

Operating Instructions

OPTISWITCH 5100 C, 5150 C

with NAMUR output



Variable area flowmeters

Vortex flowmeters

Flow controllers

Electromagnetic flowmeters

Ultrasonic flowmeters

Mass flowmeters

Level measuring instruments

Communications engineering

Engineering systems & solutions

Switches, counters, displays and recorders

Heat metering

Pressure and temperature

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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.



Sequence

Numbers set in front indicate successive steps in a procedure.

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

OPTISWITCH 5100 C, 5150 C is a sensor for level detection.

Detailed information on the application range of OPTISWITCH 5100 C, 5150 C 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

OPTISWITCH 5100 C, 5150 C 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

OPTISWITCH 5100 C, 5150 C is in CE conformity with EMC (89/336/EWG), fulfils NAMUR recommendation NE 21 and is in CE conformity with LVD (73/23/EWG).

Conformity has been judged according to the following standards:

- EMC:
 - Emission EN 61326/A1: 1998 (class B)
 - Susceptibility EN 61326: 1997/A1:1998
- LVD: EN 61010-1: 1993

2.6 SIL conformity

OPTISWITCH 5100 C, 5150 C fulfills the requirements of functional safety according to IEC 61508/IEC 61511. You can find further information in the supplementary instructions manual "*Safety Manual - Functional safety (SIL) OPTISWITCH 5XXX*".

2.7 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.

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- OPTISWITCH 5100 C, 5150 C level sensor
- Documentation
 - this operating instructions manual
 - Ex specific safety instructions (with Ex versions), if necessary further certificates

Components

OPTISWITCH 5100 C, 5150 C consists of the following components:

- Housing cover
- Housing with electronics
- process fitting with tuning fork

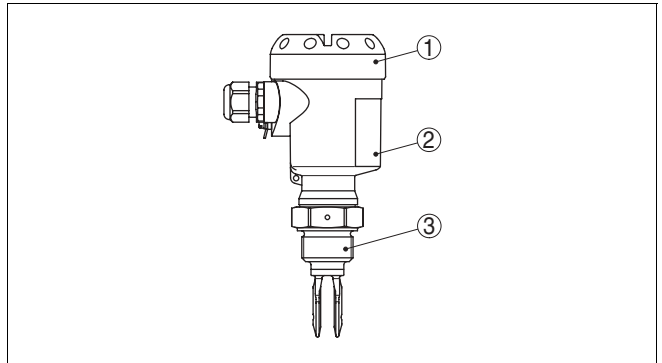


Fig. 1: OPTISWITCH 5100 C, 5150 C with plastic housing

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

3.2 Principle of operation

Area of application

OPTISWITCH 5100 C, 5150 C 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 overflow and dry run protection. With a tuning fork of only 40 mm length, OPTISWITCH 5100 C, 5150 C can be also mounted, e.g. in pipelines from DN 25. The small tuning fork allows use in vessels, tanks and pipes.

Thanks to its simple and robust measuring system, OPTISWITCH 5100 C, 5150 C 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 OPTISWITCH 5100 C, 5150 C 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 one of these faults is detected or if the power supply fails, the electronics takes on a defined output status (safe condition).

Physical 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.

Power supply

OPTISWITCH 5100 C, 5150 C 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 directly activated (e.g. a warning system, a PLC, a pump etc.).

The exact range of the power supply is stated in the "*Technical data*" in the "*Supplement*".

3.3 Operation

The switching condition of OPTISWITCH 5100 C, 5150 C with plastic housing can be checked when the housing is closed (signal lamp). With the basic setting, products with a density $>0.7 \text{ g/cm}^3$ ($>0.025 \text{ lbs/in}^3$) can be detected. The instrument can be adapted if products with lower density should be measured.

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

- Control lamp for indication of the switching condition.
- DIL switch for sensitivity adjustment
- Mode switch to select the switching condition (reverse characteristics)
- Simulation key

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 55439.

The packaging of standard instruments consists of environment-friendly, recyclable cardboard. In addition, the sensor is provided with a protective cover of ABS. 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, OPTISWITCH 5100 C, 5150 C 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 markings (notches), marking the switching point with vertical mounting. The switching point refers to water with the basic setting of the sensitivity switch $\geq 0.7 \text{ g/cm}^3$ ($\geq 0.025 \text{ lbs/in}^3$). When mounting OPTISWITCH 5100 C, 5150 C, 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 - water = 1 g/cm^3 ($= 0.036 \text{ lbs/in}^3$). For products $< 0.7 \text{ g/cm}^3$ ($< 0.025 \text{ lbs/in}^3$) and $> 0.5 \text{ g/cm}^3$ ($> 0.018 \text{ lbs/in}^3$) the density switch must be set to $\geq 0.5 \text{ g/cm}^3$.

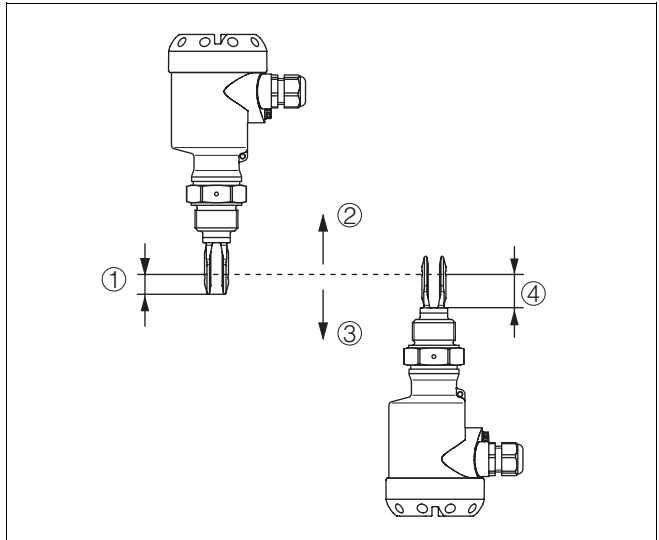


Fig. 2: Vertical mounting

- 1 Switching point approx. 13 mm (approx. 0.51 in)
- 2 Switching point with lower density
- 3 Switching point with higher density
- 4 Switching point approx. 27 mm (approx. 1.06 in)

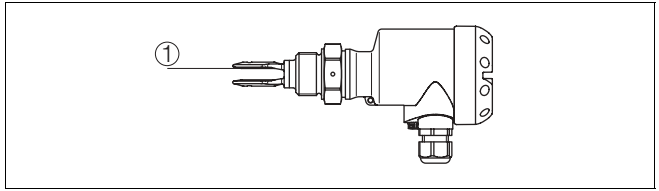


Fig. 3: Horizontal mounting
 1 Switching point

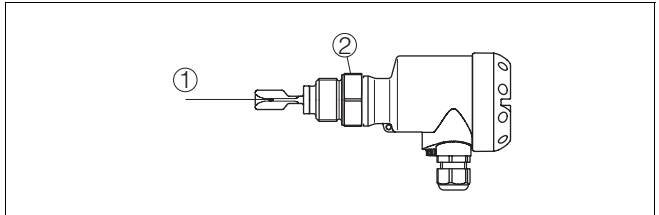


Fig. 4: Horizontal mounting (recommended installation location - particularly for adhesive products)
 1 Switching point
 2 Marking with screwed version on top - with flange versions directed to the flange holes

With flange versions, the fork is directed to the flange holes in the following way.

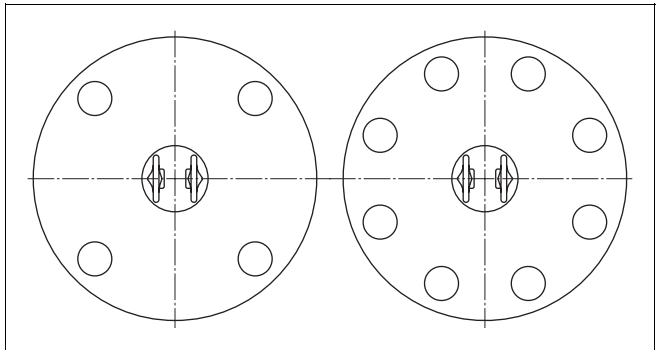


Fig. 5: Fork position with flange versions

Moisture

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

You can give your OPTISWITCH 5100 C, 5150 C 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.

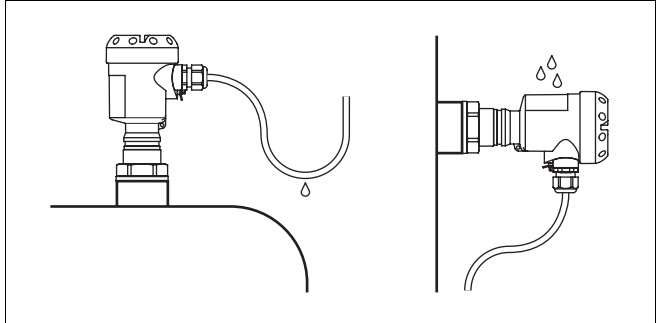


Fig. 6: Measures against moisture penetration

Transport

Do not hold OPTISWITCH 5100 C, 5150 C on the tuning fork. Particularly with flange or tube versions, the tuning fork can be damaged by the instrument weight. Transport coated instruments very carefully and avoid touching the tuning fork.

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 stated in the "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 in the instrument! Applying tightening force on the housing can damage its internal mechanical parts.

To screw in, use the hexagon above the thread.

4.2 Mounting instructions

Welded socket

OPTISWITCH 5100 C, 5150 C has a defined thread starting point. This means that every OPTISWITCH 5100 C, 5150 C is in the same fork position after being screwed in. Remove therefore the supplied seal from the thread of OPTISWITCH 5100 C, 5150 C. This seal is not required when using a welded socket with O-ring in front.

Keep in mind that this welded socket is not suitable for coated instrument versions.

Screw OPTISWITCH 5100 C, 5150 C completely into the welded socket. The later position can be determined already before welding. Mark the appropriate position of the welded socket. Before welding, unscrew OPTISWITCH 5100 C, 5150 C and remove the rubber ring from the welded socket. The welded socket has a marking (notch). Weld the socket with the notch facing upward, or in case of pipelines, aligned with the direction of flow.

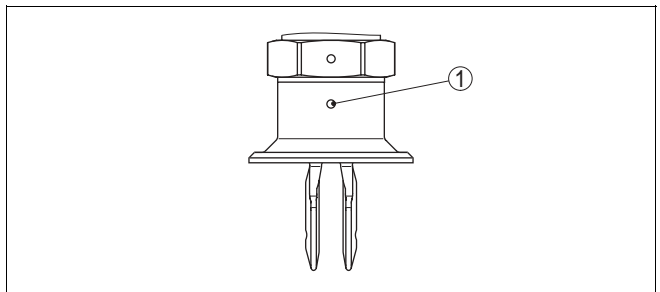


Fig. 7: Marking on the welded socket
1 Marking

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. On the screwed version you will find a marking on the hexagon. 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.

With flange versions, the fork is directed to the flange holes.

When used in adhesive and viscous products, the tuning fork should protrude into the vessel to avoid buildup. For that reason, sockets for flanges and mounting bosses should be avoided when mounting horizontally.

Inflowing medium

If OPTISWITCH 5100 C, 5150 C is mounted in the filling stream, unwanted switching signals may be generated. Mount OPTISWITCH 5100 C, 5150 C at a location in the vessel where no disturbing influence from e.g. filling openings, agitators etc. can occur.

Flows

To minimise flow resistance caused by the tuning fork, OPTISWITCH 5100 C, 5150 C should be mounted in such a way that the surfaces of the blades are parallel to the product movement.

Enamel coating

Instruments with enamel coating should be treated very carefully and shocks should be avoided. Unpack OPTISWITCH 5100 C, 5150 C directly before installation. Insert OPTISWITCH 5100 C, 5150 C carefully into the vessel opening and avoid touching any sharp vessel parts.

5 Connecting to voltage supply

5.1 Preparing the connection

Note safety instructions

Generally not the following safety instructions:

- Connect only in the complete absence of line voltage

Take note of safety instructions for Ex applications



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

Select power supply

Connect the power supply according to the following diagrams. Take note of the general installation regulations. As a rule, connect OPTISWITCH 5100 C, 5150 C to vessel ground (PA), or in case of plastic vessels, to the next ground potential. On the side of the instrument housing there is a ground terminal between the cable entries. This connection serves to drain off electrostatic charges. In Ex applications, the installation regulations for hazardous areas must be given priority.

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

Selecting the connection cable

OPTISWITCH 5100 C, 5150 C is connected with standard cable with round cross-section. An outer cable diameter of 5 ... 9 mm (0.2 ... 0.35 in) ensures the seal effect of the cable entry.

If cable with a different diameter or wire cross section is used, exchange the seal or use an appropriate cable connection.

In hazardous areas, only use approved cable connections for OPTISWITCH 5100 C, 5150 C.



Select connection cable for Ex applications



Take note of the corresponding installation regulations for Ex applications.

5.2 Connection steps



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

Proceed as follows:

- 1 Unscrew the housing cover
- 2 Loosen compression nut of the cable entry

- 3 Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) insulation from the ends of the individual wires
 - 4 Insert the cable into the sensor through the cable entry
 - 5 Open the terminals with a screwdriver
 - 6 Insert the wire ends into the open terminals according to the wiring plan
 - 7 Tighten the terminals with a screwdriver
 - 8 Check the hold of the wires in the terminals by lightly pulling on them
 - 9 Tighten the compression nut of the cable entry, the seal ring must completely encircle the cable
 - 10 Screw the housing cover back on
- The electrical connection is hence finished.

5.3 Wiring plan, single chamber housing



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

Housing overview

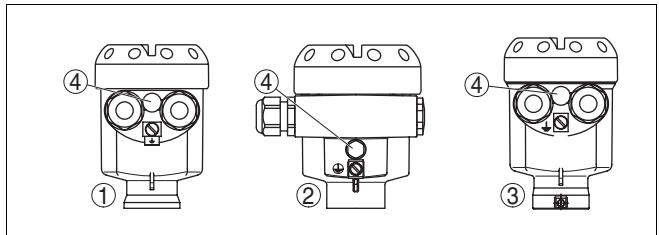


Fig. 8: Material versions, single chamber housing

- 1 Plastic (not with EEx d)
- 2 Aluminium
- 3 Stainless steel (not with EEx d)
- 4 Filter element for pressure compensation (not with EEx d)

Electronics and connection compartment

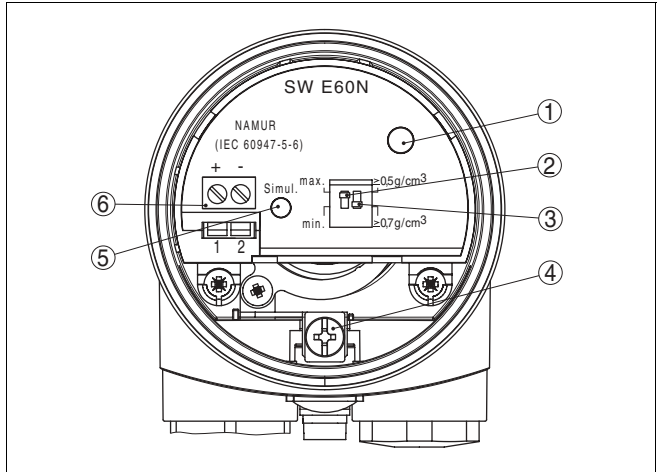


Fig. 9: Electronics and connection compartment, single chamber housing

- 1 Control lamp
- 2 DIL switch for characteristics reversal
- 3 DIL switch for sensitivity adjustment
- 4 Ground terminal
- 5 Simulation key
- 6 Screwed terminals

Wiring plan

For connection of the amplifier according to NAMUR (IEC 60947-5-6, EN 50227). You find further information in the "Technical data" in the "Supplement".

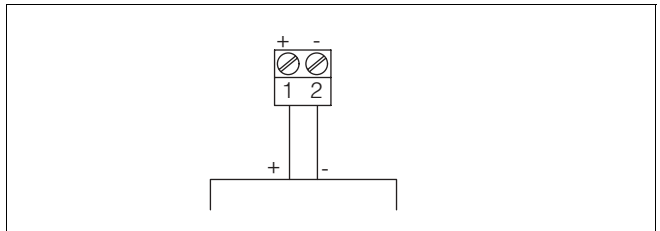


Fig. 10: Wiring plan, single chamber housing

6 Set up

6.1 General

The numbers in brackets refer to the following illustrations.

Function/Configuration

The switching condition of the electronics can be checked on the plastic housing with closed housing cover (control lamp). In the basic setting, products with a density $>0.7 \text{ g/cm}^3$ ($>0.025 \text{ lbs/in}^3$) can be detected. For products with lower density, the switch must be set to $>0.5 \text{ g/cm}^3$ ($>0.018 \text{ lbs/in}^3$).

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

- Signal lamp (1)
- DIL switch for characteristics reversal - min./max. (2)
- DIL switch for sensitivity adjustment (3)
- Simulation key (4)



Note:

For test purposes, immerse the tuning fork of OPTISWITCH 5100 C, 5150 C always in liquids. Do not test the function of OPTISWITCH 5100 C, 5150 C with the hand. This can damage the sensor.

6.2 Adjustment elements

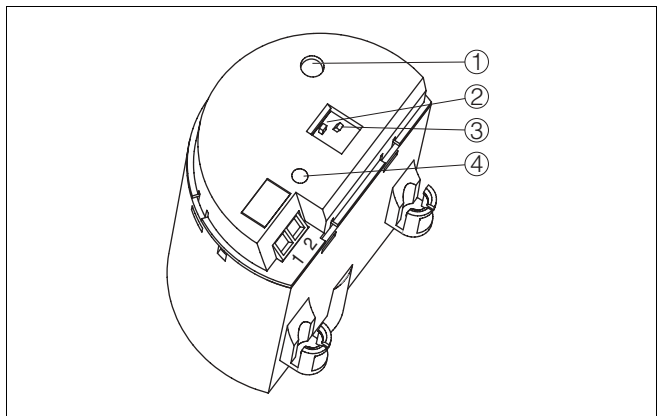


Fig. 11: Oscillator SWE60N - NAMUR output

- 1 Signal lamp (LED)
- 2 DIL switch for characteristics reversal
- 3 DIL switch for sensitivity adjustment
- 4 Simulation key

- Signal lamp (1)** Single-colour control lamp (LED) for indication of the switching condition
- red = High current ≥ 2.2 mA
 - dark = Low current ≤ 1 mA
 - red (flashing) = Failure ≤ 1 mA
- Characteristics reversal (2)** The characteristics reversal can be carried out with the DIL switch. You can choose between falling characteristic curve (switch position max.) and rising characteristic curve (switch position min.). This allows you to output the desired current.
- Modes
- min. - rising characteristic curve (High current when immersed)
 - max. - falling characteristics (Low current when immersed)
- The NAMUR output can be switched over to falling or rising characteristics (see also "*Function chart*").
- For applications acc. to WHG, the DIL switch must be set to position max.
- Sensitivity adjustment (3)** With this DIL switch (3) you can set the switching point to liquids having a density between 0.5 and 0.7 g/cm³ (0.018 and 0.025 lbs/in³). With the basic setting, liquids with a density of >0.7 g/cm³ (>0.025 lbs/in³) can be detected. In liquids with lower density, you must set the switch to >0.5 g/cm³ (>0.018 lbs/in³). The specifications for the position of the switching point relate to water - density value 1.0 g/cm³ (0.036 lbs/in³). In products with a different density, the switching point will shift in the direction of the housing or tuning fork end depending on the density and type of installation.
- Simulation key (4)** The simulation key is located in a recess on the upper side of the oscillator. Push the simulation key with a suitable object (screwdriver, pen, etc.).
- When the key is pushed, a line break between sensor and processing unit is simulated. The signal lamp on the sensor extinguishes. The measuring system must signal a fault and take on a safe condition when the key is pushed.
- Keep in mind that the connected (downstream) instruments will be activated during operation. This allows you to check the correct function of the measuring system.

6.3 Function chart

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



Note:

The mode on the NAMUR amplifier must be set so that the switching output goes to safe condition in case a fault message is received ($I \leq 1 \text{ mA}$).

	Level	Signal current - Sensor	Control lamp
Falling characteristics max.		$\geq 2.2 \text{ mA}$	
Falling characteristics min.		$\leq 1.0 \text{ mA}$	
Rising characteristics min.		$\geq 2.2 \text{ mA}$	
Rising characteristics max.		$\leq 1.0 \text{ mA}$	
Failure	any	$\leq 1.0 \text{ mA}$	 flashes

7 Maintenance and fault rectification

7.1 Maintenance

When used as directed in normal operation, OPTISWITCH 5100 C, 5150 C is completely maintenance free.

7.2 Rectify faults

Causes of malfunction

OPTISWITCH 5100 C, 5150 C offers maximum reliability. Nevertheless faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Power supply
- Signal processing

Fault rectification

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.

Checking the switching signal

- ? OPTISWITCH 5100 C, 5150 C signals "covered" when the vibrating element is not submerged (overflow protection)
- ? OPTISWITCH 5100 C, 5150 C signals "uncovered" when the vibrating element is submerged (dry run protection)
 - Supply voltage too low
 - Check the power supply
 - Electronics defective
 - Push the characteristics reversal switch. If the instrument then changes the mode, the instrument may be mechanically damaged. Should the switching function in the correct mode still be faulty, return the instrument for repair.
 - Push the characteristics reversal switch. If the instrument then does not change the mode, the oscillator may be defective. Exchange the oscillator.
 - Unfavourable installation location
 - Mount the instrument at a location in the vessel where no dead zones or air bubbles can form.

- Wrong characteristics selected
 - Set the correct characteristics on the characteristics reversal switch (overflow protection; dry run protection). Wiring should be carried out according to the quiescent current principle.

- ? Signal lamp flashes red
 - Fault in the electronics
 - Exchanging the electronics module

- ? Signal lamp flashes red
 - instrument defective
 - Exchange instrument or return instrument for repair

7.3 Instrument repair

If a repair is necessary, please proceed as follows:

You can download a return form from our website http://www.krohne-mar.com/fileadmin/media-lounge/PDF-Download/Specimen_e.pdf.

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

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof
- Attach the completed form and possibly also a safety data sheet to the instrument

8 Dismounting

8.1 Dismounting procedure

**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.



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 electronic modules 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

- | | |
|--|--|
| – Process fitting - thread | 316L, Hastelloy C4 (2.4602) |
| – Process fitting - flange | 316L, 316L with Hastelloy C4 plated, enamelled steel, 316L with ECTFE coated, 316L with PFA coated |
| – Process seal | Klingersil C-4400 |
| – Tuning fork | 316L, Hastelloy C4 (2.4610) |
| – Extension tube \varnothing 21.3 mm (0.84 in) | 316L, Hastelloy C4 (2.4610), Hastelloy C4 (2.4610) enamelled, 316L with ECTFE coating, 316L with PFA coating |

Sensor length

- | | |
|------------------------------------|--|
| – length OPTISWITCH 5100 C, 5150 C | See " <i>Supplement - Dimensions</i> " |
|------------------------------------|--|

Materials, non-wetted parts

- | | |
|---|---|
| – Housing | Plastic PBT (Polyester), Alu die-casting powder-coated, 316L |
| – Seal ring between housing and housing cover | NBR (stainless steel housing), silicone (Alu/plastic housing) |
| – waveguide in the housing cover | PMMA (Makrolon) |
| – Ground terminal | 316L |
| – Temperature adapter (optional) | 316L |
| – Gas-tight leadthrough (optional) | 316L/glass |

Weights

- | | |
|---------------------------|----------------|
| – Plastic housing | 760 g (27 oz) |
| – Aluminium housing | 1170 g (41 oz) |
| – Stainless steel housing | 1530 g (54 oz) |

Layer thickness

- | | |
|----------|----------------------------------|
| – Enamel | approx. 0.8 mm (0.03 in) |
| – ECTFE | approx. 0.5 mm (approx. 0.02 in) |
| – PFA | approx. 0.5 mm (approx. 0.02 in) |

Surface quality	
– Standard	R_a approx. 3 μm (approx. 1.18 ⁻⁴ in)
– Hygienic version 3A (OPTISWITCH 5150 C)	R_a <0.8 μm (<3.15 ⁻⁵ in)
Process fittings	
– Thread	G $\frac{3}{4}$ A, $\frac{3}{4}$ NPT, G1 A, 1 NPT
– Flanges	DIN from DN 25, ANSI from 1"
– hygienic fittings	Bolting DN 40 PN 40, Tri-Clamp 1", Tri-Clamp 1½" PN 10, conus DN 25 PN 40, Tuchenhagen Varivent DN 50 PN 10
High voltage test (enamel)	max. 5 KV
Gas-tight leadthrough (optional)	
– leakage rate	<10 ⁻⁶ mbar l/s
– pressure resistance	PN 64
– hygienic fittings	Bolting DN 40 PN 40, Tri-Clamp 1", Tri-Clamp 1½" PN 10, conus DN 25 PN 40, Tuchenhagen Varivent DN 50 PN 10

Output variable

Output	Two-wire NAMUR output
Current consumption	
– falling characteristics	≥ 2.2 mA uncovered/ ≤ 1 mA covered
– rising characteristics	≤ 1 mA uncovered/ ≥ 2.2 mA covered
– Fault signal	≤ 1.0 mA
Necessary processing system	NAMUR processing system according to IEC 60947-5-6 (EN 50227/DIN 19234)
Modes (NAMUR output adjustable to falling or rising characteristics)	
– min.	rising characteristics (High current when immersed)
– max.	falling characteristics (Low current when immersed)

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

Parameter	Limit level of liquids
Process pressure	-1 ... 64 bar (-14.5 ... 938 psi) depending on the process fitting, e.g. flange
OPTISWITCH 5100 C, 5150 C of 316L/Hastelloy C4 (2.4610)	-50 ... +150 °C (-58 ... +302 °F)
Process temperature (thread or flange temperature) with temperature adapter (option)	
– OPTISWITCH 5100 C, 5150 C of 316L/Hastelloy C4	-50 ... +250 °C (-58 ... +482 °F)
– OPTISWITCH 5100 C, 5150 C enamelled	-50 ... +200 °C (-58 ... +392 °F)
– OPTISWITCH 5100 C, 5150 C with ECTFE coating	-50 ... +150 °C (-58 ... +302 °F)
– OPTISWITCH 5100 C, 5150 C with PFA coating	-50 ... +150 °C (-58 ... +302 °F)

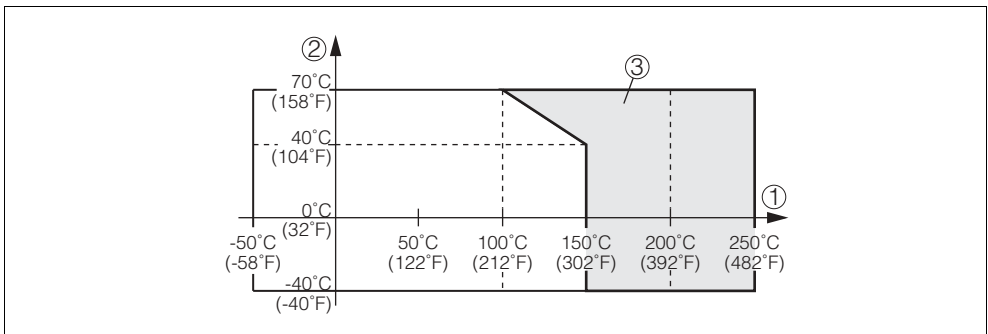


Fig. 12: Ambient temperature - Product temperature

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

Viscosity - dynamic	0.1 ... 10,000 mPa s (requirement: with density 1)
Density	0.7 ... 2.5 g/cm ³ (0.025 ... 0.09 lbs/in ³);

0.5 ... 2.5 g/cm³ (0.018 ... 0.09 lbs/in³) by switching over

Electromechanical data

Cable entry/plug¹⁾

– Single chamber housing

- 1x cable entry M20x1.5 (cable- \varnothing 5 ... 9 mm), 1x blind stopper M20x1.5

or:

- 1x closing cap ½ NPT, 1x blind plug ½ NPT

or:

- 1x plug (depending on the version), 1x blind plug M20x1.5

Screw terminals

for wire cross-section up to 1.5 mm² (0.0023 in²)

Adjustment elements

Mode switch

– min.

rising characteristics (High current when immersed)

– max.

falling characteristics (Low current when immersed)

Sensitivity switch

– 0.5

0.5 ... 2.5 g/cm³ (0.018 ... 0.9 oz/in³)

– 0.7

0.7 ... 2.5 g/cm³ (0.025 ... 0.9 oz/in³)

Test key

simulation of a line break between sensor and processing unit

Voltage supply

Supply voltage (standard characteristics)

for connection to amplifier according to NAMUR IEC 60947-5-6, approx. 8.2 V

Open-circuit voltage

U_o approx. 8.2 V

Shortcircuit current

I_U approx. 8.2 mA

Electrical protective measures

Protection

IP 66/IP 67

Overvoltage category

III

Protection class

II

¹⁾ Depending on the version M12x1, according to DIN 43650, Harting, Amphenol-Tuchel, 7/8" FF.

Approvals²⁾

ATEX II 1G, 1/2G, 2G EEx ia IIC T6

ATEX II 1/2G, 2G EExd d IIC T6³⁾

Overfill protection acc. to WHG

Ship approvals

²⁾ Deviating data in Ex applications: see separate safety instructions.

³⁾ Only with Aluminium housing.

9.2 Dimensions

Housing

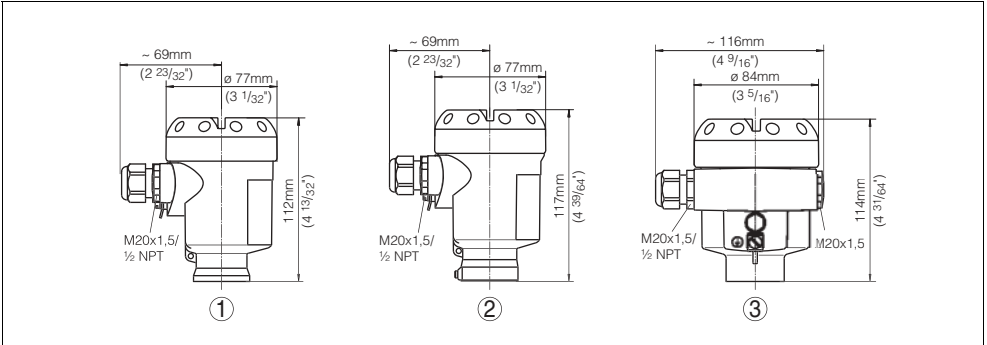


Fig. 13: Housing versions

- 1 Plastic housing
- 2 Stainless steel housing
- 3 Aluminium housing

OPTISWITCH 5100 C, 5150 C

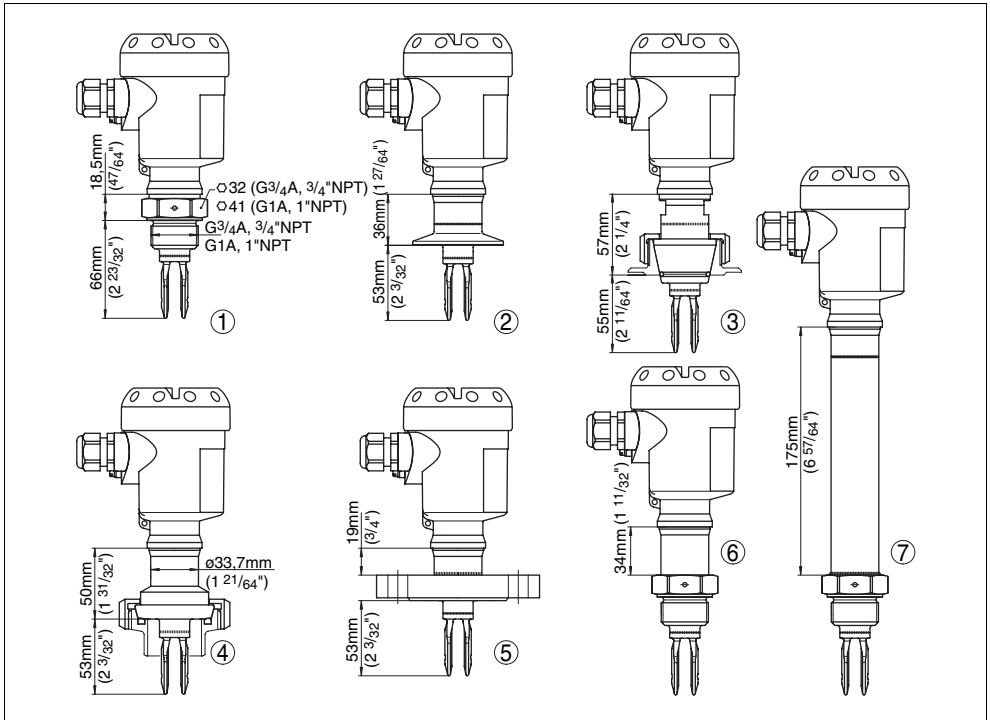


Fig. 14: OPTISWITCH 5100 C, 5150 C, threaded version

- 1 Thread
- 2 Tri-Clamp
- 3 Cone DN 25
- 4 Bolting DN 40
- 5 Flange
- 6 Gas-tight leadthrough
- 7 Temperature adapter

Subject to change without notice