

# Float switch For nuclear power plants Model FLS



Part of your business

WIKA data sheet LM 30.07



for further approvals  
see page 2

## 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

## 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
- Qualification: K3 + ad qualified according to RCC-E and IEC/IEEE 60780-323

## 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 potentialfree. 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.



### Stainless steel version, mounting thread

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.







## 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 Ex 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)

## Approvals

Logo	Description	Country
  	<b>EU declaration of conformity</b> <ul style="list-style-type: none"> <li>■ Directive for nuclear facilities IEC/IEEE 60780-323</li> <li>■ RoHS directive</li> <li>■ ATEX directive (option) Hazardous areas           <ul style="list-style-type: none"> <li>- Ex i Zone 0, gas II 1/2G Ex ia IIC T6 ... T1 Ga/Gb</li> <li>Zone 1, gas II 2G Ex d IIC T6 Gb</li> <li>Zone 0, dust II 2D Ex ib IIIC T80 ... T230 °C Db</li> <li>Zone 1, dust II 2D Ex tb IIIC T80 °C Db</li> </ul> </li> </ul>	European Union
	<b>GOST (option)</b> Metrology, measurement technology	Russia
	<b>DNV GL (option)</b> <ul style="list-style-type: none"> <li>■ Ships, shipbuilding (e.g. offshore)</li> <li>■ Hazardous areas</li> </ul>	International
	<b>ABS (option)</b> Ships, shipbuilding (e.g. offshore)	International

## Manufacturer's information and certificates

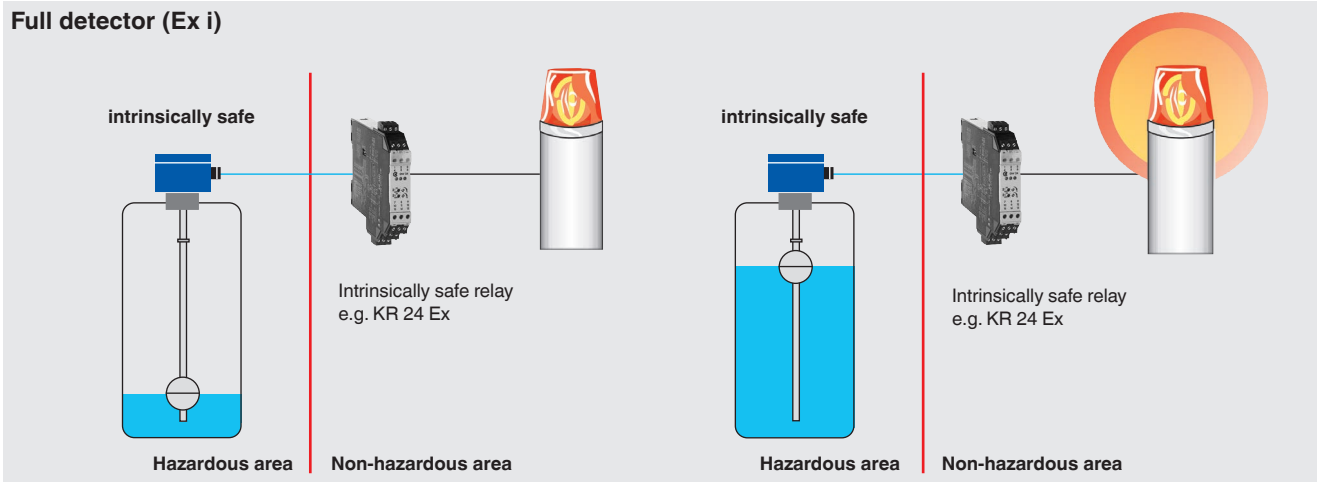
Logo	Description
<b>RCC-E</b>	<b>RCC-E</b> Design and construction rules for the electrical equipments of nuclear islands

Combinations of approvals here listed on request. Approvals, which are not shown here can also be acquired on request.

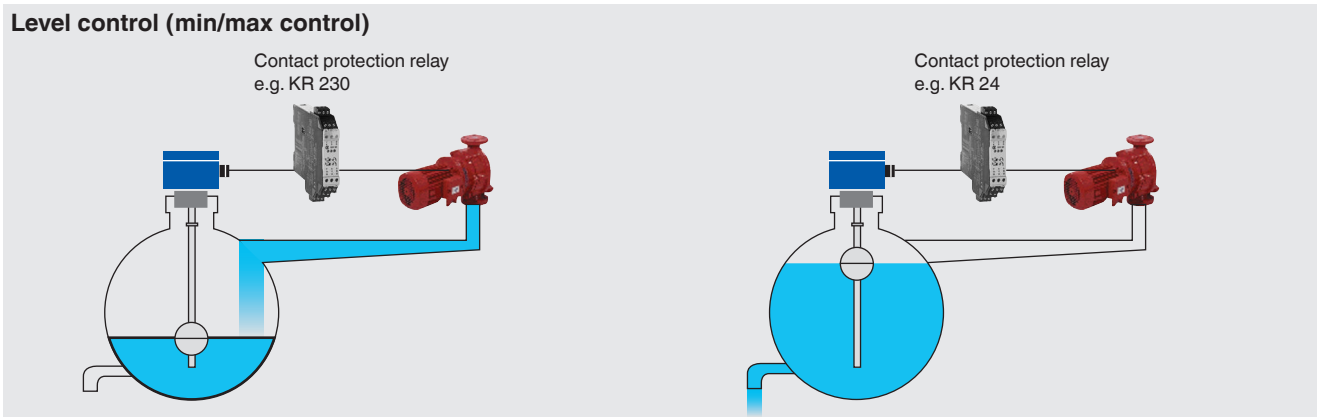
Approvals and certificates, see website

# Application examples

## Full detector (Ex i)

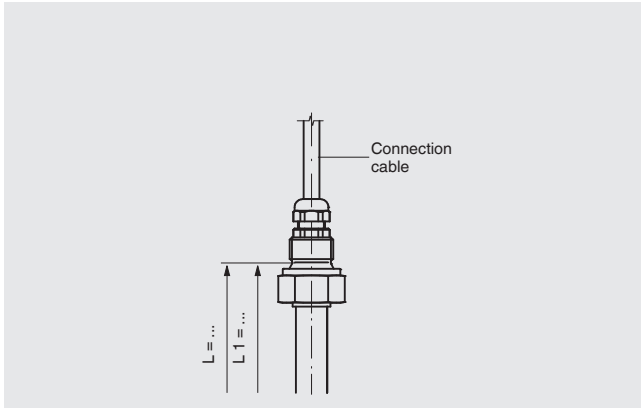


## Level control (min/max control)



## Standard version without connection housing, model FLS-S

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



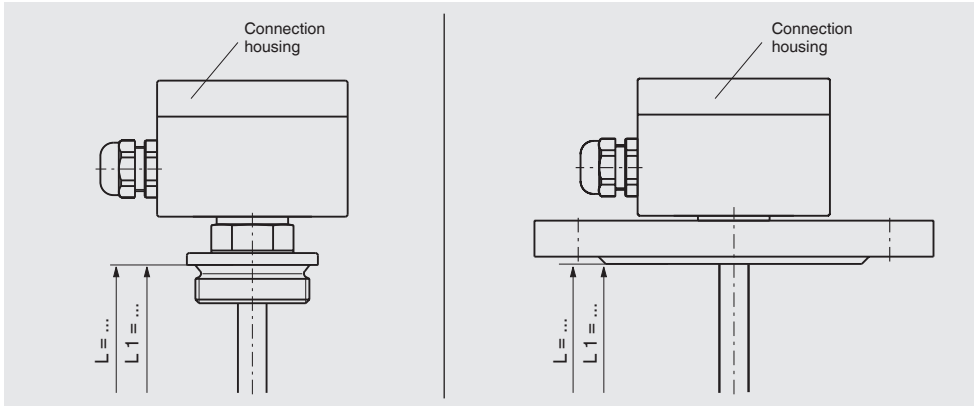
	Mounting thread (without connection housing)
<b>Electrical connection</b>	Connection cable: <ul style="list-style-type: none"> <li>■ PVC</li> <li>■ Silicone</li> <li>■ PUR</li> </ul>
<b>Process connection</b>	Mounting thread upwards <ul style="list-style-type: none"> <li>■ G 3/8 (others on request)</li> <li>■ G 1/2 (others on request)</li> </ul>
<b>Guide tube diameter</b>	12 mm / 14 mm / 18 mm
<b>Max. guide tube length L</b>	3,000 mm for guide tube diameter 12 and 14 mm 6,000 mm for guide tube diameter 18 mm <sup>1)</sup>
<b>Float</b>	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))
<b>Temperature range</b>	PVC cable: -10 ... +80 °C Silicone cable: -30 ... +130 °C
<b>Switching function</b>	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
Switch position	Dimensions L <sub>1</sub> , L <sub>2</sub> , L <sub>3</sub> ... (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))
<b>Switching power <sup>2)</sup></b>	
FLS-SA/FLS-SF (low voltage)	Normally open, 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
FLS-SB/FLS-SE (safety extra-low voltage)	Normally open, normally closed: AC < 50 V; 100 VA; 1 A DC < 75 V; 50 W; 0.5 A Change over: AC < 50 V; 40 VA; 1 A DC < 75 V; 20 W; 0.5 A
	Versions without protective conductor connection: Operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding
<b>Mounting position</b>	Vertical ±30°
<b>Ingress protection</b>	up to IP66/IP68 per IEC/EN 60529
<b>Materials</b>	<ul style="list-style-type: none"> <li style="width: 50%;">■ Stainless steel 1.4404</li> <li style="width: 50%;">■ Titanium</li> <li style="width: 50%;">■ Stainless steel 1.4435</li> <li style="width: 50%;">■ Hastelloy</li> <li style="width: 50%;">■ Stainless steel 1.4539</li> <li style="width: 50%;">Others on request</li> </ul>

1) 6,000 mm without stilling tube longer version on request

2) Dependent on number of switching points, distance between contacts and insulation possibilities in the guide tube

## Standard version with connection housing, model FLS-S

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



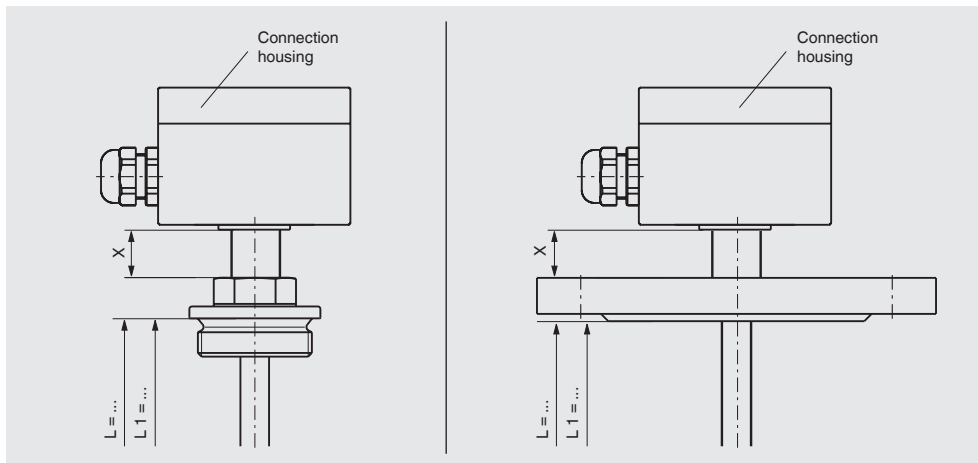
	Mounting thread	Flange
<b>Electrical connection</b>	Connection housing: <ul style="list-style-type: none"> <li>■ Aluminium 64 x 58 x 34 mm, with 1 contact</li> <li>■ Aluminium 80 x 75 x 57 mm, 2 or more contacts</li> <li>■ Option: Polypropylene, polyester, stainless steel</li> </ul>	
<b>Process connection</b>	Mounting thread downwards <ul style="list-style-type: none"> <li>■ G 1 1/2</li> <li>■ G 2</li> </ul>	Mounting flange <ul style="list-style-type: none"> <li>■ DIN DN 50 ... DN 200, PN 6 ... PN 100</li> <li>■ ANSI 2 ... 8", class 150 ... 600</li> </ul>
<b>Guide tube diameter</b>	12 mm / 14 mm / 18 mm	
<b>Max. guide tube length L</b>	3,000 mm for guide tube diameter 12 and 14 mm 6,000 mm for guide tube diameter 18 mm <sup>1)</sup>	
<b>Float</b>	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))	
<b>Temperature range</b>	-30 ... +150 °C High-temperature version (option): +150 ... +300 °C Low-temperature version (option): -196 ... -30 °C	
<b>Switching function</b>	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 <sub>1</sub> , L <sub>2</sub> , L <sub>3</sub> ... (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))	
<b>Switching power <sup>2)</sup></b>		
FLS-SA/FLS-SF (low voltage)	Normally open, 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	
FLS-SB/FLS-SE (safety extra-low voltage)	Normally open, normally closed: AC < 50 V; 100 VA; 1 A DC < 75 V; 50 W; 0.5 A Change over: AC < 50 V; 40 VA; 1 A DC < 75 V; 20 W; 0.5 A	
	Versions without protective conductor connection: Operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding	
<b>Mounting position</b>	Vertical ±30°	
<b>Ingress protection</b>	up to IP66/IP68 per IEC/EN 60529	
<b>Materials</b>	<ul style="list-style-type: none"> <li style="width: 50%;">■ Stainless steel 1.4404</li> <li style="width: 50%;">■ Titanium</li> <li style="width: 50%;">■ Stainless steel 1.4435</li> <li style="width: 50%;">■ Hastelloy</li> <li style="width: 50%;">■ Stainless steel 1.4539</li> <li style="width: 50%;">Others on request</li> </ul>	

1) 6,000 mm without stilling tube longer version on request

2) Dependent on number of switching points, distance between contacts and insulation possibilities in the guide tube

# Explosion-protected version Ex i, intrinsically safe, model FLS-S

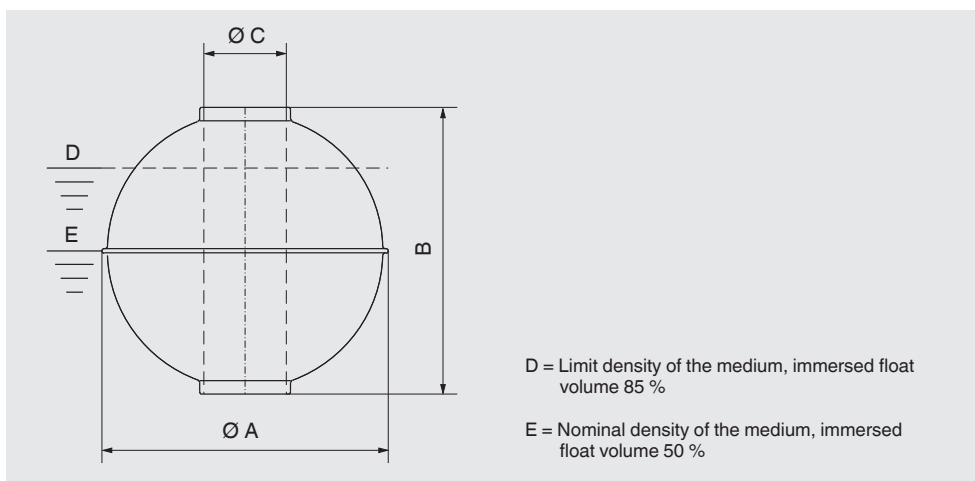
Process connection, guide tube material and float from stainless steel 1.4571 (316Ti)



	Mounting thread			Flange		
<b>Electrical connection</b>	Connection housing: ■ Aluminium 80 x 75 x 57 mm ■ Option: Polyester, stainless steel					
<b>Process connection</b>	Mounting thread downwards ■ G 1 1/2 ■ G 2 others on request			Mounting flange ■ DIN DN 50 ... DN 150, PN 6 ... PN 64 ■ ANSI 2 ... 6", class 150 ... 600		
<b>Guide tube diameter</b>	12 mm / 14 mm / 18 mm / 30 mm					
<b>Max. guide tube length L</b>	3,000 mm for guide tube diameter 12 and 14 mm 6,000 mm for guide tube diameter 18 mm <sup>1)</sup> 15,000 mm for guide tube diameter 30 mm					
<b>Float</b>	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))					
<b>Temperature class</b>	T1	T2	T3	T4	T5	T6
Surface temperature (EPL Db)	Max. 230 °C	230 °C	195 °C	130 °C	95 °C	80 °C
Process temperature	Max. 230 °C	230 °C	195 °C	130 °C	95 °C	80 °C
Ambient temperature at connection housing (T <sub>a</sub> )	Max. 80 °C	80 °C	80 °C	80 °C	65 °C	50 °C
<b>Switching function</b>	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 <sub>1</sub> , L <sub>2</sub> , L <sub>3</sub> ... (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))					
<b>Switching power</b>	Only for connection to a certified intrinsically safe circuit with U <sub>max</sub> 30 V, I <sub>max</sub> 100 mA					
<b>Mounting position</b>	Vertical ±30°					
<b>Ingress protection</b>	Up to IP66/IP68 per IEC/EN 60529					
<b>Options</b>	■ Housing heightening X (state dimension X) ■ Temperature resistance Pt100 or Pt1000 ■ Bimetal thermal contact 40 ... 120 °C (in 5 degree steps)					
<b>Materials</b>	■ Stainless steel 1.4435 ■ Titanium ■ Hastelloy Others on request					

1) 6,000 mm without stilling tube longer version on request

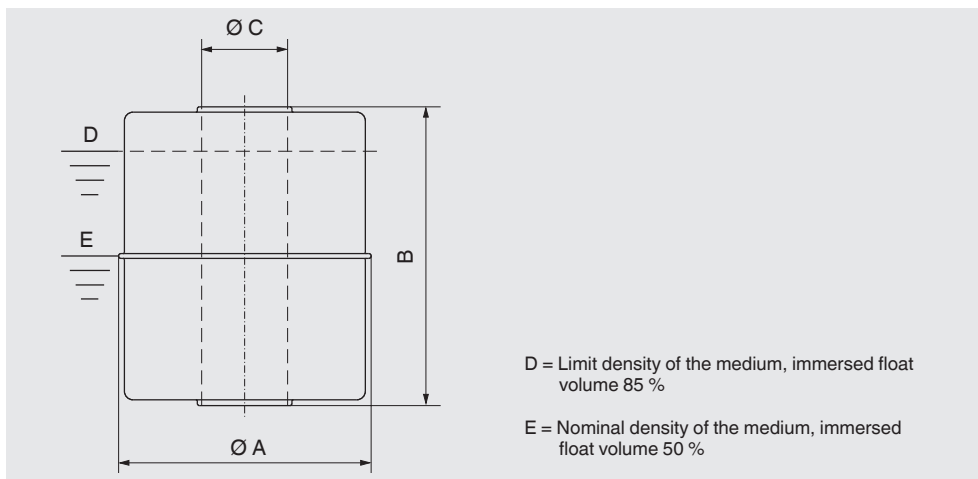
## Spherical float



Material	Suits guide tube Ø in mm	Ø A in mm	B in mm	Ø C in mm	Max. operating pressure in bar	Max. operating temperature in °C	Limit density 85 % in kg/m <sup>3</sup>
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	53	53	14	25	Depending on medium	745
	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

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

## Cylindrical float



Material	Suits guide tube $\varnothing$ in mm	$\varnothing A$ in mm	B in mm	$\varnothing C$ in mm	Max. operating pressure in bar	Max. operating temperature in $^{\circ}C$	Limit density 85 % in $kg/m^3$
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

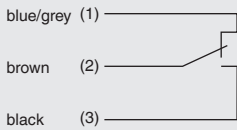
Note: The optimum float will be selected after a feasibility test carried out by WIKA.



# Electrical connections

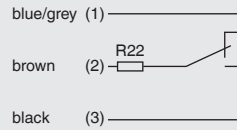
## Reed contact

1 switch point



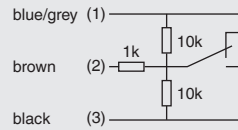
1 switch point

Wiring for operation with a PLC



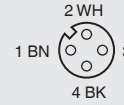
1 switch point

NAMUR circuit per DIN EN 60947-5-6

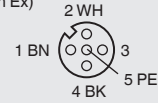


## Connector, pin assignment

4-pin



5-pin (only with Ex)



Nuclear qualified plug (HAN® 7D, SAIB, SORIAU, KKS) on request.

## Connection cable

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

Other nuclear specific cables on request

## 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

## 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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