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JUMO Instrument Co. Ltd.
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JUMO Process Control, Inc.
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JUMO NESOS R02 LS

Standard version float switch

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 4 m in length and with up to 5 switching points are available for applications involving high filling heights. Variants with a connecting plug help to minimize mounting effort.

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, as are approvals for shipbuilding. 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 408302

Special features

- Approvals and certificates available for explosion protection, shipbuilding, railroad applications 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 from -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)	03 SPDT-CO		07 SPDT-CO, bistabile		10 SPST-NO	
Switching voltage (max.) ^b	AC 175 V	DC 175 V	AC 230 V	DC 200 V	AC 230 V	DC 230 V
Switching capacity (max.) ^b	10 VA	10 W	40 VA	40 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	11 SPST-NC		12 SPDT-CO		15 SPST-NO, bistabile	
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

^a Measured, dry

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

	Pt100	Pt1000	Temperature switch, 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

Special features for products with protection rating 3 (see "Connection diagram") ^a	Switching voltage (max.)	AC ≤ 33 V (AC 46 V peak value)	DC 70 V
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^a Limit values according to EN 61010-1

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Mechanical features

Float	Form	Material	Outer diameter	Min. density kg/m ³	Pressure range (nominal pressure) in bar	Weight in grams
044	Cylinder	AISI 316 series	44	750	-1 to +24	43
045	Cylinder, e-polished	AISI 316 series	44	750	-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
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					
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
752	39.1	34.4	31.3	29	25.6	23.3

Materials of parts in contact with medium e.g. process connection, float 044, 045, 052, 053, guide tube Float 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 Cable socket Round plug M12 × 1 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 or RADOX® PBT-GF30 PBT-GF30 Aluminum, painted Aluminum, painted Aluminum, painted
Clamping range Cable fitting Terminal block	Diameter 6 to 12 mm for connection housing, cube-shaped, small (electrical connection 130) and connection housing, cube-shaped, large (electrical connection 131) Diameter 6.5 to 11.9 mm for terminal head Ex d Diameter 6 to 8 mm for cable socket 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	650 g for guide tube length of 400 mm, process connection G 1 1/2 and connection housing, cube-shaped, small

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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 AMP Superseal connector	IP67
Cable with M12 connector	IP66
Round plug M12 × 1	IP66
Cable socket	IP65
Terminal head Ex d	IP68
Connection housing, cube-shaped, small	IP66
Connection housing, cube-shaped, large	IP66
Vibration	0.7 g for 13.2 to 100 Hz and freely oscillating guide tube length up to max. 2.5 m, according to IEC 60068-2-6
Ambient temperature for electrical connection	Note dependency of extension tube length on process temperature, see diagrams below.
PVC cable	-5 to +80 °C
Silicone cable	-50 to +180 °C
PUR cable	-40 to +90 °C
RADOX® cable	-40 bis +120 °C
PVC cable, with AMP Superseal connector	-5 to +80 °C
Silicone cable, with AMP Superseal connector	-40 to +125 °C
PUR cable, with AMP Superseal connector	-40 to +90 °C
PVC cable, with M12 connector	-5 to +80 °C
Silicone cable, with M12 connector	-40 to +85 °C
PUR cable, with M12 connector	-40 to +85 °C
Round plug M12 × 1	-30 to +90 °C
Cable socket	-40 to +125 °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	
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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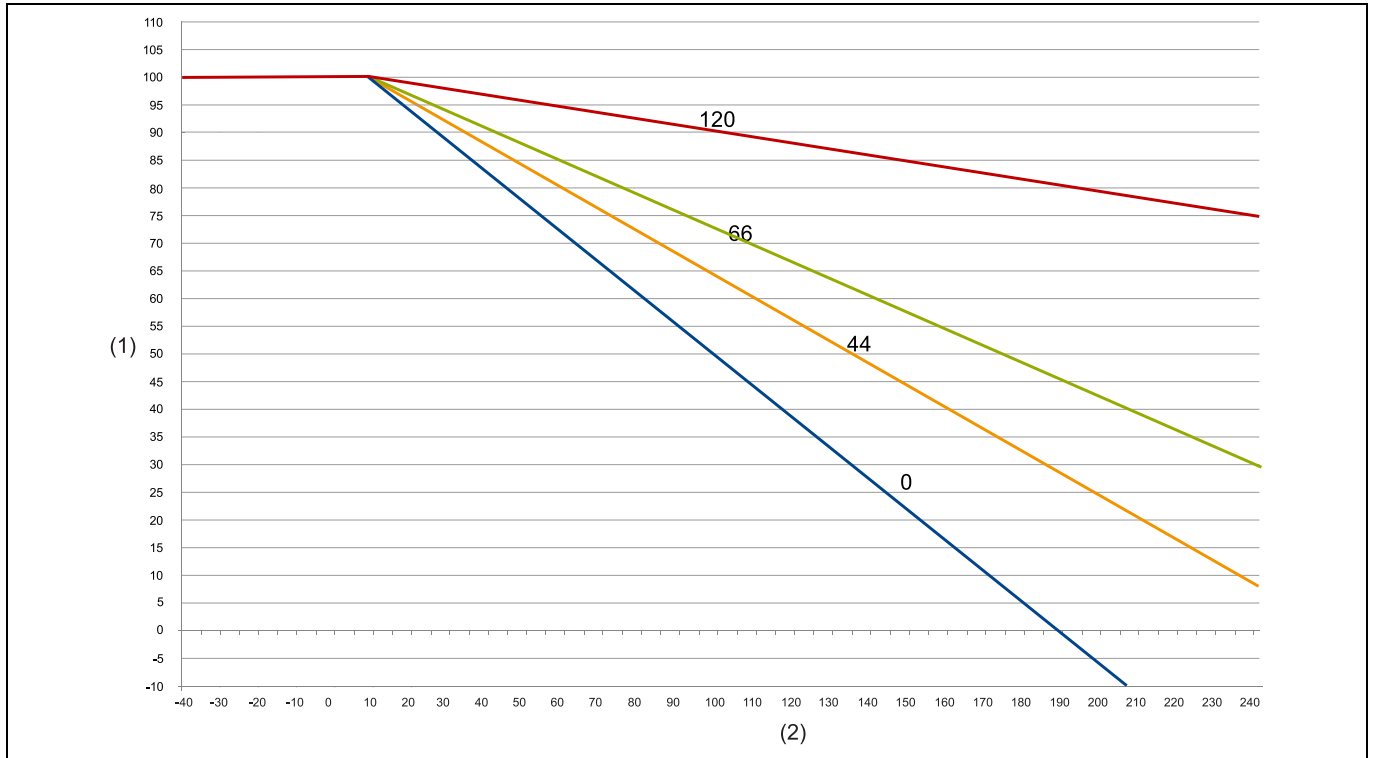
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Maximum ambient temperature depending on extension tube length and process temperature

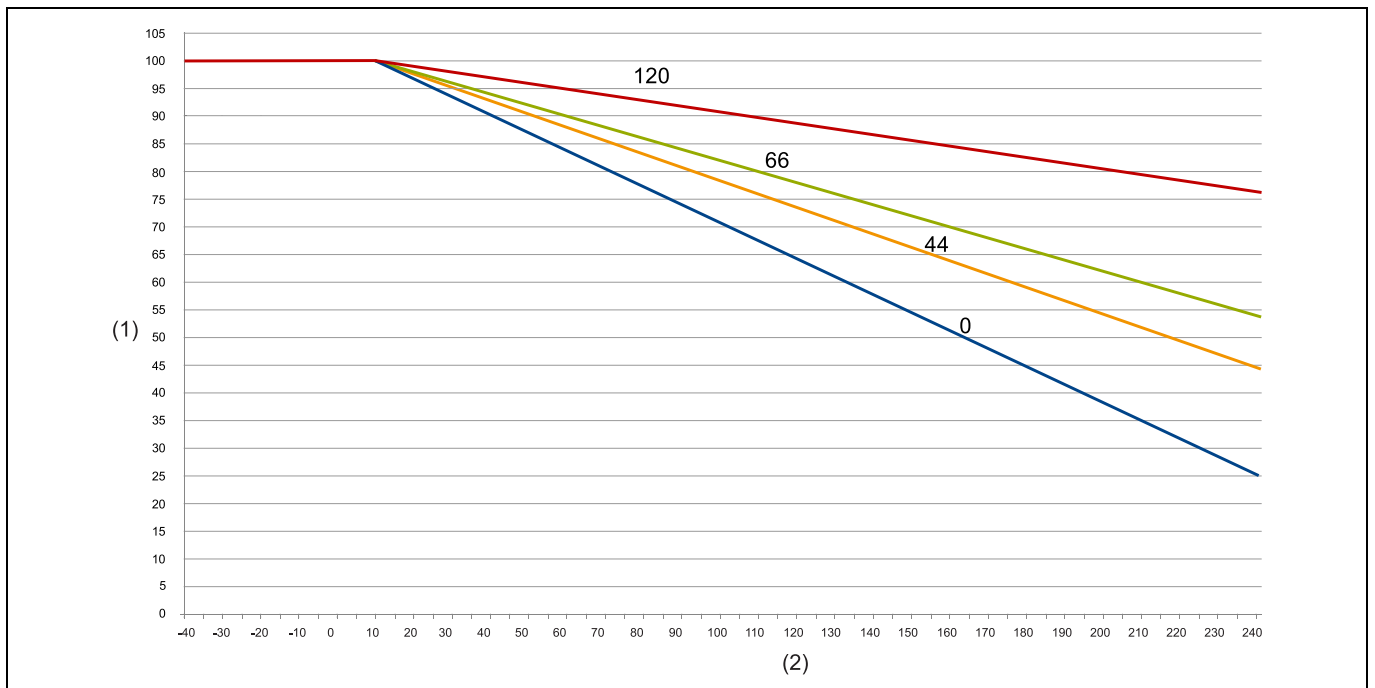
Connection housing small and large, extension tube in mm



(1) Maximum ambient temperature

(2) Medium temperature

Connection housing Ex d, extension tube in mm



(1) Maximum ambient temperature

(2) Medium temperature

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Approvals and approval marks

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 408302/263, Type 408302/362, Type 408302/662
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 408302/264, Type 408302/462, Type 408302/962
DNV GL Testing agency Certificate/certification numbers Inspection basis Valid for	DNV GL TAA00001VR Class Guidelines CG 0339, November 2016 Type 408302/062, Type 408302/662, Type 408302/962
German Water Resources Act (WHG) Testing agency Certificate/certification numbers Inspection basis Valid for	DIBT Z-65.11-608 Approval principles for safety devices for tanks and pipelines, overfill protection (ZG-ÜS) Type 408302/262, Type 408302/263, Type 408302/264
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 408302/...
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 408302/263, Type 408302/264, Type 408302/362, Type 408302/462, Type 408302/662, Type 408302/962 – each with extra code 240
Railroad application Testing agency Certificate/certification numbers Inspection basis Valid for	RST Rail System Testing, JUMO NESOS Certificate Railroad application DIN EN 50155, DIN EN 50121-3-2, EN 45545-1, EN 45545-2 Extra code 950

^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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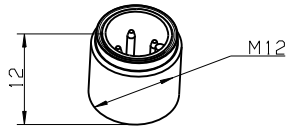
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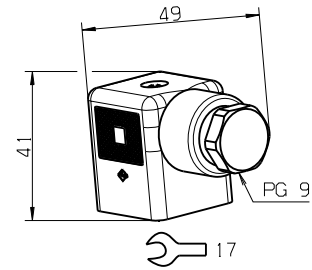
Dimensions

Electrical connection

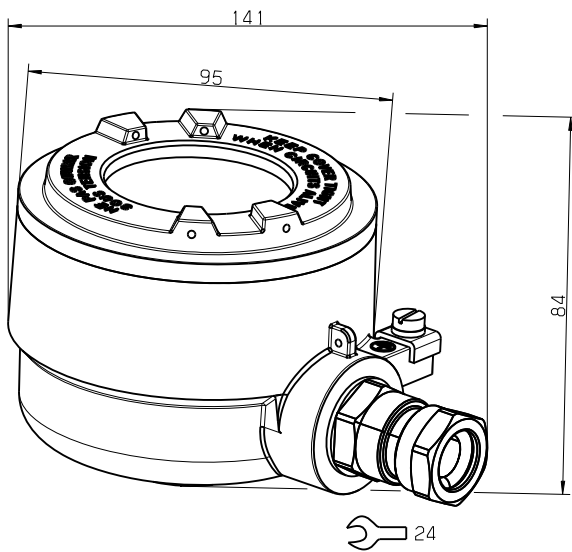
036
 Round plug M12 × 1



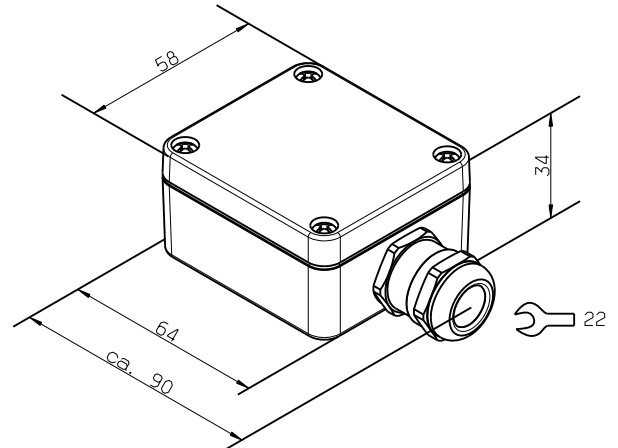
061
 Cable socket DIN EN 175301-803



115
 Terminal head Ex d



130
 Connection housing, cube-shaped, small



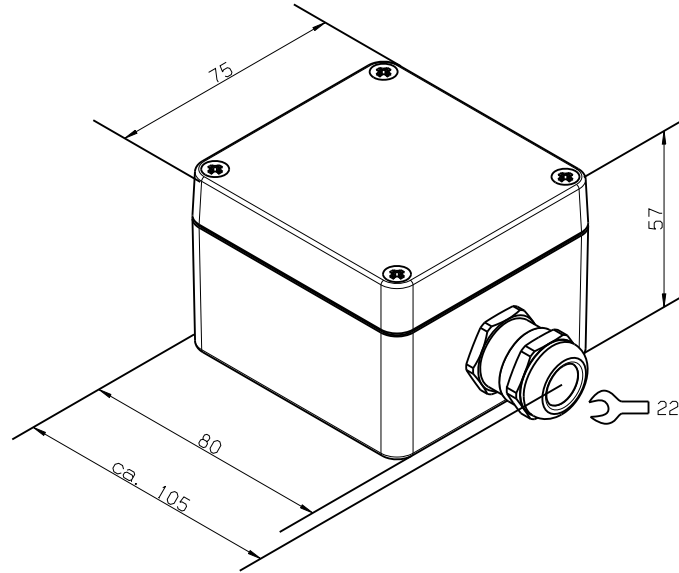
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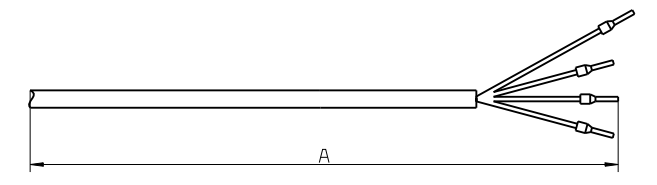
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131
 Connection housing, cube-shaped, large

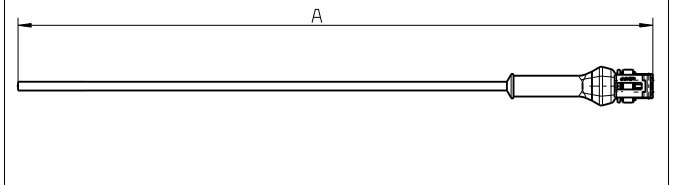


150 PVC, 160 silicone, 170 PUR, 180 RADOX®
 Cable with ferrules



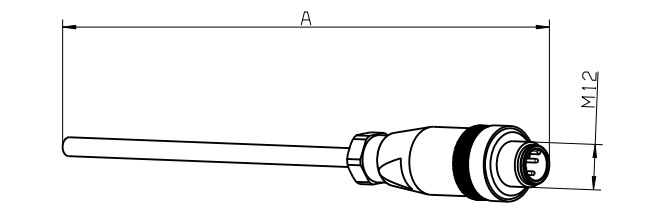
A Cable length, see order details

151 PVC, 161 silicone, 171 PUR
 Cable with AMP Superseal connector



A Cable length, see order details

152 PVC, 162 silicone, 172 PUR
 Cable with M12 connector



A Cable length, see order details

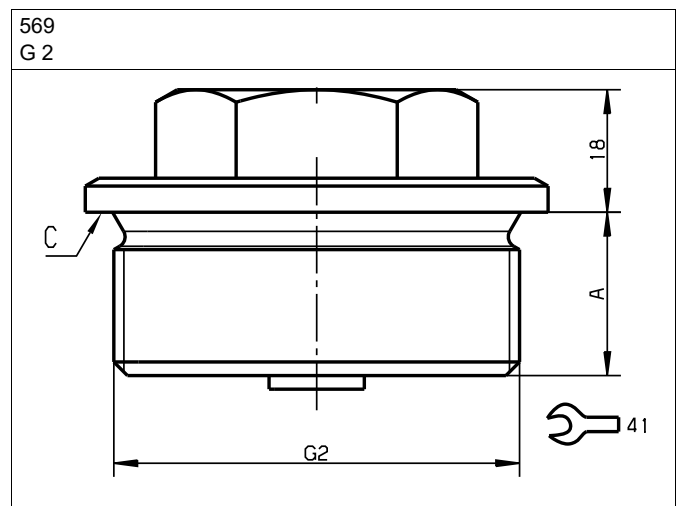
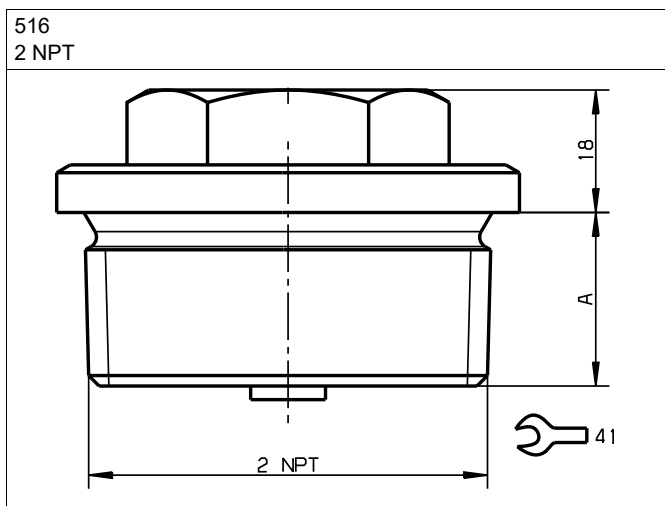
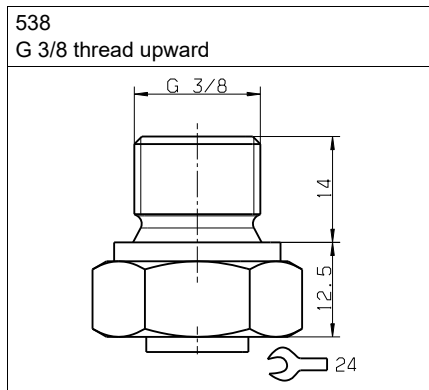
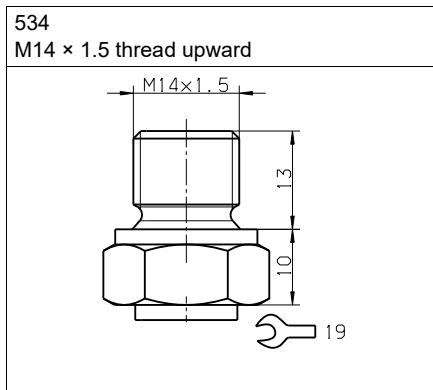
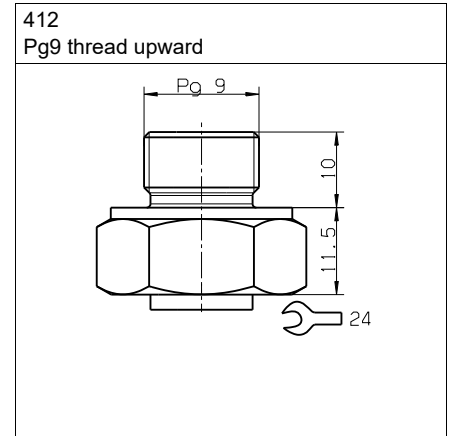
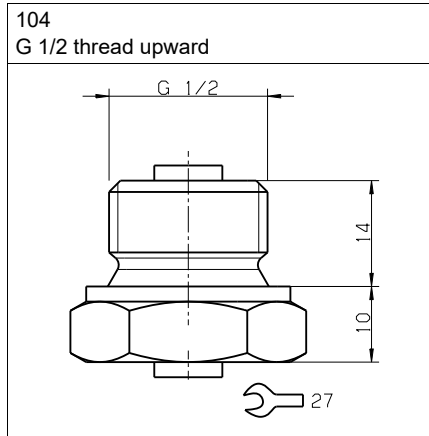
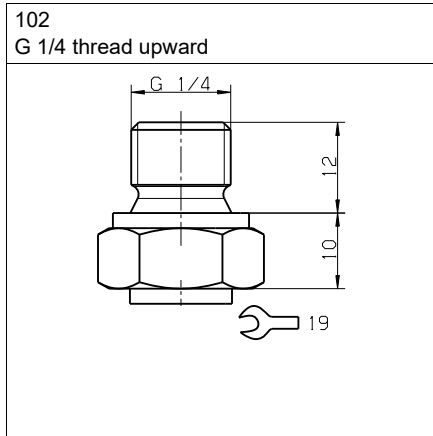
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Process connections



A 25,5

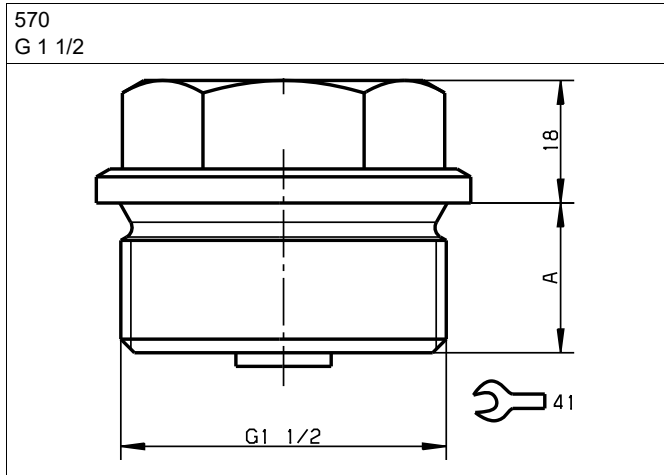
A 24 (25.5 for Ex d)

C A seal/O-ring with a thickness of at least 2 mm is recommended.

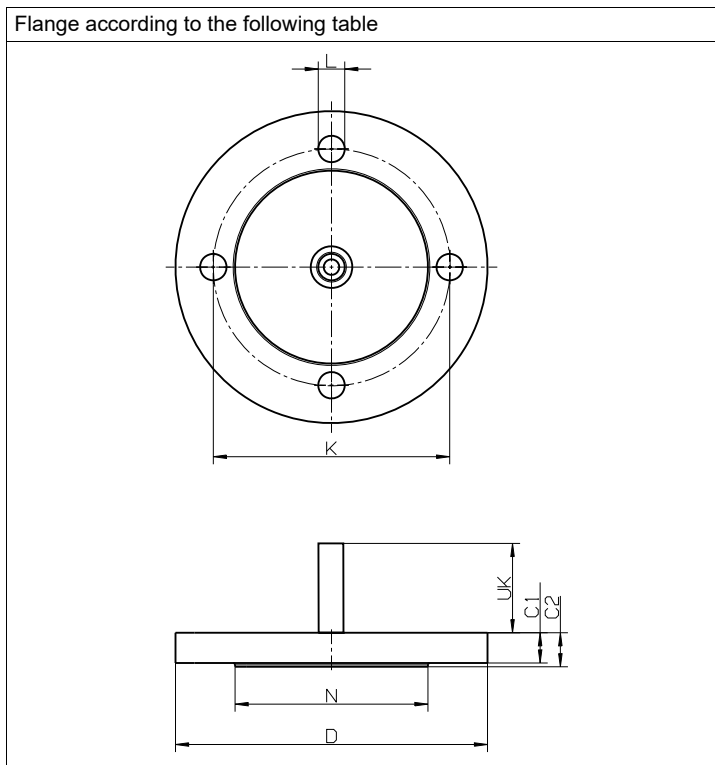
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A 22 (25.5 for Ex d)



Example for 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

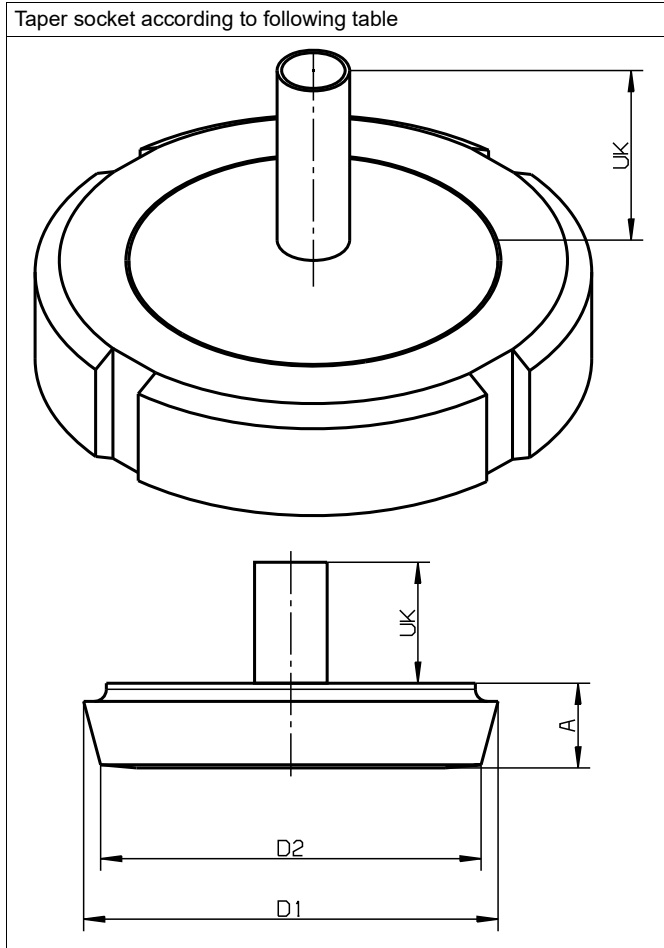
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Taper socket according to following table



Example of extension tube; also available for other process connections;
 UK = extension tube length + 9 mm

Order code	Designation	A	D1	D2
607	Taper socket with union nut DN 50, DIN 11851 (dairy pipe fitting)	14 mm	68.5 mm	62.9 mm
608	Taper socket with union nut DN 65, DIN 11851 (dairy pipe fitting)	16 mm	86 mm	79.6 mm

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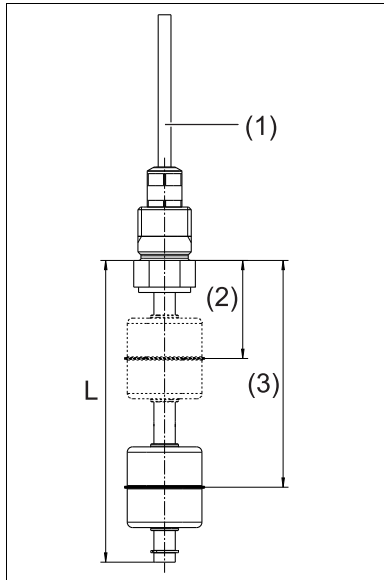
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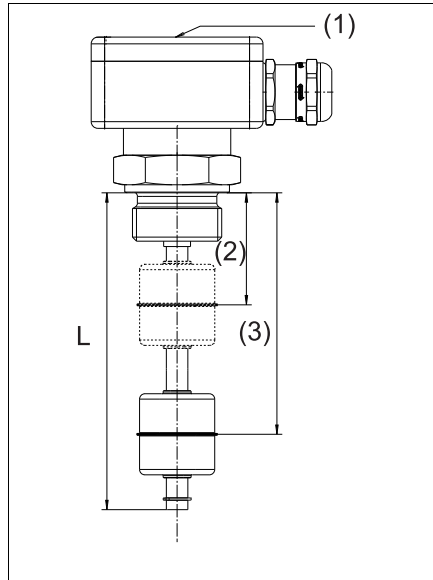


Notes to the order details

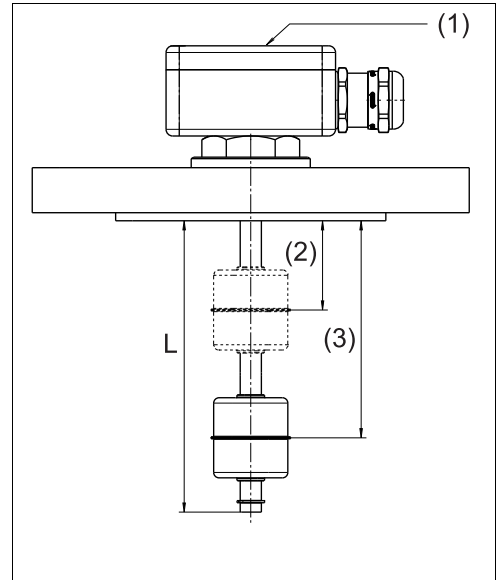
Below are examples for the dimensioning of the guide tube length L, the measuring range start (3) as well as measuring range end (2) depending on the respective process connection.



(1) Process connection
 „thread upward“



(1) Process connection
 „thread“



(1) Process connection
 „flange“

- (2) Position contact 1 (switching point) in mm
- (3) Position contact 2 (switching point) in mm
- L Guide tube length in mm

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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.

Number of contacts										
	Cable		Cable socket		Connection housing		AMP Superseal connector		Round plug M12	
	SPST-NO/NC	SPDT-CO	SPST-NO/NC	SPDT-CO	SPST-NO/NC	SPDT-CO	SPST-NO/NC	SPDT-CO	SPST-NO/NC	SPDT-CO
1	Silicone RD WH PUR BN WH PVC BN WH	Silicone RD WH RD/BU BK PVC BN WH GN								
2	Silicone RD WH RD/BU WH/BU PVC BN WH GN YE	Silicone ^a RD WH BU RD/BU WH/BU BU PVC ^b RD BK BN OG GN YE PUR ^c PK WH YE BN GN GY								

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

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Number of contacts										
	Cable		Cable socket		Connection housing		AMP Superseal connector		Round plug M12	
	SPST-NO/NC	SPDT-CO	SPST-NO/NC	SPDT-CO	SPST-NO/NC	SPDT-CO	SPST-NO/NC	SPDT-CO	SPST-NO/NC	SPDT-CO
5										
Protection rating ^d	prepared for 2 according to EN 61010-1		1	1	1	1	3	3	3	3

^a According to VDE 0298-4 max. current 0.8 A at max. 175 °C or 1 A at max. 170 °C

^b According to VDE 0298-4 max. current 0.8 A at max. 75 °C or 1 A at max. 70 °C, not available with the basic type extensions shipbuilding approval, shipbuilding approval and explosion protection, intrinsically safe, Ex i, and shipbuilding approval and explosion protection, flameproof enclosure, Ex d.

^c Only available with protection class 3.

^d According to DIN EN 61140

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	Cable	Cable socket	Connection housing	AMP Superseal connector	Round plug M12
Temperature sensor Pt100 ^a	Silicone ^b Silicone ^b 	-		-	
Temperature sensor Pt1000 ^a	PVC ^b 				
Temperature switch ^a	Silicone ^{c, d} 				
	PVC ^{c, e} 				

- ^a Assignment is always to terminals with the highest numbers
- ^b For 1x SPST-NO/NC switching contacts
- ^c For 2x SPST-NO/NC or 1x SPDT-CO switching contacts
- ^d According to VDE 0298-4 max. current 0.8 A for max. 175 °C or 2 A for max. 150 °C
- ^e According to VDE 0298-4 max. current 0.8 A for max. 75 °C or 2 A for 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
WH	White
BU	Blue
PK	Pink
GN	Green
RD	Red
YE	Yellow
GY	Gray

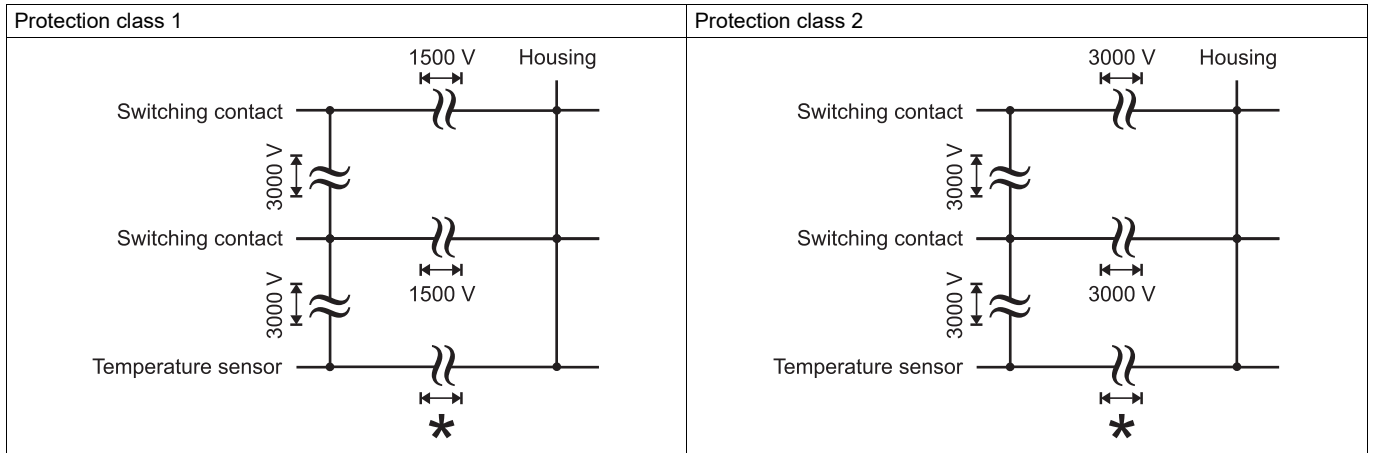
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The galvanic isolation is realized according as follows:



Caution:

* Functional galvanic isolation

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

Contact function	Max. voltage U_i in V	Max. current U_i in mA	Max. power P_i in mW	Internal inductance in μ H	Internal capacity 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 U_i in mA	Max. power P_i in mW	Internal inductance in μ H	Internal capacity 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		

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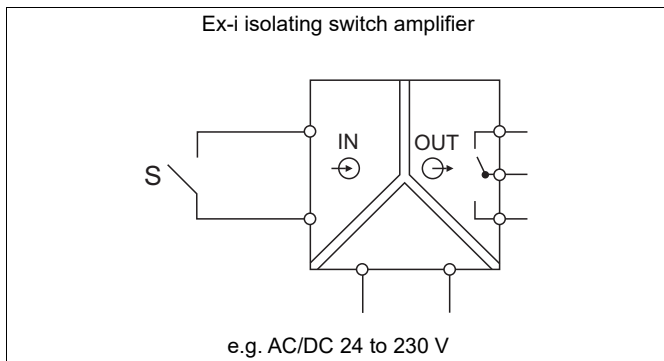
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Connection examples of versions with explosion protection

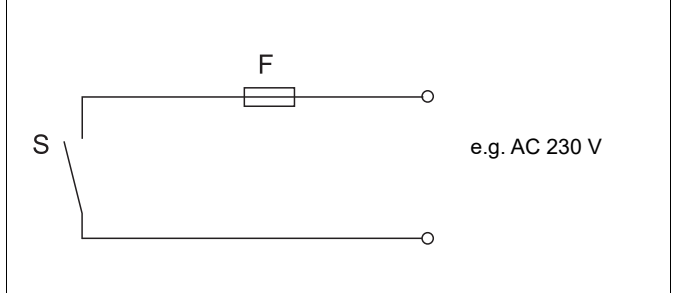
Float switch (S)

Ex i



Ex d

According to operating manual 408301, chapter 6 on "Installation", the fuse (F) must be selected.



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Order details

	(1) Basic type
408302	JUMO NESOS R02 LS – Float switch in standard version
	(2) Basic type extension
000	None
062	Shipbuilding approval
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
662	Shipbuilding approval and explosion protection, intrinsically safe, Ex i
962	Shipbuilding approval and explosion protection, flameproof enclosure, Ex d
999	Special version
	(3) Electrical connection
036	Round plug M12 × 1
061	Cable socket DIN EN 175301-803, form A
115	Terminal head Ex d
130	Connection housing, cube-shaped, small
131	Connection housing, cube-shaped, large
150	Cable, PVC
151	Cable, PVC with AMP Superseal connector ^a
152	Cable, PVC with M12 connector
160	Cable, silicone
161	Cable, silicone with AMP Superseal connector ^a
162	Cable, silicone with M12 connector
170	Cable, PUR
171	Cable, PUR with AMP Superseal connector ^a
172	Cable, PUR with M12 connector
180	Cable, RADOX®
999	Special version
	(4) Cable length
0000	None
2000	2000 mm
5000	5000 mm
100 - 5000	Specifications in plain text (increments of 100 mm)
	(5) Process connection
102	G 1/4 thread upward
104	G 1/2 thread upward
412	Pg9
516	2 NPT
534	M14 x 1.5 thread upward
538	G 3/8 thread upward
569	G 2
570	G 1 1/2
607	Taper socket with union nut DN 50, DIN 11851 (dairy pipe fitting)
608	Taper socket with union nut DN 65, DIN 11851 (dairy pipe fitting)
703	Flange 2,5" 150 lbs ANSI B 16.5 RF
713	Flange 2" 150 lbs ANSI B 16.5 RF
714	Flange 2" 300 lbs ANSI B 16.5 RF

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729	Flange DN 50, PN40, EN 1092-1, form B1
784	Flange DN 65, PN40, EN 1092-1, form B1
785	Flange DN 80, PN40, EN 1091-1, form B1
786	Flange DN 100, PN40, EN 1091-1, form B1
999	According to customer specification
(6)	Guide tube length L^b
100 - 4000	Specifications in plain text (increments of 50 mm)
(7)	Float
044	Cylinder, stainless steel, diameter 44, density 750 kg/m ³
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
752	Spherical, titanium, diameter 52, density 650 kg/m ³
(8)	Number of floats
1	1 piece
2	2 pieces
3	3 pieces
4	4 pieces
5	5 pieces
(9)	Switching function
03	SPDT-CO, changeover contact (10 VA/AC 175 V/0.5 A)
07	SPDT-CO, single-pole changeover contact, bistable (40 VA/AC 230 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)
99	According to customer specification
(10)	Number of contacts
1	1 contact
2	2 contacts
3	3 contacts
4	4 contacts
5	5 contacts
(11)	Position of contact 1^c
20 - 3970	Specifications in plain text
(12)	Position of contact 2^c
0	None
20 - 3970	Specifications in plain text
(13)	Position of contact 3^c
0	None
40 - 3970	Specifications in plain text
(14)	Position of contact 4^c
0	None
40 - 3970	Specifications in plain text
(15)	Position of contact 5^c
0	None
40 - 3970	Specifications in plain text

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(16)	Extra codes
000	None
005	Integrated temperature sensor Pt1000 ^d
007	Integrated temperature sensor Pt100 ^d
009	Temperature switch, NC contact ^e
019	Temperature monitoring of reed contact, Pt1000
240	EAC-Ex approval
307	Extension tube ^f
663	NAMUR circuit ^a
950	Railroad application ^g
954	Technical passport
976	Guide tube diameter 14 mm

- ^a Not available for shipbuilding approval, shipbuilding approval and explosion protection, intrinsically safe, Ex i, and shipbuilding approval and explosion protection, flameproof enclosure, Ex d.
 - ^b The dimensioning is in mm in relation to the contact/locating surface (threaded bushing of the container/tank wall) of the selected process connection.
 - ^c The contact positions are observed from the process connection toward the guide tube end.
 - ^d The temperature sensor is positioned at the end of the guide tube.
 - ^e Specify switching temperature in plain text. The temperature switch is positioned at the end of the guide tube.
 - ^f Specify extension tube length in plain text, depending on ambient temperature and process temperature (see chapter „Maximum ambient temperature depending on extension tube length and process temperature“).
 - ^g The extra code railroad application is only available in conjunction with M12 connector or RADOX® cable.
- ⇒ 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	408302	/	000	-	130	-	0	-	570	-	1112	-	044	-	1	-	12	-
			(10)	(11)	(12)	(13)	(14)	(15)	(16)									
			1	-	1060	-	0	-	0	-	0	-	0	-	0	/	000	

Minimum order quantity: 1 piece

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

Trademark information

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