



## OPTIBAR LC 1010 C **Technical Datasheet**

Submersible level probe with ceramic measuring cell

- Robust and high overload resistant level probe with 22 mm diameter
- Measuring ranges from 100 mbar (1mH<sub>2</sub>O) to 250 bar (100mH<sub>2</sub>O)
- Suitable also for wastewater with corrosion resistant TPE cable

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## 1.1 OPTIBAR differential pressure transmitter

The OPTIBAR LC 1010 submersible level probe has been developed for continuous level measurement of liquids in the water and wastewater industry.

The high overload resistant ceramic-capacitive measuring diaphragm is safe to install and easy to clean during operation. Together with the robust 316L housing and the highly corrosion resistant TPE cable, this level probe can be used in a variety of ways.

### Highlights

- High overload resistant ceramic measuring cell for uninterrupted measuring operations.
- 22 mm outer diameter enables easy installation in 1" pipes and in confined spaces.
- The flush ceramic measuring diaphragm allows for easy and safe cleaning.
- High quality, corrosion resistant cable made of TPE guarantees versatility in application.
- Simple parameterization through optional HART communication or in a fixed measuring range

### Industries

- Water
- Wastewater
- Environmental technology
- Plant engineering

### Applications

- Level measurement in an oil tank.
- Gauge measurement in a deep well.

## 2.1 Technical data

- *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 mH <sub>2</sub> O to 0...100 mH <sub>2</sub> O 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 ≤ ± 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 <i>Technical data</i> on page 4

### Operating conditions

Temperature	
Nominal temperature	-40...+80°C / -4...+176°F
Ambient temperature	-40...+85°C / -40...+185°F
	Ex i zone 0: -20...+60°C / -4...+140°F at $p_{abs} = 0.8...1.1$ bar
	Ex i from zone 1: -25...+65°C / -4...+158°F
Storage temperature	-40...+80°C / -40...+176°F
Medium temperature	-40...+85°C / -40...+185°F
Other conditions	
Ingress protection acc. to IEC 529 / EN 60529	IP68

### Installation conditions

Mounting position	Any - factory calibration carried out with pressure port down.
Dimensions	For detailed information refer to the chapter "Dimensions and weights".

### 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) FKM
Diaphragm	Al <sub>2</sub> O <sub>3</sub> 96% Al <sub>2</sub> O <sub>3</sub> 99.9% (optional)
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)	
Supply voltage	4...20 mA:	U <sub>b</sub> = 12...32 V DC
	4...20 mA with HART:	U <sub>b</sub> = 12...32 V DC
	Ex i 4...20 mA:	U <sub>b</sub> = 14...28 V DC
	Ex i 4...20 mA with HART:	U <sub>b</sub> = 12...28 V DC
Safety maximum values (Ex i)	U <sub>i</sub> = 28 V, I <sub>i</sub> = 93 mA, P <sub>i</sub> = 660 mW, C <sub>i</sub> ≈ 49.2 nF, L <sub>i</sub> ≈ 0 μH; The supply connections have a maximum internal capacity of 50 nF to the housing.	
Load	$R_{lmax} \leq (U_b - U_{bmin}) / 0.02 \text{ A [Ohm]}$	
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 fulfils the statutory requirements of the EC directives. The manufacturer certifies that these requirements have been met by applying the CE marking.	
Electromagnetic compatibility (EMC) acc. to EN 61326	EMC Directive: 2004/108/EC	
	For more information consult the relevant declaration of conformity.	
Pressure Equipment Directive	97/23/EC	
<b>Ex</b>		
ATEX	Zone 0: II 1G Ex ia IIC T4	
	Zone 20: II 1D Ex ia IIIC T135°C Da	
IECEX	Zone 0: Ex ia IIC T4 Ga	
	Zone 20: Ex ia IIIC T135°C Da	

## 2.2 Dimensions and weights

### Submersible level probe

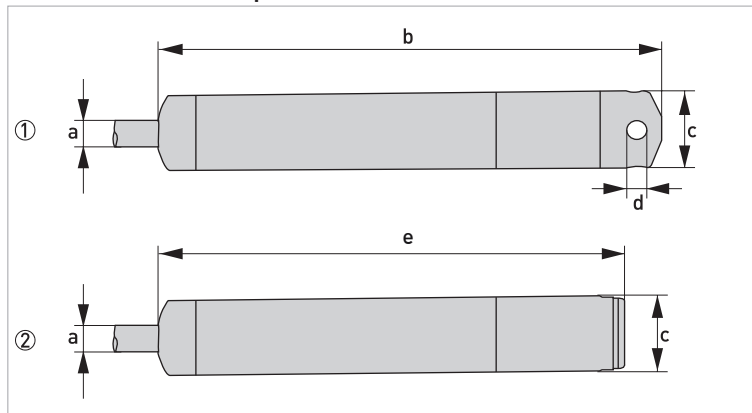


Figure 2-1: Dimensions submersible level probe

- 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	∅ 22	0.87
d	4 x ∅ 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

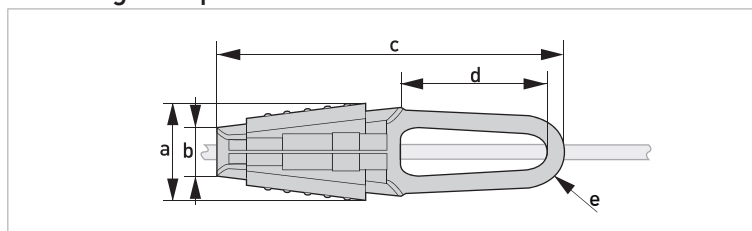


Figure 2-2: Dimensions straining clamp

	[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

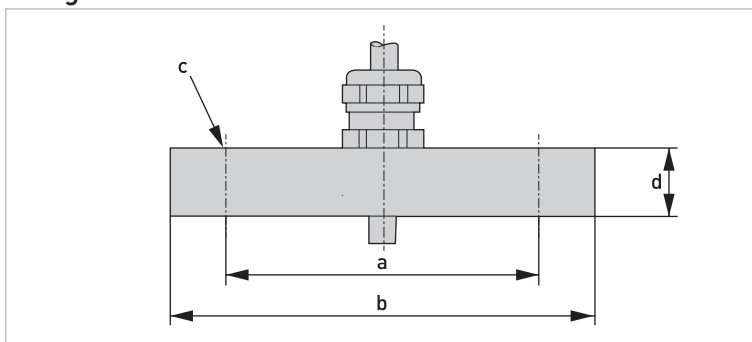


Figure 2-3: Dimensions Flange

[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

### 2.3 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				



### 3.1 General notes on installation

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

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

*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 Intended use

*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.*

*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.*

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

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

### 3.3 Installation specifications

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

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

*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.*
- 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.*

### 3.4 Mounting

- Prior to installing the pressure 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.*
- Check the materials used for the wetted parts (e.g. gasket, process connection, separating diaphragm etc.) for suitability as regards process compatibility.*

#### 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.

### Pressure equalisation capillary

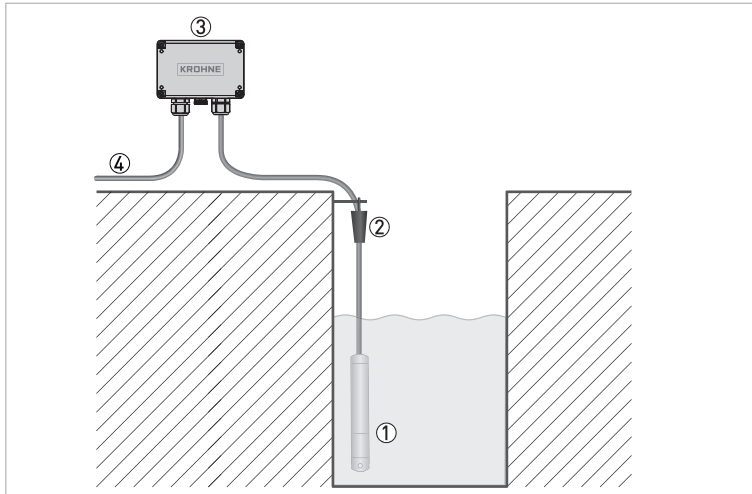


Figure 3-1: Example of a typical measuring point

- 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

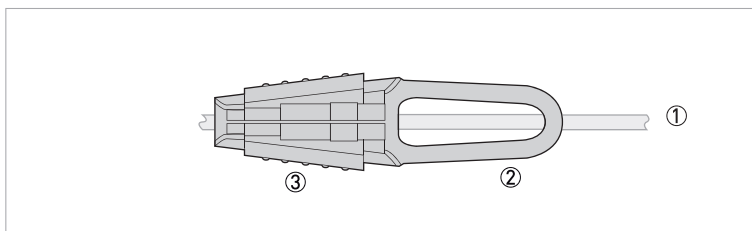


Figure 3-2: Straining clamp

- 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 clamping jaws upward and push the suspension cable between them
- Hold the suspension cable, push the clamping jaws downward and fix them with a light blow

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

## 4.1 Safety instructions

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

*Observe the national regulations for electrical installations!*

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

*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.*

*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

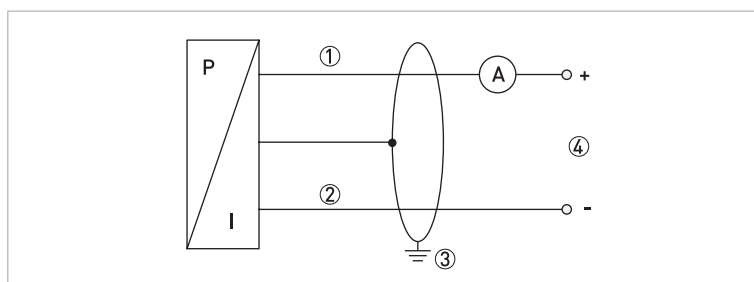


Figure 4-1: Electrical connection diagram 2-wire 4...20 mA

- ① Supply +
- ② Supply -
- ③ Shielding

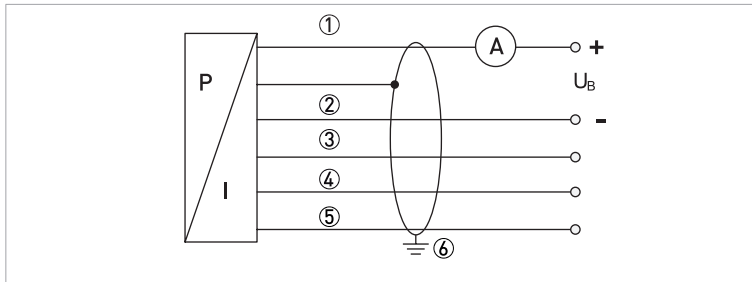


Figure 4-2: Electrical connection diagram 2-wire 4...20 mA with 3-wire Pt100

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

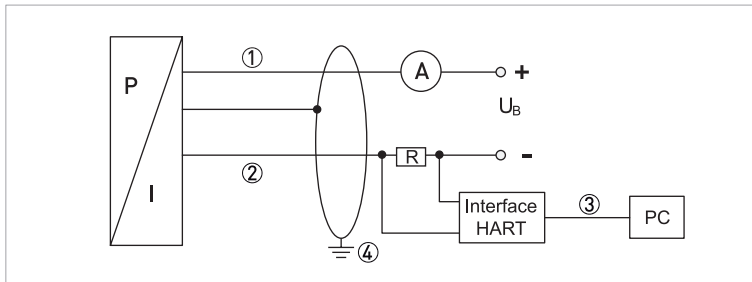


Figure 4-3: Electrical connection diagram / 4...20 mA with HART® 7

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

### 4.3 Cut the suspension cable

*Do not squeeze the capillary cable.*

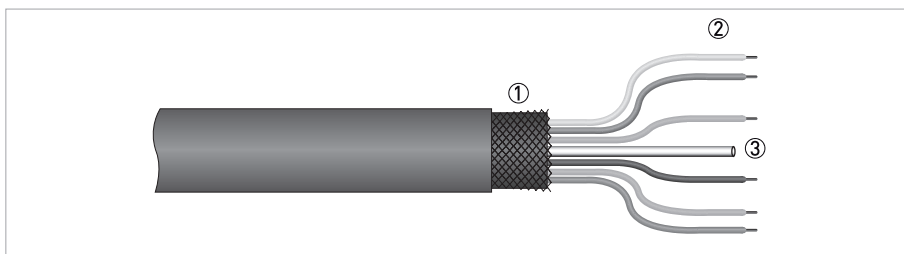


Figure 4-4: Wire assignment, suspension cable

- 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.

The characters of the order code highlighted in light grey describe the standard.

Sensor			
VGKL	4	Version	
		A	Absolute pressure (in preparation)
		R	Gauge pressure
		<b>Measuring range</b>	
		1	100 mbar / 10 kPa / 1.5 psi
		2	160 mbar / 16 kPa / 2.3 psi
		3	250 mbar / 25 kPa / 3.6 psi
		4	400 mbar / 40 kPa / 5.8 psi
		5	600 mbar / 60 kPa / 8.7 psi
		6	1.0 bar / 100 kPa / 14.5 psi
		7	1.6 bar / 160 kPa / 23 psi
		8	2.5 bar / 250 kPa / 36 psi
		A	4.0 bar / 40 kPa / 58 psi
		B	6.0 bar / 600 kPa / 87 psi
		C	10 bar / 1 MPa / 150 psi
		H	1.0 mH <sub>2</sub> O / 1.0 mWC
		K	1.6 mH <sub>2</sub> O / 1.6 mWC
		L	2.5 mH <sub>2</sub> O / 2.5 mWC
		M	4.0 mH <sub>2</sub> O / 4.0 mWC
		N	6.0 mH <sub>2</sub> O / 6.0 mWC
		P	10 mH <sub>2</sub> O / 10 mWC
		R	16 mH <sub>2</sub> O / 16 mWC
		S	25 mH <sub>2</sub> O / 25 mWC
		T	40 mH <sub>2</sub> O / 40 mWC
		U	60 mH <sub>2</sub> O / 60 mWC
		V	100 mH <sub>2</sub> O / 100 mWC
		Z	Customer specific measuring range (on request)
		<b>Housing / Diameter</b>	
		S	316L (1.4404); Ø 22 mm
		T	Titan Grade 2 (3.7035/34); Ø 22 mm (in preparation)
		<b>Membrane</b>	
		C	Ceramic; 96% Al <sub>2</sub> O <sub>3</sub>
		D	Ceramic; 99,9% Al <sub>2</sub> O <sub>3</sub> (in preparation)
		<b>Accuracy</b>	
		3	0.35%
		<b>Sealing</b>	
		E	EPDM (drinking water approvals)
		V	FKM

																		<b>Cable</b>	
																		S	5 m TPE; (-40...80°C); can be shortened
																		T	10 m TPE; (-40...80°C); can be shortened
																		U	20 m TPE; (-40...80°C); can be shortened
																		V	50 m TPE; (-40...80°C); can be shortened
																		W	100 m TPE; (-40...80°C); can be shortened
																		Z	Customer-specific cable lengths in metres
																		<b>Approval</b>	
																		0	None
																		A	ATEX / IECEx Group II Category 1G Ex ia (in preparation)
																		T	Drinking water approvals (in preparation)
																		<b>Output</b>	
																		A	2-wire 4...20 mA
																		B	2-wire 4...20 mA; 3-wire Pt100
																		H	2-wire 4...20 mA; HART 7; 3-wire Pt100 (in preparation)
																		<b>Design</b>	
																		T	Suspension cable
																		<b>Language</b>	
																		E	English
																		D	German
																		<b>Services</b>	
																		0	None
																		5	5-point factory calibration certificate
																		<b>Marking</b>	
																		0	None
																		T	Tag Plate (30 x 19 mm)
																		<b>Attachment / Material</b>	
																		0	None
																		K	Straining clamp; carbon steel, galvanized
																		F	Straining clamp; 304L (1.4301)
																		2	Thread ISO228 G1 1/2, 316L (1.4404)
																		3	Thread ANSI 1 1/2NPT, 316L (1.4404)
																		A	Flange DN25 PN40 Form C; DIN2501; nickel-plated brass
																		<b>Connection box</b>	
																		0	None
																		L	OPTIBAR LC Connect
VGKL		4																<b>Order code</b>	











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