

# Quick setup guide

Pressure transmitter with metallic measuring cell

## VEGABAR 81

Slave sensor for electronic differential pressure



Document ID: 46331



**VEGA**

# Contents

<b>1 For your safety .....</b>	<b>3</b>
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 Permissible process conditions.....	4
1.7 Environmental instructions .....	4
<b>2 Product description .....</b>	<b>5</b>
2.1 Configuration.....	5
<b>3 Mounting.....</b>	<b>6</b>
3.1 General instructions for use of the instrument .....	6
3.2 Ventilation and pressure compensation.....	6
3.3 Combination Master - Slave .....	6
<b>4 Connecting to power supply.....</b>	<b>9</b>
4.1 Connecting.....	9
4.2 Single chamber housing.....	10
4.3 Connection example .....	11
<b>5 Set up with the display and adjustment module .....</b>	<b>12</b>
5.1 Parameter adjustment - Quick setup .....	12
5.2 Parameter adjustment - Extended adjustment.....	16
5.3 Menu overview .....	17
<b>6 Supplement .....</b>	<b>20</b>
6.1 Technical data .....	20



**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 VEGABAR 81 - Slave sensor for electronic differential pressure: Document-ID 45049**

Editing status of the quick setup guide: 2019-04-02

# 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

VEGABAR 81 is a slave sensor for electronic differential pressure 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 overfill 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).

## 1.6 Permissible process conditions

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*" as well as on the type label.

The permissible process pressure range is specified by "MWP" (Maximum Working Pressure) on the type label, see chapter "*Structure*". The MWP takes the element of the measuring cell and processing fitting combination with the weakest pressure into consideration and may be applied permanently. The specification refers to a reference temperature of +20 °C (+68 °F). It also applies when a measuring cell with a higher measuring range than the permissible pressure range of the process fitting is installed order-related.

In order to prevent damage to the device, the test pressure may only exceed the specified MWP briefly by 1.5 times at reference temperature. The pressure stage of the process fitting as well as the overload resistance of the measuring cell are taken into consideration here (see chapter "*Technical Data*").

In addition, a temperature derating of the process fitting, e. g. with flanges, can limit the permissible process pressure range according to the respective standard.

## 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:

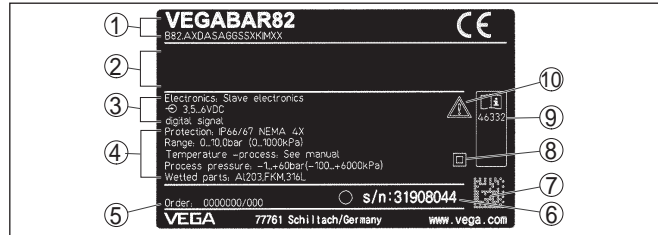


Fig. 1: Layout of the type label (example)

- 1 Instrument type and product code
- 2 Field for approvals
- 3 Power supply and signal output, electronics
- 4 Technical data
- 5 Order number
- 6 Serial number of the instrument
- 7 QR code
- 8 Symbol of the device protection class
- 9 ID numbers, instrument documentation
- 10 Reminder to observe the instrument documentation

#### 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

Move to "[www.vega.com](http://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 Data Matrix code on the type label of the instrument or
- Enter the serial number manually in the app

### 3 Mounting

#### 3.1 General instructions for use of the instrument

##### 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
- 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 depending on the housing version locked, if necessary.

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

#### 3.2 Ventilation and pressure compensation

##### Filter element - Position

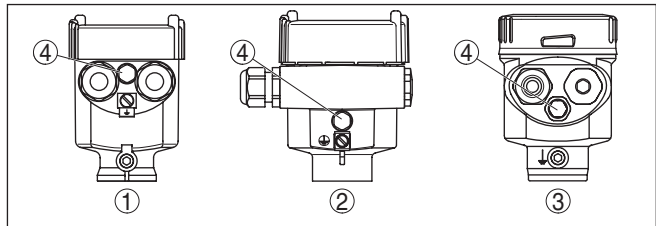


Fig. 2: Position of the filter element - non-Ex, Ex-ia version

- 1 Plastic, stainless steel housing (precision casting)
- 2 Aluminium housing
- 3 Stainless steel housing (electropolished)
- 4 Filter element

With the following instruments a blind plug is installed instead of the filter element:

- Instruments in protection IP 66/IP 68 (1 bar) - ventilation via capillaries in non-detachable cable
- Instruments with absolute pressure

#### 3.3 Combination Master - Slave

In principle, any sensor combination within the instrument series is allowed. The following requirements must be fulfilled:

- Configuration, Master sensor suitable for electronic differential pressure

- Pressure type is identical for both sensors, i.e. relative pressure/relative pressure or absolute pressure/absolute pressure
- Master sensor measures the higher pressure
- Measurement setup as shown in the following chapters

The measuring range of each sensor is selected such that it fits the measuring loop. For this, the max. recommended turn down must be noted. See chapter "*Technical data*". It is absolutely necessary the measuring ranges of Master and Slave correspond.

**Measurement result = Measured value of Master (total pressure) - measured value of Slave (static pressure)**

Depending on the application, individual combinations can result, see following examples:

#### Example - large vessel

##### Data

Application: Level measurement

Medium: Water

Vessel height: 12 m, hydrostatic pressure =  $12 \text{ m} \times 1000 \text{ kg/m}^3 \times 9.81 \text{ m/s}^2 = 117.7 \text{ kPa} = 1.18 \text{ bar}$

Superimposed pressure: 1 bar

Total pressure:  $1.18 \text{ bar} + 1 \text{ bar} = 2.18 \text{ bar}$

##### Instrument selection

Nominal measuring range Master: 2.5 bar

Nominal measuring range Slave: 1 bar

Turn Down:  $2.5 \text{ bar} / 1.18 \text{ bar} = 2.1 : 1$

#### Example - small vessel

##### Data

Application: Level measurement

Medium: Water

Vessel height: 500 mm, hydrostatic pressure =  $0.50 \text{ m} \times 1000 \text{ kg/m}^3 \times 9.81 \text{ m/s}^2 = 4.9 \text{ kPa} = 0.049 \text{ bar}$

Superimposed pressure: 350 mbar = 0.35 bar

Total pressure:  $0.049 \text{ bar} + 0.35 \text{ bar} = 0.399 \text{ bar}$

##### Instrument selection

Nominal measuring range Master: 0.4 bar

Nominal measuring range Slave: 0.4 bar

Turn Down:  $0.4 \text{ bar} / 0.049 \text{ bar} = 8.2 : 1$

#### Example - orifice in pipeline

##### Data

Application: Differential pressure measurement

Medium: Gas

Static pressure: 0.8 bar

Differential pressure on orifice: 50 mbar = 0.050 bar

Total pressure:  $0.8 \text{ bar} + 0.05 \text{ bar} = 0.85 \text{ bar}$

##### Instrument selection

Nominal measuring range Master: 1 bar

Nominal measuring range Slave: 1 bar

Turn Down: 1 bar/0.050 bar = 20 : 1

**Output measured values** The measuring result (level, pressure difference) as well as measured value Slave (static or superimposed pressure) are output by the sensor. Depending on the instrument version, output as 4 ... 20 mA signal or digitally via HART, Profibus PA or Foundation Fieldbus.



## 4 Connecting to power supply

### 4.1 Connecting

#### Connection technology

The connection to the Master sensor is carried out through spring-loaded terminals in the respective housing. For this, use the supplied, confectioned cable. Solid cores as well as flexible cores with cable 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.



#### 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.

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

#### 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, strip approx. 1 cm (0.4 in) insulation from the individual wires or use supplied connection cable
4. Insert the cable into the sensor through the cable entry



Fig. 3: Connection steps 5 and 6

5. Insert the wire ends into the terminals according to the wiring plan
6. Check the hold of the wires in the terminals by lightly pulling on them

7. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
  8. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
  9. Unscrew the blind plug on the Master, screw in the supplied cable gland
  10. Connection cable to Master, see steps 3 to 8
  11. Screw the housing lid back on
- The electrical connection is finished.

## 4.2 Single chamber housing



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

### Electronics and connection compartment

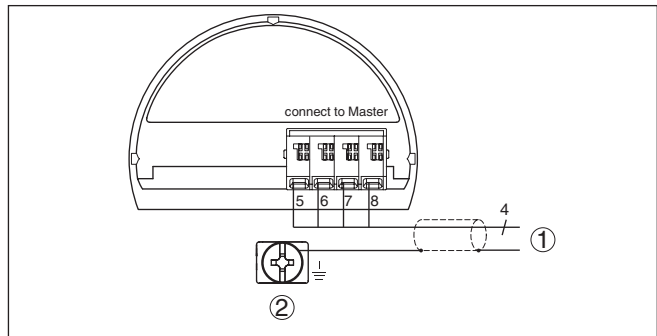


Fig. 4: Wiring plan VEGABAR 81 Slave sensor

- 1 To the Master sensor
- 2 Ground terminal for connection of the cable screening<sup>1)</sup>

<sup>1)</sup> Connect shielding here. Connect ground terminal on the outside of the housing to ground as prescribed. The two terminals are galvanically connected.

**Connection example,  
electronic differential  
pressure**

**4.3 Connection example**

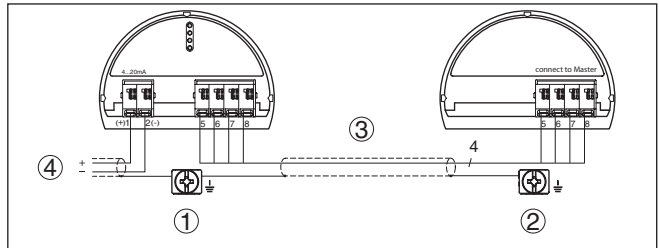


Fig. 5: Connection example, electronic differential pressure

- 1 Master sensor
- 2 Slave sensor
- 3 Connection cable
- 4 Supply and signal circuit, Master sensor

Connection between master and sensor is carried out according to the table:

Master sensor	Slave sensor
Terminal 5	Terminal 5
Terminal 6	Terminal 6
Terminal 7	Terminal 7
Terminal 8	Terminal 8

## 5 Set up with the display and adjustment module

### 5.1 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.



Carry out the following steps in the sequence specified below. The presettings apply to all applications.

You can find "Extended adjustment" in the next sub-chapter.

#### Presettings

#### 1. Measurement loop name

In the first menu item you assign a suitable measurement loop name. Permitted are names with max. 19 characters.

#### 2. Application

In this menu item you activate/deactivate the slave sensor for electronic differential pressure and select the application.

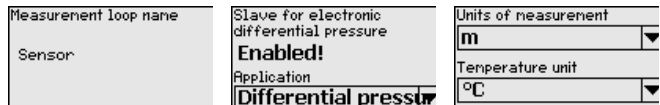


#### Note:

It is absolutely necessary to activate the slave sensor in advance to have the applications displayed in the electronic differential pressure measurement menus.

#### 3. Units

In this menu item you determine the adjustment and temperature units of the instrument. Depending on the selected application in the menu item "Application", different adjustment units are available.



#### Quick setup - Level measurement

#### 4. Unit, static pressure

In this menu item, you determine the unit of the static, i.e. superimposed pressure.

#### 5. Position correction

In this menu item you compensate the influence of the installation position of the instrument (offset) on the measured value.

#### 6. Min. adjustment

In this menu item you carry out the min. adjustment for level.

Enter the percentage value and the corresponding pressure value for the min. level.

#### 7. Max. adjustment

In this menu item you carry out the max. adjustment for level.

Enter the percentage value and the corresponding pressure value for the max. level.



The quick setup for level measurement is finished.

**Quick setup - Flow measurement**

**4. Position correction**

In this menu item you compensate the influence of the installation position of the instrument (offset) on the measured value.

**5. Min. adjustment**

In this menu item you carry out the min. adjustment for flow.

Enter the percentage value and the corresponding pressure value for the min. flow.

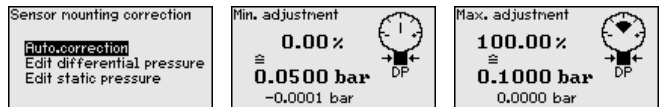
**6. Max. adjustment**

In this menu item you carry out the max. adjustment for flow.

Enter the percentage value and the corresponding pressure value for the max. flow.

**7. Linearization**

In this menu item, you select the characteristics of the output signal.



The quick setup for flow measurement is finished.

**Quick setup - Differential pressure measurement**

**4. Unit, static pressure**

In this menu item, you determine the unit of the static, i.e. superimposed pressure.

**5. Position correction**

In this menu item you compensate the influence of the installation position of the instrument (offset) on the measured value.

**6. Zero adjustment**

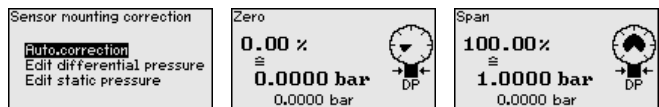
In this menu item you carry out the Zero adjustment for the differential pressure.

Enter the corresponding pressure value for 0 %.

**7. Span adjustment**

In this menu item you carry out the Span adjustment for the differential pressure

Enter the corresponding pressure value for 100 %.



### Quick setup - Density measurement

The quick setup for differential pressure measurement is finished.

#### 4. Unit, static pressure

In this menu item, you determine the unit of the static, i.e. superimposed pressure.

#### 5. Position correction

In this menu item you compensate the influence of the installation position of the instrument (offset) on the measured value.

#### 6. Distance

In this menu item, you enter the installation distance between master and slave sensor.

#### 7. Min. adjustment

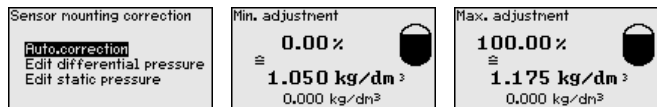
In this menu item you carry out the min. adjustment for density.

Enter the percentage value and the corresponding density value for the min. density.

#### 8. Max. adjustment

In this menu item you carry out the max. adjustment for density.

Enter the percentage value and the corresponding density value for the max. density.



The quick setup for density measurement is finished.

### Quick setup - Interface measurement

#### 4. Unit, static pressure

In this menu item, you determine the unit of the static, i.e. superimposed pressure.

#### 5. Position correction

In this menu item you compensate the influence of the installation position of the instrument (offset) on the measured value.

#### 6. Distance

In this menu item, you enter the installation distance between master and slave sensor.

#### 7. Min. adjustment

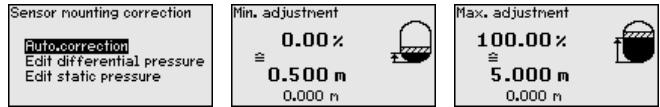
In this menu item, you carry out the adjustment for the min. height of the interface.

Enter the percentage value and the corresponding height of the interface.

#### 8. Max. adjustment

In this menu item, you carry out the adjustment for the max. height of the interface.

Enter the percentage value and the corresponding height of the interface.



The quick setup for interface measurement is finished.

**Quick setup - density-compensated level measurement**

**4. Unit, static pressure**

In this menu item, you determine the unit of the static, i.e. superimposed pressure.

**5. Position correction**

In this menu item you compensate the influence of the installation position of the instrument (offset) on the measured value.

**6. Distance**

In this menu item, you enter the installation distance between master and slave sensor.

**7. Min. adjustment**

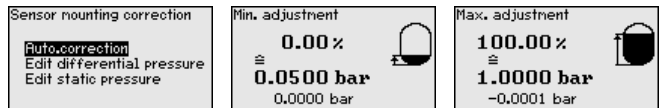
In this menu item you carry out the min. adjustment for level.

Enter the percentage value and the corresponding pressure value for the min. level.

**8. Max. adjustment**

In this menu item you carry out the max. adjustment for level.

Enter the percentage value and the corresponding pressure value for the max. level.



The quick setup for density-compensated level measurement is hence finished.

**Parameterization example**

VEGABAR 81 always measures pressure independently of the process variable selected in the menu item "Application". To output the selected process variable correctly, an allocation of the output signal to 0 % and 100 % must be carried out (adjustment).

With the application "Level", the hydrostatic pressure, e.g. with full and empty vessel, is entered for adjustment. A superimposed pressure is detected by the slave sensor and automatically compensated. See the following example:

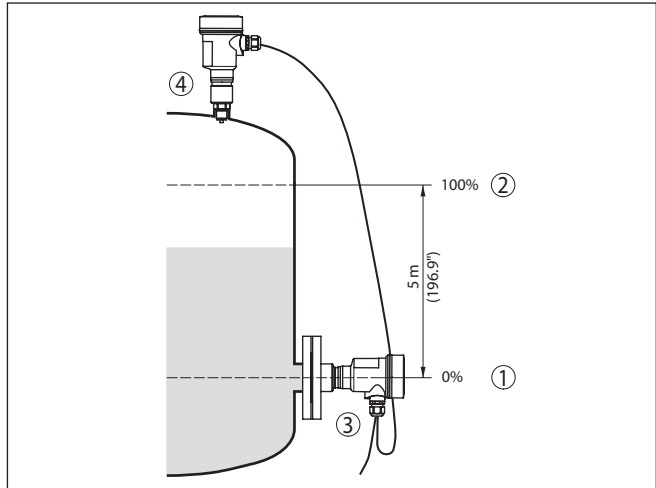


Fig. 6: Parameter adjustment example "Min./max. adjustment, level measurement"

- 1 Min. level = 0 % corresponds to 0.0 mbar
- 2 Max. level = 100 % corresponds to 490.5 mbar
- 3 VEGABAR 81
- 4 VEGABAR 81, slave sensor

If these values are not known, an adjustment with filling levels of e.g. 10 % and 90 % is also possible. By means of these settings, the real filling height is then calculated.

The real product level during the adjustment is not important, because the min./max. adjustment is always carried out without changing the product level. These settings can be made ahead of time without the instrument having to be installed.

## 5.2 Parameter adjustment - Extended adjustment

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

Quick setup  
**Extended adjustment**

### Main menu

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

**Setup**  
 Display  
 Diagnostics  
 Additional adjustments  
 Info

**Setup:** Settings, e.g., for measurement loop name, application, units, position correction, adjustment, signal output

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



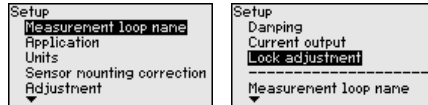
**Diagnosis:** Information, e.g. on instrument status, pointer, measurement reliability, simulation

**Additional adjustments:** PIN, date/time, reset, copy function

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

In the main menu item "Setup", the individual submenu items should be selected one after the other and provided with the correct parameter values.

The following submenu points are available:



In the following section, the menu items from the menu "Setup" for electronic differential pressure measurement are described in detail. Depending on the selected application, different sections are relevant.



**Information:**

Further menu items of the menu "Setup" as well as the complete menus "Display", "Diagnosis", "Additional adjustments" and "Info" are described in the operating instructions of the respective master sensor.

**5.3 Menu overview**

**Setup**

Menu item	Parameter	Default setting
<b>Measurement loop name</b>		Sensor
<b>Application</b>	Application	Level
	Slave for electronic differential pressure	Deactivated
<b>Units</b>	Unit of measurement	mbar (with nominal measuring range ≤ 400 mbar) bar (with nominal measuring ranges ≥ 1 bar)
	Static pressure	bar
<b>Position correction</b>		0.00 bar
<b>Adjustment</b>	Distance (with density and interface)	1.00 m
	Zero/Min. adjustment	0.00 bar 0.00 %
	Span/Max. adjustment	Nominal measuring range in bar 100.00 %
<b>Damping</b>	Integration time	0.0 s

Menu item	Parameter	Default setting
<b>Linearization</b>		Linear
<b>Current output</b>	Current output - Mode	Output characteristics 4 ... 20 mA Reaction when malfunctions occur ≤ 3.6 mA
	Current output - Min./Max.	3.8 mA 20.5 mA
<b>Lock adjustment</b>		Last setting

## Display

Menu item	Default setting
<b>Menu language</b>	Order-specific
<b>Displayed value 1</b>	Current output in %
<b>Displayed value 2</b>	Ceramic measuring cell: Measuring cell temperature in °C Metallic measuring cell: Electronics temperature in °C
<b>Display format 1 and 2</b>	Number of positions after the decimal point, automatically
<b>Backlight</b>	Switched on

## Diagnostics

Menu item	Parameter	Default setting
<b>Sensor status</b>		-
<b>Peak value</b>	Pressure	Actual measured value
	Temperature	Actual temperature values from measuring cell, electronics
<b>Simulation</b>		-

## Additional adjustments

Menu item	Parameter	Default setting
<b>PIN</b>		0000
<b>Date/Time</b>		Actual date/Actual time
<b>Copy instrument settings</b>		-
<b>Special parameters</b>		-
<b>Scaling</b>	Scaling size	Volume in l
	Scaling format	0 % corresponds to 0 l 100 % corresponds to 0 l

Menu item	Parameter	Default setting
<b>Current output</b>	Current output - Meas. variable	Lin. percent - Level
	Current output - Adjustment	0 ... 100 % correspond to 4 ... 20 mA
<b>HART mode</b>		Address 0
<b>DP flow element</b>	Unit	m <sup>3</sup> /s
	Adjustment	0.00 % correspond to 0.00 m <sup>3</sup> /s 100.00 %, 1 m <sup>3</sup> /s

**Info**

Menu item	Parameter
<b>Device name</b>	VEGABAR 81
<b>Instrument version</b>	Hardware and software version
<b>Factory calibration date</b>	Date
<b>Sensor characteristics</b>	Order-specific characteristics

## 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.

#### Electromechanical data - version IP 66/IP 67 and IP 66/IP 68 (0.2 bar)<sup>2)</sup>

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/Seal insert	Cable diameter		
	5 ... 9 mm	6 ... 12 mm	7 ... 12 mm
PA/NBR	●	●	-
Brass nickel-plated/NBR	●	●	-
Stainless steel/NBR	-	-	●

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)

#### Interface to the Master sensor

Data transmission Digital (I<sup>2</sup>C-Bus)

Connection cable Slave - Master, mechanical data

- Configuration Cores, strain relief, braided, metal foil, jacket
- Standard length 5 m (16.40 ft)
- Max. length 25 m (82.02 ft)
- Min. bending radius at 25 °C/77 °F 25 mm (0.985 in)
- Diameter approx. 8 mm (0.315 in), approx. 6 mm (0.236 in)
- Material PE, PUR
- Colour Black

Connection cable Slave - Master, electrical data

- Wire cross-section 0.34 mm<sup>2</sup> (AWG 22)
- Wire resistance < 0.05 Ω/m (0.015 Ω/ft)

#### Voltage supply for the complete system through Master

Operating voltage

- U<sub>B min</sub> 12 V DC

<sup>2)</sup> IP 66/IP 68 (0.2 bar), only with absolute pressure.

- $U_{B \min}$  with lighting switched on
- $U_{B \max}$

16 V DC

Depending on signal output and version of the master sensor



46331-EN-190404



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 2019



46331-EN-190404

VEGA Grieshaber KG  
Am Hohenstein 113  
77761 Schiltach  
Germany

Phone +49 7836 50-0  
Fax +49 7836 50-201  
E-mail: [info.de@vega.com](mailto:info.de@vega.com)  
[www.vega.com](http://www.vega.com)