

FD-GL

Hydrostatic Level Measurement in Shipping and Offshore Applications



- **Capacitive ceramic measuring cell**
- **4-20 mA output**
- **2-wire technology**
- **Materials 1.4404 or CuNiFe**
- **Excellent linearity**
- **Negligible temperature errors**
- **High long-term stability**
- **Option: Pt100 for standard version**

Description:

Hydrostatic level sensors measure the hydrostatic pressure of the fluid column that is present above the sensor and therefore the liquid level. A flush-mounted ceramic measuring cell at the bottom of a stainless steel or CuNiFe housing picks up this pressure in such manner that, out of this, the internal electronic element can generate a 4...20 mA signal that is proportional to the level. The installation costs for the suspension at the self-supporting cable and the reliable 2-wire technology design are kept perceivably low. The FD-GL level sensor meets the standard requirements of Lloyds's Register, the Germanischer Lloyd (German Lloyd) and of DNV (Det Norske Veritas). The device can optionally also be supplied with ATEX approval or integrated temperature measurement via PT100 in 3-wire-technology.

Range of application:

The FD-GL hydrostatic level probe has been developed for deployment in shipping and offshore industries. Thanks to its robust and reliable capacitive ceramic measuring cell and the optionally available sea-water resistant CuNiFe housing, the probe is well-suited for using it in ballast tanks. In addition, in the shipping industry it can be deployed, among other things, in fuel and oil tanks as well as in utility and sewage tanks. The built-in electronic element is thrice encapsulated in order to prevent condensate entering into the electronic elements through the ventilation hose. The FD-GL hydrostatic level probe can be supplied as suspension type probe, screw-in probe or as flange probe with fixing flange as per DIN DN25 to DN80.

Technical specifications:

Accuracy:	standard: $\leq \pm 0.25\%$ FSO option: $\leq \pm 0.10\%$ FSO (min. full scale value > 0.4 bar) acc. to IEC 60770 - limit point adjustment (non-linearity, hysteresis, repeatability)
Mechanical resistance:	vibration 4g (as per GL: characteristic curve 2 as per DNV: Class B base: IEC 60068-2-6)
Storage temperature:	-40°C to +125°C
Fluid temperature:	-25°C to +125°C (depending on cable sheath and seal)
Weight:	min. 650 g (without cable)
Materials:	
Housing:	stainless steel 1.4404 or CuNi10Fe1Mn (seawater resistant)
Gasket (wetted):	FKM (Viton), EPDM or FFKM (media temperature must be higher than -15°C)
Diaphragm:	standard: ceramic Al ₂ O ₃ 96% option: ceramic Al ₂ O ₃ 99.9%
Cable coating:	TPE-U (flame-resistant, halogen- free, increased resistance against oil and gasoline, resistant against salt and seawater, heavy oil)
Wetted parts:	cable, housing, gaskets, diaphragm

Electrical specifications:

Output signal:	4-20 mA, 2-wire
Supply voltage:	standard 9-32 VDC, ATEX-version 14-28 VDC
Permissible load:	$R_{max} = [(U_B - U_{Bmin}) / 0.02] \Omega$
Current consumption:	max. 21 mA
Influencing factors:	
Supply voltage:	0.05% FSO / 10 V
Load:	0.05% FSO / k Ω
Long time stability:	$\leq \pm 0.1\%$ FSO / year at reference conditions
Turn-on time:	700 ms
mean Response time:	< 200 ms
max. Response time:	380 ms
Measuring rate:	5/s
Protection class:	IP 68

Thermal error:: $\leq \pm 0.1\%$ FSO / 10 K in
compensated range -20°C to +80°C

Electrical protection:

short-circuit:	permanent
Protection against polarity reversal:	no function in case of interchanged connection but no damage
Electromagnetic compatibility:	interference signal and interference proof as per – EN 61326 – Germanischer Lloyd (GL) – Det Norske Veritas (DNV)

CE-conformity: EMC-directive 2004/108/EC

Option

ATEX-approval:	Zone 0 : II 1G Ex ia IIB T4 (ATEX II 1G Ex ia IIC T4 for version "pipe mounting")
Permissible media temperature:	in zone 0 -20°C...+60°C with patm. 0.8...1.1 bar abs. in zone 20 -25°C...+70°C
Connecting cables:	capacitance signal line/shield also signal line/signal line 160 pF/m inductance signal line/shield also signal line/signal line 1 mikroH/m

Safety rel. technical maximum values:

$U_i = 28$ VDC, $I_i = 93$ mA,
 $P_i = 660$ mW, $C_i = 105$ nF,
 $L_i = 5\mu$ H, connections opp.
housing 140 nF

Recommended Ex-amplifier:

KFD2-STC4-EX1

Option Pt 100 temperature element: (only with standard version)

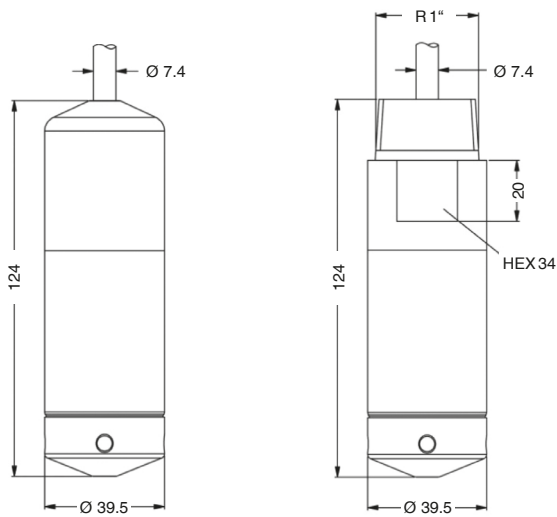
Temperature range:	-25°C to 125°C
Output signal:	3-wire
Resistance:	100 Ω at 0°C
Temperature coefficient:	3850 ppm/K
Supply Is:	0.3...1.0 mA DC

Ordering codes:

Ordering number:	FD-GL.	2.	1.	1.	2.	1.	2.	1.	1.	1.	010.	0.	0000-0000.	0
FD-GL Hydrostatic Level Measurement in Shipping and Offshore Applications														
Housing: 1 = stainless steel 1.4404 2 = copper nickel alloy (CuNi10Fe1Mn)														
Output signal: 1 = 4-20 mA, 2-wire 2 = 4-20 mA, 2-wire intrinsically safe with ATEX-approval 3 = 4-20 mA, 2-wire and Pt100, 3-wire														
Measuring element: 1 = ceramic Al ₂ O ₃ 96% 2 = ceramic Al ₂ O ₃ 99.9%														
Mounting variation: 1 = suspension type probe with self-supporting cable 2 = suspension type probe with self-supporting cable and flange 3 = screw-in probe														
Operating range: 1 = up to 0.40 m water column or 0.04 bar 2 = up to 0.6 m water column or 0.06 bar 3 = up to 1.0 m water column or 0.10 bar 4 = up to 1.6 m water column or 0.16 bar 5 = up to 2.5 m water column or 0.25 bar 6 = up to 4.0 m water column or 0.40 bar 7 = up to 6.0 m water column or 0.60 bar 8 = up to 10 m water column or 1.0 bar 9 = up to 16 m water column or 1.6 bar 10 = up to 25 m water column or 2.5 bar 11 = up to 40 m water column or 4.0 bar 12 = up to 60 m water column or 6.0 bar 13 = up to 100 m water column or 10 bar 14 = up to 160 m water column or 16 bar 15 = up to 200 m water column or 20 bar 16 = special range														
Measuring unit: 1 = gauge pressure in bar 2 = absolute pressure in bar 3 = mH ₂ O (water column)														
Gasket: 1 = FKM 2 = EPDM 3 = FFKM (media temperature must be higher than -15°C)														
Electrical connection: 1 = via cable with TPE-U coating 2 = other (please specify in detailed text)														
Accuracy: 1 = standard 0.25 % 2 = option 0.10 % (only for ranges higher than 0.4 bar)														
Cable length: 1 = please specify in meters														
Special design: 0 = none 1 = prepared for mounting inside a stainless steel pipe														
Mounting accessory for suspension type probe with self-supporting cable and flange 0000-0000 = none DN25-PN40 (ø 115 mm, 18 mm strong, 4 boreholes ø 14 mm at ø 85mm) DN50-PN40 (ø 165 mm, 20 mm strong, 4 boreholes ø 18 mm at ø 125 mm) DN80-PN16 (ø 200 mm, 20 mm strong, 8 boreholes ø 18 mm at ø 160 mm)														
Mounting bracket: 0 = none 1 = out of stainless steel 2 = out of CuNiFe														

Dimensions – in mm

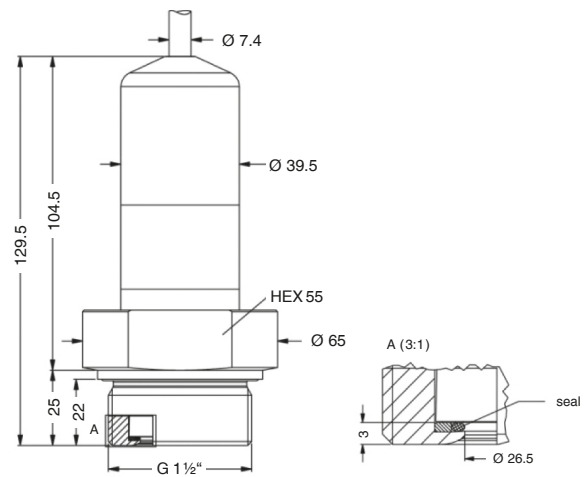
Suspension type probes:



stainless steel / CuNiFe

prepared for mounting inside a stainless steel pipe

Screw-in probe:

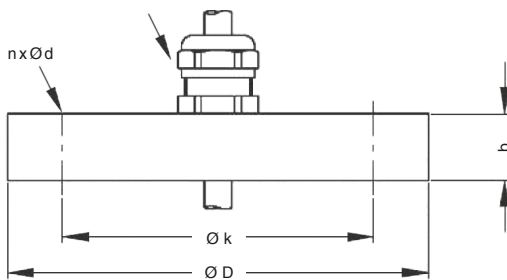


stainless steel / CuNiFe

Accessories:

Mounting flange with cable gland for suspension type probe with self-supporting cable:

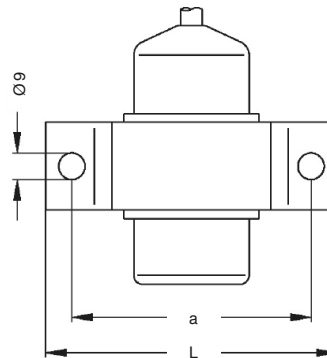
cable gland M16x1.5 with seal insert
(for cable-Ø 4 - 11 mm)



Flange (Hole pattern DIN 2501)	Dimensions				
	D	k	b	n	d
DN25 / PN40	115	85	18	4	14
DN50 / PN40	165	125	20	4	18
DN80 / PN16	200	160	20	8	18

DN80 / PN16 possible for operating ranges PN ≤ 16 bar

Mounting bracket:



Bracket material	Dimensions	
	a	L
CuNiFe	82	100
Stainless steel	100	130

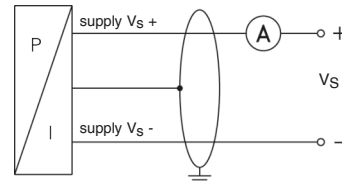
Operating ranges and Overload:

Nominal pressure [bar]	0.04	0.06	0.1	0.16	0.25	0.4	0.6	1	1.6	2.5	4	6	10	16	20
Height of fluid [mH ₂ O]	0.4	0.6	1	1.6	2.5	4	6	10	16	25	40	60	100	160	200
Max. pressure [bar]	2	2	4	4	6	6	8	8	15	25	25	35	35	45	45
Perm. vacuum [bar]	-0.2		-0.3		-0.5				-1.0						

Electrical connection table:

Electrical connection	Cable colours (DIN 47100)
supply voltage V _S +	white
supply voltage V _S -	brown
Option Pt 100 sensor, 3-wire	
supply T+ (with Pt100)	yellow
supply T- (with Pt100)	grey
supply T- (with Pt100)	pink
ground	green/yellow (shield)

Connection diagram: 2-wire-system (current)



Connection diagram: 2-wire-system (current) with Pt 100

