



Technical manual BA 0112



Filling level

Hydrocont LK

Hydrostatic filling level transmitter

for continuously measuring
of filling levels in liquids

Pressure ranges 0...0,1 bar to 0...1 bar

Ceramic membrane

Useable as put in sensor of for outside installation

Suitable for wide process temperature range from – 40 °C to +100 °C

Shortest response time and excellent accuracy up to $\leq 0,1\%$

Integrated evaluation electronic

- in 2-wire-technology with current signal 4...20 mA
- in 3-wire-technology with voltage signal 0...10 V

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Application

The device **Hydrocont LK** with integrated analogue evaluation electronic is a compact hydrostatic transmitter for continuous measuring of filling levels in liquids at hydrostatic pressures from 0 up to 1 bar within pressure less container, at process temperatures from – 40°C to +100°C.

The use of a capacitive measuring sensor with ceramic membrane, allows the use in nearly all fields of industry. Application fields are e.g. the measurement of levels in reservoirs, clarification basins, deep wells etc., but also the filling level measurement in closed containers at liquids, like e.g. water, waste water, solvents, oil, sludge, fat, cleaning liquids, etc.

Function

The device **Hydrocont LK** is used for filling level measurement by measuring the hydrostatic pressure. The device can be alternatively used as put in sensor that is sunken down into the liquid by the carrying cable and a suitable fastening, e.g. cable clamp fixing or screw plug or also be screwed-in from outside into the container wall.

Measuring principle

The height of the liquid column over the measuring membrane causes on the measuring membrane the so-called hydrostatic pressure, that is defined besides the height of the liquid column also by the density of the liquid and the gravitational constant.

$$h = \frac{P}{\rho * g} \quad \text{with} \quad \begin{array}{l} h \text{ height (filling level)} \\ p \text{ pressure} \\ \rho \text{ density of the liquid} \\ g \text{ gravitational constant} \end{array}$$

Characteristics of the ceramic measuring membrane

The hydrostatic pressure of the liquid is applied to the ceramic membrane and causes there a variation of the capacity at the back side of the membrane. A pressure transmitting liquid is not used.

The ceramic membrane offers excellent characteristics like highest pressure and pressure blow strength up to forty times the nominal pressure, vacuum resistance, very high resistance against chemicals, corrosion and abrasion as well as very good insensitiveness against temperature shocks, highest accuracy and reproducibility, good long term stability and a very low temperature influence.

Signal processing

The pressure signal of the ceramic membrane is measured by the integrated analogue electronic and converted in a output current signal of 4...20mA resp. voltage signal 0...10 V.

Permissible pressure to the measuring membrane

pressure range	vacuum pressure	overload / burst pressure measuring membrane	overload pressure put in sensor
0...0,1 bar	0 bar _{abs}	+4 bar _{rel}	+0,4 bar _{rel}
0...0,2 bar	0 bar _{abs}	+4 bar _{rel}	+0,8 bar _{rel}
0...0,4 bar	0 bar _{abs}	+4 bar _{rel}	+1,6 bar _{rel}
0...0,6 bar	0 bar _{abs}	+10 bar _{rel}	+2 bar _{rel}
0...1 bar	0 bar _{abs}	+10 bar _{rel}	+2 bar _{rel}

Safety notes

Each person that is engaged with inauguration and operation of this device, must have read and understood this technical manual and especially the safety notes.




Installation, electrical connection, inauguration and operation of the device must be made by a qualified employee according to the informations in this technical manual and the relevant standards and rules.

The device may only be used within the permitted operation limits that are listed in this technical manual. Every use besides these limits as agreed can lead to serious dangers.

The materials of the device must be chosen resp. checked for suitability to the respective application requirements (contacting substances, process temperature). An unsuitable material can lead to damage, abnormal behavior or destruction of the device and to the resulting dangers.

The sensors may not used as sole device for prevention of dangerous conditions in machines and plants.

The device meets the legal requirements of all relevant EC directives. 

Installation

The installation of the device at locations where high pressure blows can occur should be avoided.

Drive the system pressure free prior installation resp. deinstallation of the sensor.

At viscous liquids there is the possibility of sealing the drills in the protection cap. In that case the protection cap must be screwed off to avoid a faulty measuring.

For a simpler removing of the protection cap a metallic stick or the like can be slide carefully straight through the drills. If the stick is slide in at an angle, there is the possibility of damaging the measuring membrane.

Wird der Stab schräg eingeschoben, so kann es zur Beschädigung der Messmembrane kommen.

At installation of the device by the screw in thread the tightening of the process connection may only be done at the hexagon by a suitable spanner.

The maximum permitted torque strength is 50 Nm.

The screw in of the process connection by using the housing tube resp. the connection cable is not permitted.

The environmental air pressure is supplied to the measurement membrane of the probe by an integrated pressure compensation capillary. The hindrance of the pressure compensation can lead to faulty measuring results. Avoid a folding resp. the pollution of the pressure compensation capillary at the connection side of the carrying cable resp. the pressure compensation element of the wall installation housing.

To avoid faulting, a micro air filter is placed at the end of the capillary.

In the case of an application conditioned cutting of the carrying cable there must be especially paid attention that this micro air filter will be replaced to the end of the capillary after the cutting.

After the installation of the cable resp. cables the cable glands of the wall installation housing must be fixed screwed on to achieve the tightness of the housing.

Strange substances that come into the housing can lead to faulty measurement results or to the destruction of the device and to the resulting dangers.

The correct function of the device within the specific technical data can only be guaranteed, if the permitted temperature in the area of the connection housing / carrying cable (see technical data) will not be exceeded.

At installation of the device by the screw in thread this can be achieved by isolation of the liquid carrying part of the plant or by other constructive measures to reduce the transferring of an extreme temperature to the connection housing.

Maintenance

The device is free of maintenance.

Special substances can lead to solid coatings on the membrane.

Such depositions can lead to faulty measurement results of the device.

In the case of coat forming liquids the membrane must be regularly cleaned e.g. with clear water.

Don't use sharp tools or aggressive chemicals for cleaning.

Repair

A repair may only be carried out by the manufacturer.

If the device must be sent back for repair, the following informations must be enclosed:

- An exact description of the application.
- The chemical and physical characteristics of the product.
- A short description of the occurred error.

Before returning the device for repair, the following measures must be proceeded:

- All stick product residues must be removed. This is especially important, if the product is unhealthy, e.g. caustic, toxic, carcinogenic, radioactive etc.
- A returning must be refrained, if it is not possible by 100% to remove the unhealthy product completely, because e.g. it is penetrate into cracks or is diffused through plastic.

Electrical connection

The electrical connection of the device must be carried out according to the respective country specific standards. Incorrect installation or adjustment could cause applicationally conditioned risks.

Use only twisted shielded signal and measurement wires and install these wires separated from power leading wires. Connect the cable shield only at one side to earth, ideally at the installation place of the device.

The earthing of the cable shield of an connected cable can be done at the installation place of the wall installation housing by using the terminal PE.

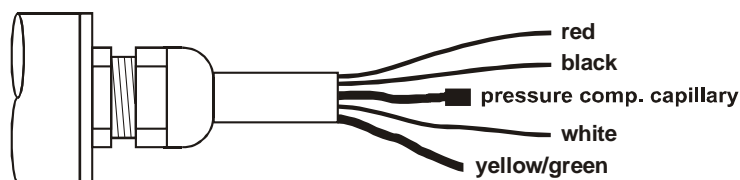
The device must be grounded.

The metallic parts of the device are electrically connected with the cable shield. At installation of the device by the screw in thread from outside into a container wall the grounding can also be done by the screw in thread.

The voltage applied to the plug contacts may not exceed 32 V, to avoid damage of the electronic.


All connections are polarity protected.

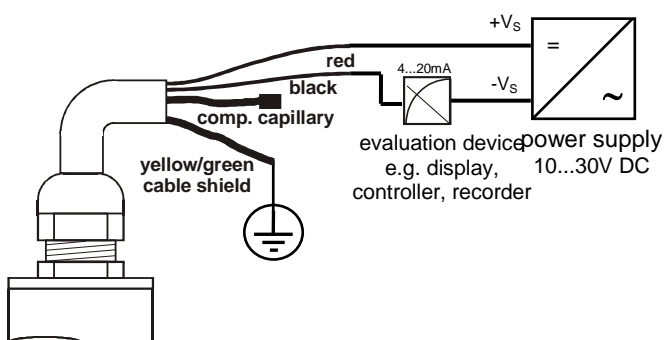
Terminal assignment



2-wire-technology / signal 4...20 mA


red signal +
black signal -

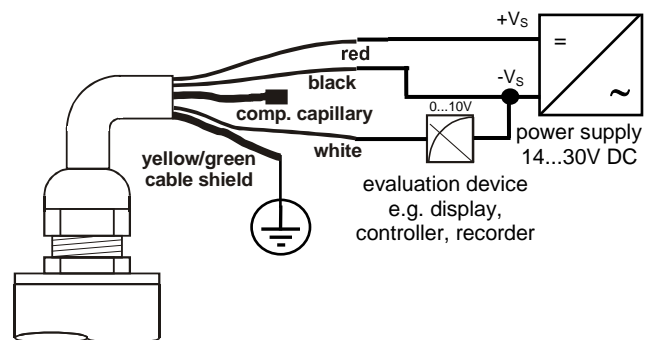
yellow/green earthing 



3-wire-technology / signal 0...10 V

red supply +
black supply -
white output +

yellow/green earthing 



Technical data

Auxiliary supply

Supply voltage:	2-wire 4...20 mA 3-wire 0...10 V	10..30 V DC 14..30 V DC	reverse polarity protected reverse polarity protected
Ripple voltage:	$\leq 2 V_{PP}$	condition:	within the permitted supply voltage range
Supply current:	2-wire 4...20 mA 3-wire 0...10 V	≤ 30 mA ≤ 6 mA	

Analogue output 4...20 mA

Signal range:	linear characteristic from ≤ 3 mA resp. ≥ 22 mA, max. 30 mA
Permitted load:	$R_L \leq (V_S - 10 \text{ V}) / 20\text{mA}$
Minimum delay time:	≤ 6 ms
Influence of supply voltage:	$\leq \pm 0,04\% \text{ FS}^2) / 10\text{V}$

Analogue output 0...10 V

Signal range:	linear characteristic from 0...11 V, max. $V_S - 1,5$ V
Permitted load:	$R_L \geq 5000 \Omega$, equals 2mA at 10 V, current limited
Minimum delay time:	≤ 6 ms
Influence of supply voltage:	$\leq \pm 0,04\% \text{ FS}^2) / 10\text{V}$

Measuring accuracy

Characteristic deviation ^{3) 5) 12)} :	$\leq \pm 0,1\% / 0,25\% \text{ FS}^2)$
Nonlinearity ¹²⁾ :	$\leq \pm 0,1\% / 0,25\% \text{ FS}^2)$
Hysteresis ¹²⁾ :	negligible
Long term drift ¹²⁾ :	$\leq \pm 0,15\% \text{ FS}^2) / \text{year}$ not cumulative
Temperature deviation ¹²⁾ :	$T_k^4)$ Zero $\leq \pm 0,15\% \text{ FS}^2) / 10 \text{ K}$, max. 1 % $T_k^4)$ Span $\leq \pm 0,15\% \text{ FS}^2) / 10 \text{ K}$, max. 1 %

Materials

Membrane: (medium contact)	Ceramic AL_2O_3 96%
Process connection: (medium contact)	Steel 1.4404 (AISI 316L) / 1.4571 (AISI 316Ti)
Protection cap: (medium contact)	POM – polyoxymethylene (Delrin [®])
Housing tube: (medium contact)	CrNi-steel
Connected cable: (medium contact)	Cable sheath PE – polyethylene
Wall installation housing:	PS – polystyrene or PC – polycarbonate, gasket PUR cable gland: housing PA – polyamide, gasket CR / NBR
Screw plug:	CrNi-steel, gasket FPM
Cable clamp fixing:	Steel, hot galvanized, jaw weather proof plastic
Pressure compens. element:	PTFE or PES
Gaskets:	medium contact \rightarrow FPM – fluorelastomere (Viton [®]) EPDM – ethylene-propylene-dienmonomere

²⁾ Referring to nominal measuring span resp. full scale (FS)

³⁾ Nonlinearity + Hysteresis + Reproducibility

⁴⁾ T_k = Temperature coefficient

⁵⁾ At limit value adjustment

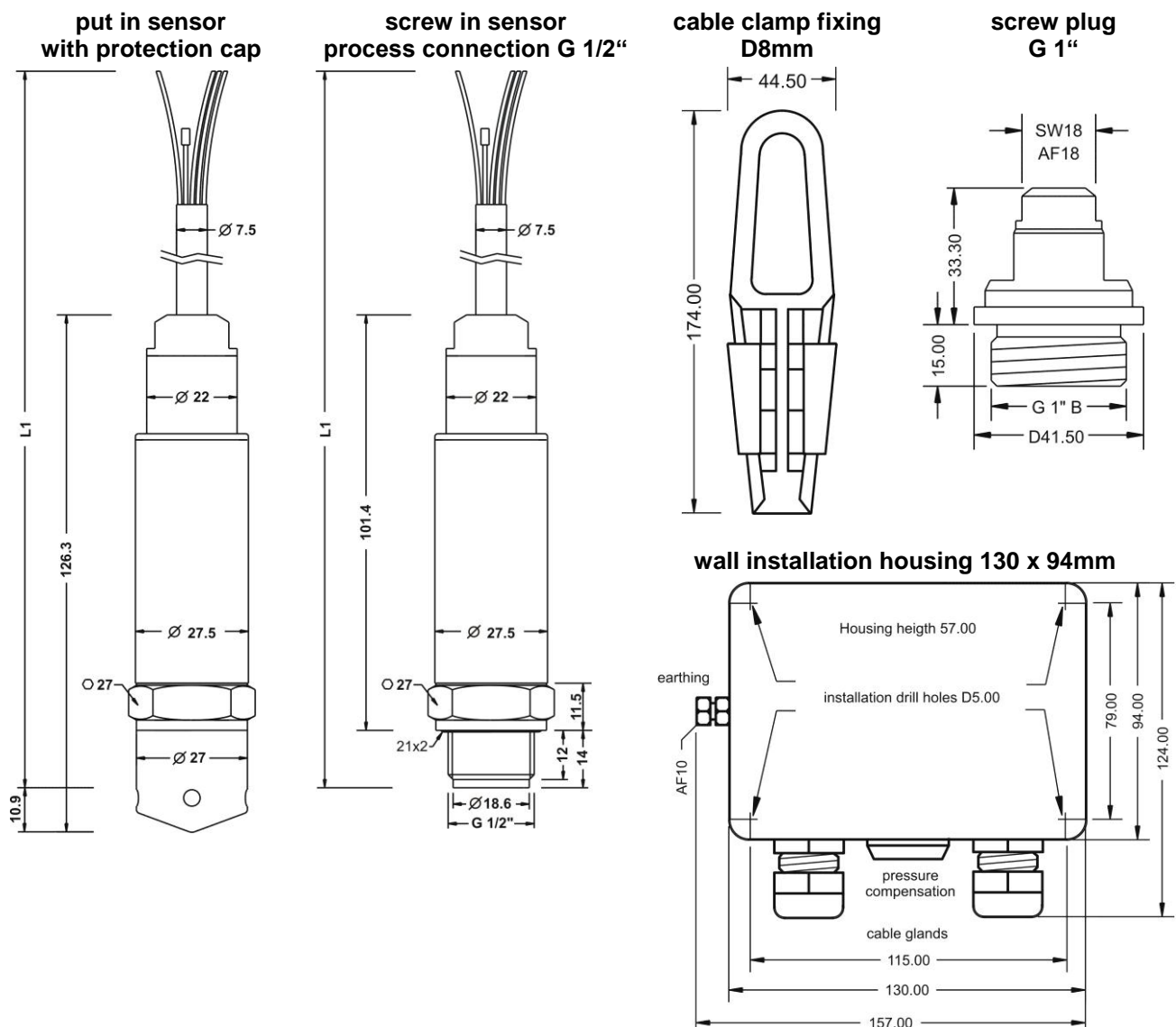
¹²⁾ Higher values for special measuring range

Technical data

Environmental conditions

Environmental temperature:	– 20°C...+70°C		
Process temperature:	– 20°C...+70°C		
	<i>Outside installation by process connection</i>		
	– 40°C...+100°C (-25°C at gasket FPM)		
Process pressure range:	maximum 0 bar ...1 bar		
Vacuum- / overload resistance:	depends on meas. range, see table perm. pressure to the membrane		
Weight:	0,25 kg + (cable length x 0,035 kg/m)		
Torque strength:	≤ 20 Nm		
Protection classification:	IP68	DIN EN 60529	
Climatic classification:	4K4H	DIN EN 60721-3-4	
Shock classification:	15 g / 11ms	DIN EN 60068-2-27	
EM – compatibility:	emission	DIN EN 61326-1	operation device class B
	immunity	DIN EN 61326-1	industrial range
Reference conditions:	DIN EN 60770-1		
	T = 25 °C, relative humidity 45...75 %, environm. air pressure 860...1060 kPa		

Dimension drawings



Order code overview

Type:

- Standard

Measuring membrane (medium contact):

LK Ceramic capacitive membrane ceramic AL₂O₃ 96%

Process connection:

0 G 1/2" B DIN EN ISO228-1 front flush
Y others on request

Gaskets (medium contact):

1 FPM fluorelastomere (Viton®)
3 EPDM etylene-propylene-dienmonomere for food applications

Material process connection (medium contact):

V Steel 1.4404 (AISI 316L) / 1.4571 (AISI 316Ti)

Material connection housing:

C CrNi-steel

Measuring range:

01 0...0,1 bar
02 0...0,2 bar
03 0...0,4 bar
04 0...0,6 bar
05 0...1 bar
YY special measuring range separate spec. necessary

Electronic – output:

A 2-wire-technology signal 4...20 mA
B 3-wire-technology signal 0...10 V

Process temperature:

0 Standard -20°C to +70°C (outside installation -40°C to 100°C)

Pressure type:

R Relative pressure

Accuracy measuring system ¹⁾:

0 0,1 %, with Linearization protocol
2 0,25 %

Probe prolongation:

A Carrying cable PE

Probe length L incl. process connection:

measure in mm

Hydrocont LK _ _ V C _ _ 0 R _ A _

Installation material and connection cable are not enclosed in the delivery contents.

¹⁾ Higher values for special measuring range

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