Magnetostrictive level transmitter
High-resolution measurement principle
Models FLM-S, FLM-T, FLM-P

for further approvals
see page 3

Applications

- High-accuracy level detection for almost all liquid media
- Chemical, petrochemical industry, natural gas, offshore, shipbuilding, machine building, power generating equipment, power plants
- Process water and drinking water treatment, food and beverage industry, pharmaceutical industry

Special features

- Process- and procedure-specific solutions possible
- Operating limits:
  - Operating temperature: T = -90 ... +450 °C
  - Operating pressure: P = Vacuum to 100 bar
  - Limit density: $\rho \geq 400$ kg/m^3
- Resolution < 0.1 mm
- Wide variety of different electrical connections, process connections and materials
- Explosion-protected versions

Level transmitter with flange connection, model FLM-T

Description

The model FLM-S, FLM-T and FLM-P level transmitters are used for the high-accuracy, continuous level detection of liquids and are based on determining the position of a magnetic float according to the magnetostrictive measurement principle.

Data sheets showing similar products:
Reed level transmitter, for the process industry; model FLR; see data sheet LM 20.02

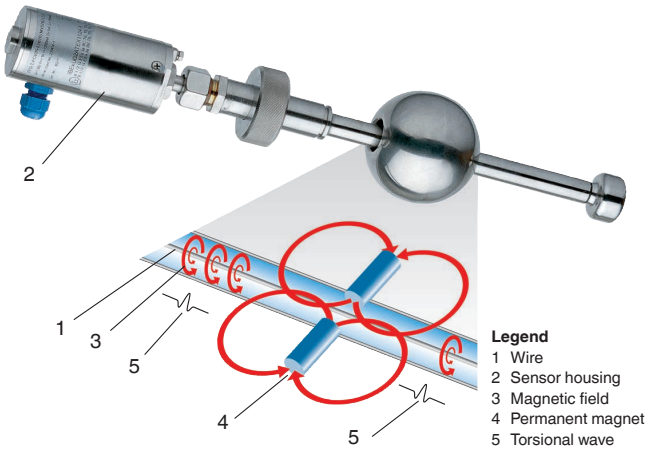
Further special features

- Large range of application due to the simple, proven functional principle
- Process connection, guide tube and float from stainless steel 1.4571, 1.4435, 1.4539 or plastic
- For harsh operating conditions, long service life
- Continuous detection of levels, independent of physical and chemical changes of the media such as: Foaming, conductivity, dielectric, pressure, vacuum, temperature, vapours, condensation, bubble formation, boiling effects, density change
- Signal transmission over long distances
- Simple installation and commissioning, onetime calibration only, no recalibration necessary
- Level displayed proportional to volume or height
- Parallel measurement of interface layer and overall level possible via HART® interface

Options

- Customer-specific solutions
- Process connection, guide tube and float from special steel, titanium, Hastelloy (others on request)
- In combination with limit switch, stepless setting of the limit values over the entire measuring range

Illustration of the principle



Design and operating principle

- The measuring process is triggered by a current impulse. This current produces a circular magnetic field (3) along a wire (1) made of magnetostrictive material fixed in the guide tube.
- At the point being measured (liquid level) there is a float with permanent magnets (4) acting as a position transducer.
- The superposition of these two magnetic fields triggers a mechanical torsional wave (5) in the wire.
- This is converted into an electrical signal at the end of the wire in the sensor housing by a piezoceramic converter.
- The measured propagation delay enables the origination point of the mechanical wave, and thus the float position, to be determined with high accuracy.

Model overview

Level transmitter	Description	Materials					
		Stainless steel			Titanium 3.7035 (grade 2)	PP	PVDF
		1.4571 (316Ti)	1.4404 (316L)	1.4435 (316L)			
FLM-S (FFG-P)	Standard version	x	x	-	x	-	-
FLM-T (FFG-T)	High-temperature version	x	x	-	x	-	-
FLM-P (FFG-TP)	Plastic version	-	-	-	-	x	x

Temperature range (process)

- Model FLM-S -60 ... +185 °C
- Model FLM-T -90 ... +450 °C
- Model FLM-P -10 ... +100 °C

Approvals

Logo	Description	Country
CE Ex	**EU declaration of conformity** ■ EMC directive EN 61326 emission (group 1, class B) and immunity (industrial application) ■ RoHS directive ■ ATEX directive (option) Hazardous areas **Model FLM-SxI (FFG-P...)** - Ex i II 1/2G Ex ia IIC T3 ... T6 No. ZELM 10 ATEX 0439 **Model FLM-SxI (FFG-T...)** - Ex i II 1/2G Ex ia IIC T6 ... T2 Ga/Gb No. IBExU 02 ATEX 1124X **Model FLM-SxD (FFG-P...)** - Ex d II 1/2G Ex d IIB T3 ... T6 Ga/Gb No. ZELM 13 ATEX 0508 X	European Union
FM APPROVED	**FM (only model FLM-S)** Hazardous areas - XP Cl I Div 1 Gp B, C, D, T* No. 3046884 - DIP Cl II, III Div 1 Gp E, F, G, T*; IP67 No. 3046884	USA
EAC Ex	**EAC** ■ EMC directive No. RU D-DE.A301.B.00820 ■ Hazardous areas No. RU C-DE.AB72.B.02373	Eurasian Economic Community
	GOST Metrology, measurement technology No. 19358 (C.29.004.A)	Russia
	KazInMetr Metrology, measurement technology No. 13946	Kazakhstan
	BelGIM Metrology, measurement technology No. 9710	Belarus
	UkrSEPRO Metrology, measurement technology No. UA.TR.113-0211-18	Ukraine
	Uzstandard Metrology, measurement technology No. 02.6648	Uzbekistan

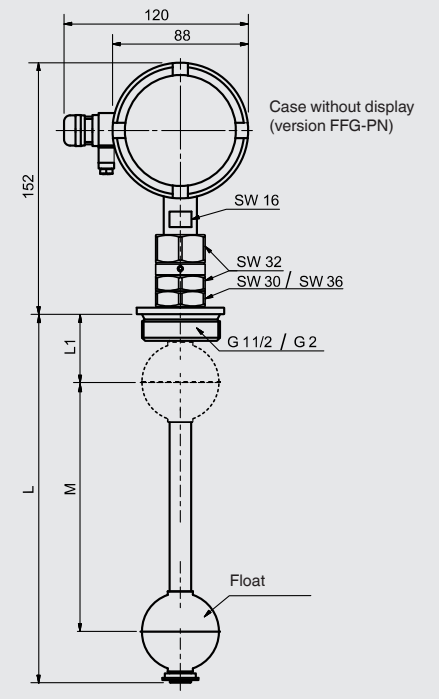
Manufacturer's information and certificates

Logo	Description
SIL	**SIL** Functional safety ■ SIL 2 for model FLM-T (FFG-T) ■ SIL 2, SIL 3 for model FLM-S (FFG-P)

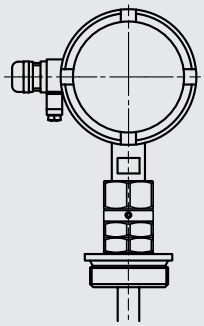
Approvals and certificates, see website

Level transmitter, standard version, explosion-protected version
Model FLM-S

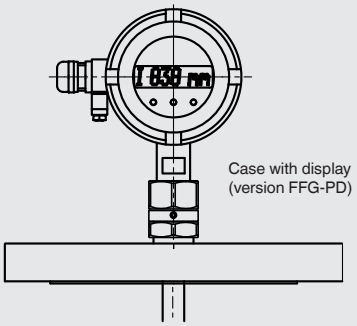
ZELM 10 ATEX 0439 (II 1/2G Ex ia IIC T3 ... T6), IBExU 02 ATEX 1124X (IBExU 02 ATEX 1124X) or
ZELM 13 ATEX 0508 X (II 1/2G Ex d IIB T3 ... T6 Ga/Gb)
Process connection, guide tube and float from stainless steel 1.4571



Mounting thread



Flange

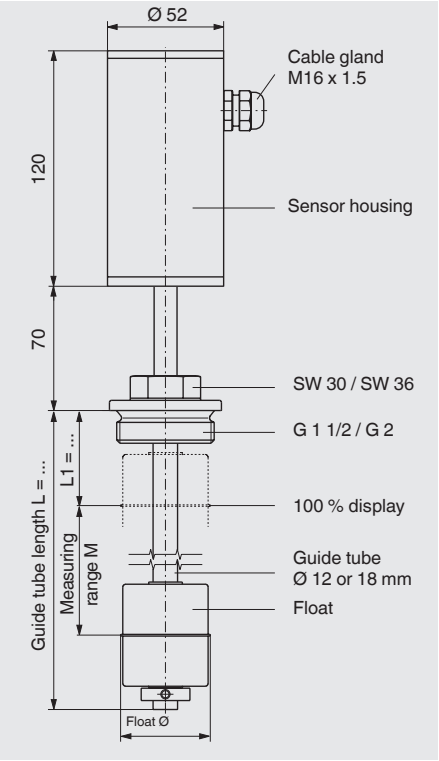


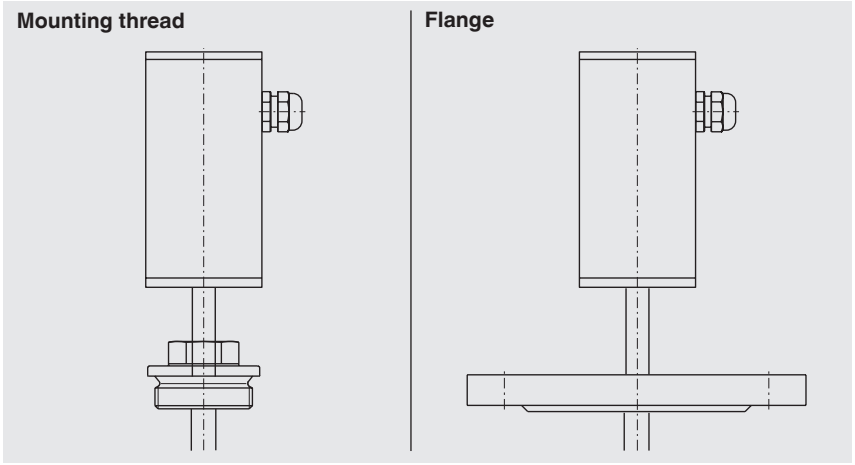
	Mounting thread	Flange
Electrical connection	Sensor housing, material stainless steel 1.4404 (316L) Version FFG-PN without display Version FFG-PD with window and display	
Display	LCD matrix (only version FFG-PD)	
Process connection	Mounting thread downwards G 1 1/2" or G 2"	Mounting flange ■ DIN DN 50 ... DN 200, PN 6 ... PN 100 ■ ANSI 2" ... 8", class 150 ... 600
Max. guide tube length L		
■ Guide tube Ø 14 mm	3,500 mm	
■ Guide tube Ø 18 mm	5,800 mm	
Float	Material: Stainless steel 1.4571 (option: Titanium) Float diameter from 44 ... 120 mm Float selection depending on guide tube Ø and process conditions (see page 8 / 9) Attention: With Ex approval no floats from titanium may be used.	
Max. operating pressure	40 bar (100 bar with float from titanium), see table on page 8 / 9	
Temperature range		
■ Medium (standard)	-60 ... +185 °C	
■ Ambient temperature		
- Standard, version without display	-40 ... +85 °C	
- Standard, version with display	-20 ... +70 °C	
Ex i version	T3/T4/T5: -20 ... +70 °C T6: -20 ... +60 °C	
Ex d version	T3/T4/T5: -20 ... +70 °C T6: -20 ... +60 °C	
Output signal	4 ... 20 mA, HART®	

	Mounting thread	Flange
Supply voltage	DC 15 ... 30 V	
Measurement accuracy	< ±0.5 mm	
Resolution	< 0.1 mm	
Load	max. 900 Ω at 30 V	
Mounting position	Vertical ±30°	
Ingress protection	IP67 per IEC/EN 60529	

Level transmitter, high-temperature version
Model FLM-T

Process connection, guide tube and float from stainless steel 1.4571

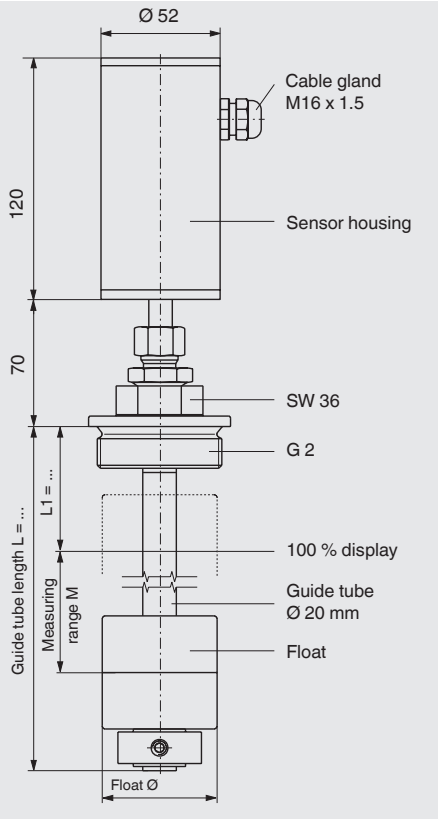


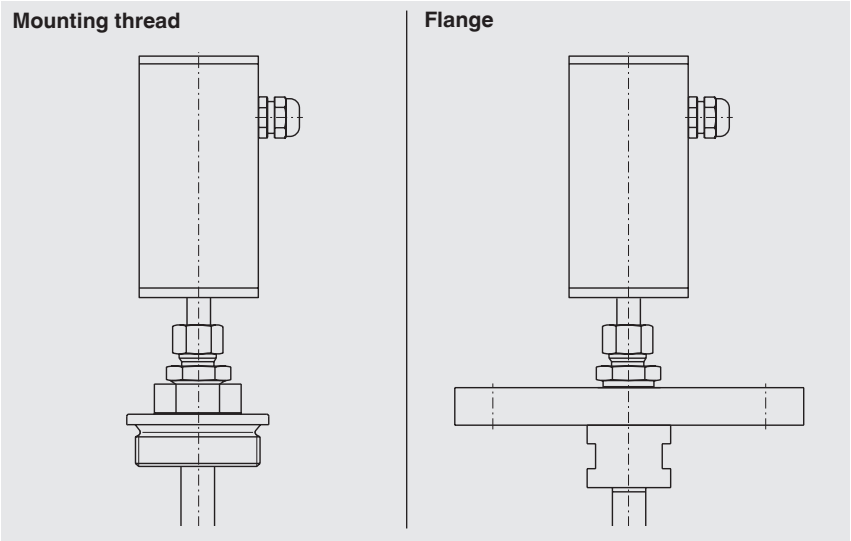


	Mounting thread	Flange
Electrical connection	Sensor housing, material stainless steel 1.4301	
Process connection	Mounting thread downwards G 1 1/2" or G 2"	Mounting flange ■ DIN DN 50 ... DN 200, PN 6 ... PN 100 ■ ANSI 2" ... 8", class 150 ... 600
Max. guide tube length L		
■ Guide tube Ø 12 mm	3,000 mm	
■ Guide tube Ø 18 mm	6,000 mm	
Float	Material: Stainless steel 1.4571 (option: Titanium) Float diameter from 44 ... 120 mm Float selection depending on guide tube Ø and process conditions (see page 8 / 9)	
Max. operating pressure	40 bar (100 bar with float from titanium), see table on page 8	
Temperature range		
■ Medium (standard)		
- High-temperature version	-45 ... +450 °C	
- Low-temperature version	-90 ... +125 °C	
■ Ambient temperature	-40 ... +85 °C	
Output signal	4 ... 20 mA, HART®	
Supply voltage	DC 10 ... 30 V	
Measurement accuracy	< ±0.5 mm	
Resolution	< 0.1 mm	
Load	max. 900 Ω at 30 V	
Mounting position	Vertical ±30°	
Ingress protection	IP68 per IEC/EN 60529	

Level transmitter, plastic version
Model FLM-P

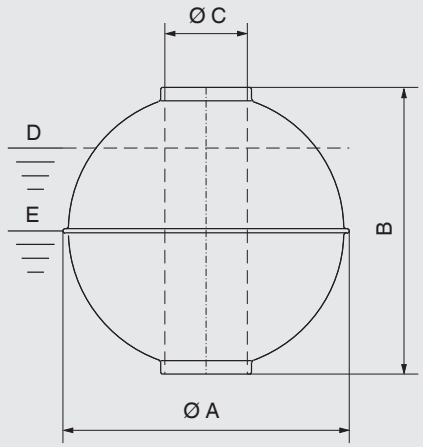
Process connection, guide tube and float from PVC, polypropylene or PVDF





	Mounting thread	Flange
Electrical connection	Sensor housing, material stainless steel 1.4305	
Process connection	Mounting thread downwards G 1 1/2" or G 2"	Mounting flange ■ DIN DN 50 ... DN 200, PN 6 ... PN 100 ■ ANSI 2" ... 8", class 150 ... 600
Max. guide tube length L	5,000 mm	
■ Guide tube Ø 16 mm	3,000 mm	
■ Guide tube Ø 20 mm	5,000 mm	
Float	Material: Polypropylene, PVDF or PVC Float diameter of 55 or 80 mm Float selection depending on guide tube Ø and process conditions (see page 8 / 9)	
Max. operating pressure	3 bar	
Temperature range		
■ Medium		
- Polypropylene	-10 ... +80 °C	
- PVDF	-10 ... +100 °C	
■ Ambient temperature	-40 ... +85 °C	
Output signal	4 ... 20 mA, HART®	
Supply voltage	DC 10 ... 30 V	
Measurement accuracy	< ±0.5 mm	
Resolution	< 0.1 mm	
Load	max. 900 Ω at 30 V	
Mounting position	Vertical ±30°	
Ingress protection	IP68 per IEC/EN 60529	

Spherical float



D = Limit density of the medium, immersed float volume 85 %

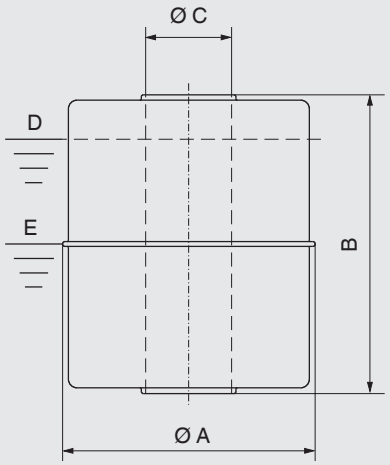
E = Nominal density of the medium, immersed float volume 50 %

Material	Version	Suits guide tube Ø in mm	Ø A in mm	B in mm	Ø C in mm	Max. operating pressure in bar	Max. operating temp. in °C	Limit density 85 % in kg/m³
Stainless steel 1.4571 (316Ti)	V52A	14	52	52	15	40	250	720
	V62A	14	62	61	15	32	250	597
	V83A	14	83	81	15	25	250	430
	V80A	18	80	76	23	25	250	660
	V98A	18	98	96	23	25	250	597
	V105A	18	105	103	23	25	250	533
	V120A	18	120	117	23	25	250	389
	V120/38A	18	120	116	38	25	250	537
Titanium 3.7035 (grade 2)	T52A	14	52	52	15	25	250	570
	T62A	14	62	62	15	25	250	505
	T83A	14	83	81	15	25	250	350
	T80A	18	80	76	23	25	250	665
	T98A	18	98	96	23	25	250	495
	T105A	18	105	103	23	25	250	369
	T120A	18	120	117	23	25	250	329

Special floats for higher temperature and pressure ranges are available on request.

Note: The optimum float will be selected after a feasibility test carried out by WIKA.

Cylindrical float



D = Limit density of the medium, immersed float volume 85 %

E = Nominal density of the medium, immersed float volume 50 %

Material	Version	Suits guide tube Ø in mm	Ø A in mm	B in mm	Ø C in mm	Max. operating pressure in bar	Max. operating temp. in °C	Limit density 85 % in kg/m³
Stainless steel 1.4571 (316Ti)	V44A	14	44	52	15	16	250	818
Titanium 3.7035 (grade 2)	T44A	14	44	52	15	16	250	550
PVC	P55A	16	55	54	22	3	60	798
	P80A	20	80	79	25	3	60	573
Polypropylene	PP55A	16	55	54	22	3	80	595
	PP80A	20	80	79	25	3	80	431
PVDF	PF55A	16	55	69	22	3	100	821
	PF80A	20	80	79	25	3	100	681

Special floats for higher temperature and pressure ranges are available on request.

Note: The optimum float will be selected after a feasibility test carried out by WIKA.

Ordering information

Model / Version / Electrical connection / Process connection / Guide tube diameter / Guide tube length (insertion length) L / 100 % mark L1 / Measuring range M (span 0 ... 100 %) / Process specifications (operating temperature and pressure, limit density) / Options

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