

Magnetic float switch For vertical installation Model FLS for nuclear power plants

KSR data sheet FLS for NPP



for further approvals
see page 3

Applications

- Level measurement for almost all liquid media
- Pump and level control and monitoring for distinct filling levels
- Chemical, petrochemical, natural gas, offshore, shipbuilding, machine building, power generating equipment, power plants
- Process water and drinking water treatment, food and beverage industry

Special features

- Large range of application due to the simple, proven functional principle
- For harsh operating conditions, long service life
- Operating limits:
 - Operating temperature: $T = -196 \dots +350 \text{ }^\circ\text{C}$
 - Operating pressure: $P = \text{Vacuum to } 40 \text{ bar}$
 - Limit density: $\rho \geq 300 \text{ kg/m}^3$
- Wide variety of different electrical connections, process connections and materials
- Explosion-protected versions

Description

A float with a permanent magnet moves reliably along with the liquid level on a guide tube. Within the guide tube is fitted a reed contact (inert gas contact), which is energised, through the non-magnetic walls of the float and guide tube, by the approach of the float magnet. By using a magnet and reed contact the switching operation is non-contact, free from wear and needs no power supply. The contacts are potential-free. Magnetic float switches are also available with multiple switch points.

The switch functions always refer to a rising liquid level: normally open, normally closed or change-over contact.

Through the use of a float for a max. of 2 switch points a bistable switch operation can be achieved, meaning that the switching status also remains available, when the filling level continues to rise above or drop below the switch point.

The float switch is simple to mount and maintenance-free, so the costs of mounting, commissioning and operation are low.



Fig.: Stainless steel version, mounting thread

Further special features

- Process connection, guide tube and float from stainless steel 1.4571, plastic or Buna
- Universal signal processing:
connection direct to a PLC is possible, NAMUR connection, signal amplification / contact protection relays
- Works independently of foaming, conductivity, dielectricity, pressure, vacuum, temperature, steam, condensation, bubble formation, boiling effects and vibrations.
- Multiple functionality in a single instrument - up to 8 potential-free contacts
- Exact repeatability of the switch points
- Magnetic float switches qualify as passive electrical equipment in accordance with DIN IEC 60079-11 and can be installed in 'Zone 1' hazardous areas without certification, so long as the equipment is operated in a certified intrinsically safe circuit with a minimum explosion protection of EEx ib

Options

- Customer-specific solutions
- Special versions for interface layer detection
 $\Delta\rho \geq 100 \text{ kg/m}^3$
- Process connection, guide tube material and float from stainless steel 1.4435, 1.4539, titanium, Hastelloy (others on request)

Model overview

Float switch model	Description	Approval						
		without	Ex i	Ex d	GL	Ex i + GL	ABS	DNV
FLS-S	Magnetic float switch, standard version	x	x	x	x	x	x	x

Float switch model	Materials			Temperature range
	Stainless steel 1.4571 (316Ti)	Stainless steel 1.4404 (316L)	Stainless steel 1.4435 (316L)	
FLS-S	x	x	x	-50 ... +350 °C

Ex approvals

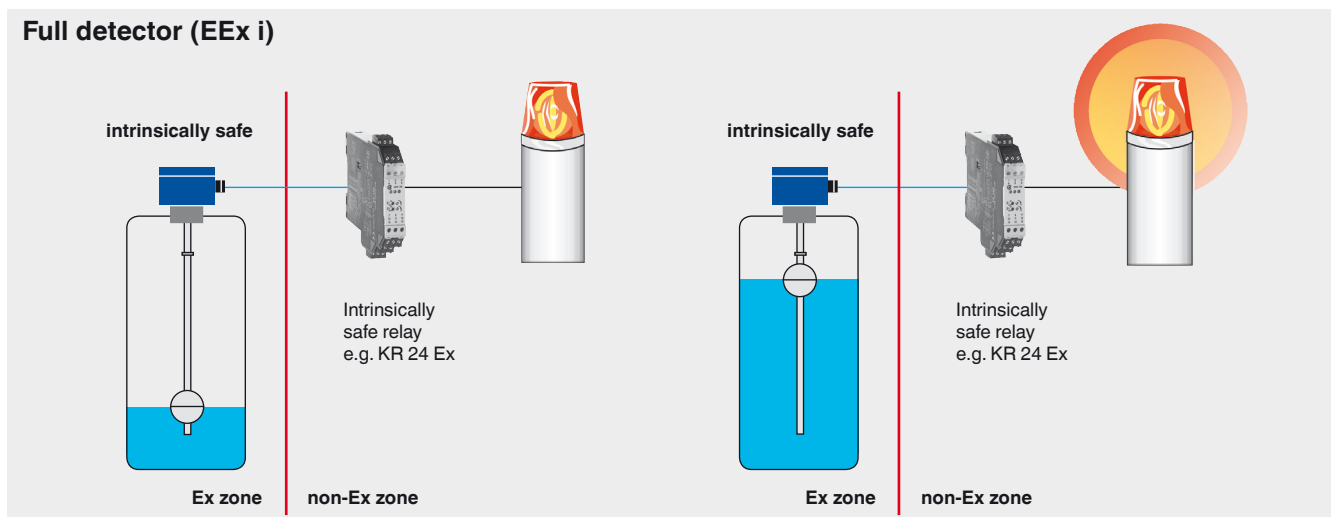
Explosion protection	Ignition protection type	Model	Zone	Approval number
ATEX	Ex i	FLS-S	Zone 0, gas	KEMA 01 ATEX1053 X II 1/2G Ex ia IIC T3 ... T6
	Ex i	FLS-M	Zone 0, gas	KEMA 01 ATEX1053 X II 1/2G Ex ia IIC T3 ... T6
	Ex d	FLS-S	Zone 1, gas/dust	TÜV 13 ATEX 7399 X II 2G Ex d IIC T6 Gb / II 2 D Ex tb IIIC T80 °C Db
	Ex i + GL	FLS-S	Zone 0, gas	KEMA 01 ATEX1053 X II 1/2G Ex ia IIC T3 ... T6 + GL - 96 716 - 95 HH

Type approval

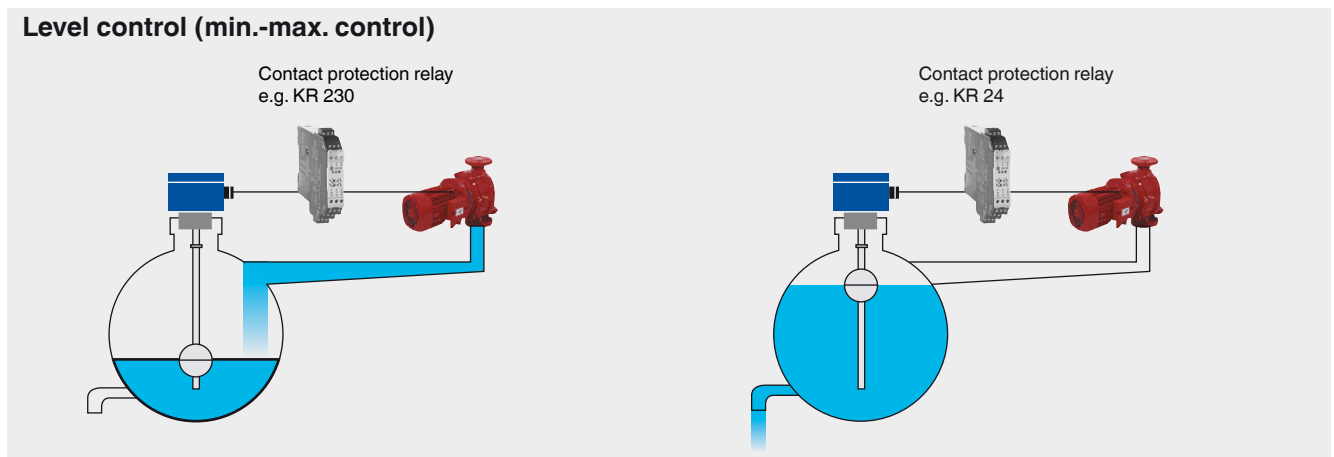
Explosion protection	Model	Approval number
GL	FLS-S	GL - 96 716 - 95 HH
ABS	FLS-S	ABS-02-HG286246-2-PDA
DNV	FLS-S	DNV - A-11453
GOST	FLS-S	959333

Application examples

Full detector (EEx i)

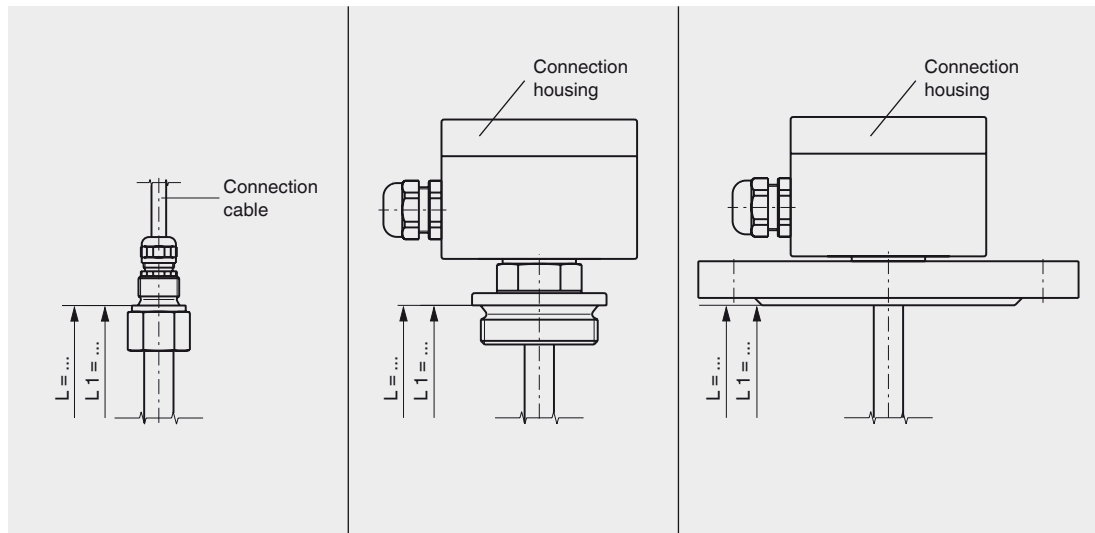


Level control (min.-max. control)



Magnetic float switch, standard version, model FLS-S

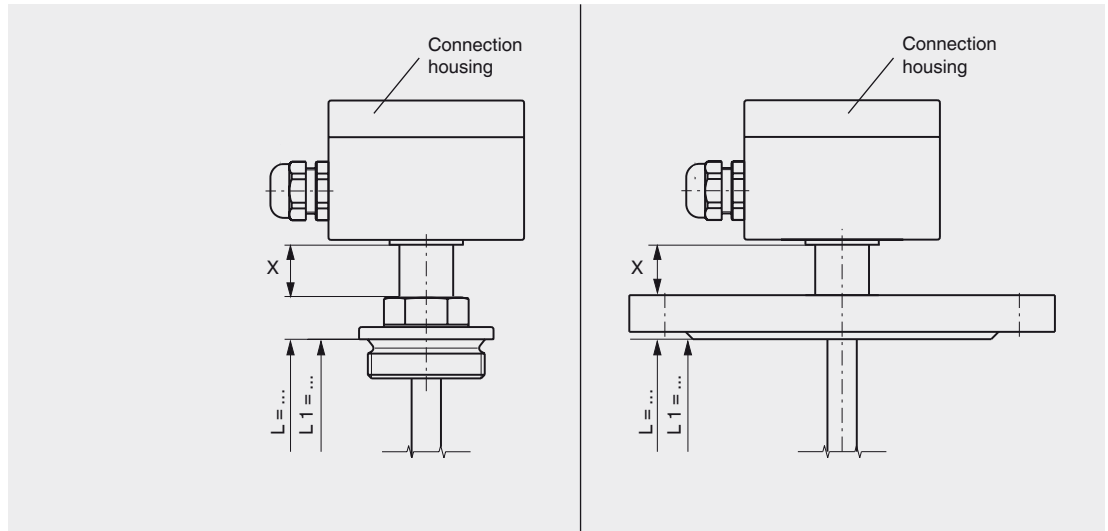
Process connection, guide tube material and float from stainless steel 1.4571 (316Ti)



	Mounting thread (without connection housing)		Mounting thread		Flange	
Electrical connection	Connection cable ■ PVC ■ Silicone ■ PUR		Connection housing ■ Aluminium 64 x 58 x 34 mm, with 1 contact ■ Aluminium 80 x 75 x 57 mm, 2 or more contacts Option: Polypropylene, polyester, stainless steel			
Process connection	Mounting thread upwards G 3/8" (others on request)		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	
Guide tube diameter	12 or 14 mm	18 mm	12 or 14 mm	18 mm	12 or 14 mm	18 mm
Guide tube length L max.	3,000 mm	6,000 mm	3,000 mm	6,000 mm	3,000 mm	6,000 mm
Float	Material stainless steel 1.4571 Float diameter from 44 ... 120 mm Float selection depending on guide tube diameter and process conditions (see floats (K) and (Z))					
Temperature range standard	PVC cable -10 ... +80 °C Silicone cable -30 ... +130 °C		-30 ... +150 °C Option: ■ High-temperature version: +150 ... +300 °C Option: ■ Low-temperature version: -196 ... -30 °C			
Switching function	Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level					
max. number of contacts	PVC cable 6 x NO or NC, or 4 x SPDT Silicone cable 5 x NO or NC, or 3 x SPDT		6 x NO or NC, or 4 x SPDT			
Switch position	Dimensions L ₁ , L ₂ , L ₃ ... (from sealing face, starting from top)					
Distance between switch points	Minimum 20 mm (depending on the selection of the float and the contacts, see floats (K) and (Z))					
Switching power	Normally open	AC 230 V; 100 VA; 1 A	DC 230 V; 50 W; 0.5 A	Normally closed	AC 230 V; 100 VA; 1 A	DC 230 V; 50 W; 0.5 A
	Change-over	AC 230 V; 40 VA; 1 A	DC 230 V; 20 W; 0.5 A	Change-over	-	DC 30 V; 0.1 A
	Attention: Versions without protective conductor connection - operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding					
Mounting position	Vertical ±30°					
Ingress protection	IP 65 per EN 60529 / IEC 60529					
Materials	Stainless steel 1.4404, 1.4435, 1.4539, titanium, Hastelloy and others on request					

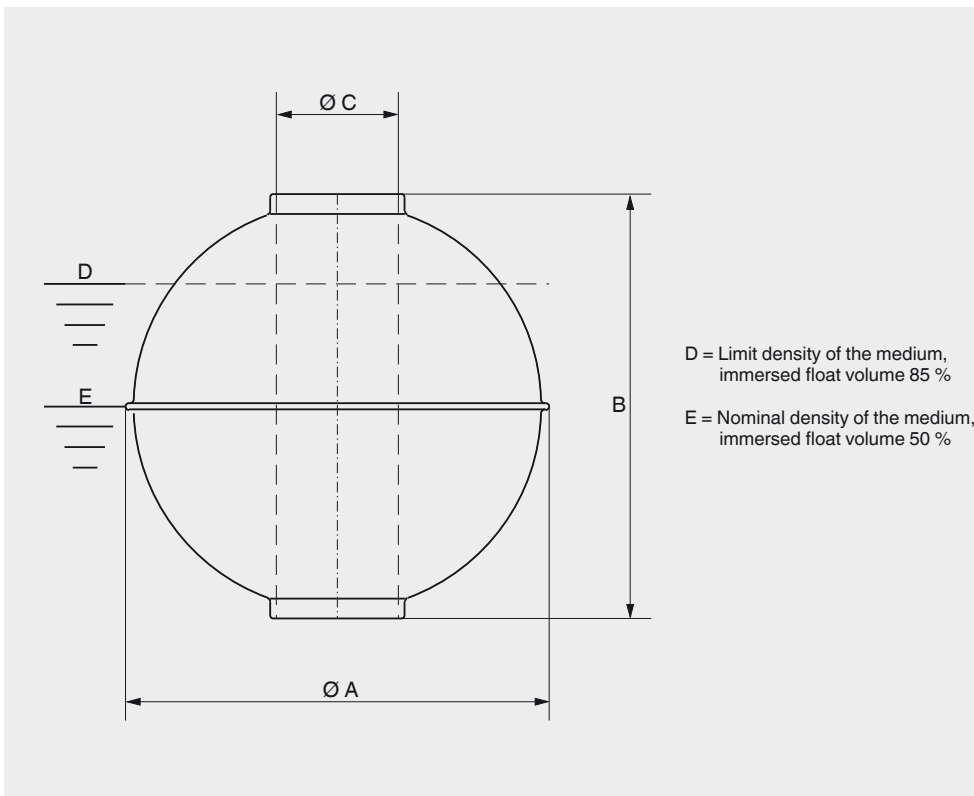
Magnetic float switch, explosion-protected version Ex i, intrinsically safe, model FLS-S

Process connection, guide tube material and float from stainless steel 1.4571 (316Ti)



Mounting thread		Flange				
Electrical connection	Connection housing ■ Aluminium 80 x 75 x 57 mm Option: Polyester, stainless steel					
Process connection	Mounting thread downwards G 1 1/2" or G 2" (others on request)		Mounting flange ■ DIN DN 50 ... DN 150, PN 6 ... PN 64 ■ ANSI 2" ... 6", class 150 ... 600			
Guide tube diameter	12 or 14 mm	18 mm	30 mm	12 or 14 mm	18 mm	30 mm
Guide tube length L max.	3,000 mm	6,000 mm	15,000 mm	3,000 mm	6,000 mm	15,000 mm
Float	Material stainless steel 1.4571 Float diameter from 44 ... 120 mm Float selection depending on guide tube diameter and process conditions (see floats (K) and (Z))					
Temperature class	T3	T4	T5	T6		
Process temperature	Max. 180 °C	130 °C	95 °C	80 °C		
Ambient temperature at connection housing	Max. 60 °C	60 °C	60 °C	60 °C		
Switching function	Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level					
max. number of contacts	6 x NO or NC, or 4 x SPDT					
Switch position	Dimensions L ₁ , L ₂ , L ₃ ... (from sealing face, starting from top)					
Distance between switch points	Minimum 20 mm (depending on the selection of the float and the contacts, see floats (K) and (Z))					
Switching power	Only for connection to a certified intrinsically safe circuit with U _{max} 30 V, I _{max} 100 mA					
Mounting position	Vertical ±30°					
Ingress protection	IP 65 per EN 60529 / IEC 60529					
Options	<ul style="list-style-type: none"> ■ Housing heightening X (state dimension X) ■ Temperature resistance Pt100 or Pt1000 ■ Bimetal thermal contact 40 ... 120 °C (in 5 degree steps) 					
Materials	Stainless steel 1.4435, titanium, Hastelloy on request					

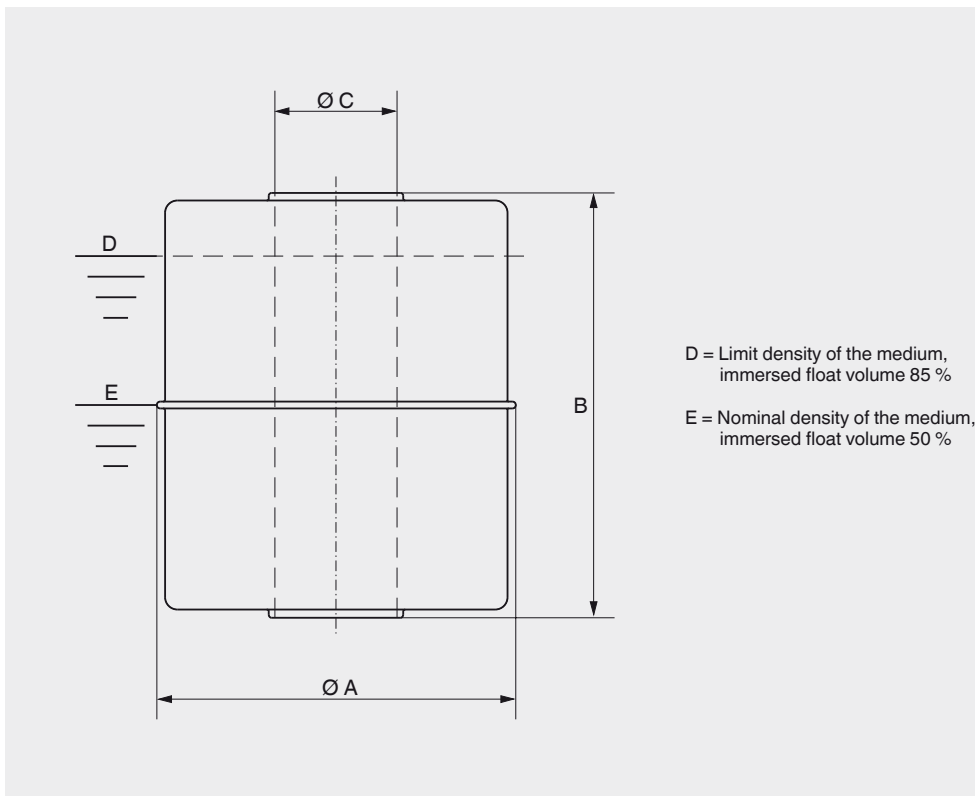
Spherical floats (K)



Material	Suits guide tube \varnothing mm	$\varnothing A$ mm	B mm	$\varnothing C$ mm	Max. operating pressure bar	Max. operating temperature °C	Limit density 85 % kg/m ³
Stainless steel 1.4571	8	29	28	9	6	100	977
	8	29	28	9	25	100	1069
	12	52	52	15	40	300	769
	12	62	61	15	32	300	597
	12	83	81	15	25	300	408
	18	80	76	23	25	300	679
	18	98	96	23	25	300	597
	18	105	103	23	25	300	533
	18	120	117	23	25	300	389
Titanium 3.7035	8	29	28	9	30	100	822
	12	52	52	15	25	300	707
	12	52	52	15	60	300	852
	12	52	52	15	80	300	1060
	12	62	62	15	25	300	505
	12	83	81	15	25	300	278
	18	80	76	23	25	300	665
	18	98	96	23	25	300	495
	18	105	103	23	25	300	369
	18	120	117	23	25	300	329
Stainless steel 1.4571	12	53	53	14	25	depending on medium	745

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

Cylindrical floats (Z)



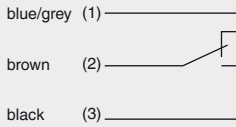
Material	Suits guide tube \varnothing mm	$\varnothing A$ mm	B mm	$\varnothing C$ mm	Max. operating pressure bar	Max. operating temperature $^{\circ}C$	Limit density 85 % kg/m^3
Stainless steel 1.4571	8	27	31	10	16	100	787
	12	44	52	15	16	300	818
Titanium 3.7035	12	44	52	15	16	300	720

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

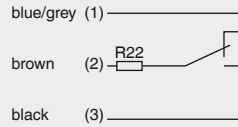
Electrical connections

Reed contact

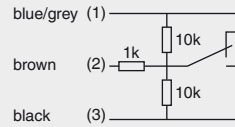
1 switch point



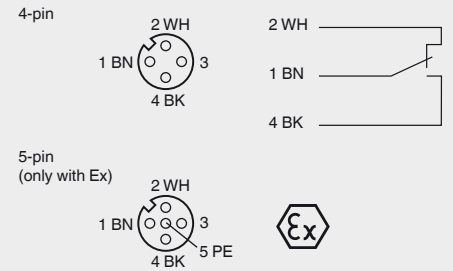
1 switch point
Wiring for operation
with a PLC



1 switch point
NAMUR circuit per
DIN EN 60947-5-6



Connector, pin assignment



Nuclear qualified plug (Han® 7D) on request.

Connection cable

Connection cable	Cross-section
PVC	4 x 0.5 mm ²
Silicone	4 x 0.75 mm ²
Armoured silicone	4 x 0.75 mm ²
LMGSG	3 x 1.5 mm ²

Colour coding per IEC 60757

Colour	Short symbol
Black	BK
Brown	BN
Red	RD
Orange	OG
Yellow	YE
Green	GN
Blue	BU
Violet	VT
Grey	GY
White	WH
Pink	PK
Turquoise	TQ
Green-Yellow	GNYE

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