10 Set up with Smartphone/tablet

10.1 Preparations

System requirements

Make sure that your smartphone/tablet meets the following system requirements:

● Operating system: iOS 8 or newer
● Operating system: Android 5.1 or newer
● Bluetooth 4.0 LE or newer

Download the VEGA Tools app from the " *Apple App Store*", " *Google Play Store*" or " *Baidu Store*" to your smartphone or tablet.

Make sure that the Bluetooth function of the display and adjustment module is activated. For this, the switch on the bottom side must be set to " *On*".
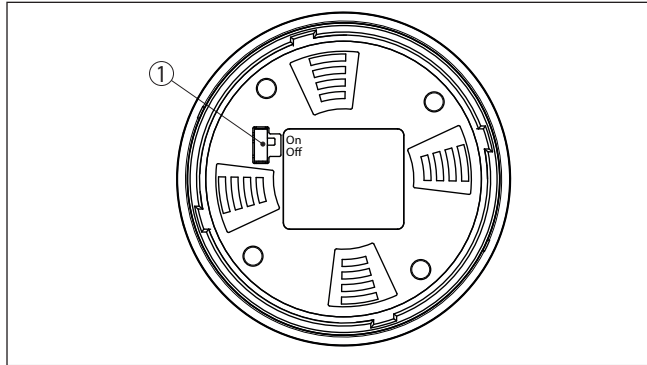
Factory setting is " **On**".

Fig. 56: Activate Bluetooth

1   Switch
On =   Bluetooth active
Off =   Bluetooth not active

10.2 Connecting

Connecting

Start the adjustment app and select the function " *Setup*". The smartphone/tablet searches automatically for Bluetooth-capable instruments in the area.

The message " *Connecting …*" is displayed.

The devices found are listed and the search is automatically continued.

Select the requested instrument in the device list.

Authenticate

When establishing the connection for the first time, the operating tool and the sensor must authenticate each other. After the first correct authentication, each subsequent connection is made without a new authentication query.

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Enter Bluetooth access code

For authentication, enter the 6-digit Bluetooth access code in the next menu window. You can find the code on the information sheet " *Pins and Codes*" in the device packaging.

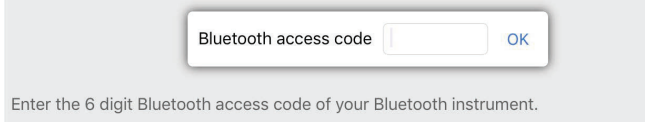For the very first connection, the adjustment unit and the sensor must authenticate each other.

| Bluetooth access code | | OK |

Enter the 6 digit Bluetooth access code of your Bluetooth instrument.

Fig. 57: Enter Bluetooth access code

ℹ **Note:**
If an incorrect code is entered, the code can only be entered again after a delay time. This time gets longer after each incorrect entry.

The message " *Waiting for authentication*" is displayed on the smartphone/tablet.

Connected

After connection, the sensor adjustment menu is displayed on the respective adjustment tool.

If the Bluetooth connection is interrupted, e.g. due to a too large distance between the two devices, this is displayed on the adjustment tool. The message disappears when the connection is restored.

Change device code

Parameter adjustment of the device is only possible if the parameter protection is deactivated. When delivered, parameter protection is deactivated by default and can be activated at any time.

It is recommended to enter a personal 6-digit device code. To do this, go to menu " *Extended functions*", " *Access protection*", menu item " *Protection of the parameter adjustment*".

10.3 Parameterization

Enter parameters

The sensor adjustment menu is divided into two areas, which are arranged next to each other or one below the other, depending on the adjustment tool.

● Navigation section
● Menu item display

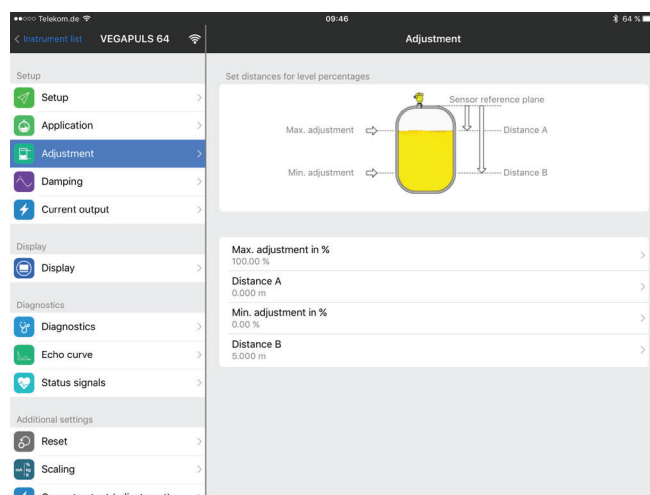The selected menu item can be recognized by the colour change.

Fig. 58: Example of an app view - Setup measured values

Enter the requested parameters and confirm via the keyboard or the editing field. The settings are then active in the sensor.

Close the app to terminate connection.

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11 Set up with PC/notebook

11.1 Preparations (Bluetooth)

System requirements

Make sure that your PC/notebook meets the following system requirements:

● Operating system Windows 10
● DTM Collection 10/2020 or newer
● Bluetooth 4.0 LE or newer

Make sure that the Bluetooth function of the display and adjustment module is activated. For this, the switch on the bottom side must be set to " *On*".
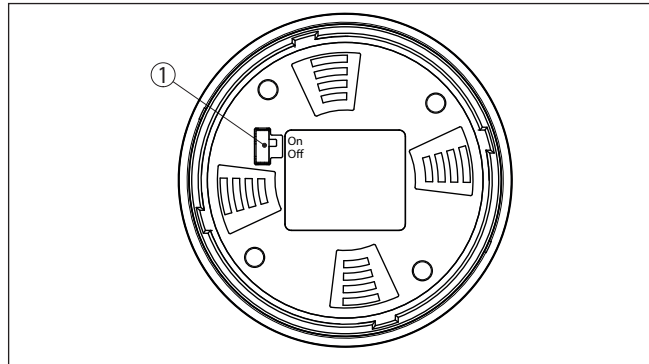
Factory setting is " **On**".

Fig. 59: Activate Bluetooth

1   Switch
On =   Bluetooth active
Off =   Bluetooth not active

Activate Bluetooth connection

Activate the Bluetooth connection via the project assistant.

> **Note:**
> Older systems do not always have an integrated Bluetooth LE. In these cases, a Bluetooth USB adapter is required. Activate the Bluetooth USB adapter using the Project Wizard.

After activating the integrated Bluetooth or the Bluetooth USB adapter, devices with Bluetooth are found and created in the project tree.

11.2 Connecting (Bluetooth)

Connecting

Select the requested device for the online parameter adjustment in the project tree.

Authenticate

When establishing the connection for the first time, the operating tool and the device must authenticate each other. After the first correct authentication, each subsequent connection is made without a new authentication query.

Enter Bluetooth access code

For authentication, enter in the next menu window the 6-digit Bluetooth access code:
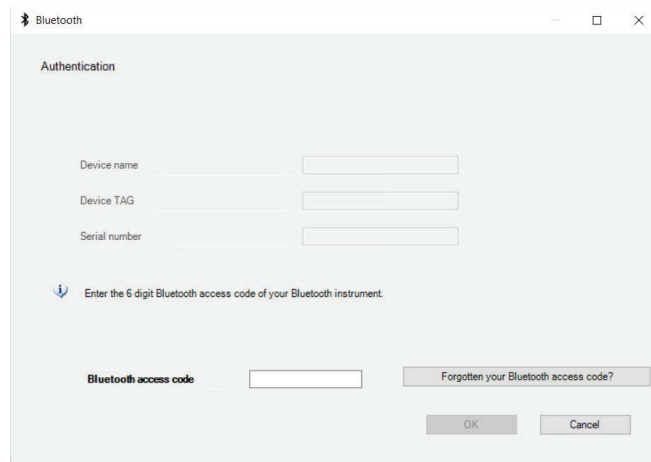

Fig. 60: Enter Bluetooth access code

You can find the code on the outside of the device housing and on the information sheet " *PINs and Codes*" in the device packaging.

ℹ **Note:**
If an incorrect code is entered, the code can only be entered again after a delay time. This time gets longer after each incorrect entry.

The message " *Waiting for authentication*" is displayed on the PC/notebook.

Connected

After connection, the device DTM appears.

If the connection is interrupted, e.g. due to a too large distance between device and adjustment tool, this is displayed on the adjustment tool. The message disappears when the connection is restored.

Change device code

Parameter adjustment of the device is only possible if the parameter protection is deactivated. When delivered, parameter protection is deactivated by default and can be activated at any time.

It is recommended to enter a personal 6-digit device code. To do this, go to menu " *Extended functions*", " *Access protection*", menu item " *Protection of the parameter adjustment*".

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11.3 Connect the PC (VEGACONNECT)
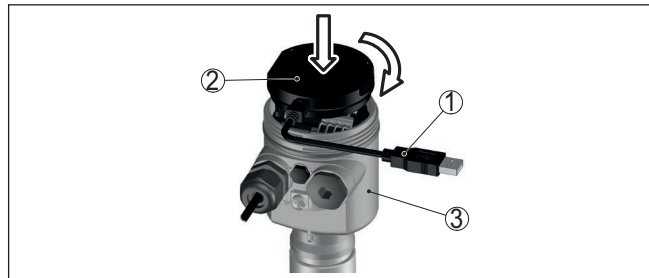
**Via the interface adapter
directly on the sensor**

Fig. 61: Connection of the PC directly to the sensor via the interface adapter
1   USB cable to the PC
2   Interface adapter VEGACONNECT
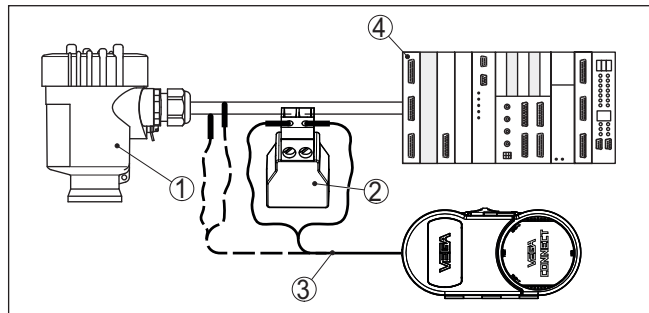3   Sensor

**Via the interface adapter
and HART**

Fig. 62: Connecting the PC via HART to the signal cable
1   Sensor
2   HART resistance 250 Ω (optional depending on evaluation)
3   Connection cable with 2 mm pins and terminals
4   Processing system/PLC/Voltage supply
5   Interface adapter, for example VEGACONNECT 4

> **ⓘ Note:**
> With power supply units with integrated HART resistance (internal
> resistance approx. 250 Ω), an additional external resistance is not
> necessary. This applies, e.g. to the VEGA instruments VEGATRENN
> 149A, VEGAMET 381, VEGAMET 391. Common Ex separators are
> also usually equipped with a sufficient current limiting resistance. In
> such cases, the interface adapter can be connected parallel to the
> 4 … 20 mA cable (dashed line in the previous illustration).

11.4 Parameterization

Prerequisites

For parameter adjustment of the instrument via a Windows PC, the
configuration software PACTware and a suitable instrument driver
(DTM) according to FDT standard are required. The latest PACTware
version as well as all available DTMs are compiled in a DTM Collec-

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tion. The DTMs can also be integrated into other frame applications according to FDT standard.

Note:
To ensure that all instrument functions are supported, you should always use the latest DTM Collection. Furthermore, not all described functions are included in older firmware versions. You can download the latest instrument software from our homepage. A description of the update procedure is also available in the Internet.

Further setup steps are described in the operating instructions manual " *DTM Collection/PACTware*" attached to each DTM Collection and which can also be downloaded from the Internet. Detailed descriptions are available in the online help of PACTware and the DTMs.
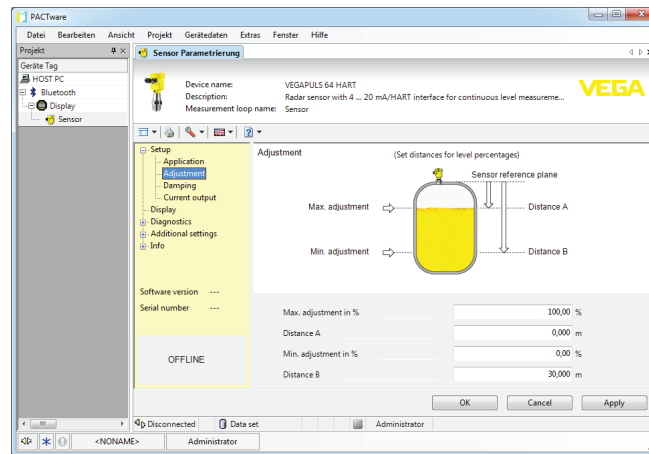

Fig. 63: Example of a DTM view

Standard/Full version

All device DTMs are available as a free-of-charge standard version and as a full version that must be purchased. In the standard version, all functions for complete setup are already included. An assistant for simple project configuration simplifies the adjustment considerably. Saving/printing the project as well as import/export functions are also part of the standard version.

In the full version there is also an extended print function for complete project documentation as well as a save function for measured value and echo curves. In addition, there is a tank calculation program as well as a multiviewer for display and analysis of the saved measured value and echo curves.

The standard version is available as a download under www.vega.com/downloads and " *Software*". The full version is available on CD from the agency serving you.

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11.5 Save parameter adjustment data

We recommend documenting or saving the parameterisation data via PACTware. That way the data are available for multiple use or service purposes.

12 Menu overview

12.1 Display and adjustment module

Lock/Unlock adjustment

Menu item	Parameter	Selection	Default setting
Lock/Unlock adjustment		Lock, unlock	Released

Setup

Menu item	Parameter	Selection	Default setting
Measurement loop name			Sensor
Distance unit	Distance unit	mm, m, in, ft	m
Type of medium	Type of medium	Liquid	Liquid [9]
		Bulk solid	Bulk solid [10]
Application	Application - liquid	Storage tank, agitator tank, dosing tank, standpipe, tank/collection basin, plastic tank (measurement through tank top), mobile plastic tank (IBC), level measurement in waters, flow measurement flume/overflow, pump station/pump shaft, combined sewer overflow, demonstration	Storage tank [11]
	Application - bulk solid	Silo, bunker, crusher, heap, demonstration	Silo [12]
Vessel height			Recommended meas. range, see chapter " *Technical data*"
Distance A (max. value)	Max. value		Max. adjustment 100 % corresponds to 0,000 m
Distance B (min. value)	Min. value		Min. adjustment 0 % corresponds to 120,000 m

[9] Plastic horn antenna, thread with integrated antenna system, flange with encapsulated antenna system
[10] Flange with lens antenna
[11] Plastic horn antenna, thread with integrated antenna system, flange with encapsulated antenna system
[12] Flange with lens antenna

Access protection

Menu item	Parameter	Selection	Default setting
Access protection	Bluetooth access code	Bluetooth access code	
	Protection of the parameterization	Protection of the parameterization	
	Device code	Device code	

Reset

Menu item	Parameter	Selection	Default setting
Reset	Reset	Reset to factory settings, Restart	-

Extended settings

Menu item	Parameter	Selection	Default setting
Temperature unit		°C, °F, K	°C
Damping	Integration time	0 … 999 s	0 s
Current output	Output value	Percent, linearized percent, filling height, distance, scaled, measurement reliability, electronics temperature, meas. rate, supply voltage	Percent
	Output characteristics	0 … 100 % correspond to 4 … 20 mA	0 … 100 % correspond to 4 … 20 mA
		0 … 100 % correspond to 20 … 4 mA	
	Current range	4 … 20 mA	4 … 20 mA
		3.8 … 20.5 mA	
	Reaction when malfunctions occur	≤ 3.6 mA, ≥ 21 mA, last valid measured value	≤ 3.6 mA
Linearisation	Linearization type - liquid	Linear, cylindrical tank, spherical tank, Venturi, trapezoidal weir, rectangular weir, Palmer-Bowlus flume, V-Notch, triangular overfall	Linear
	Linearization type - bulk solids	Linear, conical bottom, pyramid bottom, sloping bottom	Linear
	Intermediate height "h"		
Scaling	Scaling size	Scaling size (dimensionless, mass, volume, height, pressure, flow, others)	Dimensionless
		Scaling unit (unit selection depending on scaling size, user-defined)	-
	Scaling format	#, #.#, #.##, #.###, #.####	#
	Scaling	Scaling	100 % correspond to 0 % correspond to

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Menu item	Parameter	Selection	Default setting
Indication	Menu language	German, English, French, Spanish, Portuguese, Italian, Dutch, Russian, Chinese, Japanese, Turkish, Polish	Order-specific
	Presentation	One measured value, measured value and bargraph, two measured values	One measured value
	Displayed values 1, 2	Percent, linearized percent, filling height, distance, scaled, measurement reliability, electronics temperature, current output, current output 2	Percent
	Backlight	On, Off	On
False signal suppression	False signal suppression	Create new, expand, delete all	-
Date/Time	Date/Time	Date	Actual date
		Format: 24 h, 12 h	24 h
		Time	Actual time
HART mode	HART address	0 … 63	0
	Output mode	Analogue current output with HART, fix current (4 mA) with HART	Analogue current output with HART
Mode	Mode	Mode 1: EU, Albania, Andorra, Azerbaijan, Australia, Belarus, Bosnia and Herzegovina, Canada, Liechtenstein, Morocco, Moldavia, Monaco, Montenegro, New Zealand, Northern Macedonia, Norway, San Marino, Saudi Arabia, Serbia, Switzerland, Turkey, Ukraine, United Kingdom, USA	Mode 1
		Mode of operation 2: Brazil, Japan, South Korea, Taiwan, Thailand	
		Mode of operation 3: India, Malaysia, South Africa	
		Mode 4: Russia	
	Voltage supply	Permanent voltage supply	Permanent voltage supply
		Not permanent voltage supply	
Copy instrument settings		Read from sensor, store in sensor	-
Special parameters	See separate menu overview at the end oc the chapter " *Menu overview*" of the operating instructions.		

Reset

Menu item	Parameter	Selection	Default setting
Reset	Reset	Reset to factory settings, Restart	-

Diagnostics

Menu item	Parameter	Selection/Display	Default setting
Diagnosis status	Diagnosis status	Diagnosis status	-
		Change counter	-
		Checksum (CRC) current	Date parameter adjustment
		Checksum (CRC) last SIL locking	Date last SIL locking
Echo curve		Echo curve	Indication of echo curve
Peak indicator	Distance	Current value, min. distance, max. distance	Actual value
	Measurement reliability	Current value, min. measurement reliability, max. measurement reliability	Actual value
	Measuring rate	Current value, min. meas. rate, max. meas. rate	Actual value
	Electronics temperature	Current value, min. eletronics temperature, max. electronics temperature	Actual value
	Operating voltage	Current value, min. voltage supply, max. voltage supply	Actual value
Diagnostic behaviour	Behaviour with echo loss	Last measured value, maintenance message, fault signal	Last measured value
	Time until fault signal	Time until fault signal	
Sensor information		Device name, serial number, hardware/software version, device revision, factory calibration date	-
Sensor characteristics			Configuration features
Simulation	Measured value	Percent, linearized percent, filling height, distance, scaled, measurement reliability, electronics temperature, measuring rate, operating voltage, current output, current output 2	Percent
Device memory	Echo curve of the setup	Save echo curve of setup	-
	Echo curve memory	Echo curve memory	

12.2 VEGA Tools app and PACTware/DTM

Lock/Unlock adjustment

Menu item	Parameter	Selection	Default setting
Lock/Unlock adjustment		Lock, unlock	Released

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Setup

Menu item	Parameter	Selection	Default setting
Measurement loop name			Sensor
Distance unit	Distance unit	mm, m, in, ft	m
Type of medium	Type of medium	Liquid	Liquid [13]
		Bulk solid	Bulk solid [14]
Application	Application - liquid	Storage tank, agitator tank, dosing tank, standpipe, tank/collection basin, plastic tank (measurement through tank top), mobile plastic tank (IBC), level measurement in waters, flow measurement flume/overflow, pump station/pump shaft, combined sewer overflow, demonstration	Storage tank [15]
	Application - bulk solid	Silo, bunker, crusher, heap, demonstration	Silo [16]
Vessel height			Recommended meas. range, see chapter " *Technical data*"
Distance A (max. value)	Max. value		Max. adjustment 100 % corresponds to 0,000 m
Distance B (min. value)	Min. value		Min. adjustment 0 % corresponds to 120,000 m

Access protection

Menu item	Parameter	Selection	Default setting
Access protection	Bluetooth access code	Bluetooth access code	
	Protection of the parameterization	Protection of the parameterization	
	Device code	Device code	

Reset

Menu item	Parameter	Selection	Default setting
Reset	Reset	Reset to factory settings, Restart	-

[13] Plastic horn antenna, thread with integrated antenna system, flange with encapsulated antenna system
[14] Flange with lens antenna
[15] Plastic horn antenna, thread with integrated antenna system, flange with encapsulated antenna system
[16] Flange with lens antenna

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Extended settings

Menu item	Parameter	Selection	Default setting
Units	Temperature unit of the instrument	°C, °F	°C
Damping	Integration time	0 … 999 s	1 s
Current output	Output value	Percent, linearized percent, filling height, distance, scaled, measurement reliability, electronics temperature, measuring rate, operating voltage	Percent
	Initial value - Characteristic	Initial value - characteristics (4 mA)	4 mA correspond to
	Final value - Characteristic	End value - characteristics (20 mA)	20 mA correspond to
	Output characteristics	0 … 100 % correspond to 4 … 20 mA	0 … 100 % correspond to 4 … 20 mA
		0 … 100 % correspond to 20 … 4 mA	
	Current range	4 … 20 mA	4 … 20 mA
		3.8 … 20.5 mA	
	Reaction when malfunctions occur	≤ 3.6 mA, ≥ 21 mA, last valid measured value	≤ 3.6 mA
	Reaction when malfunctions occur	≤ 3.6 mA, ≥ 21 mA	≤ 3.6 mA
Linearisation	Linearization type - liquid	Linear, cylindrical tank, spherical tank, Venturi, trapezoidal weir, rectangular weir, Palmer-Bowlus flume, V-Notch, triangular overfall	Linear
	Linearization type - bulk solids	Linear, conical bottom, pyramid bottom, sloping bottom	Linear
	Intermediate height "h"		-
Scaling	Scaling size	Dimensionless, mass, volume, height, pressure, flow, others	Dimensionless
	Scaling unit	Unit selection depending on scaling size, user-defined	-
	Name of the unit		-
	Scaling format	#, #.#, #.##, #.###, #.####	#
	Scaling	100 % correspond to	100 L
		0 % correspond to	0 L

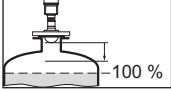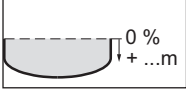| Menu item	Parameter	Selection	Default setting
Indication	Menu language (PLICSCOM)	German, English, French, Spanish, Portuguese, Italian, Dutch, Russian, Chinese, Japanese, Turkish, Polish	Order-specific
	Presentation	One measured value, measured value and bargraph, two measured values	One measured value
	Displayed values 1, 2	Percent, linearized percent, filling height, distance, scaled, measurement reliability, electronics temperature, current output, current output 2	Percent
	Backlight	On, Off	On
False signal suppression	False signal suppression	Create new, extend, delete area, delete all	-
HART variables	HART variables	Primary Value (PV)	Linearized percent
		Secondary Value (SV)	Distance
		Tertiary Value (TV)	Measurement reliability
		Quarternary Value (QV)	Electronics temperature
		LONG-TAG	
		MESSAGE	MSG
Date/Time	Date/Time	Date	Actual date
		Format: 24 h, 12 h	24 h
		Time	Actual time
Mode	Mode	Mode 1: EU, Albania, Andorra, Azerbaijan, Australia, Belarus, Bosnia and Herzegovina, Canada, Liechtenstein, Moldavia, Monaco, Montenegro, New Zealand, Northern Macedonia, Norway, San Marino, Saudi Arabia, Serbia, Switzerland, Turkey, Ukraine, United Kingdom, USA	Mode 1
		Mode of operation 2: Brazil, Japan, South Korea, Taiwan, Thailand	
		Mode of operation 3: India, Malaysia, South Africa	
		Mode 4: Russia	
	Energy supply	Permanent power supply, non-permanent power supply	Permanent voltage supply
Special parameters	See separate menu overview at the end of the chapter " *Menu overview*"		

Diagnostics
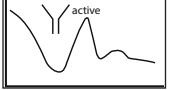
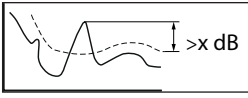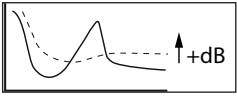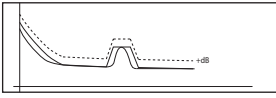| Menu item	Parameter	Selection/Display	Default setting
Status	Diagnosis status	Diagnosis status	-
	Status parameter adjustment	Change counter, modification date, checksum (CRC) current, date checksum current, checksum (CRC) last SIL locking, date last SIL locking	-
	Measured value status	Percent, linearized percent, filling height, distance, scaled, measurement reliability	-
	Status outputs	Current output	-
	HART Device Status	Field device malfunction, Configuration changed, Cold start, More status available, Analog output fixed, Analog output saturated, Non-primary variable of limits, Primary variable of limits	-
	Status additional measured values	Electronics temperature, measuring rate, operating voltage	-
Echo curve		Echo curve	Indication of echo curve
Peak indicator	Distance	Current value, min. distance, max. distance	Actual value
	Measurement reliability	Current value, min. measurement reliability, max. measurement reliability	
	Measuring rate	Current value, min. meas. rate, max. meas. rate	
	Electronics temperature	Current value, min. eletronics temperature, max. electronics temperature	
	Operating voltage	Current value, min. voltage supply, max. voltage supply	
Measured values	Measured values	Percent, linearized percent, filling height, distance, scaled, measurement reliability	
	Additional measured values	Electronics temperature, measuring rate, operating voltage	
	Outputs	Current output, Primary Value (PV), Secondary Value (SV), Tertiary Value (TV), Quarternary Value (QV)	
Diagnostic behaviour	Echo loss	Behaviour in case of echo loss, time until fault signal	Output fault current
	Electronics temperature - Behaviour outside the specification	Outside the specification, output fault current	
	Status signals	Activation of: Function control, Outside the specification, Maintenance required	Function check, outside specification, maintenance required

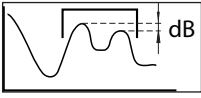VEGAPULS 6X • Two-wire 4 … 20 mA/HART

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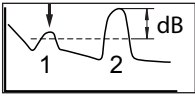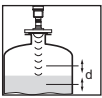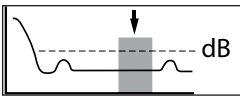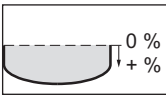
Menu item	Parameter	Selection/Display	Default setting
Sensor information		Device name, order code, serial number, hardware/software version, Device Revision, factory calibration date, device address, Loop current mode, Fieldbus Profile Rev., Expanded Device Type, sensor acc. to SIL, sensor acc. to WHG, Bustype ID	-
Sensor characteristics			Configuration features
Simulation	Measured value	Percent, linearized percent, filling height, distance, scaled, measurement reliability, electronics temperature, measuring rate, operating voltage, current output	Percent
Measured value memory (DTM)			
Device memory	Echo curve of the setup	Save echo curve of setup	
	Echo curve memory	Echo curve memory	
	Measured value memory	Measured value memory	-
	Event memory	Event memory	
Function test		Start proof test, start device test	

12.3 Special parameters

Parameter	Designation	Presentation	Default setting
SP1, SP2	Activate measuring range start limiting Manual limiting of measuring range start		Deactivated 0.000 m
SP3	Safety on the vessel bottom or measuring range end		1.000 m
SP4	Correction of the propagation speed		0.0 %
SP5, SP6	Factor for noise averaging rising Factor for noise averaging falling		2 2
SP7	Deactivate filter function "*Smooth raw value curve*"		Deactivated

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Parameter	Designation	Presentation	Default setting
SP8	Offset detection curve for echo analysis	>x dB	8 dB
SP9	Minimum measurement reliability for level echo selection	+dB	0 dB
SP10	Additional reliability for false signal storage	+dB	3 dB
SP12	Activate " *Summarize echoes*" function	dB	Deactivated
SP13	Amplitude difference in " *Summarize echoes*" function		12 dB
SP14	Echo distance for " *Summarize echoes*" function		0.500 m
SP15	Activate function measurement of the " *first large echo*"	dB 1 2	Deactivated
SP16	Minimum amplitude function " *First large echo*"		12 dB
SP17	Wide focussing range	d	240 m
SP18	Minimum measurement reliability outside focussing range	dB	6 dB
SP19	Time for opening the focussing range	t	0 s
SP22	Measured value offset		0.000 m
SP24	Factor for additional reliability at measuring range end	0 % + %	0.0 %
SP HART	Activate/Deactivate HART		Activated

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Parameter	Designation	Presentation	Default setting
SP SIL	Activate/Deactivate SIL		Activated [17]
			Deactivated [18]

13 Set up with other systems

13.1 DD adjustment programs

Device descriptions as Enhanced Device Description (EDD) are available for DD adjustment programs such as, for example, AMS™ and PDM.

The files can be downloaded at www.vega.com/downloads under " *Software*".

13.2 Field Communicator 375, 475

Device descriptions for the instrument are available as EDD for parameterisation with Field Communicator 375 or 475.

Integrating the EDD into the Field Communicator 375 or 475 requires the "Easy Upgrade Utility" software, which is available from the manufacturer. This software is updated via the Internet and new EDDs are automatically accepted into the device catalogue of this software after they are released by the manufacturer. They can then be transferred to a Field Communicator.

In the HART communication, the Universal Commands and a part of the Common Practice Commands are supported.

14 Diagnosis, asset management and service

14.1 Maintenance

Maintenance

If the device is used properly, no special maintenance is required in normal operation.

Precaution measures against buildup ⚠️

Note:
In some applications, product buildup on the antenna system can influence the measurement result.

Depending on the sensor and application, take measures to avoid heavy soiling of the antenna system. If necessary, clean the antenna system in certain intervals.

Cleaning

The cleaning helps that the type label and markings on the instrument are visible.

⚠️

Note:
Unsuitable cleaning agents and methods can damage the device. To avoid this, observe the following:

● Use only cleaning agents which do not corrode the housings, type label and seals
● Use only cleaning methods corresponding to the housing protection rating

14.2 Measured value and event memory

The instrument has several memories available for diagnostic purposes. The data remain there even in case of voltage interruption.

Measured value memory

Up to 100,000 measured values are stored in the sensor in a ring memory. Each entry contains date/time as well as the respective measured value.

Storable values are for example:

● Distance
● Filling height
● Percentage value
● Lin. percent
● Scaled
● Current value
● Measurement reliability
● Electronics temperature

When the instrument is shipped, the measured value memory is active and stores distance, measurement reliability and electronics temperature every 3 minutes.

The requested values and recording conditions are set via a PC with PACTware/DTM or the control system with EDD. Data are thus read out and also reset.

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Event memory

Up to 500 events are automatically stored with a time stamp in the sensor (non-deletable). Each entry contains date/time, event type, event description and value.

Event types are for example:

● Modification of a parameter
● Switch-on and switch-off times
● Status messages (according to NE 107)
● Error messages (according to NE 107)

The data are read out via a PC with PACTware/DTM or the control system with EDD.

Echo curve memory

The echo curves are stored with date and time and the corresponding echo data.

Echo curve of the setup:
This is used as reference echo curve for the measurement conditions during setup. Changes in the measurement conditions during operation or buildup on the sensor can thus be recognized. The echo curve of the setup is stored via:

● PC with PACTware/DTM
● Control system with EDD
● Display and adjustment module

Further echo curves:
Up to 10 echo curves can be stored in a ring buffer in this memory section. Additional echo curves are stored via:

● PC with PACTware/DTM
● Control system with EDD

14.3 Asset Management function

The instrument features self-monitoring and diagnostics according to NE 107 and VDI/VDE 2650. In addition to the status messages in the following tables there are more detailed error messages available under the menu item " *Diagnostics*" via the respective adjustment module.

Status messages

The status messages are divided into the following categories:

● Failure
● Function check
● Out of specification
● Maintenance required
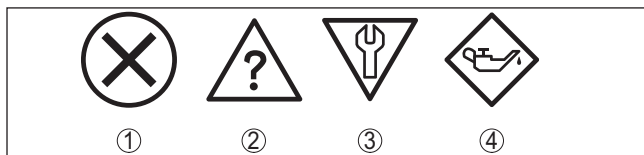
and explained by pictographs:

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Fig. 64: Pictographs of the status messages

1   Failure - red
2   Out of specification - yellow
3   Function check - orange
4   Maintenance required - blue

Malfunction (Failure):

Due to a malfunction in the instrument, a fault signal is output.

This status message is always active. It cannot be deactivated by the user.

Function check:

The instrument is being worked on, the measured value is temporarily invalid (for example during simulation).

This status message is inactive by default.

Out of specification:

The measured value is unreliable because an instrument specification was exceeded (e.g. electronics temperature).

This status message is inactive by default.

Maintenance required:

Due to external influences, the instrument function is limited. The measurement is affected, but the measured value is still valid. Plan in maintenance for the instrument because a failure is expected in the near future (e.g. due to buildup).

This status message is inactive by default.

Failure

Code Text message	Cause	Rectification	DevSpec State in CMD 48
F013 no measured value available	Sensor does not detect an echo during operation Antenna system dirty or defective	Check or correct installation and/or parameter settings Clean or exchange process component or antenna	Byte 5, Bit 0 of Byte 0 … 5
F017 Adjustment span too small	Adjustment not within specification	Change adjustment according to the limit values (difference between min. and max. ≥ 10 mm)	Byte 5, Bit 1 of Byte 0 … 5
F025 Error in the linearization table	Values are not continuously rising, for example illogical value pairs	Check linearization table Delete table/Create new	Byte 5, Bit 2 of Byte 0 … 5

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Code Text message	Cause	Rectification	DevSpec State in CMD 48
F036 No operable soft-ware	Failed or interrupted software up-date	Repeat software update Check electronics version Exchanging the electronics Send instrument for repair	Byte 5, Bit 3 of Byte 0 … 5
F040 Error in the elec-tronics	Hardware defect	Exchanging the electronics Send instrument for repair	Byte 5, Bit 4 of Byte 0 … 5
F080 General software error	General software error	Disconnect operating voltage briefly	Byte 5, Bit 5 of Byte 0 … 5
F105 Determine meas-ured value	The instrument is still in the switch-on phase, the measured value could not yet be determined	Wait for the end of the switch-on phase Duration up to approx. 3 minutes depending on the version and pa-rameter settings	Byte 5, Bit 6 of Byte 0 … 5
F113 Communication error	EMC interference	Remove EMC influences	Byte 4, Bit 4 of Byte 0 … 5
F125 Impermissible elec-tronics temperature	Temperature of the electronics in the non-specified range	Check ambient temperature Insulate electronics Use instrument with higher tem-perature range	Byte 5, Bit 7 of Byte 0 … 5
F260 Error in the cali-bration	Error in the calibration carried out in the factory Error in the EEPROM	Exchanging the electronics Send instrument for repair	Byte 4, Bit 0 of Byte 0 … 5
F261 Error in the instru-ment settings	Error during setup False signal suppression faulty Error when carrying out a reset	Repeat setup Carry out a reset	Byte 4, Bit 1 of Byte 0 … 5
F264 Installation/Setup error	Adjustment not within the vessel height/measuring range Max. measuring range of the in-strument not sufficient	Check or correct installation and/or parameter settings Use an instrument with bigger measuring range	Byte 4, Bit 2 of Byte 0 … 5
F265 Measurement func-tion disturbed	Sensor no longer carries out a measurement Operating voltage too low	Check operating voltage Carry out a reset Disconnect operating voltage briefly	Byte 4, Bit 3 of Byte 0 … 5
F267 No executable sen-sor software	Sensor cannot start	Exchanging the electronics Send instrument for repair	-

Function check

Code Text message	Cause	Rectification	DevSpec State in CMD 48
C700 Simulation active	A simulation is active	Finish simulation Wait for the automatic end after 60 mins.	"Simulation Active" in "Standardized Status 0"

Out of specification

Code Text message	Cause	Rectification	DevSpec State in CMD 48
S600 Impermissible electronics temperature	Temperature of the processing electronics in the non-specified section	Check ambient temperature Insulate electronics Use instrument with higher temperature range	Byte 23, Bit 0 of Byte 14 … 24
S601 Overfilling	Level echo in the close range not available	Reduce level 100 % adjustment: Increase value Check mounting socket Remove possible interfering signals in the close range	Byte 23, Bit 1 of Byte 14 … 24
S603 Impermissible operating voltage	Operating voltage below specified range	Check electrical connection If necessary, increase operating voltage	

Maintenance

Code Text message	Cause	Rectification	DevSpec State in CMD 48
M500 Error during the reset "delivery status"	The data could not be restored during the reset to delivery status	Repeat reset Load XML file with sensor data into the sensor	Byte 24, Bit 0 of Byte 14 … 24
M501 Error in the non-active linearisation table	Hardware error EEPROM	Exchanging the electronics Send instrument for repair	Byte 24, Bit 1 of Byte 14 … 24
M504 Error at a device interface	Hardware defect	Check connections Exchanging the electronics Send instrument for repair	Byte 24, Bit 4 of Byte 14 … 24
M505 No echo available	Sensor does not detect an echo during operation Antenna dirty or defective	Clean the antenna Use a more suitable antenna/sensor Remove possible false echoes Optimize sensor position and orientation	Byte 24, Bit 5 of Byte 14 … 24
M506 Installation/Setup error	Error during setup	Check or correct installation and/or parameter settings	Byte 24, Bit 6 of Byte 14 … 24

Code Text message	Cause	Rectification	DevSpec State in CMD 48
M507 Error in the instrument settings	Error during setup Error when carrying out a reset False signal suppression faulty	Carry out reset and repeat setup	Byte 24, Bit 7 of Byte 14 … 24

14.4 Echo curve

14.4.1 Overview

Via the adjustment software PACTware with a PC and VEGACONNECT the echo curve of the connected sensor can be displayed under the menu item " *Diagnosis*".

The echo curve enables a detailed assessment of the characteristics of a level measurement with the VEGAPULS 6X.

The following chapters show the basic course of the echo curve and describe the menu functions.

14.4.2 Echo curve presentation and description

The desired individual curves are displayed on the screen in the "Echo curve" diagram. The toolbar above is used to control the presentation and navigation.

VEGAPULS 6X • Two-wire 4 … 20 mA/HART
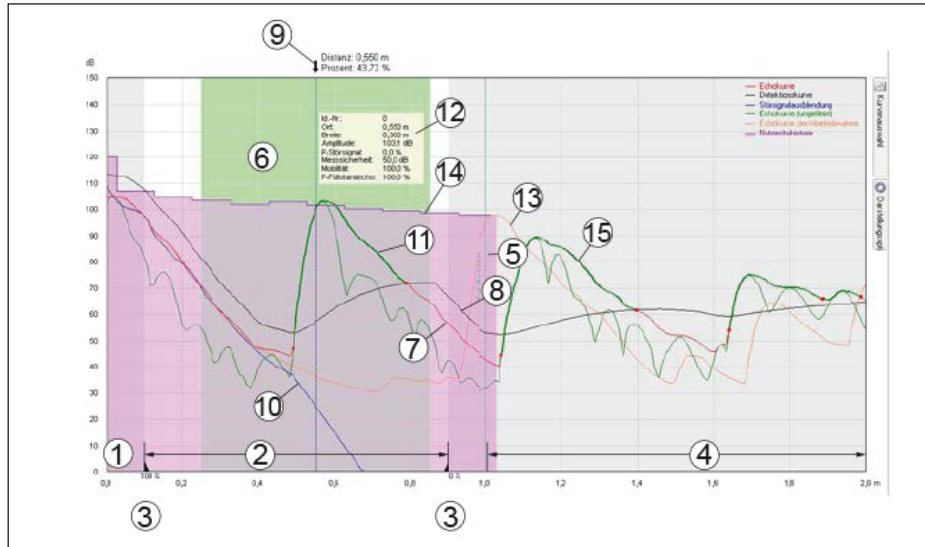
Fig. 65: Areas in the echo curve window

1   *Sensor reference plane (0 m)/Extended presentation area*
2   *Measuring range*
3   *Adjustment range*
4   *Safety area at the measuring range end*
5   *Vessel height*
6   *Focussing range*
7   *Echo curve*
8   *Detection curve*
9   *Distance and percentage value arrow*
10   *False signal suppression*
11   *Detected echo with initial and end point*
12   *Echo data of the selected echo*
13   *Echo curve of the setup*
14   *Useful echo history*
15   *Echo curve unfiltered*
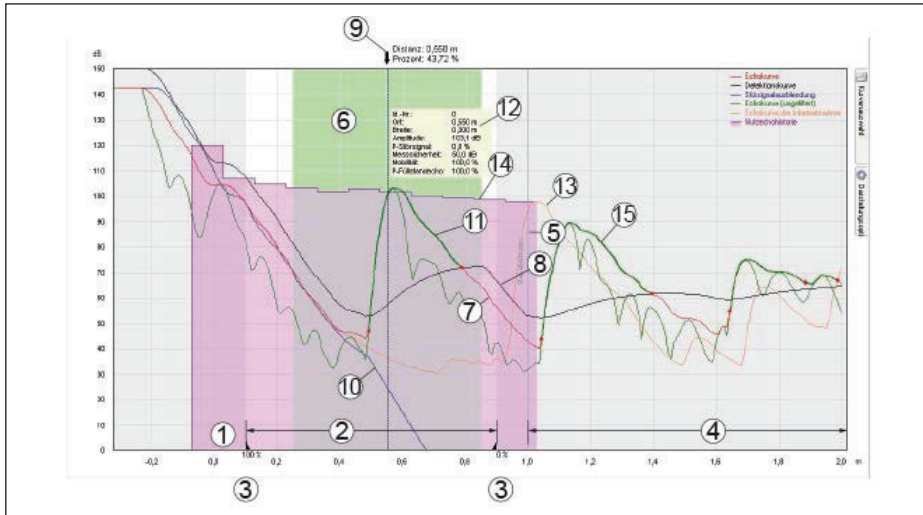
Fig. 66: Areas in the echo curve window with presentation option "Extended presentation area"

Distance and percentage value arrow	The distance arrow marks the level echo detected by the sensor. In the case of an ideal echo (flat, well-reflecting medium surface), it points to the centre of the echo.
	→ A "black" arrow means: The level echo is currently visible to the sensor. A "white" arrow means: The level echo has disappeared from the marked position.
Echo curve	The echo curve shown in red is the basis for echo detection. It shows the course and amplitude of detected echoes.
	→ Considered echoes are marked in green.
Detection curve	The detection curve shown in black follows the echo curve. It determines the sensitivity threshold of the sensor and thus in which range echoes are detected.
False signal suppression	The false signal suppression shown in blue represents the false signal profile stored in the sensor.
	→ Echoes with an amplitude below this curve are marked as false signals.
Echo curve of the setup	A high-resolution echo curve stored by the user during setup.
	→ It can be used to detect signal changes over the operating time.
High resolution	The maximum number of scanning points available in the sensor is displayed.
	→ The high-resolution display of the echo curve is necessary for a meaningful assessment of the echo curve.

Extended presentation area

The entire reading area considered by the sensor, including all securities, is displayed.

→ The extended presentation area must be selected for a meaningful assessment of the echo curve.

Focussing range

The focussing range is a measuring window that the radar sensor places symmetrically around the distance of the currently measured level echo.

→ Only within the focussing range are changes (location, amplitude, number of echoes) accepted for evaluating the current level.

Echo data of the selected echo

Detected echoes within the measuring range are displayed by means of a green line and two red dots for echo start and end.

→ For each of these echoes, the echo data is determined.

Echo curve unfiltered

The green curve corresponds to the echo curve, but without upstream filter functions.

→ The unfiltered echo curve is not influenced by the application parameters.

Useful echo history

The curve shown in purple shows the minimum level echo amplitude depending on the distance with a resolution of 0.1 m.

14.4.3 Adjustment functions

Toolbar echo curve

In the upper left section, date and time of the actually shown curve are displayed. On the right, you can find the two toolbar symbols described below:

Symbol	Function	Additional information
	Hold curves: Freeze currently displayed curves, brighter presentation	Additional presentation of the currently read curve (changes in the curve are thus immediately recognisable)
	Standard view: Exit zoomed view, presentation of the unzoomed area	

Curve selection

The adjustment element "*Curve selection*" at the right edge of the window enables the following curve views:

Designation	Additional information
Echo curve	Clicking with left mouse button on echo provides indication of associated echo data
Detection curve	
False signal suppression	
Echo curve unfiltered	Is only visible in the service login and
Useful echo history	

Designation	Additional information
Echo curve of the setup	

Presentation options

The adjustment element " *Presentation options*" at the right edge of the window enables the display of additional analysis aids:

Designation	Function	Additional information
High resolution	Loading and presenting the curves with the maximum number of measured value points	Slightly slower updating of the echo curve in the echo curve window due to the larger data volume
Extended presentation area	Presentation of additional distance safety areas of the sensor	
Focussing range	Measuring window that the sensor places symmetrically around the level echo.	
Show echo data	Tabular presentation of the echo data in the lower area of the window	

14.4.4 Additional functions and information

Additional adjustment options

A short click with the right mouse button in the echo curve opens a pop-up menu with these adjustment options:

Designation	Function	Additional information
Zoom settings	Manual input of the desired zoom range	
Unzoom	Leaving the zoomed presentation, presentation of the unzoomed area	
Load recording	Loading curves from a previous service record [19]	Function only in offline mode available
Print view	Printing the echo curve and exporting it as a pdf file	
Info	Display of information about the device from which the echo curves were recorded	

Pressing and holding the mouse buttons in the echo curve results in further functions:

Designation	Function	Additional information
Right mouse button	Shifting	By shifting the mouse, the displayed presentation area is shifted as well.

[19] Note: The DTM version, the measuring principle and the device version of the recordings must match the current DTM

Designation	Function	Additional information
Left mouse button	Zoom	Shifting the mouse sets the zoom range.

The offline mode offers the possibility to display curves from the echo curve memory. In this mode, a toolbar with additional symbols appears:

Symbol	Function
	Stop
	Replay
	To the beginning of the recording
	To the previous recording
	To the next recording
	To the end of the recording
	Load recording from device

Additional information echo data

Below the echo curve, the detected echoes are listed in tabular form with additional information.

Designation	Meaning	Additional information
ID	Ident number assigned by the sensor to the detect-ed echo	
Location	Distance from the sensor reference plane to the echo	
Amplitude	Echo amplitude of the re-spective echo in dB	

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Designation	Meaning	Additional information
Width	Width of the respective echo	
P-false signal	False echo probability	Measure for the compliance of an echo with a stored false signal curve
Measurement reliability	Usable amplitude of an echo in dB	
Mobility	Indication of whether and how far the echo moves in a certain direction	-100 %: Certainly not moved; +100 % certainly moved sufficiently
P-level echo	Level echo probability	Level echo probability is the result of the echo assessment in the sensor

14.5 Rectify faults

Reaction when malfunction occurs

The operator of the system is responsible for taking suitable measures to rectify faults.

Fault rectification

The first measures are:

● Evaluation of fault messages
● Checking the output signal
● Treatment of measurement errors

A smartphone/tablet with the adjustment app or a PC/notebook with the software PACTware and the suitable DTM offer you further comprehensive diagnostic possibilities. In many cases, the causes can be determined in this way and the faults eliminated.

4 … 20 mA signal

Connect a multimeter in the suitable measuring range according to the wiring plan. The following table describes possible errors in the current signal and helps to eliminate them:

Error	Cause	Rectification
4 … 20 mA signal not stable	Fluctuating measured value	Set damping
4 … 20 mA signal missing	Electrical connection faulty	Check connection, correct, if necessary
	Voltage supply missing	Check cables for breaks; repair if necessary
	Operating voltage too low, load resistance too high	Check, adapt if necessary
Current signal greater than 22 mA, less than 3.6 mA	Sensor electronics defective	Replace device or send in for repair depending on device version

Treatment of measurement errors

The below tables show typical examples of application-related measurement errors with liquids. The measurement errors are differentiated according to the following:

● Constant level
● Filling
● Emptying

The images in column " *Error pattern*" show the real level as a broken line and the level displayed by the sensor as a continuous line.
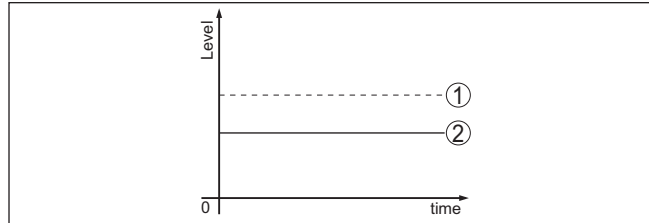

Fig. 67: Display of error images

1 *Real level*
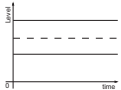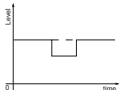2 *Level displayed by the sensor*

Note:
If the output level is constant, the cause could also be the fault setting of the current output to " *Hold value*".

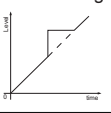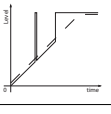If the level is too low, the reason could be a line resistance that is too high

Measurement error with constant level

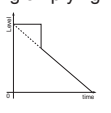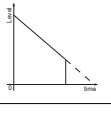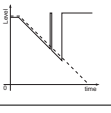| Fault description	Cause	Rectification
Measured value shows a too low or too high level	Min./max. adjustment not correct	Adapt min./max. adjustment
	Incorrect linearization curve	Adapt linearization curve
	Installation in a bypass tube or standpipe, hence running time error (small measurement error close to 100 %/large error close to 0 %)	Check parameter "Application" with respect to vessel form, adapt if necessary (bypass, standpipe, diameter).
Measured value jumps towards 0 % (liquids only)	Multiple echo (vessel top, medium surface) with amplitude higher than the level echo.	Check parameter "Application", especially vessel top, type of medium, dished bottom, high dielectric constant, and adapt if necessary.
Measured value jumps towards 100 %	Due to the process, the amplitude of the level echo sinks	Carry out a false signal suppression
	A false signal suppression was not carried out	
	Amplitude or position of a false signal has changed (e.g. condensation, buildup); false signal suppression no longer matches actual conditions.	Determine the reason for the changed false signals, carry out false signal suppression, e.g. with condensation.

Measurement error during filling

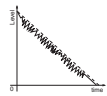| Fault description	Cause	Rectification
Measured value remains unchanged during filling	False signals in the close range too big or level echo too small Strong foam or vortex generation Max. adjustment not correct	Eliminate false signals in the close range Check measurement situation: Antenna must protrude out of the nozzle, installations Remove contamination on the antenna In case of interferences due to installations in the close range: Change polarisation direction Create a new false signal suppression Adapt max. adjustment
Measured value remains in the area of the bottom during filling	Echo from the tank bottom larger than the level echo, for example, with products with $\varepsilon_r < 2.5$ oil-based, solvents	Check parameters Medium, Vessel height and Floor form, adapt if necessary
Measured value remains momentarily unchanged during filling and then jumps to the correct level	Turbulence on the medium surface, quick filling	Check parameters, change if necessary, e.g. in dosing vessel, reactor
Measured value jumps towards 0 % during filling	Amplitude of a multiple echo (vessel top - medium surface) is larger than the level echo.	Check parameter "Application", especially vessel top, type of medium, dished bottom, high dielectric constant, and adapt if necessary.
	The level echo cannot be distinguished from the false signal at a false signal position (jumps to multiple echo).	In case of interferences due to installations in the close range: Change polarisation direction Chose a more suitable installation position
	Transverse reflection from an extraction funnel, amplitude of the transverse reflection larger than the level echo	Direct sensor to the opposite funnel wall, avoid crossing with the filling stream.
Measured value fluctuates around 10 … 20 % (only bulk solids)	Various echoes from an uneven medium surface, e.g. a material cone	Check parameter "Material Type" and adapt, if necessary Optimize installation position and sensor orientation
	Reflections from the medium surface via the vessel wall (deflection)	Select a more suitable installation position, optimize sensor orientation, e.g. with a swivelling holder

Fault description	Cause	Rectification
Measured value jumps towards 100 % during filling	Due to strong turbulence and foam generation during filling, the amplitude of the level echo sinks. Measured value jumps to false signal.	Carry out a false signal suppression
Measured value jumps sporadically to 100 % during filling	Varying condensation or contamination on the antenna.	Carry out a false signal suppression or increase false signal suppression with condensation/contamination in the close range by editing. With bulk solids, use radar sensor with purging air connection.
Measured value jumps to ≥ 100 % or 0 m distance	Level echo is no longer detected at close range due to foam generation or interference signals at close range.	Check measuring point: Antenna should protrude out of the threaded mounting socket, possible false echoes through flange socket. Remove contamination on the antenna Use a sensor with a more suitable antenna

Measurement error during emptying

Fault description	Cause	Rectification
Measured value remains unchanged in the close range during emptying	False signal larger than the level echo Level echo too small	Eliminate false signal in the close range. Check: Antenna must protrude from the nozzle. Remove contamination on the antenna In case of interferences due to installations in the close range: Change polarisation direction After eliminating the false signals, the false signal suppression must be deleted. Carry out a new false signal suppression.
Measured value jumps towards 0 % during emptying	Echo from the tank bottom larger than the level echo, for example, with products with $\varepsilon_r < 2.5$ oil-based, solvents	Check parameters Medium type, Vessel height and Floor form, adapt if necessary
Measured value jumps sporadically towards 100 % during emptying	Varying condensation or contamination on the antenna	Carry out false signal suppression or increase false signal suppression in the close range by editing. With bulk solids, use radar sensor with purging air connection.

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Fault description	Cause	Rectification
Measured value fluctuates around 10 … 20 % (only bulk solids)	Various echoes from an uneven medium surface, e.g. an extraction funnel	Check parameter "Type of medium" and adapt, if necessary.
	Reflections from the medium surface via the vessel wall (deflection)	Optimize installation position and sensor orientation.

Reaction after fault rectification

Depending on the reason for the fault and the measures taken, the steps described in chapter " *Setup*" must be carried out again or must be checked for plausibility and completeness.

24 hour service hotline

Should these measures not be successful, please call in urgent cases the VEGA service hotline under the phone no. **+49 1805 858550**.

The hotline is also available outside normal working hours, seven days a week around the clock.

Since we offer this service worldwide, the support is provided in English. The service itself is free of charge, the only costs involved are the normal call charges.

14.6 Exchanging the electronics module

If the electronics module is defective, it can be replaced by the user.

In Ex applications, only instruments and electronics modules with appropriate Ex approval may be used.

If there is no electronics module available on site, the electronics module can be ordered through the agency serving you. The electronics modules are adapted to the respective sensor and differ in signal output or voltage supply.

The new electronics module must be loaded with the default settings of the sensor. These are the options:

- In the factory
- Or on site by the user

In both cases, the serial number of the sensor is needed. The serial numbers are stated on the type label of the instrument, on the inside of the housing as well as on the delivery note.

When loading on site, the order data must first be downloaded from the Internet (see operating instructions " *Electronics module*").

Information:
All application-specific settings must be entered again. That's why you have to carry out a fresh setup after exchanging the electronics.

If you saved the parameter settings during the first setup of the sensor, you can transfer them to the replacement electronics module. A fresh setup is then not necessary.

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14.7 Software update

The device software can be updated in the following ways:

- Interface adapter VEGACONNECT
- Bluetooth

Depending on the method, the following components are required:

- Instrument
- Voltage supply
- Interface adapter VEGACONNECT
- Display and adjustment module PLICSCOM with Bluetooth function
- PC with PACTware/DTM and Bluetooth USB adapter
- Current instrument software as file

You can find the current instrument software as well as detailed information on the procedure in the download area of our homepage: www.vega.com.

You can find information about the installation in the download file.

Caution:
Instruments with approvals can be bound to certain software versions. Therefore make sure that the approval is still effective after a software update is carried out.

You can find detailed information in the download area at www.vega.com.

14.8 How to proceed if a repair is necessary

You can find an instrument return form as well as detailed information about the procedure in the download area of our homepage. By doing this you help us carry out the repair quickly and without having to call back for needed information.

Proceed as follows in case of repair:

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof
- Attach the completed form and, if need be, also a safety data sheet outside on the packaging
- Ask the agency serving you to get the address for the return shipment. You can find the agency on our homepage.

15 Dismount

15.1 Dismounting steps

To remove the device, carry out the steps in chapters " *Mounting*" and " *Connecting to power suplly*" in reverse.

Warning:
When dismounting, pay attention to the process conditions in vessels or pipelines. There is a risk of injury, e.g. due to high pressures or temperatures as well as aggressive or toxic media. Avoid this by taking appropriate protective measures.

15.2 Disposal

Pass the instrument on to a specialised recycling company and do not use the municipal collecting points.

Remove any batteries in advance, if they can be removed from the device, and dispose of them separately.

If personal data is stored on the old device to be disposed of, delete it before disposal.

If you have no way to dispose of the old instrument properly, please contact us concerning return and disposal.

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16 Certificates, approvals and certifications

16.1 Radio licenses

Radar:
The device has been tested and approved in accordance with the current edition of the applicable country-specific norms or standards.

The confirmations as well as regulations for use can be found in the document " *Radio licenses*" supplied or on our homepage.

16.2 Approvals for Ex areas

Approved versions for use in hazardous areas are available or in preparation for the device or the device series.

You can find the relevant documents on our homepage.

16.3 Approvals as overfill protection

Approved versions for use as part of an overfill protection system are available or in preparation for the device or the device series.

The corresponding approvals can be found on our homepage.

16.4 Food and pharmaceutical certificates

Versions for use in the food and pharmaceutical industries are available or in preparation for the device or the device series.

The corresponding certificates can be found on our homepage.

16.5 Conformity

The device complies with the legal requirements of the applicable country-specific directives or technical regulations. We confirm conformity with the corresponding labelling.

The corresponding conformity declarations can be found on our homepage.

16.6 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

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16.7 IT Security

The device is available as version with IT security acc. to IEC 62443-4-2 or in preparation.

You can find the corresponding VEGA " *IT security guidelines*" as well as the certification on our homepage, the " *Component Requirements*" via " *myVEGA* ".

16.8 Safety Integrity Level (SIL)

The device is available as a version with SIL qualification according to IEC 61508 or is in preparation.

The corresponding certificate can be found on our homepage.

16.9 Material and test cerfificates

Comprehensive, accepted material and test certificates are configurable or in preparation for the device.

The corresponding documents are part of the order-specific scope of delivery when ordering.

16.10 Environment management system

Protection of the environment is one of our most important duties. That is why we have introduced an environment management system with the goal of continuously improving company environmental protection. The environment management system is certified according to DIN EN ISO 14001.

Help us to meet these requirements and observe the environmental instructions in the chapters " *Packaging, transport and storage*", " *Disposal*" of this operating instructions.

17   Supplement

17.1   Technical data

Note for approved instruments

The technical data in the respective safety instructions which are included in delivery are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

All approval documents can be downloaded from our homepage.

Materials and weights

Materials, wetted parts

Plastic horn antenna

– Adapter flange	PP-GF30 black
– Seal, adapter flange	FKM (SHS FPM 70C3 GLT), EPDM (COG AP310)
– Focussing lense	PP

Thread with integrated antenna system

– Process fitting	316L, PVDF
– Antenna	PEEK
– Seal, antenna system	FKM (SHS FPM 70C3 GLT), FFKM (Kalrez 6230, Kalrez 6375 , Perlast G75B) EPDM (A+P 70.10-02)
– Process seal thread DIN 3852-A	Klingersil C-4400

Flange with encapsulated antenna system

– Flange plating, antenna encapsulation	PTFE, PFA

Horn antenna

– Antenna horn	316L, 1.4848
– Impedance cone	Ceramic (99.7 % Al_2O_3)
– Seal	Graphite

Hygienic fitting

– Hygienic antenna encapsulation	PEEK
– Surface roughness of the antenna encapsulation	$R_a < 0.76$ µm
– Additional process seal depending on the hygienic fitting	FKM (PPE V70SW), FFKM (Kalrez 6230, Perlast G74S), EPDM (Freudenberg 291)

Flange with lens antenna

– Process fitting	316L
– Antenna	PEEK
– Seal, antenna system	FKM (SHS FPM 70C3 GLT), FFKM (Kalrez 6375, G75B), EPDM (COG AP302)

Rinsing air connection

– Flushing ring	PP-GFK
– O-ring seal, purging air connection	FKM (SHS FPM 70C3 GLT), EPDM (COG AP310)
– Reflux valve	316Ti