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JUMO Instrument Co. Ltd.
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JUMO Process Control, Inc.
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JUMO NESOS R04 LS

Float switch in bend version

Applications

- Point level measurement of liquids in storage tanks, containers, oil sumps, and tanks
- Water and wastewater treatment
- Mechanical and plant engineering
- Shipbuilding
- Energy technology
- Diesel tanks

Brief description

The point level measurement is carried out according to Archimedes' principle for liquids. The float moves along the guide tube as the level rises or falls. The magnet in the float actuates the reed contact(s) installed in the guide tube with its magnetic field. The switching status of the reed contact can be evaluated and processed through downstream electronic components, relays, or contactors. Alarms, pumps, signal lamps, valves, and horns are typically switched via a contact protection relay.

Float switches of up to 2 m in length and with up to 5 switching points are available for applications involving high filling heights. The product is installed on the side of the tank or container wall and, in the case of versions with a thread, it is fixed with a lock nut.

Depending on the variant ordered, various electrical connections, process connections, guide tube lengths, floats, number and positions of contacts as well as their function (SPST-NO [N/O contact], SPST-NC [N/C contact], SPDT-CO [changeover contact], and bistable contacts) are available.

With the optional temperature sensor or temperature switch, both the point level measurement and the temperature can be acquired via just one measuring point. Variants for monitoring the reed contact temperature are also available.

Variants in an intrinsically safe [Ex i] design and flameproof enclosure [Ex d] are available for applications involving explosion protection. No isolating switch amplifier is required for installations with a flameproof enclosure.

Customer benefits

- Cost-effective installation and mounting, due to spring-cage terminals (Push-In®), for example
- Reduced operating costs due to maintenance-free device design
- Price-performance ratio optimized through the use of standard components
- No isolating switch amplifier required for [Ex d] (flameproof enclosure) applications



Type 408304 with thread (top),
with flange (bottom)

Special features

- Approvals and certificates available for explosion protection and German Water Resources Act (WHG)
- High switching voltages and switching currents
- Large operating temperature range for media from -52 to +240 °C
- Large pressure range of -1 to +37 bar
- Up to 5 switching outputs can be freely defined as N/O contact, N/C contact, changeover contact, or bistable contact
- Temperature sensor/temperature switch are available

Approvals and approval marks



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Technical data

General Information

Function principle	Magnetic float switch with reed contact					
Installation position (vertical)	±30°					
Switching point accuracy ^a	±2 mm					
Switching function (potential-free)	02 SPST-NC		03 SPDT-CO		10 SPST-NO	
Switching voltage (max.) ^b	AC 175 V	DC 175 V	AC 175 V	DC 175 V	AC 230 V	DC 230 V
Switching capacity (max.) ^b	10 VA	10 W	10 VA	10 W	100 VA	100 W
Switching current (max.) ^b	0.5 A	0.5 A	0.5 A	0.5 A	1 A	1 A

Switching function (potential-free)	11 SPST-NC		12 SPDT-CO		15 SPST-NO, bistable	
Switching voltage (max.) ^b	AC 230 V	DC 230 V	AC 230 V	DC 230 V	AC 230 V	DC 230 V
Switching capacity (max.) ^b	100 VA	100 W	60 VA	60 W	100 VA	100 W
Switching current (max.) ^b	1 A	1 A	1 A	1 A	1 A	1 A

Switching function (potential-free)	16 SPST-NC, bistable	
Switching voltage (max.) ^b	AC 230 V	DC 230 V
Switching capacity (max.) ^b	100 VA	100 W
Switching current (max.) ^b	1 A	1 A

^a Measured, dry

^b The values must also be adhered to in combination.

	Pt100	Pt1000	Temperature switch ^a , N/C contact, max. 2.5 A, AC 230 V, cos φ 0.95 [0.6], 2.5 A [1.6 A]
Measuring range	-40 to +150 °C	-40 to +150 °C	Indicate switching point specification in plain text
Accuracy	DIN class B according to DIN EN 60751 the limit deviation in °C is as follows: ±(0.3 + 0.005 t) t = temperature in °C regardless of prefix sign		Tolerance ±5 K Hysteresis 30 K ±15 K

^a Only available with guide tube diameter 12 mm.

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Mechanical features

Float	Form	Material	Outer diameter	Min. density kg/m ³	Pressure range (nominal pressure) in bar	Weight in g
027	Cylinder	AISI 316 series	27	800	-1 to +16	8
028	Cylinder, e-polished	AISI 316 series	27	800	-1 to +16	8
029	Spherical	AISI 316 series	29	900	-1 to +35	8
030	Spherical, e-polished	AISI 316 series	29	900	-1 to +35	8
044	Cylinder	AISI 316 series	44	650	-1 to +24	43
045	Cylinder, e-polished	AISI 316 series	44	650	-1 to +24	43
052	Spherical	AISI 316 series	52	680	-1 to +37	36
053	Spherical, e-polished	AISI 316 series	52	680	-1 to +37	36
729	Spherical	Titanium grade 2	29	700	-1 to +15	7
752	Spherical	Titanium grade 2	52	650	-1 to +24	35

Float	Density of medium kg/m ³					
	700	800	900	1000	1200	1400
	Immersion depth mm					
027		23.6	21	18.9	15.8	13.5
028		23.6	21	18.9	15.8	13.5
029			20.3	18.5	16.2	14.6
030			20.3	18.5	16.2	14.6
044		44.5	39.5	35.6	29.6	25.4
045		44.5	39.5	35.6	29.6	25.4
052	38.6	34.1	31.1	28.8	25.5	23.1
053	38.6	34.1	31.1	28.8	25.5	23.1
729	21.9	19.3	17.5	16.3	14.4	13.1
752	39.1	34.4	31.3	29	25.6	23.3

Materials of parts in contact with medium e.g. process connection, float 027, 028, 029, 030, 044, 045, 052, 053, guide tube Float 729, 752	The chemical resistance of the materials should be taken into account for the application. AISI 316 series Titanium Grade 2
Materials of parts not in contact with medium Cable Terminal head Ex d Connection housing, cube-shaped, small Connection housing, cube-shaped, large	The chemical resistance of the materials should be taken into account for the application. PVC or silicone or PUR Aluminum, painted Aluminum, painted Aluminum, painted
Clamping range Cable fitting Terminal block	Diameter 6 to 12 mm for connection housing, cube-shaped, small, and connection housing, cube-shaped, large Diameter 6.5 to 11.9 mm for terminal head Ex d 0.14 to 2.5 mm ² for connection housing, cube-shaped, small 0.14 to 1.5 mm ² for terminal head Ex d, and connection housing, cube-shaped, large
Weight	85 g for a guide tube length of 40+90 mm, process connection G 1/4, and cable, silicone, measuring 500 mm

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Environmental influences

Moisture	
Operation	100 % rel. humidity including condensation on the product outer shell
Storage	90 % rel. humidity without condensation
Protection type for electrical connection	According to DIN EN 60529
Cable	IP68
Cable with M12 connector	IP66
Terminal head Ex d	IP68
Connection housing, cube-shaped, small	IP66
Connection housing, cube-shaped, large	IP66
Vibration	0.7 g at 13.2 to 100 Hz with guide tube diameter 12 mm, 0.7 g at 13.2 to 100 Hz with guide tube diameter 8 mm and freely oscillating guide tube length up to max. 150 mm, according to IEC 60068-2-6
Ambient temperature for electrical connection	Observe dependency of extension tube length with process temperature, see following diagrams.
PVC cable	-5 to +80 °C
Silicone cable	-50 to +180 °C
PUR cable	-40 to +90 °C
Silicone cable, with M12 connector	-40 to +85 °C
Terminal head Ex d	-40 to +100 °C
Connection housing, cube-shaped, small	-40 to +100 °C
Connection housing, cube-shaped, large	-40 to +100 °C
Process temperature of parts in contact with medium (e.g. guide tube with float)	-40 to +150 °C (standard) -52 to +240 °C (upon request)

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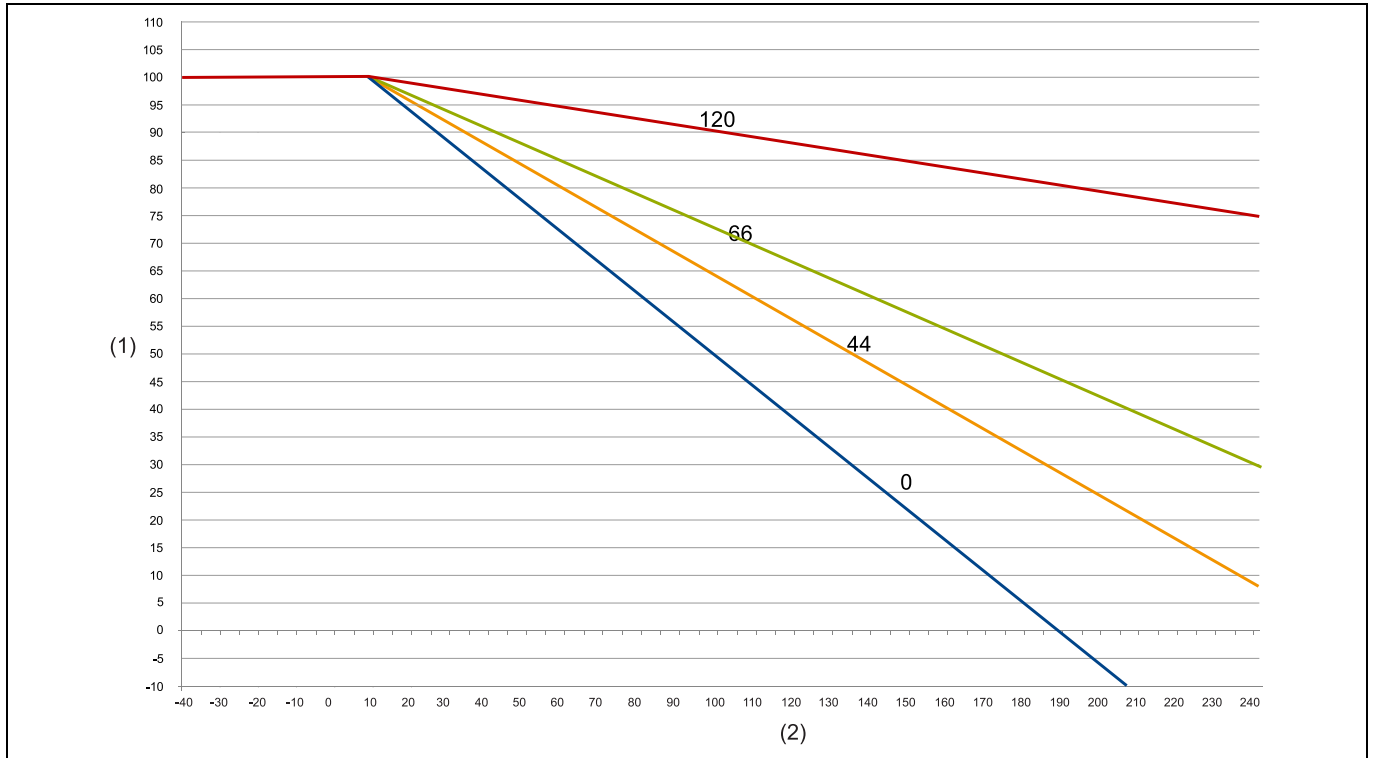
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Maximum ambient temperature depending on the extension tube length and process temperature

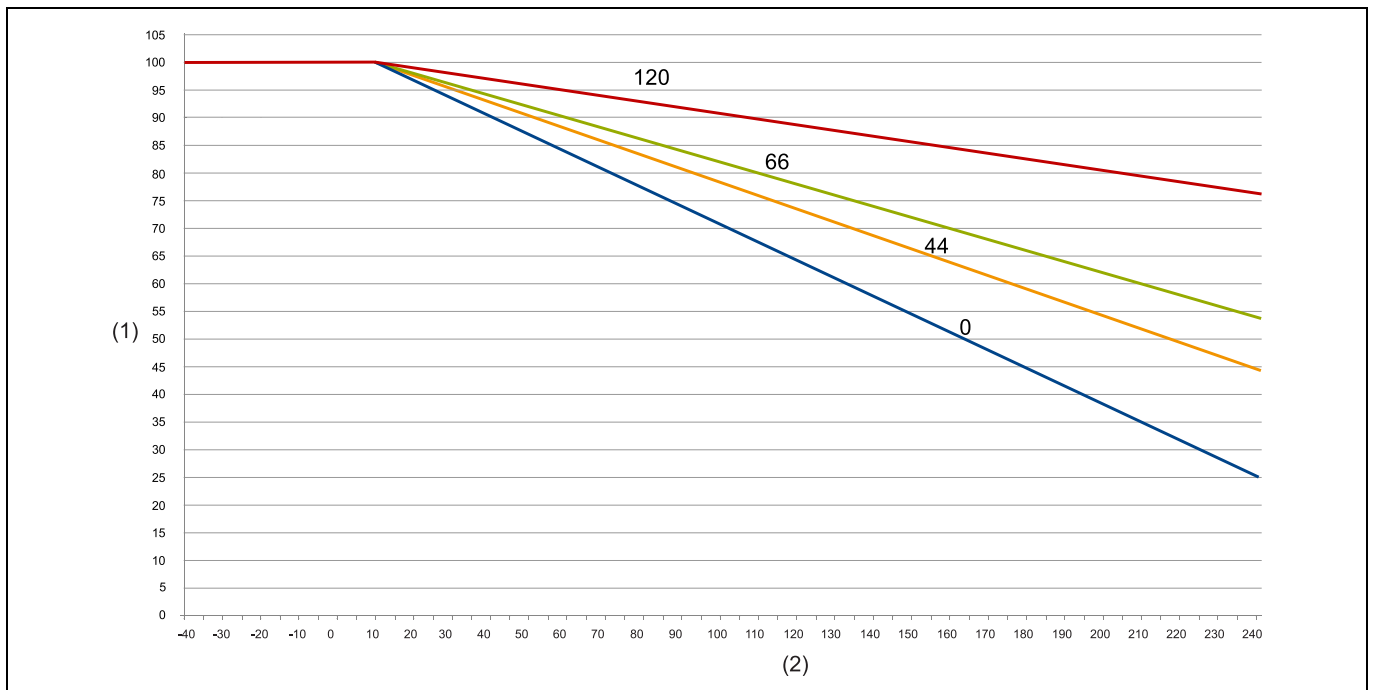
Small and large connection housing, extension tube lengths in mm



(1) Maximum ambient temperature

(2) Media temperature

Connection housing Ex d, extension tube lengths in mm



(1) Maximum ambient temperature

(2) Media temperature

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ATEX, IEC Ex, intrinsically safe, Ex i Testing agency Certificate/certification numbers Inspection basis Valid for	Eurofins Electrosuisse Product Testing AG SEV 18 ATEX 0134 X, IECEX SEV 18.0011X IEC/EN 60079-0, IEC/EN 60079-11, IEC/EN 60079-26, DIN EN ISO 80079-36, DIN EN ISO 80079-37 Type 408304/263, Type 408304/362, Type 408304/662
ATEX, IEC Ex, flameproof enclosure, Ex d Testing agency Certificate/certification numbers Inspection basis Valid for	Eurofins Electrosuisse Product Testing SEV 18 ATEX 0133 X, IECEX SEV 18.0010X IEC/EN 60079-0, IEC/EN 60079-1, IEC/EN 60079-26, IEC/EN 60079-31, DIN EN ISO 80079-36, DIN EN ISO 80079-37 Type 408304/264, Type 408304/462
German Water Resources Act (WHG) Prüfstelle Zertifikat/Prüf-Nr. Prüfgrundlage gilt für	DIBT Z-65.11-608 Approval principles for safety devices for tanks and pipelines, overfill protection (ZG-ÜS) Type 408304/262, Type 408304/263, Type 408304/264
EAC ^a Testing agency Certificate/certification numbers Inspection basis Valid for	СИСТЕМА КАЧЕСТВА Д-DE.HP15.B.06254/20 Standard TR TS 020/2011 Type 408304/...
EAC-Ex ^a Testing agency Certificate/certification numbers Inspection basis Valid for	ПрофиТест ЕАЭС RU C-DE.HB07.B.00316/20 TR TS 012/2011 Type 408304/263, Type 408302/264, Type 408304/362, Type 408304/462 – each with extra code 240

^a Russian documentation upon request

NOTE!

The special conditions for use can be found in the type examination certificate, which is available for download on the Internet on the respective product page.

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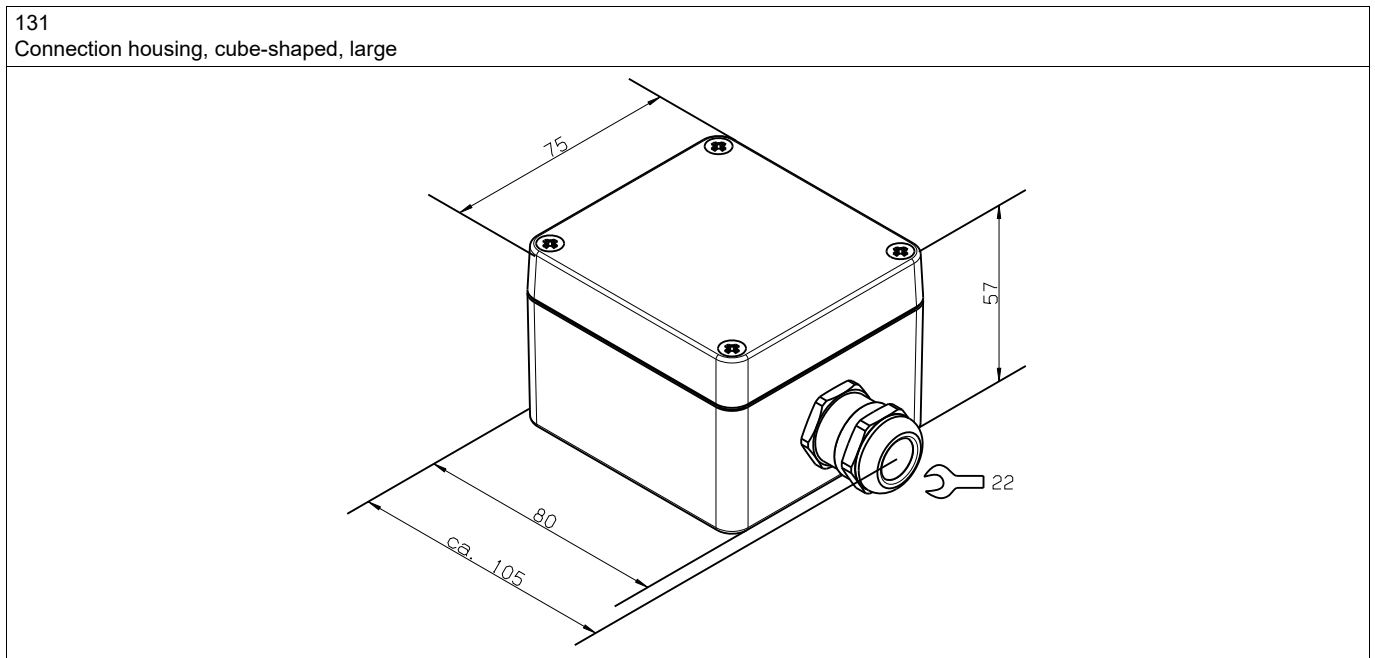
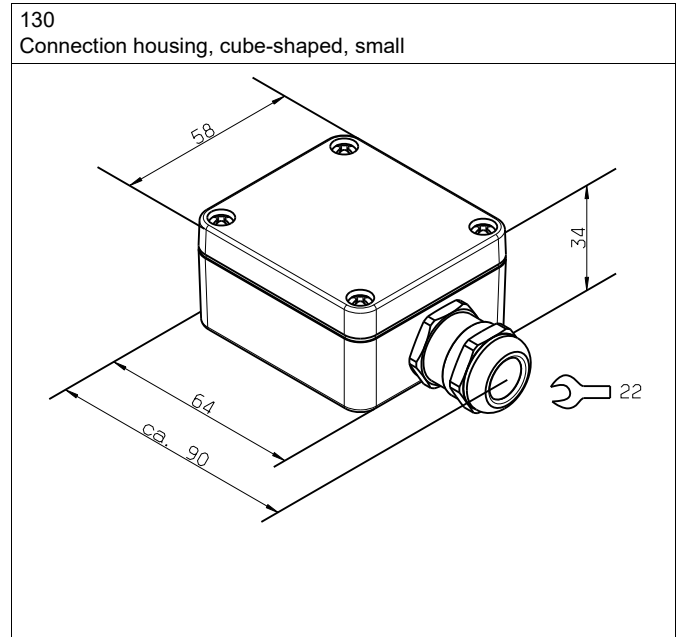
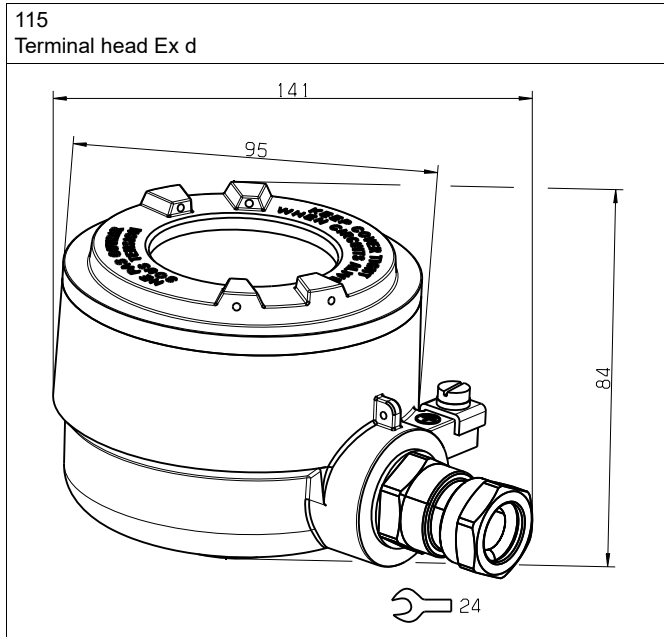
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Dimensions

Electrical connection



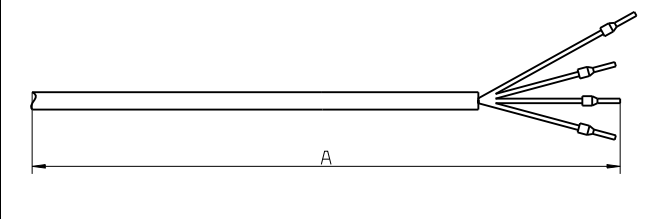
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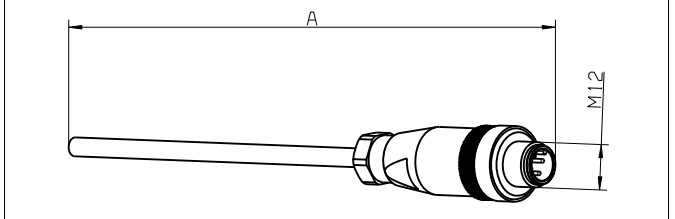


150 PVC, 160 silicone, 170 PUR
 Cable with ferrules



A Cable length, see order details

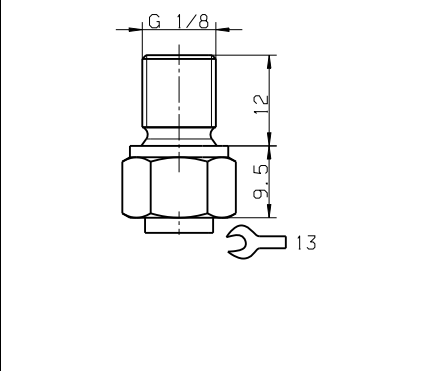
162 silicone
 Cable with M12 connector



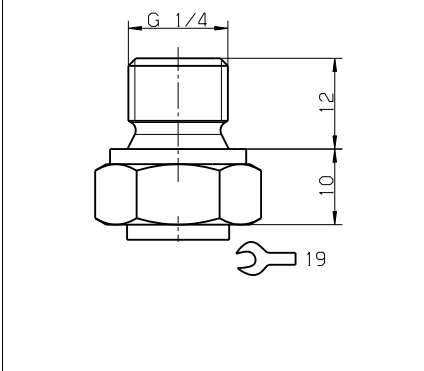
A Cable length, see order details

Process connections

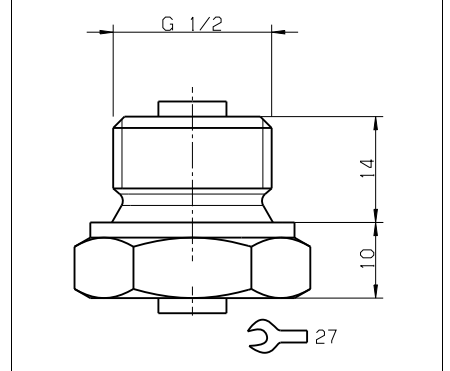
101
 G 1/8 thread upward



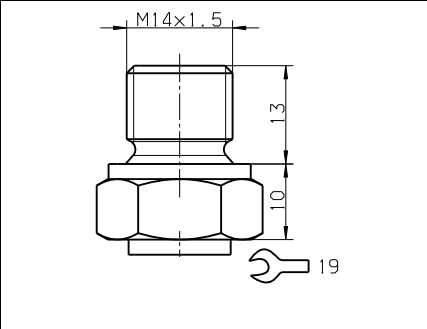
102
 G 1/4 thread upward



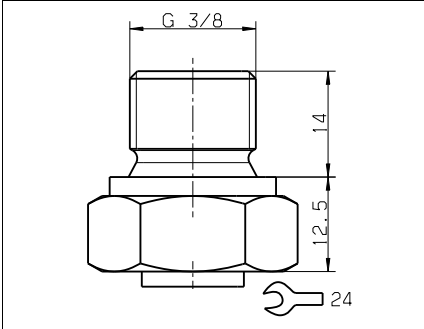
104
 G 1/2 thread upward



534
 M14 x 1.5 thread upward



538
 G 3/8 thread upward



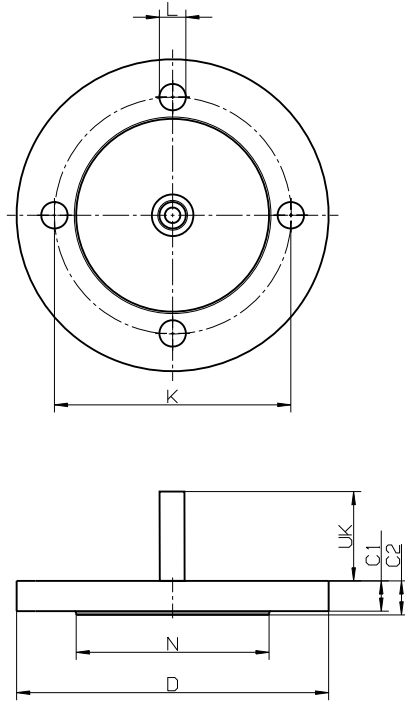
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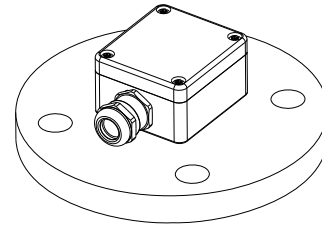
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Flange according to following table



Alignment cable gland between flange holes



Example of extension tube; also available for other process connections;

UK = extension tube length + 9 mm

Order code	Flange designation	Hole circle K	Number of holes	Diameter of holes L	Exterior diameter D	Diameter of sealing strip N	Strength of flange C1	Strength of flange including sealing strip C2
703	Flange 2.5" 150 lbs ANSI B 16.5 RF	139.7	4	19.1	177.8	104.6	26.8	28.4
713	Flange 2" 150 lbs ANSI B 16.5 RF	120.7	4	19.1	152.4	91.9	23.8	25.4
714	Flange 2" 300 lbs ANSI B 16.5 RF	127	8	19	165.1	92.1	20.6	22.2
729	Flange DN 50, PN40, EN 1092-1, form B1	125	4	18	165	102	17	20
784	Flange DN 65, PN40, EN 1092-1, form B1	145	8	18	185	122	19	22
785	Flange DN 80, PN40, EN 1092-1, form B1	160	8	18	200	138	21	24
786	Flange DN 100, PN40, EN 1092-1, form B1	190	8	22	235	162	21	24

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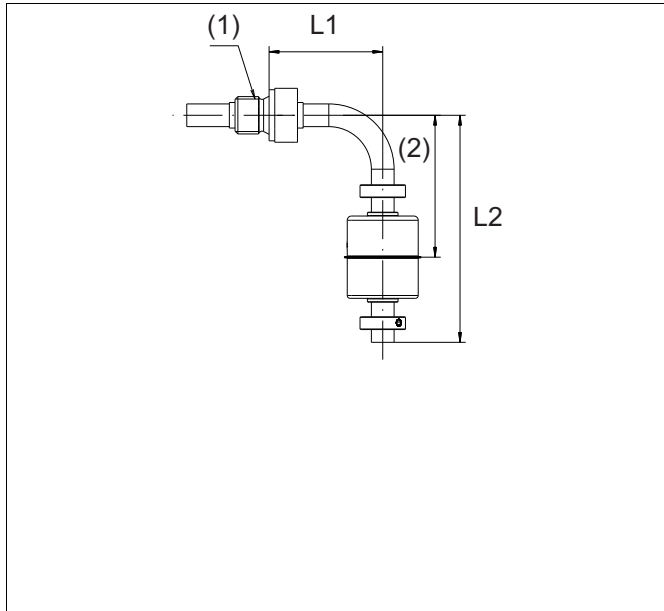
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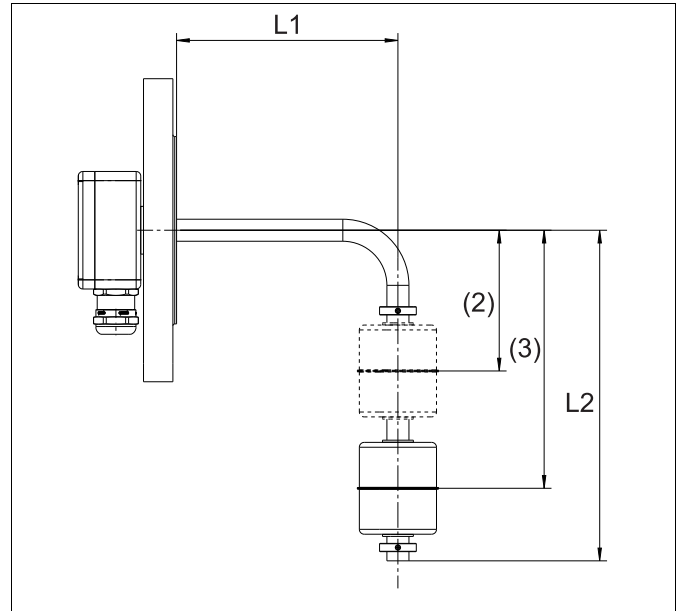


Important information about the order details

Below are examples for the dimensioning of the horizontal guide tube length L1, the vertical guide tube length L2, and the switching point (2) depending on the respective process connection.



- (1) Process connection "thread upward"
- (2) Position of contact 1 (switching point) in mm
- L1/L2 Guide tube length in mm



- (1) Process connection "flange"
- (2) Position of contact 1 (switching point) in mm
- (3) Position of contact 2 (switching point) in mm
- L1/L2 Guide tube length in mm

	Guide tube diameter 8 mm		Guide tube diameter 12 mm	
	Thread upward	Flange	Thread upward	Flange
Min. L1	70 mm	60 mm	90 mm	80 mm
Min. L2	80 mm	80 mm	125 mm	125 mm

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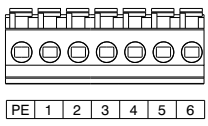
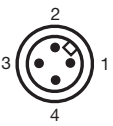



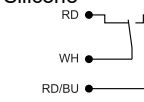
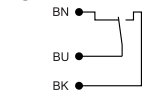
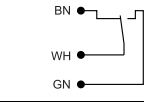
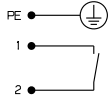
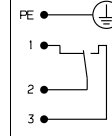
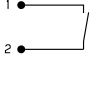
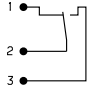

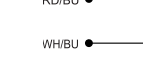

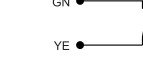
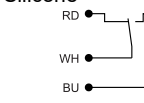
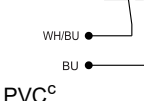
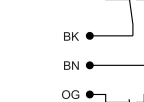

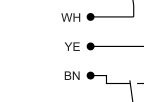
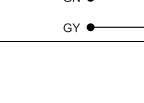
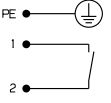
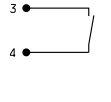
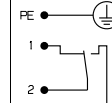
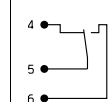

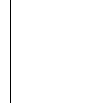
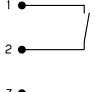
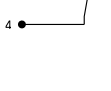


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Connection diagram

The connection diagram in the data sheet provides preliminary information about the connection options. For the electrical connection, only use the installation instructions or the operating manual. The knowledge and the correct technical compliance with the safety information and warnings contained in these documents are mandatory for mounting, electrical connection, and startup as well as for safety during operation.

In the event of product configurations with a guide tube diameter of 8 mm and more than one switching contact, mixing hazardous contact supply circuits and SELV circuits is not permitted.

Number of contacts						
	Cable SPST-NO/NC	SPDT-CO	Connection housing SPST-NO/NC	SPDT-CO	Round plug M12 ^a SPST-NO/NC	SPDT-CO
1	<p>Silicone</p>  <p>PUR</p>  <p>PVC</p> 	<p>Silicone</p>  <p>PUR</p>  <p>PVC</p> 				
2	<p>Silicone</p>   <p>PVC</p>  	<p>Silicone^b</p>   <p>PVC^c</p>   <p>PUR^d</p>  	 	   	   	-

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Number of contacts						
	Cable		Connection housing		Round plug M12^a	
	SPST-NO/NC	SPDT-CO	SPST-NO/NC	SPDT-CO	SPST-NO/NC	SPDT-CO
3	Silicone^b RD WH RD/BU WH/BU BU BU PVC^c RD BK BN OG GN YE	-				-
4	-	-			-	-

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Number of contacts						
	Cable		Connection housing		Round plug M12 ^a	
	SPST-NO/NC	SPDT-CO	SPST-NO/NC	SPDT-CO	SPST-NO/NC	SPDT-CO
5						
Protection rating according to DIN EN 61140	prepared for 2 according to EN 61010-1		1	1	2	2

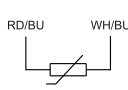
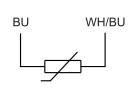


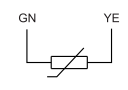
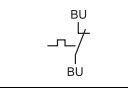


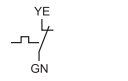
^a In the event of product configurations with more than one switching contact, mixing hazardous contact supply circuits and SELV circuits is not permitted.
^b According to VDE 0298-4 max. current 0.8 A at max. 175 °C or 1 A at max. 170 °C
^c According to VDE 0298-4 max. current 0.8 A at max. 75 °C or 1 A at max. 70 °C
^d Only available with protection class 3.

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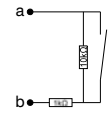
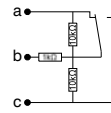
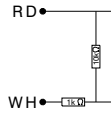
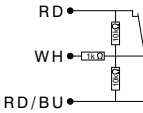


	Cable	Connection housing	Round plug M12
Temperature sensor Pt100 ^{a, b}	Silicone ^c  Silicone 		
Temperature sensor Pt1000 ^{a, b}	PVC ^c 		
Temperature switch ^a	Silicone ^{d, e} 		
	PVC ^{d, f} 		

- ^a Assignment is always to terminals with the highest numbers.
- ^b Connect all measuring circuits of a product with a guide tube diameter of 8 mm to SELV electrical circuits.
- ^c For 1x SPST-NO/NC switching contacts
- ^d For 2x SPST-NO/NC or 1x SPDT-CO switching contacts
- ^e According to VDE 0298-4 max. current 0.8 A at max. 175 °C or 2 A to max. 150 °C
- ^f According to VDE 0298-4 max. current 0.8 A at max. 75 °C or 2 A to max. 50 °C

NAMUR circuit, switching signal according to DIN EN 60947-5-6

Versions with NAMUR circuitry may only be operated with switching voltages DC ≤ 15 V. A NAMUR circuit is assigned to each switching contact. Depending on the selected electrical connection, the wiring diagram is identical to the above. The NAMUR circuit can be used to detect line faults (line break, short-circuit) in a suitable evaluation unit (e.g. see Ex-i isolating amplifier accessories).

	SPST-NO/NC	SPDT-CO
Scheme		
Example: 1 switching contact with silicone cable		

Legend: cable	BN	Brown	GN	Green
	WH	White	RD	Red
BU	Blue	YE	Yellow	
PK	Pink	GY	Gray	

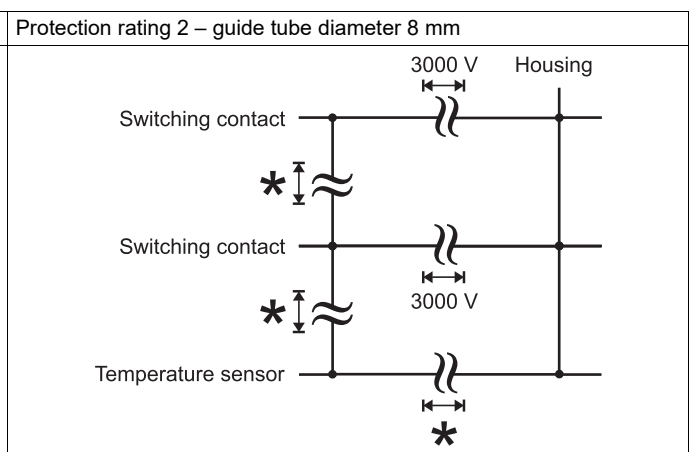
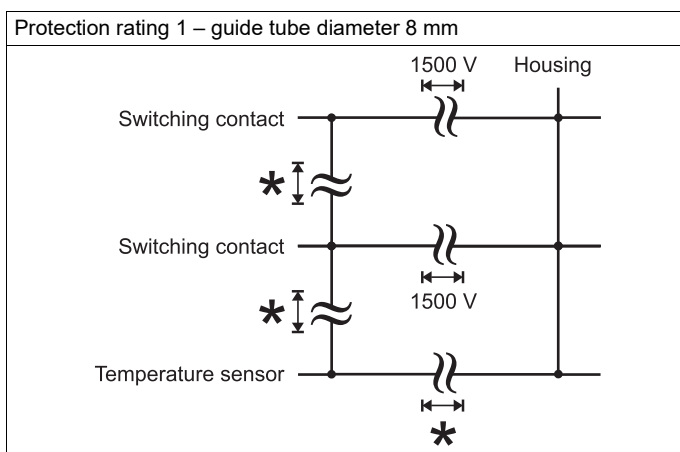
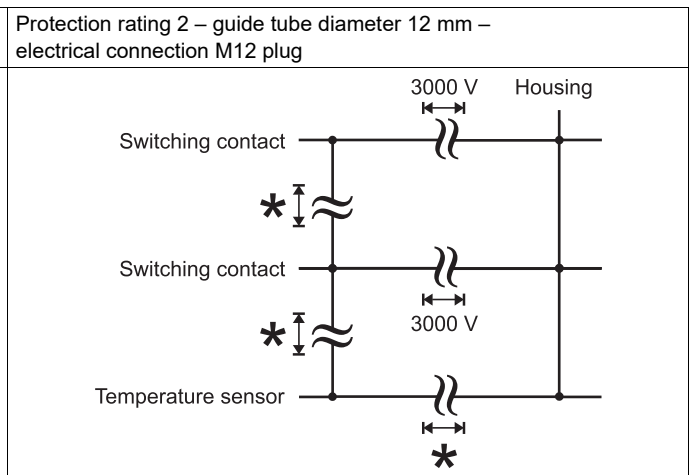
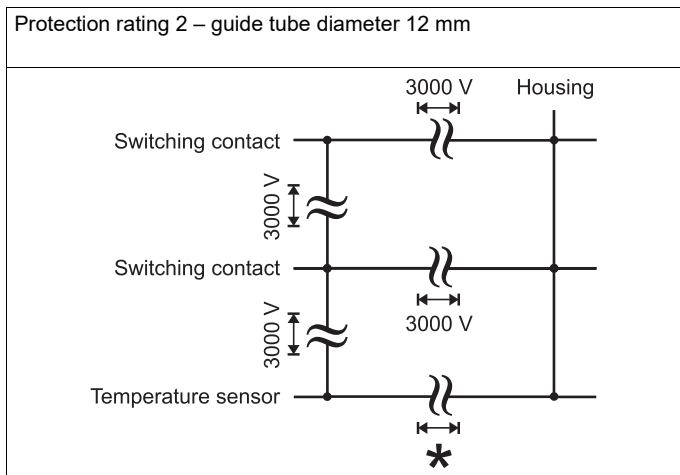
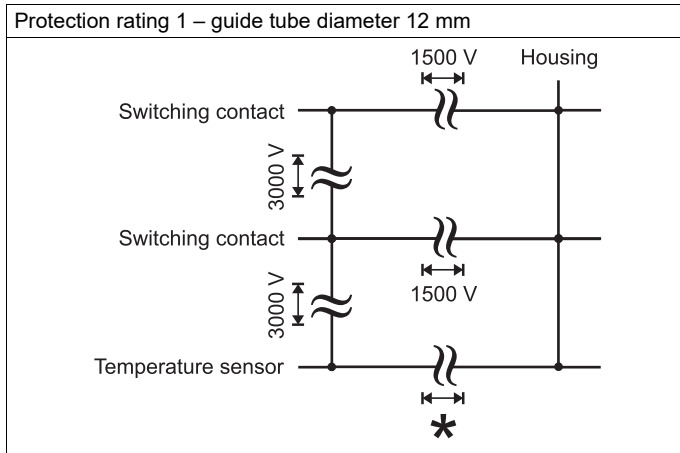
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The galvanic isolation is realized as follows:



Caution:

* Functional galvanic isolation

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If connected to a certified intrinsically safe electrical circuit Ex i, the following values are given.

Contact function	Max. voltage U_i in V	Max. current I_i in mA	Max. power P_i in mW	Internal inductance in μ H	Internal capacitance in pF
SPST-NO	≤ 30	≤ 100	≤ 750	~0 for cable version 1 μ H/m connecting cable	~0 for cable version 200 pF/m connecting cable
SPST-NC					
SPDT-CO					

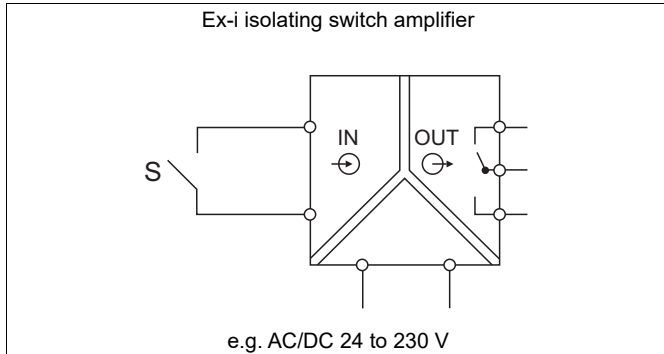
When using explosion-proof versions (intrinsically safe, Ex i, and flameproof enclosure, Ex d), the following values are given.

Contact function	Max. voltage U_i in V	Max. current I_i in mA	Max. power P_i in mW	Internal inductance in μ H	Internal capacitance in pF
Pt100	≤ 30	≤ 55	≤ 413	~0 for cable version 1 μ H/m connecting cable	~0 for cable version 200 pF/m connecting cable
Pt1000					
NAMUR circuit	≤ 15	≤ 60	≤ 225		

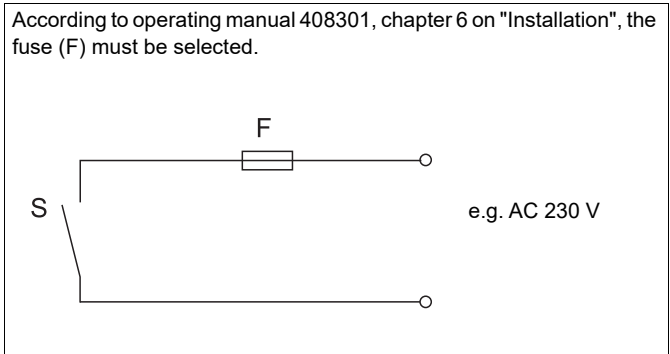
Connection examples of versions with explosion protection

Float switch (S)

Ex i



Ex d



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Order details

	(1) Basic type
408304	JUMO NESOS R04 LS – Float switch in bend version
	(2) Basic type extension
000	None
262	WHG approval (German Water Resources Act)
263	WHG approval (German Water Resources Act), explosion protection, intrinsically safe, Ex i
264	WHG approval (German Water Resources Act), explosion protection, flameproof enclosure, Ex d
362	Explosion protection, intrinsically safe, Ex i
462	Explosion protection, flameproof enclosure, Ex d
999	Special version
	(3) Electrical connection
115	Terminal head Ex d
130	Connection housing, cube-shaped, small
131	Connection housing, cube-shaped, large
150	PVC cable
160	Silicone cable
162	Silicone cable, with M12 connector
170	PUR cable
	(4) Cable length
0000	None
2000	2000 mm
5000	5000 mm
0100 - 5000	Specifications in plain text (increments of 100 mm)
	(5) Process connection
101	G 1/8 thread upward
102	G 1/4 thread upward
104	G 1/2 thread upward
534	M14 x 1.5 thread upward
538	G 3/8 thread upward
703	Flange 2,5" 150lbs ANSI B 16.5 RF
713	Flange 2" 150lbs ANSI B 16.5 RF
714	Flange 2" 300 lbs ANSI B 16.5 RF
729	Flange DN 50, PN40, DIN EN 1092-1, form B1
784	Flange DN 65, PN40, DIN EN 1092-1, form B1
785	Flange DN 80, PN40, DIN EN 1092-1, form B1
786	Flange DN 100, PN40, DIN EN 1092-1, form B1
	(6) Guide tube diameter
8	8 mm
12	12 mm
	(7) Guide tube length L1, horizontal^a
40 - 200	Specifications in plain text (increments of 50 mm)
	(8) Guide tube length L2, vertical^a
50 - 2000	Specifications in plain text (increments of 50 mm)
	(9) Float
027	Cylinder, stainless steel, diameter 27, density 800 kg/m ³
028	Cylinder, stainless steel, diameter 27, density 800 kg/m ³ , e-polished
029	Spherical, stainless steel, diameter 29, density 900 kg/m ³
030	Spherical, stainless steel, diameter 29, density 900 kg/m ³ , e-polished
044	Cylinder, stainless steel, diameter 44, density 750 kg/m ³

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045	Cylinder, stainless steel, diameter 44, density 750 kg/m ³ , e-polished
052	Spherical, stainless steel, diameter 52, density 680 kg/m ³
053	Spherical, stainless steel, diameter 52, density 680 kg/m ³ , e-polished
729	Spherical, titanium, diameter 29, density 700 kg/m ³
752	Spherical, titanium, diameter 52, density 650 kg/m ³
(10)	Number of floats
1	1 piece
2	2 pieces
3	3 pieces
4	4 pieces
(11)	Switching function
02	SPST-NC, NC contact (10 VA/AC 175 V/0.5 A)
03	SPDT-CO, single-pole changeover contact (10 VA/AC 175 V/0.5 A)
10	SPST-NO, NO contact (100 VA/AC 230 V/1 A)
11	SPST-NC, NC contact (100 VA/AC 230 V/1 A)
12	SPDT, single-pole changeover contact (60 VA/AC 230 V/1 A)
15	SPST-NO, NO contact bistable (100 VA/AC 230 V/1 A)
16	SPST-NC, NC contact bistable (100 VA/AC 230 V/1 A)
99	According to customer specification
(12)	Number of contacts
1	1 contact
2	2 contacts
3	3 contacts
4	4 contacts
(13)	Position of contact 1^b
54 - 1970	Specifications in plain text (for guide tube diameter 8 mm at least position contact 1 54 mm, for guide tube diameter 12 mm at least position contact 1 88 mm)
(14)	Position of contact 2^b
0	None
64 - 1970	Specifications in plain text (for guide tube diameter 8 mm at least position contact 2 64 mm, for guide tube diameter 12 mm at least position contact 2 98 mm)
(15)	Position of contact 3^b
0	None
104 - 1970	Specifications in plain text (for guide tube diameter 8 mm at least position contact 3 104 mm, for guide tube diameter 12 mm at least position contact 3 188 mm)
(16)	Position of contact 4^b
0	None
114 - 1970	Specifications in plain text (for guide tube diameter 8 mm at least position contact 4 114 mm, for guide tube diameter 12 mm at least position contact 4 198 mm)
(17)	Extra codes
000	None
005	Integrated temperature sensor Pt1000 ^c
007	Integrated temperature sensor Pt100 ^c
009	Temperature switch, NC contact ^d
019	Temperature monitoring of reed contact, Pt1000
240	EAC-Ex approval
663	NAMUR circuit ^a
954	Technical passport

^a The dimensioning is in mm in relation to the contact/locating surface (threaded bushing of the container/tank wall) of the selected process connection.

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- b The contact positions are viewed from the process connection toward the guide tube end.
 - c The temperature sensor is positioned at the end of the guide tube.
 - d Specify switching temperature in plain text. The temperature switch is positioned at the end of the guide tube. Only available with guide tube diameter 12 mm.
- ⇒ For details on the dimensioning of the guide tube length L depending on the respective process connection, see Operating manual B 408301, chapter 3.2.

Order code	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)									
Order example	408304	/	000	-	160	-	2000	-	102	-	8	-	40	-	80	-	027	-
	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)										
	1	-	10	-	1	-	50	-	0	-	0	-	0	/	000			

Accessories

Designation	Description	Part no.
EX-i repeater power supply and input isolating amplifier 	The intrinsically safe isolation switching amplifier ensures reliable, galvanic isolation and safe transmission of switching signals in Ex applications. It can be mounted in Ex zone 2. When using the NAMUR circuitry, line break and short circuit can be detected. Further technical data and the relevant safety regulations can be found in the operating instructions B 707540.0	00734357