

## Quick setup guide

TDR sensor for continuous level and interface measurement of liquids

### VEGAFLEX 86

Modbus

Rod and cable probe

-20 ... +250 °C



Document ID: 57774



**VEGA**

# Contents

- 1 For your safety ..... 3**
  - 1.1 Authorised personnel ..... 3
  - 1.2 Appropriate use..... 3
  - 1.3 Warning about incorrect use..... 3
  - 1.4 General safety instructions ..... 3
  - 1.5 EU conformity..... 4
  - 1.6 NAMUR recommendations ..... 4
  - 1.7 Environmental instructions ..... 4
- 2 Product description ..... 5**
  - 2.1 Configuration..... 5
- 3 Mounting ..... 7**
  - 3.1 General instructions for use of the instrument ..... 7
  - 3.2 Mounting instructions ..... 7
- 4 Connecting to power supply..... 10**
  - 4.1 Connecting..... 10
  - 4.2 Wiring plan, single chamber housing..... 11
- 5 Set up with the display and adjustment module ..... 13**
  - 5.1 Insert display and adjustment module ..... 13
  - 5.2 Parameter adjustment - Quick setup ..... 13
- 6 Supplement ..... 17**
  - 6.1 Technical data ..... 17



**Information:**

This quick setup guide enables quick setup and commissioning of your instrument.

You can find supplementary information in the corresponding, more detailed Operating Instructions Manual as well as the Safety Manual that comes with instruments with SIL qualification. These manuals are available in the download area of "[www.vega.com](http://www.vega.com)".

**Operating instructions VEGAFLEX 86 - Modbus - Rod and cable probe, -20 ... +250 °C: Document-ID 51520**

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# 1 For your safety

## 1.1 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.

## 1.2 Appropriate use

VEGAFLEX 86 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.

## 1.3 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.

## 1.4 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.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

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 and their meaning read in this operating instructions manual.

## 1.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

You can find the EU conformity declaration on our website under [www.vega.com/downloads](http://www.vega.com/downloads).

### 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.

## 1.6 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](http://www.namur.de).

## 1.7 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*"

## 2 Product description

### 2.1 Configuration

#### 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 reliability 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)
- Order-specific sensor data for an electronics exchange (XML)
- Test certificate (PDF) - optional

Go to "[www.vega.com](http://www.vega.com)", "*Instrument search (serial number)*". Enter the serial number.

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 Data Matrix code on the type label of the instrument or
- Enter the serial number manually in the app

## 3 Mounting

### Protection against moisture

### 3.1 General instructions for use of the instrument

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
- When mounting horizontally, turn the housing so that the cable gland or plug connector point downward
- 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.

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

Make sure that the degree of contamination specified in chapter "*Technical data*" meets the existing ambient conditions.

### Installation position

### 3.2 Mounting instructions

Mount VEGAFLEX 86 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 sensor 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 dead band) is stated in chapter "*Technical data*".

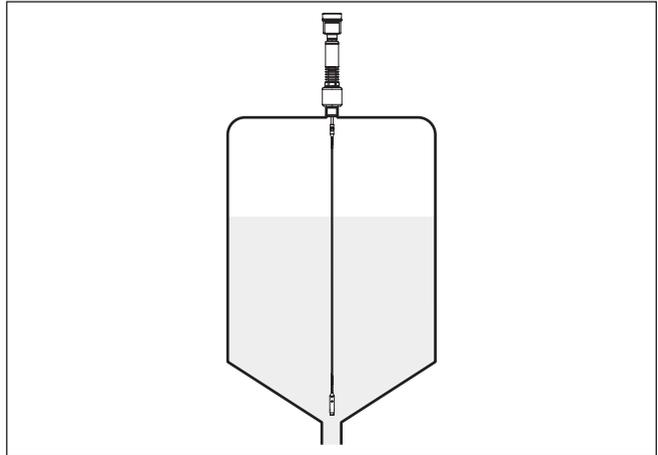


Fig. 2: Vessel with conical bottom

### 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 mounting rod or cable probes in vessels without metal walls, e.g. in plastic vessels, the measured value can be influenced by strong electromagnetic fields (emitted interference according to EN 61326: class A). In this case, use a probe with coaxial version.

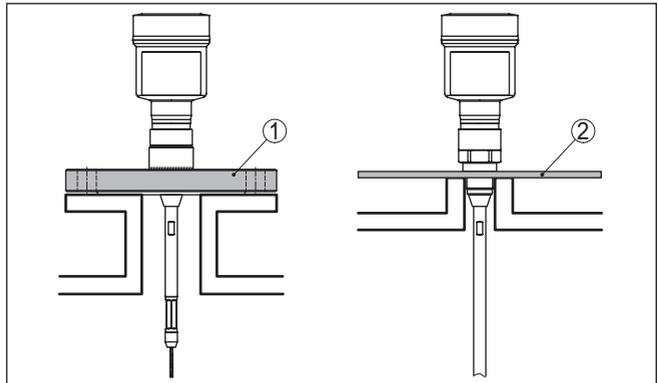


Fig. 3: Mounting in non-metallic vessel

- 1 Flange
- 2 Metal sheet

### Mounting socket

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

Higher sockets or sockets with a bigger diameter can generally be used. They can, however, increase the upper blocking distance (dead band). 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".

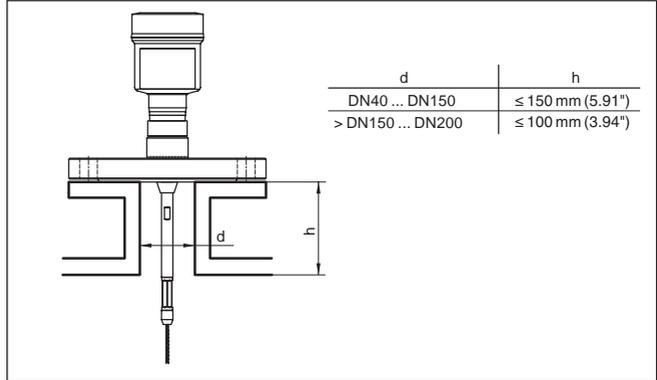


Fig. 4: Mounting socket

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

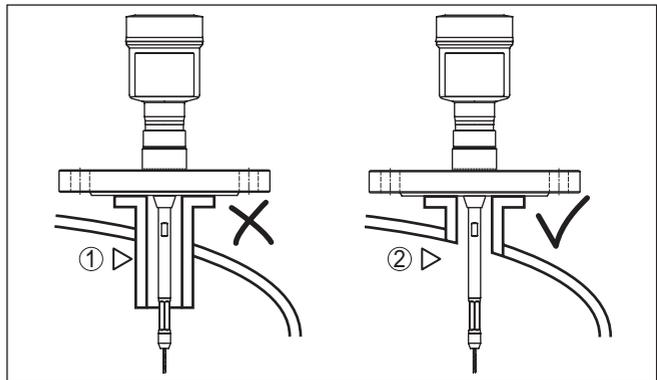


Fig. 5: Socket must be installed flush

- 1 Unfavourable mounting
- 2 Socket flush - optimum mounting

## 4 Connecting to power supply

### 4.1 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. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry



Fig. 6: Connection steps 5 and 6 - Single chamber housing

6. 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.

You can find further information on the max. wire cross-section under "*Technical data - Electromechanical data*".

7. Check the hold of the wires in the terminals by lightly pulling on them
8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation

9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
  10. Reinsert the display and adjustment module, if one was installed
  11. Screw the housing lid back on
- The electrical connection is finished.

## 4.2 Wiring plan, single chamber housing



The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

### Wiring plan - Daisy-Chain



#### Information:

With Modbus systems, several sensors can be connected in parallel. With this so called "Daisy-Chain" the cables for the signal and voltage supply are looped from sensor to sensor.

The last sensor in this "chain" must be provided with a bus termination. For this purpose there is a connectable terminating resistor on the electronics module. Make sure that the slid switch (5) on all sensors of the chain is set to "off". With the last sensor you have to set the slide switch (5) to position "on".

Please also take note of the information in the annex "Basics Modbus".

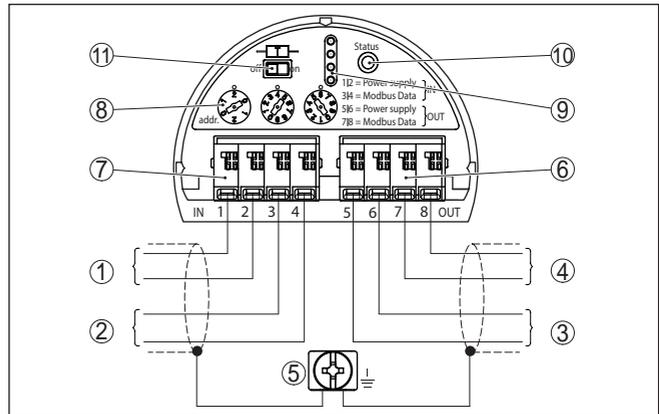


Fig. 7: Electronics compartment - Connection Daisy-Chain

- 1 Voltage supply
- 2 Signal input
- 3 Power supply (to further Modbus sensors)
- 4 Signal output (to further Modbus sensors)
- 5 Ground terminal in the housing
- 6 Terminal block - Output (OUT)
- 7 Terminal block - Input (IN)
- 8 Rotary switch for address setting
- 9 Contacts for the display and adjustment module or the interface adapter
- 10 Signal lamp - Status
- 11 Connectable bus resistor

**Wiring plan - Stub**

While connecting the sensor to a stub, the arrangement of the resistor is undefined.

Thus the connection via stub is generally possible, however not recommended.

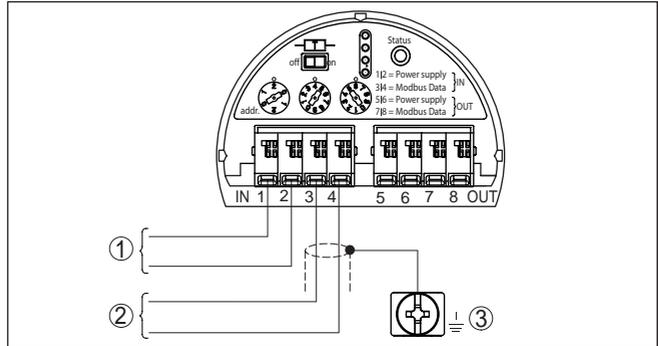


Fig. 8: Electronics compartment - Connection with stub

- 1 Voltage supply
- 2 Signal output
- 3 Ground terminal in the housing

## 5 Set up with the display and adjustment module

### 5.1 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. 9: Installing the display and adjustment module in the electronics compartment of the single chamber housing



#### 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.

### 5.2 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.



You can find "Extended adjustment" in the detailed operating instructions.

#### Quick setup

## General information

### Instrument address

An address must be assigned to each Modbus instrument. Each address may only be assigned once in the Modbus or Levelmaster network. The sensor is only recognized by the control system if the address is set correctly.

- Permitted address range - Modbus 0 ... 247
- Permitted address range - Levelmaster 0 ... 31

In delivery status, Modbus address 246 and Levelmaster address 31 are set by default. Hence the software addressing is possible by default.

The address setting is carried out either via:

- The address selection switch in the electronics compartment of the instrument (hardware addressing)
- The display and adjustment module (software addressing)
- PACTware/DTM (software addressing)

### Hardware addressing

Hardware addressing is effective if a Modbus address of 0 ... 245 is set with the address selection switches on the electronics module of VEGAFLEX 86. In such case, software addressing has no effect - only the set hardware address applies (Levelmaster addresses: 0 ... 30).

### Software addressing

Software addressing is only effective if address address 246 or higher is set on the instrument with the address selection switches (Levelmaster address: 31).



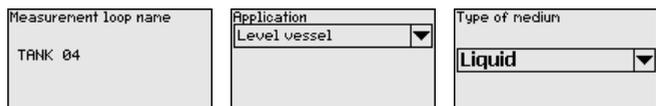
If you set a instrument address with the selection switches which is lower than 126, the set value is applicable. In such case, the address setting via the display and adjustment module has no effect.

### Measurement loop name

In the next menu item you can assign a suitable measurement loop name. You can enter a name with max. 19 characters.

### Application

In this menu item, you can select the application. You can choose between level measurement and interface measurement. You can also choose between measurement in a vessel or in a bypass or standpipe.



## Level measurement

### Medium - dielectric constant

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

**Max. adjustment**

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

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 dead band.

**Min. adjustment**

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

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).



**Interface measurement**

**Dielectric constant - upper medium**

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

**Max. adjustment**

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

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 dead band.

**Min. adjustment**

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

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).



**Max. adjustment - Interface**

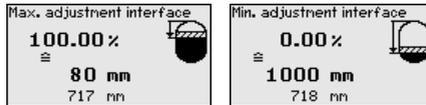
Carry out the max. adjustment for the interface.

To do this, enter the percentage value and the corresponding distance value in m for the full vessel.

**Min. adjustment - Interface**

Carry out the min. adjustment for the interface.

To do this, enter the percentage value and the corresponding distance value in m for the empty vessel.



## Linearisation

### 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 linearization applies for the measured value indication and the current output. By activating the suitable curve, the percentage vessel volume is displayed correctly.

### False signal suppression

High sockets and internal vessel installations cause interfering reflections and can influence the measurement.

A false signal suppression detects, marks and saves these false signals so that they are no longer taken into account for the level and interface measurement. We generally recommend carrying out a false signal suppression to achieve the best possible accuracy. This should be done with the lowest possible level so that all potential interfering reflections can be detected.

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

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

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



## 6 Supplement

### 6.1 Technical data

#### Note for approved instruments

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

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#### Electromechanical data - version IP 66/IP 67

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Cable gland	M20 x 1.5 or ½ NPT
Wire cross-section (spring-loaded terminals)	
– Massive wire, stranded wire	0.2 ... 2.5 mm <sup>2</sup> (AWG 24 ... 14)
– Stranded wire with end sleeve	0.2 ... 1.5 mm <sup>2</sup> (AWG 24 ... 16)

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#### Voltage supply

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Operating voltage	8 ... 30 V DC
Power consumption	< 500 mW
Reverse voltage protection	Integrated





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

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