

PiLoTREK

W-200, W-300 Non-Contact Radar Families

Programming Manual 5th Edition



Manufacturer:

NIVELCO Process Control Co.

H-1043 Budapest, Dugonics u. 11.

Tel.: +36-1-889-0100

E-mail: sales@nivelco.com ■ www.nivelco.com

TABLE OF CONTENTS

1. INTRODUCTION	6
1.1 Local Display / Menu Handling.....	6
1.1.1 SAP-300 Display Unit (Optional).....	6
1.1.2 Elements of the Display.....	7
1.1.3 Info Screens	8
1.1.4 Menu Handling	9
1.1.5 Menu Map	10
2. PilotREK SETTINGS	11
2.1 Quick Setup	11
2.2 Measurement Config.....	12
2.2.1 Region / Units	12
2.2.2 Zero-Level Distance.....	16
2.2.3 Damping Time	17
2.2.4 Application.....	17
2.2.5 PV Mode (Primary Output Value).....	18
2.2.6 SV Mode (Secondary Output Value).....	19
2.2.7 TV Mode (Third Output Value)	19
2.2.8 QV Mode (Fourth Output Value)	19
2.3 Output.....	20
2.3.1 Analog Output.....	20
2.3.2 Relay Output (optional).....	23
2.3.3 HART Address	26
2.3.4 Display Mode	27
2.3.5 Language.....	27
2.4 Measurement Optimization	28
2.4.1 Range Blocking	28
2.4.2 Echo Selection	31
2.4.3 Echo Loss Handling	32
2.4.4 Threshold Offset.....	33
2.4.5 Filling Speed	33
2.4.6 Emptying Speed.....	34
2.4.7 User Slope Correction Factor	34

2.5 Tank Calculation.....	35
2.5.1 Calculation Mode.....	35
2.5.2 Tank Shape (DIM1...DIM5)	36
2.5.3 Specific Gravity.....	37
2.5.4 Manage OCT Table.....	38
2.5.5 Tank Total Volume.....	39
2.6 Flow Calculation	39
2.6.1 Calculation Mode.....	39
2.6.2 Flume/Weir Type	40
2.6.3 Manage OCT Table.....	49
2.6.4 P46 (h=0 Distance).....	49
2.7 Service.....	50
2.7.1 Clear TOT1.....	50
2.7.2 Bluetooth® Settings.....	50
2.7.3 Security	51
2.7.4 Output Test.....	51
2.7.5 Distance Simulation.....	52
2.7.6 Defaults	54
2.8 Service Diagnostic Parameters (read only).....	55
2.9 Flow Measurement Control Parameters (read only)	55
2.10 Output Control Parameters (read only).....	55
2.11 Hardware / Software Versions (read only).....	55
3. TROUBLESHOOTING	56
3.1 Status and Error Indication in HART® Communication.....	56
3.2 Typical Application Errors.....	58
4. EView2 INSTRUCTIONS.....	58
4.1 Device Status Window	58
4.2 Echo Diagram (Oscilloscope Function)	59
4.3 Threshold Settings	59
4.4 Threshold Mask	61
4.5 The Output Conversion Table (OCT) – (EView2 OC-Table)	62
4.6 Programming Example 1 – Configuring Level Measurement (using EView2).....	64
4.7 Programming Example 2 – Configuring The Current Loop Output (Using Eview2)	65
5. PARAMETER LIST	66

Certificates		Reference document number
	ATEX, Certificate No.: BKI24ATEX0001 X	wes200hu23p02-b
		wpa200hu23p03-b
	IECEX, Certificate No.: IECEX BKI 26.0003X	wes200en26p06-b, wpa200en26h06-b
	ANATEL, Certificate No.: 04179-24-16612	wes200en26p06-b
		wpa200en26h06-b
	INMETRO, Certificate No.: DNV 24.0166 X.	wps200br24p01-b



Thank you for purchasing a NIVELCO product.

1. INTRODUCTION

Application

The **PiloTREK WE-200, W-300** compact non-contact radar level transmitters use the most advanced industrial 80 GHz FMCW radar measurement technology. It uses state-of-the-art technology to measure liquids, emulsions, bulk solids, and chemicals in industries such as water treatment, food processing, energy, pharmaceuticals, and chemicals, providing measurement results with millimeter accuracy. It can also measure materials prone to vapor formation and liquids with a gas blanket. Since the propagation of millimeter waves does not require a medium, it can also be used in a vacuum.

1.1 Local Display / Menu Handling

PiloTREK WE-200 and WT-300 type compact radar transmitters can be equipped with an SAP-300 display unit. The display is not available for WP-200 integrated types.

1.1.1 SAP-300 Display Unit (Optional)

The display shows the actual measurement value and status information by default. The display can also be used to configure most PiloTREK parameters using the four buttons.

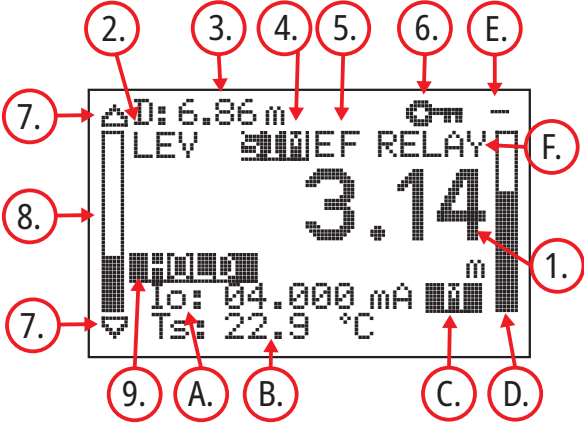
SAP-300 display unit – Technical data		Warning!
Display	64 × 128 dot matrix LCD	 Do not expose the SAP-300 to prolonged heat or sunlight as the display may be damaged.
Operating temperature:	–20...+65 °C (–4...+149 °F)	

Do not leave the SAP-300 in the PiloTREK if it is not possible to protect the PiloTREK from sunlight or if the PiloTREK is to be used outside the operating temperature range of the SAP-300.



1.1.2 Elements of the Display

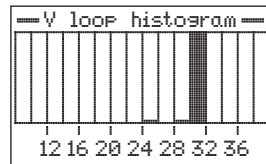
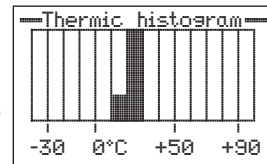
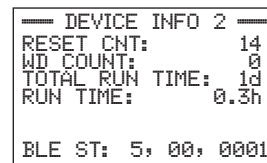
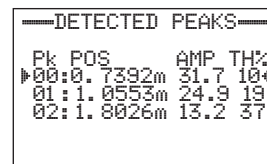
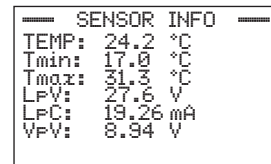
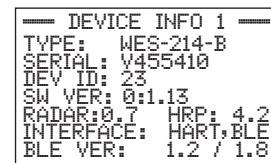
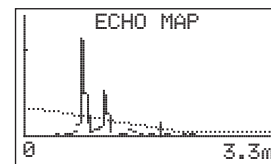
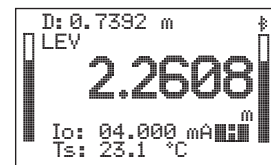
1	Measured Primary Value (PV), with unit indication below (5 digit)
2	Measured quantity (PV mode): LEV – Level, VOL – Volume, FLOW – Flow, ...
3	Raw value for PV calculation: 'D:' – Distance, 'L:' – Level, 'H:' – Flow height
4	SIM – indicator: Simulation mode active. Warning! PV is simulated, not measured.
5	Empty/Full marker: 'E' – Tank Empty, 'F' – Tank Full
6	Menu locked by: 'key' – Security code, 'REM' – Remote access active
7	Trend indicator: '△' – slow increase, '▲' – fast increase, '▽' – slow decrease, '▼' – fast decrease
8/D	Bar-graph: <i>left</i> – Level % (full range), <i>right</i> – Output % of 4...20 mA output range
9	Output status indicator: 'OCT' – Output Conversion Table active
	speed Level change speed exceeds limit, output holding last valid
	hold Echo loss, output holding last valid value
	F/EE cho loss, output continuing last valid trend
A	Output current value B Transmitter temperature
C	Output mode: 'M' – Manual, 'H' – HART multi-drop, 'E' – Error current
E	Bluetooth® status: 'B' – Enabled, '* – Connected, '–' – Disabled, 'X' – Error
F	'RELAY' – Relay On (C2 state)



1.1.3 Info Screens

You can switch between info screens using the   and  buttons.

- **Value display:** single display mode
- **Echo map:** dotted line indicates threshold level
- **Peak list:** Peak no., Position, Amplitude [dB], Threshold relative to peak amplitude
- **Device info 1:** Type and version info
- **Device info 2:** Run time info (only for advanced diagnostic purposes)
- **Sensor Info:** (TEMP) Electronics temperature, (LpV) Loop voltage, (LpC) Loop current, (VpV) Internal buffer voltage.
- **Histogram:** Thermic histogram, Loop voltage histogram



1.1.4 Menu Handling

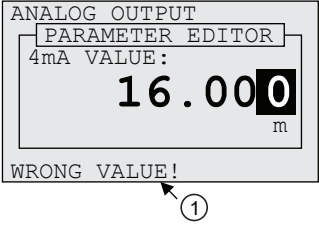
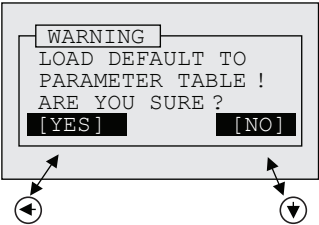
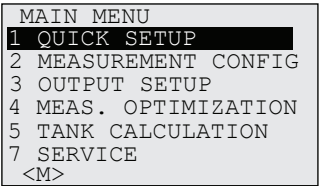
Navigating in the menu	Button	Value input	Checkbox setting
Entering the selected menu		Accepting the setting	Accepting the setting
Selecting a menu item		Modifying digit value	Selecting an item
Going back to the previous menu		Next digit	Switching checked/unchecked

Menu properties

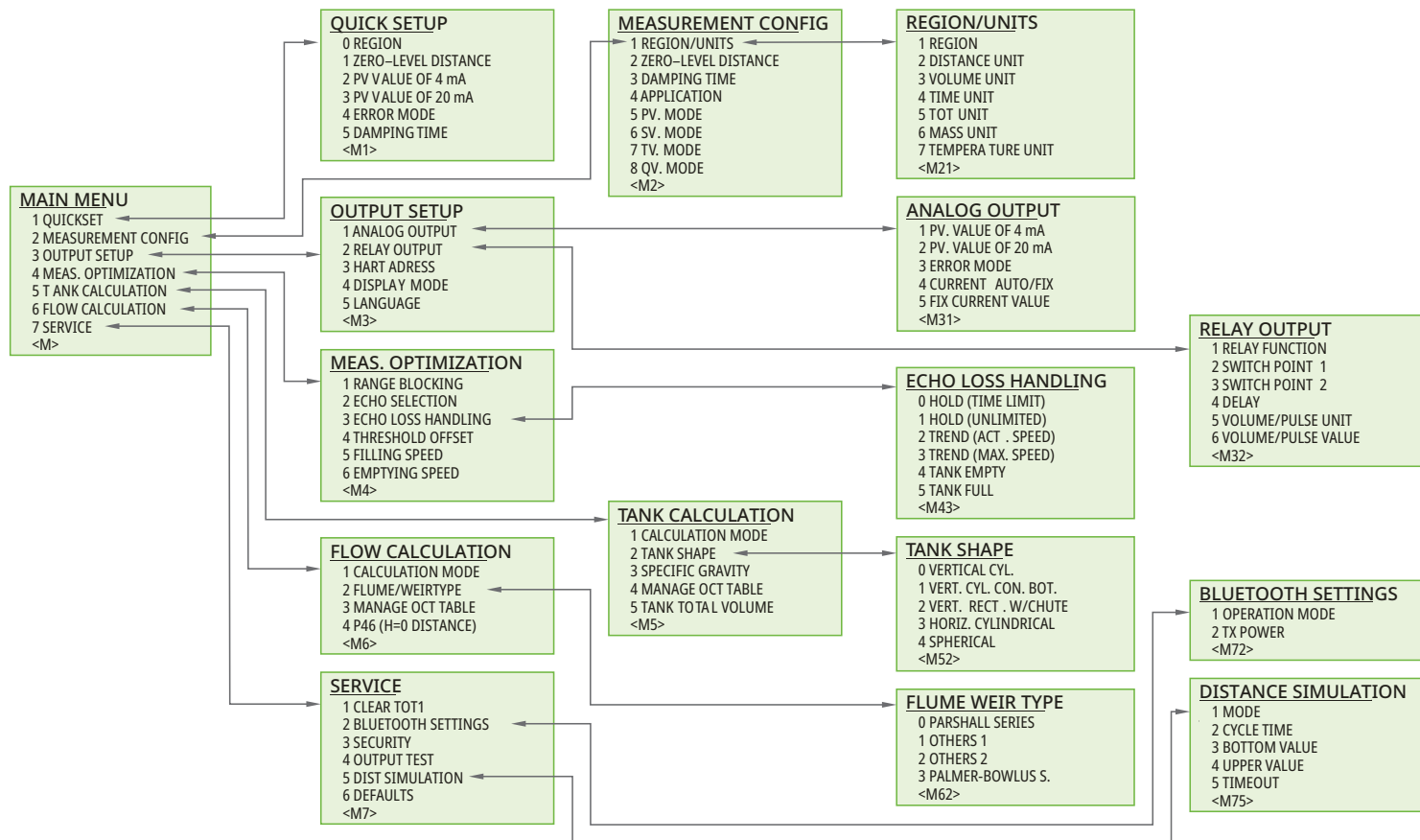
- Enter the main menu from any info screen by pressing the button.
- Menu TOP row: left – **MENU TITLE**, right – or indicates that menu can be scrolled in given direction.
- Menu BOTTOM row: left – **<Menu ID>** (M-ID), right – **Parameter-ID** (P-ID), only if relevant
- Changes take effect only after you exit the menu. Until then, the transmitter continues to operate with the previous settings.
- After 30 seconds of inactivity (or if SAT-300 is unplugged) PiloTREK will automatically exit the menu, discarding all changes.
- Local menu access and remote programming (**REM**) through Bluetooth®, HART or Modbus block each other. Whichever is first will have priority.
- Dialog BOX: or buttons perform the function displayed on the screen, e.g., [Yes], [No].

Value input – special key combinations (press simultaneously)

- + → Return to original value.
- + → Set to default value.
- + → Set to actually measured value. (Supported only at some parameters



1.1.5 Menu Map

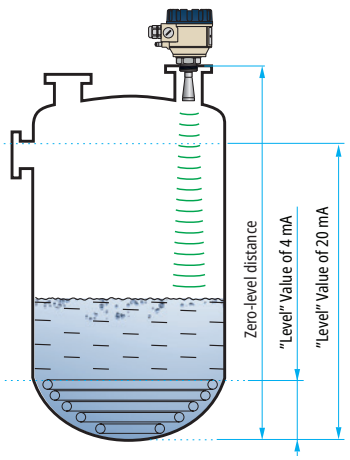


2. PilotREK SETTINGS

2.1 Quick Setup

Local display menu	M-ID	EView2	MonoCONT	P-ID	MultiCONT	Modbus
QUICKSET	Q	—	—	—	—	—

PilotREK W-200 and W-300 models with integrated display (WG□-2□□-□ and WB□/WL□/WD□/WN□-3□□-□) offer a built-in Quick Setup feature for simple LEVEL measurement applications. Quick Setup guides you sequentially through the following basic settings. Press  button for 3 seconds to exit Quick Setup any time.

#		Description	
0	REGION	Defines RF compliance and the unit system (Metric/Imperial) to be used. For USA select "US / Imperial". See Chapter 2.2.1 Region/Units for more information.	
1	ZERO-LEVEL DISTANCE	Defines the zero point for level measurement. Enter the distance between the sealing plane of the process connection and the designated zero level. See Chapter 2.2.2 . Zero-Level Distance for more information.	
2	PV VALUE OF 4 mA	Defines the LEVEL value assigned to 4 mA current output, by default the zero-level. See Chapter 2.3.1. Output Setup / PV Value of 4 mA for more information.	
3	PV VALUE OF 20 mA	Defines the LEVEL value assigned to 20 mA current output, by default the maximum measurable level. The analog output automatically scales the set level range to the 4...20 mA current output range. See Chapter 2.3.1. Output Setup / PV Value of 20 mA for more information.	
4	ERROR MODE	Defines the behavior of the current output in case of "No echo error", i.e. while no up-to-date LEVEL value is available. See Chapter 2.3.1. Output Setup / Error Mode for more information. Options: – HOLD Keeps last valid value on output (default). Recommended setting. – 3.8 mA Outputs "Low error current". – 22 mA Outputs "High error current". "Error current" setting is recommended only if recognized distinctly from 4 mA/20 mA Zero- or Max-level.	
5	DAMPING TIME	Delay, in seconds, for the output to reach a new value. Larger values smooth output, e.g. to hide waving, smaller values allow faster reaction to sudden changes. Default is 40 s. See Chapter 2.2.3. Damping Time for more information.	

2.2 Measurement Config

2.2.1 Region / Units

a. REGION

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Config → Region / Units → Region	Application → Calculation system	Transmitter → P00 Region/Mode → Engineering system	Devices → Remote Program → App. parameters → P00 Application → □□■□□	800 → □■□□
<M211>	P00 → □■□□	<T42>	—	—

The Region setting ensures compliance with local RF regulations of PiloTREK 80 GHz radar. In addition, this setting also defines the unit system.

 Changing the Region parameter resets all parameters to factory default of selected unit system. Always set this parameter first.

#	Value	Description	Default
0	EU / Metric	EU, United Kingdom, Switzerland, Canada, Australia, Albania, Andorra, Azerbaijan, Belarus, Bosnia and Herzegovina, Liechtenstein, Moldova, Monaco, Montenegro, New Zealand, North Macedonia, Norway, San Marino, Saudi Arabia, Serbia, Turkey, Ukraine	EU / Metric
1	US / Imperial	United States	
2	Region 2 / Metric	Brazil, Japan, South Korea, Taiwan, Thailand	
3	Region 2 / Imperial		
4	Region 3 / Metric ⁽¹⁾	India, Malaysia, South Africa	
5	Region 4 / Metric ⁽¹⁾	Russia, Kazakhstan	

⁽¹⁾ For 'Region 3' and 'Region 4' accuracy of $\pm 2 \text{ mm}$ (0.079") is not guaranteed.

b. Distance Unit

M212

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Config → Region / Units → Distance Unit	Application → Engineering units	Transmitter → P00 Region/Mode → Distance units	Devices → Remote Program → App. parameters → P00 Application → □□□■□	800 → □□■□
<M212>	P00 → □□■□	<T43>	—	—

#	Metric	Imperial	Description	Default (Metric/Imperial)
0	m	ft	This setting defines the level or distance unit used on digital outputs, such as local display, HART, or Modbus. Additionally, the configuration parameters also require the value given in the unit set here.  Changing the 'Distance Unit' parameter will resets all other parameters to the default of the selected unit system, except the 'Region' setting. All user parameters must be set again.	m / ft
1	cm	inch		
2	mm	inch		

c. Volume Unit

M213

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Config → Region / Units → Volume Unit ⁽¹⁾	Measurement config. → Volume unit	Transmitter → Transmitter setup → P02 Output unit → Volume units	Devices → Remote Program → Param- eters → P02 Output unit → □□□■□	804 → □□■□
<M213>	P02 → □□■□	<T1021>	—	—

⁽¹⁾ Appears only if PV, SV, TV, or QV is set to VOLUME or FLOW.

#	Metric	Imperial	Description	Default (Metric/Imperial)
0	liter	gallon	Defines the unit used for digital Volume or Flow (Volume/time) value output. ⁽²⁾ In FLOW measurement mode, use only for MGD. Otherwise, in HART transmission, it can only be interpreted in conjunction with reading the application-specific code.	m ³ / barrel
1	hL	ft ³		
2	m ³	barrel		
3	million liter ⁽²⁾	million gallon ⁽²⁾		

b. Time Unit

M214

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Config → Region / Units → Time Unit	Measurement config. → Time	Transmitter → Transmitter setup → P02 Output unit → Time units	Devices → Remote Program → Parameters → P02 Output unit → ☐ ☐ ☒ ☐	804 → ☐ ☒ ☐ ☐
<M214>	P02 → ☐ ☒ ☐ ☐	<T1023>	—	—

#	Metric	Imperial	Description	Default
0		Second	Defines the unit used for digital Time value output.	Second
1		Minute		
2		Hour		
3		Day		

e. TOT Unit

M215

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Config → Region / Units → TOT Unit ⁽¹⁾	Measurement config. → TOT unit	Transmitter → Transmitter setup → P02 Output unit → TOT units	Devices → Remote Program → Parameters → P02 Output unit → ☐ ☒ ☐ ☐	804 → ☒ ☐ ☐ ☐
<M215	P02 → ☒ ☐ ☐ ☐	<T1024>	—	—

⁽¹⁾ Appears only if PV, SV, TV, or QV is set to FLOW.

#	Metric	Imperial	Description	Default (Metric/Imperial)
0	liter	gallon	Defines the unit used for digital TOT output values.	m ³ / barrel
1	hL	ft ³		
2	m ³	barrel		
3	million liter	million gallon		

f. Mass Unit

M216

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Config → Region / Units → Mass Unit ⁽²⁾	Measurement config. → Mass unit	Transmitter → Transmitter setup → P02 Output unit > Mass Unit	Devices → Remote Program → Parameters → P02 Output unit → □□□□■	804 → □□□■
<M216>	P02 → □□□■	<T1022>	—	—

⁽²⁾ Appears only if PV, SV, TV, or QV is set to MASS.

#	Metric	Imperial	Description	Default (Metric/Imperial)
0	kg	lb	Defines the unit used for digital Mass value output.	ton / US ton
1	Metric ton	Imperial ton		
2	Imperial ton	Metric ton		

g. Temperature Unit

M217

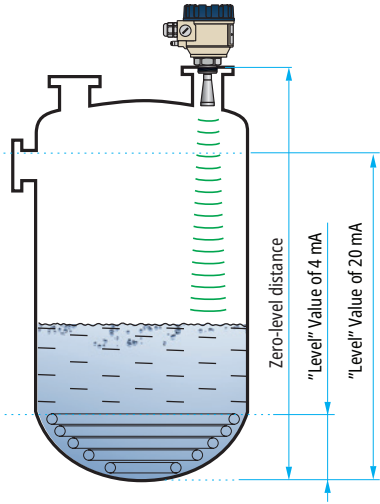
Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Config → Region / Units → Temperature Unit	Measurement config. → Temperature	Transmitter → P00 Region/Mode → Temperature Unit	Devices → Remote Program → Parameters → P00 Application → □■□□□	800 → ■□□□
<M217>	P00 → ■□□□	<T44>	—	—

#	Metric	Imperial	Description	Default
0	Celsius		Defines the unit used for digital Temperature output.	°C
1	Fahrenheit			

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Config. → Zero-Level Distance	Measurement config. → Zero-Level Dist	Transmitter → Transmitter setup → P04 Zero-level distance	Devices → Remote Program → Parameters → P04 Zero-level distance	808 → float
<M22>	P04	<T104>	—	—

The “Zero-Level Distance” – ‘A’ (or “Tank Height” – ‘A’) is the distance between the “reference plane” of the process connection and the designated “zero level” of the application, typically the bottom of the tank. The device calculates the level by subtracting the measured “Level Distance” (‘DIST’) from the “Zero-level distance”. Level: ‘LEV’ = A – DIST
This parameter shall always be set, except for distance measurement

	Value range	Unit	Default
Zero-Level Distance	(“Near blocking distance” + 5 cm [2"]) ...60 m (200 ft)	“Distance Unit”	See “X _{max} ” in the Sensing distance table



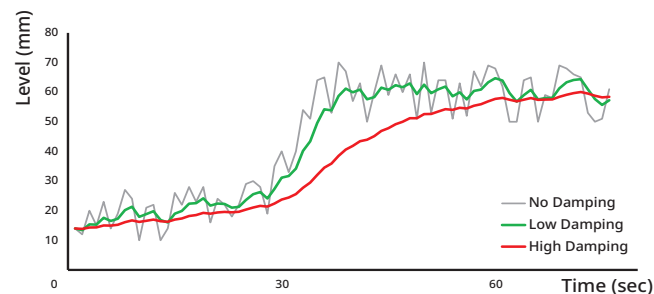
2.2.3 Damping Time

M23

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Config. → Damping Time	Measurement optimization → Damping time	Transmitter → Transmitter Setup → P20 Damping time	Devices → Remote Program → Parameters → P20 Damping Time	840 → float
<M23>	P20	<T120>	—	—

Damping time reduces unwanted fluctuations in displaying the measured data (e.g., ripples). It slows down the reaction of the output. After the set time, the output reaches 98% of the new value.

	Value range	Unit	Default
Damping Time	0...999	s	40 s



2.2.4 Application

M24

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Config. → Application	Application → Operation mode	Transmitter → P00 Region/Mode → Application	Devices → Remote Program → App. parameters → P00 Application → □□□□■	800 → □□□■
<M24>	P00 → □□□■	<T41>	—	—

#	Value	Description	Default
0	Normal	Recommended for level measurement of primarily water-based, homogeneous liquids. Suitable for media with strong radar signal reflectivity.	Normal ⁽¹⁾
1	High-sensitivity	Recommended for low dielectric constant (low DK) media and bulk solids such as powders and granules. Intended for applications where the reflected radar signal is weak, scattered, or highly attenuated. Compensates for uneven material surfaces and poor reflective properties by increasing receiver sensitivity and signal strength. Improves measurement reliability in difficult applications with low signal return. Important Limitation: High-Sensitivity mode is not recommended for highly reflective media such as water. Excessive signal strength or signal saturation may reduce measurement accuracy and can potentially cause measurement errors.	

⁽¹⁾ For devices equipped with a 3" lens antenna (W□□-3□□-□), High-Sensitivity mode is the factory default setting.

2.2.5 PV Mode (Primary Output Value)

M25

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Config. → PV Mode	Measurement configuration → Measurement Mode (PV source)	Transmitter → Transmitter setup → P01 PVSV mode → PV mode	Devices → Remote Program → Parameters → P01 Output function → □□□■	802 → □□■
<M25>	P01 → □□□■	<T1011>	—	—

Defines the value transmitted on the Primary Output (PV), including the analogue output (4...20 mA loop current), as well as the value shown on local display. Default: "Level"

#	Value	Description	Default
10	Distance	Distance (DIST) of the level as measured by the Transmitter.	Level
11	Level	Level (LEV) is calculated from "Distance" based on "Zero-Level Distance" (See "2.2.2 Zero-Level Distance").	
12	Volume	Volume (VOL) is calculated from "Level" based on tank shape settings. (See "2.5. Tank Calculation")	
15	Ullage Volume	Empty Volume (UL.VOL) is calculated from "Volume" based on "Total Volume" setting. (See "2.5. Tank Calculation")	
13	Mass	Weight (MASS) is calculated from "Volume" based on "Specific Gravity" setting. (See "2.5. Tank Calculation")	
14	Flow ⁽¹⁾	Open channel Flow (FLOW) measurement mode. (See "2.6. Flow Calculation" settings below.)	
16	Level%	Level% is the relative level in a 0% to 100% range. (100% is defined by "2.4.1 Near Blocking Distance" setting.)	
17	Volume%	Volume% is the relative volume in a 0% to 100% range.	
40	Device Temperature	Temperature of transmitter. (Indicative for ambient temperature.)	
41	Flow TOT1	TOT1 user-resettable "Flow" totalizer. (Only in combination with "Flow" mode)	
42	Flow TOT2	TOT2 non-resettable "Flow" totalizer. (Only in combination with "Flow" mode)	

⁽¹⁾ "Flow" measurement mode cannot be selected together with "Volume" and volume-based measurement modes.

2.2.6 SV Mode (Secondary Output Value)

M26

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Config. → SV Mode	Measurement configuration → Secondary value source (SV)	Transmitter → Transmitter setup → P01 PVSV mode → SV mode	Devices → Remote Program → Parameters → P01 Output function → ☐ ☒ ☐ ☐	802 → ☒ ☒ ☐ ☐
<M26>	P01 → ☒ ☒ ☐ ☐	<T1012>	—	—

Defines the Value transmitted on the Secondary Output (SV), which is available on the digital output channels like HART® or Modbus. See “PV Mode” concerning the selectable values. **Default: “Distance”**

2.2.7 TV Mode (Third Output Value)

M27

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Config. → TV Mode	Measurement configuration 2 → Third value source (TV)	Transmitter → Transmitter setup → P30 TVQV mode → TV mode	—	860 → ☐ ☐ ☒ ☒
<M27>	P30 → ☐ ☐ ☒ ☒	<T1301>	—	—

Defines the Value transmitted on the Third Output (TV), which is available on the digital output channels like HART® or Modbus. See “PV Mode” concerning the selectable values. **Default: “Level%”**

2.2.8 QV Mode (Fourth Output Value)

M28

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Config → QV Mode	Measurement configuration 2 → Fourth value source (QV)	Transmitter → Transmitter setup → P30 TVQV mode → QV mode	—	860 → ☒ ☒ ☐ ☐
<M28>	P30 → ☒ ☒ ☐ ☐	<T1302>	—	—

Defines the Value transmitted on the Fourth Output (QV), which is available on the digital output channels like HART® or Modbus. See “PV Mode” concerning the selectable values. **Default: “Temperature”**

2.3 Output

2.3.1 Analog Output

M31

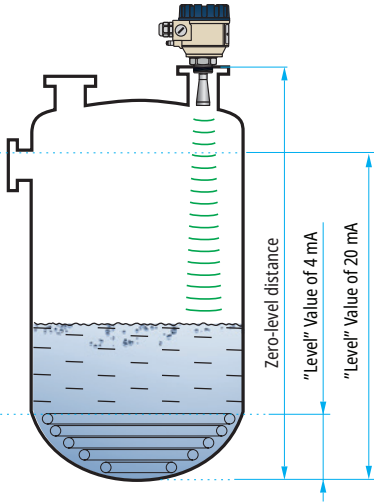
a. PV Value of 4 mA

M311

Local display	EView2	MonoCONT	MultiCONT	Modbus
Output setup → Analog Output → PV Value of 4 mA	Outputs → Current output → Assignment of 4 mA - PV	Transmitter → Transmitter setup → P10 PV Assign 4mA	Devices → Remote Program → Parameters → P10 PV assign 4 mA	820 → float
<M311>	P10	<T110>	—	—

This parameter assigns the transmitted quantity value to the 4 mA output current. Default: "0.0". In the case of "Automatic" mode of the analog current output, it is the PV value assigned to 4 mA (usually the lower limit of the measuring range in the case of level measurement). The device scales the (HART – PV, see P01 PVSV mode) output value to the analog current output 4...20 mA range using the values specified in parameters **"PV Value of 4 mA" / "PV Value of 20 mA" (P10/P11)**.

	Value range	Unit	Default
PV Value of 4 mA	0...99.999	"Distance Unit"	0



b. PV Value of 20 mA

M312

Local display	EView2	MonoCONT	MultiCONT	Modbus
Output setup → Analog Output → PV Value of 20 mA	Outputs → Current output → Assignment of 20 mA - PV	Transmitter → Transmitter setup → P11 PV Assign 20mA	Devices → Remote Program → Parameters → P11 PV assign 20 mA	822 → float
<M312>	P11	<T111>	—	—

This parameter assigns the transmitted quantity value to the 20 mA output current.

In the case of “Automatic” (current transmission) mode of the analog current output, it is the PV assigned to 20 mA (usually the upper limit of the measurement range in the case of level measurement). The device scales the HART PV output value (see P01 PVSV mode) output value to the analog 4...20 mA current output range using the values specified in parameters “PV Value of 4 mA” and “PV Value of 20 mA”. The values can be assigned inversely. (For example, 4 mA to 1 m [3.3 ft] level and 20 mA to 10 m [33 ft] level, or vice versa 20 mA to 1 m [3.3 ft] level and 4 mA to 10 m [33 ft] level.)

	Value range	Unit	Default
PV Value of 20 mA	0...99.999	“Distance Unit”	See “X _{max} ” in the Sensing distance table

c. Error Mode

M313

Local display	EView2	MonoCONT	MultiCONT	Modbus
Output setup → Analog Output → Error Mode	Outputs → Current output → Error indication by the current output	Transmitter → Transmitter setup → P12 Errorcurrent mode → Error Mode	Devices → Remote Program → Parameters → P12 current output → □□□□■	824 → □□□■
<M313>	P12 → □□□■	<T1121>	—	—

Error current mode: the device indicates the error state on the current output according to the setting below.
The error indication set as below persists until the error is cleared.

#	Value	Default
0	HOLD (holding last valid value)	HOLD
1	3.8 mA	
2	22 mA	

d. Current Auto/Fix

M314

Local display	EView2	MonoCONT	MultiCONT	Modbus
Output setup → Analog Output → Current Auto/Fix	Outputs → Current output → Current generator mode	Transmitter → Transmitter setup → P12 Errorcurrent mode → Current Mode	Devices → Remote Program → Parameters → P12 current output → ☐ ☐ ☒ ☐	824 → ☐ ☐ ☒ ☐
<M314>	P12 → ☐ ☐ ☒ ☐	<T112>	—	—

Analog current output mode:

#	Value	Description	Default
0	Auto (current transmission)	The value of the output current is calculated from the measured value using the parameters "PV Value of 4 mA" / "PV Value of 20 mA" (P10/P11). The output of the transmitter is active.	AUTO
1	Fix	The value of the output current is not calculated from the measured value. Instead, a fixed output current (P08) is sent to the output. In this mode, the setting of the fault current mode is irrelevant. In multi-drop HART communication mode, the 4 mA output is overridden by the "HART Address" (P19) setting.	

e. Fix Current Value

M315

Local display	EView2	MonoCONT	MultiCONT	Modbus
Output setup → Analog Output → Fix current value	Outputs → Current output → Fix output current (P08)	Transmitter → Transmitter setup → P08 Fix output current	Devices → Remote Program → Parameters → P08 Fix current	816 → float
<M315>	P08	<T108>	—	—

If the "Current Auto/Fix" mode (P12:b) is set to "Fix," the output current takes the value specified here, and the analog transmission switches off. A value between 3.8...20.5 mA is specified in this parameter. Caution: The device automatically switches to "Fix" current output mode when a new value is set in the "Fix current value" (P08) parameter. When 0 is entered, the device switches to "Auto" current transmission mode ("Current Auto/Fix" P12:b = 0) and resets the value of parameter P08 to the factory setting. In HART multi-drop mode (see parameter "HART Address" P19), the current loop output is fixed at 4 mA, as per standard, and the manual output current value "Fix current value" (P08) does not apply. Default: 4.0 mA

	Value range	Unit	Default
Fix current value	3.8...20.5	mA	4 mA

2.3.2 Relay Output (optional)

a. Relay Function M321

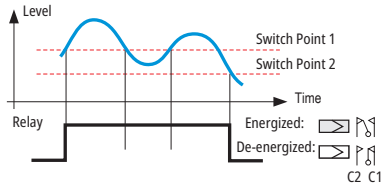
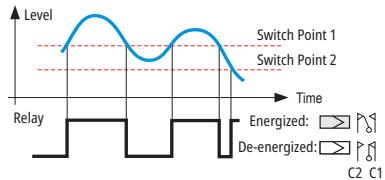
Local display	EView2	MonoCONT	MultiCONT	Modbus
Output setup → Relay Output → Relay Function	Outputs → Relay output → Relay mode	Transmitter → Transmitter setup → P13 Relay Function → Relay mode	Devices → Remote Program → Parameters → P13 Relay function → □□□■	826 → □□■
<M321>	P13 → □□■	<T1131>	—	—

This parameter sets the operating mode of the optional relay built into the device. If it is set to “by PV,” the relay operates based on the configured trigger point, “Switch Point 1” (P14), and release point, “Switch Point 2” (P15). The “No ECHO” setting enables a switched (relay contact) error signal to the process controller.

Caution! When the device is de-energized, the relay releases, so C1 is ON.

#	Value	Default
00	PV Hysteresis (see below for function)	C1 if no Echo
10	PV Window (see below for function)	
01	C1 if no Echo	
02	C2 if no Echo	
03	Flow Pulse	
04	C1 if Error	
09	Relay OFF	

Operating mode

Function		Programmable parameters	Description
Hysteresis		At least 20 mm (0.787") hysteresis is required Switch Point 1 > Switch Point 2 – normal operation Switch Point 1 < Switch Point 2 – inverted operation	The basic switching method of the RELAY set to “PV” mode can be adjusted.
Window comparator		At least 20 mm (0.787") difference is required between Switch Points 1 and 2. Switch Point 1 > Switch Point 2 – normal operation Switch Point 1 < Switch Point 2 – inverted operation	

b. Switch Point 1 M322

Local display	EView2	MonoCONT	MultiCONT	Modbus
Output setup → Relay Output → Switch Point 1	Outputs → Relay output → Relay parameters → Energized value	Transmitter → Transmitter Setup → P14 Relay on state value	Devices → Remote Program → Parameters → P14 Relay on value	828 → float
<M322>	P14	<T114>	—	—

The measured PV value at which the relay indicates that the upper limit has been reached.
Adjustable range: The value can be set within the PV setting range.

	Value range	Unit	Default
Switch Point 1	0...99.999	“Distance Unit”	0

c. Switch Point 2

M323

Local display	EView2	MonoCONT	MultiCONT	Modbus
Output setup → Relay Output → Switch Point 2	Outputs → Relay output → Relay parameters → De-energized value	Transmitter → Transmitter Setup → P15 Relay off state value	Devices → Remote Program → Parameters → P15 Relay off value	830 → float
<M323>	P15	<T115>	—	—

The measured PV value at which the relay indicates that the lower limit has been reached.

Adjustable range: The value can be set within the PV setting range.

	Value range	Unit	Default
Switch Point 2	0...99.999	"Distance Unit"	0

d. Delay

M324

Local display	EView2	MonoCONT	MultiCONT	Modbus
Output setup → Relay Output → Delay	Outputs → Relay output → Relay delay time	Transmitter → Transmitter Setup → P16 Relay delay	Devices → Remote Program → Parameters → P16 Relay delay	832 → float
<M324>	P16	<T116>	—	—

If the PV reaches the lower or upper switching value, or if an error signal occurs, the relay changes state only after this delay time has elapsed.

	Value range	Unit	Default
Delay	0...999	s	0

e. Volume/Pulse Unit

M325

Local display	EView2	MonoCONT	MultiCONT	Modbus
Output setup → Relay Output → Volume/Pulse Unit	Outputs → Relay output → Relay parameters → Pulse constant unit	Transmitter → Transmitter setup → P13 Relay Function → Relay mode → Flow Impulse Unit	Devices → Remote Program → Parameters → P13 Relay function → □□■□□	826 → □■□□
<M325>	P13 → □■□□	<T1133>	—	—

#	Metric (EU)	Imperial (US)	Default (Metric / Imperial)
0	m ³	ft ³	m ³ / ft ³
1	liter	US gallon	
2	liter	GB gallon	

f. Volume/Pulse Value

M326

Local display	EView2	MonoCONT	MultiCONT	Modbus
Output setup → Relay Output → Volume/Pulse Value	Outputs → Relay output → Relay parameters → Pulse constant	Transmitter → Transmitter setup → P17 Flow	Devices → Remote Program → Parameters → P17 Flow pulse	834 → float
<M325>	P17	<T117>	—	—

In FLOW mode, the relay generates one pulse for each volume unit specified here. The volume unit is set in parameter “Volume/Pulse Unit” (P13:c). The pulse width is 100 ms. The minimum guaranteed interval between pulses is < 3 seconds.

	Value range	Unit	Default
Volume/Pulse Value	0...999999	“Volume/Pulse Unit”	0

2.3.3 HART Address

M33

Local display	EView2	MonoCONT	MultiCONT	Modbus
Output setup → HART Address	Device Identification → HART Device Short Address	Transmitter → Transmitter setup → P19 Short Address	Devices → Remote Program → Parameters → P19 Polling addr.	838 → float
<M33>	P19	<T119>	—	—

#	Description	Default
0	Analog current loop output is active (current transmission via 4...20 mA)	0
1...15	Analog current loop inactive (no current transmission, fixed 4 mA), multi-drop	

2.3.4 Display Mode

M34

Local display	EView2	MonoCONT	MultiCONT	Modbus
Output setup → Display mode	—	—	—	1008 → □■□□
<M34>	—	—	—	—

#	Display Mode	Default
0	Single (PV)	Single (PV)
1	Double (PV, SV)	

2.3.5 Language

M35

Local display	EView2	MonoCONT	MultiCONT	Modbus
Output setup → Language	—	—	—	1008 → ■□□□
<M35>	—	—	—	—

#	Language	Default
0	English	English
1	Hungarian	
2	Polish	
3	German	

2.4 Measurement Optimization

2.4.1 Range Blocking

a. Near Blocking Distance (Dead Zone)

M411

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Optimization → Range Blocking → Near Blocking Dist.	Measurement configuration → Minimum (P05)	Transmitter → Transmitter setup → P05 Near blocking	Devices → Remote Program → Parameters → P05 Near Blocking	810 → float
<M411>	P05	<T105>	—	—

“Near Blocking Distance” (or ‘A’) defines the minimum measuring distance and as such the maximum measurable level. This parameter creates a dead zone within the specified distance from the transmitter. Any signal within this range will be ignored. It can therefore be used to suppress unwanted echo signals in the near zone.

	Value range	Unit	Default
Near Blocking Distance	Cannot be less than $X_{\min}$	“Distance Unit”	See “ $X_{\min}$ ” in the Sensing distance table

b. Far Blocking Level

M412

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Optimization → Range Blocking → Far Blocking Lev.	Measurement configuration → Far end (P06)	Transmitter → Transmitter setup → P06 Far blocking	Devices → Remote Program → Parameters → P06 Far Blocking	812 → float
<M412>	P06	<T106>	—	—

We can specify a level value below which the output will no longer follow any further level decrease. Far-end blocking is used when objects at the bottom of the tank (mixer, heating coil, funnel, etc.) cause measurement uncertainty within this range, e.g., because interfering echoes cannot be safely distinguished from the echoes of the measured surface. If an echo falls within the far-end blocking range ($LEV < \text{“Far Blocking Level” P06}$), the device sends a special signal and keeps the level value defined here on the output (see figure). The “Echo in far blocking range” flag ([see Chapter 3.1](#)) indicates that the echo is in the far-end blocking zone. Regardless of this, the “VALID” flag is active, but the “HOLD” flag remains inactive. Far-end blocking can be deactivated by setting this parameter to 0. Min. value: 0 / max. value: “Zero-Level Distance” – “Near Blocking Distance” – 5 cm (2")

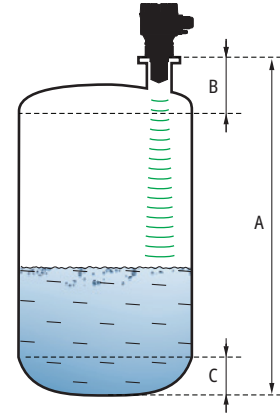
	Value range	Unit	Default
Far Blocking Level	0... “Zero-Level Distance” – “Near Blocking Distance” – 5 cm (2")	“Distance Unit”	0.0

A.) Level or volume measurement

- A = Zero-level distance (P04)
- B = Near Blocking Distance (P05)
- C = Far Blocking Level (P06)
- If the level drops below the value of “Far Blocking Level” (P06):

It keeps a level value corresponding to P06 on the output and calculates the derived values from it.

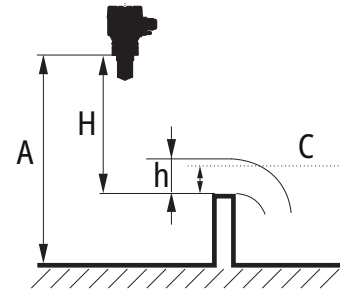
- If the level goes above the far-end blocking limit:
In level or volume measurement mode, the programmed tank dimensions are valid, so far-end blocking does not affect the measured or calculated values.



B.) Open-channel flow measurement

Far-end blocking is usually applied to those low-level values, below which exact volume flow cannot be calculated.

- A = Zero-level distance (P04)
- C = Far Blocking Level (P06)
- H = Distance to the surface without flow (P46)
- h = Flow level
- If the level in the flume drops below the blocking value:
 - The current loop output holds the value corresponding to $Q = 0$.
 - For transmitting a zero value via HART, use 'No Flow', or display 0.
- If the level in the flume rises above the blocking value:
The flow value is calculated using the parameters specified in the program, so far-end blocking does not affect the measured values.



c. Sensing Distance

M413

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Optimization → Range Blocking → Sensing Distance	Measurement configuration → Sensing Distance	Transmitter → Transmitter setup → P03 Sensing distance	Devices → Remote Program → Parameters → P03 Sensing distance	806 → float
<M413>	P03	<T103>	—	—

The maximum sensing distance measured from the process connection. The device evaluates level signals only within the specified distance. The maximum sensing distance is type-specific. See the $X_{\max}$ column (+30 cm [+1 ft]) of the type-specific measurement distance table below. Smaller values can be set. The minimum value is parameter "Near Blocking Dist." (P05) + 30 cm (1 ft). It is not necessary to set this parameter. The device automatically selects the detection distance based on the zero-level distance specified in "Zero-Level Distance" (P04), within the limits of "Sensing Distance" (P03).

Type-specific measuring distance		Minimum $X_{\min}^{(1)}$	Maximum $X_{\max}$	Default
W□P, W□V, W□F encapsulated antenna	W□□-212-□ / W□□-213-□	0.056 m (2.2")	10 m (33 ft)	$X_{\max} + 30 \text{ cm (1 ft)}$
	W□□-214-□ / W□□-215-□	0.070 m (2.75")	10 m (33 ft)	
	W□□-224-□□ / W□□-225-□	0.070 m (2.75")	20 m (66 ft)	
W□S, W□M, W□K stainless steel antenna	W□□-212-□ / W□□-213-□	0.069 m (2.7")	10 m (33 ft)	
	W□□-214-□ / W□□-215-□	0.080 m (3.15")	10 m (33 ft)	
	W□□-224-□ / W□□-225-□	0.080 m (3.15")	20 m (66 ft)	
WPC lens antenna	WPC-212-□ / WPC-213-□	0.028 m (1.1")	10 m (33 ft)	
	WPC-214-□ / WPC-215-□	0.046 m (1.81")	10 m (33 ft)	
	WPC-224-□ / WPC-225-□	0.046 m (1.81")	20 m (66 ft)	
W□C, W□E, W□G lens antenna	W□□-212-□ / W□□-213-□	0.028 m (1.1")	10 m (33 ft)	
	W□□-214-□ / W□□-215-□	0.046 m (1.81")	10 m (33 ft)	
	W□□-224-□ / W□□-225-□	0.046 m (1.81")	20 m (66 ft)	
W□F, W□T, W□L lens antenna	W□□-33□-□	0.01 m (0.39")	30 m (98.5 ft)	
	W□□-36□-□	0.01 m (0.39")	60 m (196.9 ft)	

⁽¹⁾ From the plane of the process connection.

d. Tank Full Limit

M414

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Optimization → Range Blocking → Tank Full Limit	Advanced mode → Parameters → P29 Tank Full Limit	Transmitter → Transmitter setup → P29 Tank Full Limit	Devices → Remote Program → Parameters → P29 Tank Full Limit	858 → float
<M414>	P29	<T129>	—	—

As with Far Blocking Level, the echo is tracked below the specified distance, but the output is not tracked and a "Tank Full" flag is displayed. If "Tank Full" Limit is less than "Near Blocking Dist.", the Tank Full Limit parameter is disabled

	Value range	Unit	Default
Tank Full Limit	0... "Zero-Level Distance" P04 – 5 cm (2")	"Distance Unit"	0

2.4.2 Echo Selection

M42

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Optimization → Echo Selection	Measurement optimization → Echo selection → Selection of Echo...	Transmitter → Transmitter setup → P25 Echo selection	Devices → Remote Program → Parameters → P25 Echo Selection → □□□□■	850 → □□□■
<M42>	P25 → □□□■	<T125>	—	—

The parameter "Echo Selection" (P25:a) sets the echo selection strategy. Automatic operating mode is suitable for most applications. For special application requirements, a specific echo selection can be set as required.

#	Value	Default
0	Automatic	Automatic
1	First	
2	Second	
3	Largest	
4	Last	

2.4.3 Echo Loss Handling

M43

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Optimization → Echo Loss Handling	Measurement optimization → Measurement loss management → Echo loss handling	Transmitter → Transmitter setup → P28 Echo loss	Devices → Remote Program → Parameters → P28 Echo Loss → □□□□■	856 → float
<M43>	P28 → □□□■	<T128>	—	—

Echo loss handling

#	Echo loss ("no-Echo") handling	Default	#	Echo loss ("no-Echo") handling	Default
0	Hold (time limit)	Hold (10 s)	3	Trend (at maximum speed)	Hold (10 s)
1	Hold (unlimited)		4	Tank empty (DIST = maximum / LEV = 0)	
2	Trend (actual speed)		5	Tank full (DIST minimum / LEV = maximum)	

a. Hold (Time Limit)

M431

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Optimization → Echo Loss Handling → Hold (time limit)	Measurement optimization → Measurement loss management → Error delay	Transmitter → Transmitter setup → P28 Echo loss	Devices → Remote Program → Parameters → P28 Echo Loss → □□□■□	856 → □□■□
<M431>	P28 → □□■□	<T128>	—	—

This parameter defines the time elapsed between the error's occurrence and the issuance of the error signal (error current). During the delay, the output holds the last valid measured value. The function is available for current output only if the error signal is set to a lower (3.8 mA) or upper (22 mA) error current.

Echo loss handling

#	Hold (time limit)	Default	Notes	
0	No delay	10 s	The diagram illustrates the behavior of HART and Current Output signals during an echo loss. The HART signal (top) shows a measured value, followed by a held value (P28:b) during the echo loss, and then an error code 2. The Current Output signal (bottom) shows a measured value, followed by a held value (P28:b) during the echo loss, and then an error current (P12a). The error current can be set to 22 mA (P12a=2) or 3.8 mA (P12a=1). The error current 3.8 mA (P12a=1) is shown as the default.	During a short echo loss, the last value is held in transmission for a period set in "Hold (time limit)" (P28:b). After that, it is transmitted via HART on bit 0 of DSE according to P12:a on the current loop output. DSE – "Device Specific Error" indicator bits (HART). See Chapter 7 Troubleshooting.
1	10 s			
2	20 s			
3	30 s			
4	1 min			
5	2 min			
6	5 min			
7	15 min			

2.4.4 Threshold Offset

M44

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Optimization → Threshold offset	Measurement optimization → Threshold offset	Transmitter → Transmitter setup → P34 Threshold offset	Devices → Remote Program → Parameters → P34 Thresh. offs.	868 → float
<M44>	P34	<T134>	—	—

It is used for simple relative modification of the acceptance threshold value set in the Echo diagram, the value range of which is –4000...+4000. It can increase (positive value) or decrease (negative value) the device's noise suppression ability compared to the default setting. If the value is 0, there is no change compared to the set threshold value. ([See Chapter 4.4 Threshold mask](#)).

	Value range	Unit	Default
Threshold offset	–4000...+4000	“Distance Unit”	0

2.4.5 Filling Speed

M45

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Optimization → Filling Speed	Measurement optimization → Level elevation rate (filling speed)	Transmitter → Transmitter setup → P26 Filling speed	Devices → Remote Program → Parameters → P26 Filling speed	852 → float
<M45>	P26	<T126>	—	—

The level-tracking speed is the fastest level-change speed the device can continuously track. The device will only follow a level change slower than the set value. If the device senses a level signal change faster than this value, it assumes it is the result of a measurement error (e.g., condensation), it will not accept it, and the outputs will show the last valid value. Suppose this resulted from an incorrect measurement, and the result of the next measurement is plausible based on the set maximum speed. Then the hold is canceled, and the actual measured level takes effect. Suppose the rapid change in level was actually real. In that case, the device recalculates with each measurement whether the currently measured level is within the range determined by the product of the tracking speed and the elapsed time. If it is within the range, it cancels the hold, and the output adjusts to the new value according to the set damping parameter. Setting the level tracking speed is important when technological processes, especially during filling or discharging, produce interfering factors (e.g., ripples, foaming) that affect measurement stability. The set level tracking speed must be higher than the maximum filling/discharging speed prescribed by the technology. By entering it correctly, measurements during filling and discharging become more reliable. **Caution! In tanks with a conical or pyramidal bottom, the level change rate at the bottom of the tank increases significantly due to the shape of the tank.** The parameter's unit of measure: metric: [m/h]; US: [ft/h].

	Value range	Unit	Default
Filling speed	0...9999 0: Filling speed limit disabled	m/h (ft/h)	600 (1970)

2.4.6 Emptying Speed

M46

Local display	EView2	MonoCONT	MultiCONT	Modbus
Measurement Optimization → Emptying Speed	Measurement optimization → Level descent rate (Emptying speed)	Transmitter → Transmitter setup → P27 Emptying speed	Devices → Remote Program → Parameters → P27 Emptying speed	854 → float
<M46>	P27	<T127>	—	—

	Value range	Unit	Default
Emptying speed	0...9999 0: Emptying speed limit disabled	m/h (ft/h)	600 (1970)

2.4.7 User Slope Correction Factor

—

Local display	EView2	MonoCONT	MultiCONT	Modbus
—	Measurement optimization → Velocity user correction factor	—	Parameters → P22 User slope corr	—
<M46>	P22	—	—	—

It corrects the transmitted quantity according to the distance. If the value measured by the device differs from the value under real conditions, this multiplier can be used to refine the result. The output value is multiplied by the number set here. By default, the multiplier (1) does not modify the output.

	Value range	Unit	Default
User slope correction factor	0.7...10	—	1

2.5 Tank Calculation

The Tank Calculation mode is available only when one of the outputs (PV, SV, TV, or QV) is configured to Volume, Ullage Volume, or Volume %. In the OCT setting, the tank shape must be specified in a table. Ensure that Volume is not selected on one output while Flow is selected on another.

2.5.1 Calculation Mode M51

Local display	EView2	MonoCONT	MultiCONT	Modbus
Tank Calculation → Calculation Mode	Tank/Silo parameters → Calculation Mode	Transmitter → Transmitter setup → P40 Tank / Flow Calculation	Devices → Remote Program → Parameters → P40 Tank type → ☐ ☒ ☐ ☐	880 → ☒ ☐ ☐ ☐
<M51>	P40 → ☒ ☐ ☐ ☐	<T140>	—	—

#	Value	Default
0	Formula	Formula
1	OCT Table	

2.5.2 Tank Shape (DIM1...DIM5)

M52

A selection of typical tank shapes for volume measurement. The tank dimensions can be set using parameters "Dimensions 1...5" (P41...P45) (see figures below). In the case of the OCT setting, the tank shape must be specified in a table. For proper operation, it is important to specify these dimensions accurately.

Local display	EView2	MonoCONT	MultiCONT	Modbus
Tank Calculation → Tank Shape	Tank/Silo parameters → Tank shape	Transmitter → Transmitter setup → P40 Tank / Flow Calculation → Tank Shape	Devices → Remote Program → Parameters → P40 Tank type → ☐ ☐ ☐ ☐ ☒	880 → ☐ ☐ ☐ ☒
<M52>	P40 → ☐ ☐ ☐ ☒	<T1401>	—	—

#	Value	Default
0	Vertical cylindrical tank (see tank bottom/side shape table for value)	Vertical cylindrical tank with Planar bottom
1	Vertical cylindrical tank with a conical bottom	
2	Vertical rectangular tank with or without chute	
3	Horizontal cylindrical tank (see tank bottom/side shape table for value)	
4	Spherical tank	

M521	M522	M523	M524	M525
Vertical cylindrical tank with planar or convex bottom	Vertical cylindrical tank with a conical bottom	Vertical rectangular tank with or without chute	Horizontal cylindrical tank	Spherical tank
E = Tank bottom / side shape (P40)			E = Tank bottom / side shape (P40)	

a. Tank Bottom/Side Shape (for Vertical and Horizontal Cylindrical Tanks)

M521/M524

Local display	EView2	MonoCONT	MultiCONT	Modbus
Tank Calculation → Tank Shape → Vertical cylindrical tank → Tank Bottom/Side Shape	Tank/Silo parameters → Tank shape	Transmitter → Transmitter setup → P40 Tank / Flow Calculation → 1 Tank Shape → Vertical cylindrical tank	Devices → Remote Program → Parameters → P40 Tank type → □□□■□	880 → □□■□
<M521>	P40 → □□■0	<T14011>	—	—

#	Tank bottom shape for Vertical cylindrical tank Tank side shape for Horizontal cylindrical tank	
0	Planar	Associating typical tank bottom shapes for the specific tank type to calculate the volume accurately. The exact form of the setting code can be seen in the drawings under parameters "Dimensions 1...5" (P41...P45).
1	Slightly convex	
2	Strongly convex	
3	Hemispherical	

2.5.3 Specific Gravity

M53

If the device is set to weight transmission, the specific gravity of the material (medium) stored in the tank must be entered here for the weight calculation. The value is a relative ratio number (without a unit) compared to the density of water, i.e., 1 g/cm³.

Local display	EView2	MonoCONT	MultiCONT	Modbus
Tank Calculation → Specific Gravity	Measurement optimization → Specific gravity	Transmitter → Transmitter setup → P32 Specific Gravity	Devices → Remote Program → Parameters → P32 Spec. gravity.	864 → float
<M53>	P32	<T132>	—	—

	Value range	Default
Specific Gravity	0.01...10	1.0

Local display	EView2	MonoCONT	MultiCONT	Modbus
Tank Calculation → Manage OCT Table	OC-Table (See Chapter 8.5)	Transmitter → OCT	Devices → Remote Program → Parameters → P40 Tank type.	880 → float
<M54>	P40	<T3>	—	—

An output signal of any characteristic can be assigned to the level values measured by the device. The unit of the output signal is the unit set in parameter “Unit system, default unit, region parameter” P00 or “Output Units” P02 of the output data type assigned to the “HART - PV” output in parameter “PVS Mode” P01. The characteristic can be specified with a maximum of 100 points. Between the points, the device calculates the output signal from the measured level by linear interpolation and after the last point by linear extrapolation. The OCT can assign the measured level to an arbitrary output signal. Its typical application is calculating level to volume for tanks not included in the tank shape list (e.g., dented) and specifying individual channel characteristics in the case of open channel flow measurement.

#	Value
1	View/Edit Table
2	Add Item
3	Delete Item

Conditions for correct programming of data pairs

- The table must start with L(1)= 0 and R(1)= is the output quantity assigned to it.
- Column “L” may not contain identical values.
- Columns “L” and “R” can only have increasing values from top to bottom.
- If the table contains less than 100 points, column “L”, in the row following the last valuable data pair, must be 0.

i	L (left column) MEASURED LEVEL	R (right column) OUTPUT VALUE
1	0	R (1)
2	L (2)	R (2)
	L (i)	R (i)
nn	L (nn)	R (nn)
nn+1	0	
100		

2.5.5 Tank Total Volume

M55

Local display	EView2	MonoCONT	MultiCONT	Modbus
Tank Calculation → Specific Gravity	Measurement optimization → Specific gravity	Transmitter → Transmitter setup → P32 Specific Gravity	Devices → Remote Program → Parameters → P32 Spec. gravity.	864 → float
<M53>	P32	<T132>	—	—

The total tank volume is required for empty volume calculation (see "PVSV Mode" P01). If one of the outputs (PV, SV, TV, or QV) is set to transmit "Ullage volume," then the total volume can be entered in this parameter to calculate the actual transmitted value. In this case, the transmitted data is the difference between the total volume and the actual volume of the medium. Its unit is the volume unit set in the "PVSV Mode" P01:b decade.

	Value range	Unit	Default
Tank Total Volume	0...999,999.999	"Volume Unit"	0.0

2.6 Flow Calculation

The Flow Calculation mode is available only when one of the outputs (PV, SV, TV, or QV) is configured to Flow, Flow TOT1, or Flow TOT2. In the OCT setting, the Flume/Weir Type must be specified in a table. Ensure that Volume is not selected on one output while Flow is selected on another.

2.6.1 Calculation Mode

M61

Local display	EView2	MonoCONT	MultiCONT	Modbus
Flow Calculation → Calculation Mode	Tank/Silo parameters → Calculation Mode	Transmitter → Transmitter setup → P40 Tank / Flow Calculation	Devices → Remote Program → Parameters → P40 Tank type → ☐ ☒ ☐ ☐	880 → ☒ ☐ ☐ ☐
<M61>	P40 → ☒ ☐ ☐ ☐	<T140>	—	—

#	Value	Default
0	Formula	Formula
1	OCT Table	

2.6.2 Flume/Weir Type

M62

Local display	EView2	MonoCONT	MultiCONT	Modbus
Flow Calculation → Flume/Weir Type	Flow measurement → Open channel flow measurement methods	Transmitter → Transmitter setup → P40 Tank / Flow Calculation → Flow Measurement	Devices → Remote Program → Parameters → P40 Tank type → □□□■□	880 → □□■□
<M62>	P40 → □□■□	<T1401>	—	—

#	Value	Default
0	Parshall series	Parshall series
1	Others 1	
2	Others 2	
3	Palmer-Bowlus series	

a. Parshall Series

M621

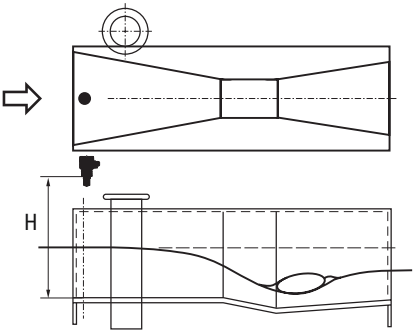
Local display	EView2	MonoCONT	MultiCONT	Modbus
Flow Calculation → Flume/Weir Type → Parshall Series	Flow measurement → Open channel flow measurement methods	Transmitter → Transmitter setup → P40 Tank / Flow Calculation → Flow Measurement → Parshall Series	Devices → Remote Program → Parameters → P40 Tank type → □□□□■	880 → □□□■
<M621>	P40 → □□□■	<T14011>	—	—

#	Value	Throat width [cm (inch)]	Calculation formula	Q_{min} [l/s (GPM)]	Q_{max} [l/s (GPM)]	"P" [l/s (GPM)]	Default
0	GPA-1P1	2.54 (1)	$Q [l/s (GPM)] = 60.87 * h^{1.552}$	0.26 (4.14)	5.38 (98.18)	30 (475.51)	GPA-1P1
1	GPA-1P2	5.08 (2)	$Q [l/s (GPM)] = 119.7 * h^{1.553}$	0.52 (8.28)	13.3 (239.52)	34 (538.91)	
2	GPA-1P3	7.62 (3)	$Q [l/s (GPM)] = 178.4 * h^{1.555}$	0.78 (12.33)	49 (862.96)	39 (618.16)	
3	GPA-1P4	15.24 (6)	$Q [l/s (GPM)] = 353.9 * h^{1.558}$	1.52 (24.22)	164 (2659.33)	53 (840.06)	
4	GPA-1P5	22.86 (9)	$Q [l/s (GPM)] = 521.4 * h^{1.558}$	2.25 (35.66)	360 (5829.4)	75 (1188.77)	
5	GPA-1P6	30.48 (12)	$Q [l/s (GPM)] = 674.6 * h^{1.556}$	2.91 (46.23)	570 (9474.97)	120 (1902.04)	
6	GPA-1P7	45.7 (18)	$Q [l/s (GPM)] = 1014.9 * h^{1.56}$	4.4 (69.57)	890 (14230.07)	130 (2060.54)	
7	GPA-1P8	61 (24)	$Q [l/s (GPM)] = 1368 * h^{1.5638}$	5.8 (91.58)	1208 (19192.1)	135 (2139.8)	
8	GPA-1P9	91.4 (36)	$Q [l/s (GPM)] = 2080.5 * h^{1.5689}$	8.7 (137.81)	1850 (29177.8)	150 (2377.55)	
9	Generic Parshall flume						

Flume / weir dimensions

Flume/
Weir Type
(P40)=00

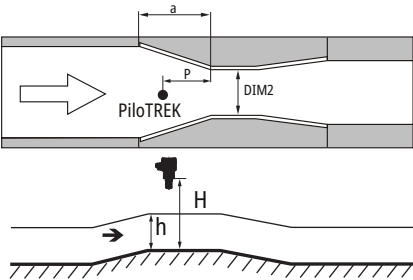
NIVELCO Parshall flume (GPA1-P1 through
GPA-1P9)
H = Distance to the surface without flow (P46)
See details in the manual of the Parshall flume.



Flume/
Weir Type
(P40)=09

Generic Parshall flume
 $0.305 < \text{DIM2 (throat width)} < 2.44 \text{ m (8 ft)}$
 $Q \left[\frac{1}{s} \right] = 372 \cdot \text{DIM2} \cdot \left(\frac{h}{0.305} \right)^{1.569 \cdot \text{DIM2}^{0.026}}$
 $2.5 < \text{DIM2}$
 $Q \left[\frac{1}{s} \right] = K \cdot \text{DIM2} \cdot h^{1.6}$
 $P = 2/3 \cdot A$
H = Distance to the surface without flow (P46)
h = Flow level [m]

P42 [m (ft)]	K
3.05 (10)	2.450
4.57 (15)	2.400
6.10 (20)	2.370
7.62 (25)	2.350
9.14 (30)	2.340
15.24 (50)	2.320



Local display	EView2	MonoCONT	MultiCONT	Modbus
Flow Calculation → Flume/Weir Type → Others 1	Flow measurement → Open channel flow measurement methods	Flow measurement → Open channel flow measurement methods	Devices → Remote Program → Parameters → P40 Tank type → □□□□■	880 → □□□■
<M622>	P40 → □□1■	<T14012>	—	—

#	Value	Default
0	Palmer-Bowlus (D/2)	Palmer-Bowlus (D/2)
1	Palmer-Bowlus (D/3)	
2	Palmer-Bowlus (rectangular)	
3	Khafagi-Venturi	
4	Step Bottomed Weir	
5	Rectangular section or BAZIN weir	
6	Trapezoidal weir	
7	1:4 trapezoidal weir	
8	V-notch weir	
9	90° V-notch (Thomson) weir	

Flume / Weir Dimensions

**Flume/Weir
Type (P40) = 10**

Palmer-Bowlus (D/2) flume

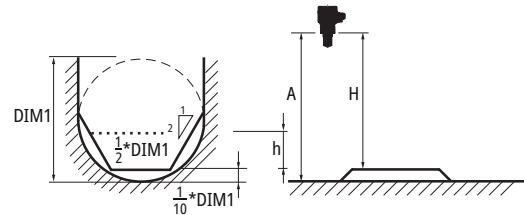
$Q \text{ [m}^3/\text{s]} = f(h1/\text{DIM1}) * \text{DIM1}^{2.5}$, where $h1[\text{m}] = h + (\text{DIM1}/10)$

DIM1 [m]

A = Zero-level distance (P04)

H = Distance to the surface without flow (P46)

h = Flow level [m]



**Flume/Weir
Type (P40) = 11**

Palmer-Bowlus (D/3) flume

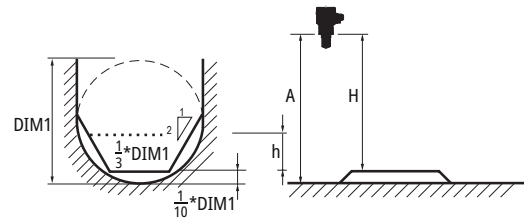
$Q \text{ [m}^3/\text{s]} = f(h1/\text{DIM1}) * \text{DIM1}^{2.5}$, where $h1[\text{m}] = h + (\text{DIM1}/10)$

DIM1 [m]

A = Zero-level distance (P04)

H = Distance to the surface without flow (P46)

h = Flow level [m]



**Flume/Weir
Type (P40) = 12**

Palmer-Bowlus (rectangular) flume

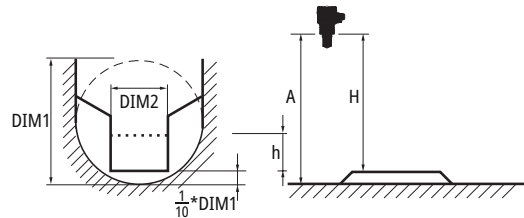
$Q \text{ [m}^3/\text{s]} = C * \text{DIM2} * h^{1.5}$, where $C = f(\text{DIM1}/\text{DIM2})$

DIM1 [m], DIM2 [m]

A = Zero-level distance (P04)

H = Distance to the surface without flow (P46)

h = Flow level [m]



Flume / Weir Dimensions

**Flume/Weir
Type (P40) = 13**

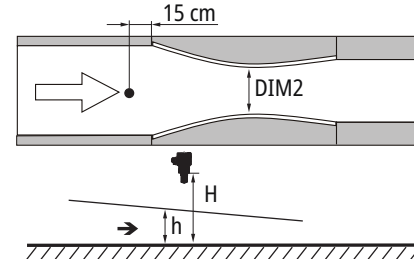
Khafagi-Venturi flume

$$Q \text{ [m}^3\text{/s]} = 1.744 * \text{DIM2} * h^{1.5} + 0.091 * h^{2.5}$$

DIM2 [m]

H = Distance to the surface without flow (P46)

h = Flow level [m]



**Flume/Weir
Type (P40) = 14**

Step-bottomed weir

$$0.0005 < Q \text{ [m}^3\text{/s]} < 1$$

$$0.3 < \text{DIM2 [m]} < 15$$

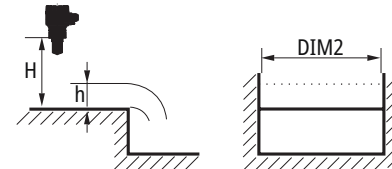
$$0.1 < h \text{ [m]} < 10$$

$$Q \text{ [m}^3\text{/s]} = 5.073 * \text{DIM2} * h^{1.5}$$

Accuracy: $\pm 10\%$

H = Distance to the surface without flow (P46)

h = Flow level [m]



**Flume/Weir
Type (P40) = 15**

Rectangular section or BAZIN weir

$$0.001 < Q \text{ [m}^3\text{/s]} < 5$$

$$0.15 < \text{DIM1 [m]} < 0.8$$

$$0.15 < \text{DIM2 [m]} < 3$$

$$0.015 < h \text{ [m]} < 0.8$$

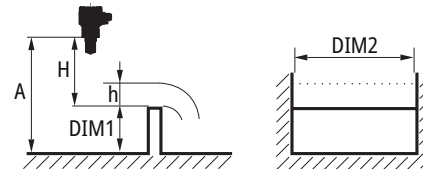
$$Q \text{ [m}^3\text{/s]} = 1.77738(1 + 0.1378h/\text{DIM1}) * \text{DIM2} * (h + 0.0012)^{1.5}$$

Accuracy: $\pm 1\%$

A = Zero-level distance (P04)

H = Distance to the surface without flow (P46)

h = Flow level [m]



Flume / Weir Dimensions

**Flume/Weir
Type (P40) = 16**

Trapezoid weir

$$0.0032 < Q \text{ [m}^3/\text{s]} < 82$$

$$20 < \text{DIM1} [^\circ] < 100$$

$$0.5 < \text{DIM2 [m]} < 15$$

$$0.1 < h \text{ [m]} < 2$$

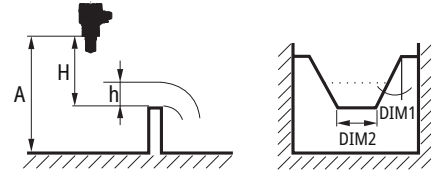
$$Q \text{ [m}^3/\text{s]} = 1.772 * \text{DIM2} * h^{1.5} + 1.320 * \text{tg}(\text{DIM1}/2) * h^{2.47}$$

Accuracy: $\pm 5\%$

A = Zero-level distance (P04)

H = Distance to the surface without flow (P46)

h = Flow level [m]



**Flume/Weir
Type (P40) = 17**

1:4 trapezoidal weir

$$0.0018 < Q \text{ [m}^3/\text{s]} < 50$$

$$0.3 < \text{DIM2 [m]} < 10$$

$$0.1 < h \text{ [m]} < 2$$

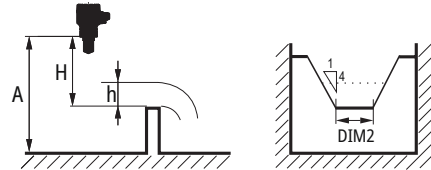
$$Q \text{ [m}^3/\text{s]} = 1.866 * \text{DIM2} * h^{1.5}$$

Accuracy: $\pm 3\%$

A = Zero-level distance (P04)

H = Distance to the surface without flow (P46)

h = Flow level [m]



Flume / Weir Dimensions

Flume/Weir Type (P40) = 18

V-notch weir

$$0.0002 < Q \text{ [m}^3/\text{s]} < 1$$

$$20 < \text{DIM2} [^\circ] < 100$$

$$0.05 < h \text{ [m]} < 1$$

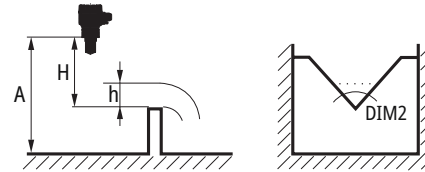
$$Q \text{ [m}^3/\text{s]} = 1.320 * \text{tg}(\text{DIM2}/2) * h^{2.47}$$

Accuracy: $\pm 3\%$

A = Zero-level distance (P04)

H = Distance to the surface without flow (P46)

h = Flow level [m]



Flume/Weir Type (P40) = 19

90° V-notch (THOMSON) weir

$$0.0002 < Q \text{ [m}^3/\text{s]} < 1$$

$$0.05 < h \text{ [m]} < 1$$

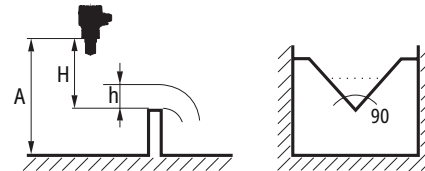
$$Q \text{ [m}^3/\text{s]} = 1.320 * h^{2.47}$$

Accuracy: $\pm 3\%$

A = Zero-level distance (P04)

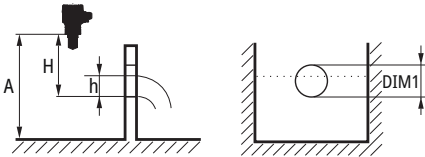
H = Distance to the surface without flow (P46)

h = Flow level [m]



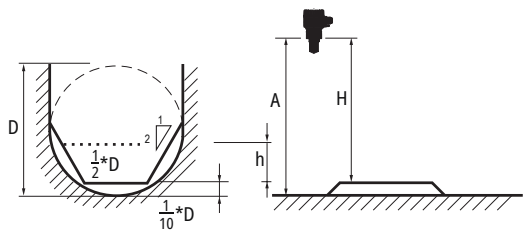
Local display	EView2	MonoCONT	MultiCONT	Modbus
Flow Calculation → Flume/Weir Type → Others 2	Flow measurement → Open channel flow measurement methods	Transmitter → Transmitter setup → P40 Tank / Flow Calculation → Flow Measurement → Others 2	Devices → Remote Program → Parameters → P40 Tank type → □□□□■	880 → □□□■
<M623>	P40 → □□2■	<T14013>	—	—

#	Value	Calculation formula	Default
0	Circular weir		Circular weir
1	Generic formula 1	$Q [l/s] = \text{DIM1} * h^{\text{DIM2}}, h [m]$	
2	Generic formula 2	$Q [l/s] = \text{DIM1} * h^{\text{DIM2}}, h [P00:cb]$	

Flume / Weir Dimensions	
Flume/Weir Type (P40) = 20 Circular weir $0.0003 < Q [m^3/s] < 25$ $0.02 < h [m] < 2$ $Q [m^3/s] = m * b * D^{2.5}$, where $b = f(h/D)$ $m = 0.555 + 0.041 * h / \text{DIM1} + (\text{DIM1} / (0.11 * h))$ Accuracy: ±5% A = Zero-level distance (P04) H = Distance to the surface without flow (P46) h = Flow level [m]	
Flume/Weir Type (P40) = 21 Generic flow formula 1: $Q [l/s] = \text{DIM1} * h^{\text{DIM2}}$ h = Flow level [m]	
Flume/Weir Type (P40) = 22 Generic flow formula 2: $Q [l/s] = \text{DIM1} * h^{\text{DIM2}}$ 'h' will be substituted in the unit set in "Region" (P00:c) and "Distance Unit" (P00:b).	

Local display	EView2	MonoCONT	MultiCONT	Modbus
Flow Calculation → Flume/Weir Type → Palmer-Bowlus series	Flow measurement → Open channel flow measurement methods	Transmitter → Transmitter setup → P40 Tank / Flow Calculation → Flow Measurement→ Palmer-Bowlus series	Devices → Remote Program → Parameters → P40 Tank type → □□□□■	880 → □□□■
<M624>	P40 → □□3■	<T14014>	—	—

#	Value	Default
0	4" Palmer-Bowlus	4" Palmer-Bowlus
1	6" Palmer-Bowlus	
2	8" Palmer-Bowlus	
3	10" Palmer-Bowlus	
4	12" Palmer-Bowlus	
5	15" Palmer-Bowlus	
6	18" Palmer-Bowlus	
7	21" Palmer-Bowlus	
8	24" Palmer-Bowlus	

Flume / Weir Dimensions	
Flume/Weir Type (P40) =30...38	Palmer-Bowlus Standard D/2 Flume (4"... 24") Refer to flume's user manual for details. The distance to the surface without flow (P46) ["Region" (P00:c), "Distance Unit" (P00:b)] A = Zero-level distance (P04) H = Distance to the surface without flow (P46) h = Flow level [m] 

2.6.3 Manage OCT Table

M63

Local display	EView2	MonoCONT	MultiCONT	Modbus
Flow Calculation → Manage OCT Table	OC-Table (See Chapter 4.5)	Transmitter → OCT	Devices → Remote Program → Parameters → P40 Tank type.	880 → float
<M54>	P40	<T3>	—	—

An output signal of any characteristic can be assigned to the level values measured by the device. The unit of the output signal is the unit set in parameter “Unit system, default unit, region parameter” P00 or “Output Units” P02 of the output data type assigned to the “HART - PV” output in parameter “PVS Mode” P01. The characteristic can be specified with a maximum of 100 points. Between the points, the device calculates the output signal from the measured level by linear interpolation and after the last point by linear extrapolation. The OCT can assign the measured level to an arbitrary output signal. Its typical application is calculating level to volume for tanks not included in the tank shape list (e.g., dented) and specifying individual channel characteristics in the case of open channel flow measurement

#	Value
1	View/Edit Table
2	Add Item
3	Delete Item

2.6.4 P46 (h=0 Distance)

M64

Local display	EView2	MonoCONT	MultiCONT	Modbus
Flow Calculation → P46 (H=0 distance)	Flow measurement → Distance between transducer face and level of Q=0	Transmitter → Transmitter setup → P40 Tank / Flow Calculation → Flow Measurement → Flume Dimensions	Devices → Remote Program → Parameters → Distance at Q0	892 → float
<M64>	P46	<T140111>	—	—

Distance associated with h=0 when measuring flow. P46 is the distance between the sensor's process connection and the liquid's surface, which can be measured at the limit of the start of the flow (Q = 0); see figures

	Value range	Unit	Default
P46 (H=0 distance)	“Near Blocking Distance” (P05) + 5 cm (2”). Maximum value: “Sensing Distance” (P03)	“Distance Unit”	0.0

2.7 Service

2.7.1 Clear TOT1

M71

Local display	EView2	MonoCONT	MultiCONT	Modbus
Service → Clear TOT1	Advanced mode → Special → Clear TOT1	Transmitter → Clear TOT1	Devices → Remote Program → Clear TOT1	—
<M71>	—	<T8>	—	—

Clears the user-resettable “Flow” totalizer TOT1 (only when used in “Flow” mode).

2.7.2 Bluetooth® Settings

M72

a. Bluetooth® Operation Mode

M721

Local display	EView2	MonoCONT	MultiCONT	Modbus
Service → Bluetooth settings → Operation Mode	Advanced mode → Parameters → P36 BLE settings	Transmitter → Transmitter setup → P36 BLE settings → Operation mode	Devices → Remote Program → Parameters → P36 BLE settings → ☐ ☐ ☐ ☒	872 → ☐ ☐ ☒
<M721>	P36 → ☐ ☐ ☒	<T1361>	—	—

#	Value	Default
0	PermanentlyOn	Off after 15 mins
1	Off after 15 mins	
9	PermanentlyOff	

b. Bluetooth Transmission Power

M722

Local display	EView2	MonoCONT	MultiCONT	Modbus
Service → Bluetooth settings → TX Power	Advanced mode → Parameters → P36 BLE settings	Transmitter → Transmitter setup → P36 BLE settings → TX Power	Devices → Remote Program → Parameters → P36 BLE settings → ☐ ☐ ☒ ☐	872 → ☐ ☐ ☒ ☐
<M722>	P36 → ☐ ☐ ☒ ☐	<T1362>	—	—

This parameter allows you to set the output power of the Bluetooth® module. The transmission power affects the available range. Please note that the Bluetooth® communication range depends on environmental conditions and on the Bluetooth® power settings of the user’s device (smartphone).

#	Value	Default
0	+0 dBm lowest signal strength	+8 dBm
1	+2 dBm signal strength	
2	+4 dBm signal strength	
3	+6 dBm signal strength	
4	+8 dBm signal strength	

2.7.3 Security

M73

Local display	EView2	MonoCONT	MultiCONT	Modbus
Service → Security	Advanced → Special → Security code	Security code → Transmitter	Devices → Remote Program → Secret unlock	2900 → float
<M73>	—	<S2>	—	—

Use this parameter to enter the user or service code to unlock the device. The unit can be protected against unauthorized reprogramming by a four-digit pin code. If a value other than zero is entered, the code is active. Entering a zero will clear the user code. When the code is active, the unit will prompt for the code when entering the menu.

#	Value range	Default
1	Set User Lock (0000...9999)	—
2	Service Unlock (0000...9999)	

2.7.4 Output Test

M74

a. Analog Output Test

M741

Local display	EView2	MonoCONT	MultiCONT	Modbus
Service → Output Test → Analog Output	—	—	—	—
<M741>	—	—	—	—

When you enter this function, the current value corresponding to the current being measured is displayed and output. In test mode, any value between 3.9 and 20.5 mA can be entered in this edit window. The output should then display the same current as the set value. A dialog box reminds you of the test condition. The test value will remain at the output until the warning window is exited. To exit the warning window, press **E**.

b. Relay Output Test

M741

Local display	EView2	MonoCONT	MultiCONT	Modbus
Service → Output Test → Relay Output	—	—	—	—
<M742>	—	—	—	—

2.7.5 Distance Simulation

M75

This function allows the user to check the outputs and the processing device connected to it. PiloTREK can simulate a constant or a variable value of the level. The simulation level values must be within the measurement range defined by "Zero Level Distance" (P04) and "Near Blocking Distance" (P05). To start the simulation, return to the Measurement mode. During simulation, the DIST, LEV or VOL symbols will flash. To end the simulation, set "Mode" (P84)= OFF.

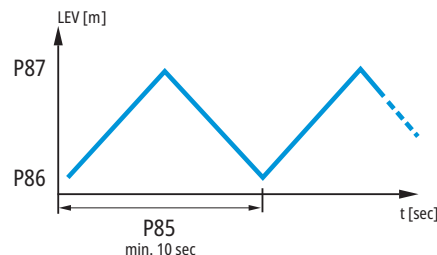
a. Mode

M751

Local display	EView2	MonoCONT	MultiCONT	Modbus
Service → Dist. Simulation → Mode	Advanced → Special → Simulation mode	Transmitter → Simulation → Settings → Mode	Devices → Remote Program → Parameters → P84 Simulation mode → ☐ ☐ ☐ ☒	968 → ☐ ☐ ☐ ☒
<M751>	P84 → ☐ ☐ ☐ ☒	<T612>	—	—

#	Simulation mode	Default
0	OFF	OFF
1	Triangular F. S.	
2	Fix value: PV = value given in "Bottom Value" (P86)	
3	Triangle Wave ⁽¹⁾	
4	Square Wave ⁽¹⁾	

⁽¹⁾ Simulation between levels "Bottom Value" (P86), "Upper Value" P87 with "Cycle Time" (P85).



b. Cycle Time

M752

Local display	EView2	MonoCONT	MultiCONT	Modbus
Service → Dist. Simulation → Cycle Time	Advanced → Special → Cycle Time (P85)	Transmitter → Simulation → Settings → Cycle time	Devices → Remote Program → Parameters → P85 Sim Cycle Time	970 → float
<M752>	P85	<T612>	—	—

Simulation cycle time. Unit of measurement: seconds [s].

	Value range	Unit	Default
Cycle Time	0...999	s	60 s

c. Bottom Value

M753

Local display	EView2	MonoCONT	MultiCONT	Modbus
Service → Dist. Simulation → Bottom Value	Advanced → Special → Sim Lower Value (P86)	Transmitter → Simulation → Settings → Bottom Value	Devices → Remote Program → Parameters → P86 Sim Lower Value	972 → float
<M753>	P86	<T613>	—	—

	Value range	Unit	Default
Bottom Value	0...99.999	"Distance unit"	20% of Zero Level Distance

d. Upper Value

M754

Local display	EView2	MonoCONT	MultiCONT	Modbus
Service → Dist. Simulation → Upper Value	Advanced → Special → Sim Upper Value (P87)	Transmitter → Simulation → Settings → Upper Value	Devices → Remote Program → Parameters → P87 Sim Upper Value	974 → float
<M654>	P87	<T614>	—	—

	Value range	Unit	Default
Upper Value	0...99.999	"Distance unit"	80% of Zero Level Distance

e. Timeout

M755

Local display	EView2	MonoCONT	MultiCONT	Modbus
Service → Dist. Simulation → Timeout	Advanced → Special → Sim Upper Value (P88)	Transmitter → Simulation → Settings → Upper Value	Devices → Remote Program → Parameters → P88 Timeout	976 → float
<M655>	P88	<T615>	—	—

Simulation mode is automatically turned off after the set time has elapsed.

	Value range	Unit	Default
Timeout	0...9999	min	10 min

2.7.6 Defaults

a. Load Default

M761

Local display	EView2	MonoCONT	MultiCONT	Modbus
Service → Defaults → Load Default	Advanced → Parameters → Load default	Transmitter → Reset → Load Defaults	Devices → Remote Program → Default	—
<M761>	—	<T93>	—	—

Restores the factory settings of the unit. The values can then be modified. Loading the factory settings does not affect the measurement currently in progress (it continues with the parameters set before entering the programming). Before loading the factory settings, the instrument displays a dialog box asking if you are sure you want to do this, because all user settings will be lost.

b. Set Threshold To Default

M762

Local display	EView2	MonoCONT	MultiCONT	Modbus
Service → Defaults → Set Threshold To Default	Threshold settings	Transmitter → Reset → Default Threshold	Remote Program → Default	—
<M762>	—	<T92>	—	—

Restores the threshold settings of the unit.

c. Restart

M763

Local display	EView2	MonoCONT	MultiCONT	Modbus
Service → Restart	Advanced → Special → Device Restart	Transmitter → Reset → Software Reset	—	—
<M763>	—	<T91>	—	—

Restarts the device ("warm start") by reloading the parameters from non-volatile memory.

2.8 Service Diagnostic Parameters (read only)

P60:	----	Number of operating hours since issuing [h]
P61:	----	The number of operating hours since the last power-on [h]
P62:	----	The number of operating hours of the relay (closed time of contact C2) [h]
P63:	----	The number of switching cycles of the relay
P64:	----	The current temperature of the device's electronics [°C / °F]
P65:	----	The highest temperature of the device ever measured [°C / °F]
P66:	----	The lowest temperature of the device ever measured [°C / °F]
P70:	----	Number of detected peaks (current)
P71:	----	Magnitude of selected echo (raw value)
P72:	----	The amplitude of the selected echo [dB]
P73:		The distance of the selected echo [m]
P74:		Echo loss-to-shot ratio

2.9 Flow Measurement Control Parameters (read only)

P76:	----	Measuring height of the flow measurement ('h' value) Measuring height required for flow measurement. This value is the “h” value in the flow calculation formula. (See P46 (H=0 distance))
P77:	----	TOT1 totalizer (can be cleared)
P78:	----	TOT2 totalizer

2.10 Output Control Parameters (read only)

P79:	----	Current generator re-measured output current [μA]
P80:	----	Current generator calculated output current [mA]
P81:	----	Relay output status

2.11 Hardware / Software Versions (read only)

P94/95:	----	Software code 2 / 3 (SLAVE MCUs)
P96:	----	Software code 3 (MAIN MCU)
P97/98:	----	Hardware identification code

3. TROUBLESHOOTING

3.1 Status and Error Indication in HART® Communication

According to the HART standard, the status and error indication is represented by two 16-bit words following the response code bytes: “Errors and Warnings” and “Status”.

Bit №	Device Specific Error/Warning flags	Meaning, possible reason, solution
0	No echo (Warning)	The device cannot detect the surface to be measured, so there is no echo or there are too many echoes due to interference. Ensure proper installation. If the problem persists, contact the dealership.
1	EEPROM is not detected (Error)	The parameter memory of the device is compromised. Contact dealership.
2	EEPROM checksum error detected (Error)	Some data stored in the device's parameter memory has been corrupted. Factory default settings are restored by the device. If the device's parameter memory fails frequently, contact the dealership.
3	OCT input side integrity error (Error)	The data in the left (L) column of the Output Conversion Table (OCT) is not incremental. Correct it.
4	OCT output side integrity error (Error)	The data in the right (R) column of the Output Conversion Table (OCT) is not incremental. Correct it.
5	OCT item count is <2 (Error)	Too few points are entered into the Output Conversion Table (OCT). At least two ($i \geq 2$) points (elements) must be entered.
6	Input level over the OCT input side (overload) (Warning)	The measured level, as the input value of the OCT, falls outside the range entered in the left (L) column of the OCT. Enhance the range.
7	EEPROM reinitiated (EEPROM layout damaged or missing) (Error)	The data structure stored in the device's parameter memory is corrupted. The device restored the factory default settings. If the device's parameter memory fails frequently, contact the dealership.
8	—	—
9	Tank full (Warning)	The measured surface is within the minimum measuring range ($X_{\min}$). Decrease the Near Blocking Distance (P05) or use a different technology to prevent the surface from getting too close to the sensor.
10	Echo in far blocking range (Warning)	The measured surface is too far, outside the device's maximum measuring range ($X_{\max}$). Set the far-end blocking (P05) to a larger value, or change the technology to ensure that the surface to be measured does not get so far from the sensor of the device.
11	—	—
12	Failure of one or more Slave controllers (Error)	An auxiliary controller has failed. A firmware error is likely. Perform a full firmware update with NiFlash (including synchronization). If the issue persists, contact your distributor.

Bit №	Device Specific Error/Warning flags	Meaning, possible reason, solution
13	Relay failure (Error)	If the device has an optional relay, it is faulty. Contact the dealership.
14	Parameter table integrity error (Error)	The value of one or more parameters is not consistent with the associated parameters. Correct the parameter value.
15	Sensor failure (Error)	The radar sensor is faulty. There can be several reasons for this, e.g., the data connection with the radar sensor unit is inadequate or insufficient energy available for the measurement. The terminal voltage of the device must be above the prescribed minimum in all circumstances. Check the voltage conditions of the loop by measurement and change it as necessary so that the electrical conditions for the terminals of the device are met. Contact the dealership if the power supply voltage level is correct and the error persists.

Bit №	Device-Specific Status flags (DSS)	Explanation
0-2	PV value type (DIST, LEV, VOL, MASS, FLOW, LEV%, VOL%, ...)	The type of the primary transmitted value (PV) by P01a.
3	Manual programming is active (Status)	The device is in manual programming mode. (Only on devices (WG□) featuring a display.)
4	Remote programming is active (Status)	The device is in remote programming mode.
5	Simulation is active (Warning)	The device is in simulation mode. Caution! The output value is independent of the measured value.
6	User password is set (Status)	Password protection is active.
7	Relay energized (Status)	Relay is energized.
8	User lock is active (Status)	User lock is active. The parameters are protected by a password set by the user.
9	Factory lock is active (Status)	Factory lock is active. The factory default settings and calibration data are locked.
10	SAP display is connected (Status)	A display is connected to the device. (Only on devices (WG□) featuring a display.)
11	Diagnostic mode is active (Status)	The device is in diagnostic mode.
12	HOLD (Warning)	The transmitted value is on hold.
13	Calibration mode is active (Status)	The device is in calibration mode.
14	Valid (Status)	The transmitted value is refreshed and valid.
15	HS communication mode is active (Status)	The device is in high-speed communication mode.

3.2 Typical Application Errors

Error	Possible cause	Solution
The transmitted value takes a value from a close range (most often around 0.2 m [7.8"]).	Condensation or dirt on the antenna.	Clean the antenna or use a threshold mask to block the interfering echo.
The measured value does not change despite the level change.	This typically happens when echo loss occurs. In most cases, this is: – during foaming of the medium – dirt on the antenna – excessive waves – incorrect max. (P03) measurement setting – it can happen in cases of echo below the threshold curve.	Remove dirt from the antenna. Check the surface of the medium to be measured, if necessary, take measures to reduce foaming or ripples. Check threshold settings. See Chapter 8.3 Check the P03 maximum measuring distance setting.

4. EView2 INSTRUCTIONS

If necessary, install the [EView2 HART configuration software](#) (hereafter EView2) as described in Chapter 3 of the program's manual.

The software can be downloaded from www.nivelco.com.

Electrical connections: Start the program and search for the transmitter with the program (for more information, see also EView2 user manual, Chapter 4). From the devices found during the detection, select the device you want to configure or program and open the "device programming" window of the device (Chapters 4.4 and 4.5 of the EView2 user manual). All the necessary parameters and function settings can be changed with EView2. This Chapter only describes the specific functions related to PiloTREKs and two programming examples. For assistance with connection issues to your PC, please refer to the EView2 User Manual for further information.



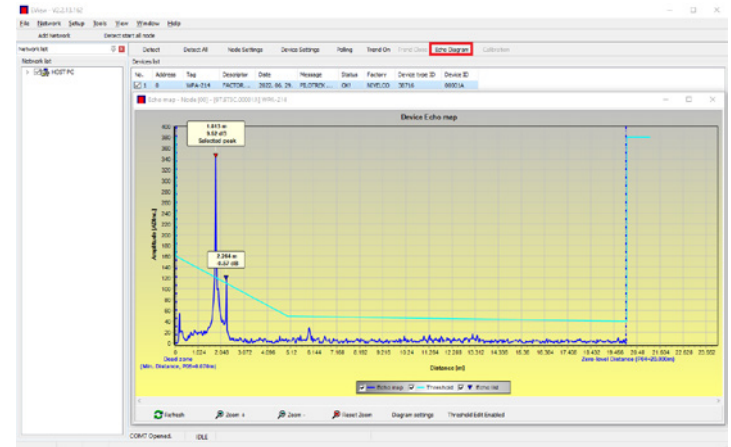
4.1 Device Status Window

To invoke the "Device Status Window" in EView2, right-click on the device line in the "Device List" in the main window and select the "Show Device Status Window" menu item in the popup window. This window shows the status and error messages of the PiloTREK. ([See Chapter 3.1](#)) The "Device Status Window" can also be summoned in the "Polling" window by activating the corresponding check box.

4.2 Echo Diagram (Oscilloscope Function)

Click the “Echo Diagram” button in EView2 to display the device's Echo Diagram. A window called “Echo map” will appear. This diagram shows the reflection curve measured by the device. In addition, this window can be used to adjust the threshold level. To update the chart or read the data, press the “Refresh” button on the bottom line of the window (or press the F4 key).

After a successful reading, an echo graph similar to the attached “Echo Diagram” appears. The displayed information content can be selected in the legend. The “Echo list” displays the location and data of the echo peaks evaluated by the device, of which the selected level signal is marked with the inscription “Selected peak.”



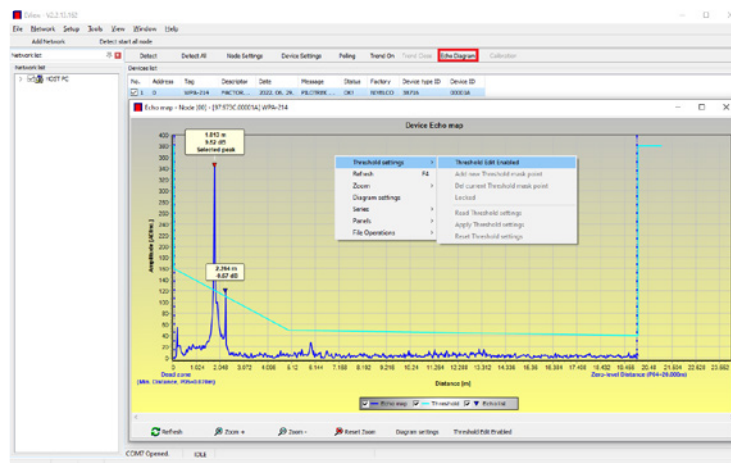
4.3 Threshold Settings

This function is intended for advanced users. Incorrect settings may prevent the device from measuring properly.

The purpose of the threshold value and the threshold line is to mask unwanted echoes from the measurement. Echo peaks below the threshold level are not taken into account in the evaluation. Setting the threshold may be necessary if the device selects the wrong echo peak as the level, for example because there is an interfering object in the path of the ultrasound during the measurement. Before modifying the threshold curve, it is recommended to minimize interfering echoes by selecting an appropriate installation location for the device.

The threshold can be edited in the Echo diagram window of the EView2 software. In addition, the height of the entire threshold can be adjusted in a simplified way with the P34 “Threshold offset” parameter among the measurement optimization parameters. The main threshold line is used to trace the general shape of the echo curve. Threshold highlights, also known as threshold masks, are available to mask interfering echo peaks protruding from the curve.

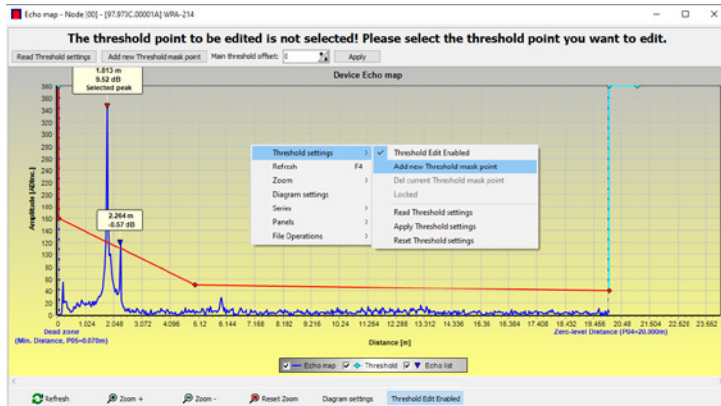
The threshold editing mode can be activated either by selecting “Threshold Edit Enable” in the bottom menu bar or by selecting “Threshold settings” → “Threshold Edit Enable” in the context menu that appears when clicking the right mouse button. In this case, the threshold editing function bar appears in the upper half of the window, and the editable points are marked red on the threshold curve. If no editable point is selected, the “Threshold offset” can be set in the function bar, so the height of the basic threshold curve consisting of three points is the same. If an editable point is selected by clicking the left mouse button, its position can also be altered separately.



Threshold points can also be moved with the mouse by clicking and holding the left mouse button over the selected point. The changes only take effect in the device after pressing the “Apply Threshold settings” button, which can also be found in the threshold editing function bar or the context menu. To display the evaluation corresponding to the new threshold, refresh the chart with the “Refresh” button in the bottom menu bar (or the F4 function key).

4.4 Threshold Mask

The “Threshold Mask” function masks an echo peak that interferes with the measurement. To do this, after pressing the “Add new threshold mask” button in the threshold editing function bar, click the left mouse button in the diagram over the position where you want to place the threshold highlight, or if using the context menu, click with the right mouse button on the desired position, then select the “Add new threshold mask” function. The position and width of the threshold mask can also be adjusted afterwards in the threshold editing function bar by selecting the center point of the highlight as described above. In the case of graphic editing, its position and height can be adjusted by dragging the center point, and its width can be adjusted by dragging the corner point. A total of 4 threshold highlights can be defined. If there are more interfering echoes than 4, it is better to choose another mounting position.



Caution! The “Cursor On” function does not provide an exact value. It only calculates the value of a given point based on the graphical representation.

The threshold highlight can be deleted by selecting its center point, or turning the “Enabled” switch off in the threshold editing function bar, or selecting the “Del current threshold mask” function in the context menu. Until the changes are applied to the device with the “Apply Threshold settings” function, it uses the previous (current) threshold settings, which can be read with the “Read Threshold settings” function. The factory default settings can be restored with the “Reset Threshold Settings” function.

4.5 The Output Conversion Table (OCT) – (EView2 OC-Table)

The output conversion table (OCT) is active if table correction is selected in parameter “Tank/Flow Calculation” (P40). [See Chapters 2.5 and 2.6](#). The OCT is filled in using the EView2 software. The conversion table is usually used for volume measurement but can also be used for weight or flow measurement.

This table assigns different output values to the measured levels. The value on the left is always the measured level (relative to the zero-level distance (P04) setting), and the value on the right is the output value for the particular level. The unit associated with the output value is determined by the setting of the “PVSV Mode” (P01, HART - PV) and “Output units” (P02) parameters.

The output value is determined by linear interpolation between two value pairs, so the accuracy of the conversion depends on the density of the associated value pairs. After the last pair of points, the output value is calculated by linear extrapolation. The maximum number of pairs is 100.

More information:

- Each new level value entered must be greater than the previous one.
- Take heed that the units in the table are always interpreted by the device according to the currently set units of measure. Therefore, the OCT must always be filled in with values corresponding to the set units.
- Caution! When using the conversion table, the setting of the current output “PV Value of 4 mA” / “PV Value of 20 mA” (P10/P11) is also interpreted according to the value range (and measurement unit) defined on the left side of the table. Accordingly, the appropriate setting of the P10/P11 parameters is recommended after uploading the table.
- If the conversion table is filled in incorrectly, the output (transmitted) value will not be correct either.

A user-defined conversion table (e.g., “level - volume”) can be created using EView2 as follows: To fill in or set the output conversion (OC) table of the device, go to the “Device Settings” → “OC-Table” tab in EView2. Upload or modify the table according to “EView2 Instructions for Use – Chapter 6.4.” If the appropriate changes have been made in the table and it has been filled in correctly, press the “Send” button on this page (“OC-Table” tab) on the right side under the “Get” button to download the table to the device.

In the following example, five-point programming is presented, example: “Level - Volume” conversion

Step	Action	Entered data / chosen value
1	In EView2, open the “Device Settings” window of the given device.	
2	Go to the point called “Application” and select the unit system (“Calculation system”).	Metric (EU)
3	Select a length unit (Engineering Unit).	m
4	Go to “Measurement configuration” and select “Measurement mode (PV source): volume transmission” from the list	Volume
5	Select a volume unit in the “Volume Units” section.	m ³
6	Go to “Measuring distances” and enter the tank height in the field named “Zero-level dist.” (Click on the field and enter the value).	6.00 m
9	Press the “Send” button in the lower right corner of the window to download the new values to the device.	Wait until the download process is complete.
10	Go to the point called “OC-Table.” Fill in the table called “OCT list” with the appropriate values. A maximum of 100 points can be entered. Each level and volume point must be entered. Each subsequent point must be larger than the previous one. New lines can be created by pressing the “Ctrl + Insert” key combination or selecting “Add new item” in the popup menu of the right mouse button. A line can be deleted by pressing the “Ctrl + D” keys together.	See the following table (Example for completing OCT)
11	To download the table to the device, press the “Send” button located on this page (“OC-Table” tab) on the right side under the “Get” button.	

Example of filling out the OCT

Point	Level (Source column)	Volume (Output column)
1	0.0 m (0.0 ft)	0.0 m ³ (0.0 ft ³)
2	0.20 m (0.66 ft)	0.5 m ³ (17.6 ft ³)
3	0.75 m (2.46 ft)	1.0 m ³ (35.3 ft ³)
4	1.00 m (3.30 ft)	1.5 m ³ (53 ft ³)
5	5.60 m (18.37 ft)	16.8 m ³ (593.3 ft ³)

Example of setting 4...20 mA current output (using EView2)

Step	Action	Entered data / value
1	Go to "Outputs" and set "Current generator mode" to "Auto" (default setting)	Auto
2	In the "Error indication ..." field, set the error status to the appropriate mode (default setting).	Hold-
3	Select "Assignment of 4 mA – PV (P10)" and enter the volume value corresponding to the output current value of 4 mA.	0.5 m ³ (17.6 ft ³)
4	Select "Assignment of 20 mA – PV (P11)" and enter the volume value corresponding to the output current value of 20 mA.	16.80 m ³ (593.3 ft ³)
5	Press the "Send" button in the lower right line of the window to download the new values to the device.	
6	Press the "X" close button to exit the device settings window.	

4.6 Programming Example 1 – Configuring Level Measurement (using EView2)

Configuring level measurement in a 9 m (29.5 ft) tank (example). Level measurement is the factory default mode; it is sufficient to enter only the actual tank height (P04 = 9.0 m [29.5 ft]). The max. measuring length of the WE-200 radar configured by the manufacturer is 10.0 m (33 ft), so it covers the required 9 m (29.5 ft).

Step	Action	Entered data / value
1	Open the "Device Settings" window corresponding to the given device in EView2.	The program reads and displays the device settings.
2	Select "Measurement configuration."	
3	Click on "Zero-level dist." (Zero-level distance) field.	Data in the field: 10.000 [m] (33.000 [ft])
4	Enter the new value.	9,000 [m] (29.500 [ft])
5	Press the "Send" button in the lower right corner of the window to download the new value to the device.	The device will work according to the new settings after the download is complete.
6	Press the "X" close button to exit the device settings window.	

4.7 Programming Example 2 – Configuring The Current Loop Output (Using Eview2)

Custom scale setting: Example: 4 mA indicates the 1 m level [3.3 ft], 20 mA indicates the full tank, for example 8 m (26.2 ft) maximum level, upper error current.

Set current range 4...20 mA with 22 mA error indication.

Choose a suitable minimum and maximum value for the scale of the measurement.

Step	Action	Entered data / value
1	In EView2, open the "Device Settings" window corresponding to the given device.	The program reads the device settings and displays them.
4	Select "Outputs"	
5	Select the "Error indication ..." drop-down list.	The field will read "Hold"
6	Select the new setting value (22 mA) in the drop-down list.	The field will read "22 mA"
7	Select the "Assignment of 4 mA – PV" data field.	The field will read "0.000 [m]" (0.000 [ft])
8	Enter the new value. This sets the level corresponding to the 4-mA minimum output (1 m).	The field will read "1.000 [m]" (3.300 [ft])
9	Select the "Assignment of 20 mA – PV" data field.	The field will show the maximum measuring distance by default.
10	Switch to 8.000 m (26.20 ft). This sets the level corresponding to the 20-mA maximum output (8 m [26.2 ft]).	The field will read "8.000 [m]" (26.20 [ft])
11	Press the "Send" button in the lower right line of the window to download the new values to the device.	After the download is complete, the device will use the new settings.
12	Press the "X" close button to exit the device settings window.	

5. PARAMETER LIST

[illegible]

Pr.	Page	Name	Pr.	Page	Name
P60	55	Number of operating hours since issuing [h]	P80	55	Current generator calculated output current [mA]
P61	55	The number of operating hours since the last power-on [h]	P81	55	Status of relay outputs
P62	55	The number of operating hours of the relay (closed time of contact C2) [h]	P82	—	—
P63	55	The number of switching cycles of the relay	P83	—	—
P64	55	The current temperature of the electronics [°C / °F]	P84	52	Distance Simulation
P65	55	The highest temperature of the device ever measured [°C / °F]	P85	52	Cycle time
P66	55	The lowest temperature of the device ever measured [°C / °F]	P86	52	Bottom Value
P67	—	—	P87	52	Upper Value
P68	—	—	P88	53	Timeout
P69	—	—	P89	—	—
P70	55	Number of detected peaks (current)	P90	—	—
P71	55	Magnitude of selected echo [raw value]	P91	—	—
P72	55	Amplitude of selected echo [dB]	P92	—	—
P73	55	Distance of selected echo [m]	P93	—	—
P74	55	Echo lost / shot rate	P94	55	Software identifier (RADAR)
P75	—	—	P95	55	Software identifier (COPROC)
P76	55	Measuring height of the flow measurement (read only) (LEV)	P96	55	Software identifier (MAIN MCU)
P77	55	TOT1 totalizer (clearable)	P97	55	Special config mode (read only)
P78	55	TOT2 totalizer	P98	55	Hardware code (read only)
P79	55	Current generator re-measured output current [μA]	P99	—	—

wps200en26p05

May 2026

Information is accurate to the best of NIVELCO's knowledge.

We reserve the right to change specifications at any time.

*The Bluetooth® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc.
and any use of such marks by NIVELCO Process Control Co. is under license.*