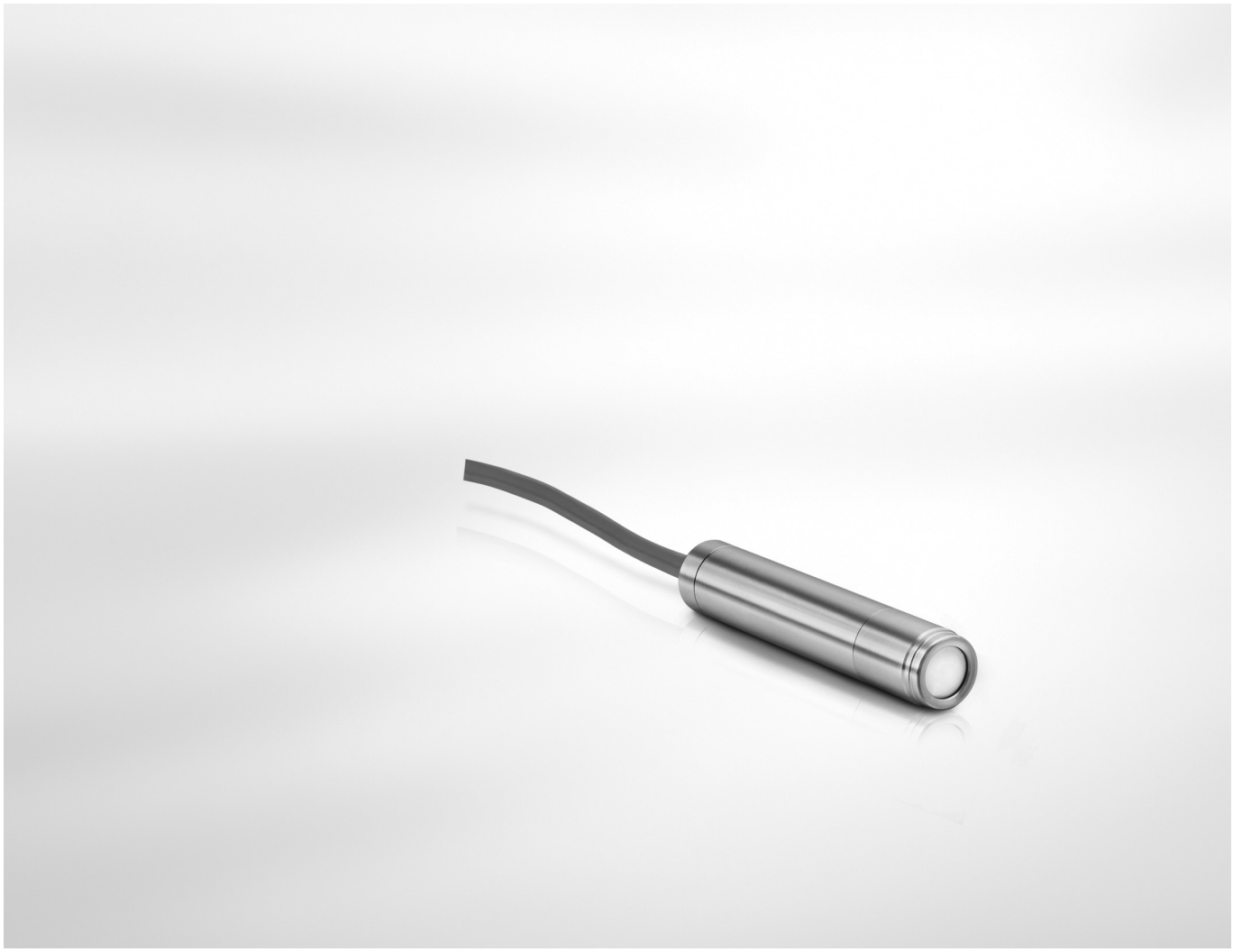

# OPTIBAR LC 1010 Handbook

## Submersible level probe with ceramic measuring cell

2-wire 4...20 mA
2-wire 4...20 mA and 3-wire Pt100
2-wire 4...20 mA / HART®



KROHNE

# IMPRINT

## 1.1 Intended use

*CAUTION!*
*Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.*

*INFORMATION!*
*This device is a Group 1, Class A device as specified within CISPR11:2009. It is intended for use in industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.*

*INFORMATION!*
*The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.*

The OPTIBAR LC 1010 pressure transmitter is designed for the level measurement and gauge measurement of liquids.

## 1.2 Technical limits

The device was constructed solely for use within the technical limits indicated on the nameplate and in the technical data. Applications outside of these limits are not permitted and could lead to significant risk of accident. For this reason, observe the following limits:

- Do not exceed the maximum working pressure (MWP).
- Do not exceed the indicated permissible operating temperature range.
- The permissible ambient temperatures given may not be exceeded or undershot.
- Check the materials used for the wetted parts (e.g. gasket, process connection, separating diaphragm etc.) for suitability as regards process compatibility.

## 1.3 Certification

### CE marking

The device fulfils the statutory requirements of the following EC directives:

- EMC directive 2014/30/EU
- EMC specification acc. to EN 61326/A1

The manufacturer certifies successful testing of the product by applying the CE marking.

### Pressure Equipment Directive PED

Devices with a permissible pressure PS ≤ 200 bar (20 MPa) comply with Article 3 Section (3) and are not subject to a conformity assessment. These devices were designed and manufactured in accordance with sound engineering practice (SEP).

The CE marking on the device does not apply to the pressure equipment directive.


*DANGER!*
*For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.*

## 1.4 Safety instructions from the manufacturer

### 1.4.1 Copyright and data protection

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The contents and works in this document are subject to copyright. Contributions from third parties are identified as such. Reproduction, processing, dissemination and any type of use beyond what is permitted under copyright requires written authorisation from the respective author and/or the manufacturer.

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The collection of personal data (such as names, street addresses or e-mail addresses) in the manufacturer's documents is always on a voluntary basis whenever possible. Whenever feasible, it is always possible to make use of the offerings and services without providing any personal data.

We draw your attention to the fact that data transmission over the Internet (e.g. when communicating by e-mail) may involve gaps in security. It is not possible to protect such data completely against access by third parties.

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### 1.4.2 Disclaimer

The manufacturer will not be liable for any damage of any kind by using its product, including, but not limited to direct, indirect or incidental and consequential damages.

This disclaimer does not apply in case the manufacturer has acted on purpose or with gross negligence. In the event any applicable law does not allow such limitations on implied warranties or the exclusion of limitation of certain damages, you may, if such law applies to you, not be subject to some or all of the above disclaimer, exclusions or limitations.

Any product purchased from the manufacturer is warranted in accordance with the relevant product documentation and our Terms and Conditions of Sale.

The manufacturer reserves the right to alter the content of its documents, including this disclaimer in any way, at any time, for any reason, without prior notification, and will not be liable in any way for possible consequences of such changes.

### 1.4.3 Product liability and warranty

The operator shall bear responsibility for the suitability of the device for the specific purpose. The manufacturer accepts no liability for the consequences of misuse by the operator. Improper installation or operation of the devices (systems) will cause the warranty to be void. The respective "Standard Terms and Conditions" which form the basis for the sales contract shall also apply.

### 1.4.4 Information concerning the documentation

To prevent any injury to the user or damage to the device it is essential that you read the information in this document and observe applicable national standards, safety requirements and accident prevention regulations.

If this document is not in your native language and if you have any problems understanding the text, we advise you to contact your local office for assistance. The manufacturer can not accept responsibility for any damage or injury caused by misunderstanding of the information in this document.

This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device. Special considerations and precautions are also described in the document, which appear in the form of icons as shown below.

### 1.4.5 Warnings and symbols used

Safety warnings are indicated by the following symbols.

*DANGER!*
*This warning refers to the immediate danger when working with electricity.*

*DANGER!*
*This warning refers to the immediate danger of burns caused by heat or hot surfaces.*


*DANGER!*
*This warning refers to the immediate danger when using this device in a hazardous atmosphere.*

*DANGER!*
*These warnings must be observed without fail. Even partial disregard of this warning can lead to serious health problems and even death. There is also the risk of seriously damaging the device or parts of the operator's plant.*

*WARNING!*
*Disregarding this safety warning, even if only in part, poses the risk of serious health problems. There is also the risk of damaging the device or parts of the operator's plant.*

*CAUTION!*
*Disregarding these instructions can result in damage to the device or to parts of the operator's plant.*

*INFORMATION!*
*These instructions contain important information for the handling of the device.*


*LEGAL NOTICE!*
*This note contains information on statutory directives and standards.*

- HANDLING
  This symbol designates all instructions for actions to be carried out by the operator in the specified sequence.

➲ RESULT
This symbol refers to all important consequences of the previous actions.

## 1.5 Safety instructions for the operator

*WARNING!*
*In general, devices from the manufacturer may only be installed, commissioned, operated and maintained by properly trained and authorized personnel.*
*This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device.*

## 2.1 Scope of delivery

*INFORMATION!*
*Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.*

*INFORMATION!*
*Do a check of the packing list to make sure that you have all the elements given in the order.*

*INFORMATION!*
*Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.*

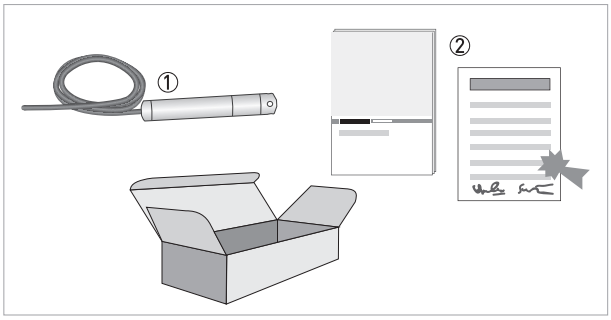


Figure 2-1: Scope of delivery

① Submersible level probe with suspension cable
② Product documentation

### Optional

- Straining clamp
- Screw connection or flange with cable locking

*INFORMATION!*
*Assembly materials and tools are not part of the delivery. Use the assembly materials and tools in compliance with the applicable occupational health and safety directives.*

## 2.2 Nameplate

*INFORMATION!*
*Look at the device nameplate to ensure that the device is delivered according to your order.*
*Check for the correct supply voltage printed on the nameplate.*

The device can be identified by its nameplate. It provides the most important data.

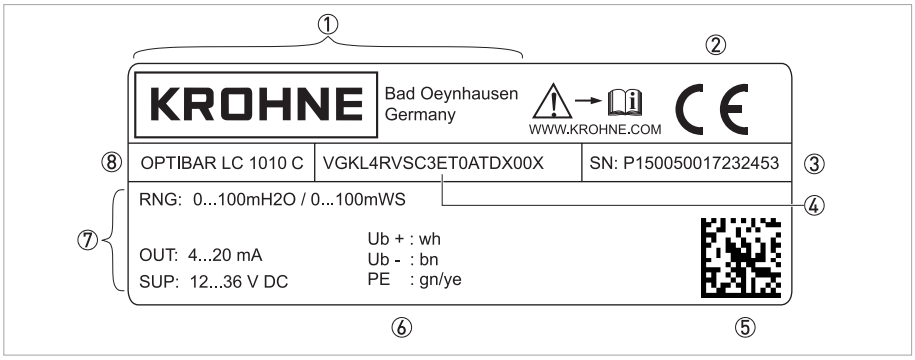


Figure 2-2: Example for a nameplate

① Manufacturer logo and address
② CE marking and other approvals (e.g. ATEX, PED,...)
③ Serial number
④ Type code
⑤ Barcode
⑥ Electrical connection diagram
⑦ Specifications for process conditions (measuring range, MWP (= Maximum Working Pressure) and electrical data (signal output and power supply))
⑧ Product name

## 3.1 General notes on installation

*INFORMATION!*
*Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.*

*INFORMATION!*
*Do a check of the packing list to make sure that you have all the elements given in the order.*

*INFORMATION!*
*Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.*

## 3.2 Installation specifications

*WARNING!*
*Install the device only when depressurised and without power!*

*DANGER!*
*For installation the respective regulations for explosion protection have to be fulfilled.*

*INFORMATION!*
*For installations outdoor and in damp areas, the following points must be observed:*

- *To ensure that no moisture can get into the connector, the device should be connected electrically immediately after installation. Otherwise a moisture admission has to be prevented e.g. by using a suitable protection cap.*
- *Install the device so it is protected from direct sunlight. In the worst case scenario, the permissible operating temperature will be exceeded in the presence of direct sunlight. This can negatively affect or damage the functionality of the device. In addition, it can lead to temporary measuring errors if the internal pressure of the device increases due to the sunlight.*
- *When installing outside where the risk of lightning or overvoltage may exist and damage the device, we recommend installing suitable overvoltage protection between the supply device or control cabinet and the device.*

*INFORMATION!*

- *Handle this highly sensitive electronic measuring device with care, both in and out of the packaging!*
- *Only remove the packaging and any protection cap from the device immediately before installing to prevent damage to the diaphragm! Keep the supplied protection cap!*
- *A device with a gauge reference in the housing (small hole next to the electrical connection) must be installed so that the gauge reference necessary for measurement is protected from dirt and moisture. Should the pressure transmitter be exposed to fluid admission, the air pressure compensation is blocked by the gauge reference. Accurate measurement in this state is not possible. It can also result in damage to the pressure transmitter.*
- *Ensure that no mechanical stress is applied to the pressure port during installation as this may result in a shift in the characteristic curve. This applies in particular to very small pressure ranges as well as to devices with plastic pressure ports.*

## 3.3 Mounting

*CAUTION!*

- *Prior to installing the transmitter, it is essential to verify whether the version of the device on hand completely fulfils the technical and safety requirements of the measuring point. This applies in particular to the measuring range, overpressure resistance, temperature, explosion protection and operating voltage.*
- *The device must not be heated by radiated heat (e.g. exposure to the sun) to an electronics housing surface temperature above the maximum permissible ambient temperature. If it is necessary to prevent damage from heat sources, a heat protection (e.g. sun shade) has to be installed.*

**Mounting position**

Lateral movements of the submersible level probe can cause measurement errors. For this reason, mount the submersible level probe in a calm area or in a suitable thermowell.
Only remove the packaging and protection caps from the device immediately prior to installing to prevent damage to the diaphragm and threads.


*DANGER!*
*Install the level probes such that the sensor head (sensor element) does not rub against or hit the container wall, for example. When installing, pay attention to the flow conditions. This applies in particular to level probes with cable output and for devices featuring a pipe extension with a length exceeding 2.8 m / 9.19 ft.*

### Pressure equalisation capillary

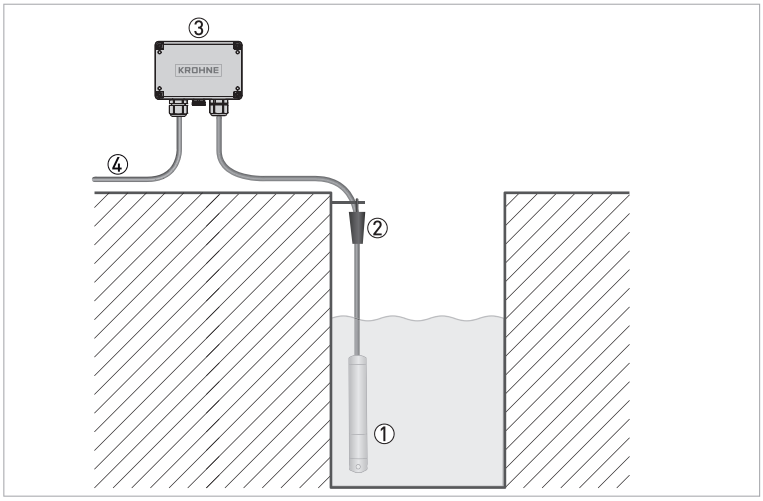


Figure 3-1: Example of a typical measuring point

① Submersible level probe
② Straining clamp
③ Terminal housing (OPTIBAR LC Connect)
④ Connection to control system

On pressure transmitters with gauge pressure, the suspension cable has a thin capillary for atmospheric pressure compensation. This capillary is also protected with a filter element at the end of the suspension cable. Therefore, always lead the capillary into a dry environment or a suitable terminal housing.

### Mounting the straining clamp

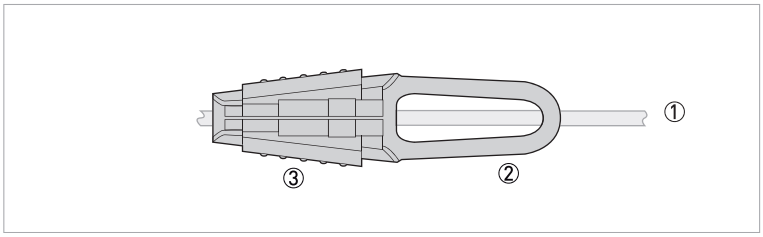


Figure 3-2: Straining clamp

① Suspension cable
② Suspension opening
③ Clamping jaws

#### Installing the straining clamp

- Hang the straining clamp on a suitable wall hook
- Lower the submersible level probe to the requested height
- Slide the terminals upward and push the suspension cable between them
- Hold the suspension cable, push the terminals downward and fix them with a light blow

Disassembly of the straining clamp is carried out in reverse order.

## 3.4 Removing the protection cap

Some level probes are equipped with a plastic protection cap to protect the diaphragm. If the level probe is to be used in highly viscous media such as slurries, remove this cap before start-up. This allows the medium to be flush with the diaphragm on the level probe.

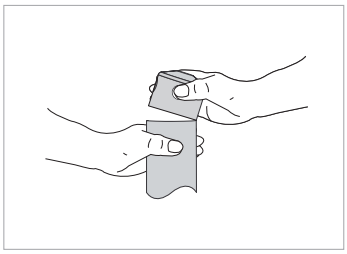

Figure 3-3: Remove the protection cap by hand

### Removing by hand

- Hold the level probe with the protection cap facing up.
- Use one hand to hold tightly to the probe by the probe body.
- Use the other hand to remove the protection cap.

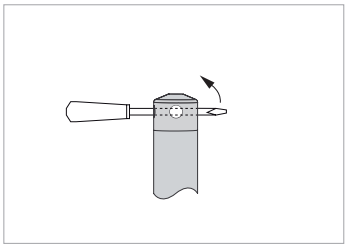

Figure 3-4: Remove the protection cap using a tool

### Removing using a tool (recommended)

- Hold the level probe with the protection cap facing up.
- Insert a thin tool such as a screwdriver straight between the two opposing holes on the protection cap.
- Lever the protection cap off.

## 4.1 Safety instructions

***DANGER!***
*All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!*

***DANGER!***
*Observe the national regulations for electrical installations!*


***DANGER!***
*For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.*

***WARNING!***
*Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.*

***INFORMATION!***
*Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.*

## 4.2 Electrical connection diagram

The suspension cable is already prefabricated. If the suspension cable requires shortening, the name plate must be reattached to the cable and the cable shield firmly connected to the enclosed shield clamp.

Connection of the submersible level probe to the power supply is made directly, or via the terminal housing.

### Specification of electrical cables

| | 4...20 mA | 4...20 mA with Pt100 | 4...20 mA with HART® |
|---|---|---|---|
| Supply + | white | white | white |
| Supply - | brown | brown | brown |
| Supply T+ (at PT 100) | | yellow | |
| Supply T- (at PT 100) | | grey | |
| Supply T- (at PT 100) | | pink | |
| Shield | Yellow / green | Yellow / green | Yellow / green |

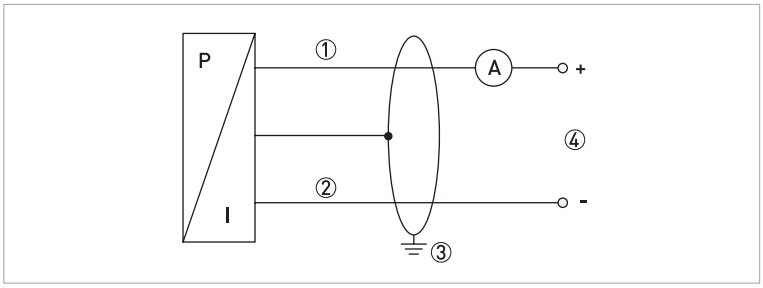


Figure 4-1: Electrical connection diagram 2-wire 4...20 mA

① Supply +
② Supply -
③ Shielding

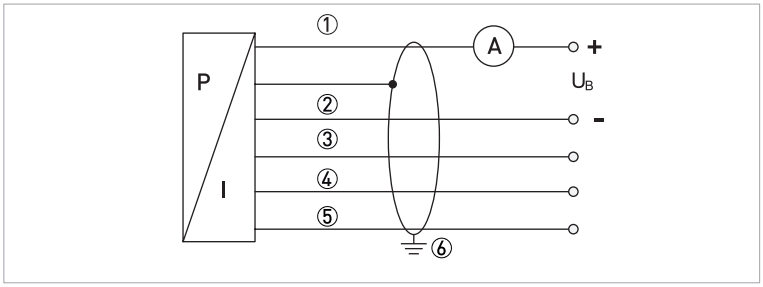


Figure 4-2: Electrical connection diagram 2-wire 4...20 mA with 3-wire Pt100

① Supply +
② Supply -
③ Supply Pt100 +
④ Supply Pt100 -
⑤ Supply Pt100 -
⑥ Shielding

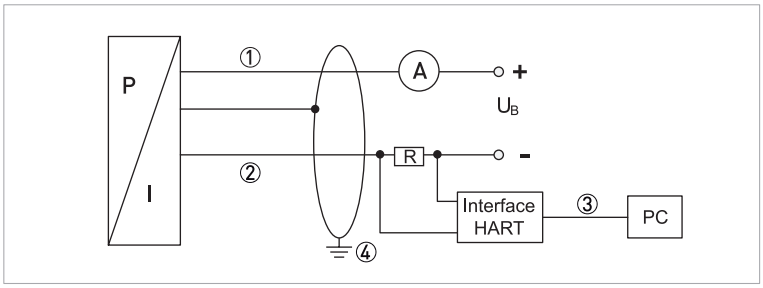


Figure 4-3: Electrical connection diagram / 4...20 mA with HART® 7

① Supply +
② Supply -
③ RS232 / USB
④ Shielding

## 4.3 Cut the suspension cable

*CAUTION!*
*Do not squeeze the capillary cable.*

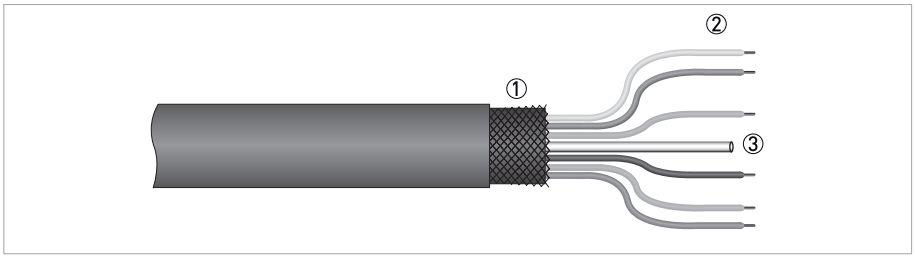


Figure 4-4: Wire assignment, suspension cable

① Cable screen
② Cables
③ Capillary

**The suspension cable can be shortened to the desired length. Proceed as follows:**

① Remove the filter adapter from the capillary and set it aside for later use.
② Cut the suspension cable to the desired length.
③ Remove approx. 5-7 cm of the cable mantle without damaging the cable screen.
④ Strip off approx. 10 mm of insulation from the ends of the wires.
⑤ Pull the cable screen downwards over the cable shield and use the enclosed shield clamp to fix the cable shield.
⑥ Then slide the filter adapter back onto the capillary.

*INFORMATION!*
*For identification purposes, the intrinsically safe cable features light blue shrink tubing (over the cable insulation). Should it become necessary to modify (e.g. shorten) the cable, eliminating the marking at the end of the cable, that marking should be restored. (Mark again using light blue shrink tubing or otherwise suitable marking label).*

*INFORMATION!*
*In the case of relative devices, the cable contains an aeration tube for pressure compensation. Guide the cable end into an area or suitable connection box that is as dry as possible and free of aggressive gases to avoid damage.*

## 4.4 Cable bending radii

Observe the following minimum bending radii when laying the cable for devices with cable output:

Cable without venting
Static installation: 5-times the cable diameter
Dynamic application: 10-times the cable diameter

Cable with venting
In the case of devices with cable output and integrated aeration tube, the PTFE filter at the end of the cable on the venting port may not be damaged or removed.
Static installation: 10-times the cable diameter
Dynamic application: 20-times the cable diameter

*INFORMATION!*
*Use a shielded and twisted multicore cable for the electrical connection.*

*INFORMATION!*
*When going from a cable with a venting port to a cable without a venting port, we recommend using the OPTIBAR LC Connect terminal box.*

## 5.1 Troubleshooting

| Problem | Possible cause | Remedy |
|---|---|---|
| 4...20 mA signal not stable | No atmospheric pressure compensation | Check the capillary and clean, if necessary<br>Check the pressure compensation on the terminal housing and clean, if necessary. |
| No 4...20 mA signal | No power supply | Check cables for breaks |
| | Cable not correctly connected | check connection diagram |
| | Operating voltage is too low | check load resistance |
| Analog output signal too small | Load resistance too high | Checking the load resistance |
| | Power supply too low | Checking the output voltage of the power supply unit |
| | Faulty power supply | Checking the power supply and power supply unit |
| Slight shifting of output signal | Diaphragm on measuring cell too dirty | Clean the measuring cell with a non-aggressive cleaning liquid |
| | Diaphragm is calcified or encrusted | Recommendation: Have KROHNE carry out cleaning. |
| Significant shifting of output signal | Diaphragm on measuring cell is damaged (caused by excess pressure or mechanical issue) | Recommendation: Contact KROHNE Service for quick repair or to replace the device. |
| Incorrect or no output signal | Mechanical, thermal or chemical damage to cable. | Recommendation: Contact KROHNE Service for quick repair or to replace the device. |

## 5.2 Maintenance

In principal, the device is maintenance free. If necessary, clean the device housing when switched off using a damp cloth and a non-aggressive cleaning solution.

Depending on the product, deposits or contamination can still occur on the diaphragm. If the product has a known affinity, the operator must determine the cleaning intervals accordingly. Once the device has been properly taken out of commission, the diaphragm can be cleaned.

***INFORMATION!***
*Improper cleaning can result in irreparable damage to the measuring cell. For this reason, never use sharp objects or compressed air to clean the diaphragm.*

## 5.3 Recalibration

During the life cycle of the device, the offset or full-scale of the device may shift. If this occurs, note that the signal value output will deviate based on the set start or end value of the measuring range. If one of these phenomena does occur following prolonged use, recalibration is recommended to ensure continued high accuracy.

## 5.4 Spare parts availability

The manufacturer adheres to the basic principle that functionally adequate spare parts for each device or each important accessory part will be kept available for a period of 3 years after delivery of the last production run for the device.

This regulation only applies to spare parts which are subject to wear and tear under normal operating conditions.

## 5.5 Availability of services

The manufacturer offers a range of services to support the customer after expiration of the warranty. These include repair, maintenance, technical support and training.

*INFORMATION!*
*For more precise information, please contact your local sales office.*

## 5.6 Repairs

Repairs must be carried out exclusively by the manufacturer or the manufacturer authorised specialist companies.

## 5.7 Returning the device to the manufacturer

### 5.7.1 General information

This device has been carefully manufactured and tested. If installed and operated in accordance with these operating instructions, it will rarely present any problems.

*WARNING!*
*Should you nevertheless need to return a device for inspection or repair, please pay strict attention to the following points:*

- *Due to statutory regulations on environmental protection and safeguarding the health and safety of the personnel, the manufacturer may only handle, test and repair returned devices that have been in contact with products without risk to personnel and environment.*
- *This means that the manufacturer can only service this device if it is accompanied by the following certificate (see next section) confirming that the device is safe to handle.*

*WARNING!*
*If the device has been operated with toxic, caustic, radioactive, flammable or water-endangering products, you are kindly requested:*

- *to check and ensure, if necessary by rinsing or neutralising, that all cavities are free from such dangerous substances,*
- *to enclose a certificate with the device confirming that it is safe to handle and stating the product used.*

### 5.7.2 Form (for copying) to accompany a returned device

*CAUTION!*
*To avoid any risk for our service personnel, this form has to be accessible from outside of the packaging with the returned device.*

| | | |
|---|---|---|
| Company: | | Address: |
| Department: | | Name: |
| Tel. no.: | | Fax no. and/or Email address: |
| Manufacturer's order no. or serial no.: | | |
| The device has been operated with the following medium: | | |
| This medium is: | | radioactive |
| | | water-hazardous |
| | | toxic |
| | | caustic |
| | | flammable |
| | | We checked that all cavities in the device are free from such substances. |
| | | We have flushed out and neutralized all cavities in the device. |
| We hereby confirm that there is no risk to persons or the environment through any residual media contained in the device when it is returned. | | |
| Date: | | Signature: |
| Stamp: | | |

## 5.8 Disposal

*LEGAL NOTICE!*
*Disposal must be carried out in accordance with legislation applicable in your country.*

**Separate collection of WEEE (Waste Electrical and Electronic Equipment) in the European Union:**

According to the directive 2012/19/EU, the monitoring and control instruments marked with the WEEE symbol and reaching their end-of-life **must not be disposed of with other waste**.
The user must dispose of the WEEE to a designated collection point for the recycling of WEEE or send them back to our local organisation or authorised representative.

## 6.1 Technical data

*INFORMATION!*

- *The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Downloadcenter).*

### Measuring system

| | |
|---|---|
| Measuring principle | Capacitive ceramic measuring cell |
| Application range | Level measurement and gauge measurement of liquids |
| Measuring range | Fixed specification of 0...1 mH2O to 0...100 mH2O and 0...100 mbar to 0...10 bar; refer also to chapter "Measuring ranges" |

### Measuring accuracy

| | |
|---|---|
| Reference conditions | Medium: air |
| | Temperature: ambient temperature |
| | Ambient pressure: 1013 mbar / 14.7 psi |
| | Nominal position: vertical, pressure port down |
| | Power supply: 24 VDC |
| Pressure type | Gauge pressure / absolute pressure |
| Reference accuracy according to IEC 60770 (terminal based) (Hysteresis, non-linearity, non-repeatability) | ≤ ± 0.35% of URL<br>≤ ± 0.25% of URL (optional) |
| Ambient temperature effect on zero and span | ≤ 1.0% of URL in compensated measuring range -20...+80°C |
| Long-term stability | ≤±0.1% of URL within one year under reference conditions |
| Step response time | < 70 ms (T90) |
| Vacuum resistance | For further information refer to *Technical data* on page 22 |

## Operating conditions

| | |
|---|---|
| **Temperature** | |
| Nominal temperature | -40...+80°C / -4...+176°F |
| Ambient temperature | -40…+85°C / -40...+185°F |
| | Ex i Zone 0: -25...+65°C / -13...+149°F at $p_{abs}$ = 0.8...1.1 bar |
| | Ex i from zone 1: -25...+65°C / -13...+149°F |
| Storage temperature | -40…+80°C / -40...+176°F |
| Medium temperature | -40…+85°C / -40...+185°F |
| **Other conditions** | |
| Ingress protection category acc. to IEC 529 / EN 60529 | IP68 |

## Installation conditions

| | |
|---|---|
| Mounting position | Any - factory calibration carried out with pressure port down. |
| Dimensions | Detailed information refer to chapter "Dimensions and weight". |

## Materials

| | |
|---|---|
| Housing | Stainless steel 1.4404 / AISI 316L |
| | Titan (Grade 2) |
| Cable | TPE (-40...+80°C) blue with drinking water approvals |
| Measuring cell seal | EPDM (with drinking water approvals)<br>FKM |
| Diaphragm | $Al_2O_3$ 99.9% |
| Protection cap | POM |
| Straining clamp | Stainless steel 1.4404 / 316L, steel (galv.) |
| Screw connection | Stainless steel 1.4404 / 316L |

## Process connections

| | |
|---|---|
| Mechanical connection variants | R 1/2" thread at rear for installation in a thermowell |
| | M20 thread at front for assembly of corresponding connecting sleeve |

## Electrical connection

| | | |
|---|---|---|
| Output signal | 2-wire 4...20 mA, 3-wire Pt100 (optional) | |
| Power supply | 4...20 mA: | Ub = 12...32 V DC |
| | 4...20 mA with HART: | Ub = 12...32 V DC |
| | Ex i 4...20 mA: | Ub = 14...28 V DC |
| | Ex i 4...20 mA with HART: | Ub = 12...28 V DC |
| Safety maximum values (Ex i) | $U_i$ = 28 V, $I_i$ = 93 mA, $P_i$ = 660 mW, $C_i \approx$ 49.2 nF, $L_i \approx$ 0 µH;<br>The supply connections have a maximum internal capacity of 50 nF to the housing. | |
| Load | $R_{lmax} \leq (U_b - U_{bmin}) / 0.02$ A [Ohm] | |
| Short circuit protection | Continuously | |
| Reverse polarity protection | In the event of reversed connections there is no damage but also no function. | |
| Ripple | 0.05% of URL / 10 V | |
| Electrical connection | Shielded suspension cable with integrated air tube for ambient pressure referencing (for "absolute" input variable the air tube is closed) | |

## Approvals and certificates

| | |
|---|---|
| CE | The device complies with the legal requirements of the EC directive. The manufacturer confirms compliance with these regulations by affixing the CE marking. |
| Electromagnetic compatibility (EMC) | EMC directive 2014/30/EU |
| | For more information consult the relevant declaration of conformity. |
| **Ex** | |
| ATEX | Zone 0: II 1G Ex ia IIC T4<br>Zone 20: II 1D Ex ia IIIC T135°C Da |

## 6.2 Dimensions and weights

### Submersible level probe

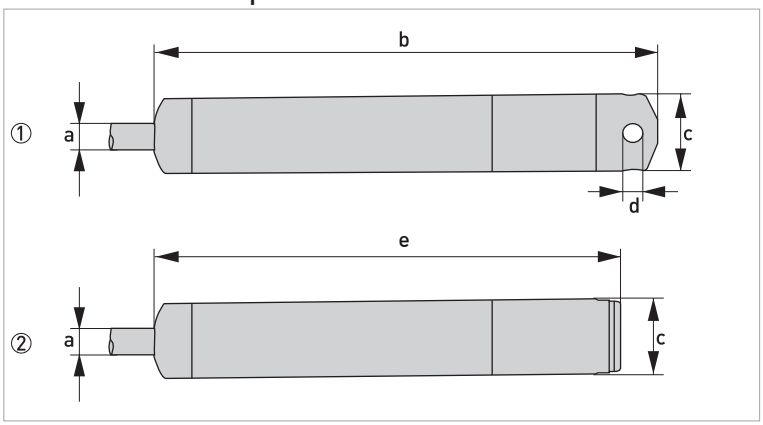


Figure 6-1: Dimensions submersible level probe

① Submersible level probe with protection cap
② Submersible level probe without protection cap

| | [mm] | [inches] |
|---|---|---|
| a | 7.4 | 0.29 |
| b | 146 | 5.75 |
| c | Ø 22 | 0.87 |
| d | 4 x Ø 5 | 0.20 |
| e | 135.5 | 5.33 |

Weight of submersible level probe: 0.18 kg / 0.4 lbs
Weight of suspension cable: 0.10 kg/m / 0.067 lbs/ft

### Straining clamp

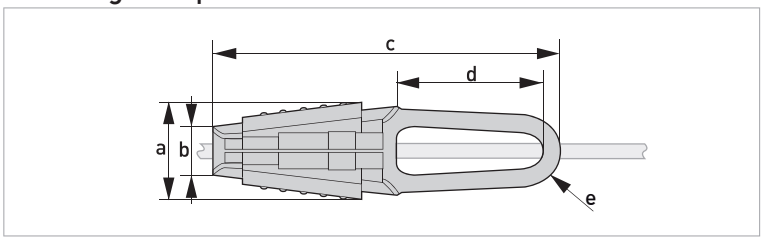


Figure 6-2: Dimensions straining clamp

| | [mm] | [inches] |
|---|---|---|
| a | 48 | 1.89 |
| b | 25 | 0.98 |
| c | 175 | 6.89 |
| d | 74 | 2.91 |
| e | R 18 | 0.71 |

Weight of straining clamp: 0.16 kg / 0.35 lbs

### Flange

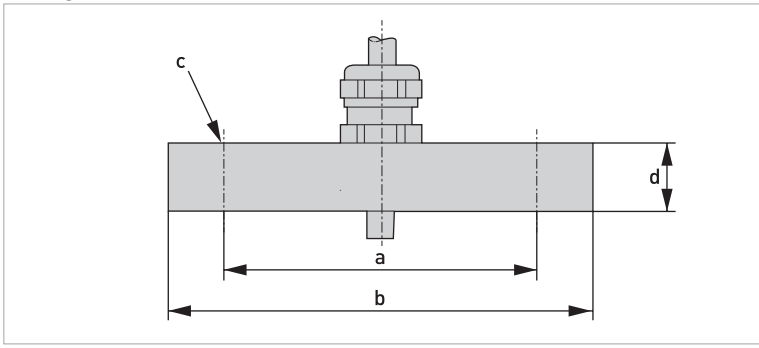


Figure 6-3: Dimensions Flange

| [mm] | a | b | c | d | Weight in [kg] |
|---|---|---|---|---|---|
| DN25 / PN40 | 85 | 115 | 4 x Ø 14 | 18 | 1.4 |
| DN50 / PN40 | 125 | 165 | 4 x Ø 18 | 20 | 3.2 |
| DN80 / PN40 | 160 | 200 | 8 x Ø 18 | 20 | 4.8 |

| [inches] | a | b | c | d | Weight in [lbs] |
|---|---|---|---|---|---|
| DN25 / PN40 | 3.35 | 4.53 | 0.16 x Ø 0.55 | 0.71 | 3.09 |
| DN50 / PN40 | 4.92 | 6.5 | 0.16 x Ø 0.71 | 0.79 | 7.05 |
| DN80 / PN40 | 6.3 | 7.87 | 0.31 x Ø 0.71 | 0.79 | 10.58 |

## 6.3 Measuring ranges

### Pressure in bar

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal pressure (gauge/abs.) | 0.1 | 0.2 | 0.3 | 0.4 | 0.6 | 1 | 1.6 | 2.5 | 4 | 6 | 10 |
| Nominal pressure (gauge/abs.) [mH20] | 1 | 1.6 | 2.5 | 4 | 6 | 10 | 16 | 25 | 40 | 60 | 100 |
| Max. working pressure (MWP) | 3 | 4 | 5 | 5 | 7 | 7 | 12 | 20 | 20 | 20 | 20 |
| Min. Pressure (Vacuum) | -0.2 | -0.3 | -0.5 | | | | -1 | | | | |

### Pressure in psi

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal pressure (gauge/abs.) | 1.45 | 2.3 | 3.6 | 5.8 | 8.7 | 14.5 | 23 | 36 | 58 | 87 | 145 |
| Nominal pressure (gauge/abs.) [mH20] | 14.5 | 23 | 36 | 58 | 87 | 145 | 232 | 363 | 580 | 870 | 1450 |
| Max. working pressure (MWP) | 44 | 58 | 73 | 73 | 102 | 102 | 174 | 290 | 290 | 290 | 290 |
| Min. Pressure (Vacuum) | -2.9 | -4.3 | -7.3 | | | | -14.5 | | | | |

## 7.1 General description

The open HART® protocol, which can be used for free, is integrated into the signal converter for communication.

Devices which support the HART® protocol are classified as either operating devices or field devices. When it comes to operating devices (Master), both manual control units (Secondary Master) and PC-supported workstations (Primary Master) are used in, for example, a control centre.

HART® field devices include measuring sensors, signal converters and actuators. The field devices range from 2-wire to intrinsically safe versions for use in hazardous areas.

The HART® data are superimposed over the analogue 4...20 mA signal via FSK modem. This way, all of the connected devices can communicate digitally with one another via the HART® protocol while simultaneously transmitting the analogue signals.

When it comes to the field devices and secondary masters, the FSK or HART® modem is integrated. If a PC is used, an external modem must be connected to the serial interface (USB interface). There are, however, other connection variants which can be seen in the following connection figures.

## 7.2 Software history

*INFORMATION!*
*In the table below, "x" is a placeholder for possible multi-digit alphanumeric combinations, depending on the available version.*

| Release date | SW version | HW version | HART® |
|---|---|---|---|
| | | | Device Revision |
| 2019-01-01 | 1.0.x | 1.0.x | 1 |

### HART® identification codes and revision numbers

| | |
|---|---|
| Manufacturer ID: | 69 (0x45) |
| Device: | 195 (0xC5) |
| Device Revision: | 1 |
| HART® Universal Revision: | 7 |

## 7.3 Connection variants

The signal converter is a 2-wire device with a passive 4...20 mA current output and a HART® interface.

- **Point-to-Point is supported**
  In conventional point-to-point operation, the signal converter communicates as a slave with the master.
- **Multidrop mode is supported**
  In a multidrop communication system, more than 2 devices are connected to a common transmission cable.
- **Burst Mode is not supported**
  In the burst operation a slave device transfers cyclic pre-defined response telegrams, to get a higher rate of data transfer.

There are two ways of using the HART® communication:

- as Point-to-Point connection and
- as multidrop connection, with 2-wire connection.

### 7.3.1 Point-to-Point connection - analogue / digital mode

Point-to-Point connection between the signal converter and the HART® Master.

The current output of the device is passive.

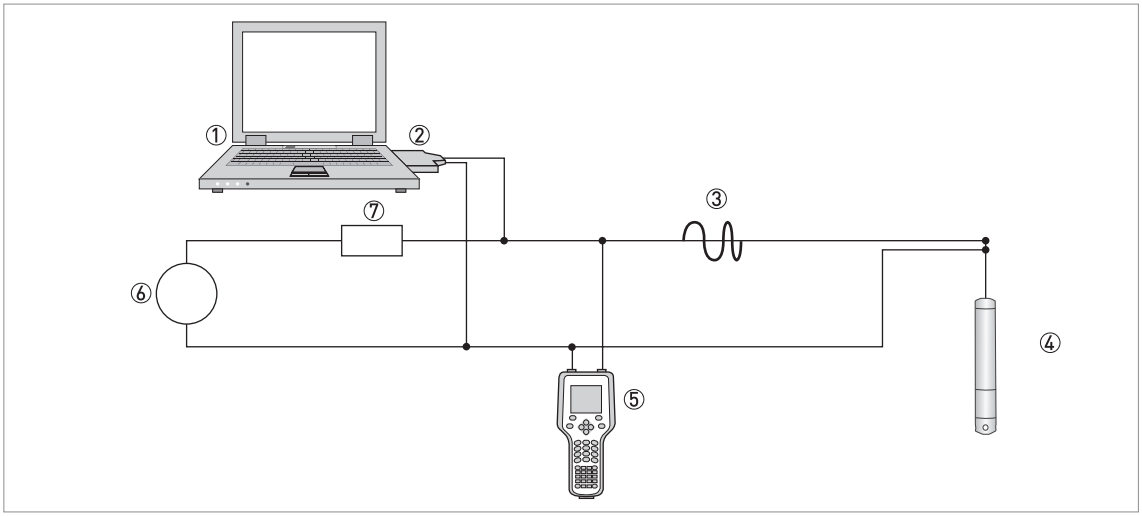


Figure 7-1: Point-to-Point connection

① Primary Master
② FSK modem
③ HART® signal
④ OPTIBAR LC 1010
⑤ Secondary Master with generic HART® DD
⑥ Power supply for devices (slaves) with passive current output
⑦ Load ≥ 250 Ω (ohm)

## 7.4 Inputs / Outputs and HART® dynamic variables and device variables

PV = Primary Variable; SV = Secondary Variable; TV = Third Variable; QV = Quarternary Variable

| HART® dynamic variable | | | |
|---|---|---|---|
| PV | SV | TV | QV |
| Linear percent value | Physical unit | Meas. cell temp. | Electronic temperature |

**Table 7-1: HART® output values acc. to HART® 7 (factory setting)**

## 7.5 Field Communicator 475 (FC 475)

The Field Communicator is a hand terminal from Emerson Process Management that is designed to configure HART® and Foundation Fieldbus devices. Device Descriptions (DDs) are used to integrate different devices into the Field Communicator.

### 7.5.1 Installation

Only the functions of a generic DD are available to the user and it is not possible to control the entire device. A "Field Communicator Easy Upgrade Programming Utility" is required to install the DDs on the Field Communicator.

The Field Communicator must be equipped with a system card with "Easy Upgrade Option". For details consult the Field Communicator User's Manual.

### 7.5.2 Operation

Operating the signal converter via the Field Communicator is very similar to manual device control using the keyboard.

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