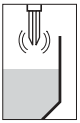
Operating Instructions

VEGASWING 51

- transistor (PNP)





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1 About this document

1.1 Function

This operating instructions manual has all the information you need for quick setup and safe operation. Please read this manual before you start setup.

1.2 Target group

This operating instructions manual is directed to trained, qualified personnel. The contents of this manual should be made available to these personnel and put into practice by them.

1.3 Symbolism used



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.

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

→ **Action**
This arrow indicates a single action.

1 **Sequence**
Numbers set in front indicate successive steps in a procedure.

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2 For your safety

2.1 Authorised personnel

All operations described in this operating instructions manual must be carried out only by trained specialist personnel authorised by the operator. For safety and warranty reasons, any internal work on the instruments must be carried out only by personnel authorised by the manufacturer.

2.2 Appropriate use

VEGASWING 51 is a sensor for level detection.

Detailed information on the application range of VEGASWING 51 is available in chapter "*Product description*".

2.3 Warning about misuse

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment.

2.4 General safety instructions

VEGASWING 51 is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards (e.g. the VDE regulations in Germany) as well as all prevailing safety regulations and accident prevention rules.

2.5 CE conformity

VEGASWING 51 is in CE conformity with EMC (89/336/EWG), fulfils NAMUR recommendation NE 21 and NE 23 and is in CE conformity with NSR (73/23/EWG).

Conformity has been judged according to the following standards:

- EMC:
  - Emission EN 61326: 1997 (class B)
  - Susceptibility EN 61326: 1997/A1:1998
- LVD: EN 61010-1: 2001

2.6 Manufacturer declaration

In conformity with DIN EN 60079-14/2004, para. 5.2.3, point c1, VEGASWING 51 is suitable for use in zone 2.

The operator must use the instrument as it was intended to be used and follow the specifications of the following documents:

- this operating instructions manual
- this manufacturer declaration (24625)
- the applicable installation regulations

Max. increase of the surface temperature during operation: 82 K (individual components in the instrument)

With an ambient temperature of 70 °C (158 °F) on the housing and a process temperature of 70 °C (158 °F), the max. ambient temperature during operation is 135 °C (275 °F).

Measures to maintain explosion protection during operation:

- Operate the instrument in the range of the specified electrical limit values. Permissible supply voltage: see "*Technical data*"
- Mount and operate the instrument in such a way that ignition danger by electrostatic charge is not expected.
- Make sure that no explosive atmosphere exists when the plug of the connection cable is pulled or plugged
- Make sure that the cable gland is tight and strain-relieved. The outer diameter of the connection cable must be adapted to the cable gland. Tighten the pressure screw of the cable gland carefully.
- The surface temperature of the housing must not exceed the ignition temperature of the surrounding explosive atmosphere

This instrument was assessed by a person who fulfils the DIN EN 60079-14 requirements.

2.7 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 "*Storage and transport*"

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- Chapter "*Disposal*"

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- VEGASWING 51 level sensor
- Test magnet
- Documentation
  - this operating instructions manual
  - if necessary, certificates

Components

VEGASWING 51 consists of the following components:

- Housing with electronics
- process fitting with tuning fork



Fig. 1: VEGASWING 51

3.2 Principle of operation

Area of application

VEGASWING 51 is a level sensor with tuning fork for level detection.

It is designed for industrial use in all areas of process technology and can be used in liquids.

Typical applications are overfill and dry run protection. With a tuning fork of only 40 mm length, VEGASWING 51 can be also mounted, e.g. in pipelines from DN 25. The small tuning fork

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allows use in vessels, tanks and pipes. Thanks to its simple and robust measuring system, VEGASWING 51 is virtually unaffected by the chemical and physical properties of the liquid.

It functions even under difficult conditions such as turbulence, air bubbles, foam generation, buildup, strong external vibration or changing products.

Fault monitoring
The electronics module of VEGASWING 51 continuously monitors via frequency evaluation the following criteria:

- Strong corrosion or damage on the tuning fork
- loss of vibration
- Line break to the piezo drive

If a malfunction is detected or in case of power failure, the electronics takes on a defined switching condition, i.e. the output transistor blocks (safe condition).

Functional principle

The tuning fork is piezoelectrically energised and vibrates at its mechanical resonance frequency of approx. 1200 Hz. The piezos are fixed mechanically and are hence not subject to temperature shock limitations. The frequency changes when the tuning fork is covered by the medium. This change is detected by the integrated oscillator and converted into a switching command.

Supply

VEGASWING 51 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 PLC, a pump etc.).

The data for power supply are stated in chapter "*Technical data*" in the "*Supplement*".

3.3 Operation

The switching status of VEGASWING 51 can be checked with closed housing (signal lamp). Products with a density >0.7 g/cm^3 (>0.025 lbs/in^3) can be detected.

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 according to DIN EN 24180.

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

Storage and transport temperature

- Storage and transport temperature see "*Supplement - Technical data - Ambient conditions*"
- Relative humidity 20 … 85 %

4 Mounting

4.1 General instructions

Switching point

In general, VEGASWING 51 can be mounted in any position. The instrument must be mounted in such a way that the tuning fork is at the height of the requested switching point.

The tuning fork has lateral marking (notches), marking the switching point with vertical mounting. The switching point refers to water (1 g/cm³/0.036 lbs/in³). When mounting VEGASWING 51, make sure that this marking is at the height of the requested switching point. Keep in mind that the switching point of the instrument is shifted if the medium has a density other than water.

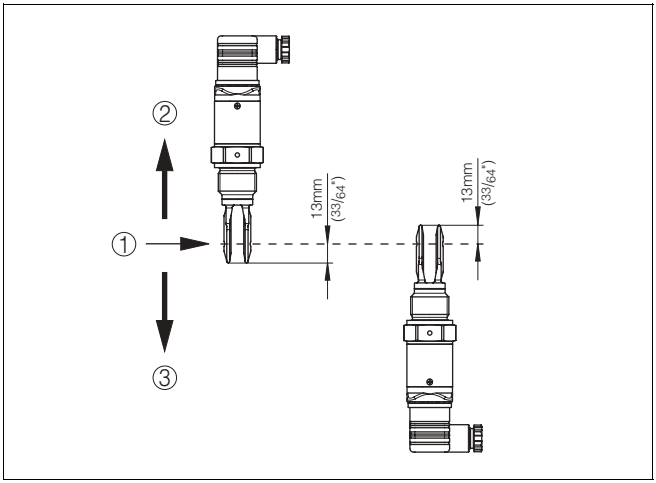


Fig. 2: Vertical mounting
1 Switching point approx. 13 mm (0.51 in)
2 Switching point with lower density
3 Switching point with higher density

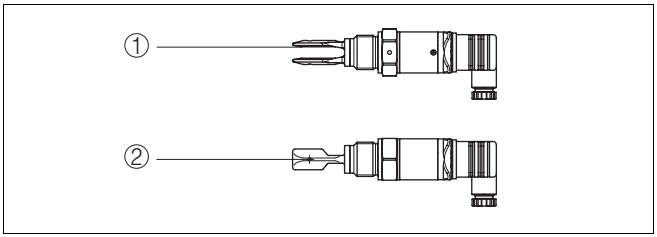


Fig. 3: Horizontal installation
1 Switching point
2 Switching point (recommended mounting position, particularly for adhesive products)

Moisture

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

You can give your VEGASWING 51 additional protection against moisture penetration by leading the connection cable downward in front of the cable entry. Rain and condensation water can thus drain off. This applies mainly to mounting outdoors, in areas where moisture is expected (e.g. by cleaning processes) or on cooled or heated vessels.

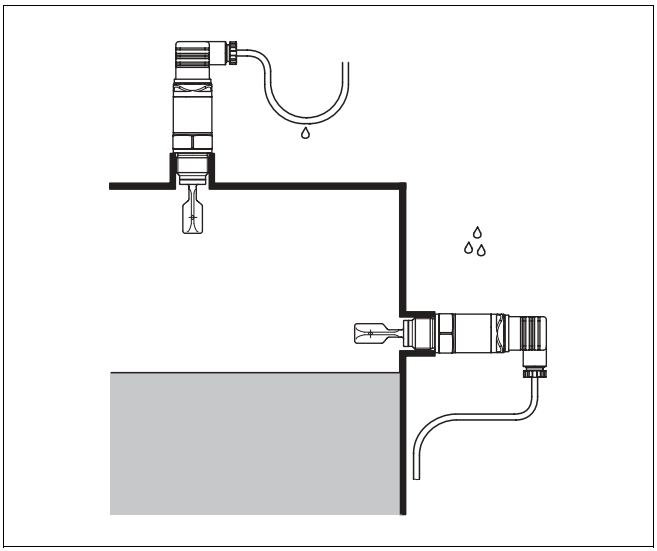


Fig. 4: Measures against moisture penetration

Transport

Do not hold VEGASWING 51 on the tuning fork.

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 stated in chapter "*Technical data*" in the "*Supplement*" 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 on the housing can damage its rotational mechanical parts.

To screw in, use the hexagon above the thread.

4.2 Mounting instructions

Welded socket

For welded socket with O-ring in front and welding marking.

VEGASWING 51 has a defined thread runout point. This means that every VEGASWING 51 is in the same position after being screwed in. Remove therefore the supplied flat seal from the thread of VEGASWING 51. This flat seal is not required when using a welded socket with front-flush O-ring.

Before welding, unscrew VEGASWING 51 and remove the rubber ring from the welded socket.

The welded socket has a marking (notch). For horizontal mounting, weld the socket with the notch facing upward or downward; in pipelines aligned with the direction of flow.

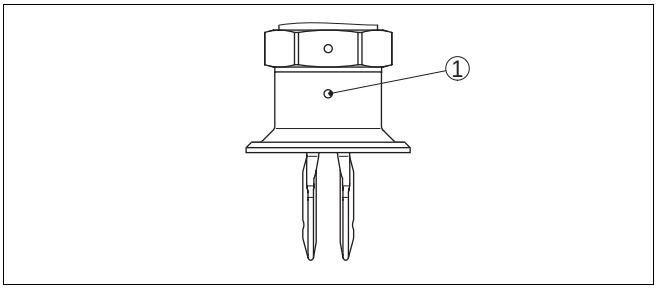


Fig. 5: Marking on the welded socket
1 Marking

Adhesive products

In case of horizontal mounting in adhesive and viscous products, the surfaces of the tuning fork should be vertical in order to reduce buildup on the tuning fork. The position of the tuning fork is indicated by a marking on the hexagon of VEGASWING 51. With this, you can check the position of the tuning fork when screwing it in. When the hexagon touches the seal, the thread can still be turned by approx. half a turn. This is sufficient to reach the recommended installation position.

In adhesive and viscous products, the surfaces of the tuning fork should protrude into the vessel to avoid buildup. Therefore sockets for flanges and mountings bosses should not exceed a certain length.

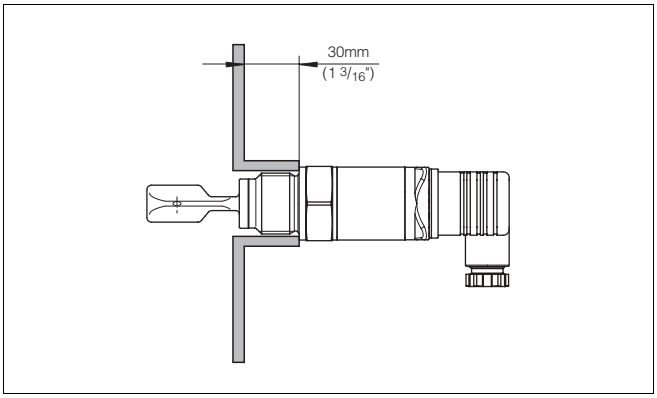


Fig. 6: Adhesive products

Inflowing medium

If VEGASWING 51 is mounted in the filling stream, unwanted false measurements may be generated. Mount VEGASWING 51 at a location in the vessel where no disturbing influence from e.g. filling openings, agitators, etc. can occur.

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Flows

To minimise flow resistance caused by the tuning fork, VEGASWING 51 should be mounted in such a way that the surfaces of the blades are parallel to the product movement.

5 Connecting to voltage supply

5.1 Preparing the connection

Note safety instructions

Generally note the following safety instructions:

- Connect only in the complete absence of line voltage

Selecting connection cable

VEGASWING 51 is connected with standard cable with round cross section. Depending on the plug connection, you have to select the outer diameter of the cable respectively so that the seal effect of the cable gland is ensured.

- Valve plug DIN 43650, ø 4.5 … 7 mm
- Valve plug DIN 43650 with IDC method of termination, ø 5.5 … 8 mm

Cable glands

Use cable with a round wire cross section and tighten the cable gland.

When mounting outdoors, on cooled vessels or in humid areas, in which cleaning is carried out e.g. with steam or high pressure, it is particularly important to seal the cable gland.

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5.2 Wiring plan

Housing overview

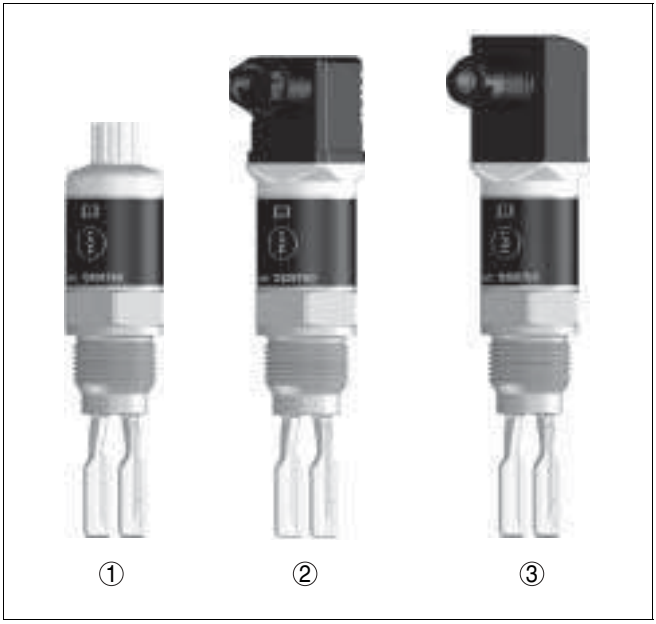


Fig. 7: Overview of the connection versions
1 M12x1 plug connection
2 Valve plug DIN 43650
3 Valve plug DIN 43650 with IDC connections

Plug versions

M12x1 plug connection
This plug connection requires a preconfectioned cable with plug. Protection IP 66/IP 67.

Valve plug DIN 43650
For this plug version, standard cable with round wire cross-section can be used. Cable diameter 4.5 … 7 mm, protection IP 65.

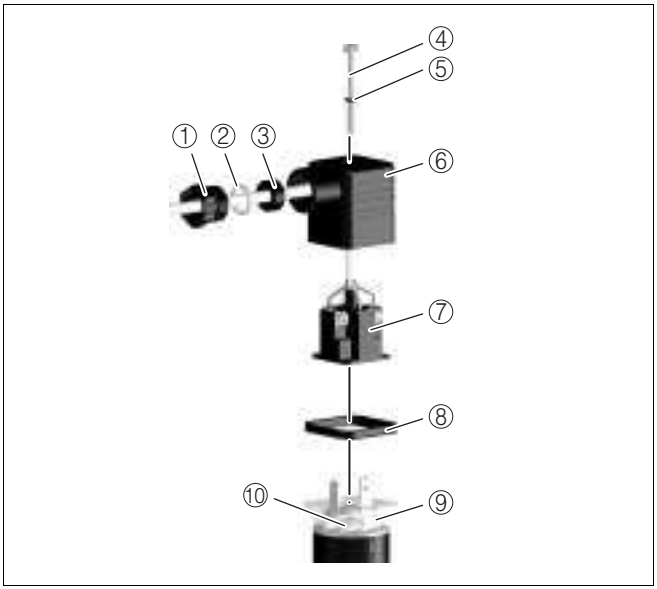


Fig. 8: Connection, valve plug DIN 43650
1 Pressure screw
2 Pressure disk
3 Seal ring
4 Fixing screw
5 Seal washer
6 Plug housing
7 Plug insert
8 Profile seal
9 Control lamp
10 VEGASWING 51

Valve plug DIN 43650 with IDC connections

For this plug version you can use standard cable with round wire cross-section. The inner cables must not be dismantled. The plug connects the cables automatically when screwing in. Cable diameter 5.5 … 8 mm, protection IP 67.

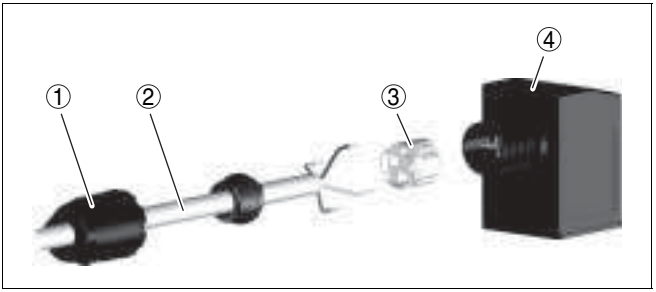


Fig. 9: Connection, valve plug DIN 43650 with IDC method of termination
1 Compression nut
2 Cable
3 Split taper socket
4 Seal insert
5 Strand
6 Plug housing

Transistor output

For connection to binary inputs of a PLC with an input resistance <100 kOhm.

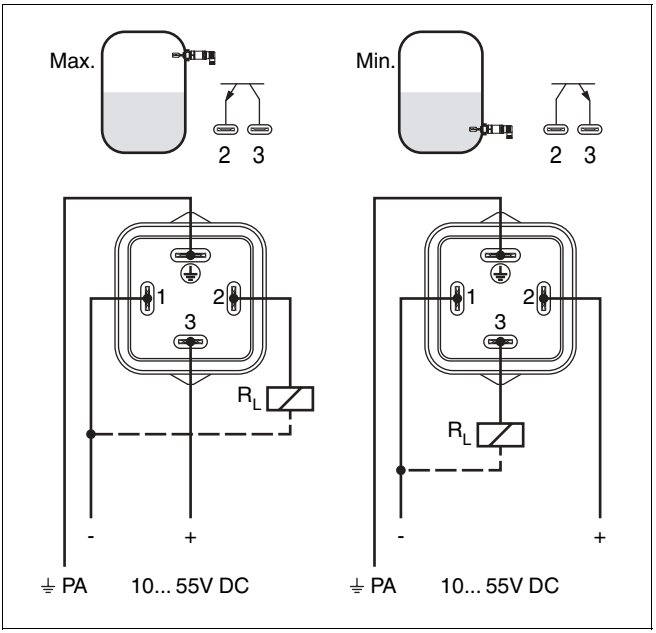


Fig. 10: Wiring plan, Transistor output with valve plug DIN 43650
PA Potential equalisation
RL Load resistance (contactor, relay etc.)

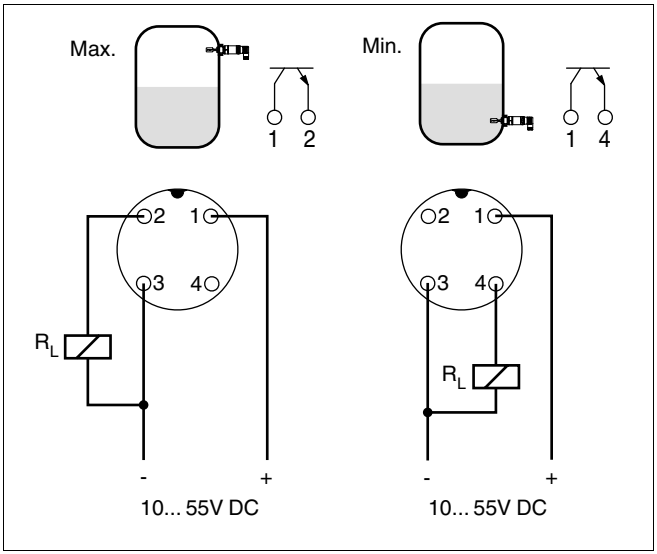


Fig. 11: Wiring plan (housing), Transistor output with M12x1 plug connection
1 Brown
2 White
3 Blue
4 Black
RL Load resistance (contactor, relay etc.)

6 Setup

6.1 Indication of the switching status

The switching status of the electronics can be checked on the upper part of the housing.

6.2 Function test

VEGASWING 51 has an integrated test switch which can be activated magnetically. Proceed as follows to test the instrument:

→ Hold the test magnet (accessory) to the magnet symbol on the instrument housing

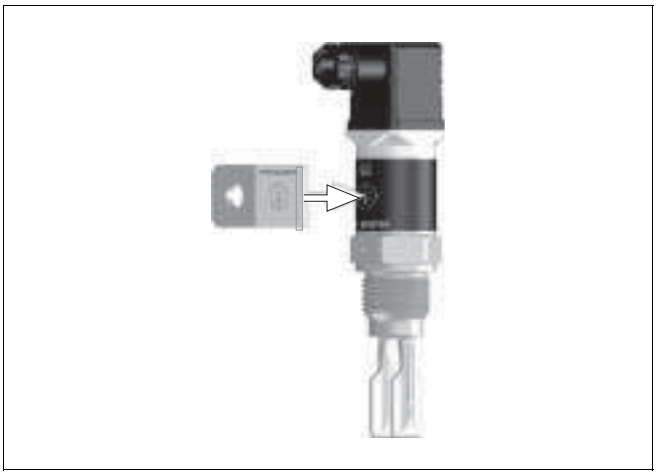


Fig. 12: Function test

The test magnet changes the current switching condition of the instrument. You can check the change on the signal lamp. Please note that the connected instruments are activated during the test.

If VEGASWING 51 does not switch over after several tests with the test magnet, you have to check the plug connection and the connection cable and test the instrument again. If there is no switching function, the electronics will be defective. In this case you have to exchange the electronics or return the instrument to our repair department.

Caution:
It is absolutely necessary that you remove the test magnet after the test from the instrument housing.

6.3 Function chart

The following chart provides an overview of the switching conditions depending on the adjusted mode and level.

	Level	Switching status	Control lamp
Mode max.		transistor conducts	Green
Mode max.		transistor blocks	red
Mode min.		transistor conducts	Green
Mode min.		transistor blocks	red
Failure	any	transistor blocks	flashes red

7 Maintenance and fault rectification

7.1 Maintenance

When used as directed in normal operation, VEGASWING 51 is completely maintenance free.

7.2 Remove interferences

Causes of malfunction

VEGASWING 51 offers maximum reliability. Nevertheless faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Supply
- Signal processing

Fault clearance

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

24 hour service hotline

However, should this measures not be successful, call the VEGA service hotline in urgent cases under the phone no. **+49 1805 858550**.

The hotline is available to you 7 days a week round-the-clock. Since we offer this service world-wide, the support is only available in the English language. The service is free of charge, only the standard telephone costs will be charged.

Checking the switching signal

? Control lamps off

- Voltage supply interrupted.

→ Check the voltage supply and the cable connection

→ Exchange the electronics module

? Signal lamp flashes red

- There was no load connected when connecting to power supply

→ Connect the instrument correctly

→ Check if the tuning fork is damage or extremely corroded

- Frequency error

→ Adjust the instrument correctly

? The signal lamp flashes alternately red and green

- Shortcircuit or overload

→ Check the electrical connection

7.3 Exchange of the electronics

To exchange the electronics in case of failure, it is not necessary to dismount the instrument.

Dismounting the electronics module can destroy the housing seal. Therefore only open the instrument if you want to insert a new electronics module. The housing seal is supplied with the electronics module.

You require an electronics module type SWE50T or SWE50C. If you want to use an electronics module with a different signal output (e.g. contactless electronic switch SWE50C), you can download the suitable operating instructions manual from our homepage under Downloads. Take note of the specifications in the respective operating instructions manual.

To exchange the electronics module, proceed as follows:

1 Separate VEGASWING 51 from operating voltage
2 Loosen screw (1) of the valve plug (2) with a wrench (loosen M12x1 plug connection by turning the compression nut)
3 Remove valve plug (2) or M12x1 according to drawing
4 Remove lateral fixing screw (7) with a crosstip screwdriver
5 Pull electronics module (4) carefully out of the housing (8)
6 Remove the plug of the connection cable (6) from the socket on the oscillator (4)
7 Set the 16-step rotating switch (5) of the new replacement electronics module (4) to the value of the defective electronics module
8 Insert the connection cable (6) in the socket of the new electronics module (4)
9 Insert electronics module (4) into the housing (8). Make sure that the lateral thread on the electronics module is above the hole on the housing (8)
10 Push the electronics module (4) flush into the housing (8)
11 Screw in the lateral fixing screw (7) with a crosstip screwdriver

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12 Plug the valve plug (2) to the instrument, make sure that the profile seal (3) is placed correctly

13 Tighten the screw (1) with a wrench (fasten M12x1 plug connection by screwing the compression nut)

VEGASWING 51 is again ready for operation.

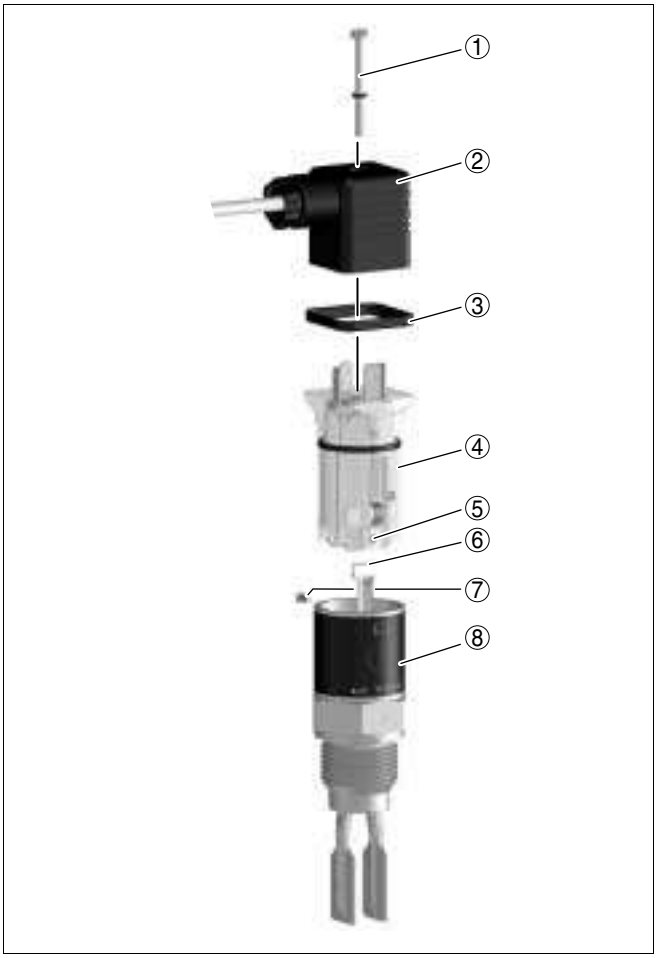


Fig. 13: Exchanging the electronics
1 Fixing screw
2 Valve plug DIN 43650
3 Profile seal
4 Electronics module
5 Rotary switch (16-steps)
6 Plug connector
7 Fixing screw
8 Housing

7.4 Instrument repair

If a repair is necessary, please proceed as follows:

You can download a return form (23 KB) in the Internet from our homepage www.vega.com under: "*Downloads - Forms*

and Certificates - Repair form".

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

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof
- Attach the filled in form and if necessary, a safety data sheet to the instrument
- Please ask the agency serving you for the address of your return shipment. You find the respective agency on our website www.vega.com under: "*Company - VEGA worldwide*"

8 Dismounting

8.1 Dismounting steps



Warning:
Before dismounting, 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 power supply*" and carry out the listed steps in reverse order.

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 2002/96/EG
This instrument is not subject to the WEEE directive 2002/96/EG and the respective national laws (in Germany, e.g. ElektroG). Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points. These may be used only for privately used products according to the WEEE directive.

Correct disposal avoids negative effects to persons and environment and ensures recycling of useful raw materials.

Materials: see "*Technical data*"

If you cannot dispose of the instrument properly, please contact us about disposal methods or return.

9 Supplement

9.1 Technical data

General data

Material 316L corresponds to 1.4404 or 1.4435

Materials, wetted parts	
– Tuning fork	316L
– Process seal	Klingersil C-4400
– Process fittings	316L
Materials, non-wetted parts	
– Housing	316L and plastic PEI
Weight	approx. 250 g (9 oz)
Process fittings	
– Thread	G¾ A, G1 A, ¾ NPT or 1 NPT
– hygienic fittings	Tri-Clamp 1", Tri-Clamp 1½", bolting DN 25 PN 40, bolting DN 40 PN 40, SMS
Surface quality	
– Standard	R_a <3.2 µm (1.26^{-4} in)
– hygienic version	R_a <0.8 µm (3.15^{-5} in)

Measuring accuracy

Hysteresis	approx. 2 mm (0.08 in) with vertical installation
Integration time	approx. 500 ms
Frequency	approx. 1200 Hz

Ambient conditions

Ambient temperature on the housing	-40 … +70 °C (-40 … +158 °F)
Storage and transport temperature	-40 … +80 °C (-40 … +176 °F)

Process conditions

Process pressure	-1 … 64 bar (-14.5 … 938 psi)
Process temperature - Standard	-40 … +100 °C (-40 … +212 °F)

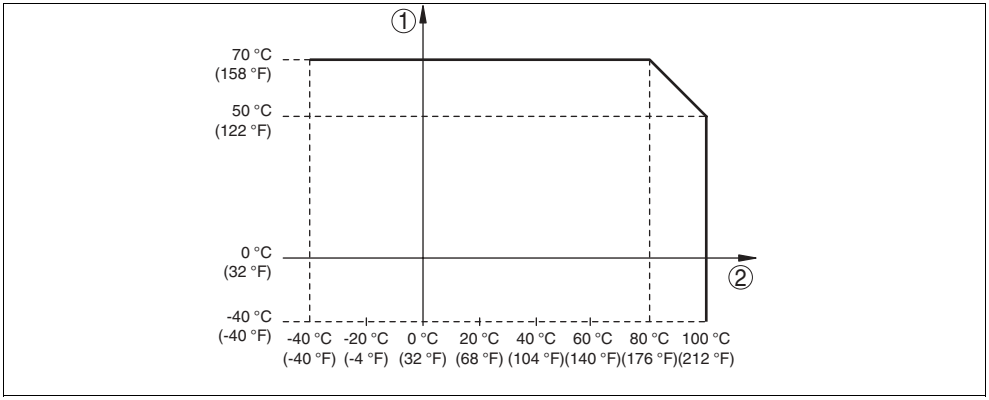


Fig. 14: Dependendency ambient temperature to process temperature
1 Ambient temperature
2 Process temperature

Process temperature - High temperature version (option)	-40 … +150 °C (-40 … +302 °F)
Temperature shock	no limitation
Viscosity - dynamic	0.1 … 10000 mPa s
Density	0.7 … 2.5 g/cm³ (0.025 … 0.09 lbs/in³)

Operation

Plug connections	Specification see "*Connecting to power supply*"
Signal lamp (LED)	
– Green	Output conductive
– red	Output blocked
– Red (flashing)	Failure, Output blocked

Output variable

Output	Transistor output PNP
Load current	max. 250 mA (output, overload and permanently shortcircuit proof)
Voltage loss	max. 1 V
Turn-on voltage	max. 55 V DC
Blocking current	<10 µA

Mode	
– Min./Max.	Changeover by electronic connection
– Max.	Overfill protection
– Min.	Dry run protection

Voltage supply

Supply voltage	10 … 55 V DC
Power consumption	max. 0.5 W

Electromechanical data

Valve plug DIN 43650	
– Wire cross-section	1.5 mm^2 (0.06 in^2)
– Cable outer diameter	4.5 … 7 mm (0.18 … 0.28 in)
Valve plug DIN 43650 with IDC connections	
– Wire cross-section	for wire cross-section of 0.5 … 1 mm^2 (0.02 … 0.04 in^2)
– Single wire diameter	>0.1 mm (0.004 in)
– Wire diameter	1.6 … 2 mm^2 (0.06 … 0.08 in^2)
– Cable outer diameter	5.5 … 8 mm (0.22 … 0.31 in)
– Connection frequency	10x (on the same cross-section)

Electrical protective measures

Protection	
– Valve plug DIN 43650	IP 65
– Valve plug DIN 43650 with IDC connections	IP 67
– M12x1 plug connection	IP 66/IP 67
Overvoltage category	III
Protection class	II

Approvals

Overfill protection according to WHG

Ship approvals

9.2 Dimensions

VEGASWING 51, standard version

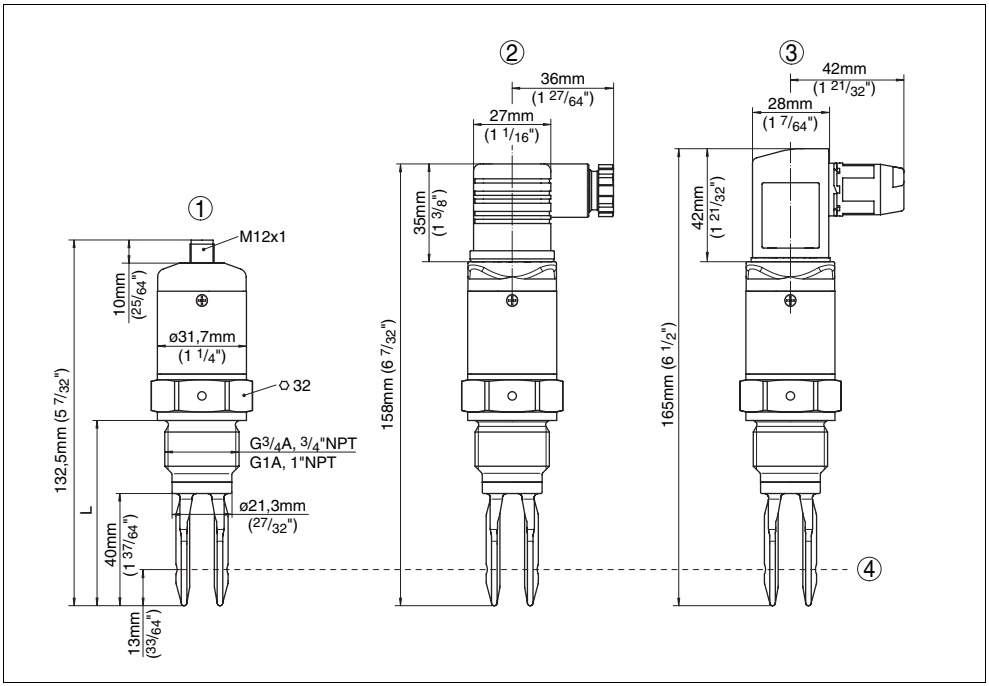


Fig. 15: VEGASWING 51, standard version
1 Thread G¾ A, G1 A, ¾ NPT or 1 NPT (M12x1)[1)]
2 Thread G¾ A, G1 A, ¾ NPT or 1 NPT (valve plug DIN 43650)
3 Thread G¾ A, G1 A, ¾ NPT or 1 NPT (valve plug DIN 43650 with IDC method of termination)
4 Switching point
L Length with G¾ A, ¾ NPT: 66 mm (2.6 in)
L Length with G1 A, 1 NPT: 69 mm (2.7 in)
L Length with switching point = L + 48 mm (1.9 in)

1) Keep in mind that the total length is extended by the plug connection.

VEGASWING 51, high temperature version

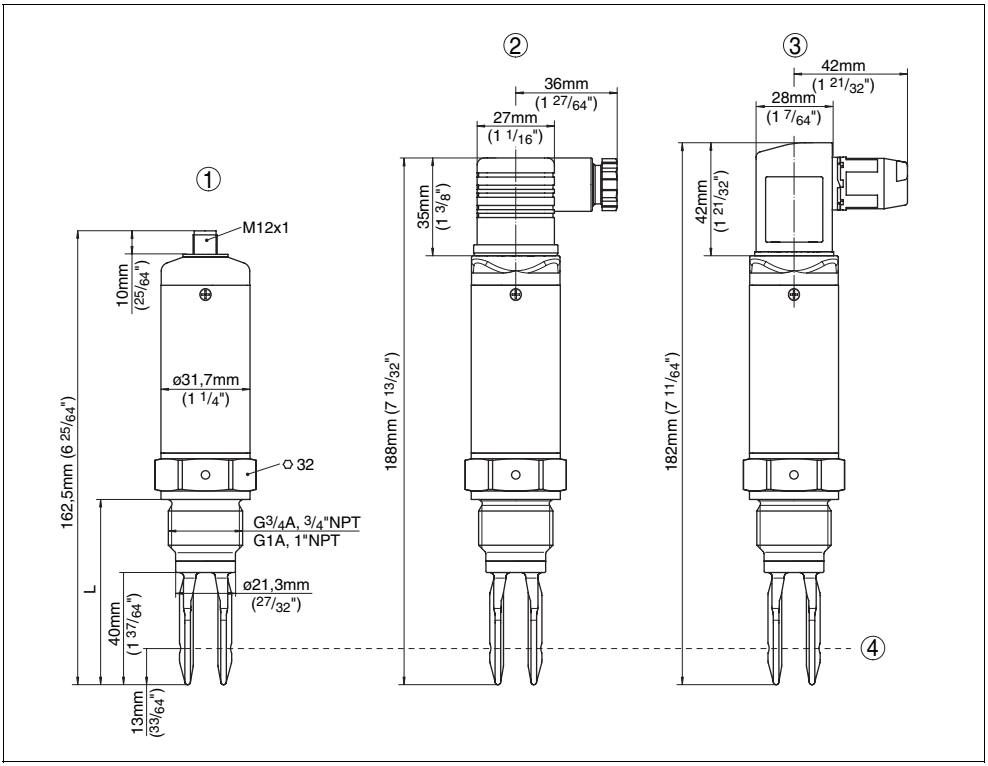


Fig. 16: VEGASWING 51, high temperature version
1 Thread G¾ A, G1 A, ¾ NPT or 1 NPT (M12x1)[2)]
2 Thread G¾ A, G1 A, ¾ NPT or 1 NPT (valve plug DIN 43650)
3 Thread G¾ A, ¾ NPT or 1 NPT (valve plug DIN 43650 with IDC method of termination)
4 Switching point
L Length with G¾ A, ¾ NPT: 66 mm (2.6 in)
L Length with G1 A, 1 NPT: 69 mm (2.7 in)
L Length with switching point = L + 48 mm (1.9 in)

2) Keep in mind that the total length is extended by the plug connection.

VEGASWING 51, hygienic versions

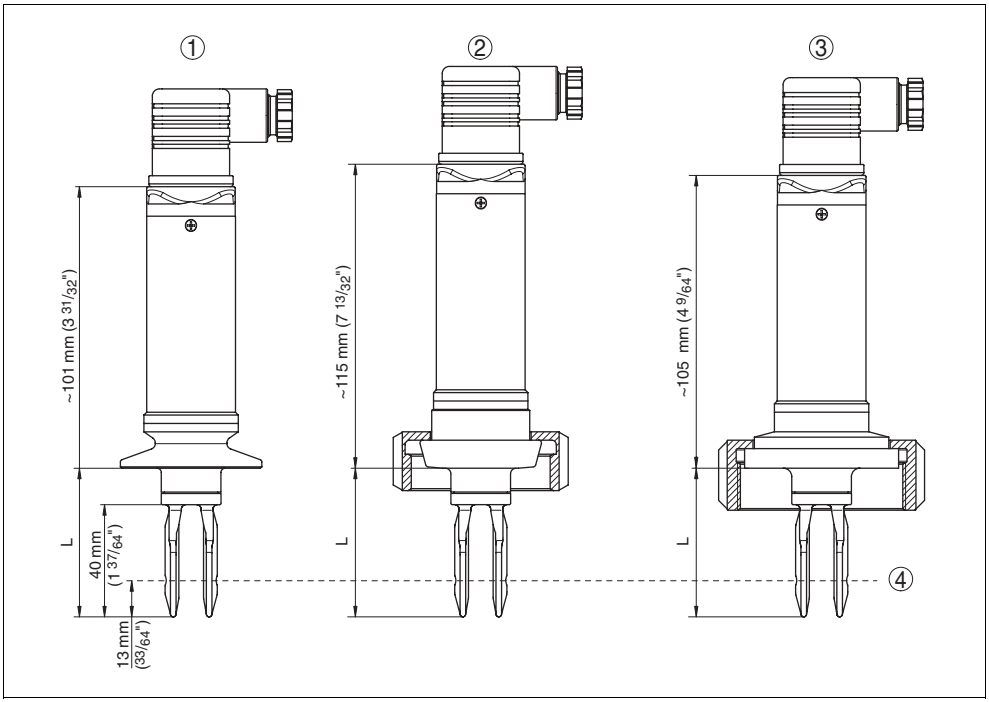


Fig. 17: VEGASWING 51, hygienic versions
1 Tri-Clamp (valve plug DIN 43650)
2 Bolting (valve plug DIN 43650)
3 SMS 1145 (valve plug DIN 43650)
4 Switching point
L Length with Tri-Clamp: 53 mm (2.1 in)
L Length with bolting: 53 mm (2.1 in)
L Length with SMS 1145: 53 mm (2.1 in)

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