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 249) for a chart.

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 59)

The Quick Start wizard provides an easy step-by-step procedure to configure the device for a simple application.

Quick Start (1.)

Note

- Do not use the Quick Start wizard to modify individual parameters. (Perform customization only after the Quick Start has been completed.)
- For access via remote operation see Quick Start Wizard via SIMATIC PDM (Page 62).
- For detailed instructions see Quick Start Wizard via the handheld programmer (Page 45).

Language (1.1.)

Material (1.2.)

Response Rate (1.3.)

Units (1.4.)

Operating Mode (1.5.)

Low Calibration Point (1.6.)

High Calibration Point (1.7.)

Apply? (Apply changes) (1.8.)

Setup (2.)

Note

- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- Values shown in the following tables can be entered via the handheld programmer.

Identification (2.1.)

Tag (2.1.1.)

Note

SITRANS PDM limits the TAG field to a maximum of 24 characters.

Text that can be used in any way. A recommended use is as a unique label for a field device in a plant. Limited to 32 ASCII characters.

Descriptor (2.1.2.)

Text that can be used in any way. Limited to 32 ASCII characters. No specific recommended use.

Message (2.1.3.)

Text that can be used in any way. Limited to 32 ASCII characters. No specific recommended use.

Device (2.2.)

Hardware Revision (2.2.1.)

Read only. Corresponds to the electronics hardware of the Field Device.

Firmware Revision (2.2.2.)

Read only. Corresponds to the software or firmware that is embedded in the Field Device.

Loader Revision (2.2.3.)

Read only. Corresponds to the software used to update the Field Device.

Order Option (2.2.4.)

Read only. Displays the device type.

Sensor (2.3.)

Unit (2.3.1)

Sensor measurement unit.

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

Level Unit (2.3.2.)

Select engineering units for Level.

Options		m, cm, mm, ft, in, %
	*	%

PV Units (volume/level) (2.3.3.)

Note

- A greater selection of volume units is available via SIMATIC PDM.
- Default unit of AIFB1 or 2 is percent.
- You can select a different unit for your application.
- PV (Primary Value): the output from the Level Transducer Block. See Transducer Block function groups (Page 222) and How the Transducer Block works (Page 223) for more details.

Select units for either volume or level.

Level values		m, cm, mm, ft, in
Volume values		liter, gal
Percent value	*	%

Temperature Units (2.3.4.)

Selects the engineering unit to be displayed with the value representing temperature.

Options		DEG C, DEG F, RANKINE, KELVIN
	*	DEG C

Material (2.3.5.)

Automatically configures the device to operate in the chosen application type, by changing one or more of the following parameters: **Propagation Factor (2.5.3.)**, **Position Detect (2.5.7.2.)**, and/or **CLEF Range (2.5.7.4.)**.

Options	*	LIQUID
		LIQUID LOW DK [a] (low dielectric liquid - CLEF algorithm enabled)
Related parameters	Propagation Factor (2.5.3.) Position Detect (2.5.7.2.) CLEF Range (2.5.7.4.)	

[a] dK < 3.0

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

LOE Timer (2.3.6.)

Note

When a Loss of Echo occurs **Value (2.6.9.2.)** determines the material level to be reported when LOE Timer expires. See Loss of Echo (LOE) (Page 210) for more detail.

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

Values	Range: **0** to **720** seconds
	Default: 100 s

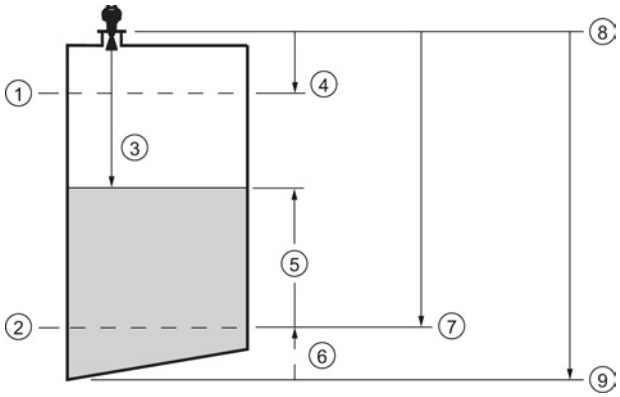
Calibration (2.3.7)

Note

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

Low Calibration Pt. (2.3.7.1.)

Distance from sensor reference point to Low Calibration Point (corresponding to Low Level Point). Units are defined in **Unit (2.3.1.).**



①	High level point (default: 100%)	⑥	Level offset (if used)
②	Low level point (default: 0%)	⑦	Low calibration point [a]
③	Sensor value	⑧	Sensor reference point
④	High calibration point	⑨	Far range
⑤	Level		

[a] Sensor reference point is the point from which level measurement is referenced. See Threaded Horn Antenna with extension (Page 177), Flanged Horn with extension (Page 182), and Flanged encapsulated antenna (3"/DN80/80A sizes and larger). (Page 188)

Values	Range: **0** to **20** m. Default 20.00 m
Related parameters	Unit (2.3.1.), Far Range (2.5.2.)

High Calibration Pt. (2.3.7.2.)

Distance from sensor reference point [1] to High Calibration Point (corresponding to High Level Point). Units are defined in **Unit (2.3.1.).**

Values	Range: **0** to **20** m. Default 0.00 m
Related parameters	Unit (2.3.1.), Near Range (2.5.1.)

When setting the High Calibration Point value, note that echoes are ignored within **Near Range (2.5.1.).**

[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 180) Flanged Horn with extension (Page 184), and Flanged encapsulated antenna (3"/DN80/80A sizes and larger) (Page 188)].

Sensor Offset (2.3.7.3.)

A constant offset that can be added to or subtracted from the sensor value to compensate for a shifted sensor reference point. (For example, when adding a thicker gasket or reducing the standoff/nozzle height.) Sensor value is the value produced by the echo processing which represents the distance from sensor reference point to the target. (see **Calibration (2.3.7.)** for an illustration).The units are defined in **Unit (2.3.1.)**.

Values	Range: **-99.999** to **99.999.** Default: 0.00 m
Related parameters	Units (2.3.1.)

Low Level Point (2.3.7.4.)

The level when the material is at Low Calibration Point. The unit is defined in Level units.

Values	Range: **-999999.00** to **999999.00**. Default: 0%

High Level Point (2.3.7.5.)

The level when the material is at High Calibration Point. The unit is defined in Level units.

Values	Range: **-999999.00** to **999999.00**. Default: 100%

Level Offset (2.3.7.6.)

A constant offset that can be added to Level. The unit is defined in Level units.

Values	Range: **-999999.00** to **999999.00**. Default: 0%

Rate (2.3.8.)

Note

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

Response Rate (2.3.8.1.)

Note

Changing Response Rate resets **Fill Rate (2.3.8.2)**, **Empty rate (2.3.8.3)**, and **Filter Time Constant (2.6.8.1.)**.

Sets the reaction speed of the device to measurement changes.

Response Rate (2.3.8.1.)		Fill Rate (2.3.8.2.)	Empty rate (2.3.8.3.)	Filter Time Constant (2.6.8.1.)
*	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 (2.3.8.2.)

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 (2.3.8.1.)** is altered.

Options	Range: **0 to 99999** m / min.		
	Response rate (2.3.8.1.)		**Fill rate**
	*	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 (2.3.8.1.)		
Related parameters	Level unit (2.3.2.)		

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

Empty Rate (2.3.8.3)

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 (2.3.8.1.)** is altered.

Options	Range: **0 to 999999** m / min.		
	Response Rate (2.3.8.1.)		**Empty Rate**
	*	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 (2.3.8.1)		
Related parameters	Level Unit (2.3.2.)		

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

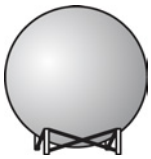
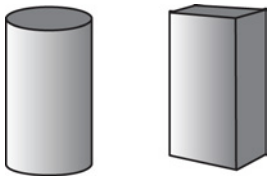
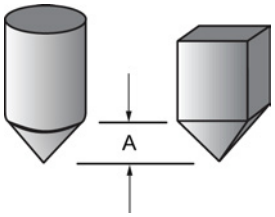
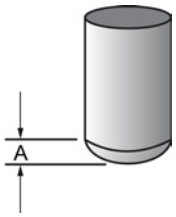
Linearization (2.4.)

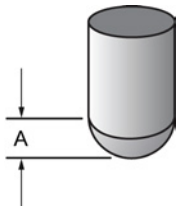
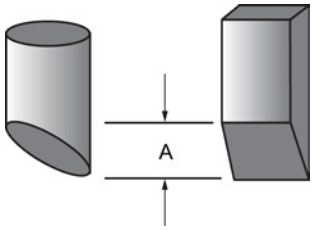
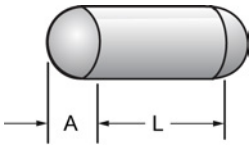
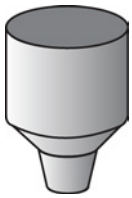
Volume (2.4.1.)

Carries out a volume conversion from a level value.

Vessel Shape (2.4.1.1.)

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 **XY index (2.4.1.5.)**] to be transferred.

Maximum Volume (2.4.1.2.)

The maximum volume of the vessel. Units are defined in **PV Units (volume/ level) (2.3.3.)**. Enter the vessel volume corresponding to High Calibration Point. The volume calculation is based on the maximum volume and scaled according to the vessel shape selected. If no vessel shape is entered, the default is 100, and the reading will be a percentage value.

Values	Range: **0.0000** to **999999**
	Default: 100.0
Related Parameters	Low Calibration Pt. (2.3.7.1.) High Calibration Pt. (2.3.7.2.) Vessel Shape (2.4.1.1.)

For readings in volumetric units instead of percentage values:

1. Select a volumetric unit from **PV Units (volume/level) (2.3.3.)**.
2. Enter the vessel volume corresponding to High Calibration Point.

Dimension A (2.4.1.3.)

The height of the vessel bottom in Level Units 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 (2.4.1.1.)** for an illustration.

Values	Range: **0.0000** to **999999** in Level Units
	Default: 0.0
Related Parameters	Vessel Shape (2.4.1.1.)

Dimension L (2.4.1.4.)

Length of the cylindrical section of a horizontal parabolic end vessel, in Level Units. See **Vessel Shape (2.4.1.1.)** for an illustration.

Values	Range: **0.0000** to **999999** in Level Units
	Default: 0.0
Related Parameters	Vessel Shape (2.4.1.1.)

XY index (2.4.1.5.)

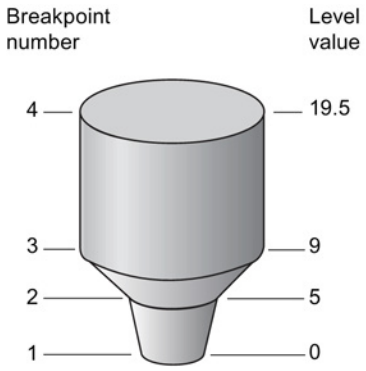
Level/Volume breakpoints allow you to define a complex vessel shape as a series of segments. A value is assigned to each level breakpoint and a corresponding value is assigned to each volume breakpoint.

Volume values are defined in volume units and can be percent or volumetric; level values are defined in level units, and can be percent or linear. See **Level Unit (2.3.2.)** and **PV Units (volume/level) (2.3.3.)**.

Level values	Range: **-999999.00** to **999999.00** (m, cm, mm, ft, in, %)
	Default: 0.0
Volume values	Range: **-999999.00** to **999999.00** (% or volumetric units)
	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.

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

Entering breakpoints via the hand-held programmer:

1. The default for level values is percent: if you want to select units instead, navigate to **Setup (2.) > Sensor (2.3.) > Level Unit (2.3.2.)**, and select the desired unit.
2. Navigate to **Setup (2.) > Sensor (2.3.) > PV Units (volume/level) (2.3.3.)**, and select the desired volume units.
3. Go to **XY index (2.4.1.5.)** and enter the number of the breakpoint you wish to adjust: for example, for breakpoint **1** enter **1**.
4. Go to **X value (2.4.1.6.)** and enter the level value for the breakpoint just identified.
5. Go to **Y value (2.4.1.7.)** and enter the volume value for the breakpoint just identified.
6. Repeat steps 3 to 5 until values have been entered for all required breakpoints.

X value (2.4.1.6.)

Y value (2.4.1.7.)

Signal Processing (2.5.)

Note

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

Near Range (2.5.1.)

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 177) for antenna heights.]

Values	Range: **0** to **20** m (0 to 65.6 ft)	
	Default depends on antenna type and process connection.	
	Examples:	1.5" threaded horn 185.3 mm (7.3")
		4" horn with stainless steel flange
		100 mm (4") extension 373.3 mm (14.7")
Related parameters	Units (2.3.1.)	

Far Range (2.5.2.)

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 **Low Calibration Pt. (2.3.7.1.)** 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 (2.3.1.)

Use this feature if the measured surface can drop below the Low calibration point in normal operation.

Propogation Factor (2.5.3.)

Note

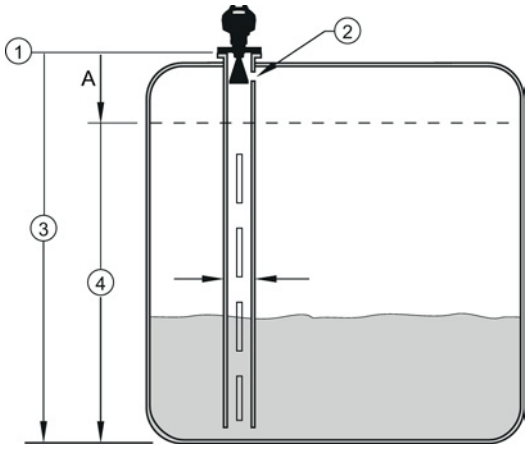
- When operating in a stillpipe, values for **CLEF Range (2.5.7.4.)**, and for the propagation factor, should be set according to the pipe size. See the table below.
- For reliable results, the antenna size must be close to the pipe size.

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 (2.5.7.4.)	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 2.5.7.4.

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).

Minimum Sensor Value (2.5.4.)

The minimum recorded Sensor value in units defined in **Unit (2.3.1.)**.

1. Open the menu **View – Device Diagnostics**, select Device Status, and click on the **Device Status** tab.
2. Check **Sensor Peak Values**.

Maximum Sensor Value (2.5.5.)

The maximum recorded Sensor value in units defined in **Unit (2.3.1.)**.

1. Open the menu **View – Device Diagnostics**, select Device Status, and click on the **Device Status** tab.
2. Check **Sensor Peak Values**.

Shots (2.5.6.)

The number of echo profile samples averaged to produce a measurement.

Values	Range: **1** to **25**
	Default: 25

Echo Select (2.5.7.)

Algorithm (2.5.7.1.)

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 (2.5.7.2.)

Note

If a stillpipe is used, the setting for CLEF range is determined by the horn size: see **CLEF Range (2.5.7.4.)** for a table of values.

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 (2.5.7.4.)

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 (2.5.7.4.)** to 0.5 m (1.64 ft).

Echo Threshold (2.5.7.3.)

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 (2.5.9.1.)** exceeds **Echo Threshold (2.5.7.3.)**, the echo is accepted as a valid echo and is evaluated.

Values	Range: **0** to **99**
	Default: 5
Related Parameters	Timer (2.3.6.)

Use this feature when an incorrect material level is reported.

CLEF Range (2.5.7.4.)

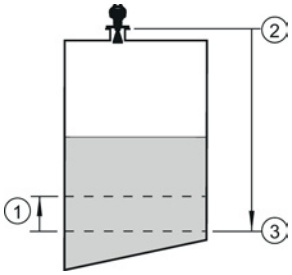
Note

CLEF Range is referenced from Low Calibration Point (process empty level).

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 206).

Values	Range: **0** to **20** m (0 to 65.6 ft)
	Default: 0.0 m
Related parameters	Position Detect (2.5.7.2.)



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 (2.5.7.2.)** to Hybrid.

Sampling (2.5.8.)

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 (2.5.8.1.)

Note

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

Selects the measurement verification process. See **Echo Lock (2.5.8.1.)** for more details.

Options		Lock Off (no verification)
		Maximum Verification (not recommended for radar)
	*	Material Agitator
		Total Lock (not recommended for radar)
Related parameters		Fill Rate (2.3.8.2.) Empty rate (2.3.8.3.) Sampling up (2.5.8.2.) Sampling down (2.5.8.3.)

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

Sampling Up (2.5.8.2.)

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 (2.5.8.3.)

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 (2.5.9.)

Confidence (2.5.9.1.)

Indicates echo reliability: higher values represent better echo quality. The display shows the echo confidence of the last measurement. **Echo Threshold (2.5.7.3.)** defines the minimum criterion for echo confidence.

Values (view only)	**0** to **99**	
	----	Shot not used
Related Parameters	Echo Threshold (2.5.7.3.)	

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

Echo Strength (2.5.9.2.)

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

Values (view only)	**-22** to **99**

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

TVT Setup (2.5.10.)

Note

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

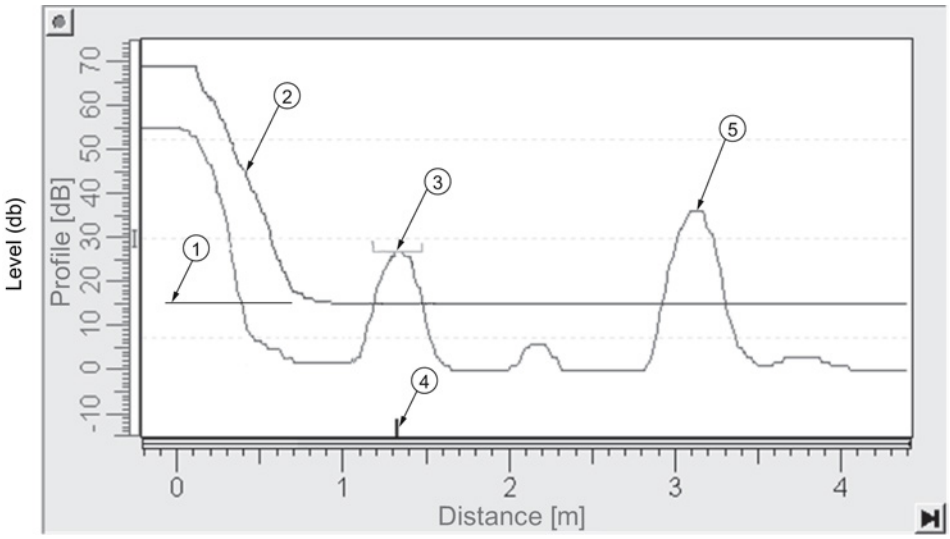
Auto False Echo Suppression (2.5.10.1.)

Used together with **Auto False Echo Suppression Range (2.5.10.2.)** 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 202) for a more detailed explanation.

Note

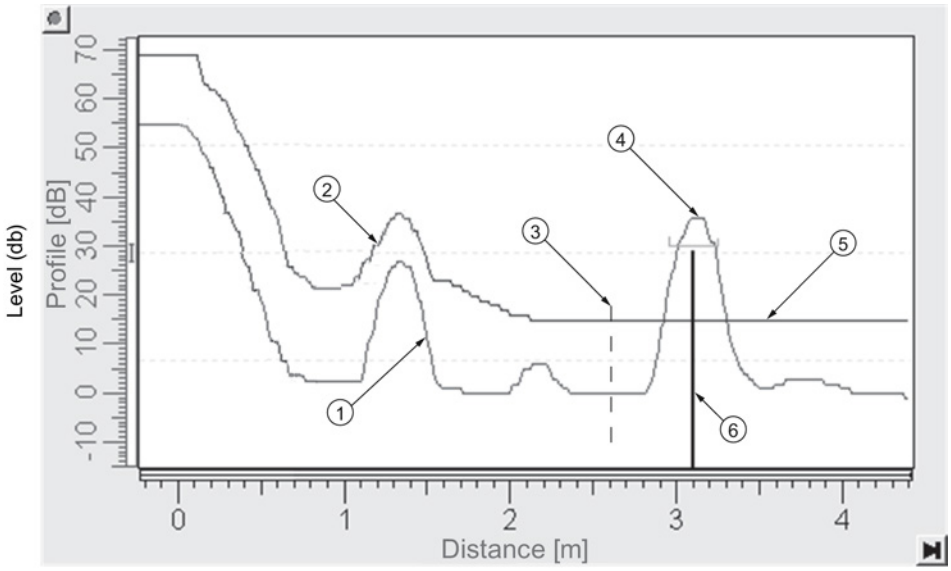
- Make sure material level is below all known obstructions when Auto False Echo Suppression is used to learn the echo profile. (An empty or almost empty vessel is recommended.)
- Note the distance to material level when Auto False Echo learns the environment. Set Auto False Echo Suppression Range to 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 device 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

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 207).

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.

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 (2.5.10.2.)** and enter the value calculated in step 2.
4. Go to **Auto False Echo Suppression (2.5.10.1.)** 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.

Auto False Echo Suppression Range (2.5.10.2.)

Defines the endpoint of the Learned TVT distance. Units are defined in **Unit (2.3.1.)**.

Values	Range: **0.00** to **20.00** m
	Default: 1.00 m

1. Press **RIGHT arrow** to open Edit mode.
2. Enter the new value and press **RIGHT arrow** to accept it.
3. Set **Auto False Echo Suppression (2.5.10.1.)**.

Hover Level (2.5.10.3.)

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 (2.5.10.1.)** 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 (2.5.10.4.)

Enables/disables **TVT shaper (2.5.11.)**

Options		ON
	*	OFF

TVT shaper (2.5.11.)

Note

- The range is –50 to 50 dB.
- **Shaper Mode (2.5.10.4.)** 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 72).

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

1. Go to **Shaper Mode (2.5.10.4.)** and select **ON**.
2. In TVT shaper, go to **Breakpoints 1-9 (2.5.11.1.)**.
3. Open Breakpoint 1 and enter the TVT Offset value (between –50 and 50 dB).
4. Go to the next Breakpoint and repeat step 3 until all desired breakpoint values have been entered.

Breakpoint 1-9 (2.5.11.1.)

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

Breakpoint 10-18 (2.5.11.2.)

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

Breakpoint 19-27 (2.5.11.3.)

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

Breakpoint 28-36 (2.5.11.4.)

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

Breakpoint 37-40 (2.5.11.5.)

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

AIFB1 (2.6.)

Note

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

Static Revision No. (2.6.1.)

The revision level of the static data associated with Analog Input Function Block 1. The Static Revision No. is updated whenever a configuration parameter is changed.

Actual mode (2.6.2.)

Used to request an operating mode from the Analog Input Function Block.

Options	*	Auto Mode (AUTO)
		Manual Mode (MAN)
		Out of Service (O/S)

Allows you to put the SITRANS LR250 into Out of Service Mode and then reset it to Auto Mode.

Manual Mode is used in conjunction with Simulation. See Simulation (Page 79). It should be used only with SIMATIC PDM in order to benefit from all the features available.

Channel (2.6.3.)

Used to select between the different Level Transducer Block outputs.

Options		Level/Volume, Level, Distance
	*	Level/Volume

Label (2.6.4.)

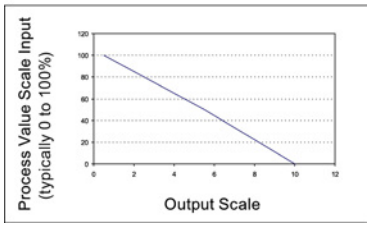
User defined label.

Input Scaling (2.6.5.)

Upper Value (2.6.5.1.)

Defines the operational upper range value of the input value (Process Value Scale) in PV (volume/level) Units. Process Value Scale normalizes the input value to a customer-defined range.

Values	Range: **-999999** to **999999**
	Default: 100%



Provides Output values (Out) to AIFB1 or AIFB2

Lower Value (2.6.5.2.)

Defines the operational lower range value of the input value (Process Value Scale) in PV (volume/level) Units. Process Value Scale normalizes the input value to a customer-defined range.

Values	Range: **-999999** to **999999**
	Default: 0%

Output Scaling (2.6.6.)

Scales the Process Variable. The function block parameter OUT SCALE contains the values of the lower limit and upper limit effective range in AIFB1 units.

Upper Value (2.6.6.1.)

Defines the operational upper range value of the output value in AIFB1 units.

Values	Range: **-999999** to **999999**
	Default: 100%

Lower Value (2.6.6.2.)

Defines the operational lower range value of the output value in AIFB1 units.

Values	Range: **-999999** to **999999**
	Default: 0%

Alarms and Warnings (2.6.7.)

Upper Limit Alarm (2.6.7.1.)

The setting for the upper alarm limit in AIFB1 units.

Values	Range: **-999999** to **999999**
	Default: 999999

Upper Limit Warning (2.6.7.2.)

The setting for the upper warning limit in AIFB1 units.

Values	Range: **-999999** to **999999**
	Default: 999999

Lower Limit Warning (2.6.7.3.)

The setting for the lower warning limit in AIFB1 units.

Values	Range: **-999999** to **999999**
	Default: -999999

Lower Limit Alarm (2.6.7.4.)

The setting for the lower alarm limit in AIFB1 units.

Values	Range: **-999999** to **999999**
	Default: -999999

Limit Hysteresis (2.6.7.5.)

Hysteresis is used to adjust the sensitivity of the trigger for alarm messages. It is used to compensate when a process variable fluctuates around the same value as a limit. A high level alarm occurs when a value exceeds an upper limit. The alarm's status remains true until the value drops below the limit minus the alarm hysteresis. The directions are reversed for low limit detection.

Values	Range: **-999999** to **999999**
	Default: 0.50

Enter a value for the hysteresis here, to be used for all warnings and alarms. The units are the same as the Output scale, i.e. AIFB1 units.

Display (2.6.8.)

Filter Time Constant (2.6.8.1.)

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 210) for more detail.

Values	Range: **0** to **600** s
	Default: 10 s

Unit (2.6.8.2.)

Note

Additional units are available in SIMATIC PDM.

Engineering unit to be displayed with the output value.

Values		m, cm, mm, ft, in, cu m, L, HL, cu in, cu ft, cu yd, gal, imp gal, bushels, Bbl, Bbl liquid, percent, PA, Follow out unit
	*	percent

Out Unit Text (2.6.8.3.)

If the desired unit is not listed in **Unit (2.6.8.2.)** you can define it in **Out Unit Text (2.6.8.3.)**.

Decimal point (2.6.8.4.)

The number of digits to display after the decimal point. (The LCD is limited to displaying two decimal places in Measurement mode. In SIMATIC PDM up to seven decimal places may be used to display measured values.)

Options	Range: 0, 1, 2, 3, 4, 5, 6, 7
	Default: 2

Fail-safe Mode (2.6.9.)

Mode (2.6.9.1.)

Fail-safe Mode occurs if the status of the input value is bad, or if the device has been put into Fail-safe mode using Simulation. **Mode** defines the material level to be reported when the LOE (Loss of Echo) timer expires.

Options		**SUB VALUE**	Substitute value. Value (2.6.9.2.) used as output value.
	*	**LAST VALUE**	Last value. (Store last valid output value).
		USE BAD VALUE	Use bad value. (Calculated output value is incorrect).

Value (2.6.9.2.)

Note

Fail-safe Mode (2.6.9.) must be set to **Substitute Value** before **Value (2.6.9.2.)** can be defined.

User-defined default for the Output Value, if sensor or sensor electronic fault is detected. Units are defined in **Unit (2.6.8.2.)**.

Values	Range: **-999999** to **999999**
	Default: 0

AIFB2 (2.7.)

See **AIFB1 (2.6.):** the parameters for AIFB2 are identical.

Measured Values (2.8.)

Read only. Allows you to view measured values for diagnostic purposes. In SIMATIC PDM, open the menu **View – Process Variables**.

Main Output (PV - Primary Value) (2.8.1.)

The value for level, or volume (if volume conversion is selected).

Output, no linearization (SV1 - Secondary Value 1) (2.8.2.)

The value for level.

Output, no level offset (SV2 - Secondary Value 2) (2.8.3.)

The value for distance.

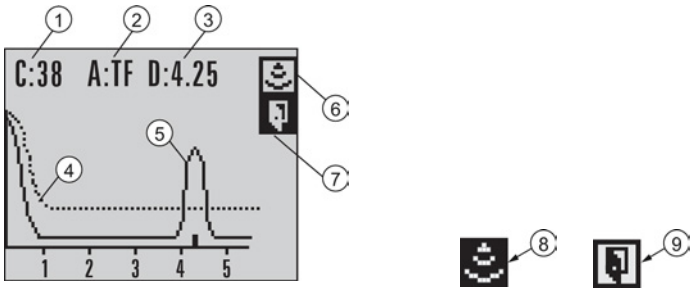
Diagnostics (3.)

Echo Profile (3.1.)

To request a profile via SIMATIC PDM:

Open the menu **Device – Echo Profile Utilities**. [See Echo Profile Utilities via SIMATIC PDM (Page 69) for more detail.]

To request a profile via the handheld programmer:



①	Echo confidence value	⑥	Measure icon, deselected
②	Algorithm selection (tFirst echo)	⑦	Exit icon, selected
③	Distance value	⑧	Measure icon, selected
④	TVT curve	⑨	Exit icon, deselected
⑤	Material level		

1. Navigate to **Level Meter > Diagnostics (3.) > Echo Profile (3.1.)**.
2. Press **RIGHT arrow** to request a profile. [See Requesting an Echo Profile (Page 48) for more details.]

Fault Reset (3.2.)

Clears the following faults:

Fault code	Description
S3	Device Lifetime Reminder 1 (Maintenance Required)
S4	Device Lifetime Reminder 2 (Maintenance Demanded)
S6	Sensor Lifetime Reminder 1 (Maintenance Required)
S7	Sensor Lifetime Reminder 2 (Maintenance Demanded)
S8	Device Service Reminder 1 (Maintenance Required)
S9	Device Service Reminder 2 (Maintenance Demanded)
S12	Internal Temperature High
S17	Calibration Schedule Reminder 1 (Maintenance Required)
S18	Calibration Schedule Reminder 2 (Maintenance Demanded)

To clear a fault using the handheld programmer:

- Enter the fault code number then press **RIGHT arrow**.

To clear a fault via SIMATIC PDM:

1. Open the menu **Device – Acknowledge Faults**.
2. Select the fault to be cleared from the pull-down menu in Extended Diagnostics.
3. Click on **Transfer** to clear the fault.

Electronics Temperature (3.3.)

Minimum Value (3.3.1.)

The minimum recorded internal electronics temperature of the SITRANS LR250.

Maximum Value (3.3.2.)

The maximum recorded internal electronics temperature of the SITRANS LR250.

Condensed Status (3.4.)

When **Enable (3.4.1.)** is enabled, you can select the level of severity of errors, and tailor a device response appropriate for your particular process.

- In **Event Index (3.5.1.)** you can select a particular event or error by means of its index number.
- In **Event Status (3.5.2.)** you can assign a status to the selected event.
- In **Event Diagnosis (3.5.3.)** you can assign a diagnosis to the selected event.

Enable (3.4.1.)

Note

When cyclic communication is in progress, Condensed Status Mode cannot be changed.

Options		NO (disabled)
	*	YES (enabled)

Select **Yes** or **No** to enable/disable Condensed Mode.

Features supported (3.4.2.)

Read only. Features supported are:

- Condensed Diagnostics
- Extended Diagnostics
- Application Relationships

Features enabled (view only) (3.4.3.)

Read only. Lists those features that have been enabled.

Allocation (3.5.)

Event Index (3.5.1.)

The numeric component of the Event Code for a Condensed Status event. Use the index number to identify a particular event in the list below.

Event index	Event code	Event description[a)]
0	S0	Loss of Echo
2	S2	No Tech Power
10	S10	Level Transducer Block (LTB) Scale
11	S11	Internal Temperature Sensor
12	S12	Internal Temperature High
14	S14	AIFB1 PV Range
15	S15	AIFB2 PV Range
28	S28	Memory RAM
29	S29	Memory EEPROM
30	S30	Memory EEPROM Flags
31	S31	Memory Flash
33	S33	Internal Temperature Calibration
34	S34	Velocity Calibration
35	S35	Receiver Init Calibration
36	S36	Receiver Calibration
37	S37	Technology Module Calibration
38	S38	Technology Module Ramp

[a)] See General Fault Codes (Page 163) for the meaning of each event.

For example:

Event Code for Loss of Echo = S0
Event Index = 0

To select a particular event via the handheld programmer:

1. Go to **Enable (3.4.1.)** and select **Yes** to enable Condensed Mode.
2. Go to **Event Index (3.5.1.)** and enter the event index number corresponding to the event.

To select a particular event via SIMATIC PDM:

1. Go to **Diagnostics > Condensed Status Setup > Condensed Status Mode** and select **Yes** to enable Condensed Mode.
2. Go to **Diagnostics > Condensed Status**.
3. For each event, you can select either the Status or the Diagnosis line, then choose a Status or Diagnosis option from the associated pull-down menu.

Event Status (3.5.2.)

Event Status allows you to assign one of the status options listed below, to any of the events listed in **Event Index (3.5.1.).** This allows you to tailor a device response appropriate for your particular process. (Event status affects Condensed status). See Condensed Status (Page 235) for more details.

Event Status options	
	Good
	Good: maintenance required
	Good: maintenance demanded
	Uncertain: maintenance demanded
*	Bad: maintenance alarm
	Uncertain: process related, no maintenance
	Bad: process related, no maintenance
	Bad: function check/local override
	Good: function check

To assign a status to a particular event via the handheld programmer:

1. Go to **Enable (3.4.1.)** and select **Yes** to enable Condensed Mode.
2. Go to **Event Index (3.5.1.)** and enter the event index number corresponding to a particular event.
3. Go to **Event Status (3.5.2.)** and choose a Status option from the table above.

To assign a status to a particular event via SIMATIC PDM:

1. Go to **Level Meter > Diagnostics > Condensed Status Setup**, select **Yes** to enable Condensed Status Mode.
2. Go to **Level Meter > Diagnostics > Condensed Status**.
3. Select the Status line for the selected Event, then choose a Status option from the associated pull-down menu.

Event Diagnosis (3.5.3.)

Allows you to assign one of the diagnostic options listed below to any of the events listed in **Event Index (3.5.1.)**. This allows you to tailor a device response appropriate for your particular process.(Event Diagnosis affects Condensed Acyclic Diagnostics and Cyclic Extended Diagnostics). See Condensed Mode Diagnosis (Page 239) for more detail.

	Event Diagnosis Options
	Status OK
	Maintenance Required
	Maintenance Demanded
*	Maintenance alarm
	Invalid process conditions
	Function check or simulation

To assign a diagnosis to a particular event via the handheld programmer:

1. Go to **Enable (3.4.1.)** and select **Yes** to enable Condensed Mode.
2. Go to **Event Index (3.5.1.)** and enter the event index number corresponding to a particular event.
3. Go to **Event Diagnosis (3.5.3.)** and choose a Diagnosis option from the table above.

To assign a status to a particular event via SIMATIC PDM:

1. Go to **Level Meter > Diagnostics > Condensed Status Setup**, and select **Yes** to enable Condensed Status Mode.
2. Go to **Level Meter > Diagnostics > Condensed Status**.
3. Select the Diagnosis line for the selected Event, then choose a Diagnosis option from the associated pull-down menu.

Peak Values (3.6.)

To view via SIMATIC PDM:

Open the menu **View – Device Diagnostics**, select **Device Status**, and click on the tab **Device Status**. For more details see Device Diagnostics (Page 86).

Min. Measured Value (3.6.1.)

The minimum recorded Sensor value, reported in units defined in **Unit (2.3.1.)**.

Max. Measured Value (3.6.2.)

The maximum recorded Sensor value, reported in units defined in **Unit (2.3.1.)**.

Minimum Output Value - AIFB1 (3.6.3.)

The minimum recorded Output Value from the Analog Input Function Block 1.

Maximum Output Value - AIFB1 (3.6.4.)

The maximum recorded Output Value from the Analog Input Function Block 1.

Minimum Output Value - AIFB2 (3.6.5.)

The minimum recorded Output Value from the Analog Input Function Block 2.

Maximum Output Value - AIFB2 (3.6.6.)

The maximum recorded Output Value from the Analog Input Function Block 2.

Service (4.)

Note

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

Master Reset (4.1.)

Note

Following a Factory Reset, some degree of reprogramming may be required, depending on the option chosen below.

Reset options	Result
Factory Defaults	Resets all user parameters to the manufacturer's default settings, with certain exceptions. The list of exceptions includes, but is not limited to: • Tag • Message • Descriptor • Installation Data • Device Address • Write Protection • Auto False Echo Suppression Range • learned TVT
Standard Defaults	Resets all resettable parameters excluding device addresses to the PROFIBUS standard default settings.
Informational	Resets Tag parameter.
Functional	Resets parameters that control device behavior and functionality (such as calibration points)
Warm Start	Has the same effect as recycling power to the device
Reset Address to 126	Resets the PROFIBUS device address to 126 If the address lock was on, will disable the lock.

To access via SIMATIC PDM:

Open the menu **Device – Master Reset**. For more detail see Master Reset (Page 82).

To perform a reset via the handheld programmer:

1. Press **RIGHT Arrow** to open Edit Mode then scroll down to the desired Reset option and press **RIGHT Arrow** to select it.
2. Press **LEFT Arrow** to exit.

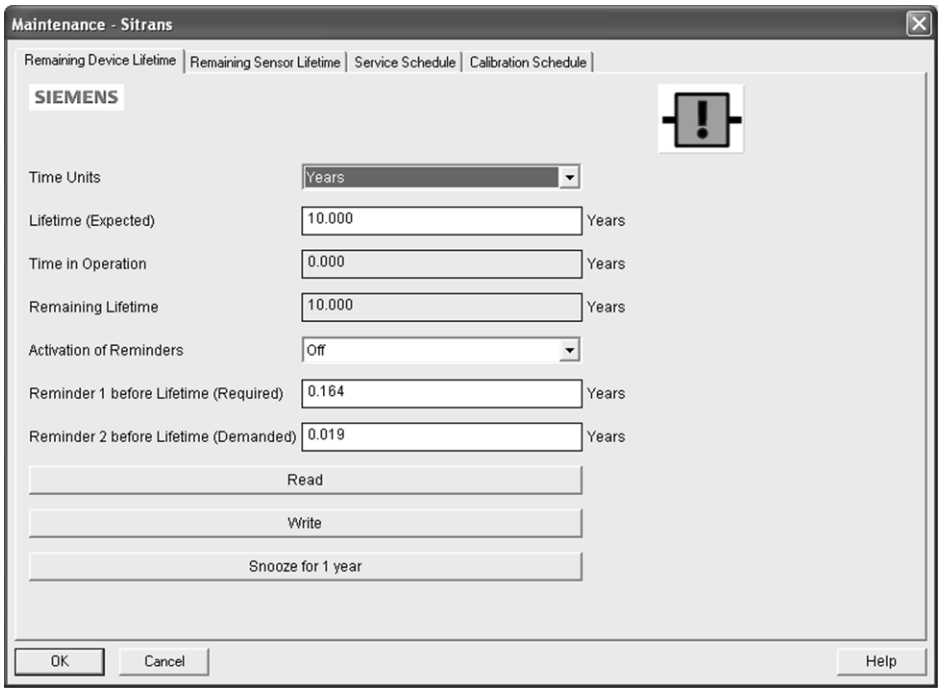
Remaining Device Lifetime (4.2.)

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 Service/Calibration 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 alarms are communicated via the Status byte. 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

Note: The device always operates in years. Changing the units affects only the parameter view of the Remaining Device Lifetime 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 (4.2.2.)

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.).**

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

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

Reminder 1 (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 **20** years
	Default: 0.164 years

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

Reminder 2 (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 **20** years
	Default: 0.019 years

1. Modify limit values as required.
2. Set **Reminder Activation (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 Diagnostics,** select **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 Diagnostics,** select **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 Diagnostics,** select **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:

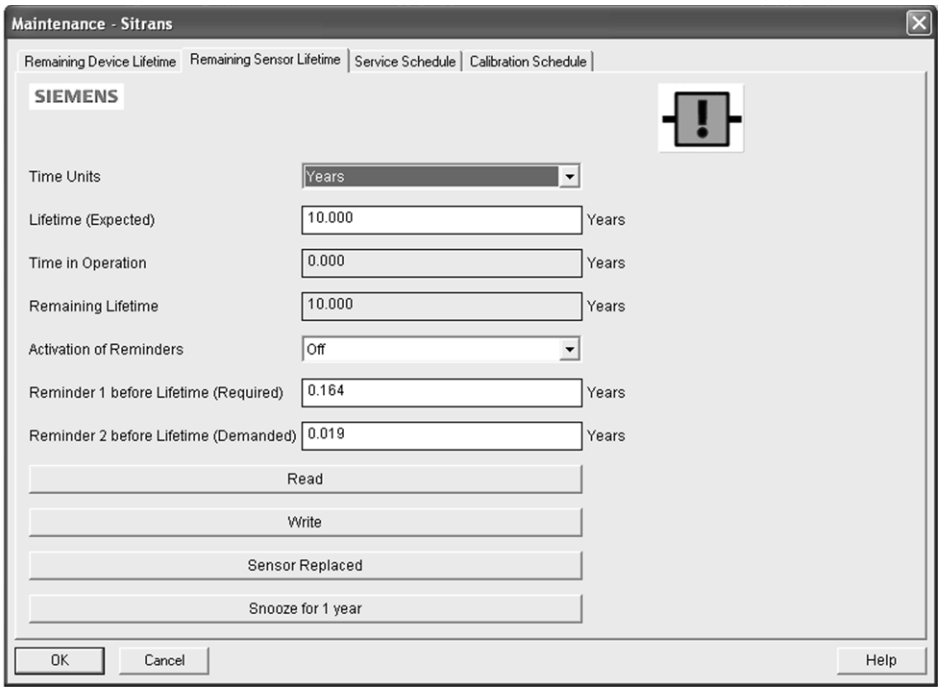
1. Press **RIGHT arrow** twice to open parameter view and activate **Edit** Mode.
2. Press **RIGHT arrow** to acknowledge the reminder.

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.)**.

Reminder Activation (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 (Required) (4.3.5.)**/**Reminder 2 (Demanded) (4.3.6.)**.
2. Select the desired **Reminder Activation** option.

Reminder 1 (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 **20** years
	Default: 0.164 years

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

Reminder 2 (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 **20** years
	Default: 0.019 years

1. Modify values as required.
2. Set **Reminder Activation (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 Diagnostics,** select **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 Diagnostics,** select **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 Diagnostics,** select **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

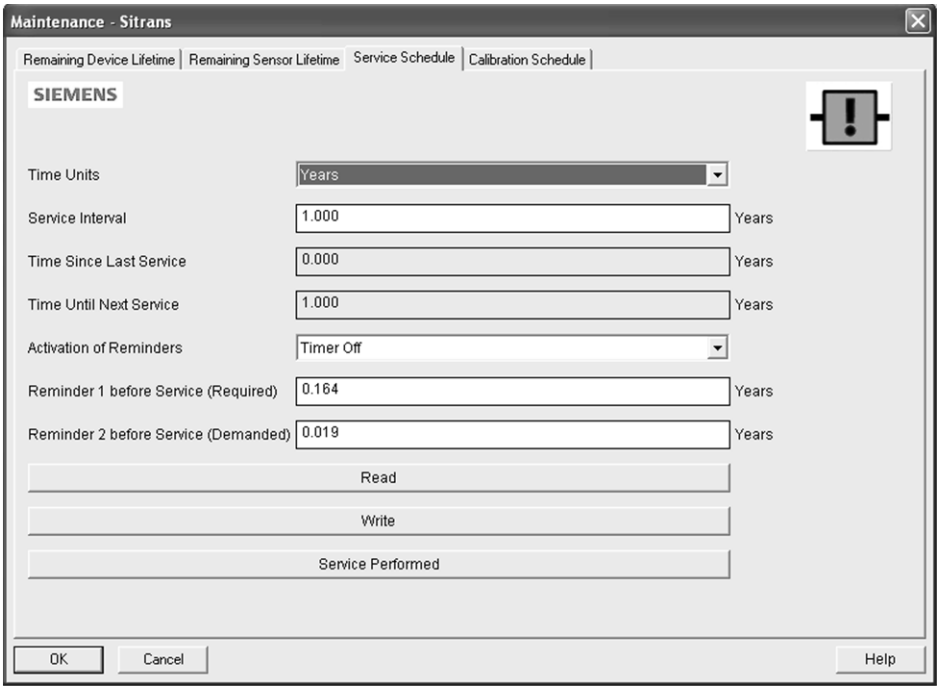
- Four sets of parameters allow you to monitor the Device/Sensor Lifetimes and set up Service/Calibration schedules, based on operating hours instead of a calendar-based schedule. See also **Remaining Device Lifetime (4.2.)**, **Remaining Sensor Lifetime (4.3.)**, and **Calibration Schedule (4.5.)**.
- 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 alarms are communicated via the Status byte. 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.)**.

Reminder Activation (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 (Required) (4.4.5.)**/**Reminder 2 (Demanded) (4.4.6.)**.
2. Select the desired **Reminder Activation** option.

Reminder 1 (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 **20** years
	Default: 0.164 years

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

Reminder 2 (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 Demanded** reminder.

Values	Range: **0** to **20** years
	Default: 0.019 years

1. Modify values as required
2. Set **Reminder Activation (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 Diagnostics,** select **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 Diagnostics,** select **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 Diagnostics,** select **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.)

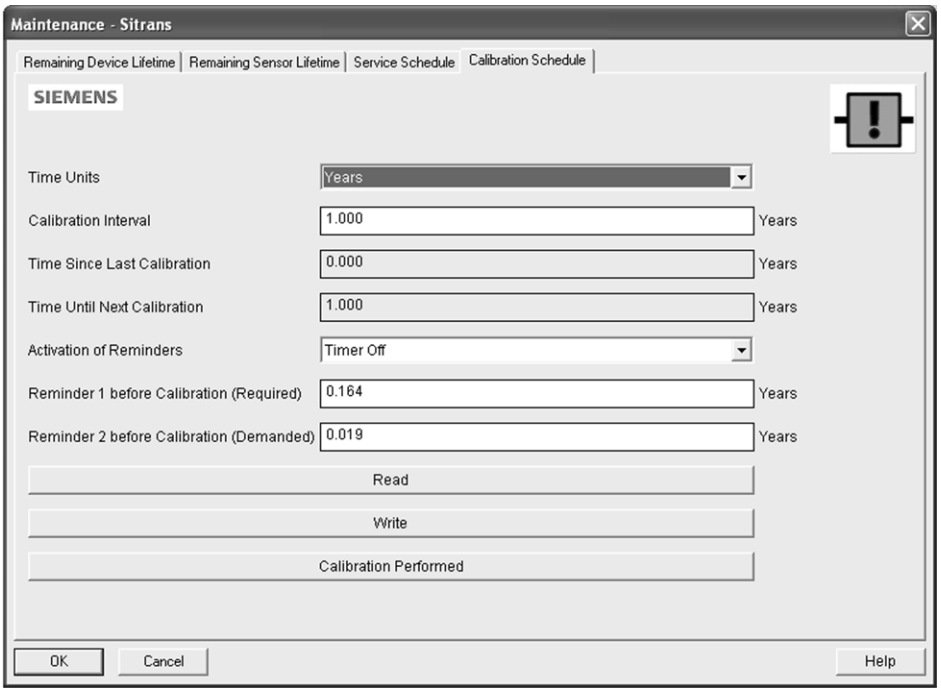
Note

- 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 Service/Calibration 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 the Calibration Interval 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.)**.

Reminder Activation (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 (Required) (4.5.5.)**/**Reminder 2 (Demanded) (4.5.6.)**.
2. Select the desired **Reminder Activation** option.

Reminder 1 (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 **20** years
	Default: **0.164** years

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

Reminder 2 (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 **20** years
	Default: **0.019** years

1. Modify values as required.
2. Set **Reminder Activation (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 Diagnostics,** select **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 Diagnostics,** select **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 Diagnostics,** select **Device Status** and click on the **Maintenance** tab.
2. In the **Calibration 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**
	*	**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 different temperatures and in light conditions. Change the value in small steps to ensure you can continue to read the display.

Communication (5.)

Note

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

Device Address (5.1.)

Note

The address can be changed and locked from a remote master. See PROFIBUS address (Page 231) for details on disabling the address lock and **Master Reset (4.1.)** to reset Device Address to 126.

Sets the unique address of the device on the network (also called PROFIBUS address).

Values	**0** - **126**. Default: 126

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.**

To change Device Address via the handheld programmer:

See Device Address (Page 49) for details.

PROFIBUS Ident Number (5.2.)

Identifies the device on the network. The Ident Number must match that in the GSD file (the GSD file provides information on the device to the master).

Options		**STD PROFILE**	Standard Profile (uses generic GSD for 2 AIFB) [ident # = 0x9701]
	*	**MANUFACTURER**	Manufacturer-specific (uses Siemens EDD and GSD file, which identifies the LR250 PROFIBUS PA [ident # = 0x8150]
		STD – AIFB 1 ONL.	Standard Profile AIFB 1 only (uses generic GSD for 1 AIFB) [ident # = 0x9700]

Security (6.)

Note

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

Remote Access (6.1.)

Remote Lockout (6.1.1.)

Note

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

Enables or disables programming via the network and PDM.

Options	*	OFF (Remote operation enabled)
		ON (Remote operation disabled)

Local Access (6.2.)

Write Protection (6.2.1.)

Note

Do not lose this number value.

Prevents any changes to parameters via PDM or the hand-held programmer.

Hand-held programmer values	Range: **0** to **99999.** Default: Off	
	2457 (unlock value)	Off (enables programming)
	any other value	On (disables programming)

Local Operation (6.2.2.)

Enables or disables programming via the hand-held programmer.

Options	*	ENABLED
		DISABLED

In SIMATIC PDM, open the menu **Device – Write Locking**, select **On** or **Off**, and click on **Transfer**.

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 93).

Event Status (3.5.2.)
Event Diagnosis (3.5.3.)
Fail-safe Mode (2.6.9.)
Far Range (2.5.2.)
Fault Reset (3.2.)
Fill Rate (2.3.8.2.)
Filter Time Constant (2.6.8.1.)
Firmware Revision (2.2.2.)
Hardware Revision (2.2.1.)
High Calibration Pt. (2.3.7.2.)
High Level Point (2.3.7.5.)
Hover Level (2.5.10.3.)
Identification (2.1.)
Input Scaling (2.6.5.)
Label (2.6.4.)
Language (7.)
LCD Contrast (4.10.)
LCD Fast Mode (4.9.)
Level Offset (2.3.7.6.)
Level Unit (2.3.2.)
Limit Hysteresis (2.6.7.5.)
Linearization (2.4.)
Loader Revision (2.2.3.)
Local Access (6.2.)
Local Operation (6.2.2.)
LOE Timer (2.3.6.)
Low Calibration Pt. (2.3.7.1.)
Lower Limit Warning (2.6.7.3.)
Lower Limit Alarm (2.6.7.4.)
Low Level Point (2.3.7.4.)
Main Output (PV– Primary Value) (2.8.1.)
Material (2.3.5.)

Master Reset (4.1.)
Max. Measured Value (3.6.2.)
Maximum Output Value - AIFB1 (3.6.4.)
Maximum Output Value - AIFB2 (3.6.6.)
Maximum Sensor Value (2.5.5.)
Maximum Value (3.3.2.)
Maximum Volume (2.4.1.2.)
Measured Values (2.8.)
Message (2.1.3.)
Min. Measured Value (3.6.1.)
Minimum Output Value - AIFB1 (3.6.3.)
Minimum Output Value - AIFB2 (3.6.5.)
Minimum Sensor Value (2.5.4.)
Minimum Value (3.3.1.)
Mode (2.6.9.1.)
Near Range (2.5.1.)
Order Option (2.2.4.)
Output, no level offset (SV2 – Secondary Value 2) (2.8.3.)
Output, no linearization (SV1 – Secondary Value 1) (2.8.2.)
Output Scaling (2.6.6.)
Peak Values (3.6.)
Position Detect (2.5.7.2.)
Powered Hours (4.7.)
Power-on Resets (4.8.)
PROFIBUS Ident Number (5.2.)
Propagation Factor (2.5.3.)
PV Units (volume/level) (2.3.3.)
Quick Start (1.)
Rate (2.3.8.)
Remaining Device Lifetime (4.2.)
Remaining Sensor Lifetime (4.3.)
Remote Access (6.1.)

Remote Lockout (6.1.1.)
Response Rate (2.3.8.1.)
Sampling (2.5.8.)
Sampling down (2.5.8.3.)
Sampling up (2.5.8.2.)
Sensor (2.3.)
Sensor Offset (2.3.7.3.)
Service Schedule (4.4.)
Shaper Mode (2.5.10.4.)
Shots (2.5.6.)
Signal Processing (2.5.)
Static Revision No. (2.6.1.)
Tag (2.1.1.)
Temperature Units (2.3.4.)
TVT setup (2.5.10.)
TVT shaper (2.5.11.)
Upper Limit Warning (2.6.7.2.)
Upper Limit Alarm (2.6.7.1.)
Unit (2.3.1.)
Value (2.6.9.2.)
Vessel Shape (2.4.1.1.)
Volume (2.4.1.)
Write Protection (6.2.1.)
XY index (2.4.1.5.)
X value (2.4.1.6.)
Y value (2.4.1.7.)

Service and maintenance

9

9.1 Maintenance

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.

9.2 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.

9.3 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

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 Acyclic Extended Diagnostics (General Fault Codes) (Page 240) for a detailed list.
2. Verify that the wiring connections are correct.
3. Check the PROFIBUS address and make sure all devices are at unique PROFIBUS addresses.
4. See the table below for specific symptoms.

Symptom	Corrective action
The device cannot be programmed via the handheld programmer.	• Make sure **Write Protection (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 **Remote Lockout (6.1.1.)** is disabled. • Ensure **Write Protection (6.2.1.)** is set to the unlock value. • See Resetting the PROFIBUS address to 126 (Page 82) to disable an address lock.
The PLC value equals the display value but does not correspond to actual material level.	• Ensure Scaling in AIFB1 is correctly entered. • Ensure High Calibration Point is correctly entered. • View the echo profile to see if the wrong echo is being selected. If so, see Operation Troubleshooting (Page 166) for possible causes and corrective action.
The PLC value is not equal to the displayed value (regardless of actual material level).	• Confirm you are looking at the right spot in the PLC. • Ensure scaling has not been programmed into the PLC: all scaling should be performed by the LR250. • Check the network to ensure the PLC is communicating with the LR250.

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.

10.1 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.
		• No data exchange
		• Write access enabled
		• Write access disabled

10.2 General fault codes

Note

- The status icon shown associated with each fault is the default icon in Condensed Mode.
- 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 **Reminder 1 (Required) (4.2.5.)**.	Replacement is recommended.
S: 4 		Device is nearing its lifetime limit according to the value set in **Reminder 2 (Demanded) (4.2.6.)**.	Replacement is recommended.
S: 6 		Sensor is nearing its lifetime limit according to the value set in **Reminder 1 (Required) (4.3.5.)**.	Replacement is recommended.
S: 7 		Sensor is nearing its lifetime limit according to the value set in **Reminder 2 (Demanded) (4.3.6.)**.	Replacement is recommended.
S: 8 		Service interval as defined in **Reminder 1 (Required) (4.4.5.)** has expired.	Perform service.

Code/ Icon		Meaning	Corrective Action
S: 9		Service interval as defined in **Reminder 2 (Demanded) (4.4.6.)** has expired.	Perform service.
S: 10		Input parameters **Low Calibration Point (1.6.)** and **High Calibration Point (1.7.)** are the same.	• Check calibration settings of device. • Ensure settings for High Calibration Point and Low Calibration Point are different.
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: 14		**Input Scaling (2.6.5.)** Upper and lower values for AIFB1 are the same.	• Check configuration for AIFB1. • Ensure that Upper Value and Lower Value (Input Scaling) are not the same.
S: 15		**Input Scaling (2.6.5.)** Upper and lower values for AIFB2 are the same.	• Check configuration for AIFB2. • Ensure that Upper Value and Lower Value (Input Scaling) are not the same.
S: 17		Calibration interval as defined in **Reminder 1 (Required) (4.5.5.)** has expired.	Perform calibration.
S: 18		Calibration interval as defined in **Reminder 2 (Demanded) (4.5.6.)** 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.

Code/ Icon		Meaning	Corrective Action
S: 32 		IDENT number conflict.	Ensure value of the Ident number selector is correct for the network configuration. If it is correct, the device needs to be re parameterized by the PLC.
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.
S: 36 	*	Unable to start microwave module.	Cycle power. If fault persists, contact your local Siemens representative for repair.
S: 37 	*	Measurement hardware problem.	Cycle power. If fault persists, contact your local Siemens representative for repair.
S: 38 	*	Microwave module hardware failure: unable to calculate distance measurement.	Cycle power. If fault persists, contact your local Siemens representative: repair required for repair.
S: 43 	*	Factory calibration for the radar receiver has been lost.	Repair required: contact your local Siemens representative.

10.3 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. (1.6.)** • increase **Confidence (2.5.9.1.)**
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 207) • 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 temperature in **Maximum Value (3.3.2.)** • use foam deflector or stillpipe • relocate • use a defoamer • set **Algorithm (2.5.7.1.)** to t**F** (trueFirst 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 (2.5.10.1.)** • if necessary: see Auto False Echo Suppression (Page 207)
Measurement is consistently off by a constant amount	• setting for **Low Calibration Point (2.3.7.1.)** not correct • setting for **Sensor Offset (2.3.7.3.)** not correct	• check distance from sensor reference point to **Low Calibration Point (2.3.7.1.)** • check **Sensor Offset (2.3.7.3.)**
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 (2.5.9.1.)** • use **Auto False Echo Suppression (2.5.10.1.)** and **Auto False Echo Suppression Range (2.5.10.2.)** • use foam deflector or stillpipe
	liquid surface vortexed	• decrease **Fill Rate (2.3.8.2..)** • relocate device to side pipe • increase confidence threshold in **Echo Threshold (2.5.7.3.)**
	material filling	• Re-locate SITRANS LR250
Reading response slow	**Fill Rate (2.3.8.2.)** 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 (2.5.10.1.)** and **Auto False Echo Suppression Range (2.5.10.2.)**
Level reading lower than actual material level	• material is within Near Range zone • multiple echoes processed	• decrease **Near Range (2.5.1.)** (minimum value depends on antenna type) • raise SITRANS LR250 • ensure **Algorithm (2.5.7.1.)** is set to t**F** (First echo)
	• vessel near empty and low dK material	• ensure **Material (1.2.)** selection is LIQUID LOW DK • set **Position Detect (2.5.7.2.)** to **Hybrid** • check the setting for **CLEF Range (2.5.7.4.):** see the table below **Propogation Factor (2.5.3.)** for recommended settings

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:

Bus powered	Per IEC 61158-2 (PROFIBUS PA)
Current consumed	15 mA

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, and 2" threaded PVDF antenna, and 2"/DN50/50A Flanged encapsulated antenna (FEA)	10 m (32.8 ft)
	all other versions	20 m (65.6 ft)
Minimum detectable distance	50 mm (2") from end of antenna[5)]	
Update time[7)]	minimum 1 second, depending on settings for **Response Rate (2.3.8.1.)** 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 antenna and Flanged encapsulated antennas,, the maximum measured error <500 mm from the sensor reference point =25 mm (1").

4) From sensor reference point: see Dimension drawings (Page 177) and Flanged Horn with extension (Page 184).

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

6) Minimum range is antenna length + 50 mm (2"). See Dimension drawings (Page 177).

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

11.3 Interface

Communication	PROFIBUS PA	
Configuration	Remote	Siemens SIMATIC PDM
	Local	Siemens infrared handheld programmer
	Display (local)[1)]	graphic LCD, with bar graph representing level

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

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 174).
- 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 212) and Process Pressure/Temperature derating curves (Page 213).

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 213).

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 30)	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 33)	ATEX II 3 G, Ex nA IIC T4 Gc	Europe
		NEPSI Ex nA IIC T4 Gc	China
	Non-incendive (Page 33)	FM/CSA Class I, Div. 2, Groups A, B, C, D T5	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

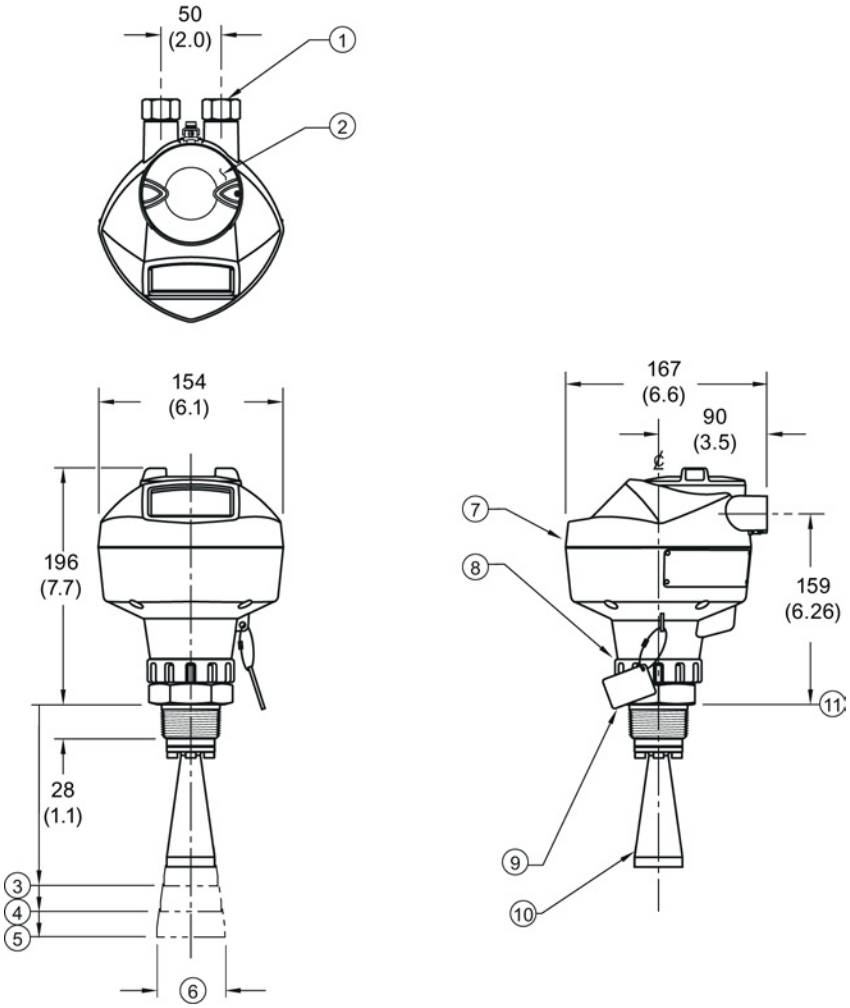
Dimension drawings

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)

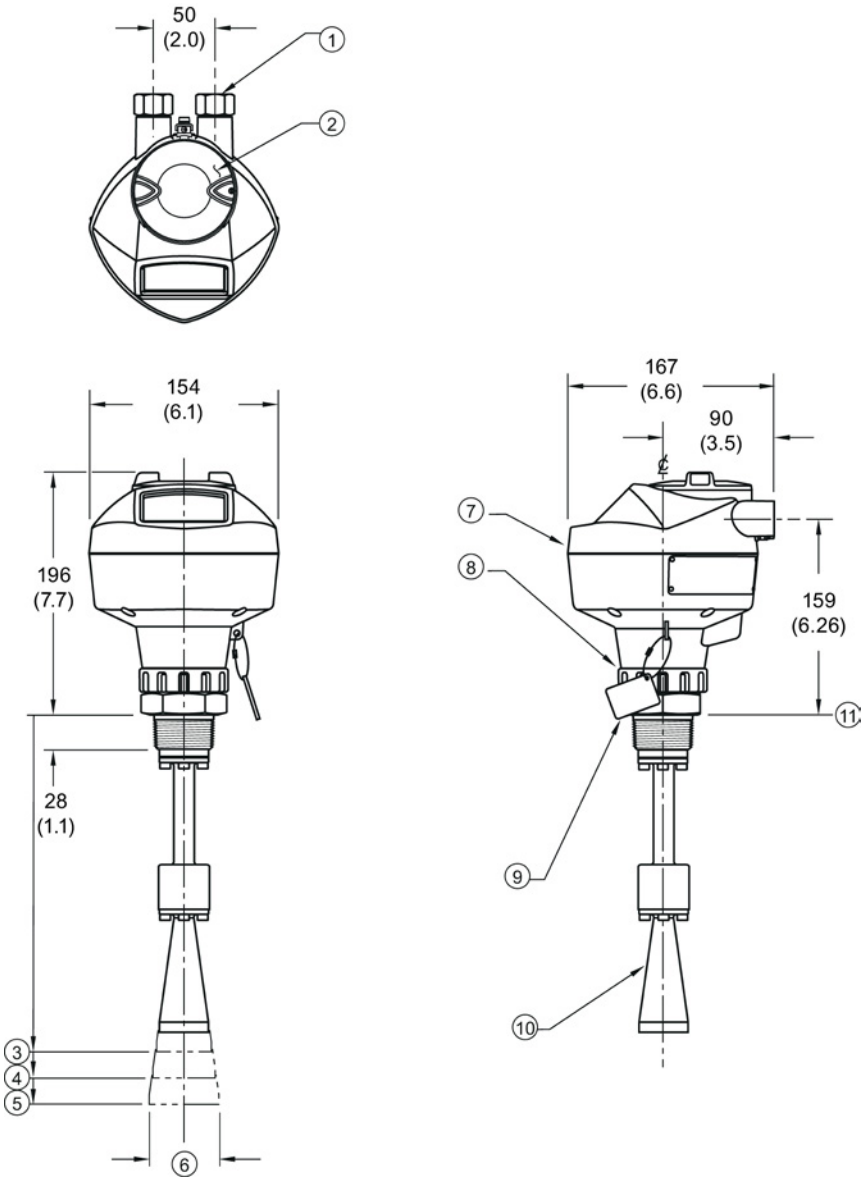
Threaded horn dimensions

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)

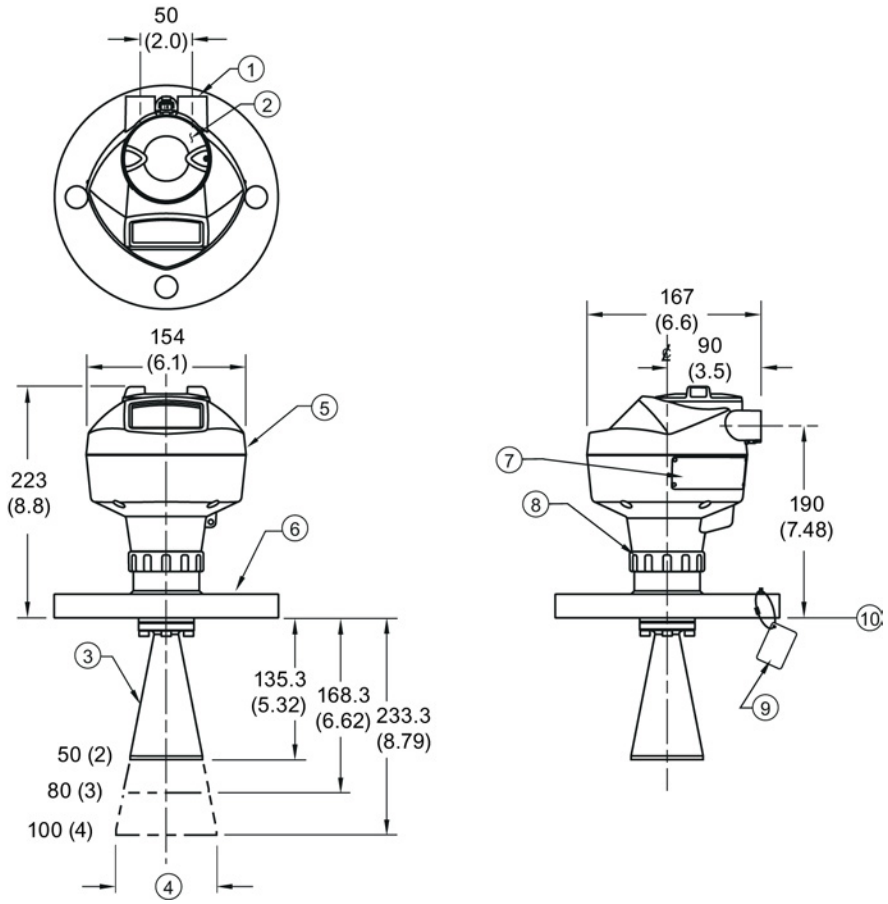
Threaded horn with extension dimensions

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 184). See also Raised-Face flange per EN 1092-1 for flanged horn antenna (Page 192), or Flat-Face flange (Page 197).

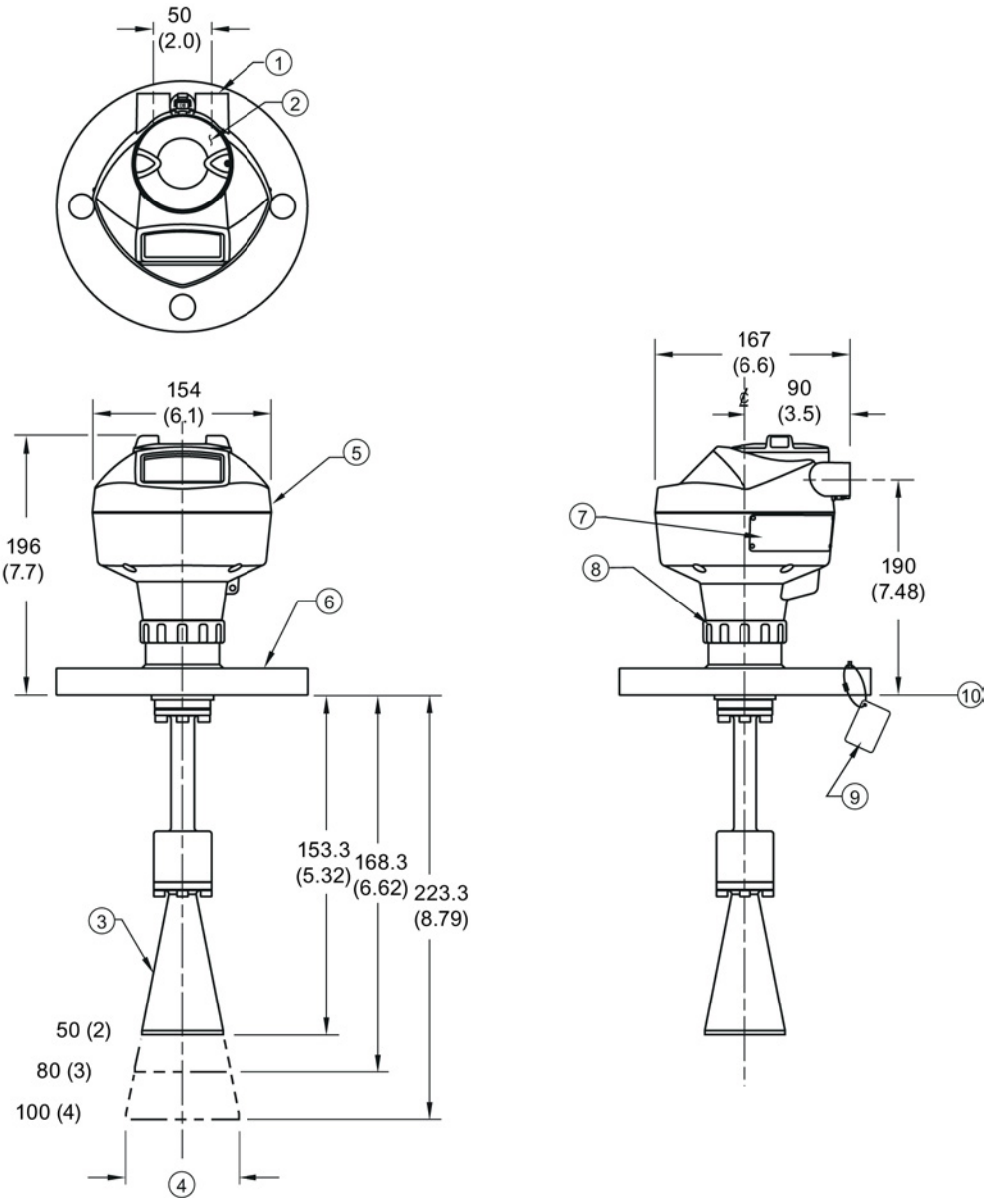
[b] -3dB in the direction of the polarization axis (see Polarization reference point (Page 20) for an illustration).

[c] Optional alloy N06022/2.4602 (Hastelloy® C-22 or equivalent). See Raised-Face Flange Dimensions (Page 192).

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 192) or Flat-Face Flange. (Page 197)

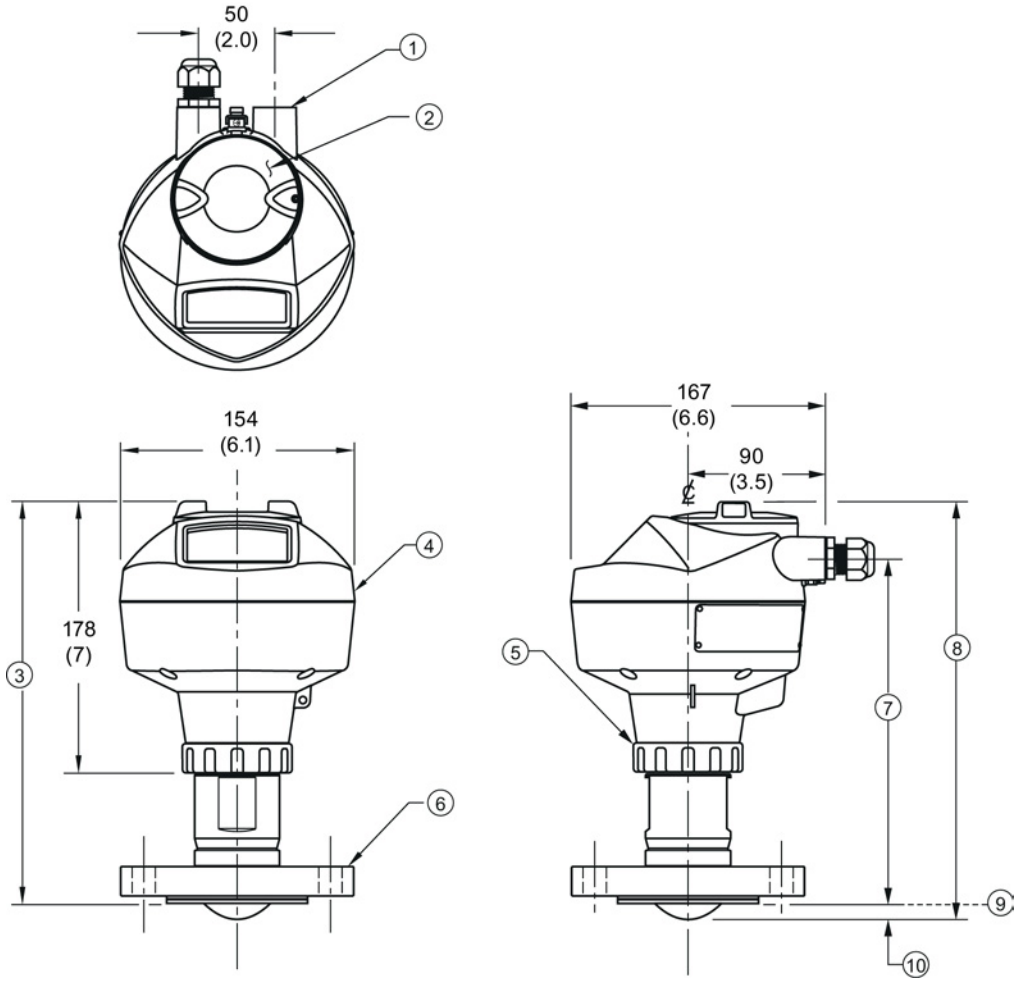
[b] -3dB in the direction of the polarization axis (see Polarization reference point (Page 20) for an illustration).

[c] Optional alloy N06022/2.4602 (Hastelloy® C-22 or equivalent). See Raised-Face flange per EN 1092-1 for flanged horn antenna (Page 192).

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.

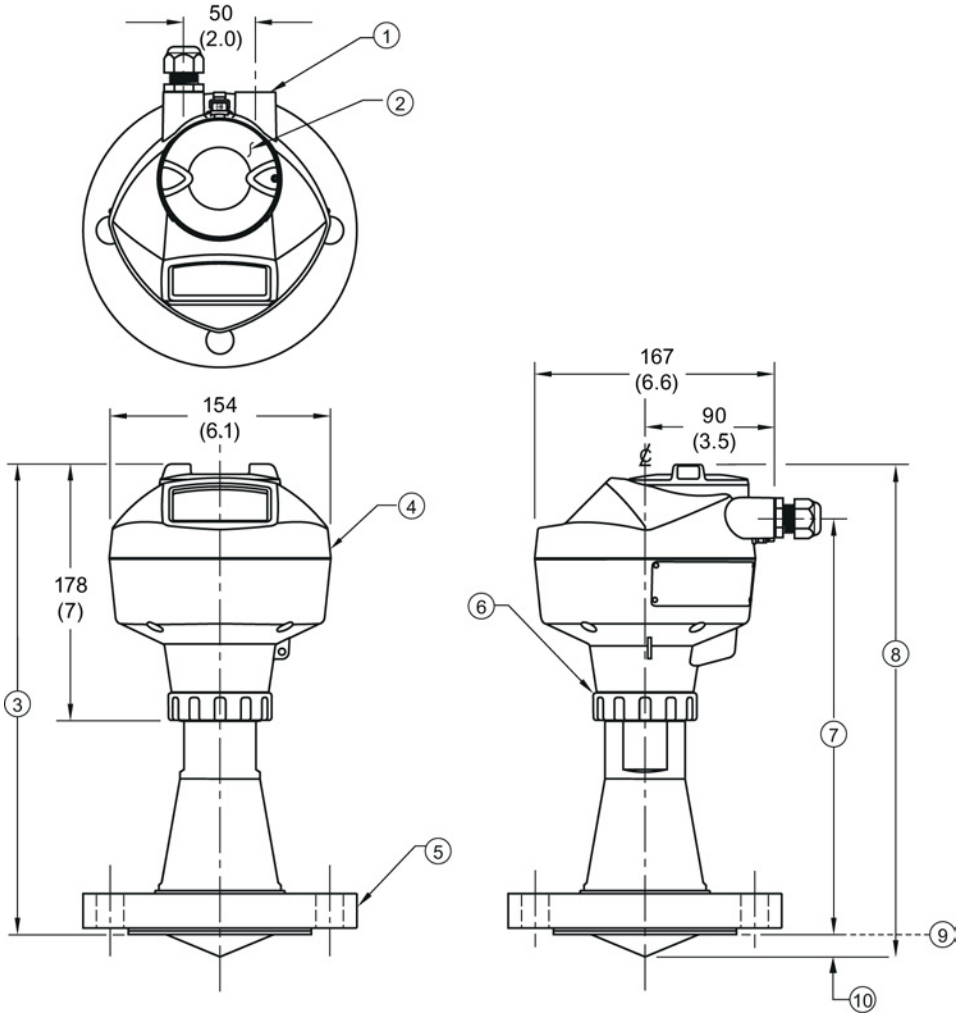
Flange size	Flange class	Flange O.D. [mm (inch)]	Antenna aperture size [mm (inch)]	Beam angle (°)[1]	Measurement range [m (ft)]
2"	150 LB	152 (5.98)	50 (1.97)	12.8	10 (32.8)[2]
DN50	PN10/16	165 (6.50)			
50A	10K	155 (6.10)			

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 194)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)

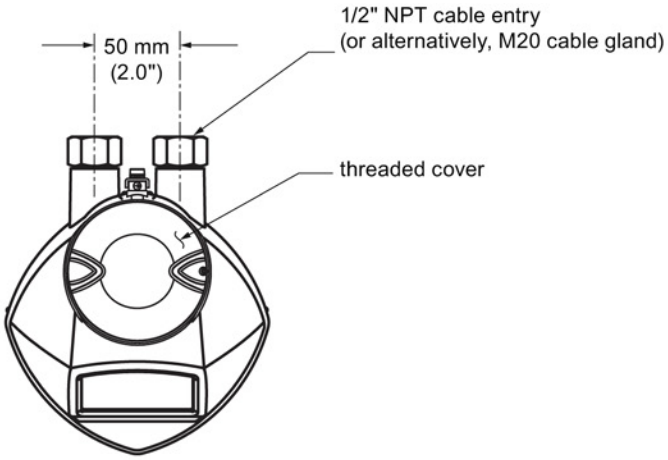
1) Height from tip of lens to sensor reference point as shown. See also Raised-Face Flange per EN 1092-1.

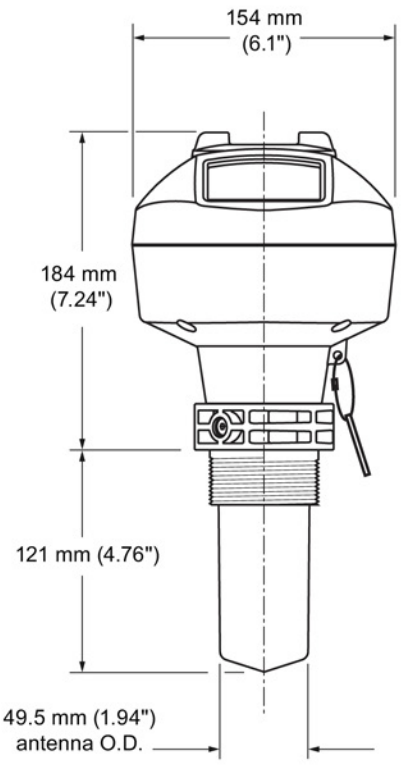
Flange size	Flange class	Flange O.D. [mm (inch)]	Antenna aperture size [mm (inch)]	Beam angle (°)[1]	Measurement range [m (ft)]
3"	150 LB	190 (7.48)	75 (2.95)	9.6	20 (65.6)
DN80	PN10/16	200 (7.87)			
80A	10K	185 (7.28)			
4"	150 LB	230 (9.06)	75 (2.95)	9.6	20 (65.6)
DN100	PN10/16	220 (8.66)			
100A	10K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

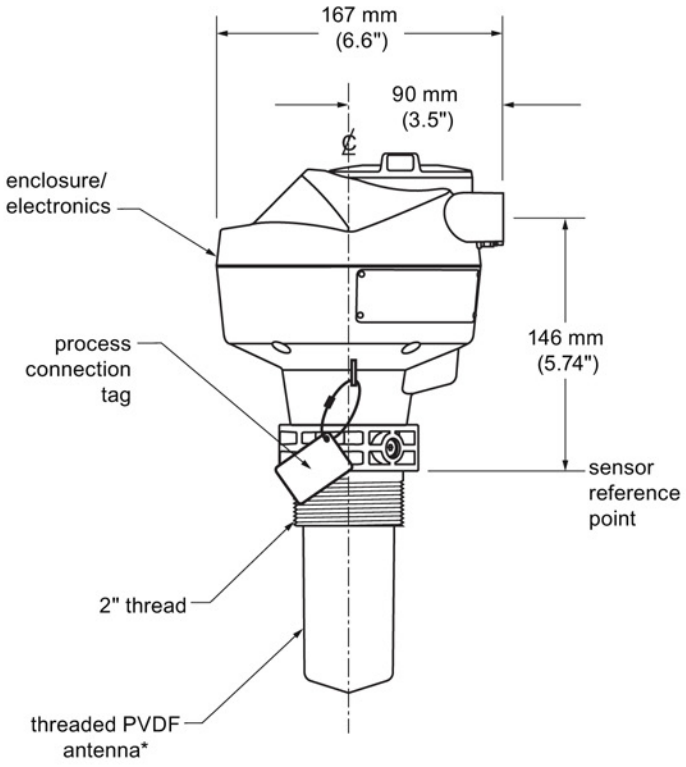
See Raised-Face Flange per EN 1092-1 (Page 194), and Polarization reference point (Page 20).

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.

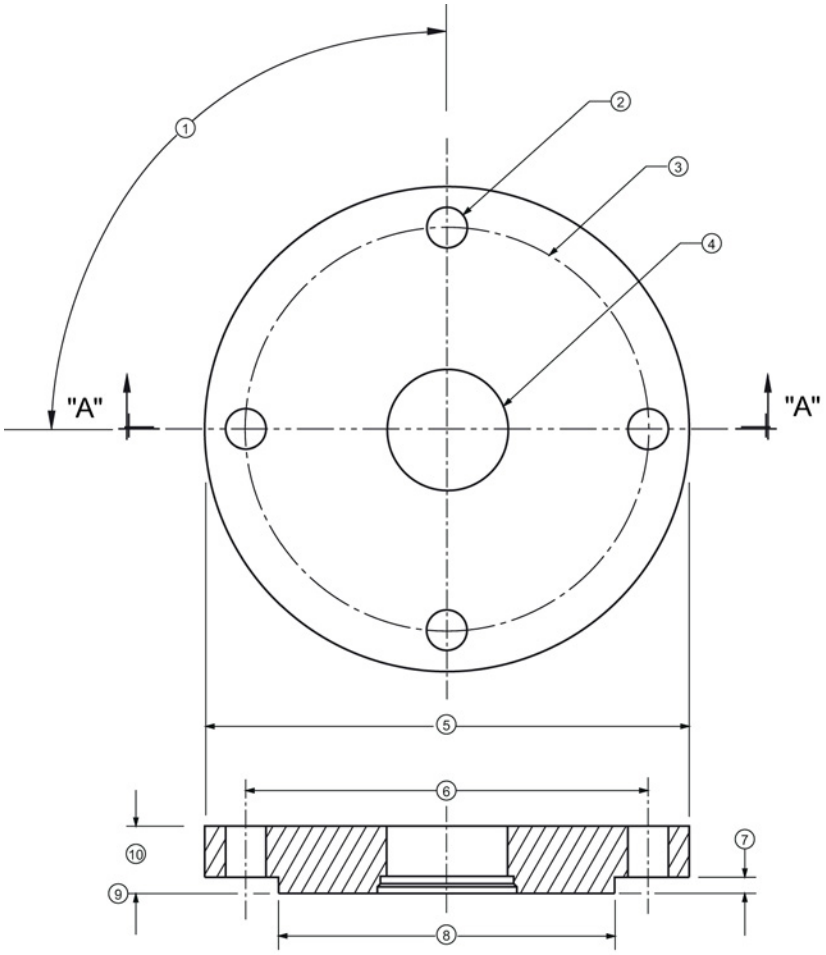
12.8 Threaded connection markings

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)



VIEW "A"-"A"

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.

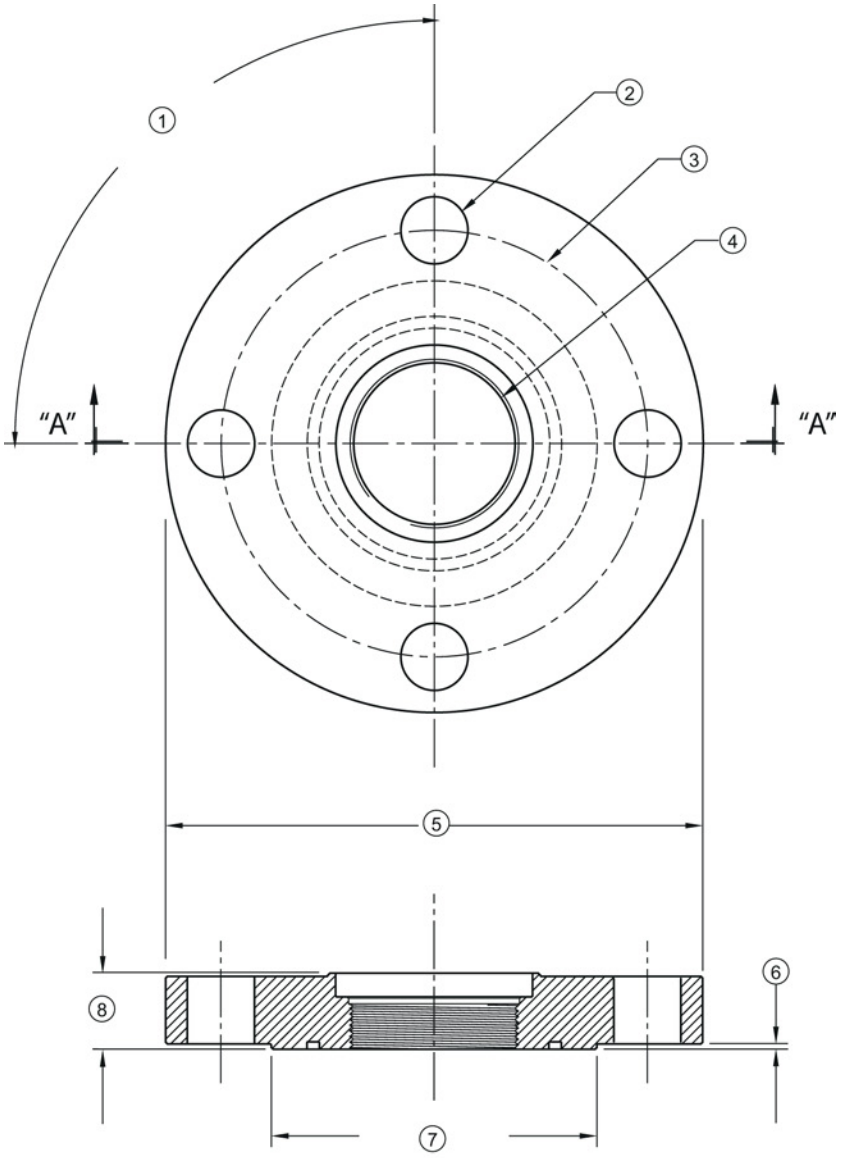
Serial number: a unique number allotted to each flange, including the date of manufacture (MMDDYY) followed by a number from 001 to 999 (indicating the sequential unit produced).

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

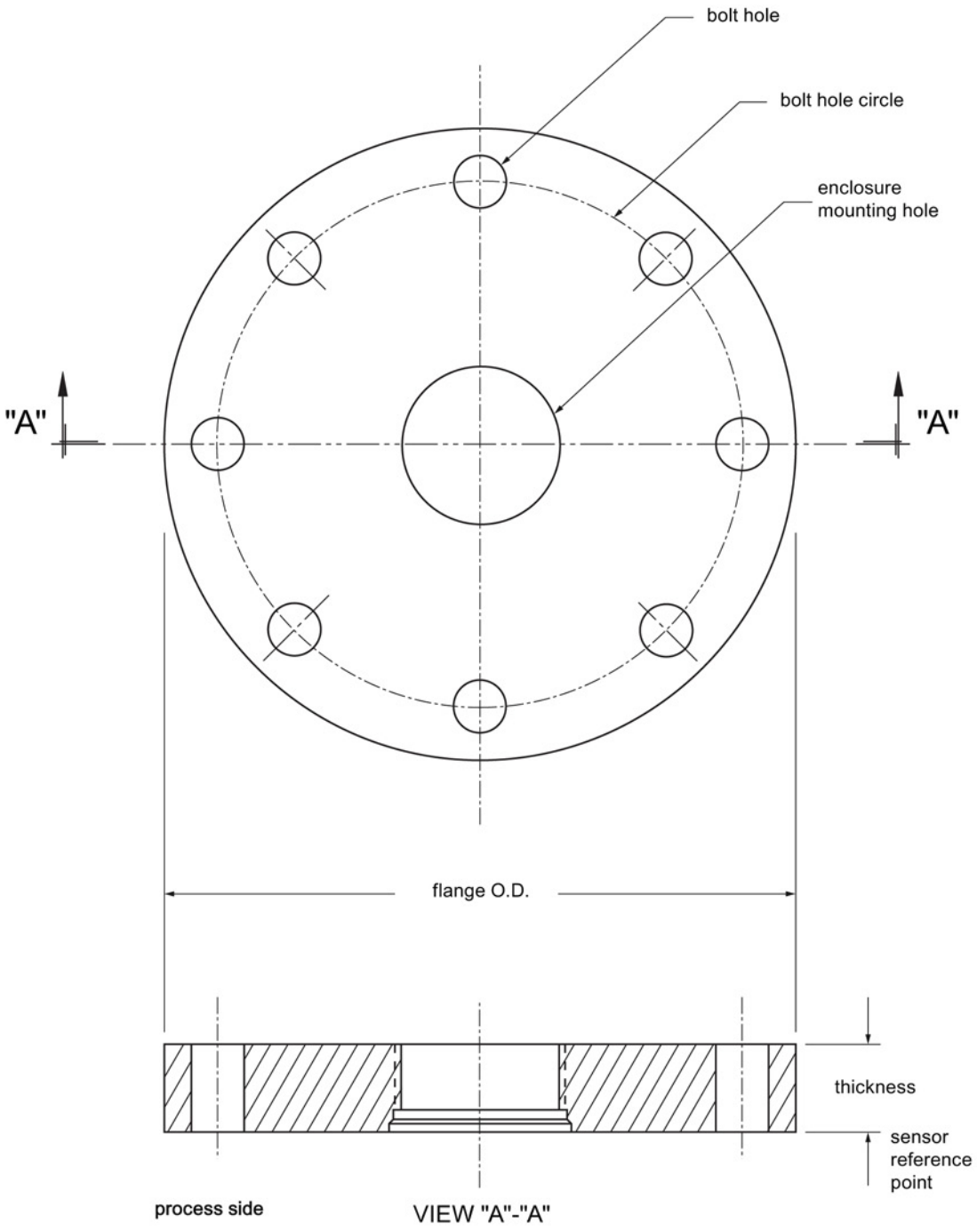
The flange markings are located around the outside edge of the flange.

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 93) 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 177). 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.

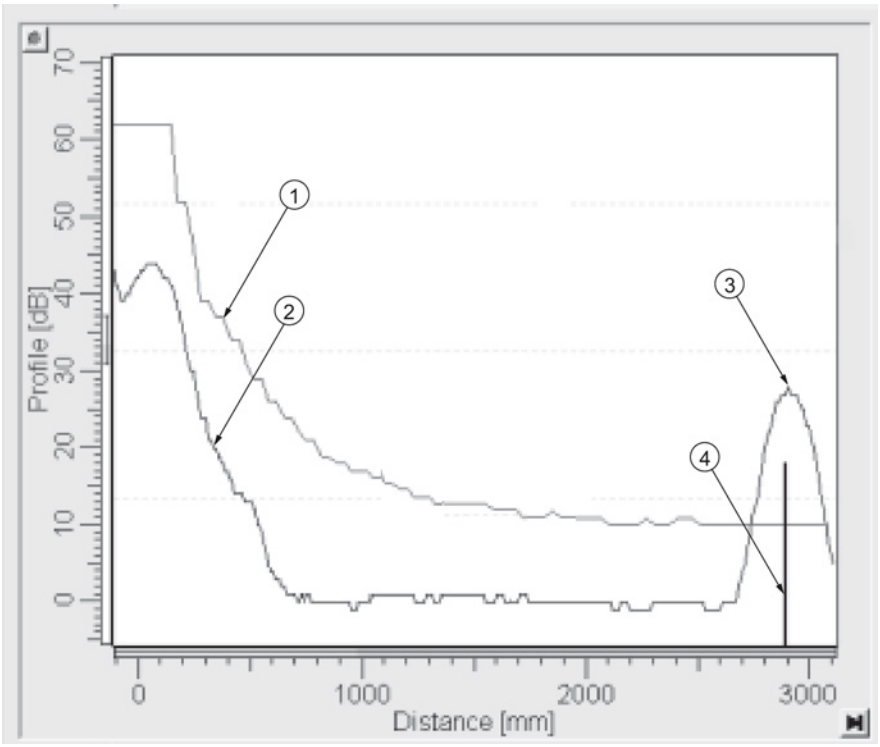
A.2.2 Echo Selection

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 207) 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 (2.5.7.1.)

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 (2.5.7.2.)

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 (2.5.3.)** 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)

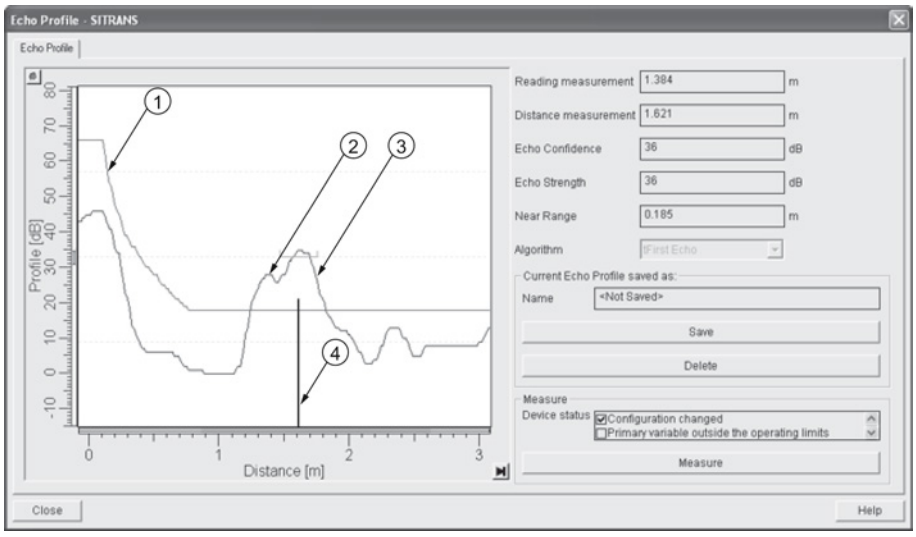
- Uses the leading edge of the echo.
- Is used mainly to process the echo from materials with a low dK value.

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

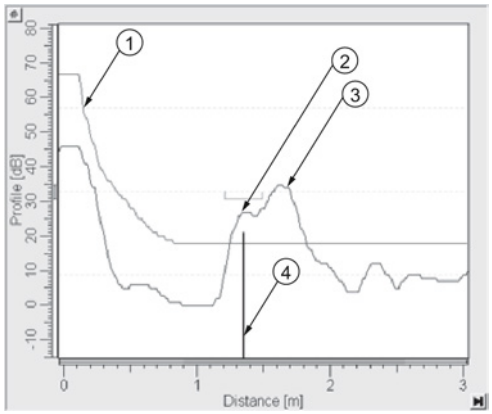
Vessel height: 1.5 m; CLEF range set to 0 (**Center** algorithm gives the same result.)



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

Example: CLEF enabled

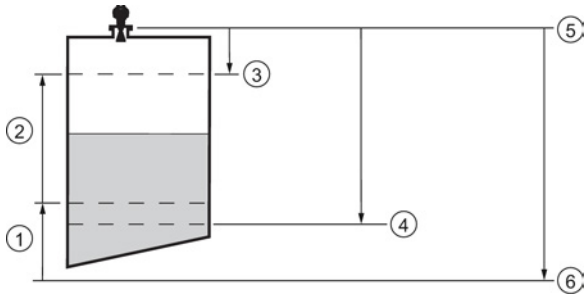
Vessel height: 1.5 m; CLEF range set to 0.5 m



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

A.2.3 CLEF Range

Determines the level below which the CLEF algorithm will be used. Above this level the Center algorithm is used when Hybrid is selected in **Position Detect (2.5.7.2.)**. CLEF Range is referenced from Low Calibration Point (process empty level).



①	CLEF range	④	Low calibration point
②	(Center algorithm applied)	⑤	Sensor reference point
③	High calibration point	⑥	Low Calibration Point (process empty level)

A.2.4 Echo Threshold

Confidence (2.5.9.1.) describes the quality of an echo. Higher values represent higher quality. **Echo Threshold** 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:

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 73).
- For detailed instructions on using this feature via the handheld programmer see **Auto False Echo Suppression (2.5.10.1.).**

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.

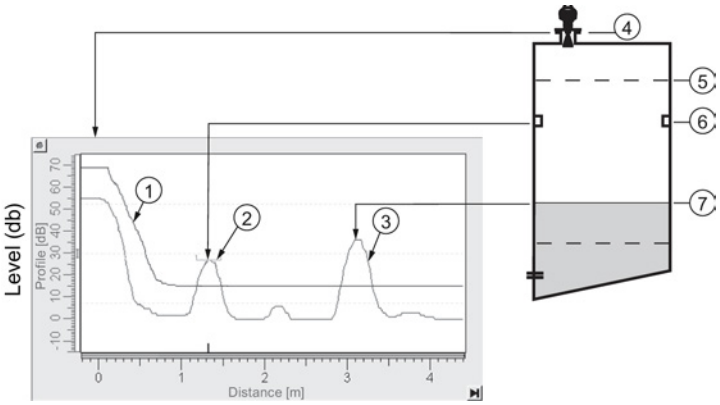
Auto False Echo Suppression Range (2.5.10.2.)

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.

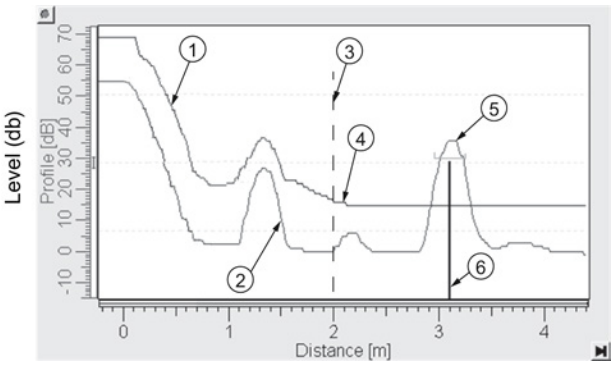
Auto False Echo Suppression Range must be set to a distance shorter than the distance to the material level when the environment was learned, to avoid the material echo being screened out.

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 (2.5.1.)

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 (2.5.10.1.)** is generally recommended in preference to extending the blanking distance from factory values.

Far Range (2.5.2.)

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 (2.3.1.)** and are in meters by default.

Response Rate (2.3.8.1.) 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 (2.3.8.1)		Fill Rate (2.3.8.2)/Empty Rate (2.3.8.3)	
*	**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

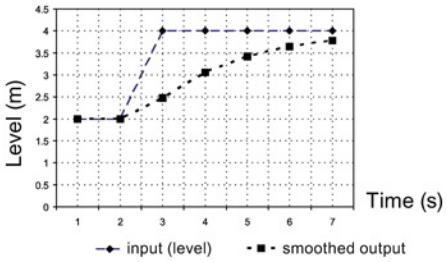
A.2.9 Damping

Filter Time Constant (2.6.8.1) 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.2.10 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 (2.5.9.1.) describes the quality of an echo. Higher values represent higher quality.

Echo Threshold (2.5.7.3.) 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 (2.3.6.)** 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 faulty power supply:

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

A.2.10.1 LOE Timer

LOE Timer (2.3.6.) determines the length of time a Loss of Echo (LOE) condition will persist before a Fail-safe state is activated. The default is 100 seconds. Fail-safe Mode determines the level to be reported when the Fail-safe timer expires.

A.2.10.2 Fail-safe Behavior

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.

Fail-safe mode may be triggered by a loss of echo, a bad configuration, or certain device faults. You can select one of three possible values to be reported when a Fail-safe mode is activated.

Mode

Mode (2.6.9.1.) determines the material level to be reported when **LOE Timer (2.3.6.)** expires.

Mode (2.6.9.1.)		
SUB VALUE		Use substitute value. **Value (2.6.9.2.)** used as output value.
LAST VALUE	*	Last value (Store last valid output value).
USE BAD VALUE		Use bad value (Calculated output value is incorrect).

Value

Value (2.6.9.2.) defines the material level to be reported if the option **Use substitute value** is selected in **Mode (2.6.9.1.)**.

The two Analog Input Function blocks are set separately.

To set a user-defined value

- Navigate to the Level Meter > Setup > desired Analog Input (1 or 2).
- Set **Mode (2.6.9.1.)** to **Use substitute value**.
- Go to **Value (2.6.9.2.)** and enter the desired value.

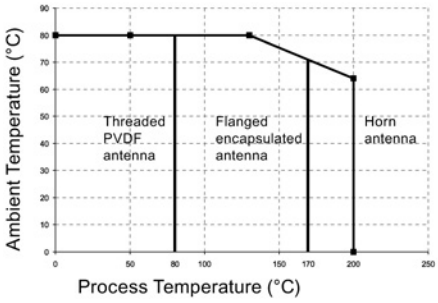
A.3 Maximum Process Temperature Chart

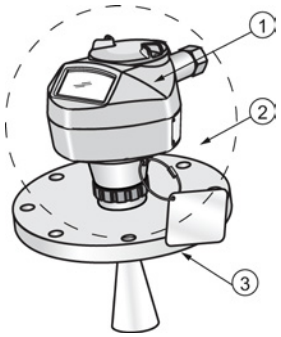
⚠ WARNING
Internal temperature must not exceed +80 ° C (+176 °F).

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 **Minimum Value (3.3.1.)** and **Maximum Value (3.3.2.)** to monitor the Internal Temperature.

A.4 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.4.1 Horn antenna

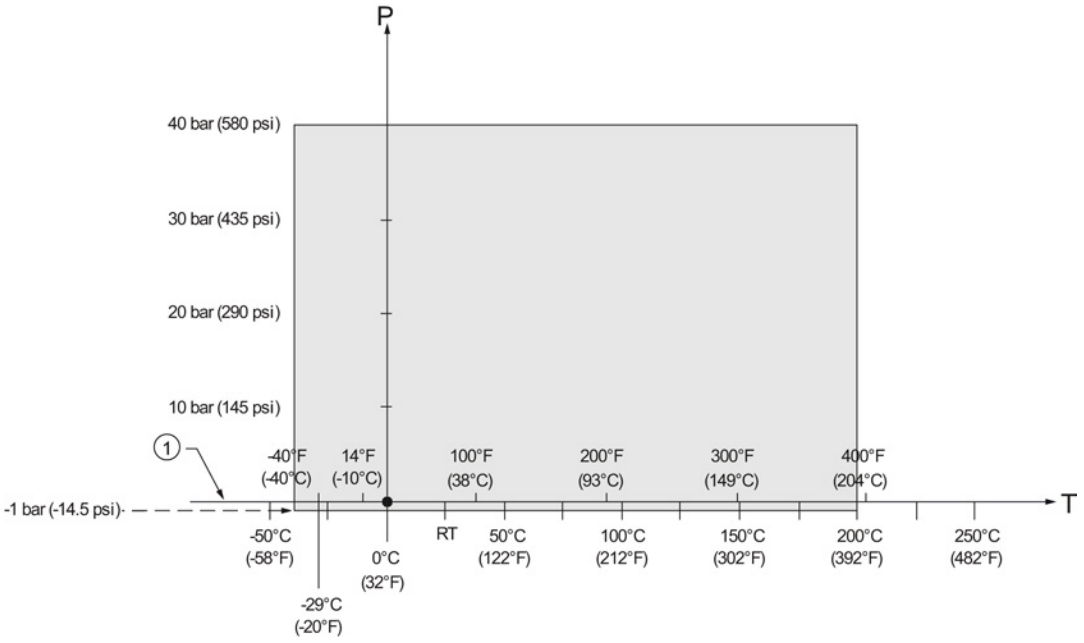
⚠ WARNING

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

Note

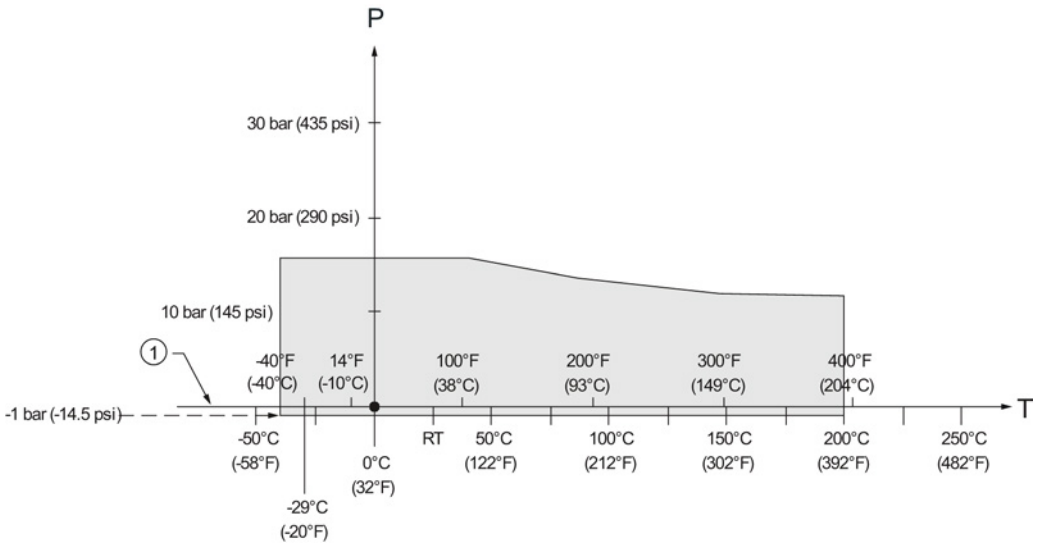
Customer to provide adequate bolting and gasketing to retain vessel pressure and provide sufficient sealing.

1.5", 2" and 3" Threaded Versions

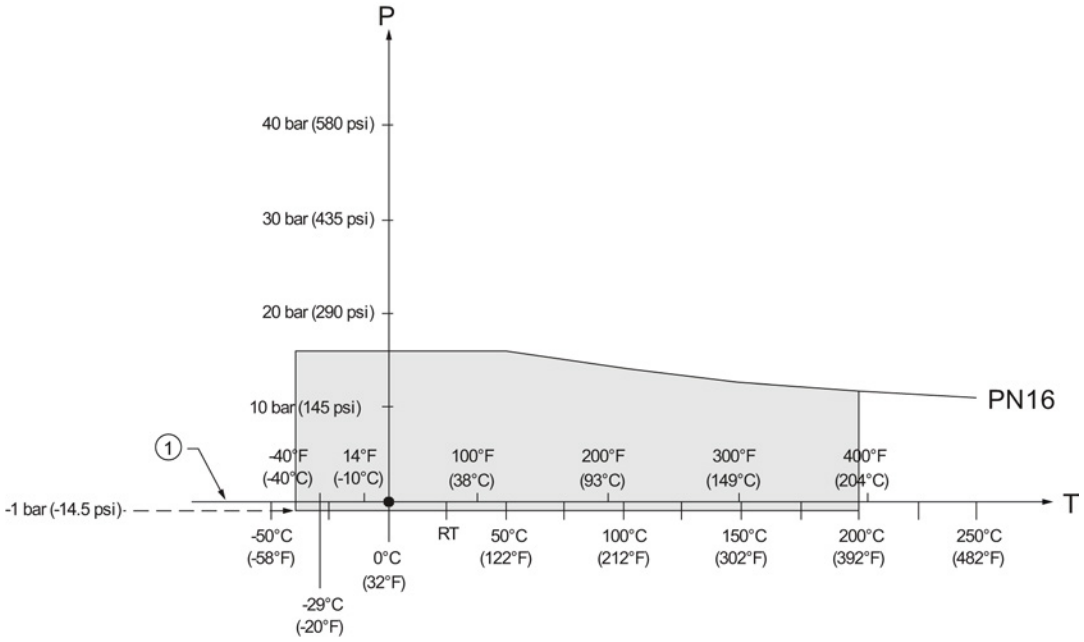


A.4.2 Flanged horn antenna

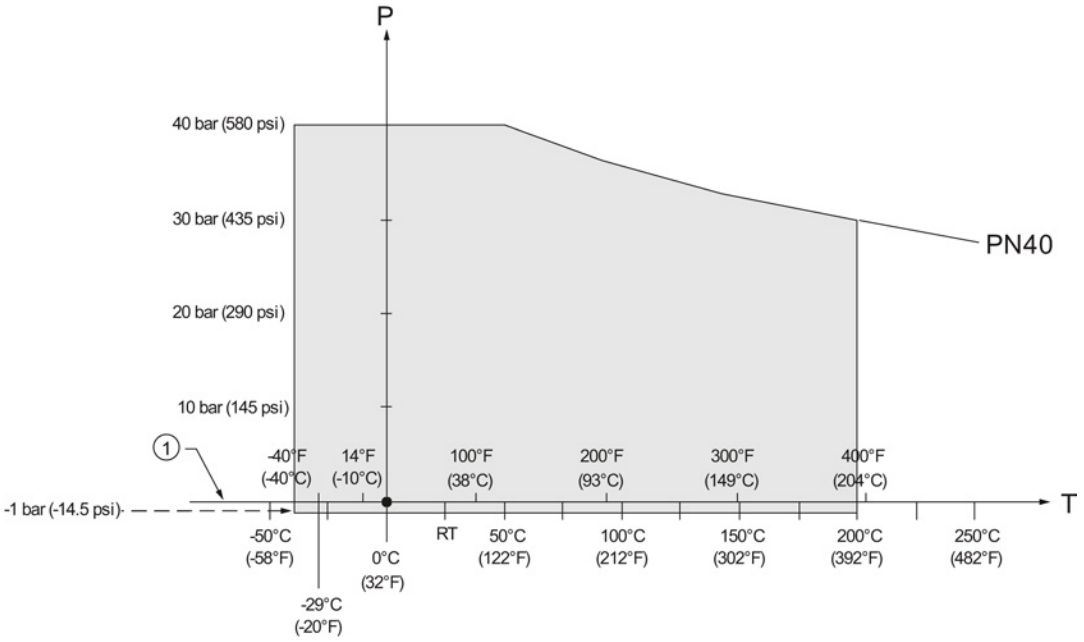
50A, 80A and 100A Flanged Versions: JIS 10K



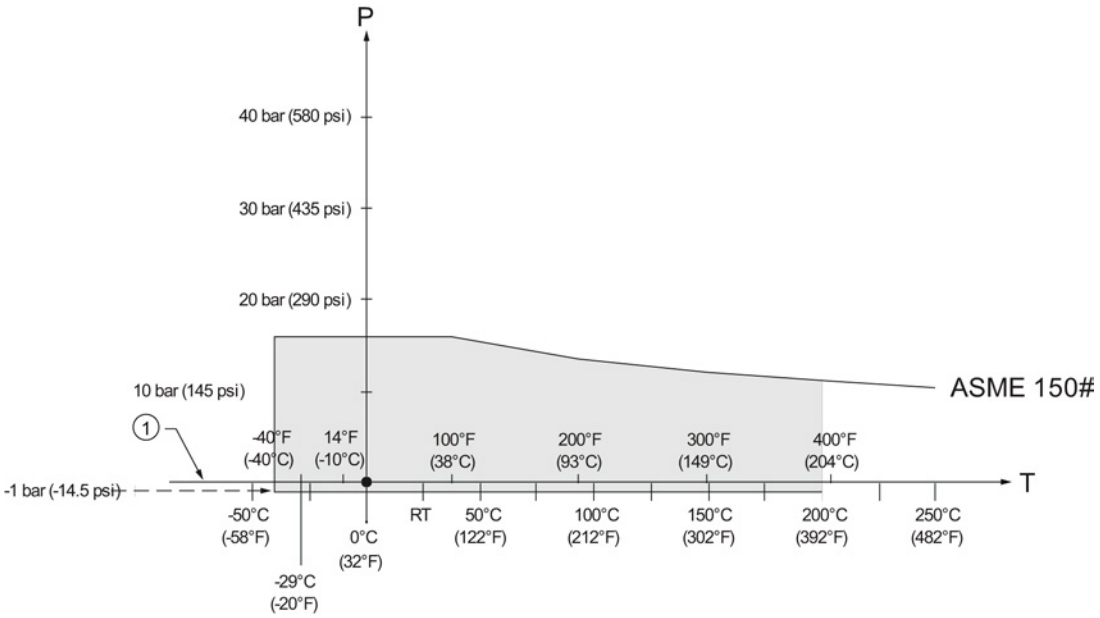
DN50, DN80, DN100, and DN150 Flanged Versions: PN16



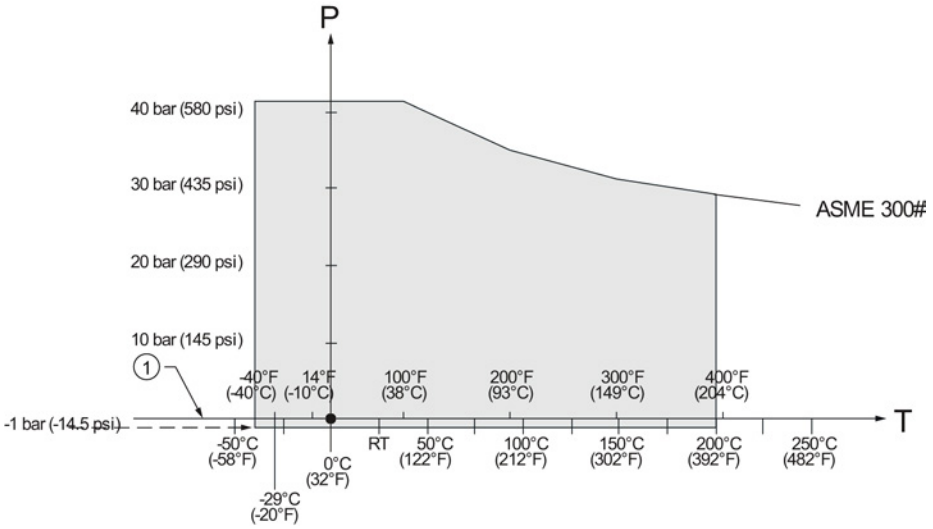
DN50, DN80, DN100, and DN150 Flanged Versions: PN40



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

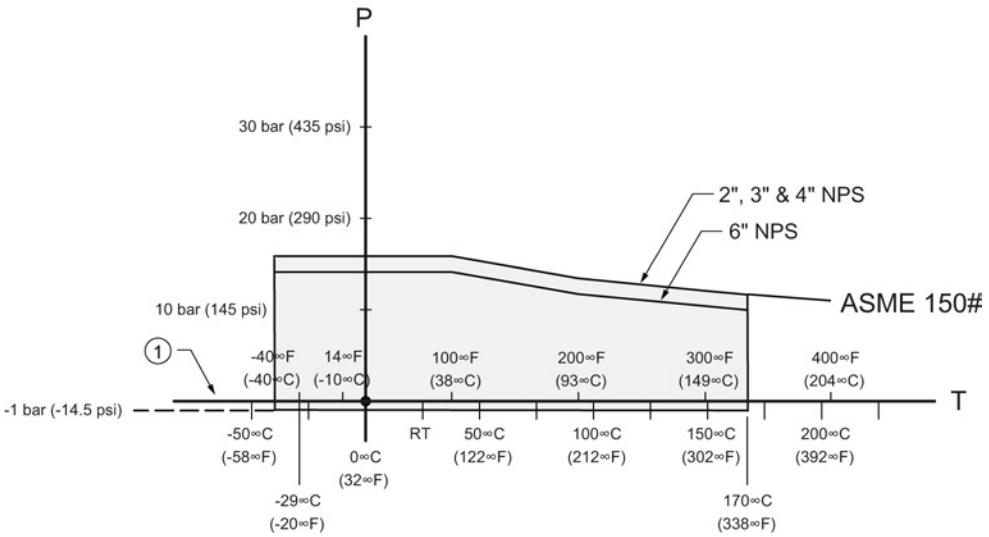


2", 3", and 4" Flanged Versions: 300 lb



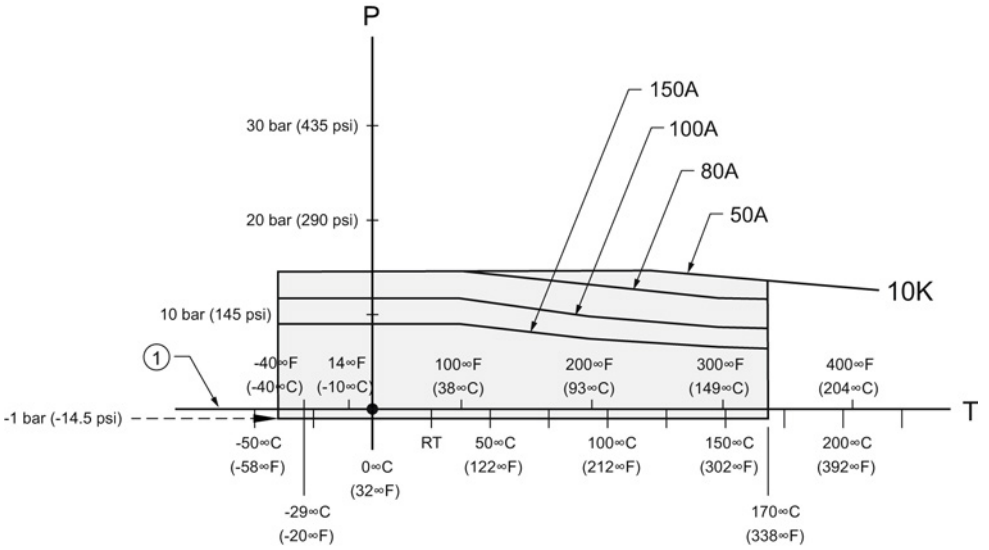
A.4.3 Flanged encapsulated antenna

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



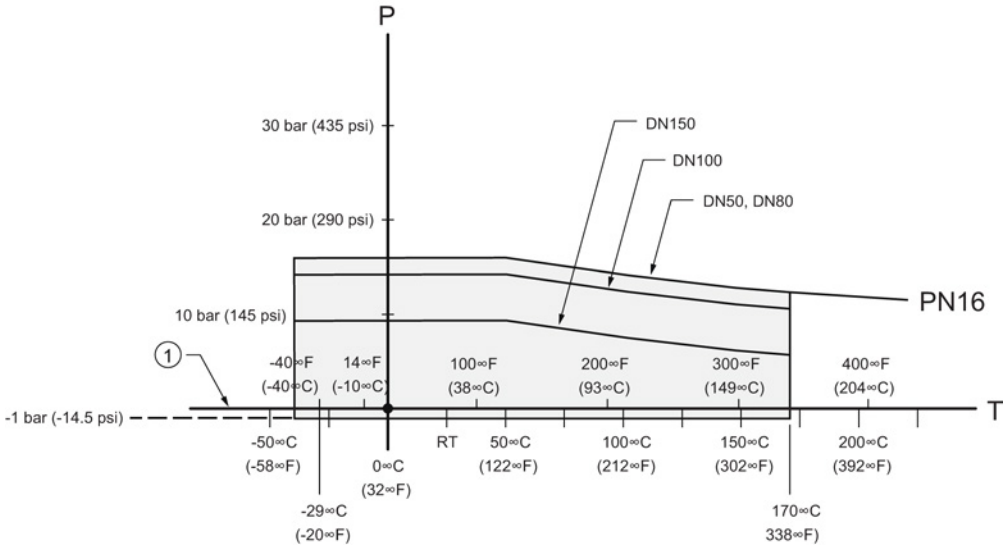
① Atmospheric
P Allowable operating pressures
T Allowable operating temperatures

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



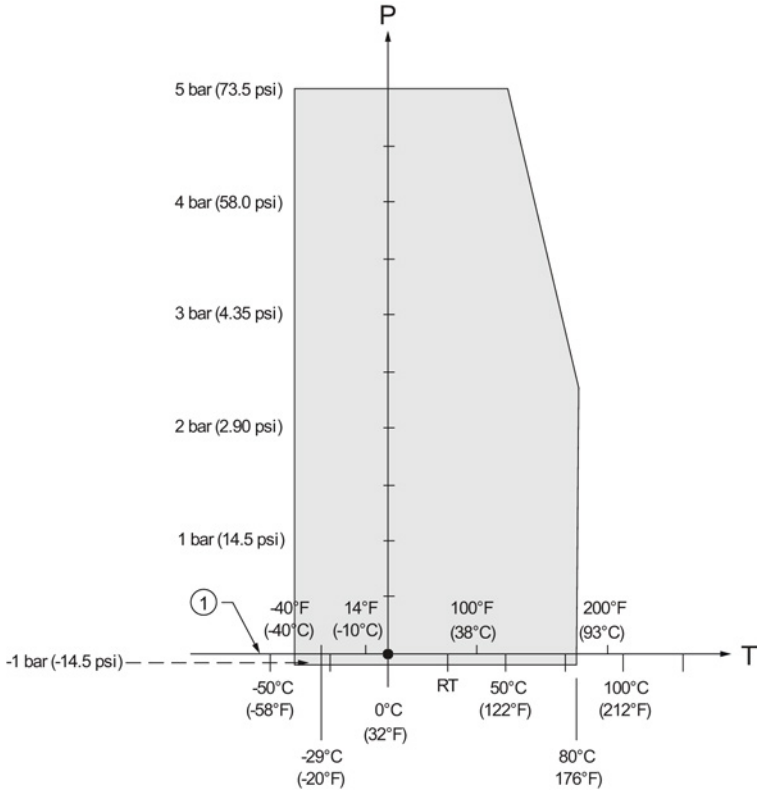
① Atmospheric

P Allowable operating pressures

T Allowable operating temperatures

A.4.4 PVDF antenna

2" Threaded PVDF Antenna Versions



Appendix B: PROFIBUS PA profile structure

B

B.1 PROFIBUS Level Device Design

The device follows the profile block model and is implemented as a Profile 3.0, Class B, PA device. Standard profile parameters are used to program the level transducer block.

B.2 Block Model

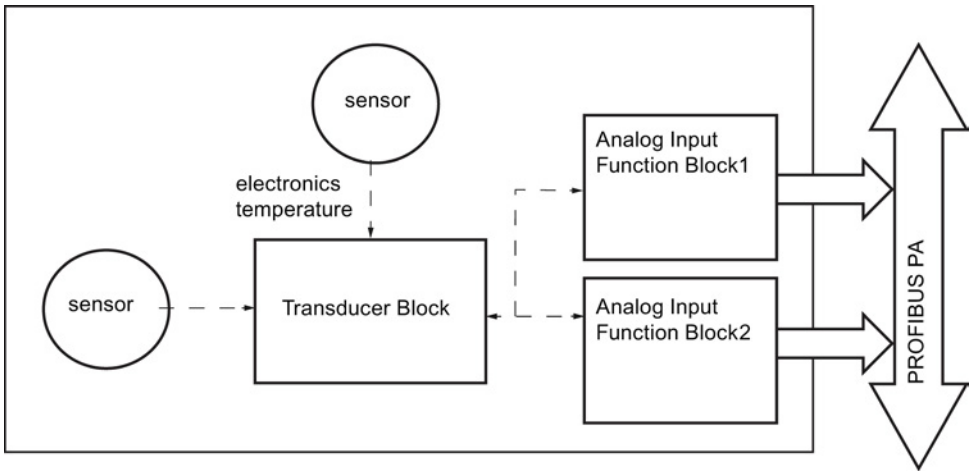
The Block Model represents how measured values are recorded and processed. All data is viewed from the perspective of the DCS or PLC, so information from the sensor is an input.

The functions of the device are divided into blocks with different areas of responsibility. The blocks are configured by parameters.

The device is implemented with one Physical Block, one Transducer Block (TB), and two Analog Input Function Blocks (AIFB1 and AIFB2).

Physical Block

The Physical Block handles functionality and descriptions relating to the device as a whole: for example, LCD Contrast (functionality) and Firmware Revision and Tag (descriptions).



Transducer Block (TB)

The Transducer Block carries out adjustments to the sensor, such as level calibration and volume calibration. It supplies the measurement value [Primary Value (PV), Secondary Value 1 (SV1), or Secondary Value 2 (SV2)] utilized by either or both of the AIFBs.

Analog Input Function Blocks AIFB1 and AIFB2

The two AIFBs are completely independent of each other. They utilize the measurement value output from the Transducer Block [Primary Value (PV), Secondary Value 1 (SV1), or Secondary Value 2 (SV2)] and apply any required quality checks, scaling, and Fail-safe operation selections. The Analog Input Function Block output supplies the measured value and associated status information to the PROFIBUS PA network via cyclic data transfer.

B.2.1 Description of the blocks

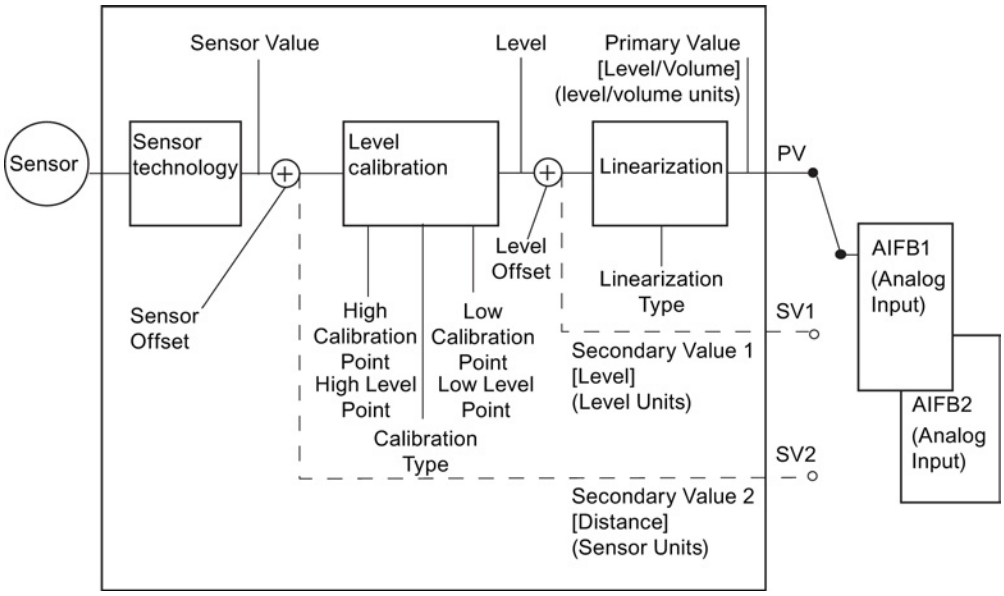
B.2.1.1 Transducer Block function groups

The figure below shows the signal flow of measured values from the sensor through the Transducer Block into the output value:

- Primary Value (PV): Level or Volume
- Secondary Value 1 (SV1): Level
- Secondary Value 2 (SV2): Distance

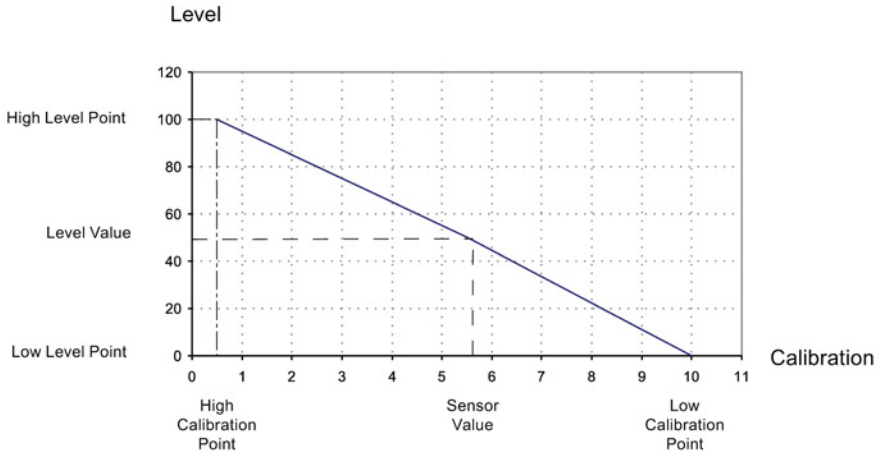
The Transducer Block implements all of the basic parameters (see diagram below), including level to volume calculation, if that option has been selected.

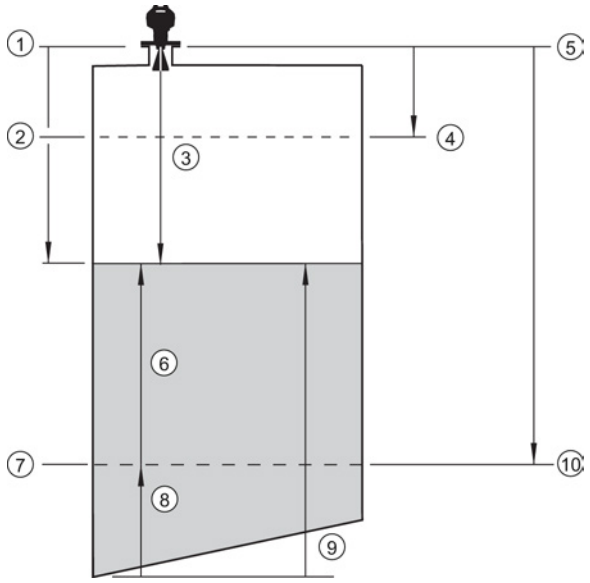
Transducer Block



B.2.1.2 How the transducer block works:

1. The sensor technology block selects the proper echo. For an explanation of sensor technology, see Appendix A: Technical Reference (Page 201).
   The sensor value (in sensor units) is checked to see if it is within its measuring limits. If the limit is exceeded, this results in a **Bad** status and the error message **Failure in measurement**.
   The sensor value is stored in Sensor Value.
   The analog signal from the sensor is transformed into a digital representation.
   A Sensor Offset (default 0) compensates for changes to the sensor reference point, if necessary.
2. Level Calibration is a linear transfer function that converts a sensor value to a level value.





①	Distance/SV2	⑥	Level
②	High level point (default: 100%)	⑦	Low level point (default: 0%)
③	Sensor value [a]	⑧	Level offset [c]
④	High calibration point	⑨	Secondary value 1
⑤	Sensor reference point [b]	⑩	Low calibration point

[a] Referenced from Sensor Reference Point.

[b] **Sensor Offset (2.3.7.3.)** is a constant offset that can be added to or subtracted from sensor reference point to compensate if the sensor has been changed.

[c] Level Offset (default O) can compensate for specific vessel configurations.

3. Linearization can be carried out to accommodate complex vessel shapes, or to provide level to volume conversion.
4. The Transducer Block provides three possible outputs:
   - Primary Value (PV) / Level or Volume
   - Secondary Value 1 (SV1) / Level
   - Secondary Value 2 (SV2) / Distance (sensor units)

Electronics temperature

The Transducer Block monitors the internal temperature of the device electronics. A change in temperature can provide advance warning of a possible device failure, and allow for preventive maintenance.

If a temperature limit is exceeded, the output value is unchanged but the output status changes. (The permitted limits correspond to those of the permitted ambient temperature.)

Peak indicators allow you to check the maximum and minimum temperatures that have occurred. To see peak temperature values, Open the menu **View – Device Diagnostics**, select **Device Status**, and click on the tab **Device Status**.

B.2.1.3 Analog Input Function Blocks 1 and 2

The input to the AIFB is a value with a status. See Transducer Block function groups (Page 222) for a graphic representation.

Output conversion

The Analog Input Function Blocks can modify the output value.

Scaling

Output Scaling (2.6.6.) allows you to scale the output to any desired units.

Fail-safe

If the status of the input (TB output value or Simulation Value) is **bad**, the fault logic can output either the last usable measured value, or a given substitute value. Set **Fail-safe Mode (2.6.9.)** and, if desired, define a value in **Value (2.6.9.2.)**.

Device/input simulation

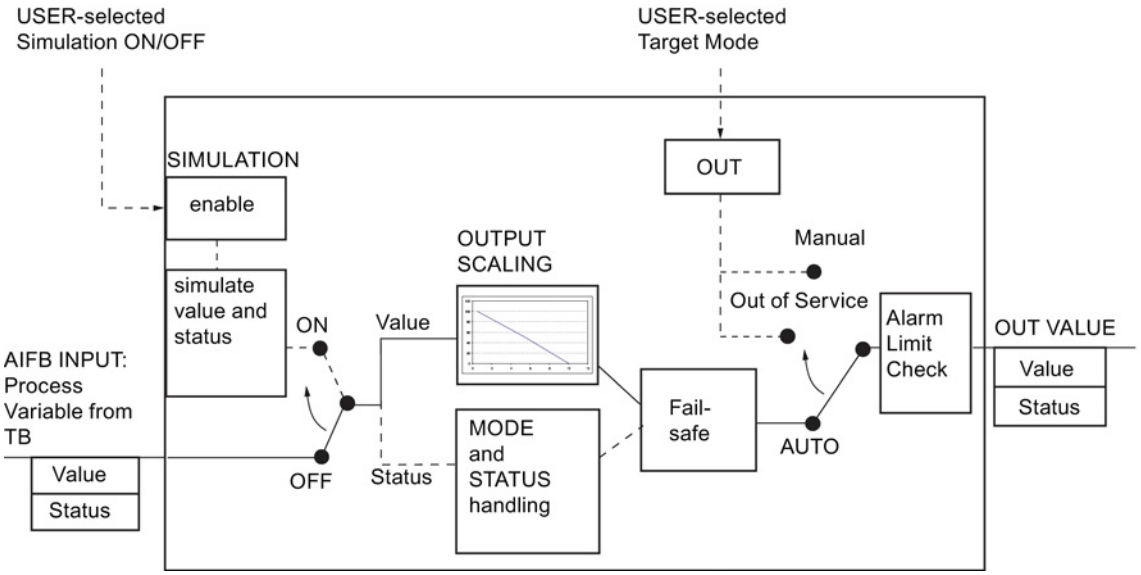
You can define a simulated value to be input to the AIFB instead of the output value from the Transducer Block. The simulated value allows the AIFB to be tested independently of the characteristics of the environment.

Actual Mode: Device / Output Simulation

Actual Mode allows you to select one of three possible outputs.

Actual Mode (2.6.2.)	Description	Output value
AUTO	automatic	the automatically-recorded measured value
MAN	manual	a manually-set fixed simulation value
O/S	function block disabled	the preset safety value.

AIFB function groups



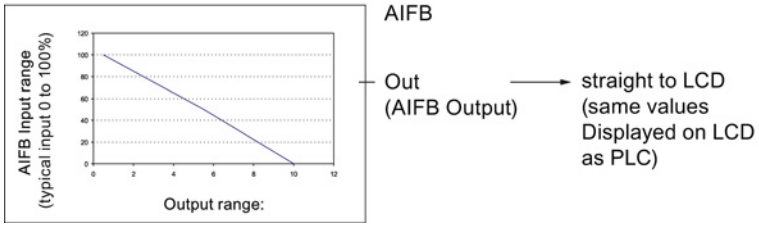
Analog Input Function Block function groups (simulation, mode and status)

Measured values are processed within an Analog Input Function Block to produce the device output. See AIFB function groups (Page 226). The output is communicated via cyclic transfer to PROFIBUS PA and displayed on the LCD.

How an Analog Input Function Block works

The AIFB provides a linear conversion to any desired units.

1. The AIFB Input value is the processed output value of the Transducer Block, in Transducer Block units.
2. The user selects the desired AIFB output units and scaling is applied.



3. Damping may be applied based on a time constant provided by the user. See Damping (Page 210) for details.
4. The status of the input value from the Transducer Block is checked. If the status is Bad, a Fail-safe condition occurs. The output is determined by the setting for Failsafe Mode.
5. **Actual Mode (2.6.2.)** allows the entire AI block to be overridden by a Manual Output value. See **Actual Mode (2.6.2.)** for details.
6. The value is checked against the user-defined warning and alarm limits. The upper and lower limits are defined in units corresponding to the Output range, and a limit hysteresis can be used to adjust the sensitivity. See **Alarms and Warnings (2.6.7.)** for details.
7. The output value (OUT) is communicated via cyclic data transfer.

Appendix C: Communications via PROFIBUS

C

SITRANS LR250 (PROFIBUS PA) is a Profile Version 3.01, Class B, PA device. It supports Class 1 Master for cyclic and acyclic data exchange, and Class 2 for acyclic services. The full range of SITRANS LR250 functions is available only over a PROFIBUS PA network.

PROFIBUS PA is an open industrial protocol. Full details about PROFIBUS PA can be obtained from PROFIBUS International at:

PROFIBUS PA (http://www.profibus.com/)

C.1 Device configuration

To use PROFIBUS PA, you will need a PC configuration tool: we recommend SIMATIC PDM. Please consult the operating instructions or online help for details on using SIMATIC PDM. You can find more information at:

SIMATIC PDM (www.siemens.com/simatic-pdm)

C.1.1 SIMATIC PDM

SIMATIC PDM is a software package used to commission and maintain SITRANS LR250 and other process devices. For more detail see Functions in SIMATIC PDM (Page 59).

C.1.1.1 Electronic Device Description

In order to use **Process Device Manager (PDM)** with PROFIBUS PA, you will need the Electronic Device Description for SITRANS LR250. For details see Electronic Device Description (EDD) (Page 61).

C.2 Network configuration

To configure a PROFIBUS PA Class 1 Master (for example, a PLC), you will need a **GSD** file.

C.2.1 The GSD file

The GSD file **SIEM8150.gsd** is available from the SITRANS LR250 product page on our web site. Go to the product page of our website and click on **Support > Software Downloads:**

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

C.3 Bus termination

Note

PROFIBUS PA cable shield MUST be terminated at both ends of the cable for it to work properly. Please refer to the PROFIBUS PA User and Installation Guidelines (order number 2.092), available from:

PROFIBUS PA (http://www.profibus.com/)

C.4 Power demands

To determine how many devices can be connected to a bus line, calculate the combined maximum current consumption of all the connected devices: 15 mA for SITRANS LR250. Allow a current reserve for safety.

C.5 PROFIBUS address

A unique PROFIBUS address identifies each device on the network. To set the PROFIBUS address see **Device Address (5.1.)**.

Note

- It is possible to change the device address via a Class 1 master (for example, a PLC) and lock the device address to prevent further changes.
- If this Address Lock is on, the PA address cannot be changed. This lock can be disabled only by performing an Address Reset.

Resetting the PROFIBUS address to 126

- Via SIMATIC PDM:

1. Open the menu **Device – Master Reset** and click on **Reset Address to 126**.
2. Click on OK: the address will be reset to 126, and if the address lock was on, it will be disabled.

- Via the handheld programmer:

1. Navigate to **Service (4.) > Master Reset (4.1.)**. (You can enter the numeric value instead of navigating via the Arrow keys.)
2. Press **RIGHT Arrow** to open Edit Mode then scroll down to **DEV ADDRESS** and press **RIGHT Arrow** to select it. The address will be reset to 126, and if the address lock was on, it will be disabled.
3. Press **LEFT** Arrow to exit.

C.6 Operating as a profile device

Every manufactured PROFIBUS product has a unique PROFIBUS identification number which identifies it to the system. PROFIBUS Profile Standard version 3.01 also defines a Profile Model which can identify a product as a generic profile device on the network.

SITRANS LR250 can be identified in one of three ways:

	Device Identification	Profile Model
	STD PROFILE	Standard Profile (uses generic GSD for 2 AIFB [ident # = 0x9701]
*	**MANUFACTURER**	Manufacturer-specific (uses Siemens EDD and GSD file, which identifies the LR250 [PROFIBUS PA]) [ident # = 0x8150]
	STD – AIFB 1 ONLY	Standard Profile AIFB 1 only (uses generic GSD for 1 AIFB) [ident # = 0x9700]

Defining the device as Profile-specific as opposed to Manufacturer-specific makes it possible to exchange the device for any other device of the same profile type without changing the GSD file.

To set up SITRANS LR250 as a profile device see **PROFIBUS Ident Number (5.2.)**.

C.6.1 Configuring a new device

See Configuring a new device (Page 61).

C.6.2 Configuring PROFIBUS PA with an S7-300/ 400 PLC

1. If SITRANS LR250 is not listed in the STEP 7 device catalog, you can download the EDD files from the Siemens Web site and add them to your computer using the device integration procedure specific to your host software (eg. Step 7, or PDM, etc.) version. Go to the product page of our website and click on **Support > Software Downloads:**
   Product page (http://www.siemens.com/LR250)
2. Add the SITRANS LR250 "rack": click and drag the SITRANS LR250 folder from the hardware catalog.
3. Fill the rack with desired modules, by dragging and dropping them from the hardware catalog.
4. After configuring PROFIBUS PA in steps 2 and 3, download it to the PLC.
5. Add code to the PLC program to read data consistently using the SFC14.

C.7 Cyclic versus acyclic data

When you request data from a device via PROFIBUS PA, you have two choices. Cyclic data is provided at every bus scan: acyclic data is requested and provided as needed.

Input information is always requested at every bus scan and is set up as cyclic data. Configuration information is only needed periodically and is set up as acyclic data.

C.7.1 Cyclic data

When you configure SITRANS LR250 on the PROFIBUS PA bus, there are two slots available for modules.

Note

Each of the slots has to have a module defined in it.

Slot 0 always transmits **AIFB1** information; slot 1 defaults to Free Place, but can be changed to **AIFB2** information. If you do not wish to have data transmitted, then you must use a **Free Place** module in that slot.

Each of the two Analog Input Function Blocks can be set up to return **Level, Distance, or Volume**. Within the function blocks, the values are scaled according to the user requirements [see Analog Input Function Blocks 1 and 2 (Page 225) for details].

AIFB1 and **AIFB2** return 5 bytes of data each:

	Floating Point				Status
AIFB1	byte 1	byte 2	byte 3	byte 4	byte 5
AIFB2	byte 6	byte 7	byte 8	byte 9	byte 10

The first 4 bytes are the floating point representation (IEEE) of the variable. The variables are the outputs of the function block. The 5th byte is the status word and the list of possible values is given in the chart below.

The 5 bytes must be read consistently, in a contiguous chunk: they cannot be read byte by byte, and cannot suffer an interrupt. If you are using an S7-300 / 400, you will need to use SFC14 DPRD_DAT: Read Consistent Data of a Standard PD Slave.

C.8 Status byte

In PROFIBUS PA there are two possible types of status byte:

- **status byte**: originally defined in Profile Standard V3.0
- **condensed status**: an alternative status byte defined in Profile Standard V3.01

You can choose which type of status byte will be returned, by enabling or disabling **Condensed Status (3.4.)**: see **Enable (3.4.1.)** for details. When Condensed Status is disabled, Status Byte will be returned, and the following codes will be used.

Status Codes for good quality	
Values in hex notation	Description
0x80	Data is GOOD.
0x84	A parameter in the function block has been changed: status active for 10 s
0x89	Active low warning.
0x8A	Active high warning.
0x8D	Active low alarm.
0x8E	Active high alarm.

Status Codes for Uncertain Quality	
Values in hex notation	**Description**
0x4B	Value is a substituted value (normally used in Failsafe).
0x4C/0x4F	Initial value.
0x47	Last usable value.

Status Codes for Bad Quality	
Values in hex notation	Description
0x10	The LOE timer has expired: this could be caused by LOE or by a sensor malfunction: value is BAD.
0x01	There is an error in the configuration of the function blocks in PROFIBUS PA [a].
0X1F	The function block, or the transducer block, has been placed out of service.

[a] This could happen when a firmware download has been done, but a system reset has not been done. This could also happen if the function blocks are not configured properly using the handheld programmer, PDM or acyclic services.

C.9 Condensed status

These codes are available when Condensed Status is enabled. See **Condensed Status (3.4.)** for more details.

Condensed Status (GOOD)		
Hex value	Status - GOOD	Description
0x80	GOOD – ok	No error or special condition is associated with this value.
0x84	GOOD – update event	Set if the value is good and the block has an active Update event. (This status remains active for 20 seconds.)
0x86	GOOD – active advisory alarm	Set if the value is good and the block has an active Alarm.
0x80 ...0x8E	GOOD – limit check/ update event	See Status Codes for Good Quality (Page 234).
0xA0 ...0xA3	GOOD – initiate fail safe	This fault is not generated by the product, but can be simulated.
0xA4 ...0xA7	GOOD – maintenance required	Value is valid. Maintenance is recommended within a medium-term period.
0xA8 ...0xAB	GOOD – maintenance demanded	Value is valid. Maintenance is demanded within a short- term period.
0xBC ...0xBF	GOOD – function check	Device performs internal function check without influencing the process. Value is valid.

Condensed Status (UNCERTAIN)		
Hex value	Status - UNCERTAIN	Description
0x45	UNCERTAIN – substitute set	Output of Failsafe logic only.
0x4F	UNCERTAIN – initial value	Default value as long as no measured value is available or until a diagnosis is made that affects the value and the status accorded to it.
0x68 ...0x6B	UNCERTAIN – maintenance demanded	Usability of the process value depends on the application. Value is potentially invalid. Cause can be determined by reading the extended diagnostics [a]. Maintenance is demanded within a short-term period.

Condensed Status (UNCERTAIN)		
Hex value	**Status - UNCERTAIN**	**Description**
0x73	UNCERTAIN – simulated value, start	Indicates the start of a simulation. Simulation of a measured value or Input FB mode changes from AUTO to MAN. • This status remains active for at least 10 seconds: – after enabling simulation – after setting the FB to MAN mode – after a restart (e.g. power down cycle) if the simulation is enabled or the FB is in MAN mode – after passivation is cleared if simulation is enabled or the FB is in MAN mode • In MAN mode the status remains until a subsequent write command overwrites the OUT value after the 10 seconds have expired. • In simulation mode the written status is buffered and appears in the value flow after 10 seconds. However the new written SIMULATE parameter with its status can be read before the 10 seconds have expired.
0x74 ...0x77	UNCERTAIN – simulated value, end	Indicates the end of a simulation. Simulation of a measured value is disabled or Input FB mode changes from MAN to AUTO. This Status remains active for 10 seconds after simulation ends. While this status is active there is no reliable process value. Measured values and their status are updated afterwards.

See Acyclic Extended Diagnostics (General Fault Codes) (Page 240).

Condensed Status (BAD)		
Hex value	Status - BAD	Description
0x00	BAD – non specific	Proxy determines that a device does not communicate.
0x23	BAD – passivated (diagnostics alerts disabled)	Configured failsafe value is used, accompanied by this status.
0x24 ...0x27	BAD – maintenance alarm, more diagnosis available	No measurement available because of a failure.
0x25	BAD – process related, no maintenance	No measurement available because of invalid process conditions.
0x3C ...0x3F	BAD – function check / local override, value not usable	Occurs during cleaning or calibration process.

C.10 Diagnostics

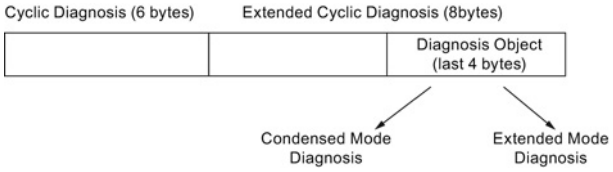
All diagnostic information shown below is viewable via PDM.

C.10.1 Diagnosis reply (available cyclically)

During DPV0 data exchange, the PROFIBUS PA slave will notify the Master when a serious error occurs. The Master will then send a Diagnosis request. The reply to this request is normally logged in the PLC and is referred to as the "Hex values."

The reply may contain two parts. The first part is 6 bytes long and is defined by the PROFIBUS standard. If there is a second part, it is called the 'extended cyclic diagnosis' and it is 8 bytes long. The last 4 bytes of the extended diagnostic message give the error diagnosis [see Extended Mode Diagnosis (Page 238) and Condensed Mode Diagnosis (Page 239)].

The same information is also available acyclically via the Diagnosis Object.



C.10.2 Diagnosis object (available cyclically or acyclically)

This consists of four bytes.

In PROFIBUS PA there are two options for the Diagnosis Object:

- Extended Mode Diagnosis (Page 238)
- Condensed Mode Diagnosis (Page 239)

You can choose which of these will be returned, by enabling or disabling Condensed Status. See **Enable (3.4.1.)**. When Condensed Status is disabled **Extended Mode Diagnosis** will be returned, and the following codes will be used.

C.10.3 Extended mode diagnosis

Extended Mode Diagnosis				
Hex values	Byte	Bit	Description	Indication class [a]
0x01000000	0	0	Electronics failure	R
0x02000000		1	Mechanical failure	R
0x04000000		2	Motor Temperature too high	R
0x08000000		3	Electronics temperature too high	R
0x10000000		4	Memory error	R
0x20000000		5	Measurement failure	R
0x40000000		6	Device not initialized (no calibration)	R
0x80000000		7	Self calibration failed	R
0x00010000	1	0	Zero point error (limit position)	R
0x00020000		1	Power supply failure (electrical, pneumatic)	R
0x00040000		2	Configuration invalid	R
0x00080000		3	New startup carried out (Warm Start)	A
0x00100000		4	Restart carried out (Cold Start)	A
0x00200000		5	Maintenance required	R
0x00400000		6	Characterization invalid	R
0x00800000		7	Set to 1 (one), if the Ident_Number of the running cyclic data transfer and the value of Physical Block IDENT__NUMBER_SELECTOR parameter are different.	R
	2	0 to 7	Reserved for use within the PNO	
	3	0 to 6	Reserved for use within the PNO	
0x00000080		7	More diagnosis information is available	

[a] **R** indicates the message remains active as long as the reason for the message exists.
A indicates the message will automatically reset after 10 seconds.

Values of the DIAGNOSIS bit: **0** = not set; **1** = set

C.10.4 Condensed mode diagnosis

Condensed Mode Diagnosis				
Hex values	Byte	Bit	Description	Indication class [a]
0x01000000	0	0	Electronics failure	R
0x02000000		1	Mechanical failure	R
0x04000000		2	Motor Temperature too high	R
0x08000000		3	Electronics temperature too high	R
0x10000000		4	Memory error	R
0x20000000		5	Measurement failure	R
0x40000000		6	Device not initialized (no calibration)	R
0x80000000		7	Self calibration failed	R
0x00080000	2	3	New startup carried out (Warm Start)	R
0x00100000		4	Restart carried out (Cold Start)	R
0x00200000		5	Maintenance required	R
0x00400000		6	Reserved for use within the PNO	A
0x00800000		7	Set to 1 (one), if the Ident_Number of the running cyclic data transfer and the value of Physical Block IDENT__NUMBER_SELECTOR parameter are different.	A
0x00010000	3	0	Failure of the device or armature	R
0x00020000		1	Maintenance demanded	R
0x00040000		2	Device is in function check mode, or simulation, or under local control e.g. maintenance	R
0x00080000		3	The process conditions do not allow the return of valid values. (Set if a value has the quality Uncertain - Process related, no maintenance or Bad - Process related, no maintenance.)	R
		4 to 7	Reserved for use within the PNO	
	4	0 to 6	Reserved for use within the PNO	
0x80000000		7	0: There is no more information available 1: More diagnosis information is available in DIAGNOSIS_EXTENSION	

[a] **R** indicates the message remains active as long as the reason for the message exists. **A** indicates the message will automatically reset after 10 seconds.

C.10.5 Acyclic extended diagnostics (general fault codes)

In addition to the extended diagnostics available by cyclic data exchange (shown above), further extended diagnostics are available via acyclic communications. This consists of six bytes. See Diagnosis reply (available cyclically) (Page 237) for information on the location of the **Extended Diagnostics.**

Note

Certain fault codes (identified by an asterisk [*] in the table below) will persist until a manual reset has been performed [see **Fault Reset (3.2.)**].

Acyclic Extended Diagnostics /General Fault Codes					
LCD display		**Meaning**	**Corrective Action**	**Byte**	**Bit**
S:0		The device was unable to get a measurement within the Failsafe LOE Timer period. Possible causes: faulty installation, antenna material buildup, foaming/other adverse process conditions, invalid calibration 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 range calibration. • If fault persists, contact your local Siemens representative.	0	0
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.		2
S:3		Device is nearing its lifetime limit according to the value set in Maintenance Required Limit.	Replacement is recommended.		3
S:4		Device is nearing its lifetime limit according to the value set in Maintenance Demanded Limit.	Replacement is recommended.		4
S:6		Sensor is nearing its lifetime limit according to the value set in Maintenance Required Limit.	Replacement is recommended.		6
S:7		Sensor is nearing its lifetime limit according to the value set in Maintenance Demanded Limit.	Replacement is recommended.		7
S:8		Service interval as defined in Maintenance Required Limit has expired.	Perform service		0
S:9		Service interval as defined in Maintenance Demanded Limit has expired.	Perform service.		1
S:10		Input parameters High Calibration Point and Low Calibration Point are the same.	• Check calibration settings of device. • Ensure settings for High Calibration Point and Low Calibration Point are different.		3
S:11		Internal temperature sensor failure.	Repair required. Contact your local Siemens representative.		4

Acyclic Extended Diagnostics /General Fault Codes					
LCD display		**Meaning**	**Corrective Action**	**Byte**	**Bit**
S:12	*	Internal temperature of the 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 PDM or the LCD interface.	1	5
S:14		Upper and lower input values (Process Value Scale) for AIFB1 are the same.	• Check configuration for AIFB1. • Ensure that Upper Value and Lower Value (Process Value Scale) are not the same.		6
S:15		Upper and lower input values (Process Value Scale) for AIFB2 are the same.	• Check configuration for AIFB2. • Ensure that Upper Value and Lower Value (Process Value Scale) are not the same.		7
S:17		Calibration interval as defined in Maintenance Required Limit has expired.	Perform calibration.	2	1
S:18		Calibration interval as defined in Maintenance Demanded Limit has expired.	Perform calibration.		2
S:28		Internal device failure caused by a RAM memory error.	Repair required: contact your local Siemens representative.	3	4
S:29		EEPROM damaged.	Repair required: contact your local Siemens representative.		5
S:31		Flash error.	Repair required: contact your local Siemens representative.		7

Acyclic Extended Diagnostics /General Fault Codes					
LCD display		**Meaning**	**Corrective Action**	**Byte**	**Bit**
S:32		IDENT number conflict.	Ensure value of the Ident number selector is correct for the network configuration. If it is correct, the device needs to be re-parameterized by the PLC.	4	0
S:33		Factory calibration for the internal temperature sensor has been lost.	Repair required: contact your local Siemens representative.		1
S:34		Factory calibration for the device has been lost.	Repair required: contact your local Siemens representative.		2
S:35		Factory calibration for the device has been lost.	Repair required: contact your local Siemens representative.		3
S:36		Unable to start microwave module.	Cycle power. If fault persists, contact your local Siemens representative.		4
S:37		Measurement hardware problem.	Cycle power. If fault persists, contact your local Siemens representative.		5
S:38		Microwave module hardware failure: unable to calculate distance measurement.	Cycle power. If fault persists, contact your local Siemens representative.		6
S:43		Factory calibration for the radar receiver has been lost.	Repair required: contact your local Siemens representative.	5	3

C.10.6 Acyclic data

SITRANS LR250 supports up to four simultaneous connections by a Class 2 Master (C2 connection). It supports one connection by a Class 1 Master (C1 connection).

In order for a Class 1 Master to read parameters from a device, it needs to know the slot and absolute index of the parameter.

The parameters are all listed in SIMATIC PDM under Help. If you do not have SIMATIC PDM you can download the EDD (Electronic Device Description) and reference the HTML help file directly.

To find the slot and index numbers via SIMATIC PDM, go to Help > Communications, and select the appropriate block from the list. For each parameter, the slot and the relative index is listed. For example.

AIFB 1		
Index	**Parameter**	**Datatype**
1	Static Revision No.	UNSIGNED_INTEGER (2)

Each block has a slot number and an Index Offset value.

Block Name	Slot	Index Offset
Physical block	0	16
Transducer block	0	77
AIFB 1	1	16
AIFB 2	2	16

To get the absolute index for any parameter, add the Index Offset for the appropriate block to the relative index for that parameter. The parameter takes the slot number of the block in which it is located.

For example:

- Parameter **Static Revision Number** has relative index = 1 and is located on AIFB1.
- It has Absolute Index = 17 (relative index 1 + index offset 16).
- It is located at Slot 1 (the slot number for AIFB 1).

Appendix D: Certificates and Support

D

D.1 Certificates

Certificates can be downloaded from our website at:

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

D.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
AIFB	Analog Input Function Block		
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		
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		
SELV	Safety extra low voltage		
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

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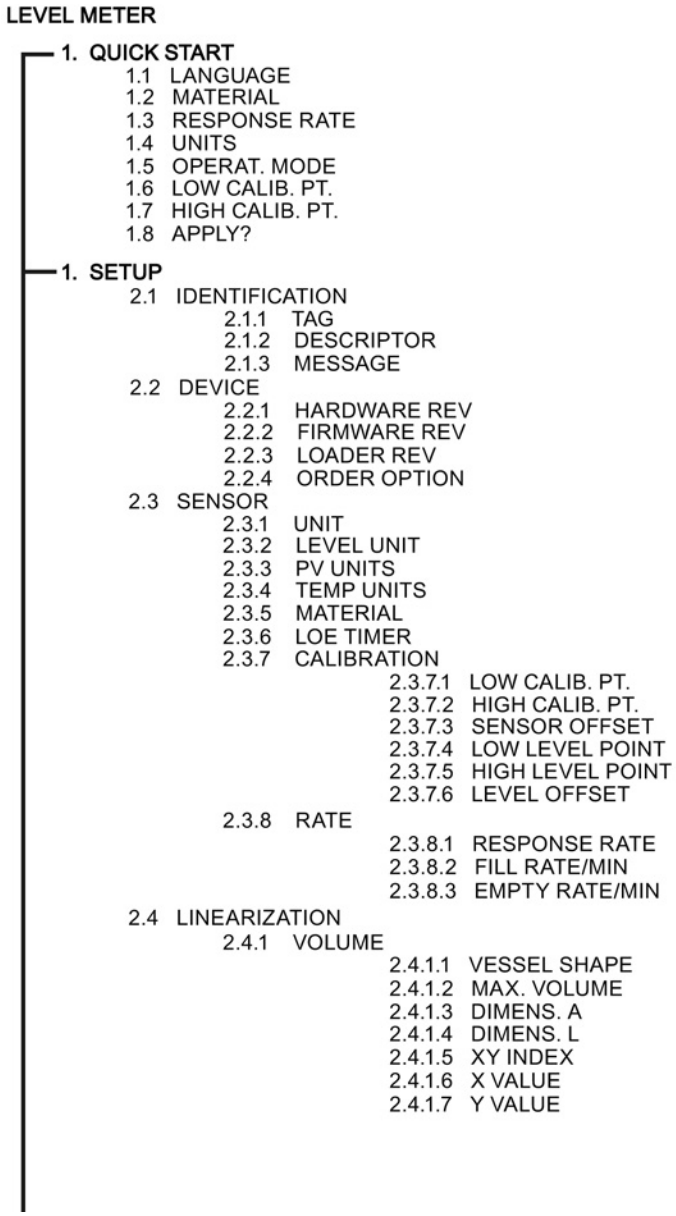
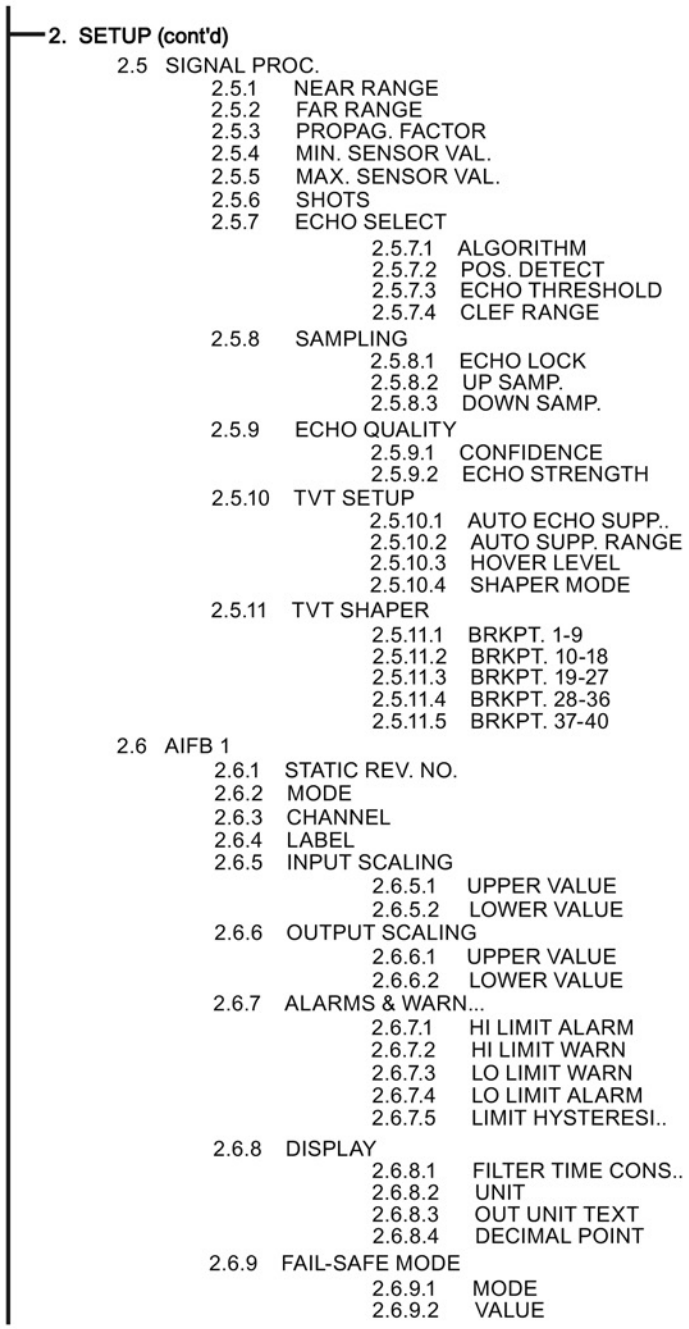
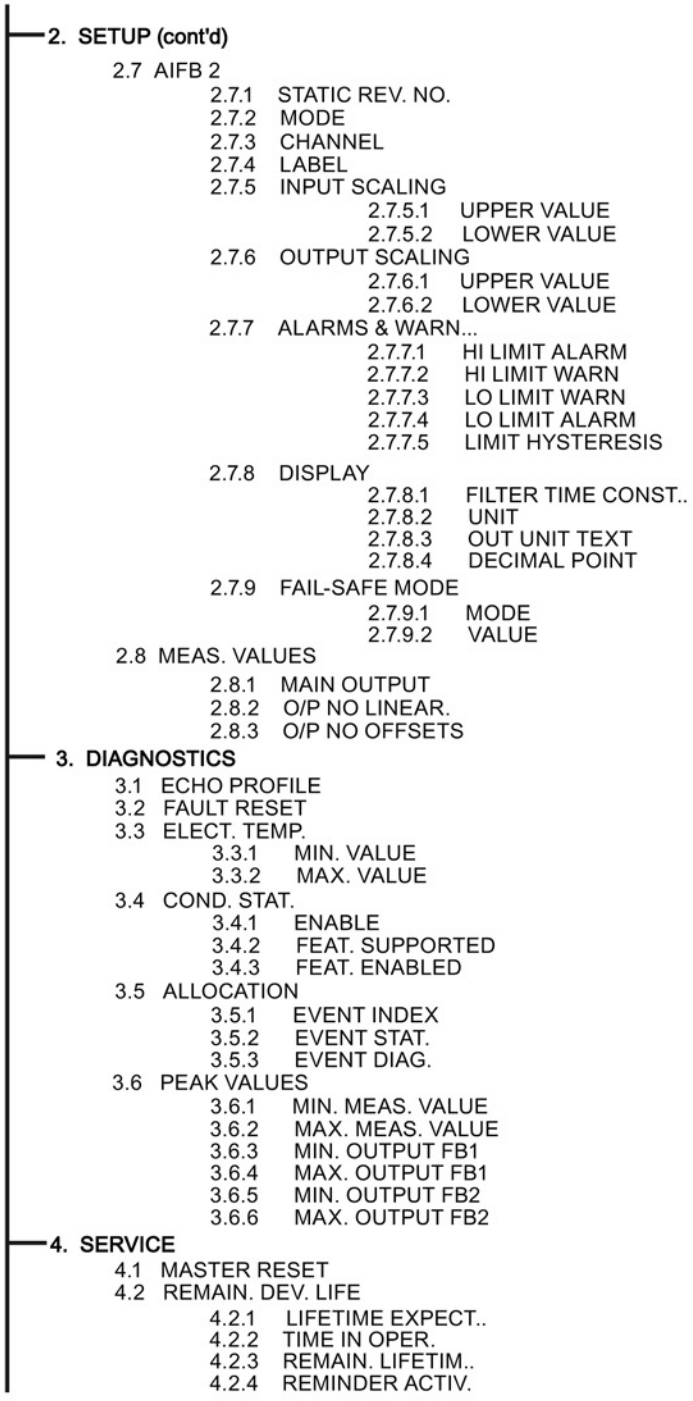
Note

- In Navigation mode, **ARROW keys** (◄ ▲ ► ▼) navigate the menu in the direction of the arrow. See Parameter Reference (Page 93) for detailed information and instructions.


LEVEL METER
1. QUICK START
1.1 LANGUAGE
1.2 MATERIAL
1.3 RESPONSE RATE
1.4 UNITS
1.5 OPERAT. MODE
1.6 LOW CALIB. PT.
1.7 HIGH CALIB. PT.
1.8 APPLY?
1. SETUP
2.1 IDENTIFICATION
2.1.1 TAG
2.1.2 DESCRIPTOR
2.1.3 MESSAGE
2.2 DEVICE
2.2.1 HARDWARE REV
2.2.2 FIRMWARE REV
2.2.3 LOADER REV
2.2.4 ORDER OPTION
2.3 SENSOR
2.3.1 UNIT
2.3.2 LEVEL UNIT
2.3.3 PV UNITS
2.3.4 TEMP UNITS
2.3.5 MATERIAL
2.3.6 LOE TIMER
2.3.7 CALIBRATION
2.3.7.1 LOW CALIB. PT.
2.3.7.2 HIGH CALIB. PT.
2.3.7.3 SENSOR OFFSET
2.3.7.4 LOW LEVEL POINT
2.3.7.5 HIGH LEVEL POINT
2.3.7.6 LEVEL OFFSET
2.3.8 RATE
2.3.8.1 RESPONSE RATE
2.3.8.2 FILL RATE/MIN
2.3.8.3 EMPTY RATE/MIN
2.4 LINEARIZATION
2.4.1 VOLUME
2.4.1.1 VESSEL SHAPE
2.4.1.2 MAX. VOLUME
2.4.1.3 DIMENS. A
2.4.1.4 DIMENS. L
2.4.1.5 XY INDEX
2.4.1.6 X VALUE
2.4.1.7 Y VALUE


2. SETUP (cont'd)
2.5 SIGNAL PROC.
2.5.1 NEAR RANGE
2.5.2 FAR RANGE
2.5.3 PROPAG. FACTOR
2.5.4 MIN. SENSOR VAL.
2.5.5 MAX. SENSOR VAL.
2.5.6 SHOTS
2.5.7 ECHO SELECT
2.5.7.1 ALGORITHM
2.5.7.2 POS. DETECT
2.5.7.3 ECHO THRESHOLD
2.5.7.4 CLEF RANGE
2.5.8 SAMPLING
2.5.8.1 ECHO LOCK
2.5.8.2 UP SAMP.
2.5.8.3 DOWN SAMP.
2.5.9 ECHO QUALITY
2.5.9.1 CONFIDENCE
2.5.9.2 ECHO STRENGTH
2.5.10 TVT SETUP
2.5.10.1 AUTO ECHO SUPP..
2.5.10.2 AUTO SUPP. RANGE
2.5.10.3 HOVER LEVEL
2.5.10.4 SHAPER MODE
2.5.11 TVT SHAPER
2.5.11.1 BRKPT. 1-9
2.5.11.2 BRKPT. 10-18
2.5.11.3 BRKPT. 19-27
2.5.11.4 BRKPT. 28-36
2.5.11.5 BRKPT. 37-40
2.6 AIFB 1
2.6.1 STATIC REV. NO.
2.6.2 MODE
2.6.3 CHANNEL
2.6.4 LABEL
2.6.5 INPUT SCALING
2.6.5.1 UPPER VALUE
2.6.5.2 LOWER VALUE
2.6.6 OUTPUT SCALING
2.6.6.1 UPPER VALUE
2.6.6.2 LOWER VALUE
2.6.7 ALARMS & WARN...
2.6.7.1 HI LIMIT ALARM
2.6.7.2 HI LIMIT WARN
2.6.7.3 LO LIMIT WARN
2.6.7.4 LO LIMIT ALARM
2.6.7.5 LIMIT HYSTERESI..
2.6.8 DISPLAY
2.6.8.1 FILTER TIME CONS..
2.6.8.2 UNIT
2.6.8.3 OUT UNIT TEXT
2.6.8.4 DECIMAL POINT
2.6.9 FAIL-SAFE MODE
2.6.9.1 MODE
2.6.9.2 VALUE


2. SETUP (cont'd)
2.7 AIFB 2
2.7.1 STATIC REV. NO.
2.7.2 MODE
2.7.3 CHANNEL
2.7.4 LABEL
2.7.5 INPUT SCALING
2.7.5.1 UPPER VALUE
2.7.5.2 LOWER VALUE
2.7.6 OUTPUT SCALING
2.7.6.1 UPPER VALUE
2.7.6.2 LOWER VALUE
2.7.7 ALARMS & WARN...
2.7.7.1 HI LIMIT ALARM
2.7.7.2 HI LIMIT WARN
2.7.7.3 LO LIMIT WARN
2.7.7.4 LO LIMIT ALARM
2.7.7.5 LIMIT HYSTERESIS
2.7.8 DISPLAY
2.7.8.1 FILTER TIME CONST..
2.7.8.2 UNIT
2.7.8.3 OUT UNIT TEXT
2.7.8.4 DECIMAL POINT
2.7.9 FAIL-SAFE MODE
2.7.9.1 MODE
2.7.9.2 VALUE
2.8 MEAS. VALUES
2.8.1 MAIN OUTPUT
2.8.2 O/P NO LINEAR.
2.8.3 O/P NO OFFSETS
3. DIAGNOSTICS
3.1 ECHO PROFILE
3.2 FAULT RESET
3.3 ELECT. TEMP.
3.3.1 MIN. VALUE
3.3.2 MAX. VALUE
3.4 COND. STAT.
3.4.1 ENABLE
3.4.2 FEAT. SUPPORTED
3.4.3 FEAT. ENABLED
3.5 ALLOCATION
3.5.1 EVENT INDEX
3.5.2 EVENT STAT.
3.5.3 EVENT DIAG.
3.6 PEAK VALUES
3.6.1 MIN. MEAS. VALUE
3.6.2 MAX. MEAS. VALUE
3.6.3 MIN. OUTPUT FB1
3.6.4 MAX. OUTPUT FB1
3.6.5 MIN. OUTPUT FB2
3.6.6 MAX. OUTPUT FB2
4. SERVICE
4.1 MASTER RESET
4.2 REMAIN. DEV. LIFE
4.2.1 LIFETIME EXPECT..
4.2.2 TIME IN OPER.
4.2.3 REMAIN. LIFETIM..
4.2.4 REMINDER ACTIV.

- **4. SERVICE (cont'd)**
  - 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 EXPECT..
    - 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
  - 4.4 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
- **5. COMMUNICATION**
  - 5.1 DEVICE ADDRESS
  - 5.2 PROFIBUS IDENT
- **6. SECURITY**
  - 6.1 REMOTE ACCESS
    - 6.1.1 REMOTE LOCKOUT
  - 6.2 LOCAL ACCESS
    - 6.2.1 WRITE PROTECTION
    - 6.2.2 LOCAL OPERATION
- **7. LANGUAGE**

Glossary

accuracy

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

agitator

mechanical apparatus for mixing or aerating. A device for creating turbulence.

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 angle

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

beam spreading

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

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.

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.

PROFIBUS PA

one of the PROFIBUS family of protocols, specifically tailored for the needs of process industries (PA = Process Automation).

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 RAdio Detection And Ranging. 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 permittivity

see dielectric constant.

repeatability

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

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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