

Operating Instructions

Vibrating level switch
for granulated bulk solids

VR-90

VIBRATING ROD



Document ID: 29266



BINMASTER

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**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.

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1 About this document

1.1 Function

This operating instructions 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, tip, note

This symbol indicates helpful additional information.



Caution: If this warning is ignored, faults or malfunctions can result.



Warning: If this warning is ignored, injury to persons and/or serious damage to the instrument can result.



Danger: If this warning is ignored, serious injury to persons and/or destruction of the instrument can result.



Ex applications

This symbol indicates special instructions for Ex applications.



SIL applications

This symbol indicates instructions for functional safety which must be taken into account particularly for safety-relevant applications.



List

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



Action

This arrow indicates a single action.



Sequence of actions

Numbers set in front indicate successive steps in a procedure.



Battery disposal

This symbol indicates special information about the disposal of batteries and accumulators.

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

The VR-90 is a sensor for point level detection.

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.

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.

2.3 Warning about incorrect use

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overflow or damage to system components through incorrect mounting or adjustment. Thus damage to property, to persons or environmental contamination can be caused. Also the protective characteristics of the instrument can be influenced.

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.

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.

2.5 Safety label on the instrument

The safety approval markings and safety tips on the device must be observed.

2.6 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.

2.7 SIL conformity

VR-90 meets the requirements of functional safety according to IEC 61508. Further information is available in the Safety Manual "VEGA VIB series 60".

2.8 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 (ANSI/NFPA 70).

Installations in Canada shall comply with the relevant requirements of the Canadian Electrical Code.

2.9 Safety instructions for Ex areas

Please note the Ex-specific safety information for installation and operation in Ex areas. These safety instructions are part of the operating instructions manual and come with the Ex-approved instruments.

2.10 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:

- VR-90 point level switch
- Documentation
 - This operating instructions manual
 - Safety Manual "*Functional safety (SIL)*" (optional)
 - Supplementary instructions manual "*Plug connector for level sensors*" (optional)
 - Ex-specific "*Safety instructions*" (with Ex versions)
 - If necessary, further certificates

Constituent parts

The VR-90 consists of the components:

- Housing lid
- Housing with electronics
- Process fitting with vibrating rod

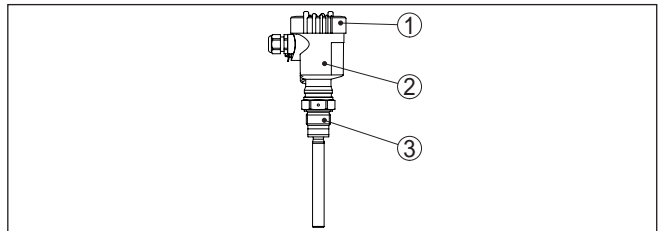


Fig. 1: VR-90 with plastic housing

- 1 Housing lid
- 2 Housing with electronics
- 3 Process fitting

Type label

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

- Article number
- Serial number
- Technical data
- Article numbers, documentation
- SIL identification (with SIL rating ex works)

With the serial number, you can access the delivery data of the instrument via "www.vega.com", "*Search*". You can find the serial number on the inside of the instrument as well as on the type label on the outside.

3.2 Principle of operation

VR-90 is a point level sensor with vibrating rod for point level detection.

It is designed for industrial use in all areas of process technology and is preferably used for bulk solids.

Application area

Typical applications are overfill and dry run protection. Thanks to its simple and robust measuring system, VR-90 is virtually unaffected by the chemical and physical properties of the bulk solid.

It also works when subjected to strong external vibrations or changing products.

Solid detection in water

If VR-90 was ordered for solid detection in water, the vibrating rod is calibrated to the density of water. If covered by water (density: 1 g/cm³/0.036 lbs/in) VR-90 signals "uncovered". Only if the vibrating element is also covered with solids (e.g. sand, sludge, gravel etc.) will the sensor signal "covered".

Function monitoring

The electronics module of VR-90 continuously monitors the following criteria:

- Correct vibrating frequency
- Line break to the piezo drive

If one of the stated malfunctions is detected or in case of voltage supply, the electronics takes on a defined switching status, i.e. the contactless electronic switch opens (safe state).

Functional principle

The vibrating rod is piezoelectrically energised and vibrates at its mechanical resonance frequency of approx. 360 Hz. When the vibrating rod is submerged in the product, the vibration amplitude changes. This change is detected by the integrated electronics module and converted into a switching command.

Voltage supply

VR-90 is a compact instrument, i.e. it can be operated without external evaluation system. The integrated electronics evaluates the level signal and outputs a switching signal. With this switching signal, a connected device can be operated directly (e.g. a warning system, a pump etc.).

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

3.3 Adjustment

On the electronics module you will find the following display and adjustment elements:

- Signal lamp for indication of the switching condition (green/red)
- Potentiometer for adaptation to the product density
- Mode switch for selecting the switching condition (min./max.)

3.4 Storage and transport

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 of standard instruments consists of environment-friendly, recyclable carton material. The sensing element is additionally protected with a cardboard cover. For special versions, PE foam or

PE foil is also used. Please dispose of the packaging material through 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 humidity 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.

4 Mounting

4.1 General instructions

Suitability for the process conditions

Make sure that all parts of the instrument coming in direct contact with the process, especially the sensor element, process seal and process fitting, are suitable for the existing process conditions, such as process pressure, process temperature as well as the chemical properties of the medium.

You can find the specifications in chapter "*Technical data*" and on the nameplate.

Suitability for the ambient conditions

The instrument is suitable for standard and extended ambient conditions acc. to DIN/EN/IEC/ANSI/ISA/UL/CSA 61010-1.

Switching point

In general, VR-90 can be installed in any position. The instrument only has to be mounted in such a way that the vibrating element is at the height of the desired switching point.

Moisture

Use the recommended cables (see chapter "*Connecting to power supply*") and tighten the cable gland.

You can give your instrument additional protection against moisture penetration by leading the connection cable downward in front of the cable gland. Rain and condensation water can thus drain off. This applies mainly to outdoor mounting as well as installation in areas where high humidity is expected (e.g. through cleaning processes) or 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.

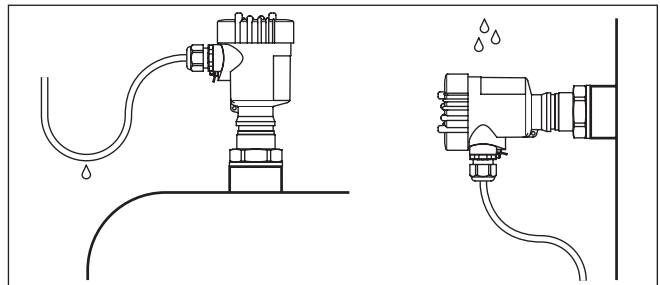


Fig. 2: Measures against moisture ingress

Transport

Do not hold VR-90 on the vibrating element. Especially with flange and tube versions, the sensor can be damaged by the weight of the instrument.

Remove the protective cover just before mounting.

Pressure/Vacuum

The process fitting must be sealed if there is gauge or low pressure in the vessel. Before use, check if the seal 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.

Handling

The vibrating level switch is a measuring instrument and must be treated accordingly. Bending the vibrating element will destroy the instrument.



Warning:

The housing must not be used to screw the instrument in! Applying tightening force can damage internal parts of the housing.

Use the hexagon above the thread for screwing in.

**Cable entries - NPT thread
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.

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

4.2 Mounting instructions

Mounting socket

The vibrating element should protrude into the vessel to avoid buildup. For that reason, avoid using mounting bosses for flanges and screwed fittings. This applies particularly to use with adhesive products.

Filling opening

Mount the instrument in such a way that the vibrating rod does not protrude directly into the filling stream.

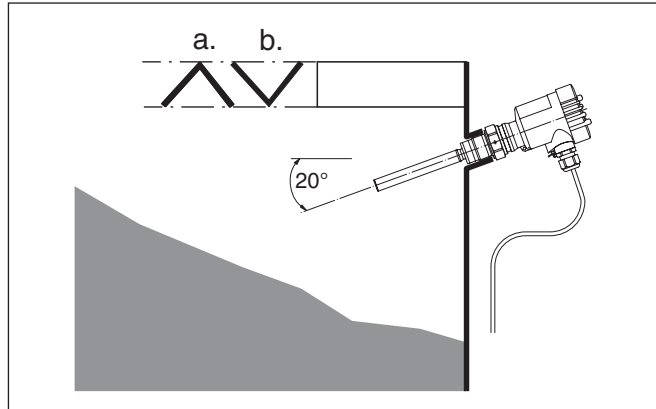


Fig. 3: Horizontal installation

- a Protective sheet
- b Concave protective sheet for abrasive solids

If such an installation location should be necessary, mount a suitable protective sheet above or in front of the vibrating element, see illustration "a").

In abrasive solids, mounting according to illustration "b" has proven. A spout forms in the concave protective sheet preventing wear of the protective sheet.

Material cone

In silos for bulk solids, material cones can form and change the switching point. Please keep this in mind when installing the sensor in the vessel. We recommend selecting an installation location where the vibrating rod detects an average value of the material cone.

The vibrating rod must be mounted in a way that takes the arrangement of the filling and emptying apertures into account.

To compensate measurement errors caused by the material cone in cylindrical vessels, the sensor must be mounted at a distance of $d/6$ from the vessel wall.

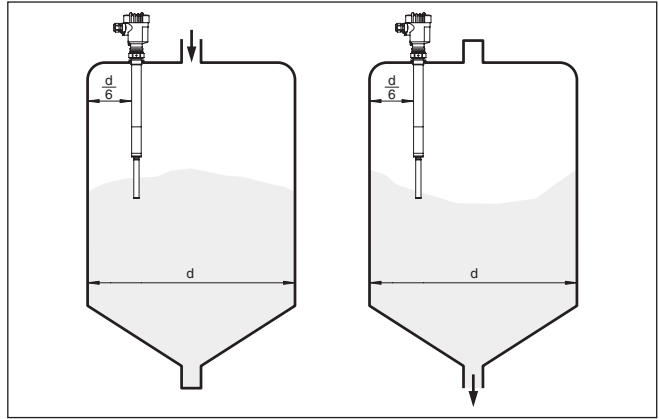


Fig. 4: Filling and emptying centred

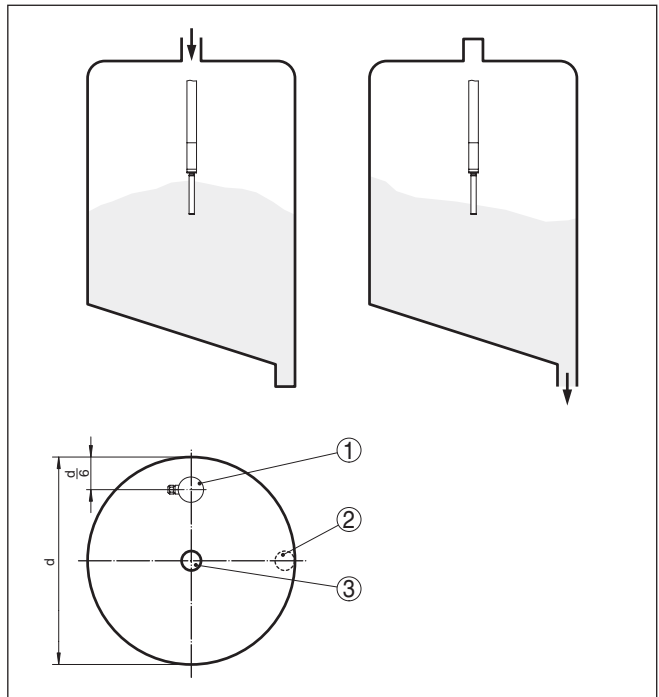


Fig. 5: Filling in the centre, emptying laterally

- 1 VR-90
- 2 Discharge opening
- 3 Filling opening

Horizontal mounting

To achieve a very precise switching point, you can install VR-90 horizontally. However, if the switching point can have a tolerance of a

few centimeters, we recommend mounting VR-90 approx. 20° inclined to the vessel bottom to avoid buildup.

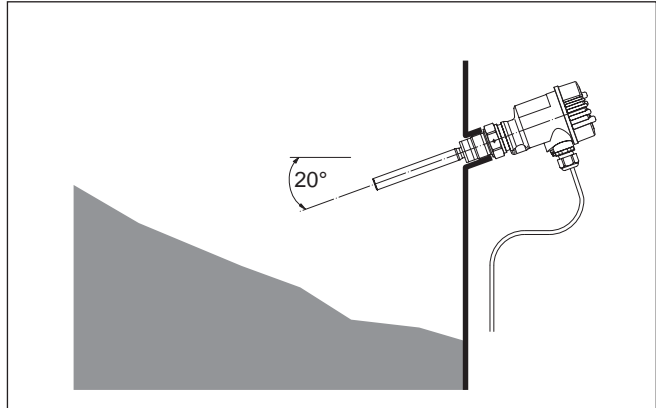


Fig. 6: Horizontal mounting

Inflowing medium

If VR-90 is mounted in the filling stream, unwanted false measurement signals can be generated. For this reason, mount VR-90 at a position in the vessel where no disturbances, e.g. from filling openings, agitators, etc., can occur.

Baffle protection against falling rocks

In applications such as grit chambers or settling basins for coarse sediments, the vibrating element must be protected against damage with a suitable baffle.

This baffle must be manufactured by you.

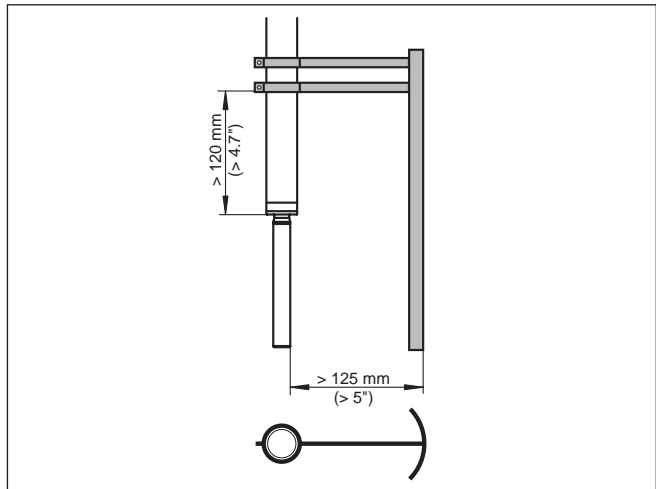


Fig. 7: Baffle for protection against mechanical damage

5 Connecting to power supply

5.1 Preparing the connection

Note safety instructions Always keep in mind the following safety instructions:



Warning:

Connect only in the complete absence of line voltage.

- The electrical connection must only be carried out by trained, qualified personnel authorised by the plant operator.
- Always switch off power supply, before connecting or disconnecting the instrument.



Note:

Install a disconnecting device for the instrument which is easy to access. The disconnecting device must be marked for the instrument (IEC/EN 61010).

Take note of safety instructions for Ex applications



In hazardous areas you must take note of the respective regulations, conformity and type approval certificates of the sensors and power supply units.

Voltage supply

Connect the voltage supply according to the connection diagrams. The electronics module VB60C is designed in protection class I. To maintain this protection class, it is absolutely necessary that the earth conductor be connected to the inner earth conductor terminal. Keep the general installation regulations in mind. Take note of the corresponding installation regulations for hazardous areas with Ex applications.

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

Connection cable

The instrument is connected with standard three-wire cable without screen. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used.

Make sure that the cable used has the required temperature resistance and fire safety for max. occurring ambient temperature

Use cable with round cross-section. A cable outer diameter of 5 ... 9 mm (0.2 ... 0.35 in) ensures the seal effect of the cable gland. If you are using cable with a different diameter or cross-section, exchange the seal or use a suitable cable gland.



In hazardous areas, use only approved cable connections for VR-90.

Connection cable for Ex applications



Take note of the corresponding installation regulations for Ex applications.

Cover all housing openings conforming to standard according to EN 60079-1.

5.2 Connection procedure



With Ex instruments, the housing cover may only be opened if there is no explosive atmosphere present.

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) of insulation from the ends of the individual wires
4. Insert the cable into the sensor through the cable entry
5. Lift the opening levers of the terminals with a screwdriver (see following illustration)

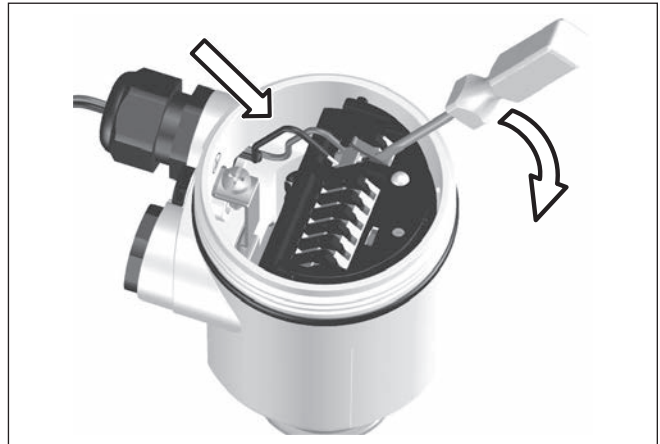


Fig. 8: Connection steps 5 and 6

6. Insert the wire ends into the open terminals according to the wiring plan
7. Press down the opening levers of the terminals, you will hear the terminal spring closing
8. Check the hold of the wires in the terminals by lightly pulling on them
9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
10. If necessary, carry out a fresh adjustment
11. Screw the housing lid back on

The electrical connection is finished.

5.3 Wiring plan, single chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-d version.

Housing overview

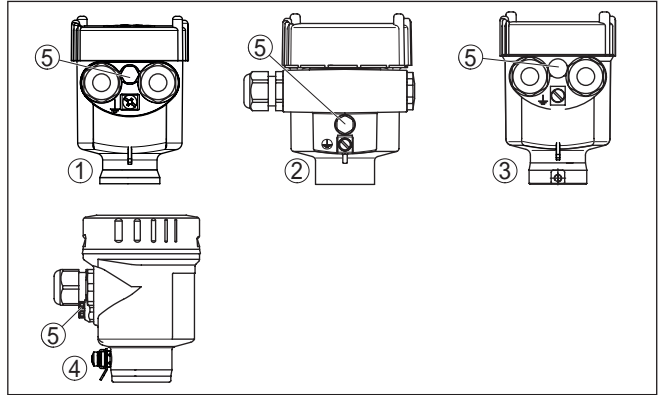


Fig. 9: Material versions, single chamber housing

- 1 Plastic (not with Ex d)
- 2 Aluminium
- 3 Stainless steel (not with Ex d)
- 4 Stainless steel, electropolished (not with Ex d)
- 5 Filter element for pressure compensation (not with Ex d)

Wiring plan

We recommend connecting VR-90 in such a way that the switching circuit is open when there is a level signal, line break or failure (safe state).

The contactless electronic switch is always shown in non-operative condition.



Warning:

The instrument must not be operated without an intermediately connected load, because the electronics would be destroyed if connected directly to the mains. It is not suitable for connection to low voltage PLC inputs.

Examples for typical applications:

- Load resistance at 24 V DC: 88 ... 1800 Ω
- Rated power, relay 253 V AC: > 2.5 VA
- Rated power, relay 24 V AC: > 0.5 VA

For direct control of relays, contactors, magnet valves, warning lights, horns etc.

Domestic current is temporarily lowered below 1 mA after switching off the load so that contactors, whose holding current is lower than the constant domestic current of the electronics, are reliably switched off.

When VR-90 is used as part of an overflow protection system according to WHG, also note the regulations of the general type approval.

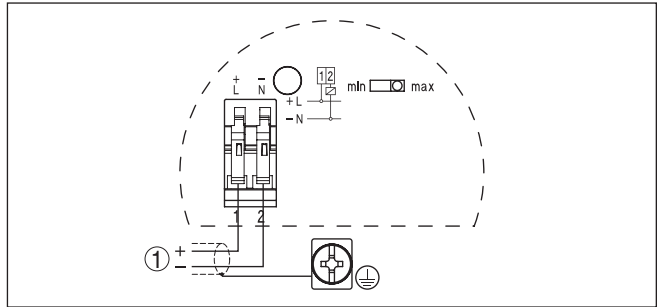


Fig. 10: Wiring plan

1 Shielding

6 Setup

6.1 General information

The figures in brackets refer to the following illustrations.

Function/Configuration On the electronics module you will find the following display and adjustment elements:

- Potentiometer for adjustment of the density range (1)
- DIL switch for mode adjustment - min./max. (2)
- Signal lamp (5)



Note:

As a rule, always set the mode with mode switch (2) before starting the setup of VR-90. The switching output will change if you set the mode switch (2) afterwards. This could possibly trigger other connected instruments or devices.

Electronics and connection compartment

6.2 Adjustment elements

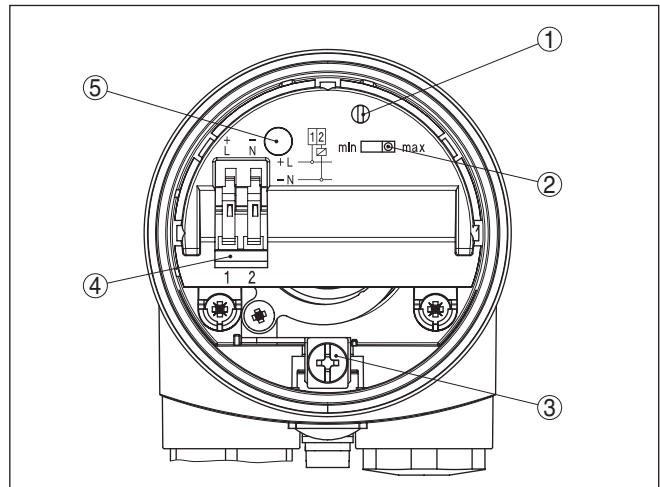


Fig. 11: Electronics and connection compartment - contactless electronic switch

- 1 Potentiometer for adjustment of the density range
- 2 DIL switch for mode adjustment
- 3 Ground terminal
- 4 Connection terminals
- 5 Control lamp

Adjustment of the density range (1)

With the potentiometer you can adapt the switching point to the solid. It is already preset and must only be modified in special cases.

As a default setting, the potentiometer of VR-90 is set to the complete right position ($> 0.1 \text{ g/cm}^3$ or 0.0036 lbs/in^3). In very light solids you have to turn the potentiometer to the complete left position ($0.02 \dots 0.1 \text{ g/cm}^3$ or $0.0007 \dots 0.0036 \text{ lbs/in}^3$). By doing this,

VR-90 will be more sensitive and light solids can be detected more reliably.

For instruments detecting solids in water, these settings are not applicable. The density range is preset and must not be changed.

Mode adjustment (2)

With the mode adjustment (min./max.) you can change the switching condition of the output. You can set the required mode according to the "Function table" (max. - max. detection or overflow protection, min. - min. detection or dry run protection).

We recommend connecting according to the idle current principle (contactless electronic switch is open when the switching point is reached) because the contactless electronic switch takes on the same (safe) state if a failure is detected.















Signal lamp (5)



Control lamp for indication of the switching status

- green = switch closed
- red = switch open
- red (flashing) = failure

6.3 Function table

The following table provides an overview of the switching conditions depending on the set mode and the level.

	Level	Switching status	Control lamp
Mode max. Overflow protection		 Switch closed	 Green
Mode max. Overflow protection		 Switch open	 Red
Mode min. Dry run protection		 Switch closed	 Green
Mode min. Dry run protection		 Switch open	 Red
Failure of the supply voltage (min./max. mode)	any	 Switch open	

	Level	Switching status	Control lamp
Fault	any	 Switch open	 flashes red

7 Maintenance and fault rectification

7.1 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

7.2 Rectify faults

Reaction when malfunction occurs

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

Causes of malfunction

VR-90 offers maximum reliability. Nevertheless, faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Voltage supply
- Signal processing

Fault rectification

The first measure to take is to check the output signal. In many cases, the causes can be determined this way and the faults quickly rectified.

24 hour service hotline

Should these measures not be successful, please call BinMaster service at **+1 402-434-9102**.

Checking the switching signal

Error	Cause	Rectification
VR-90 signals "covered" without being submerged (overflow protection) VR-90 signals "uncovered" when being submerged (dry run protection)	Operating voltage too low	Check operating voltage
	Electronics defective	Press the mode switch. If the instrument then changes the mode, the vibrating element may be covered with buildup or mechanically damaged. Should the switching function in the correct mode still be faulty, return the instrument for repair.
		Press the mode switch. If the instrument then does not change the mode, the electronics module may be defective. Exchange the electronics module.
	Unfavourable installation location	Mount the instrument at a location in the vessel where no dead zones or mounds can form.
	Buildup on the vibrating element	Check the vibrating element and the sensor for buildup and remove the buildup if there is any.
	Wrong mode selected	Set the correct mode with the mode switch (overflow protection, dry run protection). Wiring should be carried out according to the closed-circuit principle.
Signal lamp flashes red	Error on the vibrating element	Check if the vibrating element is damaged or extremely corroded.
	Interference on the electronics module	Exchanging the electronics module
	instrument defective	Exchange the instrument or send it in for repair

Reaction after fault rectification

Depending on the reason for the fault and the measures taken, the steps described in chapter "Set up" may have to be carried out again.

7.3 Exchanging the electronics module

In general, all electronics modules of series VB60 can be interchanged. If you want to use an electronics module with a different signal output, you can download the corresponding operating instructions manual from our homepage under Downloads.



With Ex-d instruments, the housing cover may only be opened if there is no explosive atmosphere present.

Proceed as follows:

1. Switch off voltage supply
2. Unscrew the housing lid
3. Lift the opening levers of the terminals with a screwdriver
4. Pull the connection cables out of the terminals
5. Loosen the two screws with a screw driver (Torx size T10 or slot 4)

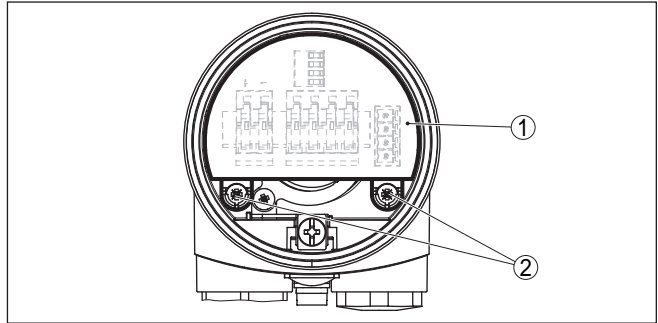


Fig. 28: Loosen the holding screws

- 1 Electronics module
- 2 Screws (2 pcs.)

6. Pull out the old electronics module
7. Compare the new electronics module with the old one. The type label of the electronics module must correspond to that of the old electronics module. This applies particularly to instruments used in hazardous areas.
8. Compare the settings of the two electronics modules. Set the adjustment elements of the new electronics module to the same setting of the old one.



Information:

Make sure that the housing is not rotated during the electronics exchange. Otherwise the plug may be in a different position later.

9. Insert the electronics module carefully. Make sure that the plug is in the correct position.
 10. Screw in and tighten the two holding screws with a screwdriver (Torx size T10 or Phillips 4)
 11. Insert the wire ends into the open terminals according to the wiring plan
 12. Press down the opening levers of the terminals, you will hear the terminal spring closing
 13. Check the hold of the wires in the terminals by lightly pulling on them
 14. Check cable gland on tightness. The seal ring must completely encircle the cable.
 15. Screw the housing lid back on
- The electronics exchange is now finished.

7.4 How to proceed if a repair is necessary

You can find an RMA return form as well as detailed information about the procedure in the support area of our website: www.binmaster.com.

By doing this you help us carry out the repair quickly and without having to call back for needed information.

If a repair is necessary, please proceed as follows:

- 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

8 Dismount

8.1 Dismounting steps

**Warning:**

Before dismantling, be aware of dangerous process conditions such as e.g. pressure in the vessel, high temperatures, corrosive or toxic products etc.

Take note of chapters "*Mounting*" and "*Connecting to voltage supply*" and carry out the listed steps in reverse order.



With Ex instruments, the housing cover may only be opened if there is no explosive atmosphere present.

8.2 Disposal

The instrument consists of materials which can be recycled by specialised recycling companies. We use recyclable materials and have designed the electronics to be easily separable.

WEEE directive

The instrument does not fall in the scope of the EU WEEE directive. Article 2 of this Directive exempts electrical and electronic equipment from this requirement if it is part of another instrument that does not fall in the scope of the Directive. These include stationary industrial plants.

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

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

9 Supplement

9.1 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.

General data

Material 316L corresponds to 1.4404 or 1.4435

Materials, wetted parts

- Process fitting - thread 316L
- Process fitting - flange 316L
- Process seal Klingersil C-4400
- Vibrating rod 316L, 318 S13 (1.4462)
- Extension tube \varnothing 29 mm (1.14 in) 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
- Seal between housing and housing lid Silicone
- Light guide in housing cover (plastic) PMMA (Makrolon)
- Ground terminal 316L
- Cable gland PA, stainless steel, brass
- Sealing, cable gland NBR
- Blind plug, cable gland PA

Process fittings

- Pipe thread, cylindrical (DIN 3852-A) G1, G1½
- Pipe thread, conical (ASME B1.20.1) 1 NPT, 1½ NPT
1 NPT: core diameter of the internal thread > 29.2 mm (1.15 in)

Instrument weight (depending on process fitting) 0.8 ... 4 kg (0.18 ... 8.82 lbs)

Max. lateral load 400 N (90 lbf)

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)

Output variable

Output	Contactless electronic switch
Modes (switchable)	min./max.
Switching delay	
– When immersed	0.5 s
– When laid bare	1 s

Ambient conditions

Ambient temperature on the housing	-40 ... +80 °C (-40 ... +176 °F)
Storage and transport temperature	-40 ... +80 °C (-40 ... +176 °F)

Process conditions

Measured variable	Limit level of solids
Process pressure	-1 ... 16 bar/-100 ... 1600 kPa (-14.5 ... 232 psig)

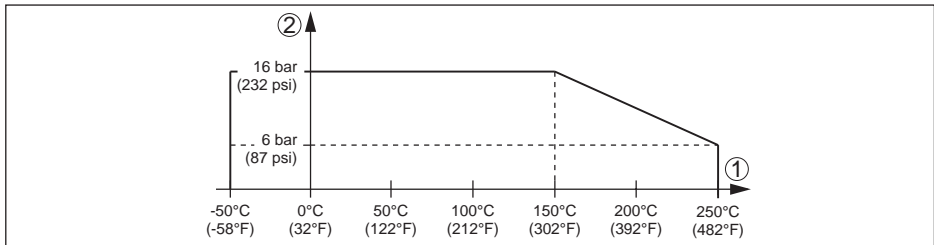


Fig. 29: Process pressure - Process temperature

- 1 Process temperature
- 2 Process pressure

VR-90 of 316L	-50 ... +150 °C (-58 ... +302 °F)
Process temperature (thread or flange temperature) with temperature adapter (option)	-50 ... +250 °C (-58 ... +482 °F)

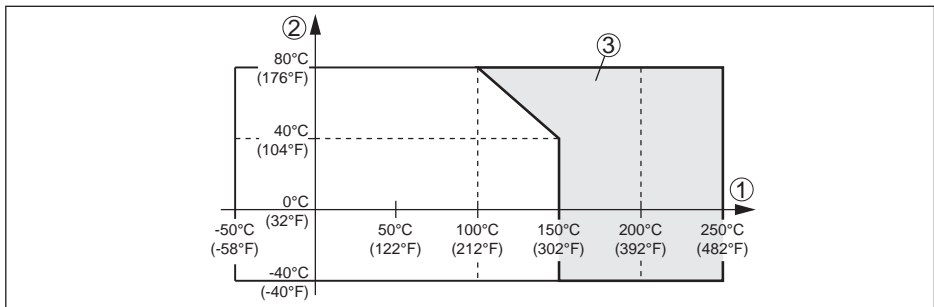


Fig. 30: Ambient temperature - Process temperature

- 1 Process temperature
- 2 Ambient temperature
- 3 Temperature range with temperature adapter

Density

- Standard sensitivity > 0.1 g/cm³ (0.0036 lbs/in³)
 - High sensitivity 0.02 ... 0.1 g/cm³ (0.0007 ... 0.0036 lbs/in³)
- Granular size no limitation¹⁾

Electromechanical data

Cable entry/plug (dependent on the version)

- Single chamber housing
 - 1 x cable entry M20 x 1.5 (cable: ø 5 ... 9 mm),
1 x blind plug M20 x 1.5; attached 1 x cable entry M20 x 1.5
 - or:
 - 1 x cable entry ½ NPT, 1 x blind plug ½ NPT, 1 x cable entry ½ NPT
 - or:
 - 1 x plug M12 x 1; 1 x blind plug M20 x 1.5
- Spring-loaded terminals for wire cross-section up to 1.5 mm² (AWG 16)

Adjustment elements

Mode switch

- Min. Min. detection or dry run protection
- Max. Max. detection or overflow protection

Voltage supply

- Operating voltage 20 ... 253 V AC, 50/60 Hz, 20 ... 253 V DC
- Domestic current requirement < 5 mA (via load circuit)
- Load current
 - Min. 10 mA
 - Max. 400 mA (at I > 300 mA the ambient temperature can be max. 60 °C/140 °F) max. 4 A up to 40 ms

Electrical protective measures

- Protection rating IP 66/IP 67 (NEMA Type 4X)
- Altitude above sea level up to 5000 m (16404 ft)
- Overvoltage category
 - up to 2000 m (6562 ft) III
 - up to 5000 m (16404 ft) II
- Protection class I

Approvals

Instruments with approvals can have different technical specifications depending on the version. For that reason the associated approval documents of these instruments have to be carefully noted. They are part of the delivery or can be downloaded under www.vega.com, "Instrument search (serial number)" as well as in the general download area.

¹⁾ Max. 20 mm (0.8 in) with product density < 0.03 g/cm³ (0.0011 lbs/in³).

9.2 Dimensions

VR-90, housing

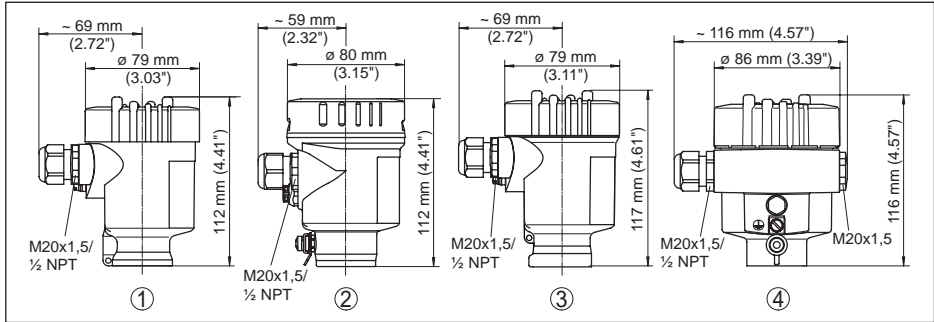


Fig. 31: Housing versions

- 1 Plastic single chamber
- 2 Stainless steel single chamber (electropolished)
- 3 Stainless steel single chamber (precision casting)
- 4 Aluminium - single chamber

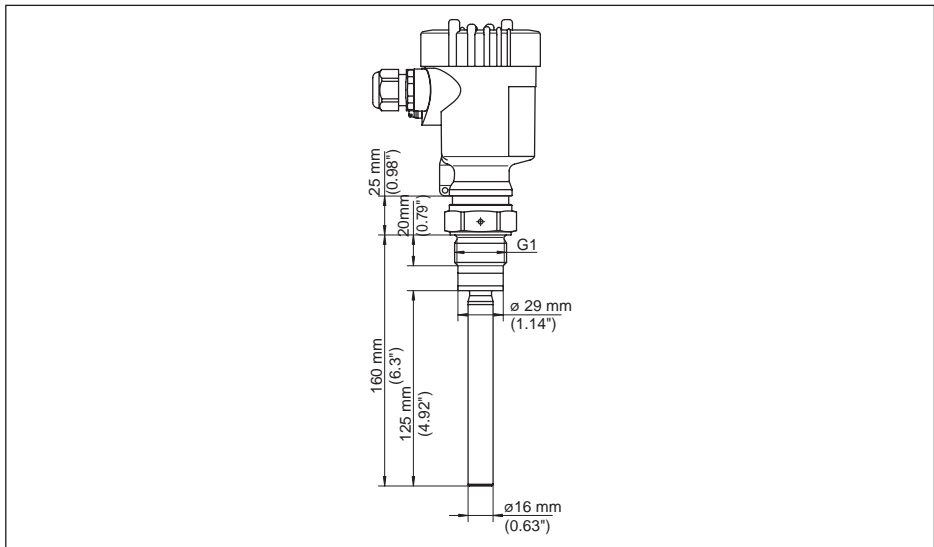


Fig. 32: VR-90, threaded version G1 (DIN ISO 228/1)

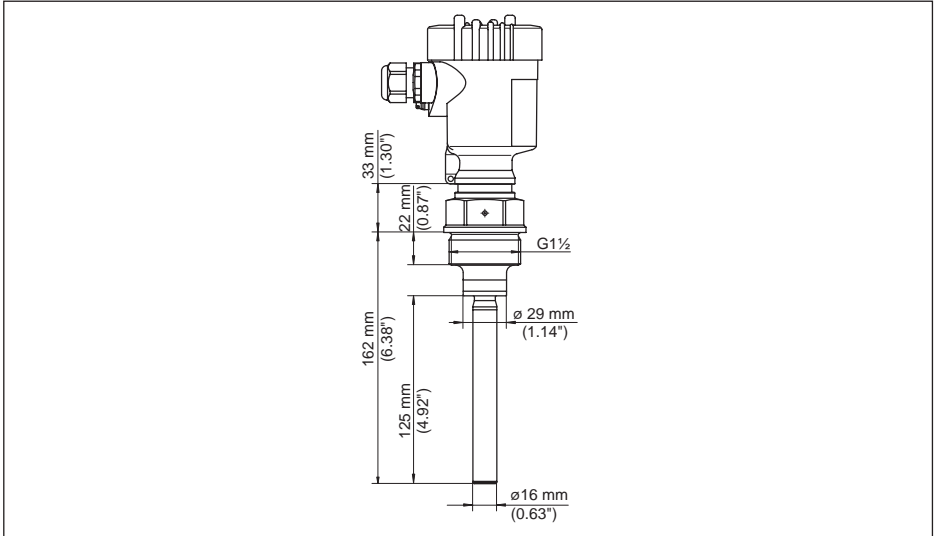


Fig. 33: VR-90, threaded version G1½ (DIN ISO 228/1)

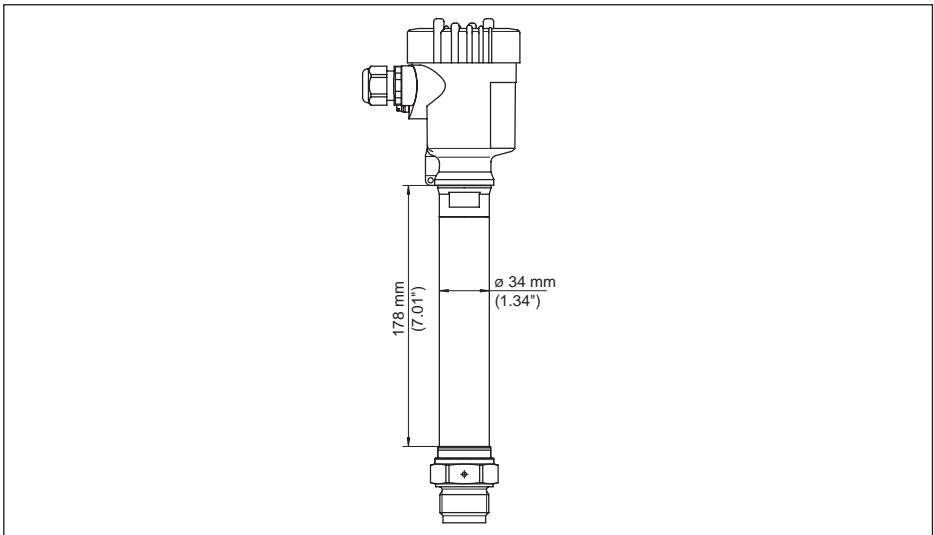


Fig. 34: Temperature adapter

9.3 Industrial property rights

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

9.4 Trademark

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

A large grid of graph paper for taking notes, consisting of 20 columns and 30 rows of small squares.



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A large grid of graph paper for taking notes, consisting of 20 columns and 30 rows of small squares.

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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.

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