.71)	2 (0.08)
DN80		200 (7.87)	160 (6.30)		8	45	138 (5.43)	20 (0.79)	2 (0.08)
DN100		220 (8.66)	180 (7.09)				158 (6.22)		2 (0.08)
DN150		285 (11.22)	240 (9.45)	22 (0.87)			212 (8.35)	22 (0.87)	2 (0.08)
50A	10K	155 (6.10)	120 (4.72)	19 (0.75)	4	90	96 (3.78)	16 (0.63)	2 (0.08)
80A		185 (7.28)	150 (5.91)		8	45	126 (4.96)	18 (0.71)	2 (0.08)
100A		210 (8.27)	175 (6.89)				151 (5.94)		2 (0.08)
150A		280 (11.02)	240 (9.45)	23 (0.91)			212 (8.35)	22 (0.87)	2 (0.08)

Raised-Face flange markings

Blind Flange Markings (Optional Manufacturer's Logo [optional]; Flange Standard; Nominal Size; Material; Heat Code)	Machining Identification			Welded Assembly Identification		
	Serial no.	Logo	Flange series	Flange series	Heat Code no.	Facing
Manufacturer's logo; EN 1092-1 05 'B1'; 'DN50' 'PN16' '1.4404 or 1.4435' A1B2C3	mmddyyxx		xxxxx	xxxxx	A1B2C3	RF

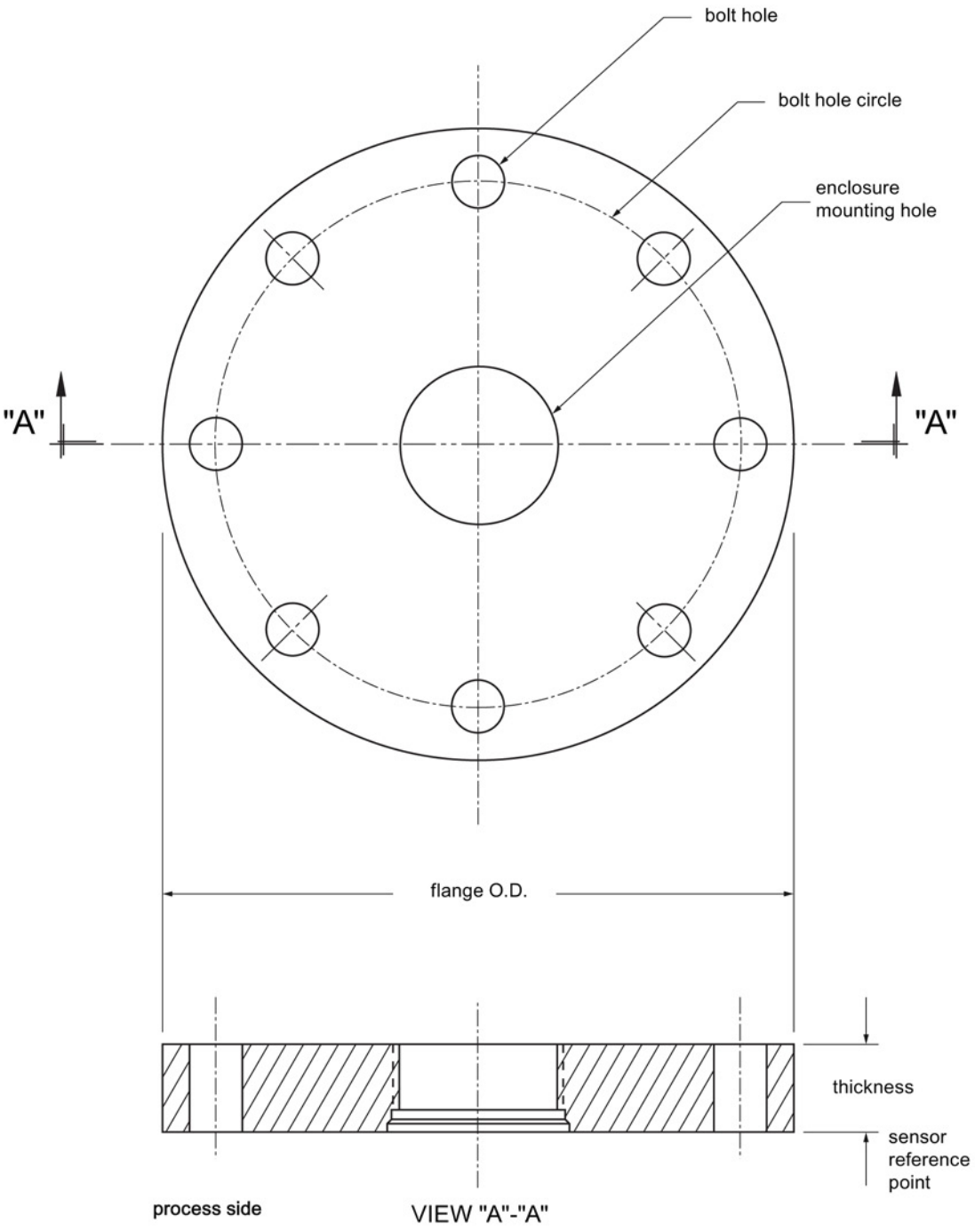
The flange markings are located around the outside edge of the flange.

Serial number: a unique number allotted to each flange, including the date of manufacture (MMDDYY) followed by a number from 001 to 999 (indicating the sequential unit produced).

Flange series: the Siemens Milltronics drawing identification.

Heat code: a flange material batch code identification.

12.11 Flat-Face flange



Flat-Face flange dimensions

Flange size [a]	Flange class	Flange O.D.	Bolt hole circle Ø	Bolt hole Ø	No. of bolt holes	Thickness
2"	ASME 150 lb	6.0"	4.75"	0.75"	4	0.88"
3"	ASME 150 lb	7.5"	6.0"	0.75"	4	0.96"
4"	ASME 150 lb	9.0"	7.50"	0.75"	8	1.25"
2"	ASME 300 lb	6.50"	5.00"	0.75"	8	1.12"
3"	ASME 300 lb	8.25"	6.62"	0.88"	8	1.38"
4"	ASME 300 lb	10.00"	7.88"	0.88"	8	1.50"
DN 50	EN PN 16	165 mm	125 mm	18 mm	4	24.4 mm
DN 80	EN PN 16	200 mm	160 mm	18 mm	8	31.8 mm
DN 100	EN PN 16	220 mm	180 mm	18 mm	8	31.8 mm
DN 50	EN PN 40	165 mm	125 mm	18 mm	4	25.4 mm
DN 80	EN PN 40	200 mm	160 mm	18 mm	8	31.8 mm
DN 100	EN PN 40	235 mm	190 mm	22 mm	8	38.1 mm
50A	JIS 10K	155 mm	120 mm	19 mm	4	23.8 mm
80A	JIS 10K	185 mm	150 mm	19 mm	8	24.4 mm
100A	JIS 10K	210 mm	175 mm	19 mm	8	28.5 mm

[a] A 2" flange is designed to fit a 2" pipe: for actual flange dimensions see Flange O.D. Flange markings located around the outside edge of the flat faced flange identify the flange assembly on which the device is mounted.

Flat-Face flange markings

Flat Face Flange Identification							Welded Assembly Identification	
Serial No.	Logo	Flange series			Material	Heat code	Flange series	Heat code no.
		Series	Nominal size					
MMDDYYXXX		25556	2	150	316L/ 1.4404 or 316L/ 1.4435	A1B2C3	25546	A1B2C3
			DN80	PN16				

Serial number: A unique number allotted to each flange, including the date of manufacture (MMDDYY) followed by a number from 001 to 999 (indicating the sequential unit produced).

Flange series: The Siemens Milltronics drawing identification.

Nominal size: The flange size followed by the hole pattern for a particular flange class. For example:

- A 2 inch ASME B16.5 150 lb class flange (North America)
- A DN 80 EN 1092-1 PN 16 class flange (Europe)

Material: The basic flange material (AISI or EU material designation). North American material codes are followed by European ones. For example, material designation 316L/1.4404.

Heat code: A flange material batch code identification.

12.12 Process connection tag (pressure rated versions)

For pressure-rated versions only, the process connection label lists the following information:

Process connection tag (pressure rated versions)

Item	Sample Text	Comments/Explanation
SERIAL #	GYZ / 00000000	Pressure Boundary Assembly
NOMINAL PIPE SIZE (DN)	4 INCH / 100mm	Nominal Pipe Size
INSTRUMENT MAWP (PS)	11.0 BAR	Maximum Allowable Working Pressure at Design Temperature for the device
DESIGN TEMP. (TS)	200 ºC	Maximum Allowable Working Temperature
MINIMUM PROCESS	15.9 BAR AT 40 ºC	Minimum Wetted Process Conditions
TEST PRESSURE (PT)	22.7 BAR	Production Test Pressure
TEST DATE	10/11/11	Date of Pressure Test (Year/Month/Day)
CONNECTION SERIES	ASME B16.5	Flange Series: dimensional pattern based on ASME B16.5 flange standards
PROCESS SERIES	25546	Pressure Tag Family Series
WETTED NON-METALLICS	TFM	Antenna Emitter
WETTED METALLICS	316L	Process Connection Material(s)
WETTED SEALS	FKM	Seal Material(s)

- Minimum Wetted Process Conditions: the minimum pressure and temperature to which the device assembly may be exposed in the process, and continue to provide a pressure-retaining function.
- Pressure Tag Family Series: the identification number used to indicate specific process connection information relating to operating conditions.
- For Flanged encapsulated antenna: this information is laser-etched on antenna body

BACK FACE	
Sample Text	Comments/Explanation
CRN 0Fxxxxx.5	Canadian Registration Number (CRN)

Appendix A: Technical reference

A

Note

Where a number follows the parameter name [for example, **Master Reset (4.1.)**] this is the parameter access number via the handheld programmer. See Parameter Reference (Page 113) for a complete list of parameters.

A.1 Principles of operation

SITRANS LR250 is a 2-wire 25 GHz pulse radar level transmitter for continuous monitoring of liquids and slurries. (The microwave output level is significantly less than that emitted from cellular phones.) Radar level measurement uses the time of flight principle to determine distance to a material surface. The device transmits a signal and waits for the return echo. The transit time is directly proportional to the distance from the material.

Pulse radar uses polarized electromagnetic waves. Microwave pulses are emitted from the antenna at a fixed repetition rate, and reflect off the interface between two materials with different dielectric constants (the atmosphere and the material being monitored).

Electromagnetic wave propagation is virtually unaffected by temperature or pressure changes, or by changes in the vapor levels inside a vessel. Electromagnetic waves are not attenuated by dust.

SITRANS LR250 consists of an enclosed electronic circuit coupled to an antenna and process connection. The electronic circuit generates a radar signal (25 GHz) that is directed to the antenna.

The signal is emitted from the antenna, and the reflected echoes are digitally converted to an echo profile. The profile is analyzed to determine the distance from the material surface to the sensor reference point. See Dimension drawings (Page 191). This distance is used as a basis for the display of material level and mA output.

A.2 Echo Processing

A.2.1 Process Intelligence

The signal processing technology embedded in Siemens radar level devices is known as **Process Intelligence**.

Process intelligence provides high measurement reliability regardless of the dynamically changing conditions within the vessel being monitored. The embedded Process Intelligence dynamically adjusts to the constantly changing material surfaces within these vessels.

Process Intelligence is able to differentiate between the true microwave reflections from the surface of the material and unwanted reflections being returned from obstructions such as seam welds or supports within a vessel. The result is repeatable, fast and reliable measurement. This technology was developed as result of field data gained over some twenty years from more than 1,000,000 installations in many industries around the world.

Higher order mathematical techniques and algorithms are used to provide intelligent processing of microwave reflection profiles. This "knowledge based" technique produces superior performance and reliability.

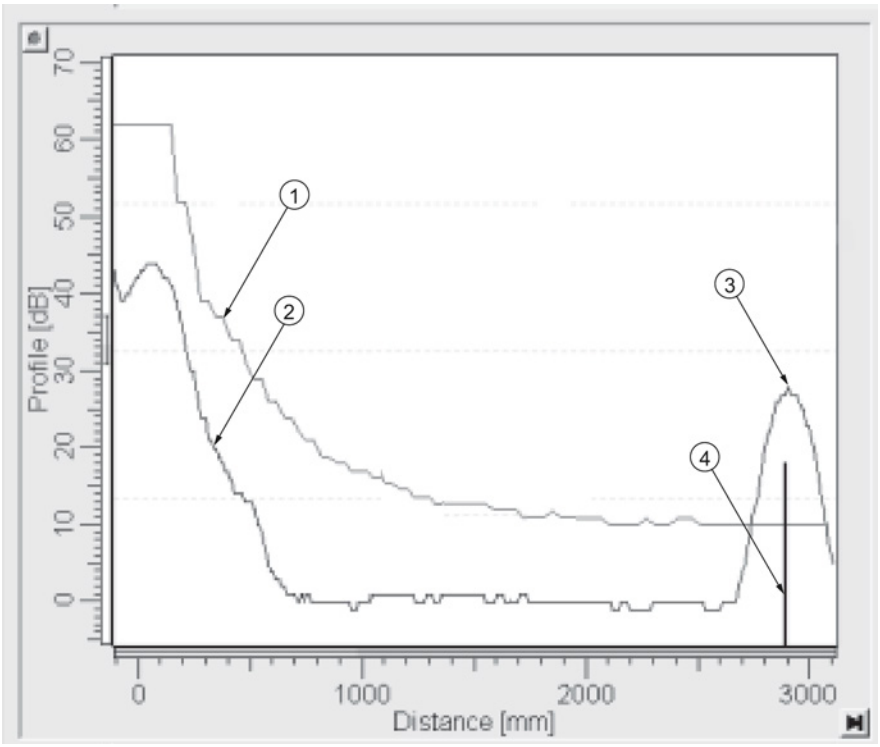
A.2.2 Echo Selection

Time Varying Threshold (TVT)

A Time Varying Threshold (TVT) hovers above the echo profile to screen out unwanted reflections (false echoes).

In most cases the material echo is the only one which rises above the default TVT.

In a vessel with obstructions, a false echo may occur. See Auto False Echo Suppression (Page 221) for more details.



① default TVT
② echo profile
③ material level
④ echo marker

The device characterizes all echoes that rise above the TVT as potential good echoes. Each peak is assigned a rating based on its strength, area, height above the TVT, and reliability, amongst other characteristics.

Algorithm (2.8.4.1.)

The true echo is selected based on the setting for the Echo selection algorithm. Options are **t**rue **F**irst Echo, **L**argest Echo, or **b**est of **F**irst and **L**argest.

Position Detect (2.8.4.2.)

The echo position detection algorithm determines which point on the echo will be used to calculate the precise time of flight, and calculates the range using the calibrated propagation velocity (see **Propagation Factor (2.8.3.)** for values). There are three options:

- **Center**
- **Hybrid**
- **CLEF** (Constrained Leading Edge Fit)

Center

Uses center of the echo.

Hybrid

Uses the Center algorithm for the top part of the vessel, and the CLEF algorithm for the part nearest the vessel bottom, according to the setting for **CLEF range**.

CLEF (Constrained Leading Edge Fit)

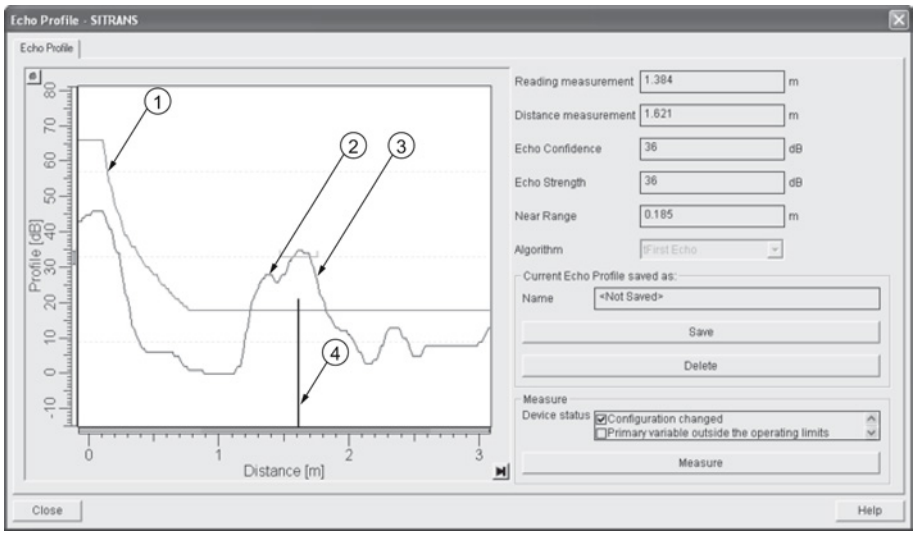
- Uses the leading edge of the echo.
- Is used mainly to process the echo from materials with a low dK value.

In an almost empty flat-bottomed vessel, a low dK material may reflect an echo weaker than the echo from the vessel bottom. The echo profile shows these echoes merging. The device may then report a material level equal to or lower than empty.

The CLEF algorithm enables the device to report the level correctly.

Example: CLEF off: Position set to Hybrid

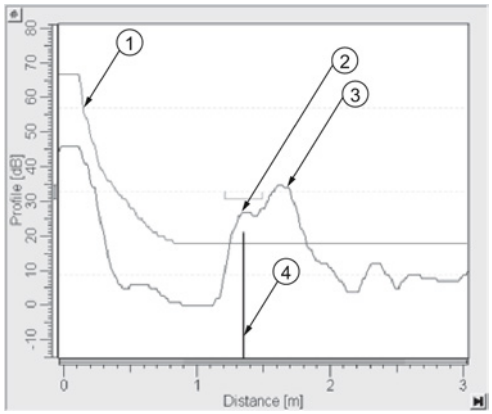
Vessel height: 1.5 m; CLEF range set to 0 (Center algorithm gives the same result.)



① default TVT
② material echo
③ vessel bottom echo selected
④ echo marker

Example: CLEF enabled

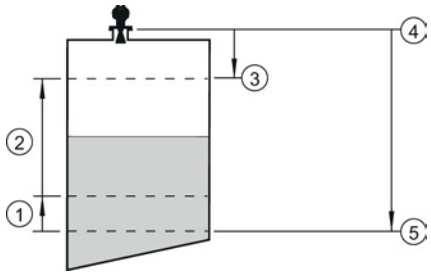
Vessel height: 1.5 m; CLEF range set to 0.5 m



① default TVT
② material echo selected
③ vessel bottom echo
④ echo marker

A.2.3 CLEF Range

CLEF Range (2.8.4.4.) is referenced from Low Calibration Point (process empty level). When the **Hybrid** algorithm is selected in **Position Detect (2.8.4.2.)**, the CLEF algorithm will be applied up to the limit of CLEF Range. Above this limit the Center algorithm will be applied.



① CLEF Range
② (Center algorithm applied)
③ High Calibration Point (process full level)
④ Sensor reference point
⑤ Low Calibration Point (process empty level)

A.2.4 Echo Threshold

Confidence (2.8.6.1.) describes the quality of an echo. Higher values represent higher quality. **Echo Threshold (2.8.4.3.)** defines the minimum confidence value required for an echo to be accepted as valid and evaluated.

A.2.5 Echo Lock

If the echo selected by **Algorithm** is within the Echo Lock window, the window is centered about the echo, which is used to derive the measurement. In radar applications, two measurement verification options are used with **Echo Lock (2.8.5.1.)**:

Lock Off

SITRANS LR250 responds immediately to a new selected echo (within the restrictions set by the Maximum Fill / Empty Rate), but measurement reliability is affected.

Material Agitator

A new measurement outside the Echo Lock Window must meet the sampling criteria before the window will move to include it.
The other available options, **Maximum Verification** and **Total Lock** are not recommended for radar.

A.2.6 Auto False Echo Suppression

Note

- For detailed instructions on using this feature via PDM see Auto False Echo Suppression (Page 76).
- For detailed instructions on using this feature via the handheld programmer see **Auto False Echo Suppression (2.8.7.1.).**

Auto False Echo Suppression is designed to learn a specific environment (for example, a particular vessel with known obstructions), and in conjunction with Auto False Echo Suppression Range to remove false echoes appearing in front of the material echo.

The material level should be below all known obstructions at the moment when Auto False Echo Suppression learns the echo profile. Ideally the vessel should be empty or almost empty, and if an agitator is present, it should be running.

The device learns the echo profile over the whole measurement range and the TVT is shaped around all echoes present at that moment.

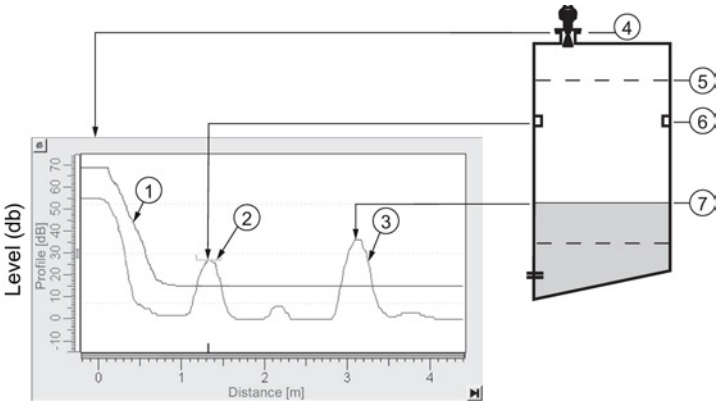
Auto False Echo Suppression Range (2.8.7.2.)

Auto False Echo Suppression Range specifies the range within which the learned TVT is applied. Default TVT is applied over the remainder of the range.

The learned TVT screens out the false echoes caused by obstructions. The default TVT allows the material echo to rise above it.

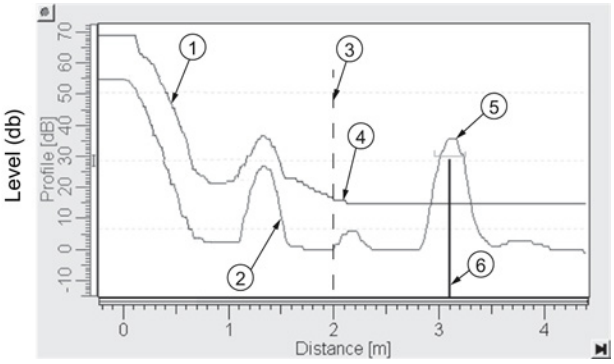
Auto False Echo Suppression Range must be set to a distance shorter than the distance to the material level when the environment was learned, to avoid the material echo being screened out.

Example before Auto False Echo Suppression



① default TVT
② false echo
③ material echo
④ sensor reference point
⑤ high calibration point = 0
⑥ obstruction at 1.3. m
⑦ material level at 3.2 m

Example after Auto False Echo Suppression



Auto False Echo Suppression Range set to 2 m

① learned TVT
② false echo
③ Auto False Echo Suppression Range
④ default TVT
⑤ material echo
⑥ echo marker

A.2.7 Measurement Range

Near Range (2.8.1.)

Near Range programs SITRANS LR250 to ignore the zone in front of the antenna. The default blanking distance is 50 mm (1.97") from the end of the antenna.

Near Range allows you to increase the blanking value from its factory default. But **Auto False Echo Suppression (2.8.7.1.)** is generally recommended in preference to extending the blanking distance from factory values.

Far Range (2.8.2.)

Far Range can be used in applications where the base of the vessel is conical or parabolic. A reliable echo may be available below the vessel empty distance, due to an indirect reflection path.

Increasing Far Range to 30% or 40% can provide stable empty vessel readings.

A.2.8 Measurement Response

Note

Units are defined in **Units (2.2.1.)** and are in meters by default.

Response Rate (2.4.1.) limits the maximum rate at which the display and output respond to changes in the measurement. There are three preset options: slow, medium, and fast.

Once the real process fill/empty rate (m/s by default) is established, a response rate can be selected that is slightly higher than the application rate. Response Rate automatically adjusts the filters that affect the output response rate.

Response Rate (2.4.1.)		Fill Rate per Minute (2.4.2.)/Empty Rate per Minute (2.4.3.)	Damping Filter (2.2.4.)
*	**Slow**	0.1 m/min (0.32 ft/min)	10 s
	Medium	1.0 m/min (3.28 ft.min)	10 s
	Fast	10.0 m/min (32.8 ft/min)	0 s

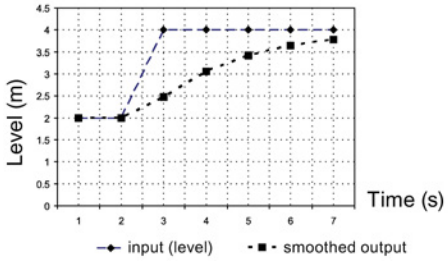
A.2.9 Damping

Damping Filter (2.2.4.) smooths out the response to a sudden change in level. This is an exponential filter and the engineering unit is always in seconds.

In 5 time constants the output rises exponentially: from 63.2% of the change in the first time constant, to almost 100% of the change by the end of the 5th time constant.

Damping example

time constant = 2 seconds
input (level) change = 2 m



A.3 Analog Output

The mA Output (current output) is proportional to material level in the range 4 to 20 mA. 0% and 100% are percentages of the full-scale reading (m, cm, mm, ft, in). Typically mA output is set so that 4 mA equals 0% and 20 mA equals 100%.

When SITRANS LR250 is put into **PROGRAM** mode (for example, by navigating through the menu) it stops updating the output of the device (local user interface and mA Output). It stores the most recent measurement, and holds the associated readings and mA signal output. The device reverts to the parameter last addressed during the previous program session.

When the device is returned to **Measurement** mode, the transceiver resumes operation. The reading and mA output default to the last measurement taken. The reading and associated outputs migrate to the current process level at a rate controlled by **Response Rate (2.4.1.)**.

If the device is left in **PROGRAM** mode for 10 minutes without input, it automatically reverts to **Measurement** mode.

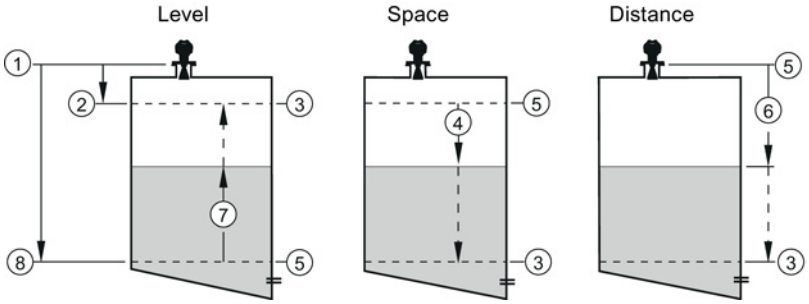
A.3.1 Sensor Mode

This parameter controls the input. Depending on the reference point used, the measurement reports either Level, Space, or Distance. By default Sensor Mode is set to **Level**.

Operation	Description	Reference point
NO SERVICE	Measurement and associated loop current not being updated. Device defaults to Fail-safe mode [a].	
LEVEL	Distance to material surface	Low Calibration Point (process empty level)
SPACE	Distance to material surface	High Calibration Point (process full level)
DISTANCE	Distance to material surface	Sensor reference point

[a] See Fail-safe Mode (Page 227).

You also have the option to put the device out of service, in which case the device defaults to Fail-safe mode, and the reported level depends on the device type. A standard device reports the last valid reading, and a NAMUR NE 43-compliant device reports the user-defined value for Material Level (3.58 mA by default).



① Sensor reference point
② High calibration point
③ 20 mA 100%
④ Space
⑤ 4 mA 0%
⑥ Distance
⑦ Level
⑧ Low calibration point

A.3.2 Current Output Function

Current Output Function (2.6.1.) controls the mA output and applies any relevant scaling. By default it is set to **Level**. Other options are Space, Distance, and Volume. (The device can carry out a volume calculation only after a vessel shape has been specified.)

When a volume application type is chosen, Sensor Mode remains as **Level** and the mA Output is automatically converted to **Volume**.

To view the mA reading in the secondary region of the LCD, press 5 on the handheld programmer.

A.3.3 Loss of Echo (LOE)

A loss of echo (LOE) occurs when the calculated measurement is judged to be unreliable because the echo confidence value has dropped below the echo confidence threshold.

Confidence (2.8.6.1.) describes the quality of an echo. Higher values represent higher quality.

Echo Threshold (2.8.4.3.) defines the minimum confidence value required for an echo to be accepted as valid and evaluated.

If the LOE condition persists beyond the time limit set in **LOE Timer (2.5.2.)** the LCD displays the Service Required icon, and the text region displays the fault code **S: 0** and the text LOE.

If two faults are present at the same time, the fault code, error text, and error icon for each fault are displayed alternately. For example, Loss of Echo and Fail-safe.


S: 0 LOE


S: 52 Fail-safe

A.3.4 Fail-safe Mode

The purpose of the Fail-safe setting is to put the process into a safe mode of operation in the event of a fault or failure. The value to be reported in the event of a fault is selected so that a loss of power or loss of signal triggers the same response as an unsafe level.

LOE Timer (2.5.2.) determines the length of time a **Loss of Echo (LOE)** condition will persist before a Fail-safe state is activated. The default setting is 100 seconds.

Material Level (2.5.1.) determines the material level to be reported when **LOE Timer (2.5.2.)** expires, depending on the device type (standard or NAMUR NE 43-compliant.)

STANDARD DEVICE			
Options		**HI**	**20.5** mA (max. mA Limit)
		LO	**3.8** mA (min. mA Limit)
	*	**HOLD**	Last valid reading
		VALUE	User-selected value defined in **Fail-Safe mA Value (2.5.3.)**

NAMUR NE 43-COMPLIANT DEVICE			
Options		**HI**	**20.5** mA (max. mA Limit)
		LO	**3.8** mA (min. mA Limit)
		HOLD	Last valid reading
	*	**VALUE**	User-selected value **Fail-Safe mA Value (2.5.3.)**, default 3.58 mA

Upon receiving a reliable echo, the loss of echo condition is aborted, the Service Required icon and error message are cleared, and the reading and mA output return to the current material level.

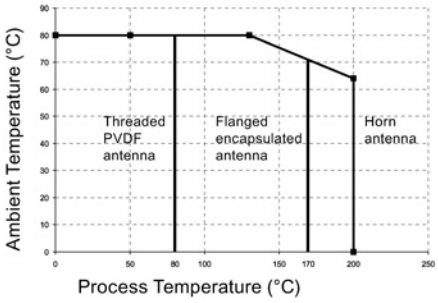
A.4 Maximum Process Temperature Chart

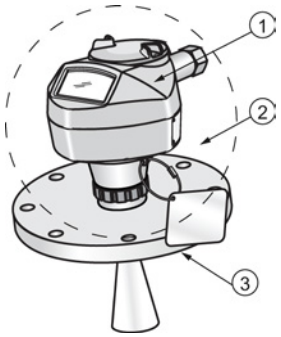
⚠ WARNING
Internal temperature must not exceed +80 ° C (+176 °F).

Note

- The chart below is for guidance only.
- The chart does not represent every possible process connection arrangement. For example, it will NOT apply if you are mounting SITRANS LR250 directly on a metallic vessel surface.
- The chart does not take into consideration heating from direct sunshine exposure.

Maximum Process Temperatures versus allowable ambient





① Internal enclosure temperature

② Ambient temperature

③ Process temperature (at process connection)

Where the chart does not apply, please use your own judgement regarding the use of SITRANS LR250.

If the internal temperature exceeds the maximum allowable limit, a sun shield or a longer nozzle may be required.

See **Current Internal Temperature (3.2.1.)** to monitor the Internal Temperature.

A.5 Process Pressure/Temperature derating curves

⚠ WARNING

- Never attempt to loosen, remove or disassemble process connection or device housing while vessel contents are under pressure.
- Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.
- The user is responsible for the selection of bolting and gasket materials which will fall within the limits of the flange and its intended use and which are suitable for the service conditions.
- Improper installation may result in loss of process pressure and/or release of process fluids and/or gases.

Note

- The process connection tag shall remain with the process pressure boundary assembly. (The process pressure boundary assembly comprises the components that act as a barrier against pressure loss from the process vessel: that is, the combination of process connection body and emitter, but normally excluding the electrical enclosure). In the event the device package is replaced, the process connection tag shall be transferred to the replacement unit.
- SITRANS LR250 units are hydrostatically tested, meeting or exceeding the requirements of the ASME Boiler and Pressure Vessel Code and the European Pressure Equipment Directive.
- The serial numbers stamped in each process connection body, (flange, threaded, or sanitary), provide a unique identification number indicating date of manufacture. Example: MMDDYY – XXX (where MM = month, DD = day, YY = year, and XXX= sequential unit produced)
- Further markings (space permitting) indicate flange configuration, size, pressure class, material, and material heat code.

Pressure Equipment Directive, PED, 97/23/EC

Siemens Level Transmitters with flanged, threaded, or sanitary clamp type process mounts have no pressure-bearing housing of their own and, therefore, do not come under the Pressure Equipment Directive as pressure or safety accessories (see EU Commission Guideline 1/8 and 1/20).

A.5.1 Horn antenna

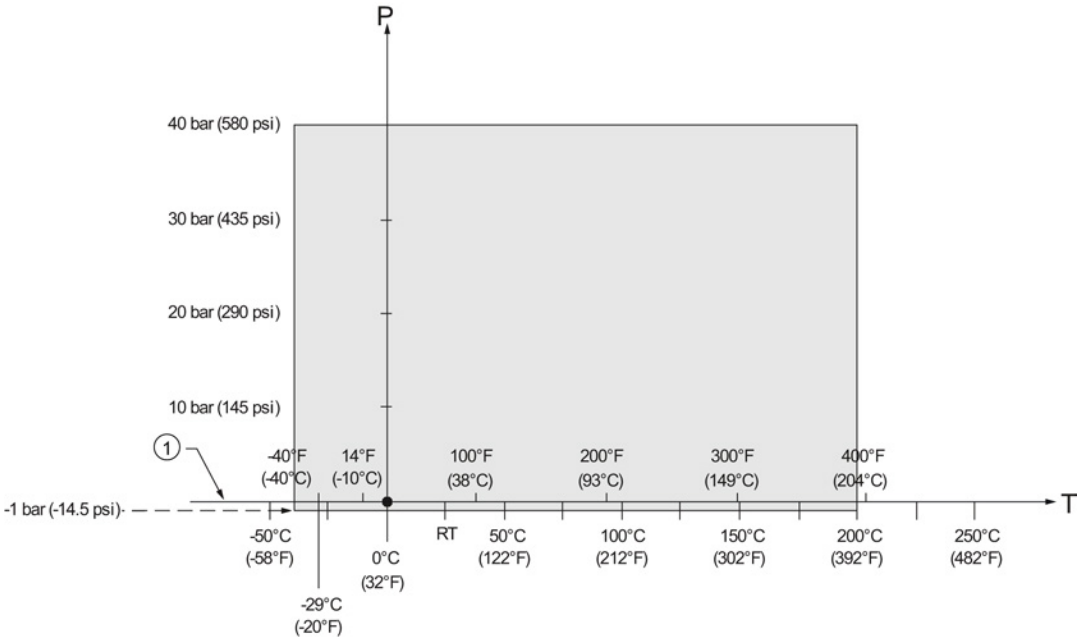
WARNING

Never attempt to loosen, remove or disassemble process connection or device housing while vessel contents are under pressure.

Note

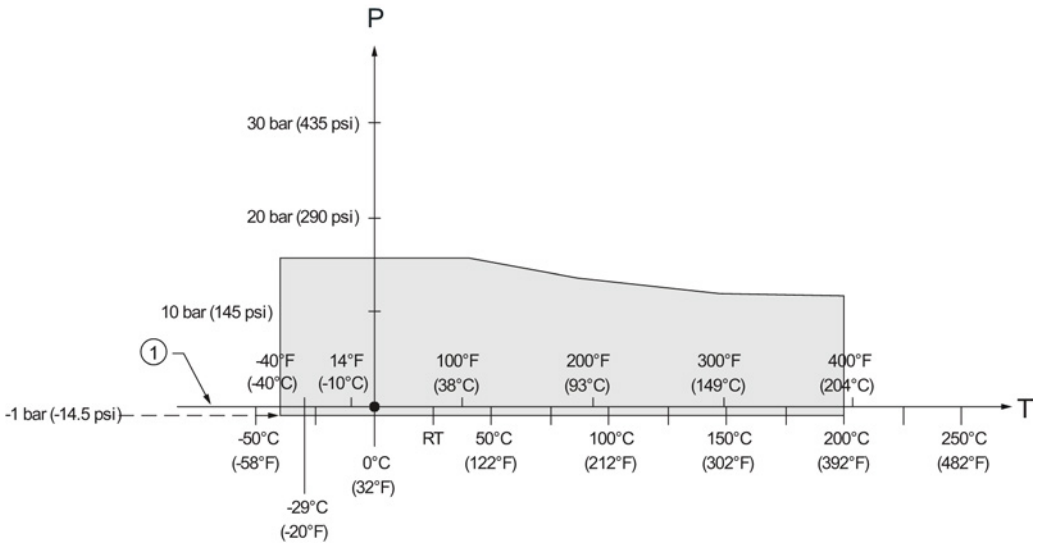
Customer to provide adequate bolting and gasketing to retain vessel pressure and provide sufficient sealing.

1.5", 2" and 3" Threaded Versions

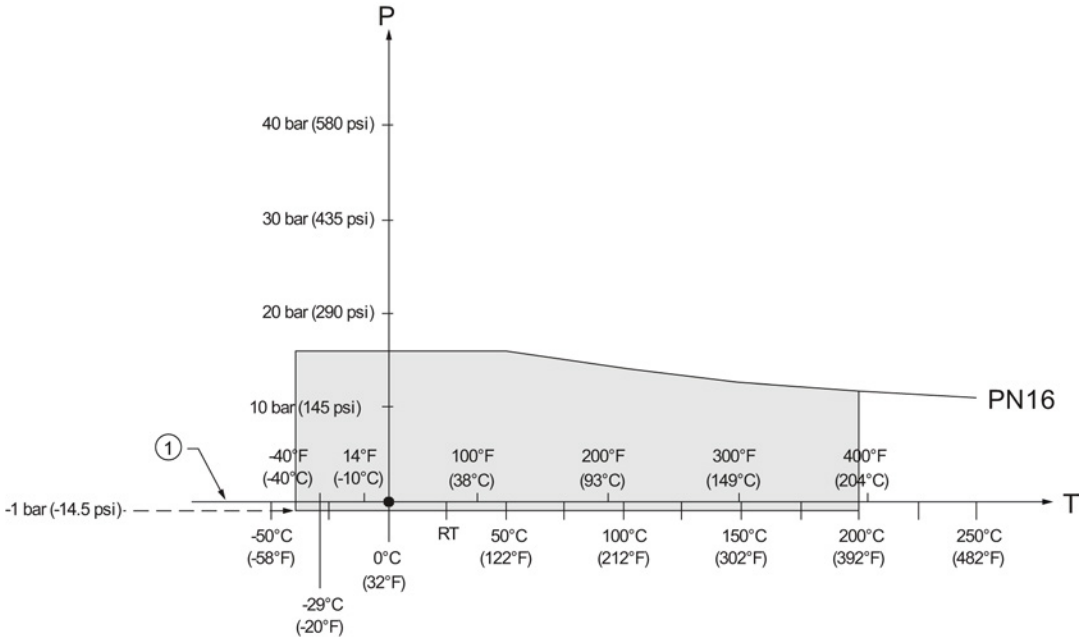


A.5.2 Flanged horn antenna

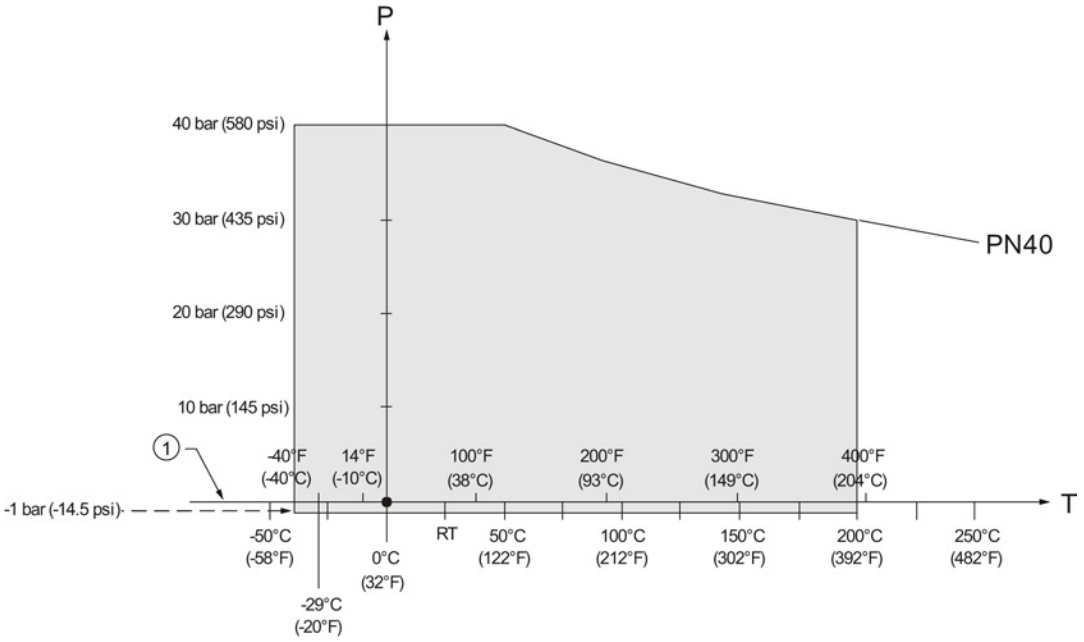
50A, 80A and 100A Flanged Versions: JIS 10K



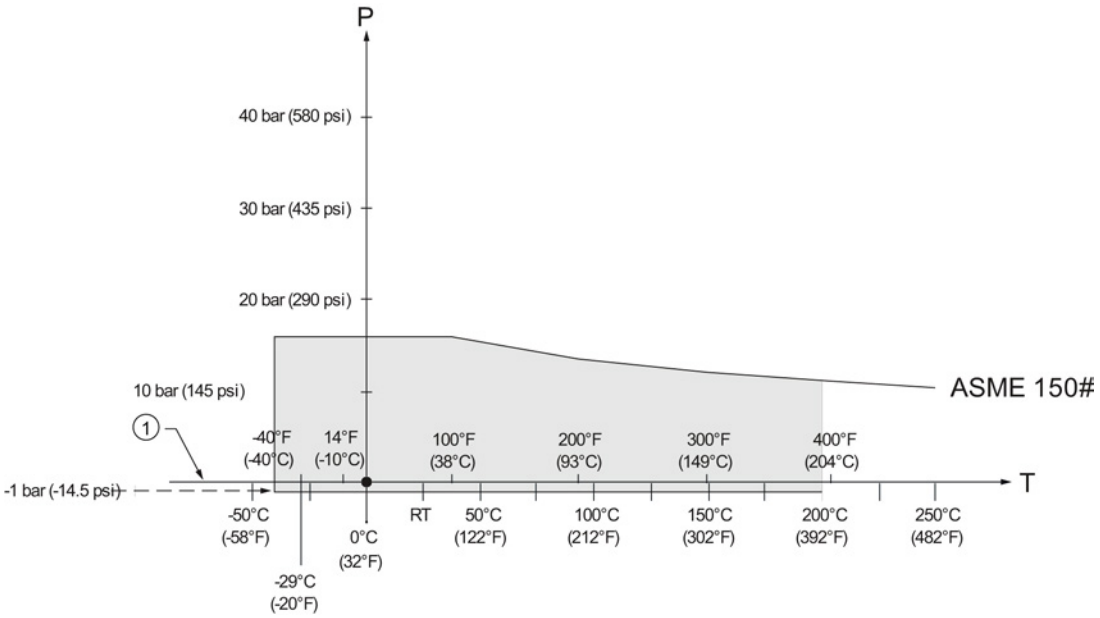
DN50, DN80, DN100, and DN150 Flanged Versions: PN16



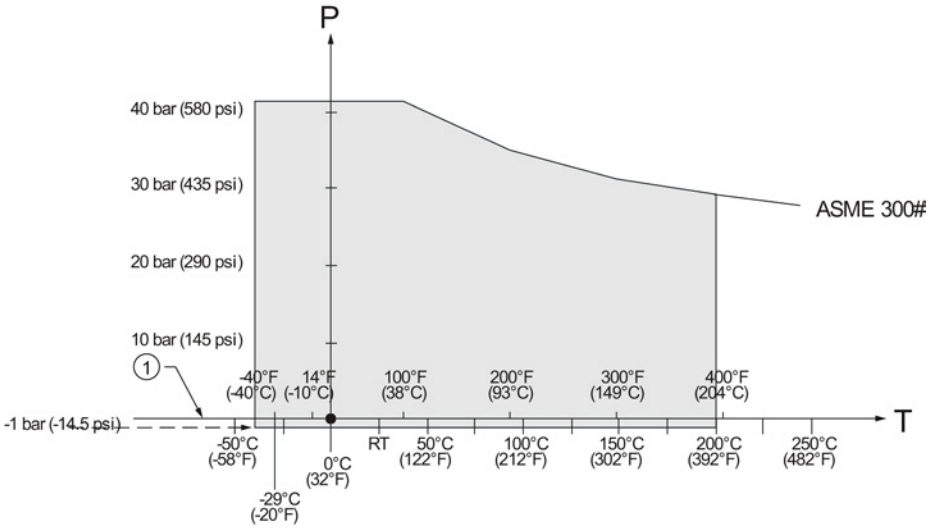
DN50, DN80, DN100, and DN150 Flanged Versions: PN40



2", 3" and 4" Flanged Versions: 150 lb

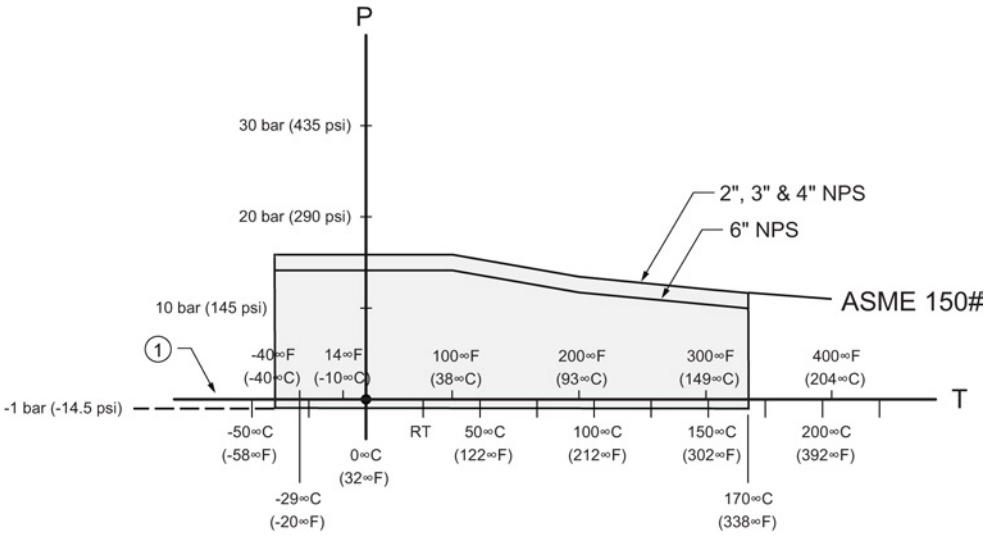


2", 3", and 4" Flanged Versions: 300 lb



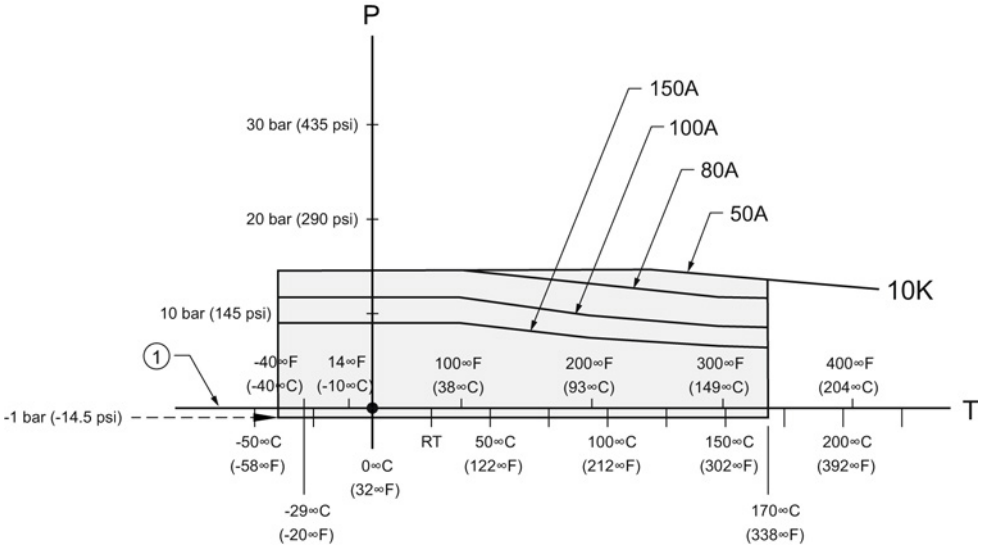
A.5.3 Flanged encapsulated antenna

ASME B16.5, Class 150, 2", 3", 4", 6" NPS



① Atmospheric
P Allowable operating pressures
T Allowable operating temperatures

JIS B 2220, 10K, 50A, 80A, 100A, 150A

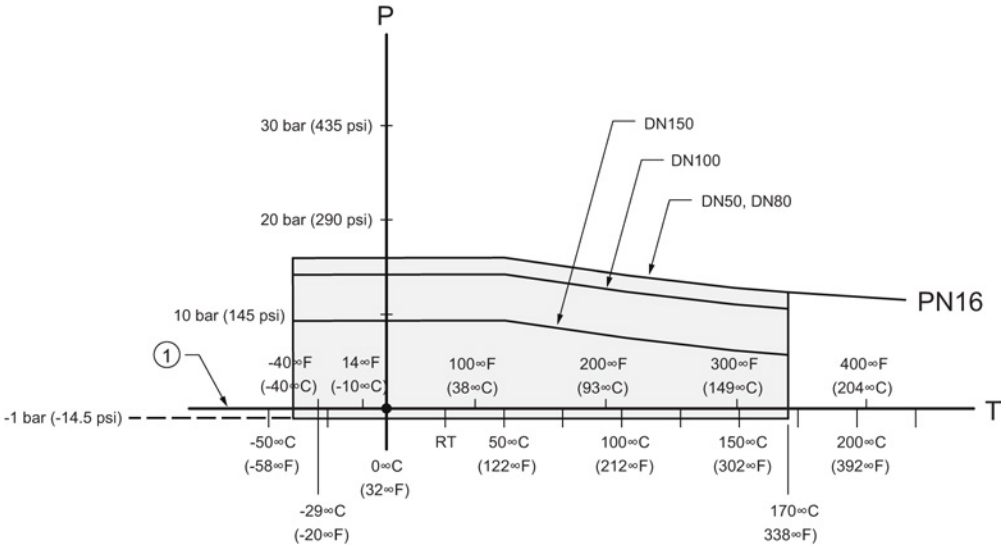


① Atmospheric

P Allowable operating pressures

T Allowable operating temperatures

EN1092-1, PN10/16, DN50, DN80, DN100, DN150



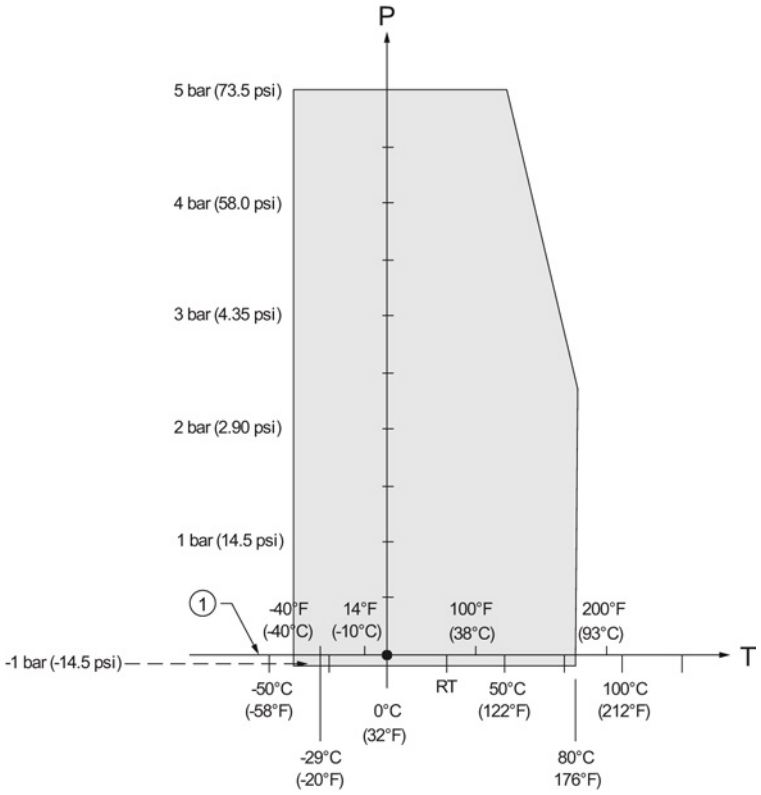
① Atmospheric

P Allowable operating pressures

T Allowable operating temperatures

A.5.4 PVDF antenna

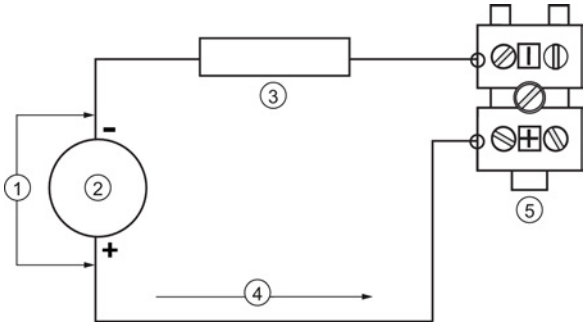
2" Threaded PVDF Antenna Versions



A.6 Loop power

Note

Loop voltage is the voltage at the terminals of the power supply (not the voltage at the terminals of the device).



① Loop voltage VL
② Power supply
③ Loop resistance RL
④ Loop current IL
⑤ LR250

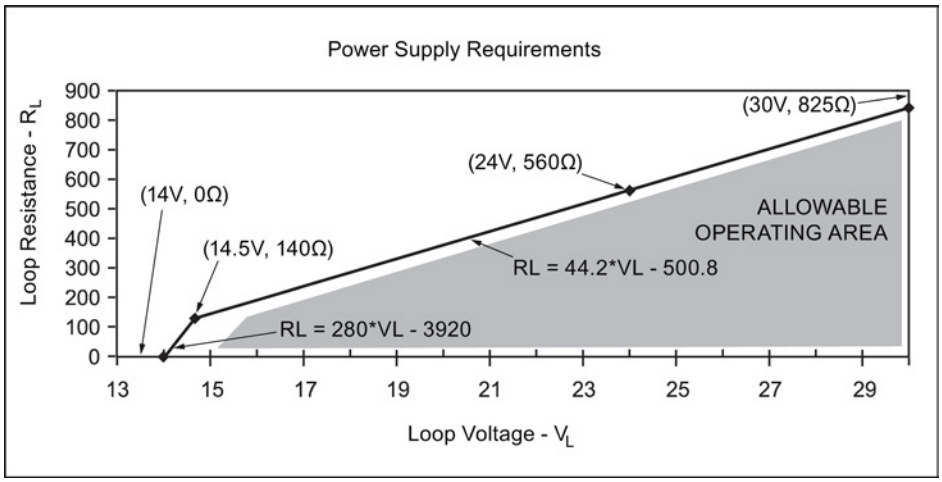
A.6.1 Allowable operating area of SITRANS LR250

Note

The curves below apply to a standalone device, configured via the Siemens handheld programmer.

A.6.2 Curve 1 (General Purpose, Intrinsically Safe, Non-Sparking, Non-incendive)

Loop Voltage versus Loop Resistance

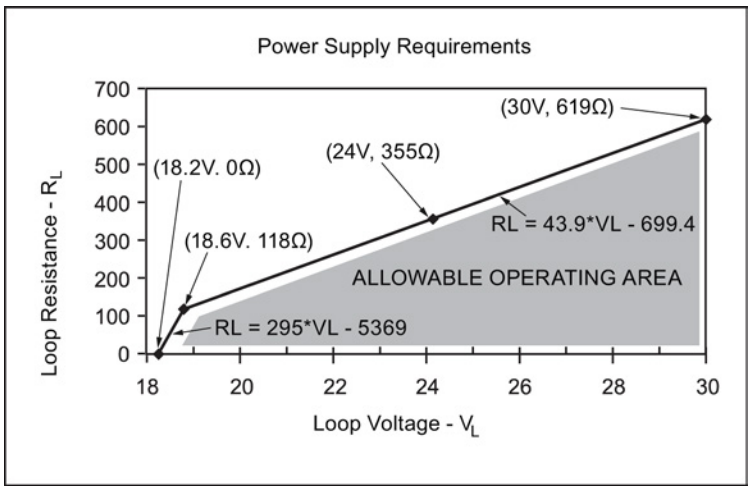


Note

When using HART communications, the minimum voltage with 220 Ohms (RL) is 16.3 V DC.

A.6.3 Curve 2 (Flameproof, Increased Safety, Explosion-proof)

Loop Voltage versus Loop Resistance



Note

When using HART communications, the minimum voltage with 220 Ohms (RL) is 20.94 V DC.

A.7 Startup behavior

- The device draws less than 3.6 mA at startup.
- Time to first measurement is less than 50 seconds.

Appendix B: HART communications

B

Highway Addressable Remote Transducer, HART, is an industrial protocol that is superimposed on the 4-20 mA signal. It is an open standard, and full details about HART can be obtained from the HART Communication Foundation website:

HART Communication Foundation (http://www.hartcomm.org/)

The radar device can be configured over the HART network using either the HART Communicator 375 by Fisher-Rosemount, or a software package. The recommended software package is the SIMATIC Process Device Manager (PDM) by Siemens.

B.1 SIMATIC PDM

This software package is designed to permit easy configuration, monitoring, and troubleshooting of HART devices. The HART EDD for this device was written with SIMATIC PDM in mind and has been extensively tested with this software. For more information, see Operating via SIMATIC PDM (Page 61).

B.2 HART Electronic Device Description (EDD)

In order to configure a HART device, the configuration software requires the HART Electronic Device Description for the instrument in question.

You can download the HART EDD for this device from our website:

Product page (http://www.siemens.com/LR250)

Click on **Support>Software Downloads.** Older versions of the library will have to be updated in order to use all the features of this device.

B.3 HART Handheld 375/475

If the SITRANS LR250 HART device revision is higher than revision 2, the FC375 will report that the Device Description is not installed and will ask whether you wish to proceed in forward compatibility mode. It is recommended to choose YES in order to use revision 3 with the FC375.

B.4 HART Communicator 375 menu structure

Note

HART Communicator 375 is supported by SITRANS LR250 HART.

LEVEL METER

1. IDENTIFICATION
- 1. TAG
- 2. DESCRIPTION
- 3. MESSAGE
- 4. INSTALLATION DATE
- 5. DEVICE ORDER NUMBER

2. SETUP
- 1. DEVICE
  - 1. FIRMWARE REVISION
  - 2. LOADER REVISION
  - 3. HARDWARE REVISION
- 2. INPUT
  - 1. SENSOR CALIBRATION
    - 1. MATERIAL
    - 2. SENSOR UNITS
    - 3. OPERATION
    - 4. LOW CALIBRATION PT.
    - 5. HIGH CALIBRATION PT.
    - 6. NEAR RANGE
    - 7. FAR RANGE
    - 8. PROPAG. FACTOR
    - 9. SENSOR OFFSET
  - 2. VOLUME CONVERSION
    - 1. VESSEL SHAPE
    - 2. MAXIMUM VOLUME
    - 3. DIMENSION A
    - 4. DIMENSION L
  - 3. VOLUME BREAKPOINT
    - 1. TABLE 1 - 8 (Lev./Vol. Breakpoints 1-8)
    - 2. TABLE 9 - 16 (Lev./Vol. Breakpoints 9-16)
    - 3. TABLE 17 - 24 (Lev./Vol. Breakpoints 17-24)
    - 4. TABLE 25 - 32 (Lev./Vol. Breakpoints 25-32)
  - 4. ECHO PROCESSING
    - 1. ECHO SELECT
      - 1. ALGORITHM
      - 2. POSITION DETECT
      - 3. ECHO THRESHOLD
    - 2. SAMPLING
      - 1. ECHO LOCK
      - 2. SAMPLING UP
      - 3. SAMPLING DOWN
    - 3. FILTERING
      - 1. DAMPING FILTER
    - 4. TANK BOTTOM ALGORITHM
      - 1. CLEF RANGE
    - 5. NOISE
      - 1. ECHO CONFIDENCE
      - 2. ECHO STRENGTH
      - 3. NOISE AVERAGE

5. TVT SETUP
    1. TVT HOVER LEVEL
    2. AUTO FALSE ECHO SUPPRESSION
    3. AUTO SUPPRESSION RANGE
    4. SHAPER MODE
6. TVT SHAPER
    1. SHAPER 1-9 (Shaper points 1-9)
    2. SHAPER 10-18 (Shaper points 10-18)
    3. SHAPER 19-27 (Shaper points 19-27)
    4. SHAPER 28-36 (Shaper points 28-36)
    5. SHAPER 37-40 (Shaper points 37-40)
7. RATE
    1. RESPONSE RATE
    2. FILL RATE PER MINUTE
    3. EMPTY RATE PER MINUTE

3. OUTPUT
    1. MA OUTPUT
        1. MA OUTPUT FUNCTION
        2. 4 MA SETPOINT
        3. 20 MA SETPOINT
        4. MINIMUM MA LIMIT
        5. MAXIMUM MA LIMIT
    4. FAIL-SAFE
        1. FAILSAFE TIMER
        2. FAILSAFE MATERIAL LEVEL
        3. FAILSAFE LEVEL

3. DIAGNOSTICS

1. MEASURED VALUES
    1. CURRENT INTERNAL TEMP.
    2. MAX. INTERNAL TEMP.
    3. MIN. INTERNAL TEMP.

4. SERVICE

1. REMAINING DEVICE LIFETIME
    1. TOTAL EXPECTED DEVICE LIFE
    2. TOTAL DEVICE OPERATING TIME
    3. REMAINING DEVICE LIFETIME
    4. MAINTENANCE REQUIRED LIFETIME
    5. MAINTENANCE DEMANDED LIFETIME
    6. MAINTENANCE ALERT ACTIVATION
    7. DEVICE LIFETIME MAINTENANCE ACKNOWLEDGE
2. REMAINING SENSOR LIFETIME
    1. TOTAL EXPECTED SENSOR LIFE
    2. TOTAL SENSOR OPERATING TIME
    3. REMAINING SENSOR LIFETIME
    4. MAINTENANCE REQUIRED LIMIT
    5. MAINTENANCE DEMANDED LIMIT
    6. MAINTENANCE ALERT ACTIVATION
    7. SENSOR LIFETIME MAINTENANCE ACKOWLEDGE

3. SERVICE INTERVAL
    1. TOTAL SERVICE INTERVAL
    2. TIME ELAPSED SINCE LAST SERVICE
    3. REMAINING LIFETIME
    4. MAINTENANCE REQUIRED LIMIT
    5. MAINTENANCE DEMANDED LIMIT
    6. MAINTENANCE ALERT ACTIVATION
    7. SERVICE ACKNOWLEDGE
4. CALIBRATION INTERVAL
    1. TOTAL CALIBRATION INTERVAL
    2. TIME ELAPSED SINCE LAST CALIBRATION
    3. REMAINING LIFETIME
    4. MAINTENANCE REQUIRED LIMIT
    5. MAINTENANCE DEMANDED LIMIT
    6. MAINTENANCE ALERT ACTIVATION
    7. CALIBRATION ACKNOWLEDGE
5. POWERED DAYS
6. POWER ON RESETS
7. LCD FAST MODE
8. LCD CONTRAST

5. COMMUNICATION
    1. COMMUNICATION CONTROL

6. SECURITY
    1. WRITE PROTECT
    2. PIN TO UNLOCK

7. LANGUAGE
    1. LANGUAGE

B.5 HART version

SITRANS LR250 conforms to HART rev. 5.

B.5.1 Burst Mode

SITRANS LR250 does not support burst mode.

B.5.2 HART Multidrop Mode

We do not recommend the use of HART Multidrop Mode.

Appendix C: Certificates and support

C

C.1 Certificates

Certificates can be downloaded from our website at:

Product page (http://www.siemens.com/LR250).

C.2 Technical support

If you have any technical questions about the device described in these Operating Instructions and do not find the right answers, you can contact Customer Support:

- Via the Internet using the **Support Request:**
  Support request (http://www.siemens.com/automation/support-request)
- Via Phone:
  - Europe: +49 (0)911 895 7222
  - America: +1 423 262 5710
  - Asia-Pacific: +86 10 6475 7575

Further information about our technical support is available on the Internet at
Technical support (http://support.automation.siemens.com/WW/view/en/16604318)

Service & Support on the Internet

In addition to our documentation, we offer a comprehensive knowledge base online on the Internet at:

Service & Support (http://www.siemens.com/automation/service&support)

There you will find:

- The latest product information, FAQs, downloads, tips and tricks.
- Our newsletter, providing you with the latest information about your products.
- Our bulletin board, where users and specialists share their knowledge worldwide.
- You can find your local contact partner for Industry Automation and Drives Technologies in our partner database.
- Information about field service, repairs, spare parts and lots more under "Services."

Additional Support

Please contact your local Siemens representative and offices if you have additional questions about the device

Find your contact partner at:

Local contact person (http://www.siemens.com/automation/partner)

List of abbreviations

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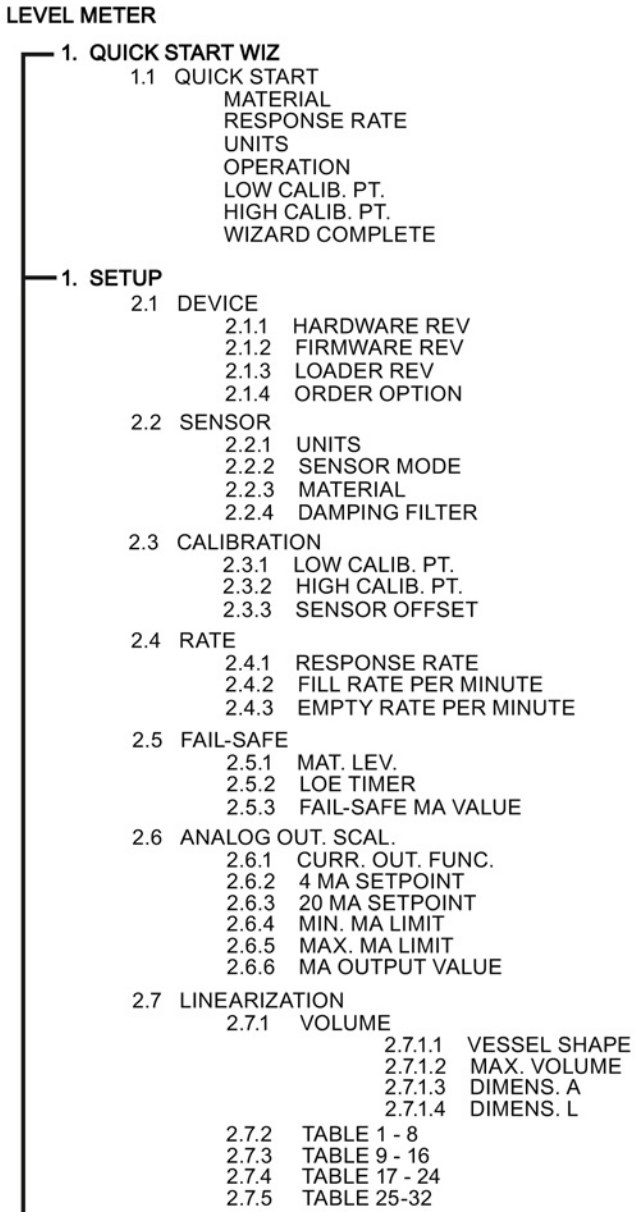
Short form	Long form	Description	Units
CE / FM / CSA	Conformité Européene / Factory Mutual / Canadian Standards Association	safety approval	
C_i	Internal capacitance		F
D/A	Dialog to analog		
DCS	Distributed Control System	control room apparatus	
dK	dielectric constant		
EDD	Electronic Device Description		
FEA	Flanged encapsulated antenna		
HART	Highway Addressable Remote Transducer		
I_i	Input current		mA
I_o	Output current		mA
IS	Intrinsically Safe	safety approval	
L_i	Internal inductance		mH
mH	milliHenry	10^{-3}	H
µF	microFarad	10^{-6}	F
µs	microsecond	10^{-6}	s
PED	Pressure Equipment Directive	safety approval	
pF	pico Farads	10^{-12}	F
ppm	parts per million		
PV	Primary Variable	measured value	
PVDF	Polyvinylidene fluoride		
SV	Secondary Variable	equivalent value	
TB	Transducer Block		
TVT	Time Varying Threshold	sensitivity threshold	
U_i	Input voltage		V
U_o	Output voltage		V

LCD menu structure

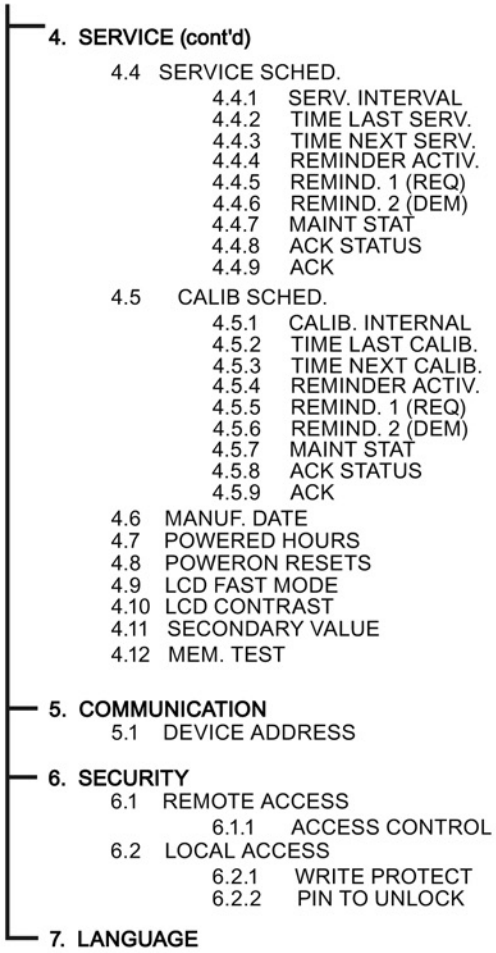
14

Note

- In Navigation mode, **ARROW keys** (◄ ▲ ► ▼) navigate the menu in the direction of the arrow. See Parameter Reference (Page 113) for detailed information and instructions.


LEVEL METER
1. QUICK START WIZ
1.1 QUICK START
MATERIAL
RESPONSE RATE
UNITS
OPERATION
LOW CALIB. PT.
HIGH CALIB. PT.
WIZARD COMPLETE
1. SETUP
2.1 DEVICE
2.1.1 HARDWARE REV
2.1.2 FIRMWARE REV
2.1.3 LOADER REV
2.1.4 ORDER OPTION
2.2 SENSOR
2.2.1 UNITS
2.2.2 SENSOR MODE
2.2.3 MATERIAL
2.2.4 DAMPING FILTER
2.3 CALIBRATION
2.3.1 LOW CALIB. PT.
2.3.2 HIGH CALIB. PT.
2.3.3 SENSOR OFFSET
2.4 RATE
2.4.1 RESPONSE RATE
2.4.2 FILL RATE PER MINUTE
2.4.3 EMPTY RATE PER MINUTE
2.5 FAIL-SAFE
2.5.1 MAT. LEV.
2.5.2 LOE TIMER
2.5.3 FAIL-SAFE MA VALUE
2.6 ANALOG OUT. SCAL.
2.6.1 CURR. OUT. FUNC.
2.6.2 4 MA SETPOINT
2.6.3 20 MA SETPOINT
2.6.4 MIN. MA LIMIT
2.6.5 MAX. MA LIMIT
2.6.6 MA OUTPUT VALUE
2.7 LINEARIZATION
2.7.1 VOLUME
2.7.1.1 VESSEL SHAPE
2.7.1.2 MAX. VOLUME
2.7.1.3 DIMENS. A
2.7.1.4 DIMENS. L
2.7.2 TABLE 1 - 8
2.7.3 TABLE 9 - 16
2.7.4 TABLE 17 - 24
2.7.5 TABLE 25-32

- **2. SETUP (cont'd)**
  - 2.8 SIGNAL PROC.
    - 2.8.1 NEAR RANGE
    - 2.8.2 FAR RANGE
    - 2.8.3 PROPAG. FACTOR
    - 2.8.4 ECHO SELECT
      - 2.8.4.1 ALGORITHM
      - 2.8.4.2 POS. DETECT
      - 2.8.4.3 ECHO THRESHOLD
      - 2.8.4.4 CLEF RANGE
    - 2.8.5 SAMPLING
      - 2.8.5.1 ECHO LOCK
      - 2.8.5.2 UP SAMP.
      - 2.8.5.3 DOWN SAMP.
    - 2.8.6 ECHO QUALITY
      - 2.8.6.1 CONFIDENCE
      - 2.8.6.2 ECHO STRENGTH
      - 2.8.6.3 NOISE AVERAGE
    - 2.8.7 TVT SETUP
      - 2.8.7.1 AUTO FALSE ECHO
      - 2.8.7.2 AUTO SUPP RANGE
      - 2.8.7.3 HOVER LEVEL
      - 2.8.7.4 SHAPER MODE
    - 2.8.8 TVT SHAPER
      - 2.8.8.1 BRKPT. 1-9
      - 2.8.8.2 BRKPT. 10-18
      - 2.8.8.3 BRKPT. 19-27
      - 2.8.8.4 BRKPT. 28-36
      - 2.8.8.5 BRKPT. 37-40
    - 2.8.9 MEAS. VALUES
      - 2.8.9.1 LEVEL MEAS.
      - 2.8.9.2 SPACE MEAS.
      - 2.8.9.3 DISTANCE MEAS.
      - 2.8.9.4 VOLUME MEAS.
- **3. DIAGNOSTICS**
  - 3.1 ECHO PROFILE
  - 3.2 ELECT. TEMP.
    - 3.2.1 CURR. INTERN. TEMP..
    - 3.2.2 HIGHEST VALUE.
    - 3.2.3 LOWEST VALUE.
- **4. SERVICE**
  - 4.1 MASTER RESET
  - 4.2 REMAIN. DEV. LIFE
    - 4.2.1 LIFETIME EXPECTE..
    - 4.2.2 TIME IN OPER..
    - 4.2.3 REMAIN. LIFETIM..
    - 4.2.4 REMINDER ACTIV.
    - 4.2.5 REMIND. 1 (REQ)
    - 4.2.6 REMIND. 2 (DEM)
    - 4.2.7 MAINT STAT
    - 4.2.8 ACK STATUS
    - 4.2.9 ACK
  - 4.3 REMAIN. SENS. LIFE
    - 4.3.1 LIFETIME EXPECTE..
    - 4.3.2 TIME IN OPER..
    - 4.3.3 REMAIN. LIFETIM..
    - 4.3.4 REMINDER ACTIV.
    - 4.3.5 REMIND. 1 (REQ)
    - 4.3.6 REMIND. 2 (DEM)
    - 4.3.7 MAINT STAT
    - 4.3.8 ACK STATUS
    - 4.3.9 ACK


4. SERVICE (cont'd)
4.4 SERVICE SCHED.
4.4.1 SERV. INTERVAL
4.4.2 TIME LAST SERV.
4.4.3 TIME NEXT SERV.
4.4.4 REMINDER ACTIV.
4.4.5 REMIND. 1 (REQ)
4.4.6 REMIND. 2 (DEM)
4.4.7 MAINT STAT
4.4.8 ACK STATUS
4.4.9 ACK
4.5 CALIB SCHED.
4.5.1 CALIB. INTERNAL
4.5.2 TIME LAST CALIB.
4.5.3 TIME NEXT CALIB.
4.5.4 REMINDER ACTIV.
4.5.5 REMIND. 1 (REQ)
4.5.6 REMIND. 2 (DEM)
4.5.7 MAINT STAT
4.5.8 ACK STATUS
4.5.9 ACK
4.6 MANUF. DATE
4.7 POWERED HOURS
4.8 POWERON RESETS
4.9 LCD FAST MODE
4.10 LCD CONTRAST
4.11 SECONDARY VALUE
4.12 MEM. TEST
5. COMMUNICATION
5.1 DEVICE ADDRESS
6. SECURITY
6.1 REMOTE ACCESS
6.1.1 ACCESS CONTROL
6.2 LOCAL ACCESS
6.2.1 WRITE PROTECT
6.2.2 PIN TO UNLOCK
7. LANGUAGE

Glossary

accuracy

degree of conformity of a measure to a standard or a true value.

algorithm

a prescribed set of well-defined rules or processes for the solution of a problem in a finite number of steps.

ambient temperature

the temperature of the surrounding air that comes in contact with the enclosure of the device.

antenna

an aerial which sends out and receives a signal in a specific direction. There are four basic types of antenna in radar level measurement, horn, parabolic, rod, and waveguide.

attenuation

a term used to denote a decrease in signal magnitude in transmission from one point to another. Attenuation may be expressed as a scalar ratio of the input magnitude to the output magnitude or in decibels.

Auto False-Echo Suppression

a technique used to adjust the level of a TVT to avoid the reading of false echoes. (See TVT.)

Auto-False Echo Suppression Distance

defines the endpoint of the TVT distance. (See TVT.) This is used in conjunction with auto false echo suppression.

beam spreading

the divergence of a beam as it travels through a medium.

beam width

the angle diametrically subtended by the one-half power limits (-3 dB) of the microwave beam.

blanking

a blind zone extending away from the reference point plus any additional shield length.The device is programmed to ignore this zone.

capacitance

the property of a system of conductors and dielectrics that permits the storage of electricity when potential differences exist between the conductors. Its value is expressed as the ratio of a quantity of electricity to a potential difference, and the unit is a Farad.

confidence

see Echo Confidence.

damping

term applied to the performance of a device to denote the manner in which the measurement settles to its steady indication after a change in the value of the level.

dB (decibel)

a unit used to measure the amplitude of signals.

derating

to decrease a rating suitable for normal conditions according to guidelines specified for different conditions.

dielectric

a nonconductor of direct electric current. Many conductive liquids/electrolytes exhibit dielectric properties; the relative dielectric constant of water is 80.

dielectric constant (dK)

the ability of a dielectric to store electrical potential energy under the influence of an electric field. Also known as Relative Permittivity. An increase in the
dielectric constant is directly proportional to an increase in signal amplitude. The value is usually given relative to a vacuum /dry air: the dielectric constant of air is 1.

echo

a signal that has been reflected with sufficient magnitude and delay to be perceived in some manner as a signal distinct from that directly transmitted. Echoes are frequently measured in decibels relative to the directly transmitted signal.

Echo Confidence

describes the quality of an echo. Higher values represent higher quality. Echo Threshold defines the minimum value required for an echo to be accepted as valid and evaluated.

Echo Lock Window

a window centered on an echo in order to locate and display the echo's position and true reading. Echoes outside the window are not immediately processed.

Echo Marker

a marker that points to the processed echo.

Echo Processing

the process by which the radar unit determines echoes.

Echo Profile

a graphical display of a processed echo.

Echo Strength

describes the strength of the selected echo in dB referred to 1 µV rms.

false Echo

any echo which is not the echo from the desired target. Generally, false echoes are created by vessel obstructions.

frequency

the number of periods occurring per unit time. Frequency may be stated in cycles per second.

HART

Highway **A**ddressable **R**emote **T**ransducer. An open communication protocol used to address field instruments.

Hertz (Hz):

unit of frequency, one cycle per second. 1 Gigahertz (GHz) is equal to 10^9 Hz.

horn antenna

a conical, horn-shaped antenna which focuses microwave signals. The larger the horn diameter, the more focused the radar beam.

inductance

the property of an electric circuit by virtue of which a varying current induces an electromotive force in that circuit or in a neighboring circuit. The unit is a Henry.

microwaves

the term for the electromagnetic frequencies occupying the portion of the radio frequency spectrum from 1 GHz to 300 GHz.

multiple echoes

secondary echoes that appear as double, triple, or quadruple echoes in the distance from the target echo.

Near Blanking

see Blanking.

nozzle

a length of pipe mounted onto a vessel that supports the flange.

parameters

in programming, variables that are given constant values for specific purposes or processes.

polarization

the property of a radiated electromagnetic wave describing the time-varying direction and amplitude of the electric field vector.

polarization error

the error arising from the transmission or reception of an electromagnetic wave having a polarization other than that intended for the system.

propagation factor (pf)

where the maximum velocity is 1.0, pf is a value that represents a reduction in propagation velocity as a result of the wave travelling through a pipe or
medium.

pulse radar

a radar type that directly measures distance using short microwave pulses. Distance is determined by the return transit time.

radar

radar is an acronym for **RA**dio **D**etection **A**nd **R**anging. A device that radiates electromagnetic waves and utilizes the reflection of such waves from distant objects to determine their existence or position.

range

distance between a transmitter and a target.

range extension

the distance below the zero percent or empty point in a vessel.

relative humidity

the ratio of the actual amount of moisture in the atmosphere to the maximum amount of moisture the atmosphere could hold (which varies depending on the air temperature).

relative permittivity

see dielectric constant.

repeatability

the closeness of agreement among repeated measurements of the same variable under the same conditions.

sensor value

the value produced by the echo processing which represents the distance from sensor reference point to the target. (see **Sensor Mode (2.2.2.)** for an illustration).

shot

one transmit pulse or measurement.

speed of light

the speed of electromagnetic waves (including microwave and light) in free space. Light speed is a constant 299, 792, 458 meters per second.

stilling-well

see stillpipe.

stillpipe

a pipe that is mounted inside a vessel parallel to the vessel wall, and is open to the vessel at the bottom.

TVT (Time Varying Threshold)

a time-varying curve that determines the threshold level above which echoes are determined to be valid.

two wire radar

a low-energy radar. Can be loop powered, analog, intrinsically safe 4 to 20 mA, or a digital (BUS) transmitter.

waveguide antenna

a hollow, metallic tube that transmits a microwave signal to the product target.

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