

Operating Instructions

TDR sensor for continuous level measurement of bulk solids

VEGAFLEX 82

Modbus and Levelmaster protocol

Converter version in second chamber

Rod and cable probe



Document ID: 41833



VEGA

Contents

| | | |
|----------|---|-----------|
| 1 | About this document | 4 |
| 1.1 | Function | 4 |
| 1.2 | Target group | 4 |
| 1.3 | Symbols used | 4 |
| 2 | For your safety | 5 |
| 2.1 | Authorised personnel | 5 |
| 2.2 | Appropriate use | 5 |
| 2.3 | Warning about incorrect use | 5 |
| 2.4 | General safety instructions | 5 |
| 2.5 | Conformity | 5 |
| 2.6 | NAMUR recommendations | 6 |
| 2.7 | Installation and operation in the USA and Canada | 6 |
| 2.8 | Environmental instructions | 6 |
| 3 | Product description | 7 |
| 3.1 | Configuration | 7 |
| 3.2 | Principle of operation | 9 |
| 3.3 | Packaging, transport and storage | 9 |
| 3.4 | Accessories | 10 |
| 4 | Mounting | 12 |
| 4.1 | General instructions | 12 |
| 4.2 | Mounting instructions | 13 |
| 5 | Connecting to power supply and bus system | 18 |
| 5.1 | Preparing the connection | 18 |
| 5.2 | Connecting | 19 |
| 5.3 | Wiring plan | 21 |
| 5.4 | Double chamber housing with VEGADIS-Adapter | 22 |
| 5.5 | Switch-on phase | 23 |
| 6 | Set up the sensor with the display and adjustment module | 24 |
| 6.1 | Adjustment volume | 24 |
| 6.2 | Insert display and adjustment module | 24 |
| 6.3 | Adjustment system | 25 |
| 6.4 | Parameter adjustment - Quick setup | 27 |
| 6.5 | Parameter adjustment - Extended adjustment | 27 |
| 6.6 | Save parameter adjustment data | 42 |
| 7 | Set up with smartphone/tablet/PC/notebook via Bluetooth | 43 |
| 7.1 | Preparations | 43 |
| 7.2 | Connecting | 44 |
| 7.3 | Sensor parameter adjustment | 45 |
| 8 | Setting up sensor and Modbus interface with PACTware | 46 |
| 8.1 | Connect the PC | 46 |
| 8.2 | Parameter adjustment with PACTware | 47 |
| 8.3 | Set instrument address | 48 |
| 8.4 | Set up with the quick setup | 49 |
| 8.5 | Save parameter adjustment data | 51 |
| 9 | Diagnosis, asset management and service | 52 |
| 9.1 | Maintenance | 52 |

| | | |
|-----------|--|-----------|
| 9.2 | Measured value and event memory | 52 |
| 9.3 | Asset Management function..... | 53 |
| 9.4 | Rectify faults..... | 56 |
| 9.5 | Exchanging the electronics module..... | 59 |
| 9.6 | Exchange or shorten cable/rod | 60 |
| 9.7 | Software update | 62 |
| 9.8 | How to proceed if a repair is necessary..... | 62 |
| 10 | Dismount..... | 63 |
| 10.1 | Dismounting steps..... | 63 |
| 10.2 | Disposal | 63 |
| 11 | Supplement | 64 |
| 11.1 | Technical data | 64 |
| 11.2 | Device communication Modbus | 74 |
| 11.3 | Modbus register | 75 |
| 11.4 | Modbus RTU commands | 77 |
| 11.5 | Levelmaster commands | 80 |
| 11.6 | Configuration of typical Modbus hosts | 83 |
| 11.7 | Dimensions | 83 |
| 11.8 | Industrial property rights..... | 88 |
| 11.9 | Trademark | 88 |



Safety instructions for Ex areas:

Take note of the Ex specific safety instructions for Ex applications. These instructions are attached as documents to each instrument with Ex approval and are part of the operating instructions.

Editing status: 2023-05-23

1 About this document

1.1 Function

This instruction provides all the information you need for mounting, connection and setup as well as important instructions for maintenance, fault rectification, the exchange of parts and the safety of the user. Please read this information before putting the instrument into operation and keep this manual accessible in the immediate vicinity of the device.

1.2 Target group

This operating instructions manual is directed to trained personnel. The contents of this manual must be made available to the qualified personnel and implemented.

1.3 Symbols used



Document ID

This symbol on the front page of this instruction refers to the Document ID. By entering the Document ID on www.vega.com you will reach the document download.



Information, note, tip: This symbol indicates helpful additional information and tips for successful work.



Note: This symbol indicates notes to prevent failures, malfunctions, damage to devices or plants.



Caution: Non-observance of the information marked with this symbol may result in personal injury.



Warning: Non-observance of the information marked with this symbol may result in serious or fatal personal injury.



Danger: Non-observance of the information marked with this symbol results in serious or fatal personal injury.



Ex applications

This symbol indicates special instructions for Ex applications.



List

The dot set in front indicates a list with no implied sequence.



Sequence of actions

Numbers set in front indicate successive steps in a procedure.



Disposal

This symbol indicates special instructions for disposal.

2 For your safety

2.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

2.2 Appropriate use

VEGAFLEX 82 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter " *Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

2.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overflow through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

2.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed.

2.5 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.

Electromagnetic compatibility

Instruments in four-wire or Ex d ia version are designed for use in an industrial environment. Nevertheless, electromagnetic interference from electrical conductors and radiated emissions must be taken into account, as is usual with class A instruments according to EN 61326-1. If the instrument is used in a different environment, the electromagnetic compatibility to other instruments must be ensured by suitable measures.

2.6 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 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.

2.7 Installation and operation in the USA and Canada

This information is only valid for USA and Canada. Hence the following text is only available in the English language.

Installations in the US shall comply with the relevant requirements of the National Electrical Code (NEC - NFPA 70) (USA).

Installations in Canada shall comply with the relevant requirements of the Canadian Electrical Code (CEC Par I) (Canada).

2.8 Environmental instructions

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.

Please help us fulfil this obligation by observing the environmental instructions in this manual:

- Chapter " *Packaging, transport and storage* "
- Chapter " *Disposal* "

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- Sensor VEGAFLEX 82
- Optional accessory
- Optionally integrated Bluetooth module

The further scope of delivery encompasses:

- Documentation
 - Quick setup guide VEGAFLEX 82
 - Instructions for optional instrument features
 - Ex-specific "*Safety instructions*" (with Ex versions)
 - If necessary, further certificates



Information:

Optional instrument features are also described in this operating instructions manual. The respective scope of delivery results from the order specification.

Scope of this operating instructions

This operating instructions manual applies to the following instrument versions:

- Hardware from 1.0.0
- Software from 1.3.0
- Only for instrument versions without SIL qualification

Type label

The type label contains the most important data for identification and use of the instrument:

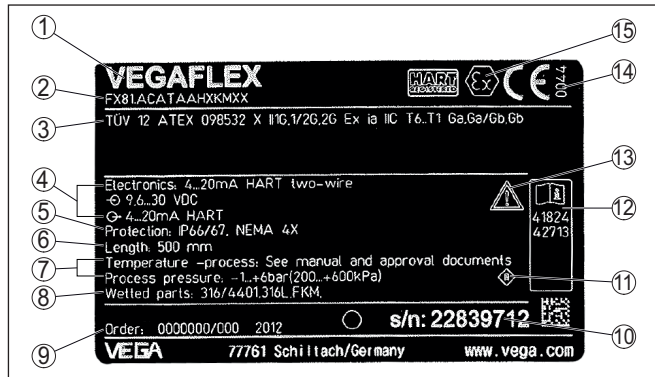


Fig. 1: Layout of the type label (example)

- 1 Instrument type
- 2 Product code
- 3 Approvals
- 4 Power supply and signal output, electronics
- 5 Protection rating
- 6 Probe length (measurement accuracy optional)
- 7 Process and ambient temperature, process pressure
- 8 Material wetted parts
- 9 Order number
- 10 Serial number of the instrument
- 11 Symbol of the device protection class
- 12 ID numbers, instrument documentation
- 13 Reminder to observe the instrument documentation
- 14 Notified authority for CE marking
- 15 Approval directives

Serial number - Instrument search

The type label contains the serial number of the instrument. With it you can find the following instrument data on our homepage:

- Product code (HTML)
- Delivery date (HTML)
- Order-specific instrument features (HTML)
- Operating instructions and quick setup guide at the time of shipment (PDF)
- Test certificate (PDF) - optional

Move to "www.vega.com" and enter in the search field the serial number of your instrument.

Alternatively, you can access the data via your smartphone:

- Download the VEGA Tools app from the "Apple App Store" or the "Google Play Store"
- Scan the QR-code on the type label of the device or
- Enter the serial number manually in the app

Electronics design

The instrument contains two different electronics in its housing chambers:

- The Modbus electronics for power supply and communication with the Modbus-RTU

- The sensor electronics for the actual measuring tasks

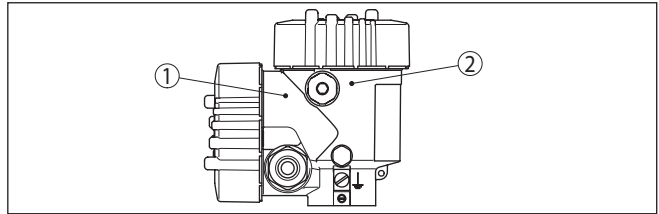


Fig. 2: Position of Modbus and sensor electronics

- 1 Modbus electronics
- 2 Sensor electronics

3.2 Principle of operation

Application area

The VEGAFLEX 82 is a level sensor with cable or rod probe for continuous level measurement, suitable for applications in bulk solids.

Functional principle - level measurement

High frequency microwave pulses are guided along a steel cable or a rod. Upon reaching the medium surface, the microwave pulses are reflected. The running time is evaluated by the instrument and output as level.

3.3 Packaging, transport and storage

Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test based on ISO 4180.

The packaging consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

Transport

Transport must be carried out in due consideration of the notes on the transport packaging. Nonobservance of these instructions can cause damage to the device.

Transport inspection

The delivery must be checked for completeness and possible transit damage immediately at receipt. Ascertained transit damage or concealed defects must be appropriately dealt with.

Storage

Up to the time of installation, the packages must be left closed and stored according to the orientation and storage markings on the outside.

Unless otherwise indicated, the packages must be stored only under the following conditions:

- Not in the open
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration

Storage and transport temperature

- Storage and transport temperature see chapter " *Supplement - Technical data - Ambient conditions*"
- Relative moisture 20 ... 85 %

Lifting and carrying

With instrument weights of more than 18 kg (39.68 lbs) suitable and approved equipment must be used for lifting and carrying.

3.4 Accessories

The instructions for the listed accessories can be found in the download area on our homepage.

Display and adjustment module

The display and adjustment module is used for measured value indication, adjustment and diagnosis.

The integrated Bluetooth module (optional) enables wireless adjustment via standard adjustment devices.

VEGACONNECT

The interface adapter VEGACONNECT enables the connection of communication-capable instruments to the USB interface of a PC.

VEGADIS 81

The VEGADIS 81 is an external display and adjustment unit for VEGAPLICS® sensors.

VEGADIS adapter

The VEGADIS adapter is an accessory part for sensors with double chamber housing. It enables the connection of VEGADIS 81 to the sensor housing via an M12 x 1 plug.

Protective cover

The protective cover protects the sensor housing against soiling and intense heat from solar radiation.

Flanges

Screwed flanges are available in different versions according to the following standards: DIN 2501, EN 1092-1, BS 10, ASME B 16.5, JIS B 2210-1984, GOST 12821-80.

External housing

If the standard sensor housing is too big or in case of strong vibrations, an external housing can be used.

Then the sensor housing is made of stainless steel. The electronics is located in the external housing which can be mounted in a distance of up to 10 m (32.8 ft) to the sensor by using a connection cable.

Rod components

If you are using an instrument with rod version, you can extend the rod probe individually with curved segments and rod and cable extensions of different lengths.

All extensions used must not exceed a total length of 6 m (19.7 ft).

The extensions are available in the following lengths:

Rod: ø 16 mm (0.63 in)

- Basic segments: 20 ... 5900 mm (0.79 ... 232 in)
- Rod/cable segments: 20 ... 5900 mm (0.79 ... 232 in)
- Curved segments: 100 x 100 mm (3.94 ... 3.94 in)

Centering

If you mount the VEGAFLEX 82 in a bypass tube or standpipe, you have to avoid contact to the bypass tube by using a spacer at the probe end.

4 Mounting

4.1 General instructions

Screwing in

Devices with threaded fitting are screwed into the process fitting with a suitable wrench via the hexagon.

See chapter "Dimensions" for wrench size.



Warning:

The housing or the electrical connection may not be used for screwing in! Depending on the device version, tightening can cause damage, e.g. to the rotation mechanism of the housing.

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "Connecting to power supply")
- Tighten the cable gland or plug connector
- Lead the connection cable downward in front of the cable entry or plug connector

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.



Note:

Make sure that during installation or maintenance no moisture or dirt can get inside the instrument.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

Cable glands

Metric threads

In the case of instrument housings with metric thread, the cable glands are screwed in at the factory. They are sealed with plastic plugs as transport protection.

You have to remove these plugs before electrical connection.

NPT thread

In the case of instrument housings with self-sealing NPT threads, it is not possible to have the cable entries screwed in at the factory. The free openings for the cable glands are therefore covered with red dust protection caps as transport protection. The dust protection caps do not provide sufficient protection against moisture.

Prior to setup you have to replace these protective caps with approved cable glands or close the openings with suitable blind plugs.

Process conditions



Note:

For safety reasons, the instrument must only be operated within the permissible process conditions. You can find detailed information on the process conditions in chapter "Technical data" of the operating instructions or on the type label.

Hence make sure before mounting that all parts of the instrument exposed to the process are suitable for the existing process conditions.

These are mainly:

- Active measuring component
- Process fitting
- Process seal

Process conditions in particular are:

- Process pressure
- Process temperature
- Chemical properties of the medium
- Abrasion and mechanical influences

4.2 Mounting instructions

Installation position

Mount the device in such a way that the distance to vessel installations or to the vessel wall is at least 300 mm (12 in). In non-metallic vessels, the distance to the vessel wall should be at least 500 mm (19.7 in).

During operation, the probe must not touch any installations or the vessel wall. If necessary, fasten the probe end.

In vessels with conical bottom it can be advantageous to mount the device in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower blocking distance) is stated in chapter " *Technical data*" of the operating instructions.

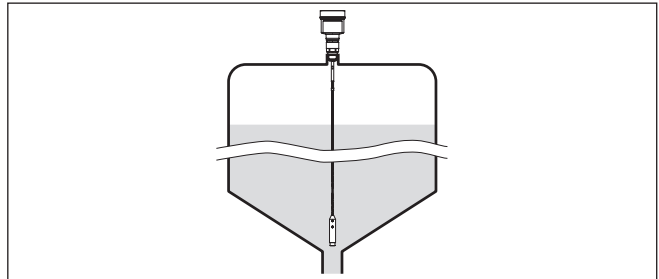


Fig. 3: Vessel with conical bottom

Type of vessel

Plastic vessel/Glass vessel

The guided microwave principle requires a metallic surface on the process fitting. Therefore, in plastic vessels, etc., use an instrument version with flange (from DN 50) or place a metal sheet ($\varnothing > 200$ mm/8 in) beneath the process fitting when screwing it in.

Make sure that the plate has direct contact with the process fitting.

When using the probes without metal vessel wall, e.g. in plastic vessels, the measured value can be influenced by strong electromagnetic fields (emitted interference according to EN 61326: class A).

Use a probe in coax version for applications in liquids.

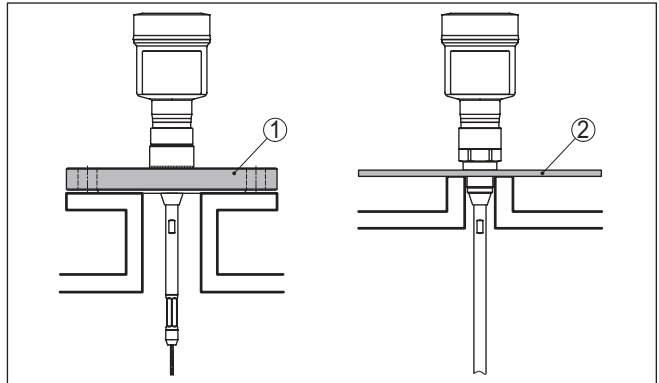


Fig. 4: Mounting in non-metallic vessel

- 1 Flange
- 2 Metal sheet

Concrete vessel

When mounting in thick concrete ceilings, VEGAFLEX 82 should be mounted front flush to the lower edge. In concrete silos, the distance to the wall should be at least 500 mm (20 in).

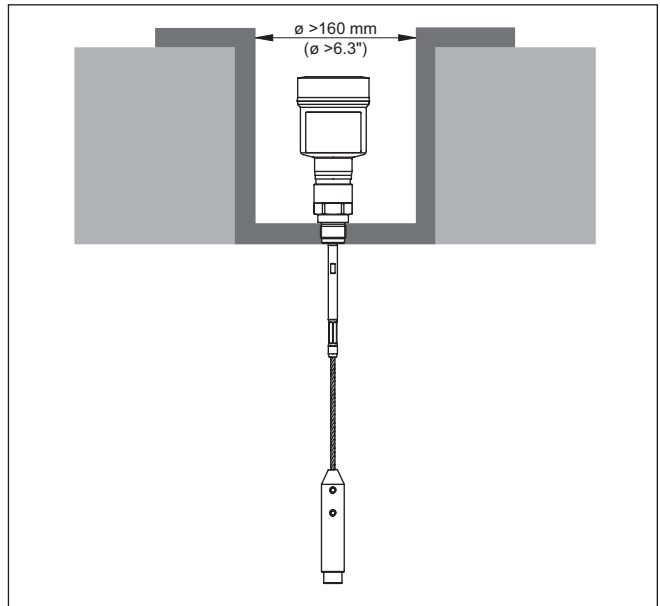


Fig. 5: Mounting in concrete silo

Nozzle

If possible, avoid nozzles. Mount the sensor flush with the vessel top. If this is not possible, use short nozzles with small diameter.

Higher nozzles or nozzles with a bigger diameter can generally be used. They can, however, increase the upper blocking distance. Check if this is relevant for your measurement.

In such cases, always carry out a false signal suppression after mounting. You can find further information under "Setup procedure".

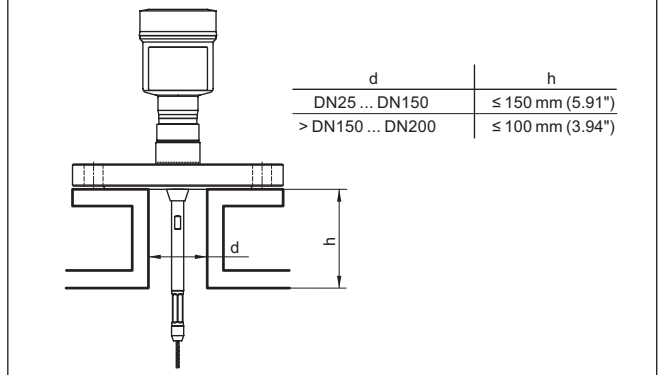


Fig. 6: Mounting socket

When welding the nozzle, make sure that the nozzle is flush with the vessel top.

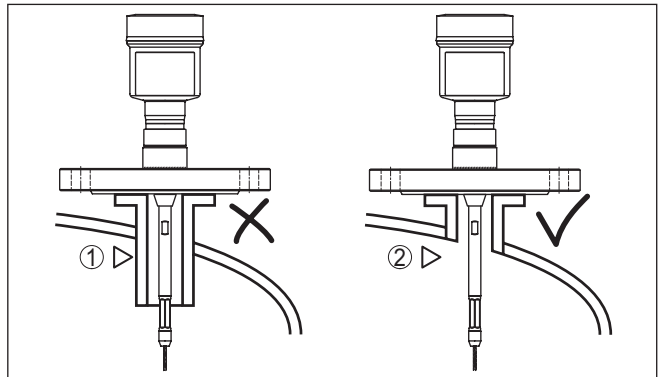


Fig. 7: Nozzle must be installed flush

- 1 Unfavourable mounting
- 2 Nozzle flush - optimum mounting

Welding work

Before beginning the welding work, remove the electronics module from the sensor. By doing this, you avoid damage to the electronics through inductive coupling.

Inflowing medium

Do not mount the instruments in or above the filling stream. Make sure that you detect the medium surface, not the inflowing product.

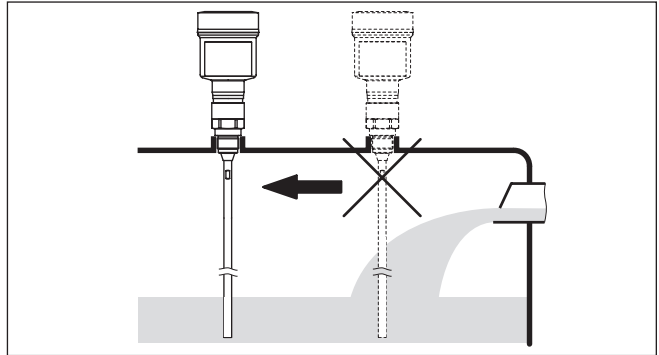


Fig. 8: Mounting of the sensor with inflowing medium

Measuring range

The reference plane for the measuring range of the sensors is the sealing surface of the thread or flange.

Keep in mind that a min. distance must be maintained below the reference plane and possibly also at the end of the probe - measurement in these areas is not possible (blocking distance). The length of the cable can be used all the way to the end only when measuring conductive products. These blocking distances for different mediums are listed in chapter " *Technical data*". Keep in mind for the adjustment that the default setting for the measuring range refers to water.

Pressure

The process fitting must be sealed if there is gauge or low pressure in the vessel. Before use, check if the sealing material is resistant against the measured product and the process temperature.

The max. permissible pressure is specified in chapter " *Technical data*" or on the type label of the sensor.

Fasten

If there is a risk of the cable probe touching the vessel wall during operation due to product movements or agitators, etc., the measuring probe should be securely fixed.

In the gravity weight there is an internal thread (M12), e.g. for an eye-bolt (optional) - (article no. 2.27423).

Make sure that the probe cable is not completely taut. Avoid tensile loads on the cable.

Avoid undefined vessel connections, i.e. the connection must be either grounded reliably or isolated reliably. Any undefined change of this condition can lead to measurement errors.

If there is a danger of the rod probe touching the vessel wall, fasten the probe at the bottom end.

Keep in mind that measurement is not possible below the fastening point.

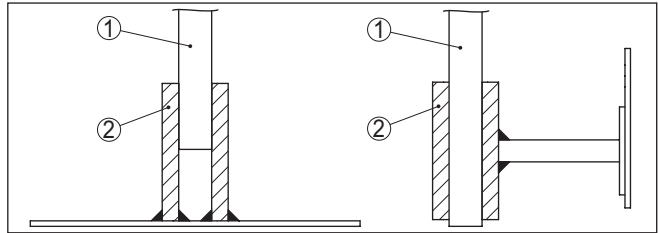


Fig. 9: Fasten the probe

- 1 Measuring probe
- 2 Retaining sleeve

Lateral installation

In case of difficult installation conditions in liquid applications, the probe can be also mounted laterally. For this purpose, adapt the rod with rod extensions or bow-shaped segments.

To compensate for the resulting changes in signal runtime, let the instrument determine the probe length automatically.

The determined probe length can deviate from the actual probe length when using curved or angled segments.

If internal installations such as struts, ladders, etc. are present on the vessel wall, the measuring probe should be mounted at least 300 mm (11.81 in) away from the vessel wall.

You can find further information in the supplementary instructions of the rod extension.

Rod extension

In case of difficult installation conditions, for example in a nozzle, the probe can be suitably adapted with a rod extension.

To compensate for the resulting changes in signal runtime, let the instrument determine the probe length automatically.

You can find further information in the supplementary instructions of the rod and cable components.

5 Connecting to power supply and bus system

5.1 Preparing the connection

Safety instructions

Always keep in mind the following safety instructions:

- Carry out electrical connection by trained, qualified personnel authorised by the plant operator
- If overvoltage surges are expected, overvoltage arresters should be installed



Warning:

Only connect or disconnect in de-energized state.

Voltage supply

The operating voltage and the digital bus signal are routed via separate two-wire connection cables.

The data for power supply are specified in chapter " *Technical data*".



Note:

Power the instrument via an energy-limited circuit (power max. 100 W) acc. to IEC 61010-1, e.g.

- Class 2 power supply unit (acc. to UL1310)
- SELV power supply unit (safety extra-low voltage) with suitable internal or external limitation of the output current

Connection cable

The instrument is connected with standard two-wire, twisted cable suitable for RS 485. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, shielded cable should be used.

Use cable with round cross section for instruments with housing and cable gland. Use a cable gland suitable for the cable diameter to ensure the seal effect of the cable gland (IP protection rating).

Make sure that the entire installation is carried out according to the Fieldbus specification. In particular, make sure that the bus is terminated with suitable terminating resistors.

Cable glands

Metric threads:

In the case of instrument housings with metric thread, the cable glands are screwed in at the factory. They are sealed with plastic plugs as transport protection.



Note:

You have to remove these plugs before electrical connection.

NPT thread:

In the case of instrument housings with self-sealing NPT threads, it is not possible to have the cable entries screwed in at the factory. The free openings for the cable glands are therefore covered with red dust protection caps as transport protection.



Note:

Prior to setup you have to replace these protective caps with approved cable glands or close the openings with suitable blind plugs.

On plastic housings, the NPT cable gland or the Conduit steel tube must be screwed into the threaded insert without grease.

Max. torque for all housings, see chapter " *Technical data*".

Cable screening and grounding

Make sure that the cable screen and grounding are carried out according to Fieldbus specification. We recommend to connect the cable screening to ground potential on both ends.

In systems with potential equalisation, connect the cable screening directly to ground potential at the power supply unit and the sensor. The cable screening in the sensor must be connected directly to the internal ground terminal. The ground terminal outside on the housing must be connected to the potential equalisation (low impedance).

5.2 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.



Information:

The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. Loosen compression nut of the cable gland and remove blind plug
3. Remove approx. 10 cm (4 in) of the cable mantle (signal output), strip approx. 1 cm (0.4 in) insulation from the ends of the individual wires
4. Insert the cable into the sensor through the cable entry



Fig. 10: Connection steps 5 and 6

5. Insert the wire ends into the terminals according to the wiring plan



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

6. Check the hold of the wires in the terminals by lightly pulling on them
7. Connect the cable screening to the internal ground terminal, connect the outer ground terminal to potential equalisation in case of power supply via low voltage
8. Connect the lead cable for voltage supply in the same way according to the wiring plan, in addition connect the ground conductor to the inner ground terminal when powered with mains voltage.
9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
10. Screw the housing lid back on

The electrical connection is finished.



Information:

The terminal blocks are pluggable and can be removed from the housing insert. To do this, lift the terminal block with a small screwdriver and pull it out. When inserting the terminal block again, you should hear it snap in.

5.3 Wiring plan

Overview

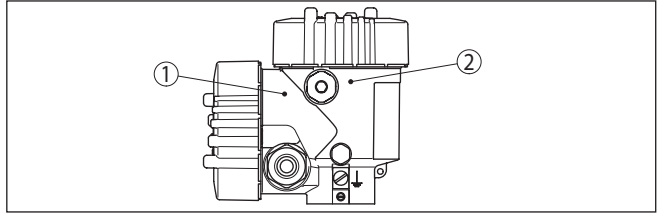


Fig. 11: Position of connection compartment (Modbus electronics) and electronics compartment (sensor electronics)

- 1 Connection compartment
- 2 Electronics compartment

Electronics compartment

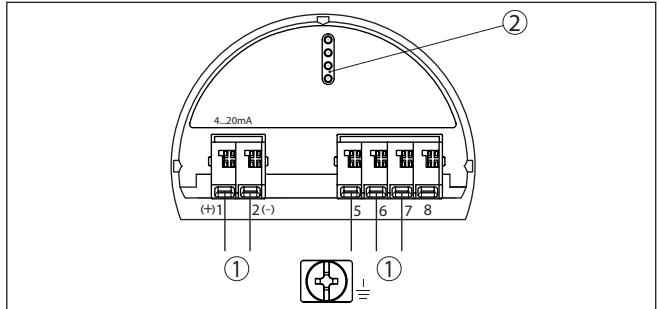


Fig. 12: Electronics compartment - double chamber housing

- 1 Internal connection to the connection compartment
- 2 For display and adjustment module or interface adapter

Connection compartment

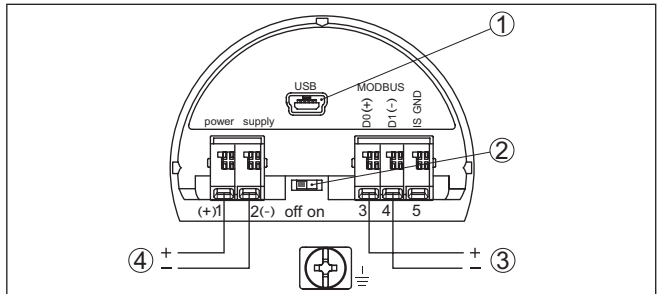


Fig. 13: Connection compartment

- 1 USB interface
- 2 Slide switch for integrated termination resistor (120 Ω)
- 3 Modbus signal
- 4 Voltage supply

| Terminal | Function | Polarity |
|----------|----------------|----------|
| 1 | Voltage supply | + |

| Terminal | Function | Polarity |
|----------|---|----------|
| 2 | Voltage supply | - |
| 3 | Modbus signal D0 | + |
| 4 | Modbus signal D1 | - |
| 5 | Function ground when installing according to CSA (Canadian Standards Association) | |

5.4 Double chamber housing with VEGADIS-Adapter

Electronics compartment

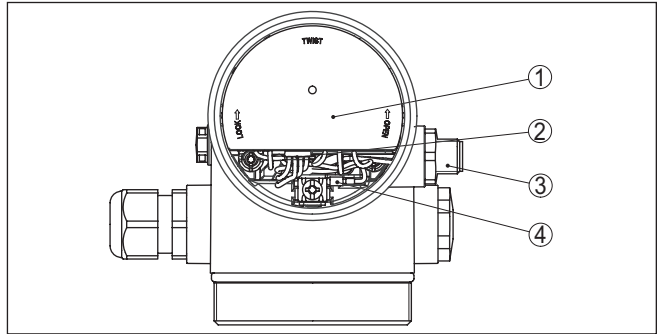


Fig. 14: View to the electronics compartment with VEGADIS adapter for connection of the external display and adjustment unit

- 1 VEGADIS adapter
- 2 Internal plug connection
- 3 M12 x 1 plug connector

Assignment of the plug connector

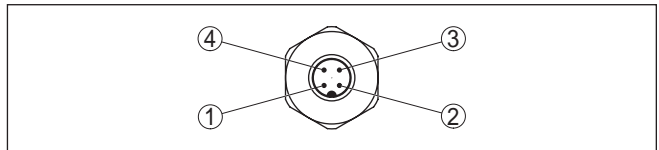


Fig. 15: Top view of the M12 x 1 plug connector

- 1 Pin 1
- 2 Pin 2
- 3 Pin 3
- 4 Pin 4

| Contact pin | Colour, connection cable in the sensor | Terminal, electronics module |
|-------------|--|------------------------------|
| Pin 1 | Brown | 5 |
| Pin 2 | White | 6 |
| Pin 3 | Blue | 7 |
| Pin 4 | Black | 8 |

5.5 Switch-on phase

After connecting VEGAFLEX 82 to the bus system, the device first performs a self-test:

- Internal check of the electronics
- Indication of the status message " *F 105 Determine measured value*" on the display or PC
- Status byte goes to fault value

Then the actual measured value is output to the signal cable. The value takes into account settings that have already been carried out, e.g. default setting.

6 Set up the sensor with the display and adjustment module

6.1 Adjustment volume

The display and adjustment module is only used for parameter adjustment of the sensor, i.e. for adaptation to the measurement task.

The parameter adjustment of the Modbus interface is carried out via a PC with PACTware. You can find the procedure in chapter "Set up sensor and Modbus interface with PACTware".

6.2 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 16: Insertion of the display and adjustment module



Note:

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

6.3 Adjustment system

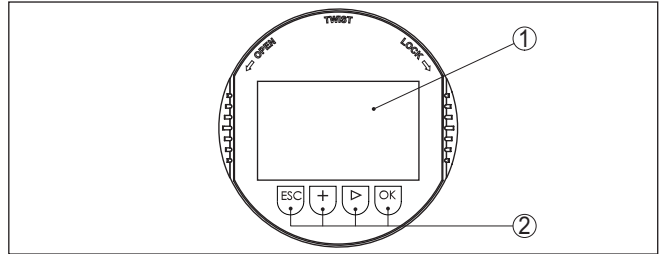


Fig. 17: Display and adjustment elements

- 1 LC display
- 2 Adjustment keys

Key functions

- **[OK]** key:
 - Move to the menu overview
 - Confirm selected menu
 - Edit parameter
 - Save value
- **[->]** key:
 - Change measured value presentation
 - Select list entry
 - Select editing position
- **[+]** key:
 - Change value of the parameter
- **[ESC]** key:
 - Interrupt input
 - Jump to next higher menu

Adjustment system

The instrument is operated via the four keys of the display and adjustment module. The individual menu items are shown on the LC display. You can find the function of the individual keys in the previous illustration.

Adjustment system - keys via magnetic pen

With the Bluetooth version of the display and adjustment module you can also adjust the instrument with the magnetic pen. The pen operates the four keys of the display and adjustment module right through the closed lid (with inspection window) of the sensor housing.

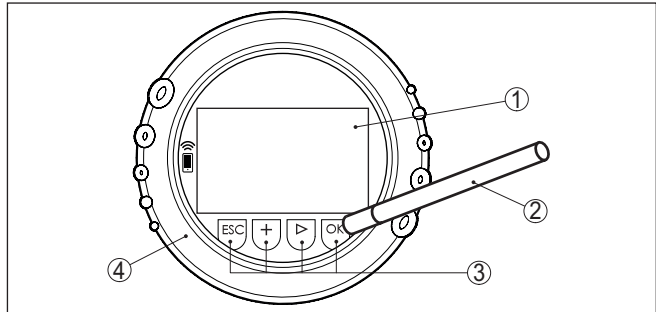


Fig. 18: Display and adjustment elements - with adjustment via magnetic pen

- 1 LC display
- 2 Magnetic pen
- 3 Adjustment keys
- 4 Lid with inspection window

Time functions

When the **[+]** and **[->]** keys are pressed quickly, the edited value, or the cursor, changes one value or position at a time. If the key is pressed longer than 1 s, the value or position changes continuously.

When the **[OK]** and **[ESC]** keys are pressed simultaneously for more than 5 s, the display returns to the main menu. The menu language is then switched over to "English".

Approx. 60 minutes after the last pressing of a key, an automatic reset to measured value indication is triggered. Any values not confirmed with **[OK]** will not be saved.

Switch-on phase

After switching on, the VEGAFLEX 82 carries out a short self-test where the device software is checked.

The output signal transmits a fault signal during the switch-on phase.

The following information is displayed on the display and adjustment module during the startup procedure:

- Instrument type
- Device name
- Software version (SW-Ver)
- Hardware version (HW-Ver)

Measured value indication

With the **[->]** key you move between three different indication modes:

In the first view, the selected measured value is displayed in large digits.

In the second view, the selected measured value and a respective bargraph presentation are displayed.

In the third view, the selected measured value as well as a second selectable value, e.g. the temperature, are displayed.



Quick setup

6.4 Parameter adjustment - Quick setup

To quickly and easily adapt the sensor to the application, select the menu item " *Quick setup*" in the start graphic on the display and adjustment module.



The following steps for the quick setup can be reached also in the " *Extended adjustment*".

- Instrument address
- Measurement loop name
- Medium type (optional)
- Application
- Max. adjustment
- Min. adjustment
- False signal suppression

You can find the description of the individual menu items in the following chapter " *Parameter adjustment - Extended adjustment*".

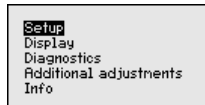
6.5 Parameter adjustment - Extended adjustment

For technically demanding measuring points, you can carry out extended settings in " *Extended adjustment*".



Main menu

The main menu is divided into five sections with the following functions:



Setup: Settings, e.g. measurement loop name, medium, vessel, adjustment, signal output, device unit, false signal suppression, linearization curve

Display: Settings, e.g., for language, measured value display, lighting

Diagnostics: Information, e.g. on instrument status, peak indicator, measurement reliability, simulation, echo curve

Additional adjustments: Reset, date/time, reset, copy function

Info: Instrument name, hardware and software version, date of manufacture, instrument features



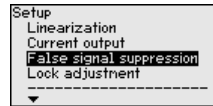
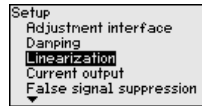
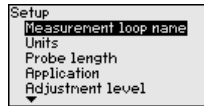
Note:

For optimum setting of the measuring point, the individual submenu items in the main menu item " *Setup*" should be selected one after

the other and provided with the correct parameters. If possible, go through the items in the given sequence.

The procedure is described below.

The following submenu points are available:



The submenu points are described below.

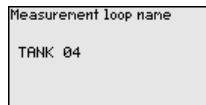
6.5.1 Setup

Measurement loop name

Here you can assign a suitable measurement loop name. Push the "OK" key to start the editing. With the "+" key you change the sign and with the "->" key you jump to the next position.

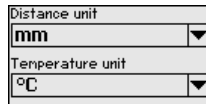
You can enter names with max. 19 characters. The character set comprises:

- Capital letters from A ... Z
- Numbers from 0 ... 9
- Special characters + - / _ blanks



Units

In this menu item you select the distance unit and the temperature unit.

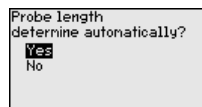
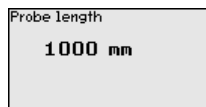


For the distance units you can choose between m, mm and ft and for the temperature units °C, °F and K.

Probe length

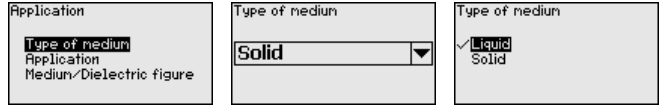
In this menu item you can enter the probe length or have the length determined automatically by the sensor system.

When choosing "Yes", then the probe length will be determined automatically. When choosing "No", you can enter the probe length manually.



Application - Medium type

In this menu item you can select which type of medium you want to measure. You can choose between liquid or bulk solid.



Application

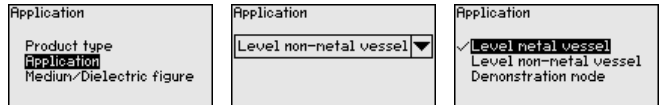
In this menu item you can select the application. You can choose between metallic or non-metallic vessels.



Note:

The selection of the application has a considerable influence on all other menu items. Keep in mind that as you continue with the parameter adjustment, individual menu items are only optionally available.

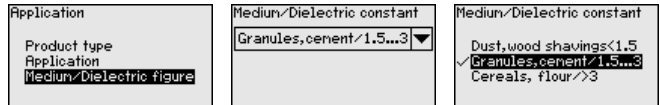
You have the option of choosing the demonstration mode. This mode is only suitable for test and demonstration purposes. In this mode, the sensor ignores the parameters of the application and reacts immediately to any change.



Medium, dielectric constant

In this menu item, you can define the type of medium (product).

This menu item is only available if you have selected level measurement under the menu item "Application".

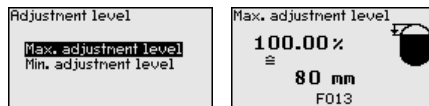


You can choose between the following medium types:

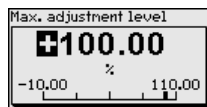
| Dielectric constant | Medium type | Examples |
|---------------------|-------------------|----------------------------------|
| > 3 | Cereals, flour | All kind of cereals, wheat flour |
| 1.5 ... 3 | Granules, cement | Lime, gypsum, cement |
| < 1.5 | Dusts, wood chips | Wood chips, sawdust |

Max. adjustment level

In this menu item, you can enter the max. adjustment for the level.



Adjust the requested percentage value with **[+]** and store with **[OK]**.



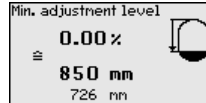
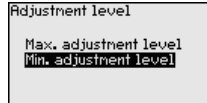
Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. The distance refers to the sensor

reference plane (seal surface of the process fitting). Keep in mind that the max. level must lie below the blocking distance.

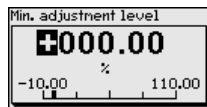


Min. adjustment level

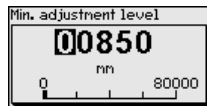
In this menu item, you can enter the min. adjustment for the level.



Adjust the requested percentage value with **[+]** and store with **[OK]**.

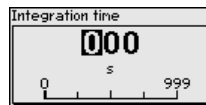
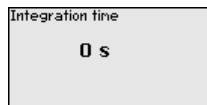


Enter the suitable distance value in m for the empty vessel (e.g. distance from the flange to the probe end) corresponding to the percentage value. The distance refers to the sensor reference plane (seal surface of the process fitting).



Damping

To damp process-dependent measured value fluctuations, set an integration time of 0 ... 999 s in this menu item.

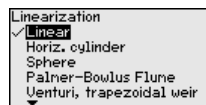
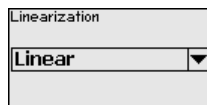


The default setting is a damping of 0 s.

Linearisation

A linearisation is necessary for all vessels in which the vessel volume does not increase linearly with the level, e.g. a horizontal cylindrical or spherical tank, when the indication or output of the volume is required. Corresponding linearisation curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume.

The linearisation applies to the measured value indication and the output. By activating the appropriate curve, the volume percentage of the vessel is displayed correctly. If the volume should not be displayed in percent but e.g. in l or kg, a scaling can be also set in the menu item "Display".





Warning:

If a linearisation curve is selected, the measuring signal is no longer necessarily linear to the filling height. This must be considered by the user especially when setting the switching point on the limit signal transmitter.

In the following, you have to enter the values for your vessel, for example the vessel height and the socket correction.

For non-linear vessel forms, enter the vessel height and the socket correction.

For the vessel height, you have to enter the total height of the vessel.

For the nozzle correction you have to enter the height of the nozzle above the upper edge of the vessel. If the nozzle is lower than the upper edge of the vessel, this value can also be negative.

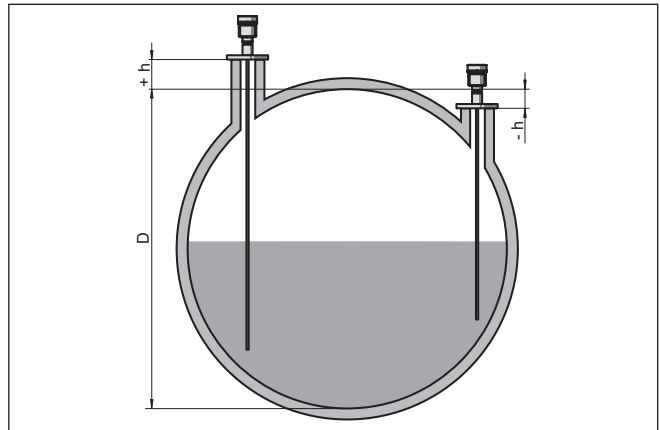
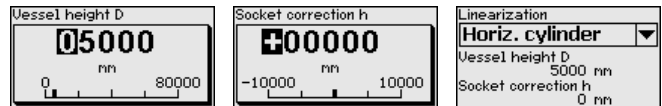


Fig. 19: Vessel height and socket correction value

D Vessel height

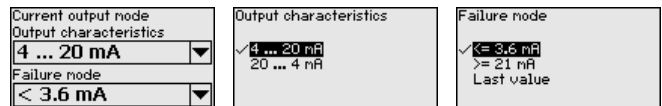
+h Positive socket correction value

-h Negative socket correction value



Current output mode

In the menu item "Current output mode" you determine the output characteristics and reaction of the current output in case of fault.



The default setting is output characteristics 4 ... 20 mA, fault mode < 3.6 mA.

Current output, min./max. In the menu item " *Current output Min./Max.*", you determine the reaction of the current output during operation.

| | | |
|---|----------------------------------|------------------------------------|
| Current output min./max. Min. current 4 mA Max. current 20 mA | Min. current 3.8 mA ✓ 4 mA | Max. current ✓ 20 mA 20.5 mA |
|---|----------------------------------|------------------------------------|

The default setting is min. current 3.8 mA and max. current 20.5 mA.

False signal suppression The following circumstances cause interfering reflections and can influence the measurement:

- High mounting nozzles
- Vessel internals such as struts
- Deflectors, etc.



Note:

A false signal suppression is only recommended with liquid applications.

A false signal suppression detects, marks and saves these false signals to ensure that they are ignored in the level measurement.

This should be done with the lowest possible level so that all potential interfering reflections can be detected.

Proceed as follows:

| | |
|--|--|
| False signal suppression Change? | False signal suppression Create new Delete |
|--|--|

Enter the actual distance from the sensor to the medium surface.

| | |
|--|--|
| False signal suppression Probe covered Probe uncovered | |
|--|--|

All interfering signals in this section are detected by the sensor and stored.

Keep in mind that with covered probe only false signals in the uncovered area of the probe are detected.



Note:

Check the distance to the medium surface, because if an incorrect (too large) value is entered, the existing level will be saved as a false signal. The level would then no longer be detectable in this area.

If a false signal suppression has already been created in the sensor, the following menu window appears when selecting " *False signal suppression*":

| |
|--|
| False signal suppression Create new Delete |
|--|

The instrument carries out an automatic false signal suppression as soon as the probe is uncovered. The false signal suppression is always updated.

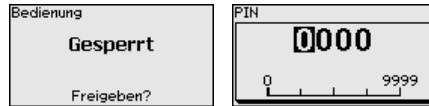
The menu item "Delete" is used to completely delete an already created false signal suppression. This is useful if the saved false signal suppression no longer matches the metrological conditions in the vessel.

Lock/Unlock adjustment

In the menu item "Lock/unlock adjustment", you can protect the sensor parameters against unauthorized or inadvertent modification. The PIN is activated/deactivated permanently.

With active PIN, only the following adjustment functions are possible without entering a PIN:

- Select menu items and show data
- Read data from the sensor into the display and adjustment module



Caution:

When the PIN is active, adjustment via PACTware/DTM as well as other systems is also blocked.

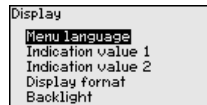
In delivery status, the PIN is **0000**.

Call our service department if you have modified and forgotten the PIN.

6.5.2 Display

In the main menu point "Display", the individual submenu points should be selected one after the other and provided with the correct parameters to ensure the optimum adjustment of the display. The procedure is described in the following.

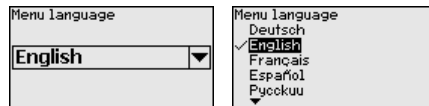
The following submenu points are available:



The submenu points are described below.

Menu language

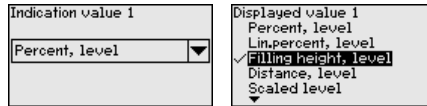
This menu item enables the setting of the requested national language.



In delivery status, the sensor is set to English.

Displayed value 1

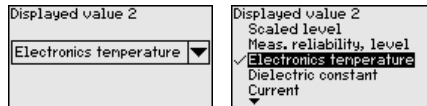
In this menu item, you define the indication of the measured value on the display. You can display two different measured values. In this menu item, you define measured value 1.



The default setting for the displayed value 1 is " *Filling height Level*".

Displayed value 2

In this menu item, you define the indication of the measured value on the display. You can display two different measured values. In this menu item, you define measured value 2.

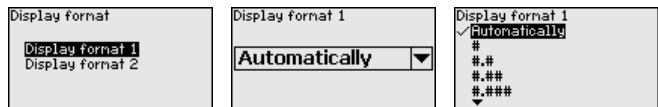


The default setting for the displayed value 2 is the electronics temperature.

Display format

In this menu item, you define the display format of the measured value on the display. You can define different display formats for the two measured values.

You can thus define the number of decimal positions the measured value is displayed with.



The default setting for the display format is " *Automatic*".

Backlight

The integrated background lighting can be switched off via the adjustment menu. The function depends on the strength of the operating voltage, see " *Technical data*".

To maintain the function of the device, the lighting is temporarily switched off if the power supply is insufficient.

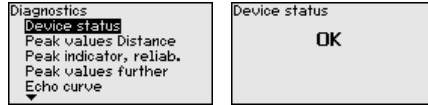


In delivery status, the lighting is switched on.

6.5.3 Diagnostics**Device status**

In this menu item, the device status is displayed.

When the instrument displays a fault signal, you can here get detailed information on the failure reason.

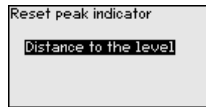


Peak indicator, distance

The respective min. and max. measured value is saved in the sensor. The two values are displayed in the menu item " *Peak indicator, distance*".



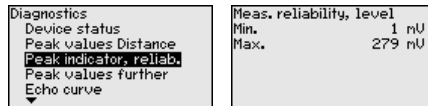
In another window you can reset the peak value.



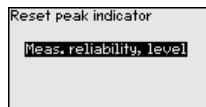
Peak indicator, measurement reliability

The respective min. and max. measured values are saved in the sensor. The two values are displayed in the menu item " *Peak indicator, measurement reliability*".

The measurement can be influenced by the process conditions. In this menu item, the measurement reliability of the level measurement is displayed in mV. The higher the value, the more reliable the measurement.



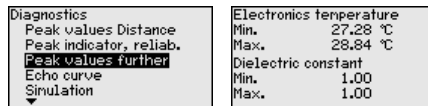
In another window you can reset the peak value.



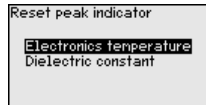
Peak indicator, additional

The respective min. and max. measured values are saved in the sensor. The values are displayed in the menu item " *Peak indicator Additional*".

This menu item displays the peak values of the electronics temperature as well as the dielectric constant.



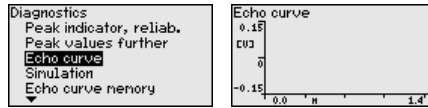
In another window you can carry out a reset of the two peak values separately.

**Information:**

If one of the display values flashes, there is actually no valid value available.

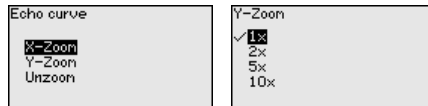
Echo curve

The menu item "Echo curve" shows the signal strength of the echoes over the measuring range in V. The signal strength enables an evaluation of the quality of the measurement.

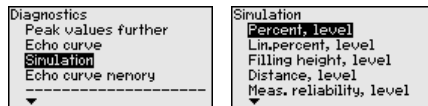


With the following functions you can zoom part sections of the echo curve.

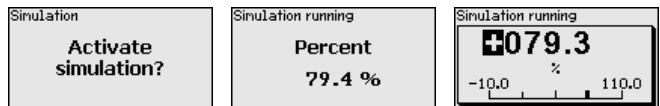
- "X-Zoom": Zoom function for the meas. distance
- "Y-Zoom": 1, 2, 5 and 10x signal magnification in "V"
- "Unzoom": Reset the presentation to the nominal measuring range without magnification

**Simulation**

In this menu item you can simulate measured values via the current output. This allows the signal path to be tested, e.g. through downstream indicating instruments or the input card of the control system.



Select the requested simulation variable and set the requested value.

**Caution:**

During simulation, the simulated value is output as 4 ... 20 mA current value and digital HART signal.

Push the [ESC] key to deactivate the simulation.

**Information:**

The simulation is terminated automatically 60 minutes after the activation of the simulation.

Echo curve memory

With the menu item " *Setup*" the echo curve it is possible to save at the time of setup. This is generally recommended; for using the Asset Management functions it is necessary. If possible, the curve should be saved with a low level in the vessel.

With this, you can detect signal changes over the operating time. With the adjustment software PACTware and the PC, the high-resolution echo curve can be displayed and used to compare the echo curve of the setup with the actual echo curve.

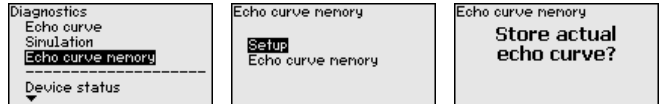


The function " *Echo curve memory*" enables storing echo curves of the measurement.

Under the sub-menu item " *Echo curve memory*" you can store the current echo curve.

Parameter settings for recording the echo curve and the settings of the echo curve itself can be carried out in the adjustment software PACTware.

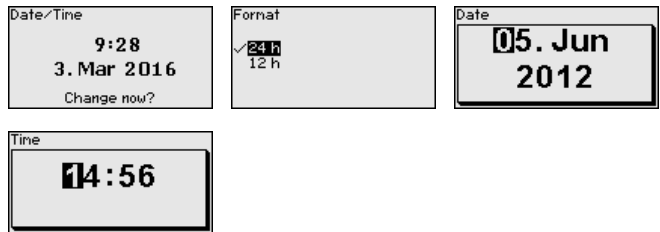
With the adjustment software PACTware and the PC the high-resolution echo curve can be displayed and used later on to assess the quality of the measurement.



6.5.4 Additional adjustments

Date/Time

In this menu item, the internal clock of the sensor is set.



Reset

After a reset, certain parameter adjustments made by the user are reset.



Note:

After this menu window, the reset process is carried out. No further safety inquiry follows.



The following reset functions are available:

Delivery status: Restores the parameter settings at the time of shipment from the factory, incl. order-specific settings. Any stored false signal suppression or user-programmed linearisation curve, as well as the measured value memory, are deleted.

Basic settings: Restores the parameter settings, incl. special parameters, to the default values of the respective instrument. Any stored false signal suppression or user-programmed linearisation curve, as well as the measured value memory, are deleted.

The following table shows the default values of the instrument. Depending on the instrument version or application, all menu items may not be available or some may be differently assigned:

Menu - Setup

| Menu item | Default value |
|---|---|
| Lock adjustment | Released |
| Measurement loop name | Sensor |
| Units | Distance unit: order-specific Temperature unit: order-specific |
| Probe length | Länge der Messsonde factory setting |
| Type of medium | Bulk solid |
| Application | Level in the metallic vessel |
| Medium, dielectric constant | Cereals, flour, sand / > 3 |
| Superimposed gas phase | Yes |
| Max. adjustment - Level | 100 % |
| Max. adjustment - Level | Distance: 0.000 m(d) - note blocking distances |
| Min. adjustment - Level | 0 % |
| Min. adjustment - Level | Distance: Probe length - take dead band into account |
| Integration time - Level | 0.0 s |
| Linearization type | Linear |
| Linearisation - Socket correction | 0 mm |
| Linearisation - Vessel height | Probe length |
| Scaling variable - Level | Volume in l |
| Scaling unit - Level | Litres |
| Scaling format - Level | Without decimal positions |
| Scaling level - 100 % corresponds to | 100 |
| Scaling level - 0 % corresponds to | 0 |
| Current output, output variable First HART variable (PV) | Lin. percent - Level |
| Current output - Output characteristics | 0 ... 100 % correspond to 4 ... 20 mA |
| Current output - Reaction in case of fault | ≤ 3.6 mA |

| Menu item | Default value |
|---------------------------|--------------------------------|
| Current output - Min. | 3.8 mA |
| Current output - Max. | 20.5 mA |
| Third HART variable (TV) | Measurement reliability, level |
| Fourth HART variable (QV) | Electronics temperature |

Menu - Display

| Menu item | Default value |
|-------------------|-------------------------|
| Language | Selected language |
| Displayed value 1 | Filling height Level |
| Displayed value 2 | Electronics temperature |
| Display format 1 | Automatically |
| Display format 2 | Automatically |
| Backlight | Switched on |

Menu - Additional adjustments

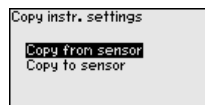
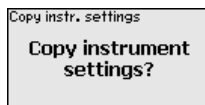
| Menu item | Default value |
|---------------|-----------------|
| PIN | 0000 |
| Date | Actual date |
| Time | Actual time |
| Time - Format | 24 hours |
| Probe type | Device-specific |

Copy instrument settings The instrument settings are copied with this function. The following functions are available:

- **Read from sensor:** Read data from sensor and store into the display and adjustment module
- **Write into sensor:** Store data from the display and adjustment module back into the sensor

The following data or settings for adjustment of the display and adjustment module are saved:

- All data of the menu "Setup" and "Display"
- In the menu "Additional adjustments" the items "Reset, Date/Time"
- Special parameters



Prerequisites

The following requirements must be met for a successful transmission:

- The data can only be transferred to the same device type, e.g. VEGAFLEX 82
- It must be the same probe type, e.g. rod probe
- The firmware of both devices is identical

The copied data are permanently saved in an EEPROM memory in the display and adjustment module and remain there even in case of power failure. From there, they can be written into one or more sensors or kept as backup for a possible electronics exchange.



Note:

Before the data are stored in the sensor, a check is carried out to determine if the data fit the sensor. If the data do not fit, a fault signal is triggered or the function is blocked. When data are being written into the sensor, the display shows which instrument type the data originate from and which TAG number this sensor had.

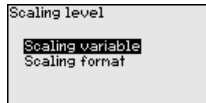


Tip:

We recommend to save the instrument adjustments. In case of an electronics exchange the saved parameter adjustment data relieve this process.

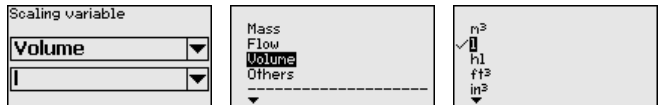
Scaling level

Since scaling is very extensive, scaling of the level value was divided into two menu items.

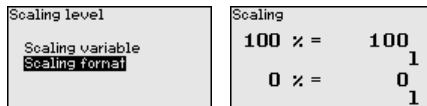


Scaling level - Scaling prime

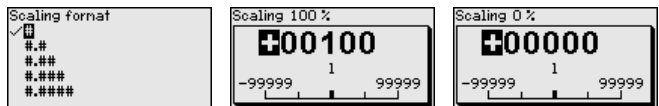
In menu item " *Scaling variable*" you define the scaling variable and the scaling unit for the level value on the display, e.g. volume in l.



Scaling level - Scaling format

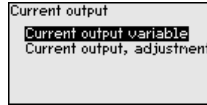


In menu item " *Scaling format*" you define the scaling format on the display and the scaling of the measured level value for 0 % and 100 %.



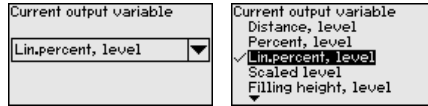
Current output

Since scaling is very extensive, scaling of the level value was divided into two menu items.



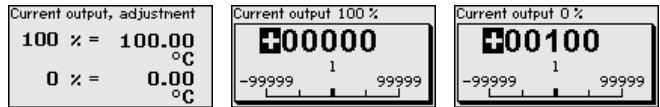
Current output - Current output size

In menu item " *Current output, variable*" you specify which measured variable the current output refers to.



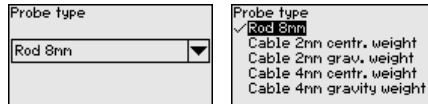
Current output - Current output adjustment

In menu item " *Current output, adjustment*" you can assign a respective measured value to the current output.



Probe type

In this menu item you can select the type and size of your probe from a list of all possible probes. This is necessary to adapt the electronics optimally to the probe.



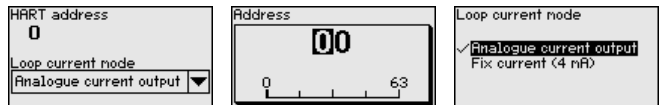
HART mode

The sensor offers the HART modes " *Analogue current output*" and " *Fix current (4 mA)*". In this menu item you determine the HART mode and enter the address with Multidrop mode.

In the mode " *Fixed current output*" up to 63 sensors can be operated on one two-wire cable (Multidrop operation). An address between 0 and 63 must be assigned to each sensor.

If you select the function " *Analogue current output*" and also enter an address number, you can output a 4 ... 20 mA signal in Multidrop mode.

In the mode " *Fixed current (4 mA)*" a fixed 4 mA signal is output independently of the actual level.



The default setting is " *Analogue current output*" and the address 00.

Special parameters

In this menu item you gain access to the protected area where you can enter special parameters. In exceptional cases, individual parameters can be modified in order to adapt the sensor to special requirements.

Change the settings of the special parameters only after having contacted our service staff.



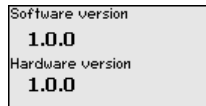
6.5.5 Info

Device name

In this menu, you read out the instrument name and the instrument serial number.

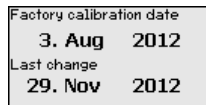
Instrument version

In this menu item, the hardware and software version of the sensor is displayed.



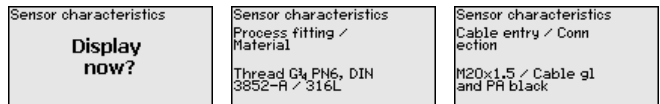
Factory calibration date

In this menu item, the date of factory calibration of the sensor as well as the date of the last change of sensor parameters are displayed via the display and adjustment module or via the PC.



Sensor characteristics

In this menu item, the features of the sensor such as approval, process fitting, seal, measuring range, electronics, housing and others are displayed.



Example for displayed sensor features.

6.6 Save parameter adjustment data

On paper

We recommend writing down the adjustment data, e.g. in this operating instructions manual, and archiving them afterwards. They are thus available for multiple use or service purposes.

In the display and adjustment module

If the instrument is equipped with a display and adjustment module, the parameter adjustment data can be saved therein. The procedure is described in menu item "Copy device settings".

7 Set up with smartphone/tablet/PC/notebook via Bluetooth

7.1 Preparations

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".

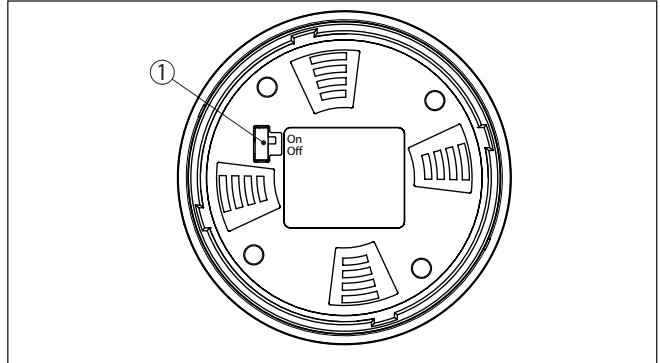


Fig. 20: Activate Bluetooth

- 1 Bluetooth switch
- On Bluetooth active
- Off Bluetooth not active

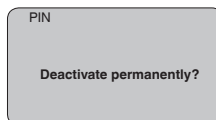
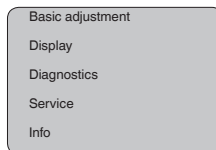
Change sensor PIN

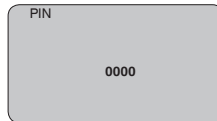
The security concept of Bluetooth operation absolutely requires that the default setting of the sensor PIN be changed. This prevents unauthorized access to the sensor.

The default setting of the sensor PIN is "0000". First of all you have to change the sensor PIN in the adjustment menu of the respective sensor, e.g. to "1111".

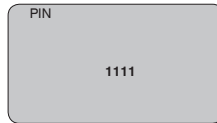


Use "OK" to switch to the input menu.





Change the PIN, e.g. to "1111".

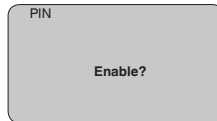


This permanently deactivates the PIN.

The display immediately changes to PIN activation.

Press "ESC" to cancel the activation of the PIN.

With "OK" you can enter and activate a PIN.



After the sensor PIN has been changed, sensor adjustment can be enabled again. For access (authentication) with Bluetooth, the modified PIN is still effective.



Information:

Bluetooth communication functions only if the actual sensor PIN differs from the default setting "0000".

7.2 Connecting

Preparations

Smartphone/Tablet

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

PC/Notebook

Start PACTware and the VEGA project assistant. Select the device search via Bluetooth and start the search function. The device automatically searches for Bluetooth-capable devices in the vicinity.

Connecting

The message " *Searching ...*" is displayed.

All found instruments will be listed in the adjustment window. The search is continued automatically.

Select the requested instrument in the device list.

The message " *Connecting ...*" is displayed.

Authenticate

For the first connection, the operating device and the sensor must authenticate each other. After successful authentication, the next connection functions without authentication.

For authentication, enter in the next menu window the 4-digit sensor PIN.

7.3 Sensor parameter adjustment

The sensor parameterization is carried out via the adjustment app on the smartphone/tablet or the DTM on the PC/notebook.

App view

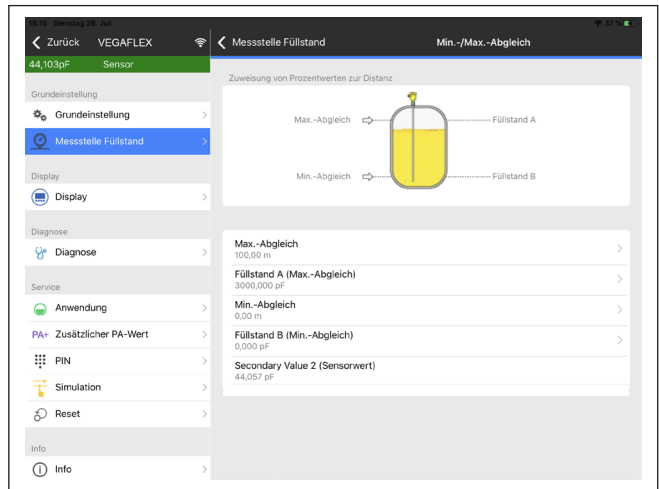


Fig. 21: Example of an app view - Setup sensor adjustment

8 Setting up sensor and Modbus interface with PACTware

8.1 Connect the PC

To the sensor electronics Connection of the PC to the sensor electronics is carried out via the interface adapter VEGACONNECT.

Scope of the parameter adjustment:

- Sensor electronics

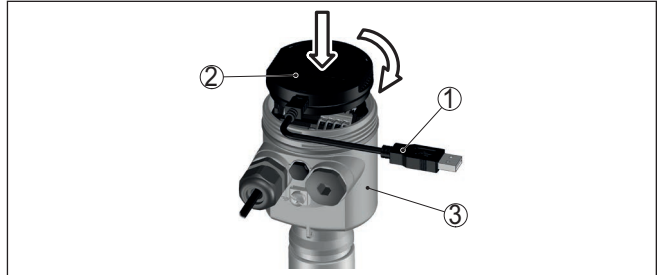


Fig. 22: Connection of the PC directly to the sensor via the interface adapter

- 1 USB cable to the PC
- 2 Interface adapter VEGACONNECT
- 3 Sensor

To the Modbus electronics

Connection of the PC to the Modbus electronics is carried out via a USB cable.

Scope of the parameter adjustment:

- Sensor electronics
- Modbus electronics



Fig. 23: Connecting the PC via USB to the Modbus electronics

- 1 USB cable to the PC

To the RS 485 cable

Connection of the PC to the RS 485 cable is carried out via a standard interface adapter RS 485/USB.

Scope of the parameter adjustment:

- Sensor electronics
- Modbus electronics



Information:

For parameter adjustment, it is absolutely necessary to disconnect from the RTU.

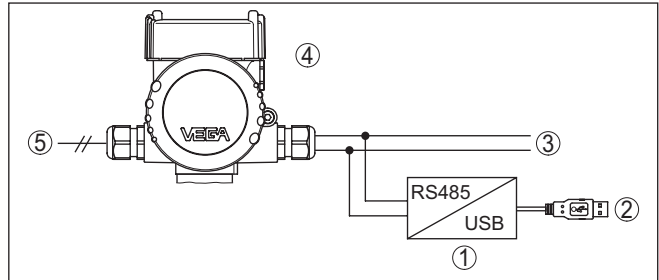


Fig. 24: Connection of the PC via the interface adapter to the RS 485 cable

- 1 Interface adapter RS 485/USB
- 2 USB cable to the PC
- 3 RS 485 cable
- 4 Sensor
- 5 Voltage supply

Prerequisites

8.2 Parameter adjustment with PACTware

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

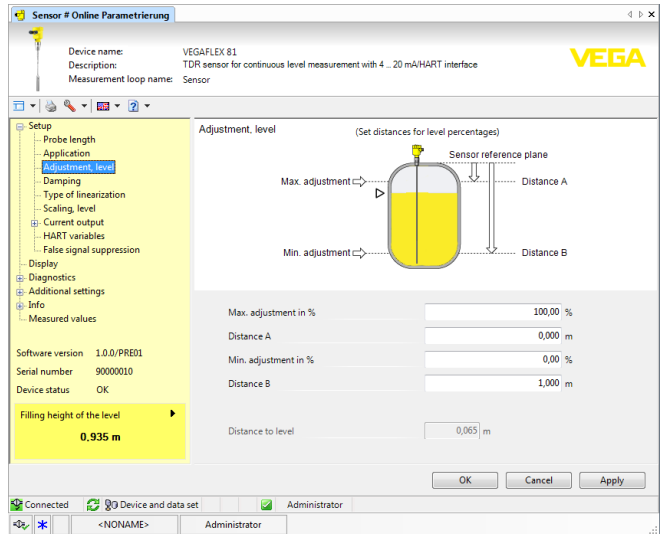


Fig. 25: Example of a DTM view

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.

8.3 Set instrument address

The VEGAFLEX 82 requires an address for participating as a sensor in the Modbus communication. The address setting is carried out via a PC with PACTware/DTM or Modbus RTU.

The default settings for the address are:

- Modbus: 246
- Levelmaster: 31



Note:

The setting of the instrument address can only be carried out online.

Via PC through Modbus electronics

Start the project assistant and wait until the project tree has been set up. Then, in the project tree, go to the symbol for the Modbus gateway. Select with the right mouse key "*Parameter*", then "*Online parameter adjustment*" and start the DTM for the Modbus electronics.

In the menu bar of the DTM, go to the list arrow next to the symbol for "*Screwdriver*". Select the menu item "*Change address in the instrument*" and set the requested address.

Via PC through RS 485 cable

In the device catalogue, select the option "*Modbus Serial*" under "*Driver*". Double click on this driver and integrate it into the project tree.

Open the device manager on your PC and find out which COM interface the USB/RS 485 adapter is located on. Then go to the symbol "*Modbus COM*." in the project tree. Select "*Parameter*" with the right mouse key and start the DTM for the USB/RS 485 adapter. Enter the COM interface no. from the device manager under "*Basic settings*".

Select with the right mouse key "*Additional functions*" and "*Instrument search*". The DTM then searches for the connected Modbus participants and integrates them into the project tree. Now, in the project tree, go to the symbol for the Modbus gateway. Select with the right mouse key "*Parameter*", then "*Online parameter setting*" and start the DTM for the Modbus electronics.

In the menu bar of the DTM, go to the list arrow next to the symbol for "*Screwdriver*". Select the menu item "*Change address in the instrument*" and set the requested address.

Then move again to the symbol "*Modbus COM*." in the project tree. Select with the right mouse key "*Additional functions*" and "*Change DTM addresses*". Enter here the modified address of the Modbus gateway.

Via Modbus-RTU

The instrument address is set in register no. 200 of the Holding Register (see chapter "*Modbus register*" in this operating instructions manual).

The procedure depends on the respective Modbus-RTU and the configuration tool.

8.4 Set up with the quick setup**General information**

The quick setup is another option for parameter adjustment of the sensor. It allows fast, convenient adjustment of the most important parameters to adapt the sensor quickly to standard applications. To use it, select the function "*Quick setup*" in the start screen.

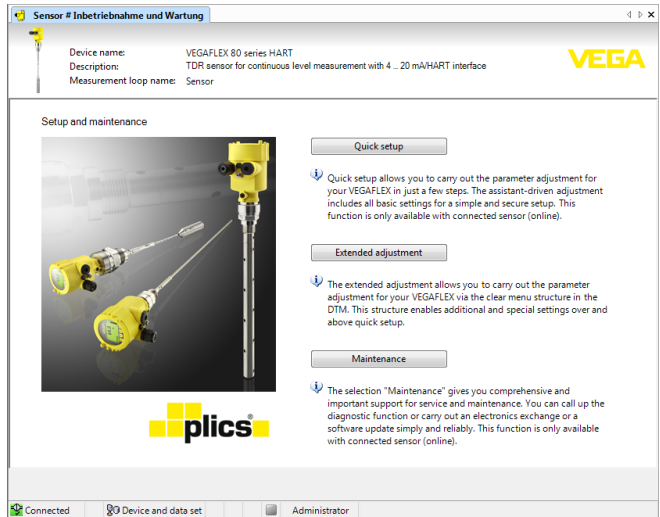


Fig. 26: Select quick setup

- 1 Quick setup
- 2 Extended adjustment
- 3 Maintenance

Quick setup

With quick setup you can carry out the parameter adjustment of VEGAFLEX 82 for your application in just a few simple steps. The assistant-driven adjustment includes the basic settings for simple, reliable setup and commissioning.



Information:

If the function is inactive, then possibly no instrument is connected. Check the connection to the instrument.

Extended adjustment

With the extended adjustment, you carry out the parameter adjustment for the instrument via the clear menu structure in the DTM (Device Type Manager). This enables additional and special settings over and above those offered by quick setup.

Maintenance

Under the menu item "Maintenance" you get comprehensive and important support for servicing and maintenance. You can call up diagnostic functions and carry out an electronics exchange or a software update.

Start quick setup

Click to the button "Quick setup", to start the assistant-driven adjustment for a simplified and reliable setup.

8.5 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.

9 Diagnosis, asset management and service

9.1 Maintenance

Maintenance

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

Cleaning

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

Take note of 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

9.2 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 can be 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.

In "Extended adjustment" you can select the respective measured values.

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.

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. The memory is divided into two sections:

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
- Display and adjustment module

9.3 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:

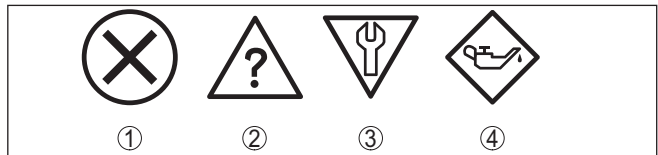


Fig. 27: Pictographs of the status messages

- 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 (failure)

| Code Text message | Cause | Rectification | DevSpec Diagnosis Bits |
|--|--|---|---------------------------|
| F013 no measured value available | Sensor does not detect an echo during operation Antenna system dirty or defective | Check for correct mounting and/or parameter adjustment Clean or exchange process component or antenna | Bit 0 |
| F017 Adjustment span too small | Adjustment not within specification | Change adjustment according to the limit values (difference between min. and max. ≥ 10 mm) | Bit 1 |
| F025 Error in the linearization table | Index markers are not continuously rising, for example illogical value pairs | Check linearization table Delete table/Create new | Bit 2 |
| F036 No operable software | Failed or interrupted software update | Repeat software update Check electronics version Exchanging the electronics Send instrument for repair | Bit 3 |
| F040 Error in the electronics | Hardware defect | Exchanging the electronics Send instrument for repair | Bit 4 |
| F041 Probe loss | Cable probe broken or rod probe defective | Check probe and exchange, if necessary | Bit 13 |
| F080 General software error | General software error | Disconnect operating voltage briefly | Bit 5 |
| F105 Measured value is determined | 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 parameter settings | Bit 6 |
| F113 Communication error | Error in the internal instrument communication | Disconnect operating voltage briefly Send instrument for repair | - |

| Code Text message | Cause | Rectification | DevSpec Diagnosis Bits |
|---|--|---|-----------------------------------|
| F125 Impermissible electronics temperature | Temperature of the electronics in the non-specified range | Check ambient temperature Insulate electronics Use instrument with higher temperature range | Bit 7 |
| F260 Error in the calibration | Error in the calibration carried out in the factory Error in the EEPROM | Exchanging the electronics Send instrument for repair | Bit 8 |
| F261 Error in the instrument settings | Error during setup False signal suppression faulty Error when carrying out a reset | Repeat setup Repeat reset | Bit 9 |
| F264 Installation/Set-up error | Adjustment not within the vessel height/measuring range Max. measuring range of the instrument not sufficient | Check for correct mounting and/or parameter adjustment Use an instrument with bigger measuring range | Bit 10 |
| F265 Measurement function disturbed | Sensor no longer carries out a measurement Operating voltage too low | Check operating voltage Carry out a reset Disconnect operating voltage briefly | Bit 11 |
| F266 Impermissible operating voltage | Wrong operating voltage | Check operating voltage Check connection cables | Bit 14 |
| F267 No executable sensor software | Sensor cannot start | Exchanging the electronics Send instrument for repair | - |

Tab. 7: Error codes and text messages, information on causes as well as corrective measures

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" |

Tab. 8: Error codes and text messages, information on causes as well as corrective measures

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 | Bit 8 of Byte 14 ... 24 |

41833-EN-230605

| Code Text message | Cause | Rectification | DevSpec State in CMD 48 |
|--|---|--|-----------------------------|
| 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 Use coaxial probe | Bit 9 of Byte 14 ... 24 |
| S602 Level within the search range, compensation echo | Compensation echo superimposed by medium | 100 % adjustment: Increase value | Bit 10 of Byte 14 ... 24 |
| S603 Impermissible operating voltage | Operating voltage below specified range | Check electrical connection If necessary, increase operating voltage | Bit 11 of Byte 14 ... 24 |

Tab. 9: Error codes and text messages, information on causes as well as corrective measures

Maintenance

| Code Text message | Cause | Rectification | DevSpec State in CMD 48 |
|---|--|--|----------------------------|
| M500 Error in the 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 | Bit 0 of Byte 14 ... 24 |
| M501 Error in the non-active linearisation table | Index markers are not continuously rising, for example illogical value pairs | Check linearization table Delete table/Create new | Bit 1 of Byte 14 ... 24 |
| M504 Error at a device interface | Hardware defect | Exchanging the electronics Send instrument for repair | Bit 4 of Byte 14 ... 24 |
| M505 no measured value available | Sensor does not detect an echo during operation | Check and correct mounting and/or parameter adjustment | Bit 5 of Byte 14 ... 24 |
| | Process component or probe contaminated or defective | Clean or exchange process component or probe | |
| M506 Installation/Set-up error | Error during setup | Check and correct mounting and/or parameter adjustment Check probe length | Bit 6 of Byte 14 ... 24 |
| 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 | Bit 7 of Byte 14 ... 24 |

Tab. 10: Error codes and text messages, information on causes as well as corrective measures

9.4 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 for application-relevant measurement errors. There are two measurement errors:

- 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.

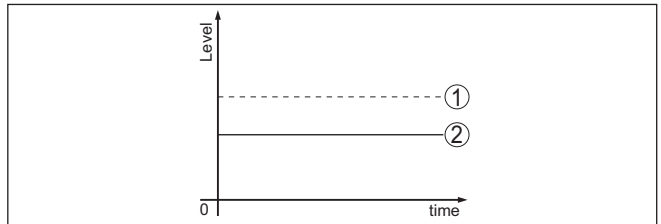


Fig. 28: The broken line 1 shows the real level, the continuous line 2 shows the level displayed by the sensor

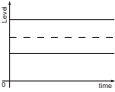
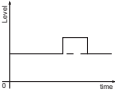


Note:

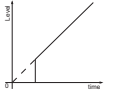

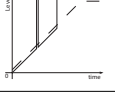
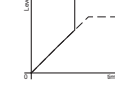
If the output level is constant, the cause could also be the fault setting of the output to "Hold value".

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 |
| | Running time error (small measurement error close to 100 %/serious error close to 0 %) | Repeat setup |
| Measured value jumps towards 100 %  | Due to the process, the amplitude of the product echo decreases A false signal suppression was not carried out | Carry out a false signal suppression |
| | Amplitude or position of a false signal has changed (e.g. buildup); false signal suppression no longer matches | Determine the reason for the changed false signals, carry out false signal suppression, e.g. with buildup |

Measurement error during filling

| Fault description | Cause | Rectification |
|---|---|---|
| Measured value remains in the area of the bottom during filling  | Echo from the probe end larger than the product echo, for example, with products with $\epsilon_r < 2.5$ oil-based, solvents, etc. | Check parameter "Medium" and "Vessel height", 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 sporadically to 100 % during filling  | Changing condensation or contamination on the probe | Carry out a false signal suppression |
| Measured value jumps to $\geq 100\%$ or 0 m distance  | Level echo is no longer detected in the close range due to false signals in the close range. The sensor goes into overfill protection mode. The max. level (0 m distance) as well as the status message "Overfill protection" are output. | Eliminate false signals in the close range Check installation conditions If possible, switch off the function "Overfill protection" |

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 signals in the close range Remove contamination on the probe. After having removed the source of the false signals, the false signal suppression must be deleted. Carry out a new false signal suppression |
| Measured value remains reproducible in one position during emptying  | Stored false signals in this position are larger than the level echo | Delete false signal suppression Carry out a new false signal suppression |

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.

9.5 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.

9.6 Exchange or shorten cable/rod

Exchanging the cable/rod

The cable or rod (meas. part) of the probe can be shortened, if necessary. To loosen the rod or cable you need a fork spanner with spanner width 13.

1. Loosen the rod or cable by applying a fork spanner to the flat surfaces (SW 13), provide counterforce with another fork spanner (SW 13)
2. Unscrew the loosened rod or cable manually.
3. Place the enclosed new double washer onto the thread.

**Caution:**

Make sure that the two components of the double washer remain together.

4. Screw the new rod and the new cable manually to the thread on the process fitting.
5. Exert counterforce with the second fork spanner and tighten the measuring rod or cable on the flat surfaces with a torque of 20 Nm (15 lbf ft).

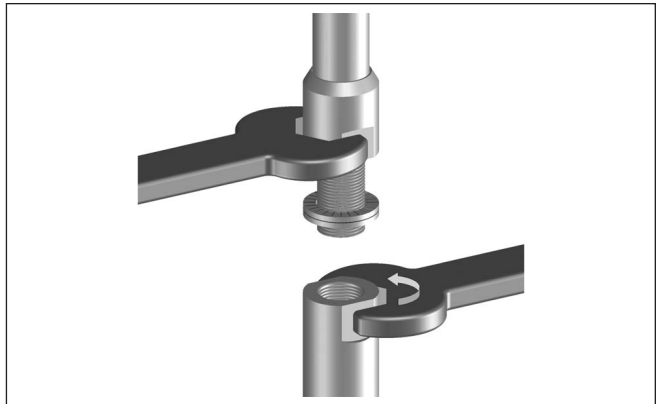


Fig. 29: Exchange cable or rod

**Information:**

Please maintain the specified torque so that the max. tensile strength of the connection remains.

6. Enter new probe length and if necessary the new probe type and then carry out a fresh adjustment (see " Setup procedure, Carrying out min. adjustment - Carrying out max. adjustment").

Shorten cable/rod

The rod or cable of the probe can be shortened individually.

1. Mark the requested length with mounted measuring rod.
2. Cable: Loosen the three pins on the gravity weight
 Cable \varnothing 4: hexagon 3
 Cable \varnothing 6, cable \varnothing 8: hexagon 4
3. Cable: remove the pins
4. Cable: Pull the cable out of the gravity weight
5. Shorten the cable/rod with a cut-off wheel or metal saw at the marking. Take note of the specifications in the following illustration when shortening the cable.
6. Cable: shift the cable into the gravity weight (according to the drawing)
 Plastic coated cable: remove coating according drawing to 70 mm (2.76 in).
7. Cable: Fasten the cable with three pins, torque 20 Nm (14.75 lbf in)
 Cable \varnothing 4: 7 Nm (5.16 lbf ft)
 Cable \varnothing 6, cable \varnothing 8: 20 Nm (14.75 lbf ft)
8. Enter new probe length and then carry out a fresh adjustment (see "Setup procedure, Carrying out min. adjustment - Carrying out max. adjustment").

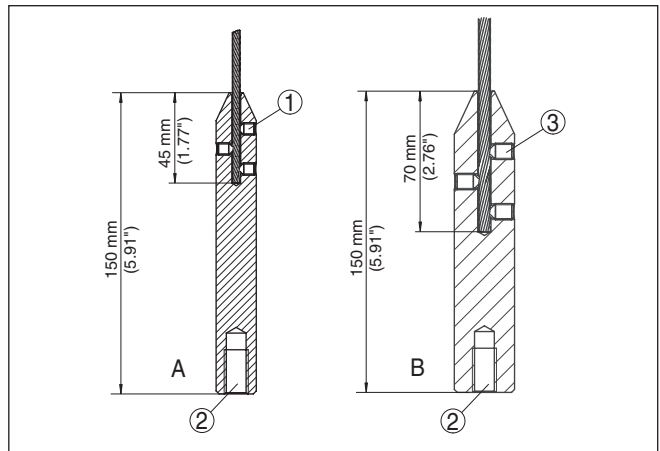


Fig. 30: Shortening the cable probe

- A Gravity weight - cable \varnothing 4 mm
- B Gravity weight - cable \varnothing 6 mm
- 1 Threaded pins
- 2 Thread M12 for eye-bolt
- 3 Threaded pins

9.7 Software update

The following components are required to update the instrument software:

- Instrument
- Voltage supply
- Interface adapter VEGACONNECT
- PC with PACTware
- 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.

9.8 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.

10 Dismount

10.1 Dismounting steps

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



Warning:

When dismantling, 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.

10.2 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.

11 Supplement

11.1 Technical data

General data

316L corresponds to 1.4404 or 1.4435

Materials, wetted parts

| | |
|---|---|
| – Process fitting | 316L and PPS GF 40, Alloy C22 (2.4602) and PPS GF 40 |
| – Process seal on the instrument side (cable/rod leadthrough) | FKM (SHS FPM 70C3 GLT), FFKM (Kalrez 6375 + Eco-last NH5750), EPDM (A+P 70.10-02) |
| – Process seal | On site (instruments with thread: Klingersil C-4400 is enclosed) |
| – Inner conductor (up to the separation cable/rod) | 316L |
| – Rod: \varnothing 16 mm (0.63 in) | 316L or Alloy C22 (2.4602) |
| – Cable: \varnothing 4 mm (0.157 in) | 316 (1.4401) |
| – Cable: \varnothing 6 mm (0.236 in), PA coated | Steel (galvanized), PA coated |
| – Cable: \varnothing 6 mm (0.236 in) | 316 (1.4401) |
| – Cable: \varnothing 11 mm (0.433 in), PA coated | Steel (galvanized), PA coated |
| – Gravity weight (optionally available) | 316L |

Materials, non-wetted parts

| | |
|---|---|
| – Plastic housing | Plastic PBT (Polyester) |
| – Aluminium die-cast housing | Aluminium die-casting AlSi10Mg, powder-coated (Basis: Polyester) |
| – Stainless steel housing (precision casting) | 316L |
| – Stainless steel housing (electropolished) | 316L |
| – Second Line of Defense (optional) ¹⁾ | Borosilicate glass GPC 540 |
| – Seal between housing and housing lid | Silicone SI 850 R |
| – Inspection window in housing cover (optional) | Plastic housing: Polycarbonate (UL746-C listed) Metal housing: Glass ²⁾ |
| – Ground terminal | 316L |
| – Cable gland | PA, stainless steel, brass |
| – Sealing, cable gland | NBR |
| – Blind plug, cable gland | PA |
| Second Line of Defense (optional) ³⁾ | |
| – Supporting material | 316L |
| – Glass potting | Borosilicate glass GPC 540 |
| – Contacts | Alloy C22 (2.4602) |

¹⁾ Only with Ex-d version.

²⁾ Aluminium, stainless steel precision casting and Ex d housing

³⁾ Only with Ex-d version.

| | |
|-----------------------|--|
| - Helium leak rate | < 10 ⁻⁶ mbar l/s |
| - Pressure resistance | See process pressure of the sensor |
| Conductive connection | Between ground terminal, process fitting and probe |

Process fittings

| | |
|---|------------------------------|
| - Pipe thread, cylindrical (ISO 228 T1) | G¾, G1, G1½ (DIN 3852-A) |
| - Pipe thread, conical (ASME B1.20.1) | ¾ NPT, 1 NPT, 1½ NPT |
| - Flanges | DIN from DN 25, ASME from 1" |

Weight

| | |
|--|--|
| - Instrument weight (depending on process fitting) | approx. 0.8 ... 8 kg (0.176 ... 17.64 lbs) |
| - Rod: ø 16 mm (0.63 in) | approx. 1580 g/m (17 oz/ft) |
| - Cable: ø 4 mm (0.157 in) | approx. 78 g/m (0.84 oz/ft) |
| - Cable: ø 6 mm (0.236 in), PA coated | approx. 180 g/m (1.9 oz/ft) |
| - Cable: ø 6 mm (0.236 in) | approx. 80 g/m (0.86 oz/ft) |
| - Cable: ø 11 mm (0.433 in), PA coated | approx. 320 g/m (3.44 oz/ft) |
| - Gravity weight for cable ø 4 mm (0.157 in) and ø 6 mm (0.236 in), PA coated | 325 g (11.46 oz) |
| - Gravity weight for cable ø 6 mm (0.236 in) and ø 11 mm (0.433 in), PA coated | 780 g (27.51 oz) |

Probe length L (from seal surface)

| | |
|--|--------------------------------------|
| - Rod: ø 16 mm (0.63 in) | up to 6 m (19.69 ft) |
| - Trimming accuracy (rod) | ±(1 mm + 0.05 % of the rod length) |
| - Cable: ø 4 mm (0.157 in) | up to 75 m (246.1 ft) |
| - Cable: ø 6 mm (0.236 in), PA coated | up to 65 m (213.3 ft) |
| - Cable: ø 6 mm (0.236 in) | up to 75 m (246.1 ft) |
| - Cable: ø 11 mm (0.433 in), PA coated | up to 65 m (213.3 ft) |
| - Trimming accuracy - Cable | ±(2 mm + 0.05 % of the cable length) |

Lateral load with rod: ø 16 mm (0.63 in) 30 Nm (22.13 lbf ft)

Max. tensile load

| | |
|--|------------------|
| - Cable: ø 4 mm (0.157 in) | 12 KN (2698 lbf) |
| - Cable: ø 6 mm (0.236 in), PA coated | 8 KN (1798 lbf) |
| - Cable: ø 6 mm (0.236 in) | 30 KN (6744 lbf) |
| - Cable: ø 11 mm (0.433 in), PA coated | 30 KN (6744 lbf) |

The tensile force of solids are subject of a normal fluctuation range. For this reason, the determined diagram value of the following diagrams must be multiplied with safety factor 2.

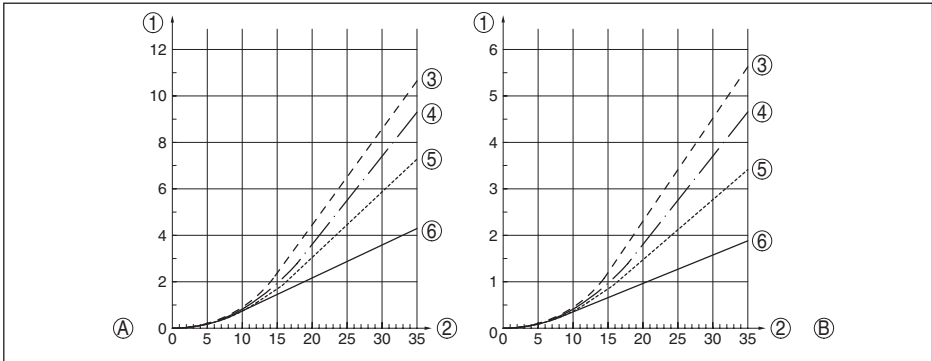


Fig. 31: Max. tensile load with cereals and plastic granules - Cable: \varnothing 4 mm (0.157 in)

A Cereals

B Plastic granules

1 Tensile force in kN (the determined value must be multiplied with safety factor 2)

2 Cable length in m

3 Vessel diameter 12 m (39.37 ft)

4 Vessel diameter 9 m (29.53 ft)

5 Vessel diameter 6 m (19.69 ft)

6 Vessel diameter 3 m (9.843 ft)

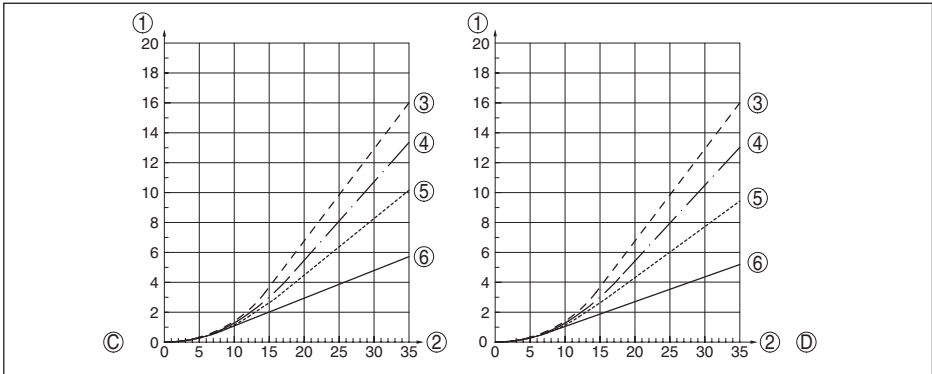


Fig. 32: Max. tensile load with sand and cement - Cable: \varnothing 4 mm (0.157 in)

C Sand

D Cement

1 Tensile force in kN (the determined value must be multiplied with safety factor 2)

2 Cable length in m

3 Vessel diameter 12 m (39.37 ft)

4 Vessel diameter 9 m (29.53 ft)

5 Vessel diameter 6 m (19.69 ft)

6 Vessel diameter 3 m (9.843 ft)

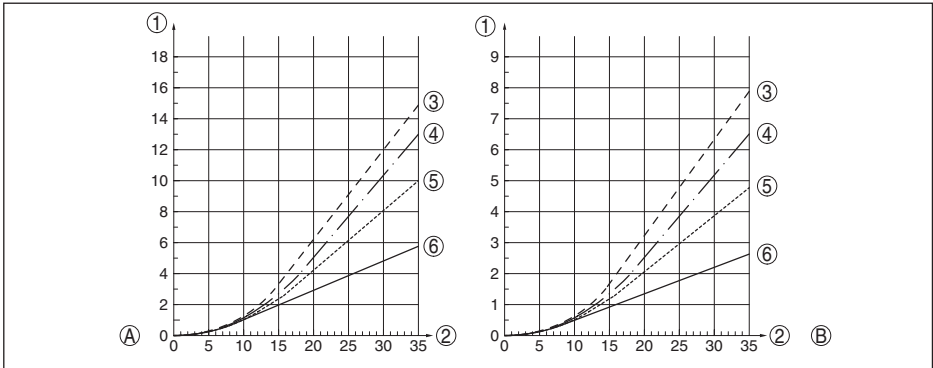


Fig. 33: Max. tensile load with cereals and plastic granules - Cable: ϕ 6 mm, ϕ 11 mm, PA coated

A Cereals

B Plastic granules

1 Tensile force in kN (the determined value must be multiplied with safety factor 2)

2 Cable length in m

3 Vessel diameter 12 m (39.37 ft)

4 Vessel diameter 9 m (29.53 ft)

5 Vessel diameter 6 m (19.69 ft)

6 Vessel diameter 3 m (9.843 ft)

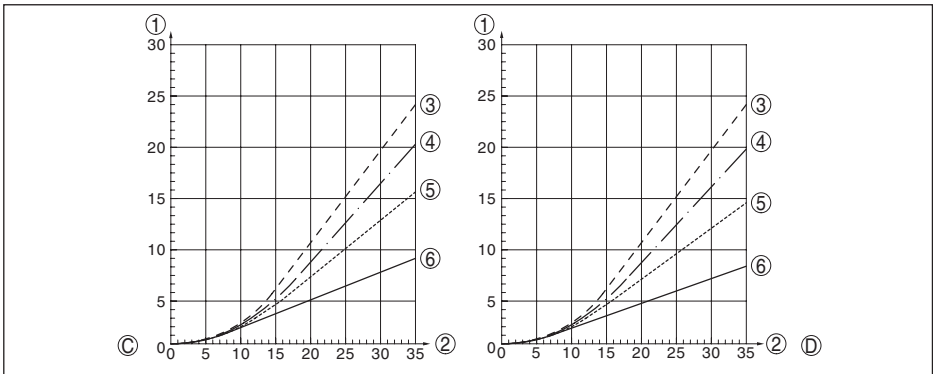


Fig. 34: Max. tensile load with sand and cement - Cable: ϕ 6 mm, ϕ 11 mm, PA coated

C Sand

D Cement

1 Tensile force in kN (the determined value must be multiplied with safety factor 2)

2 Cable length in m

3 Vessel diameter 12 m (39.37 ft)

4 Vessel diameter 9 m (29.53 ft)

5 Vessel diameter 6 m (19.69 ft)

6 Vessel diameter 3 m (9.843 ft)

41833-EN-230605

Thread in gravity weight, e.g. for eye-bolt M 12
(cable version)

Torque for exchangeable cable or rod probe (in the process fitting)

– Cable: ϕ 4 mm (0.157 in) 8 Nm (5.9 lbf ft)

- Cable: \varnothing 6 mm (0.236 in), PA coated 8 Nm (5.9 lbf ft)
- Cable: \varnothing 6 mm (0.236 in) 20 Nm (14.75 lbf ft)
- Cable: \varnothing 11 mm (0.433 in), PA coated 20 Nm (14.75 lbf ft)
- Rod: \varnothing 16 mm (0.63 in) 20 Nm (14.75 lbf ft)

Torque for NPT cable glands and Conduit tubes

- Plastic housing max. 10 Nm (7.376 lbf ft)
- Aluminium/Stainless steel housing max. 50 Nm (36.88 lbf ft)

Input variable

| | |
|--|-----------------|
| Measured variable | Level of solids |
| Min. dielectric constant of the medium | ≥ 1.5 |

Output variable

Output

- Physical layer Digital output signal according to standard EIA-485
 - Bus specifications Modbus Application Protocol V1.1b3, Modbus over serial line V1.02
 - Data protocols Modbus RTU, Modbus ASCII, Levelmaster
- Max. transmission rate 57.6 Kbit/s

Measurement accuracy (according to DIN EN 60770-1)

Process reference conditions according to DIN EN 61298-1

- Temperature +18 ... +30 °C (+64 ... +86 °F)
- Relative humidity 45 ... 75 %
- Air pressure +860 ... +1060 mbar/+86 ... +106 kPa
(+12.5 ... +15.4 psig)

Mounting, reference conditions

- Min. distance to internal installations > 500 mm (19.69 in)
 - Vessel metallic, \varnothing 1 m (3.281 ft), centric mounting, process fitting flush with the vessel ceiling
 - Reflector metallic, \varnothing 1 m
 - Medium Bulk solids - cereals, flour, cement (dielectric constant \sim 2.0)
 - Mounting Probe end does not touch the vessel bottom
- Sensor parameter adjustment No gating out of false signals carried out

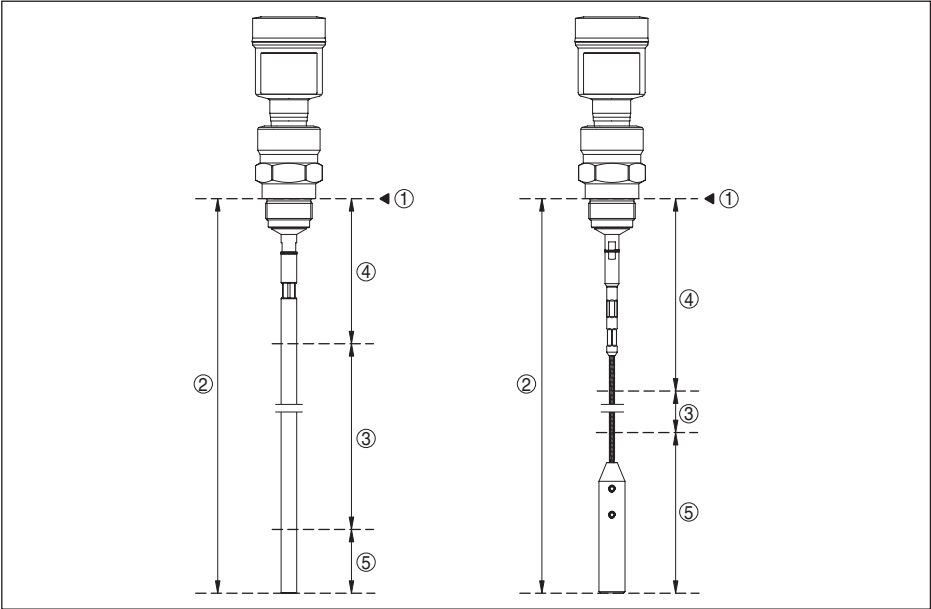


Fig. 35: Measuring ranges - VEGAFLEX 82

- 1 Reference plane
- 2 Probe length L
- 3 Measuring range
- 4 Upper blocking distance (see following diagrams - grey section)
- 5 Lower blocking distance (see following diagrams - grey section)

Typical deviation ⁴⁾

See following diagrams

⁴⁾ Depending on the mounting conditions, deviations can occur which can be rectified by adapting the adjustment or changing the measured value offset in the DTM service mode.

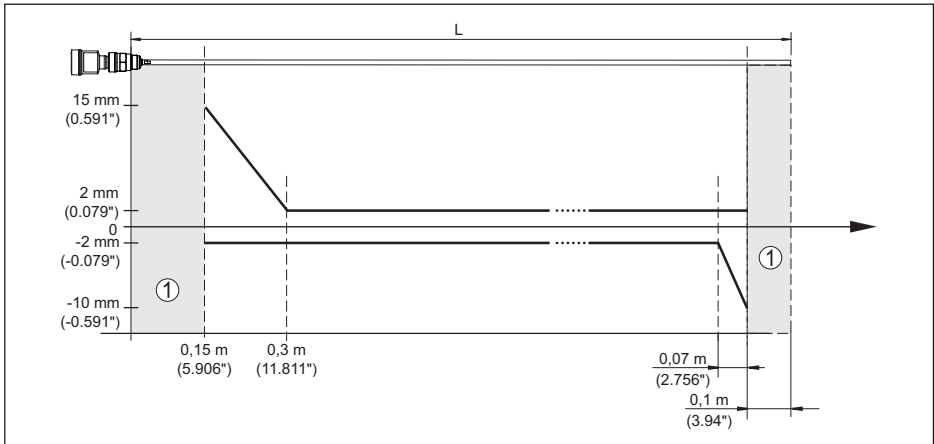


Fig. 36: Deviation VEGAFLEX 82 in rod version

- 1 Blocking distance (no measurement possible in this area)
- L Probe length

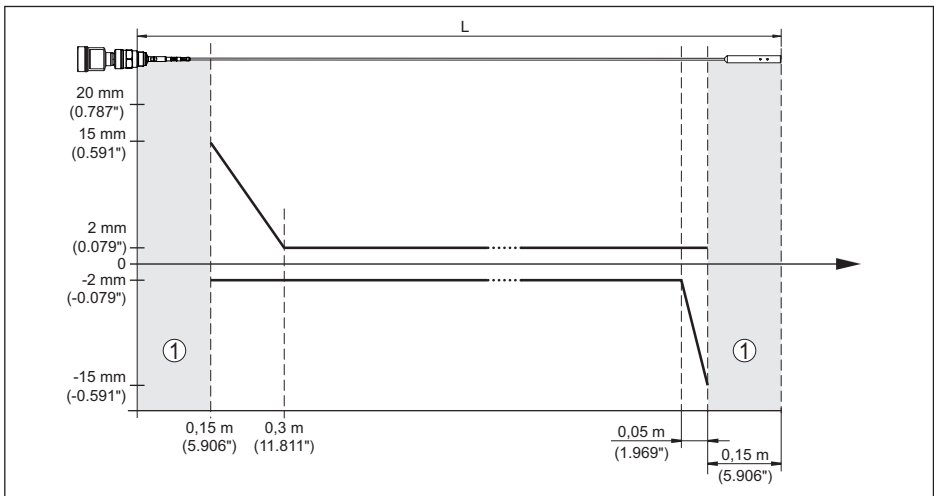


Fig. 37: Deviation VEGAFLEX 82 in cable version

- 1 Blocking distance (no measurement possible in this area)
- L Probe length

Non-repeatability $\leq \pm 1 \text{ mm}$

Variables influencing measurement accuracy

Temperature drift - Digital output $\pm 3 \text{ mm}/10 \text{ K}$ relating to the max. measuring range or max. 10 mm (0.394 in)

Additional deviation through electromagnetic interference acc. to EN 61326 $< \pm 10 \text{ mm}$ ($< \pm 0.394 \text{ in}$)

Influence of the superimposed gas and pressure on measurement accuracy

The propagation speed of the radar impulses in gas or vapour above the medium is reduced by high pressure. This effect depends on the superimposed gas or vapours.

The following table shows the resulting deviation for some typical gases and vapours. The specified values refer to the distance. Positive values mean that the measured distance is too large, negative values that the measured distance is too small.

| Gas phase | Temperature | Pressure | | |
|-------------------------|-----------------|-------------------|-------------------|-------------------|
| | | 1 bar (14.5 psig) | 10 bar (145 psig) | 50 bar (725 psig) |
| Air | 20 °C (68 °F) | 0 % | 0.22 % | 1.2 % |
| | 200 °C (392 °F) | -0.01 % | 0.13 % | 0.74 % |
| | 400 °C (752 °F) | -0.02 % | 0.08 % | 0.52 % |
| Hydrogen | 20 °C (68 °F) | -0.01 % | 0.1 % | 0.61 % |
| | 200 °C (392 °F) | -0.02 % | 0.05 % | 0.37 % |
| | 400 °C (752 °F) | -0.02 % | 0.03 % | 0.25 % |
| Steam (saturated steam) | 100 °C (212 °F) | 0.26 % | - | - |
| | 180 °C (356 °F) | 0.17 % | 2.1 % | - |
| | 264 °C (507 °F) | 0.12 % | 1.44 % | 9.2 % |
| | 366 °C (691 °F) | 0.07 % | 1.01 % | 5.7 % |

Characteristics and performance data

| | |
|----------------------------------|--|
| Measuring cycle time | < 500 ms |
| Step response time ⁵⁾ | ≤ 3 s |
| Max. filling/emptying speed | 1 m/min |
| | Products with high dielectric constant (> 10) up to 5 m/minute |

Ambient conditions

| | |
|--|----------------------------------|
| Ambient, storage and transport temperature | |
| - Standard | -40 ... +80 °C (-40 ... +176 °F) |
| - CSA, Ordinary Location | -40 ... +60 °C (-40 ... +140 °F) |

Process conditions

For the process conditions, please also note the specifications on the type label. The lowest value always applies.

The measurement error through the process conditions in the specified pressure and temperature range is < 1 %.

Process pressure -1 ... +40 bar/-100 ... +4000 kPa (-14.5 ... +580 psig), depending on the process fitting

Vessel pressure relating to the flange nominal pressure stage see supplementary instructions manual " *Flanges according to DIN-EN-ASME-JIS*"

⁵⁾ Time span after a sudden measuring distance change by max. 0.5 m in liquid applications, max 2 m with bulk solids applications, until the output signal has taken for the first time 90 % of the final value (IEC 61298-2).

Process temperature - Cable versions with PA coating -40 ... +80 °C (-40 ... +176 °F)

Process temperature (thread or flange temperature) with process seals

- FKM (SHS FPM 70C3 GLT) -40 ... +150 °C (-40 ... +302 °F)
- EPDM (A+P 70.10-02) -40 ... +150 °C (-40 ... +302 °F)
- FFKM (Kalrez 6375) - with temperature adapter -20 ... +200 °C (-4 ... +392 °F)

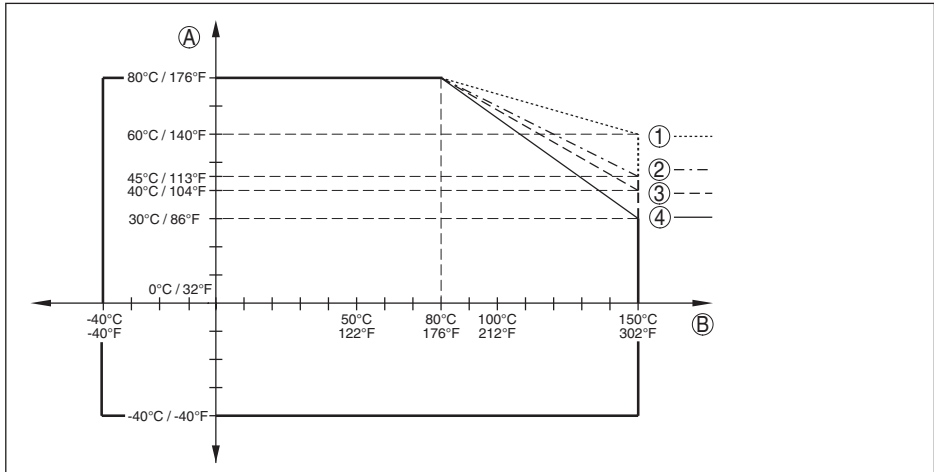


Fig. 38: Ambient temperature - process temperature, standard version

- A Ambient temperature
 B Process temperature (depending on the seal material)
- 1 Aluminium housing
 - 2 Plastic housing
 - 3 Stainless steel housing (precision casting)
 - 4 Stainless steel housing (electropolished)

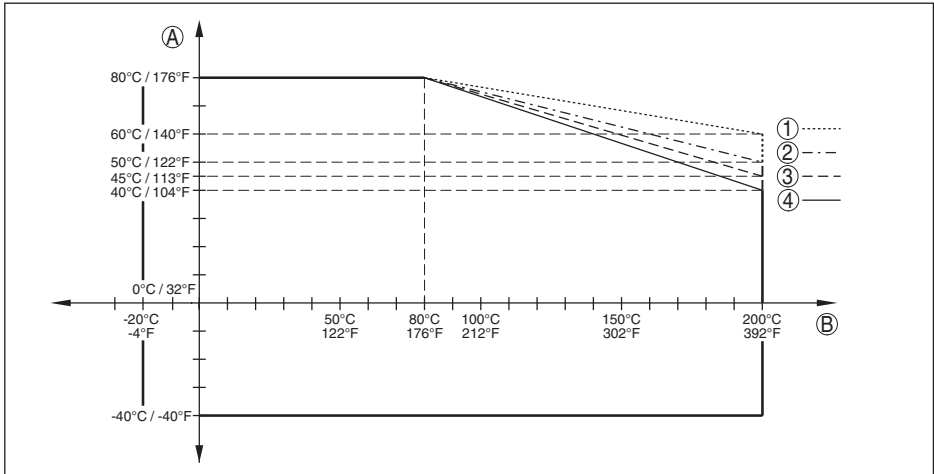


Fig. 39: Ambient temperature - process temperature, version with temperature adapter

- A Ambient temperature
- B Process temperature (depending on the seal material)
- 1 Aluminium housing
- 2 Plastic housing
- 3 Stainless steel housing (precision casting)
- 4 Stainless steel housing (electropolished)

Vibration resistance

- Rod probe 1 g with 5 ... 200 Hz according EN 60068-2-6 (vibration at resonance) with rod length 50 cm (19.69 in)

Shock resistance

- Rod probe 25 g, 6 ms according to EN 60068-2-27 (mechanical shock) with rod length 50 cm (19.69 in)

Electromechanical data - version IP67

Options of the cable entry

- Cable entry M20 x 1.5; ½ NPT
- Cable gland M20 x 1.5; ½ NPT (cable ø see below table)
- Blind plug M20 x 1.5; ½ NPT
- Closing cap ½ NPT

| Material cable gland | Material seal insert | Cable diameter | | | | |
|----------------------|----------------------|----------------|------------|-------------|-------------|--------------|
| | | 4.5 ... 8.5 mm | 5 ... 9 mm | 6 ... 12 mm | 7 ... 12 mm | 10 ... 14 mm |
| PA | NBR | - | ● | ● | - | ● |
| Brass, nickel-plated | NBR | ● | ● | ● | - | - |
| Stainless steel | NBR | - | ● | ● | - | ● |

41833-EN-230605

Wire cross-section (spring-loaded terminals)

| | |
|---------------------------------|---|
| – Massive wire, stranded wire | 0.2 ... 2.5 mm ² (AWG 24 ... 14) |
| – Stranded wire with end sleeve | 0.2 ... 1.5 mm ² (AWG 24 ... 16) |

Integrated clock

| | |
|----------------------------|----------------|
| Date format | Day.Month.Year |
| Time format | 12 h/24 h |
| Time zone, factory setting | CET |
| Max. rate deviation | 10.5 min/year |

Additional output parameter - Electronics temperature

| | |
|--|---------------------------------------|
| Range | -40 ... +85 °C (-40 ... +185 °F) |
| Resolution | < 0.1 K |
| Deviation | ± 3 K |
| Availability of the temperature values | |
| – Indication | Via the display and adjustment module |
| – Output | Via the respective output signal |

Voltage supply

| | |
|----------------------------|---------------|
| Operating voltage | 8 ... 30 V DC |
| Max. power consumption | 520 mW |
| Reverse voltage protection | Integrated |

Potential connections and electrical separating measures in the instrument

| | |
|--|--|
| Electronics | Non-floating |
| Galvanic separation | |
| – between electronics and metallic parts of the device | Reference voltage 500 V AC |
| Conductive connection | Between ground terminal and metallic process fitting |

Electrical protective measures

| | |
|---|--|
| Protection, depending on housing version | |
| – Plastic housing | IP67 acc. to IEC 60529, Type 4X acc. to NEMA |
| – Aluminium housing; stainless steel housing - precision casting | IP68 (0.2 bar) acc. to IEC 60529, Type 6P acc. to NEMA |
| Connection of the feeding power supply unit to networks of overvoltage category | III |
| Pollution degree ⁶⁾ | 4 |
| Protection rating (IEC 61010-1) | III |

11.2 Device communication Modbus

In the following, the necessary device-specific details are shown. You can find further information of

⁶⁾ When used with fulfilled housing protection

Modbus on www.modbus.org.

Parameters for the bus communication

The VEGAFLEX 82 is preset with the following default values:

| Parameter | Configurable Values | Default Value |
|----------------------|-------------------------------|---------------|
| Baud Rate | 1200, 2400, 4800, 9600, 19200 | 9600 |
| Start Bits | 1 | 1 |
| Data Bits | 7, 8 | 8 |
| Parity | None, Odd, Even | None |
| Stop Bits | 1, 2 | 1 |
| Address range Modbus | 1 ... 255 | 246 |

Start bits and data bits cannot be modified.

General configuration of the host

The data exchange with status and variables between field device and host is carried out via register. For this, a configuration in the host is required. Floating point numbers with short prevision (4 bytes) according to IEEE 754 are transmitted with individually selectable order of the data bytes (byte transmission order). This "Byte transmission order" is determined in the parameter "Format Code". Hence the RTU knows the registers of the VEGAFLEX 82 which must be contacted for the variables and status information.

| Format Code | Byte transmission order |
|-------------|-------------------------|
| 0 | ABCD |
| 1 | CDAB |
| 2 | DCBA |
| 3 | BADC |

11.3 Modbus register

Holding Register

The Holding registers consist of 16 bit. They can be read and written. Before each command, the address (1 byte), after each command, a CRC (2 byte) is sent.

| Register Name | Register Number | Type | Configurable Values | Default Value | Unit |
|-----------------------------------|-----------------|------|---|---------------|------|
| Address | 200 | Word | 1 ... 255 | 246 | – |
| Baud Rate | 201 | Word | 1200, 2400, 4800, 9600, 19200, 38400, 57600 | 9600 | – |
| Parity | 202 | Word | 0 = None, 1 = Odd, 2 = Even | 0 | – |
| Stopbits | 203 | Word | 1 = One, 2 = Two | 1 | – |
| Delay Time | 206 | Word | 10 ... 250 | 50 | ms |
| Byte Oder (Floating point format) | 3000 | Word | 0, 1, 2, 3 | 0 | – |

41833-EN-230605

Input register

The input registers consist of 16 bits. They can only be read. The address (1 byte) is sent before each command, a CRC (2 bytes) after each command. PV, SV, TV and QV can be set via the sensor DTM.

| Register Name | Register Number | Type | Note |
|---------------|-----------------|-------|--|
| Status | 100 | DWord | Bit 0: Invalid Measurement Value PV Bit 1: Invalid Measurement Value SV Bit 2: Invalid Measurement Value TV Bit 3: Invalid Measurement Value QV |
| PV Unit | 104 | DWord | Unit Code |
| PV | 106 | | Primary Variable in Byte Order CDAB |
| SV Unit | 108 | DWord | Unit Code |
| SV | 110 | | Secondary Variable in Byte Order CDAB |
| TV Unit | 112 | DWord | Unit Code |
| TV | 114 | | Third Variable in Byte Order CDAB |
| QV Unit | 116 | DWord | Unit Code |
| QV | 118 | | Quarternary Variable in Byte Order CDAB |
| | | | |
| Status | 1300 | DWord | See Register 100 |
| PV | 1302 | | Primary Variable in Byte Order of Register 3000 |
| SV | 1304 | | Secondary Variable in Byte Order of Register 3000 |
| TV | 1306 | | Third Variable in Byte Order of Register 3000 |
| QV | 1308 | | Quarternary Variable in Byte Order of Register 3000 |
| | | | |
| Status | 1400 | DWord | See Register 100 |
| PV | 1402 | | Primary Variable in Byte Order CDAB |
| Status | 1412 | DWord | See Register 100 |
| SV | 1414 | | Secondary Variable in Byte Order CDAB |
| Status | 1424 | DWord | See Register 100 |
| TV | 1426 | | Third Variable in Byte Order CDAB |
| Status | 1436 | DWord | See Register 100 |
| QV | 1438 | | Quarternary Variable in Byte Order CDAB |
| | | | |
| Status | 2000 | DWord | See Register 100 |
| PV | 2002 | DWord | Primary Variable in Byte Order ABCD (Big Endian) |
| SV | 2004 | DWord | Secondary Variable in Byte Order ABCD (Big Endian) |
| TV | 2006 | DWord | Third Variable in Byte Order ABCD (Big Endian) |
| QV | 2008 | DWord | Quarternary Variable in Byte Order ABCD (Big Endian) |
| | | | |
| Status | 2100 | DWord | See Register 100 |

| Register Name | Register Number | Type | Note |
|---------------|-----------------|-------|---|
| PV | 2102 | DWord | Primary Variable in Byte Order DCBA (Little Endian) |
| SV | 2104 | DWord | Secondary Variable in Byte Order DCBA (Little Endian) |
| TV | 2106 | DWord | Third Variable in Byte Order ABCD DCBA (Little Endian) |
| QV | 2108 | DWord | Quarternary Variable in Byte Order DCBA (Little Endian) |
| | | | |
| Status | 2200 | DWord | See Register 100 |
| PV | 2202 | DWord | Primary Variable in Byte Order BACD (Middle Endian) |
| SV | 2204 | DWord | Secondary Variable in Byte Order BACD (Middle Endian) |
| TV | 2206 | DWord | Third Variable in Byte Order BACD (Middle Endian) |
| QV | 2208 | DWord | Quarternary Variable in Byte Order BACD (Middle Endian) |

Unit Codes for Register 104, 108, 112, 116

| Unit Code | Measurement Unit |
|-----------|-------------------|
| 32 | Degree Celsius |
| 33 | Degree Fahrenheit |
| 40 | US Gallon |
| 41 | Liters |
| 42 | Imperial Gallons |
| 43 | Cubic Meters |
| 44 | Feet |
| 45 | Meters |
| 46 | Barrels |
| 47 | Inches |
| 48 | Centimeters |
| 49 | Millimeters |
| 111 | Cubic Yards |
| 112 | Cubic Feet |
| 113 | Cubic Inches |

11.4 Modbus RTU commands

FC3 Read Holding Register

With this command, any number (1-127) of holding registers is read out. The start register, from which the readout should start, and the number of registers are transmitted.

| | Parameter | Length | Code/Data |
|----------|---------------------|---------|------------------|
| Request: | Function Code | 1 Byte | 0x03 |
| | Start Address | 2 Bytes | 0x0000 to 0xFFFF |
| | Number of Registers | 2 Bytes | 1 to 127 (0x7D) |

41833-EN-230605

| | Parameter | Length | Code/Data |
|-----------|----------------|-----------|-----------|
| Response: | Function Code | 1 Byte | 0x03 |
| | Byte Count | 2 Bytes | 2*N |
| | Register Value | N*2 Bytes | Data |

FC4 Read Input Register

With this command, any number (1-127) of input registers is read out. The start register, from which the readout should start, and the number of registers are transmitted.

| | Parameter | Length | Code/Data |
|-----------|---------------------|-----------|------------------|
| Request: | Function Code | 1 Byte | 0x04 |
| | Start Address | 2 Bytes | 0x0000 to 0xFFFF |
| | Number of Registers | N*2 Bytes | 1 to 127 (0x7D) |
| Response: | Function Code | 1 Byte | 0x04 |
| | Byte Count | 2 Bytes | 2*N |
| | Register Value | N*2 Bytes | Data |

FC6 Write Single Register

This function code is used to write to a single Holding Register.

| | Parameter | Length | Code/Data |
|-----------|---------------------|---------|------------------|
| Request: | Function Code | 1 Byte | 0x06 |
| | Start Address | 2 Bytes | 0x0000 to 0xFFFF |
| | Number of Registers | 2 Bytes | Data |
| Response: | Function Code | 1 Byte | 0x04 |
| | Start Address | 2 Bytes | 2*N |
| | Register Value | 2 Bytes | Data |

FC8 Diagnostics

With this function code different diagnostic functions are triggered or diagnostic values read out.

| | Parameter | Length | Code/Data |
|-----------|-------------------|-----------|-----------|
| Request: | Function Code | 1 Byte | 0x08 |
| | Sub Function Code | 2 Bytes | |
| | Data | N*2 Bytes | Data |
| Response: | Function Code | 1 Byte | 0x08 |
| | Sub Function Code | 2 Bytes | |
| | Data | N*2 Bytes | Data |

Implemented function codes:

| Sub Function Code | Name |
|-------------------|------------------------|
| 0x00 | Return Data Request |
| 0x0B | Return Message Counter |

With sub function codes 0x00 only one 16 bit value can be written.

FC16 Write Multiple Register

This function code is used to write to several Holding Registers. In a request, it can only be written to registers that are in direct succession.

| | Parameter | Length | Code/Data |
|-----------|---------------------|-----------|------------------|
| Request: | Function Code | 1 Byte | 0x10 |
| | Start Address | 2 Bytes | 0x0000 to 0xFFFF |
| | Number of Registers | 2 Bytes | 0x0001 to 0x007B |
| | Byte Count | 1 Byte | 2*N |
| | Register Value | N*2 Bytes | Data |
| Response: | Function Code | 1 Byte | 0x10 |
| | Start Address | 2 Bytes | 0x0000 to 0xFFFF |
| | Number of Registers | 2 Bytes | 0x01 to 0x7B |

FC17 Report Sensor ID

With this function code, the sensor ID on Modbus is queried.

| | Parameter | Length | Code/Data |
|-----------|----------------------|--------|-----------|
| Request: | Function Code | 1 Byte | 0x11 |
| Response: | Function Code | 1 Byte | 0x11 |
| | Byte Number | 1 Byte | |
| | Sensor ID | 1 Byte | |
| | Run Indicator Status | 1 Byte | |

FC43 Sub 14, Read Device Identification

With this function code, the Device Identification is queried.

| | Parameter | Length | Code/Data |
|----------|---------------------|--------|--------------|
| Request: | Function Code | 1 Byte | 0x2B |
| | MEI Type | 1 Byte | 0x0E |
| | Read Device ID Code | 1 Byte | 0x01 to 0x04 |
| | Object ID | 1 Byte | 0x00 to 0xFF |

| | Parameter | Length | Code/Data |
|-----------|-----------------------|--------|------------------------------------|
| Response: | Function Code | 1 Byte | 0x2B |
| | MEI Type | 1 Byte | 0x0E |
| | Read Device ID Code | 1 Byte | 0x01 to 0x04 |
| | Confirmity Level | 1 Byte | 0x01, 0x02, 0x03, 0x81, 0x82, 0x83 |
| | More follows | 1 Byte | 00/FF |
| | Next Object ID | 1 Byte | Object ID number |
| | Number of Objects | 1 Byte | |
| | List of Object ID | 1 Byte | |
| | List of Object length | 1 Byte | |
| | List of Object value | 1 Byte | Depending on the Object ID |

11.5 Levelmaster commands

The VEGAFLEX 82 is also suitable for connection to the following RTUs with Levelmaster protocol. The Levelmaster protocol is often called "*Siemens*" "*Tank protocol*".

| RTU | Protocol |
|---------------------------|-------------|
| ABB Totalflow | Levelmaster |
| Kimray DACC 2000/3000 | Levelmaster |
| Thermo Electron Autopilot | Levelmaster |

Parameters for the bus communication

The VEGAFLEX 82 is preset with the default values:

| Parameter | Configurable Values | Default Value |
|---------------------------|-------------------------------|---------------|
| Baud Rate | 1200, 2400, 4800, 9600, 19200 | 9600 |
| Start Bits | 1 | 1 |
| Data Bits | 7, 8 | 8 |
| Parity | None, Odd, Even | None |
| Stop Bits | 1, 2 | 1 |
| Address range Levelmaster | 32 | 32 |

The Levelmaster commands are based on the following syntax:

- Capital letters are at the beginning of certain data fields
- Small letters stand for data fields
- All commands are terminated with "*<cr>*" (carriage return)
- All commands start with "*Uuu*", whereby "*uu*" stands for the address (00-31)
- "*''*" can be used as a joker for any position in the address. The sensor always converts this in its address. In case of more than one sensor, the joker must not be used, because otherwise several slaves will answer
- Commands that modify the instrument return the command with "*OK*". "*EE-ERROR*" replaces "*OK*" if there was a problem changing the configuration

Report Level (and Temperature)

| | Parameter | Length | Code/Data |
|-----------|--------------------------------|---------------------|---|
| Request: | Report Level (and Temperature) | 4 characters ASCII | Uuu? |
| Response: | Report Level (and Temperature) | 24 characters ASCII | UuuDIII.IIFttEeeeeWwww uu = Address III.II = PV in inches tt = Temperature in Fahrenheit eeee = Error number (0 no error, 1 level data not readable) www = Warning number (0 no warning) |

PV in inches will be repeated if " *Set number of floats*" is set to 2. Hence 2 measured values can be transmitted. PV value is transmitted as first measured value, SV as second measured value.



Information:

The max. value for the PV to be transmitted is 999.99 inches (corresponds to approx. 25.4 m).

If the temperature should be transmitted in the Levelmaster protocol, then TV must be set in the sensor to temperature.

PV, SV and TV can be adjusted via the sensor DTM.

Report Unit Number

| | Parameter | Length | Code/Data |
|-----------|--------------------------------|--------------------|-----------|
| Request: | Report Unit Number | 5 characters ASCII | U**N? |
| Response: | Report Level (and Temperature) | 6 characters ASCII | UuuNnn |

Assign Unit Number

| | Parameter | Length | Code/Data |
|-----------|--------------------|--------------------|----------------------------|
| Request: | Assign Unit Number | 6 characters ASCII | UuuNnn |
| Response: | Assign Unit Number | 6 characters ASCII | UuuNOK uu = new Address |

Set number of Floats

| | Parameter | Length | Code/Data |
|-----------|----------------------|--------------------|-----------|
| Request: | Set number of Floats | 5 characters ASCII | UuuFn |
| Response: | Set number of Floats | 6 characters ASCII | UuuFOK |

If the number is set to 0, no level is returned

Set Baud Rate

| | Parameter | Length | Code/Data |
|-----------|---------------|-------------------------|--|
| Request: | Set Baud Rate | 8 (12) characters ASCII | UuuBbbbb[b][pds] Bbbbb[b] = 1200, 9600 (default) pds = parity, data length, stop bit (optional) parity: none = N, even = E (default), odd = O |
| Response: | Set Baud Rate | 11 characters ASCII | |

Example: U01B9600E71

Change instrument on address 1 to baudrate 9600, parity even, 7 data bits, 1 stop bit

Set Receive to Transmit Delay

| | Parameter | Length | Code/Data |
|-----------|-------------------------------|--------------------|---|
| Request: | Set Receive to Transmit Delay | 7 characters ASCII | UuuRmmm mmm = milliseconds (50 up to 250), default = 127 ms |
| Response: | Set Receive to Transmit Delay | 6 characters ASCII | UuuROK |

Report Number of Floats

| | Parameter | Length | Code/Data |
|-----------|-------------------------|--------------------|--|
| Request: | Report Number of Floats | 4 characters ASCII | UuuF |
| Response: | Report Number of Floats | 5 characters ASCII | UuuFn n = number of measurement values (0, 1 or 2) |

Report Receive to Transmit Delay

| | Parameter | Length | Code/Data |
|-----------|----------------------------------|--------------------|--|
| Request: | Report Receive to Transmit Delay | 4 characters ASCII | UuuR |
| Response: | Report Receive to Transmit Delay | 7 characters ASCII | UuuRmmm mmm = milliseconds (50 up to 250), default = 127 ms |

Error codes

| Error Code | Name |
|------------|--|
| EE-Error | Error While Storing Data in EEPROM |
| FR-Error | Error in Frame (too short, too long, wrong data) |
| LV-Error | Value out of limits |

11.6 Configuration of typical Modbus hosts

Fisher ROC 809

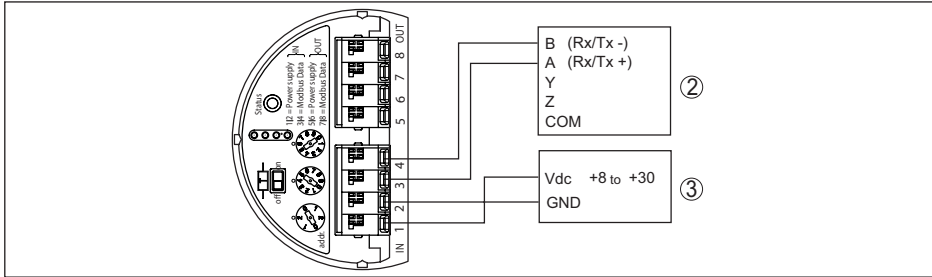


Fig. 40: Connection of VEGAFLEX 82 to RTU Fisher ROC 809

- 1 VEGAFLEX 82
- 2 RTU Fisher ROC 809
- 3 Voltage supply

Parameters for Modbus Hosts

| Parameter | Value Fisher ROC 809 | Value ABB Total Flow | Value Fisher Thermo Electron Autopilot | Value Fisher Bristol Control-Wave Micro | Value Scada-Pack |
|----------------------------|----------------------|----------------------|--|---|------------------|
| Baud Rate | 9600 | 9600 | 9600 | 9600 | 9600 |
| Floating Point Format Code | 0 | 0 | 0 | 2 (FC4) | 0 |
| RTU Data Type | Conversion Code 66 | 16 Bit Modicon | IEE Fit 2R | 32-bit registers as 2 16-bit registers | Floating Point |
| Input Register Base Number | 0 | 1 | 0 | 1 | 30001 |

The basic number of the input registers is always added to the input register address of VEGAFLEX 82.

This results in the following constellations:

- Fisher ROC 809 - Register address for 1300 is address 1300
- ABB Total Flow - Register address for 1302 is address 1303
- Thermo Electron Autopilot - Register address for 1300 is address 1300
- Bristol ControlWave Micro - Register address for 1302 is address 1303
- ScadaPack - Register address for 1302 is address 31303

11.7 Dimensions

The following dimensional drawings represent only an extract of all possible versions. Detailed dimensional drawings can be downloaded at www.vega.com/downloads under "Drawings".

Housing

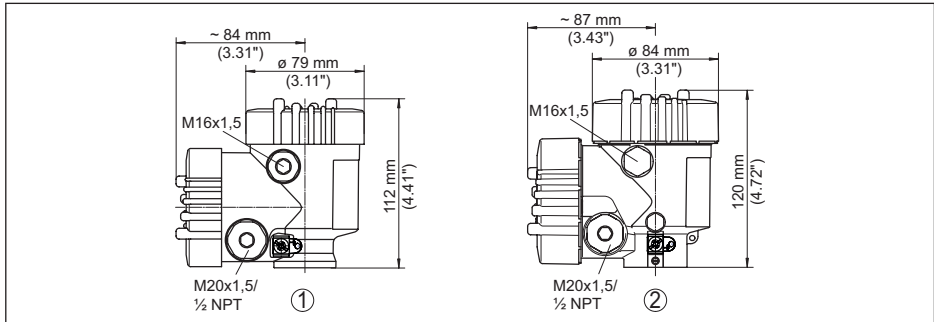


Fig. 41: Dimensions housing (with integrated display and adjustment module the housing is 9 mm/0.35 in higher)

- 1 Plastic double chamber
- 2 Aluminium/Stainless steel double chamber

VEGAFLEX 82, cable version \varnothing 4 mm (0.157 in), \varnothing 6 mm (0.236 in), PA coated

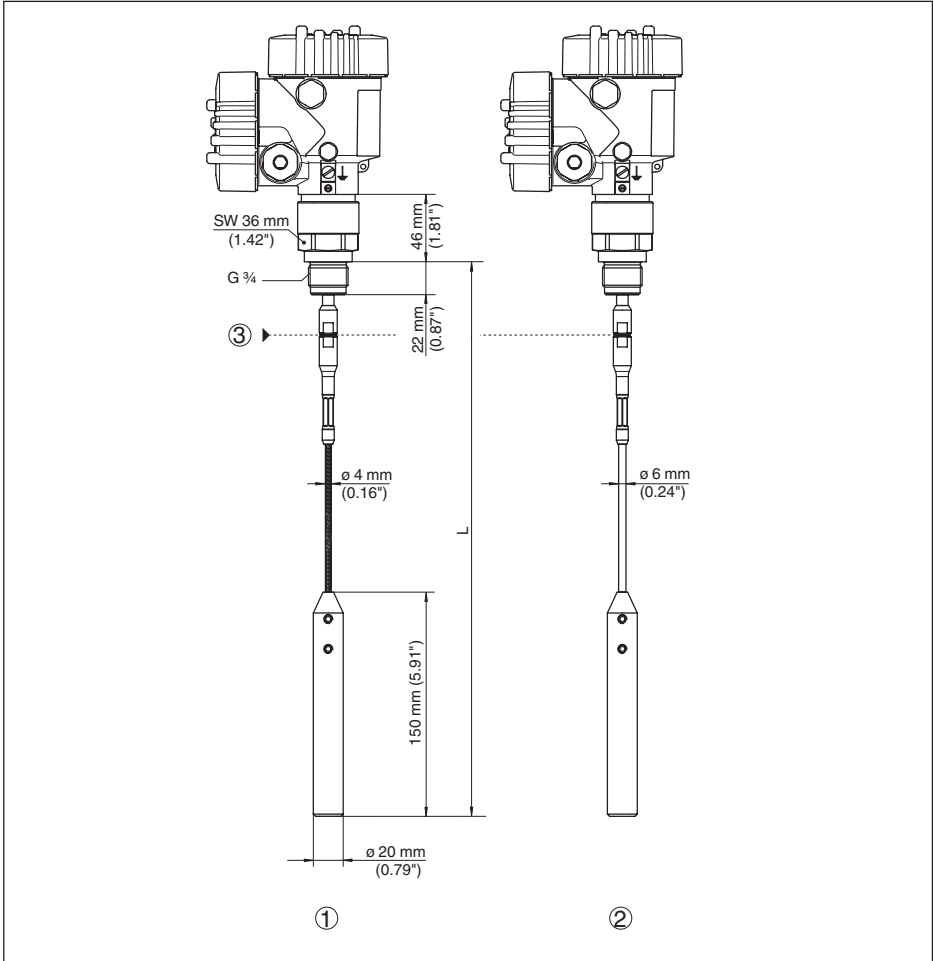


Fig. 42: VEGAFLEX 82, cable \varnothing 4 mm (0.157 in), \varnothing 6 mm (0.236 in) threaded version with gravity weight (all gravity weights with thread M12 for eye-bolt)

L Sensor length, see chapter "Technical data"

1 Cable \varnothing 4 mm (0.157 in)

2 Cable \varnothing 6 mm (0.236 in), PA coated

3 Joint - cable

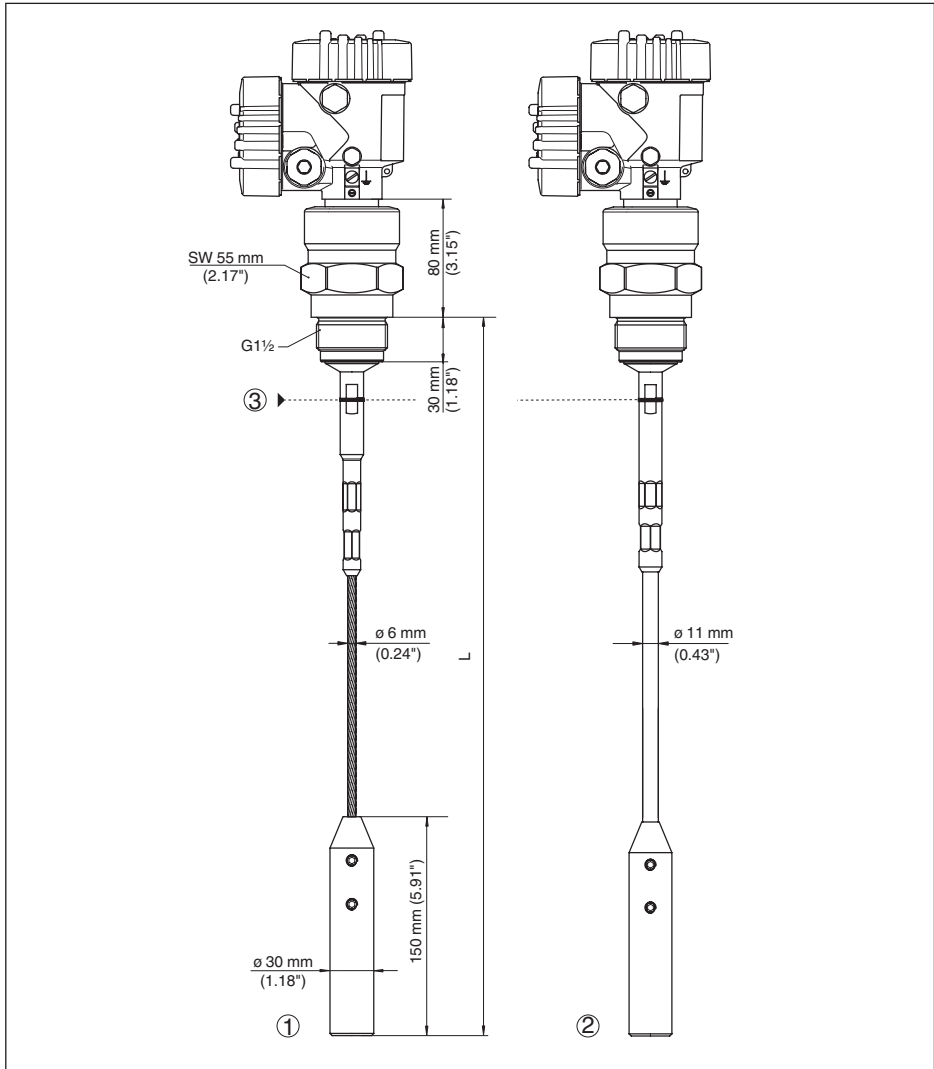
VEGAFLEX 82, cable version \varnothing 6 mm (0.236 in), \varnothing 11 mm (0.433 in), PA coated


Fig. 43: VEGAFLEX 82, cable \varnothing 6 mm (0.236 in), \varnothing 11 mm (0.433 in) threaded version with gravity weight (all gravity weights with thread M12 for eye-bolt)

L Sensor length, see chapter "Technical data"

- 1 Cable \varnothing 6 mm (0.236 in)
- 2 Cable \varnothing 11 mm (0.433 in), PA coated
- 3 Joint - cable

VEGAFLEX 82, rod version \varnothing 16 mm (0.63 in)

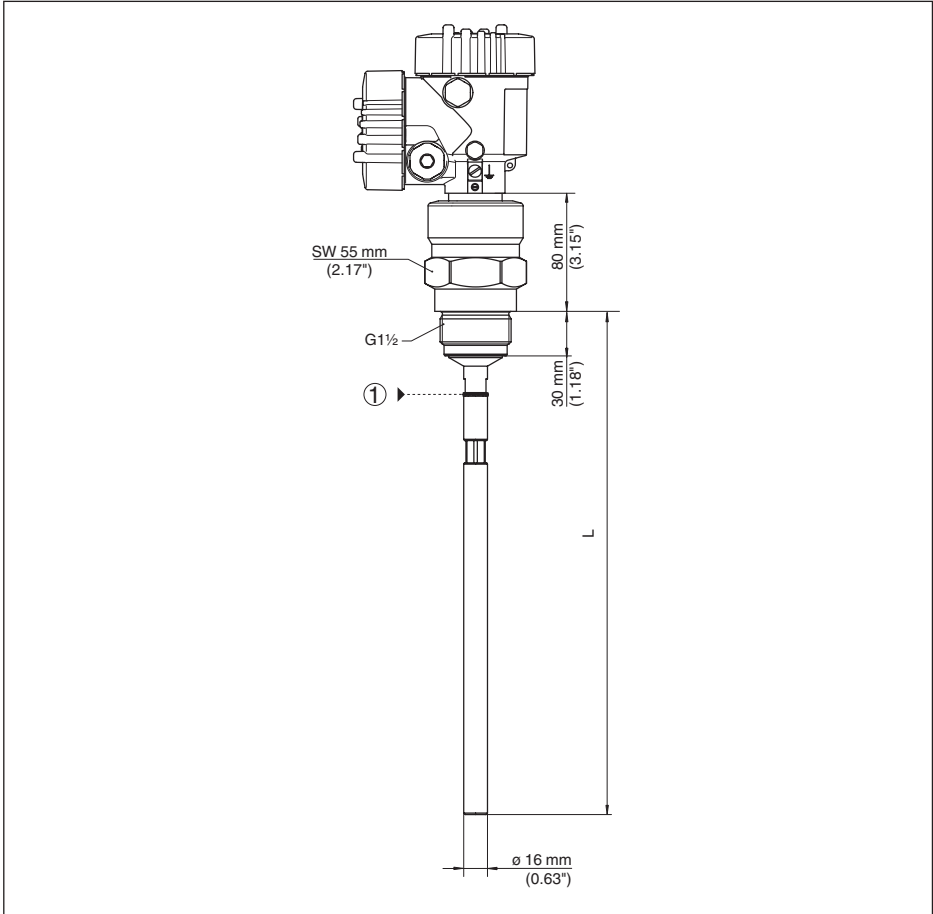


Fig. 44: VEGAFLEX 82, rod \varnothing 16 mm (0.63 in), threaded version

L Sensor length, see chapter "Technical data"

1 Joint - rod

11.8 Industrial property rights

VEGA product lines are global protected by industrial property rights. Further information see www.vega.com.

VEGA Produktfamilien sind weltweit geschützt durch gewerbliche Schutzrechte.

Nähere Informationen unter www.vega.com.

Les lignes de produits VEGA sont globalement protégées par des droits de propriété intellectuelle. Pour plus d'informations, on pourra se référer au site www.vega.com.

VEGA lineas de productos están protegidas por los derechos en el campo de la propiedad industrial. Para mayor información revise la pagina web www.vega.com.

Линии продукции фирмы ВЕГА защищаются по всему миру правами на интеллектуальную собственность. Дальнейшую информацию смотрите на сайте www.vega.com.

VEGA系列产品在全球享有知识产权保护。

进一步信息请参见网站 < www.vega.com。

11.9 Trademark

All the brands as well as trade and company names used are property of their lawful proprietor/originator.

INDEX

A

- Adjustment
 - Max. adjustment 29
 - Min. adjustment 30
- Adjustment system 25
- Application 29
- Application area 9

B

- Backlight 34

C

- Connection procedure 19
- Connection technology 19
- Copy sensor settings 39
- Current output 40
- Current output, adjustment 41
- Current output, meas. variable 41
- Current output, min./max. 32
- Current output mode 31
- Curve display
 - Echo curve 36

D

- Damping 30
- Date of manufacture 42
- Date/Time 37
- Default values 38
- Deviation 57
- Device status 34
- Display format 34

E

- Echo curve memory 53
- Echo curve of the setup 37
- Electronics compartment 21
- Error codes 55

F

- Factory calibration date 42
- False signal suppression 32
- Fault rectification 57
- Functional principle 9

H

- HART address 41

I

- Inflowing medium 15
- Installation position 13

K

- Key function 25

L

- Language 33
- Linearisation 30
- Lock adjustment 33

M

- Main menu 27
- Measured value indication 34
- Measured value memory 52
- Measurement loop name 28
- Measurement reliability 35

N

- NAMUR NE 107 53
 - Failure 54
 - Maintenance 56
 - Out of specification 55

P

- Peak indicator 35
- Probe length 28
- Probe type 41

Q

- Quick setup 27

R

- Read out info 42
- Repair 62
- Replacement parts
 - Rod components 10
 - Spacer 11
- Reset 37

S

- Scaling measured value 40
- Sensor characteristics 42
- Service hotline 59
- Simulation 36
- Special parameters 41

T

- Type label 7
- Type of medium 28

U

- Units 28

Printing date:

VEGA

All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.

Subject to change without prior notice

© VEGA Grieshaber KG, Schiltach/Germany 2023



41833-EN-230605

VEGA Grieshaber KG
Am Hohenstein 113
77761 Schiltach
Germany

Phone +49 7836 50-0
E-mail: info.de@vega.com
www.vega.com