

By using SIMATIC PDM, you can display a list of all echoes in your vessel. It provides the distance between the flange and the measuring medium's surface, as well as the distances of fixed targets. These may be directly used and transferred to the fix distance list.

4.2.3.9: Auto False Echo Suppression (F = use)

Learns and records the current signal up to the suppression distance setting. These signals are then ignored during operation.

Values	off
	record
	use

If all signals fall below this defined threshold, then the failsafe timer is initiated.

4.2.3.A: Auto False Echo Suppression Distance (F = 2/3 vessel height)

Defines the end point of the Auto False echo suppression distance

Value	variable
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4.2.4: Level Parameter

4.2.4.1: Level URV (= parameter 1.5)

4.2.4.2: Level URV (= parameter 1.6)

4.2.4.3: Level URV (= parameter 1.7)

4.2.4.4: MinLim Level (F = 0 m)

Lower limit value of the level (see "Functional Dimensions" on page 25)

Value	numerical value
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Set the lower limit value of the level as a height above the LRV.

4.2.4.5: MaxLim Level (F = 0 m)

Upper limit value of the level (see "Functional Dimensions" on page 25)

Value	numerical value
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Set the upper limit value of the level as a height above the LRV.

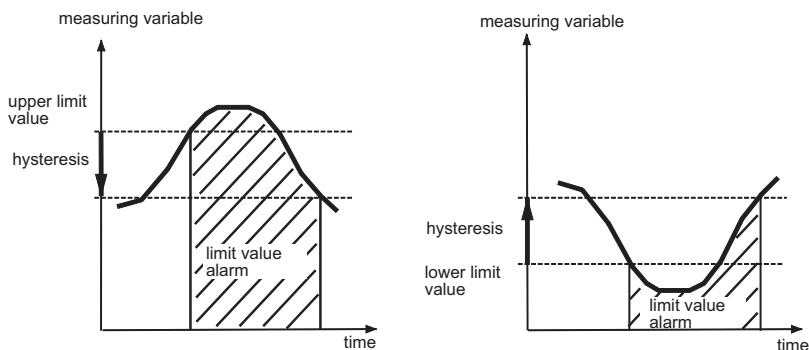
4.2.4.6: HYST Level ($F = 0.5 \text{ m}$)

Hysteresis of the level limit values

Value	numerical value
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Set the hysteresis of the limit values in the units system selected according to Parameter 4.1.1 (see diagram below).

Limit value alarm



4.2.5: Volume parameters

To calculate the volume of the measuring medium, you need the level parameters (see parameter 4.2.4) in the units selected according to parameter 4.1.1 and additionally a vessel characteristic (parameter 4.2.5.7).

4.2.5.1: Volume URV ($F = 20 \text{ m}^3$)

Full scale of the volume

Value	numerical value
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4.2.5.2: Volume LRV ($F = 0 \text{ m}^3$)

Start of scale of the volume

Value	numerical value
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4.2.5.3: Volume Damping ($F = 1 \text{ s}$)

Damping of the volume

Value	numerical value
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4.2.5.4: MinLim Volume ($F = 0 \text{ m}^3$)

Lower limit value of the volume

Value	numerical value
-------	-----------------

4.2.5.5: MaxLim Volume ($F = 0 \text{ m}^3$)

Upper limit value of the volume

Value	numerical value
-------	-----------------

4.2.5.6: HYST Volume ($F = 0.5 \text{ m}^3$)

Hysteresis of the volume limit values

Value	numerical value
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4.2.5.7: Tank Characteristic ($F = \text{Calibrate/table}$)

Determining the vessel characteristic

Value	Calibrate/table
	Calculate

Select the option "Calculate" or "Calibrate/Table" as required. The selection controls the display of Parameter 4.2.5.8.

The possibilities of each parameter are listed below. For the values associated with Parameter 4.2.5.8: Calculate, go to page 43.

4.2.5.8: Calibrate/table

If your vessel deviates from the forms offered, the necessary data is not available or is unknown or you need a vessel characteristic with greater accuracy you must calibrate it by liters. You can enter reference values from a table provided by the vessel manufacturer or do the calibration manually and enter the determined reference values.

You can only enter pairs of values consisting of level and volume.

Note: Entering the vessel characteristic with the operation and monitoring module can be a time-consuming procedure. It can be done more quickly and comfortably with the SIMATIC PDM software. There, an entered table can be edited simply – an option which is only conditionally possible with the operating and monitoring module.

The 4.2.5.8: Calibrate parameter offers the following selection possibilities:

4.2.5.8.1: Calibrate

Here you can enter up to 50 reference values whose levels SITRANS LR 400 measures. Enter the appropriate volume (determined by manual calibration).

If you access this parameter, first the currently measured level is displayed. Accept it by pressing . Enter the appropriate volume, save it by pressing  or reject it by pressing .

Then the device displays the “Calibrate” selection again. Access again (press ) to select a further reference value. The device automatically offers you the next undefined reference value.

It is recommended to enter a maximum of two or three reference values for the linear range of the vessel and to use the others for the non-linear portion

If you enter a second volume value for the same level, the reference value saved earlier is overwritten.

4.2.5.8.2: Enter table

Manual entry of a table

Value	numerical value
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Here you can enter up to 50 reference values provided by the vessel manufacturer in any order.

The first reference value is offered when you access the parameter. Enter the level as a distance from the floor of the vessel in the units selected according to parameter 4.1.1 (parameter “Enter level” and the volume corresponding to the level (parameter “Enter volume”).

The device then displays the selection “Enter table” again. Access again to enter a further reference value. The device automatically offers you the next undefined reference value.

It is recommendable to enter a maximum of two or three reference values for the linear range of the vessel and to use the others for the non-linear part.

If you enter a second volume value for the same level, the reference value saved earlier is overwritten.

4.2.5.8.3: Show table

Display table

Value	selection
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Here you can display the entered reference values sorted on levels. In the second line, the level corresponding to the first reference value appears first and then the corresponding volume value when you switch further. Each switching accesses a further reference value.

4.2.5.8.4: Clear table

Delete table

Value	selection
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If you access the “all” selection in this parameter, the entire saved table is deleted. You can delete individual reference values with the selection “1st,” “2nd” etc. which were displayed in parameter 4.2.5.8.3.

Note: The reference values are sorted in order of filling states and do not necessarily correspond to the order of the value pairs you have entered.

or

4.2.5.8: Calculate

Automatic calculation of a vessel characteristic is faster than manual entry by calibrating or a table. However, the calculated vessel characteristic is not as accurate as a manually calibrated characteristic – especially in the non-linear areas of the vessel in which errors of $\leq 1\%$ may occur. As well, the necessary data which you can get from the design documents of your vessel must still correspond to the real conditions.

The 4.2.5.8: Calculate parameter requires the following parameters:

4.2.5.8.1: Tank Design (F = Vertical Cylinder)

Value	Linear
	Vertical cylinder
	Horizontal cylinder
	sphere

Enter the external form of your vessel. You can choose from:

- Linear (any form with vertical walls and a flat floor)
- Vertical cylinder (vertically standing cylindrical form with curved covers)
- Horizontal cylinder (horizontal cylindrical form with curved caps)
- Sphere

4.2.5.8.2: Bottom Design (F = Dished end)

Value	Dished end
	Basket end
	Bullet bottom

Enter the form of the two vessel cover caps. You can choose from:

- Dished (according to DIN 28011)
- Basket (according to DIN 28013)
- Bullet (hemispherical shaped floor)

4.2.5.8.3: Tank volume (F = 20 m³)

Value	numerical value
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4.3: Analog Output

4.3.1: Error Level (F = D: Error Signal)

Level for the error signal to alarm in Analog or Digital output

Value	D: Error Signal
	D+F: Error Signal
	D+F+W: Error Signal

When D is selected, all errors are displayed. When D+F is selected, there is special handling for failsafe. When D+F+W is selected, there is special handling for warnings.

4.3.2: AO Select (F = Level)

Assignment of a measured value to the analog output

Values	Level
	Volume

Here you can set whether the analog output supplies the level or the volume to the control system.

The selection controls the following parameter 4.3.3.

4.3.3: Level Parameter (= Parameter 4.2.4)

or

4.3.3: Volume Parameter (= Parameter 4.2.5)

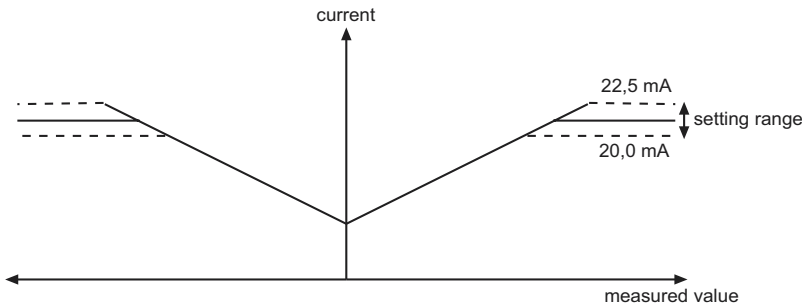
4.3.4: Current Limit (F = 20 mA)

Upper current limit

Value	20 - 22.5 mA
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Here you can set the upper current limit of the output signal in steps of 0.1 mA (see Current limiting diagram below).

Current limiting



The URV is always at 20 mA. If you set the current limit to a higher value, you can have the measured values output outside the measuring range (up to approx. 115%).

4.3.5: Error Signal (F = 3.6 mA)

Current value of the error signal

Value	3.6 mA
	22.0 mA
	24.0 mA
	Hold 10 s
	Hold 1 min
	Hold 2 min
	Hold 3 min
	Hold continuously

In the event of a fault the device applies the current defined here to the analog output. You can choose between 3.6 mA, 22 mA, 24 mA, Hold 10 s, Hold 1 min, Hold 2 min, Hold 3 min and Hold permanent.

In the “Hold...” parameters, the device outputs the last valid value until the set time has run out or the fault has been eliminated. If the fault persists after the set time runs out, the analog output switches to an error signal of 3.6 mA.

4.4 Digital Output

4.4.1: parameter DO (F = Alarm)

Assignment of the digital output

Value	MaxLim Level
	MinLim Level
	MaxLim Volume
	MinLim Volume
	Alarm
	No Function

Here you can select whether the digital output supplies the upper or lower limit value of level or volume or an alarm (device error, measurement error; see parameter 3.1) to the control system. If you select the “No function” option, the digital output is switched off.

Selection of a limit value enables parameter 4.4.3.

4.4.2: Error Level (F = D: Error Signal)

Level for the error signal to alarm in Analog or Digital output

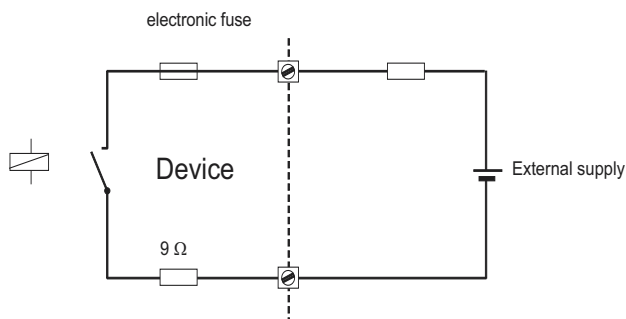
Value	D: Error Signal
	D+F: Error Signal
	D+F+W: Error Signal

When D is selected, all errors are displayed. When D+F is selected, there is special handling for failsafe. When D+F+W is selected, there is special handling for warnings.

4.4.3: Signal Type DO (F = Relay closes)

Value	Relay closes
	Relay opens

Here you can determine the behavior of the digital output. Select whether its contact closes or opens at an event.



The following parameters are only enabled when the digital output supplies a limit value.

4.6.9.6: Antenna offset (see page 51)

4.6.9.7: Reference distance (see page 51)

4.4.4: Level Parameter (= Parameter 4.2.4)

or

4.4.4: Volume Parameter (= Parameter 4.2.5)

4.5: Display Parameters

4.5.1: Multi-Display

4.5.1.1: Line 1 Local (F = Level)

Choice of measured value in line 1

Value	Level
	Volume

4.5.1.2: Display Local (F = Eng Unit)

Method of display in line 1

Value	Eng unit
	%
	Bar graph

4.5.1.3: Level Parameter (= Parameter 4.2.4)

or

4.5.1.3: Volume Parameter (= Parameter 4.2.5)

4.5.1.4: Line 2 Local (F = S/N ratio)

Display in line 2

Value	Level
	Volume
	Temperature
	Validity
	S/N ratio
	Amplitude
	Digital output
	Analog output

4.5.1.5: Level Parameter (= Parameter 4.2.4)

or

4.5.1.5: Volume Parameter (= Parameter 4.2.5)

4.5.2: Language Local (= parameter 1.1)

4.5.3: LCD Lighting (F = off)

Background illumination of the LCD

Value	on
	off

4.6: Device Information

4.6.1: Power Supply (F according to customer specifications)

Voltage range of the built-in power supply unit

Value	non-editable
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4.6.2: Flange Temperature (according to customer specifications)

Temperature range of the flange in °C

Value	non-editable
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4.6.3: Electrical Connection (according to customer specifications)

Value	non-editable
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4.6.4: Antenna and Flange

4.6.4.1: Flange Size (according to customer specifications)

Size of the flange

Value	DN 80, 3 in
	DN 100, 4 in
	DN 150, 6 in
	Special Design

4.6.4.2: Flange Type (according to customer specifications)

Type of flange

Value	DIN 2527
	ANSI
	JIS
	Special Design

4.6.4.3: Pressure Stage (according to customer specifications)

Pressure range of the process connection

Value	non-editable
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4.6.4.4: Antenna Type (according to customer settings)

Value	Horn type long
	Horn type short
	Special design

4.6.4.6: Flange Material (according to customer specifications)

Value	316/316L
	Special Design

4.6.4.7: Seal Material (according to customer specifications)

Sealing material

Value	Teflon
	Kalrez
	Viton
	Perbunan
	Special Design

4.6.5: Tag (according to customer specifications)

Device identification

Value	up to any eight characters
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4.6.6: Descriptor (according to customer specifications)

Measuring point description

Value	up to any 16 characters
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4.6.7: Message (according to customer specifications)

Measuring point message, e.g. the date of the last check or clean

Value	up to any 32 characters
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4.6.8: Manufacturer Identification

4.6.8.1: Serial Number (F = unique number)

Factory serial number

Value	non-editable
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4.6.8.2: Order Number (according to customer specifications)

Device order number (delivery state)

Value	non-editable
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4.6.8.3: Fld Dev Rev (F = Number)

Device version

Value	non-editable
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4.6.8.4: Software Revision (F = Number)

Value	non-editable
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4.6.8.5: Hardware Revision (F = Number)

Value	non-editable
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4.6.8.6: Antenna Offset (F = approx. 0.5 m [calibration value])

Distance sensor/flange

The antenna offset defines the propagation time of the measuring signal between the sensor and the flange as a distance. It is preset at the factory and cannot be changed.

4.6.8.7: Reference Difference (F = approx. 106 m [calibration value])

Internal reference distance

The length of the reference distance in the units system selected according to parameter 4.1.5 can only be read out and not changed. The device uses this to calibrate itself so that no manual adjustment is necessary in long-term operation.

5. Options

5.1: Enter Code

Input of customer code to enable programmability

Value	Customer code
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The device compares a code number which you enter here with the code number defined by parameter 5.2. If your entry matches the customer code completely, it releases the programming lock for all parameters. Any other code number locks and disables programming.

5.2: Customer Code (F = 0)

Determination of customer code

Value	up to 4-digit code
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Here you define the up to four digit long *customer code with which you can protect the device parameters against undesirable programming errors.

Meaning and parameter of the customer code are explained in “Disabling and enabling programming” on page 22

5.3: Factory Reset (F = no)

Reset all parameters to factory setting

Value	yes
	no

This parameter allows you to reset all parameters to the original factory setting as described in “Parameters (HART)” on page 25.

Parameters (Profibus PA)

Parameters (Profibus PA)

Device parameter, parameter, menu identification	Description	Factory Setting	Setting Possibilities
1: Auto-Setup			
Language local	Language of the local user interface	English	English Deutsch
Length Unit		m	cm m mm ft in
Nozzle height	Height flange to top of tank	0 m	numerical value
Tank Height	Height tank bottom to top	20 m	numerical value
Level URV	Full scale of level (see Functional Dimensions Diagram)	20 m	numerical value
Level LRV	Start of scale of level (See Functional Dimensions Diagram)	0 m	numerical value
Level damping	Damping of level in s	1 s	numerical value
Application type	Use of the vessel	Liquid (store)	Liquid (store) Liquid (process) Silo1 (solids) Silo2 (solids) User tank1 User tank2
1.8: Bus address	Current bus address	126	numerical value
2: Display			
2.1: Multi-display	Display of two measured values	Level in Signal-to-noise ratio in dB	non-editable
2.2: Level	Level of measured medium	m	non-editable
2.3: Volume	Volume of measured medium	m ³	non-editable
2.5: Current Output	Value of the analog output in mA		non-editable
3: Diagnostics			

Parameters (Profibus PA)

Device parameter, parameter, menu identification	Description	Factory Setting	Setting Possibilities
3.1: Status			
3.1.1: Wear			
3.1.1.1: Operating Hours	Total previous operating time of the device in hours (approximate value)		non-editable
3.1.1.2: Maximum temp.	Previous maximum tem- perature of device	26°C	non-editable
3.1.1.3: Minimum temp.	Previous minimum tem- perature of the device	26°C	non-editable
3.1.1.4: Aging	Approximate value for the previous life of the device in % (100% = approx. 10 years)		non-editable
3.1.1.5: Hours > 85°C	Previous time during which the maximum per- missible sensor tempera- ture was exceeded in hours		non-editable
3.1.x: Sensor and/or	Diagnostic messages of the sensor		non-editable
3.1.x: Electronics and/or	Diagnostic messages of the electronics		non-editable
3.1.x: Software and/or	Diagnostic messages of the software		non-editable
3.1.x: Application and/or	Diagnostic messages to the application		non-editable
3.1.x: Parameters and/or	Display of the false parameters		non-editable
3.1.x: Service	for service purposes only		non-editable
3.2: Device test			
3.2.1: Self-test	Check device state		non-editable
3.2.2: Display test	Visual check of LCD		non-editable
3.3: Sensor variables			
3.3.1: Raw value	Distance from flange to measured medium		
3.3.2: Echo Amplitude	Measure of quality of reflection		
3.3.3: S/N ratio	Signal-to-noise ratio of the measured value in dB		
3.3.4: Validity	Validity of the measured value in %		

Parameters (Profibus PA)

Device parameter, parameter, menu identification	Description	Factory Setting	Setting Possibilities
3.3.5: SensorTemp	Sensor temperature		
4: Device data			
4.1: Units			
4.1.1 Length unit	= [1.2]		
4.1.2: Volume unit		m ³	bbl yd ³ ft ³ in ³ bush bbl (fl.) l m ³ hL Gal ImpGal
4.1.4: Temperature Unit	Unit of the sensor temperature	°C	°C °F K
4.1.5: Other units	Units system for all other units	SI	SI unit US/UK unit
4.2: Operating parameters			
4.2.1: Tank geometry			
4.2.1.1: Nozzle height	= [1.3]		
4.2.1.2: Tank height	= [1.4]		
4.2.1.3: Stilling pipe?	Stilling pipe available?	no	yes no
If yes: Pipe diameter	Diameter (= internal) of the stilling pipe	100 mm	numerical value
4.2.2: Measuring conditions			
4.2.2.1: Applic. type	Use of the tank	Liquid (store)	Liquid (store) Liquid (process) Silo1 (solids-pellets) Silo2 (solids-powders) User tank1 User tank2

Parameters (Profibus PA)

Device parameter, parameter, menu identification	Description	Factory Setting	Setting Possibilities
4.2.2.2: Surface	Surface structure of the measured medium Not displayed if a user tank is selected in [4.2.2.3].	wavy	smooth wavy turbulent
4.2.2.3: Dead band	Area beneath the flange in which measured values are ignored	0.26 m	numerical value, Minimum value = Length of the antenna
4.2.2.4: Correction factor	Correction factor for physical measuring influences	1.0	numerical value
4.2.2.5: Filling speed	Typical speed of change of the level Not displayed if a user tank is selected in [4.2.2.3].	200 mm/min	numerical value
4.2.2.7: Failsafe Level	Selects the default measurement in the even the failsafe timer expires	Hold	100 % 0 % Hold
4.2.2.8: Failsafe Timer	Sets the time delay, in minutes, before going into fail-safe level	10 min	1 min 2 min etc.
4.2.2.9: Range Extension	Sets the distance below the tank height included in the evaluation	3 m	1 m 2 m etc.
4.2.3: Sensor parameter			
4.2.3.1: Sensor damping	Averaging of measuring signal Not displayed if a user tank is selected in [4.2.2.3].	10 s	numerical value
4.2.3.2: Multiple echo	Evaluate multiple echo	on	on off
4.2.3.3: Echo motion	Evaluate echo motion	on	on off
4.2.3.4: Window tracking		on	on off
4.2.3.5: Tank empty detect.		on	on off
4.2.3.6: Auto fix dist.	Automatic fixed target detection	on	on off

Parameters (Profibus PA)

Device parameter, parameter, menu identification	Description	Factory Setting	Setting Possibilities
4.2.3.7: Fix dist. list	Manual input of up to nine fixed targets		numerical values
4.2.3.9: Auto False Echo Suppression	Learns and records the current signal up to the suppression distance setting. These signals are then ignored during operation	use	use record off
4.2.3.A: Auto False Echo Suppression Distance	Defines the end point of the Auto False echo suppression distance	0 m	variable
4.2.4: Level param.			
4.2.4.1: Level URV	= [1.5]		
4.2.4.2: Level LRV	= [1.6]		
4.2.4.3: Level damping	= [1.7]		
4.2.4.4: Min Warn level	Limit before reach lower limit value	0 m	numerical value
4.2.4.5: MinLim level	Lower limit value of the level (See Functional Dimensions Diagram)	0 m	numerical value
4.2.4.6: MaxLim level	Upper limit value of the level (See Functional Dimensions Diagram)	0 m	numerical value
4.2.4.7: MaxWarn level	Limit before reach upper limit value	0 m	numerical value
4.2.4.8: HYST level	Hysteresis of the level limit values	0.5 m	numerical value
4.2.5: Volume param.			
4.2.5.1: Volume URV	Full scale of the volume	20 m ³	numerical value
4.2.5.2: Volume LRV	Start of scale of the volume	0 m ³	numerical value
4.2.5.3: Volume damping	Damping of the volume	1 s	numerical value
4.2.5.4: MinWarn volume	Limit before reach lower limit value	0 m	numerical value
4.2.5.5: MinLim volume	Lower limit value of the volume	0 m ³	numerical value
4.2.5.6: MaxLim volume	Upper limit value of the volume	0 m ³	numerical value

Parameters (Profibus PA)

Device parameter, parameter, menu identification	Description	Factory Setting	Setting Possibilities
4.2.5.7: MaxWarn volume	Limit before reach upper limit value	0 m	numerical value
4.2.5.8: HYST volume	Hysteresis of the volume limit values	0.5 m ³	numerical value
4.2.5.0: Tank characteristic	Determining the tank characteristic	Calibrate/ table	Calibrate/table Calculate
4.2.5.A: Calibrate/table or 4.2.5.A: Calculate			
4.2.5.A.1: Calibrate or 4.2.5.A.1: Tank design	Automatic litering		Confirm input
		Vertical cylinder	Linear Vertical cylinder Horizontal Cylinder Sphere
4.2.5.A.2: Enter table or 4.2.5.A.2: Bottom design	Manual entry of a table		numerical value
		Dished end	Dished end Basket end Bullet bottom
4.2.5.A.3: Show table or 4.2.5.A.3: Tank volume	Display table		Selection
		20 m ³	numerical value
4.2.5.A.4: Clear table or 4.2.5.A.4: Tank height	Delete table = [4.2.1.2]		Selection
4.3: Output parameter			
4.3.1: BusIdentNr.			Profile specific Manufacturer specific
4.3.2: Bus address	= [1.8]		
4.4: Display param.			
4.4.1: Multi display			
4.4.1.1: Line 1 local	Choice of measured value in line 1	Level	Level Volume
4.4.1.2: Display local	Method of display in line 1	Eng unit	Eng unit % Bargraph