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JUMO NESOS R20 LT

Level transmitter via float

Applications

- 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

Level measurement is carried out according to the Archimedes' principle for liquids in a semi continuous manner. The float moves along the guide tube as the level rises or falls. With its magnetic field, the magnet in the float actuates the reed chain that is installed in the guide tube. As a result, a resistance value is converted into a standard signal 4 to 20 mA and transmitted. The signal can be evaluated and processed further by downstream electronic components. The output signal always refers to increasing level.

In the case of applications with large filling heights, level transmitters of up to 4 m in length are available. In the event of limited space or too high temperatures at the connection housing in the application, the potentiometric output signal, for example in the PLC or in the control cabinet, can be realized using transmitters (separate version).

Depending on the variant ordered, various electrical connections, process connections, guide tube lengths, floats, and resolutions are available.

With the optional temperature sensor or temperature switch, the temperature can also be recorded via just one measuring point in addition to the level measurement.

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 supply isolator is required for installations with a flameproof enclosure.

Customer benefits

- Cost-effective installation and mounting; amongst other things, no programming or configuration required
- Reduced operating costs due to maintenance-free device design
- Price-performance ratio optimized through the use of standard components
- No supply isolator required for [Ex d] (flameproof enclosure) applications
- In the event of an optional temperature switch, no isolating switch amplifier is required for [Ex d] (flameproof enclosure) applications
- Customer-specific linearization for tank volume calculation possible upon request



Type 408320

Special features

- Approvals for shipbuilding and explosion protection are available
- High resolutions up to 5.5 mm available
- Large operating temperature range for media of -52 to +180 °C
- Large pressure range of -1 to +37 bar
- Temperature sensor/temperature switch are available
- Error current according to NAMUR 43
- Reverse voltage protection

Approvals and approval marks



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Technical data

General Information

Reference conditions	DIN EN 60770 and DIN EN 61298
Function principle	Level transmitter via float and reed chain
Installation position (vertical)	±30°

Output

Analog output	4 to 20 mA, two-wire (output 405) (including optional temperature transmitters, extra code 140)
Step response T ₉₀	≤ 135 ms (filling level) ≤ 50 s (temperature)
Reverse voltage protection	Yes
Error current	NAMUR NE43, 3.5 mA and 23 mA
Burden	$R_L \leq (U_B - 8 \text{ V}) \div 0.023 \text{ A} (\Omega)$

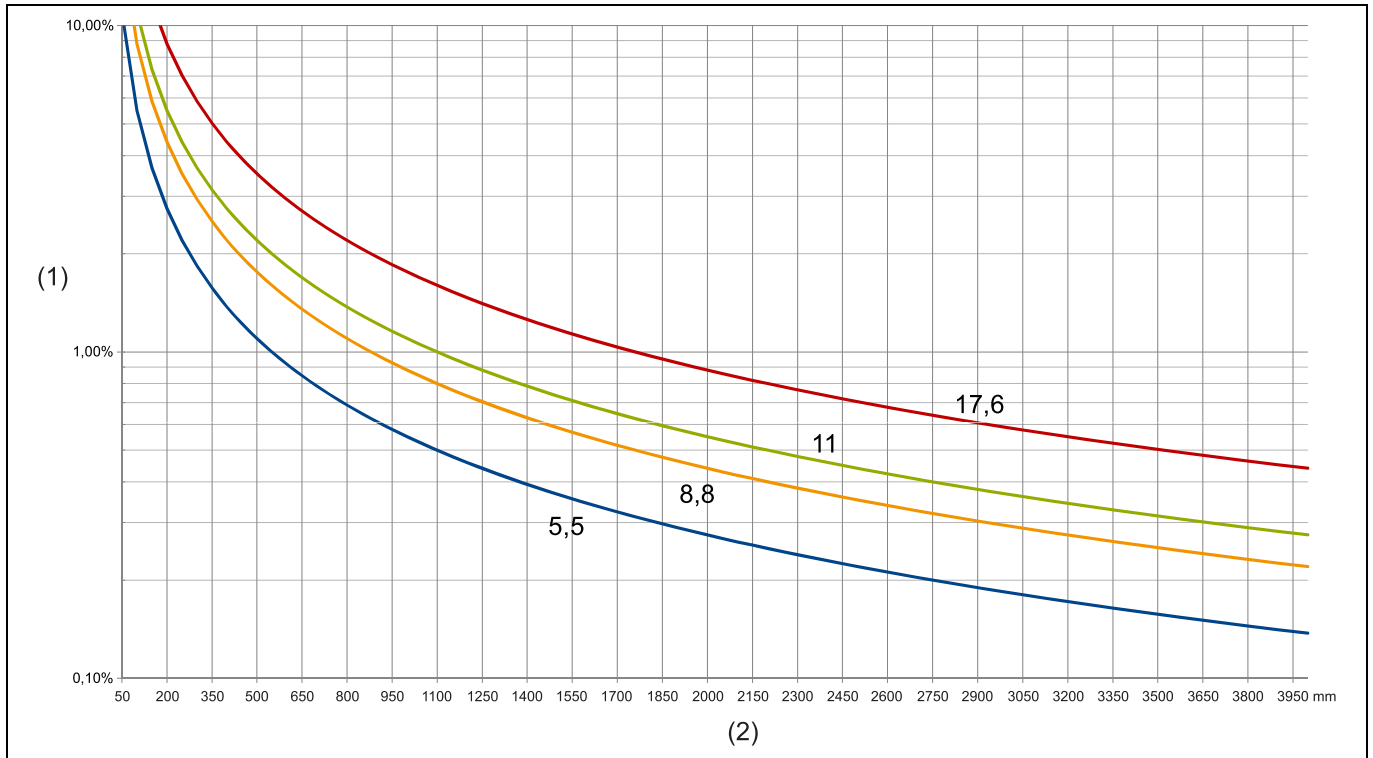
Resistance output	Resistance value (ohm), potentiometric three-wire (output 501)
Resistance value	Depending on the length and resolution, see "Important information about the order details", Page 13

	Pt100	Pt1000	Temperature switch, N/C contact, 1 A, 50 mA min. load	Temperature transmitter
Measuring range	-40 to +150 °C	-40 to +150 °C	Indicate switching point specification in plain text	0 to 100 °C configured as default setting
Accuracy	DIN class B According to DIN EN 60751, the limit deviation in °C is: $\pm(0.3 + 0.005 t)$ $ t $ = temperature in °C regardless of prefix sign		Tolerance ±5 K Hysteresis 30 K ±15 K	±0.2 K $\sqrt{[(0.2)^2 + (0.3 + 0.005 t)^2]}$

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- (1) Accuracy as a percentage depending on the resolution
- (2) Measuring range

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	41
052	Spherical	AISI 316 series	52	680	-1 to +37	38
053	Spherical, e-polished	AISI 316 series	52	680	-1 to +37	38
752	Spherical	Titanium grade 2	52	650	-1 to +24	32

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
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

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Materials of parts in contact with medium ^a e.g. process connection, float, guide tube	AISI 316 series, in the case of float 752 only floats made of titanium
Materials of parts not in contact with medium ^a Cable Round plug M12 × 1 Cable socket Terminal head BUZ Terminal head BUZ-H Terminal head Ex d Terminal head Form BEGF with M12 connector Connection housing, cube-shaped, large	PVC or silicone or PUR PBT GF30 PBT GF30 Aluminum, painted Aluminum, painted Aluminum, painted AISI 321, CuZn, PA Aluminum, painted
Clamping range Cable fitting	Diameter 6 to 12 mm for connection housing, cube-shaped, large (electrical connection 131), terminal head BUZ (electrical connection 110) and terminal head BUZ-H (electrical connection 111) Diameter 6.5 to 11.9 mm for terminal head Ex d (electrical connection 115)

^a The chemical resistance of the materials should be taken into account for the application.

Auxiliary power

Voltage supply 4 to 20 mA (output 405), temperature transmitter, analog (extra code 140)	DC 8 to 30 V, nominal voltage DC 24 V
Power consumption	5 to 800 mW
Current consumption	≤ 23 mA
Voltage supply ^a Resistance value (ohm) (output 501) Temperature switch (extra code 009)	Voltage value (rms): AC ≤ 33 V Peak value: AC ≤ 46 V; DC ≤ 70 V DC ≤ 60 V
Electrical circuit SELV	The device must be equipped with an electrical circuit that meets the requirements of EN 61010-1 with regard to "Limited-energy circuits".

^a Limit values according to DIN EN 61010-1

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Environmental influences

Moisture	
Operation	100 % rel. humidity including condensation on the product outer shell
Storage	90 % rel. humidity without condensation
Electromagnetic compatibility	
Interference emission ^a	Class B ^b
Interference immunity ^c	Industrial requirements
Protection type for electrical connection ^d	
Cable	IP68
Cable with M12 connector	IP66
Round plug M12 × 1	IP66
Cable socket	IP65
Terminal head BUZ	IP65
Terminal head BUZ-H	IP65
Terminal head Ex d	IP68
Terminal head Form BEGF with M12 connector	IP65
Connection housing, cube-shaped, large	IP66
Vibration ^e	0.7 g for 13.2 to 100 Hz and freely oscillating guide tube length up to max. 2.5 m
Ambient temperature for electrical connection ^f	
PVC cable	-5 to +80 °C
Silicone cable	-50 to +180 °C
PUR cable	-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 BUZ	-40 to +74 °C
Terminal head BUZ-H	-40 to +79 °C
Terminal head Ex d	-40 to +80 °C
Terminal head Form BEGF with M12 connector	-40 to +74 °C
Connection housing, cube-shaped, large	-40 to +81 °C
Process temperature	
Parts in contact with medium (e.g. guide tube with float)	-40 to +150 °C (standard) -52 to +180 °C (upon request)

^a According to DIN EN 61326-1

^b The product is suitable for industrial use as well as for households and small businesses.

^c According to DIN EN 61326-2-3

^d According to DIN EN 60529

^e According to IEC 60068-2-6

^f Observe dependency of extension tube length with process temperature, see following diagrams

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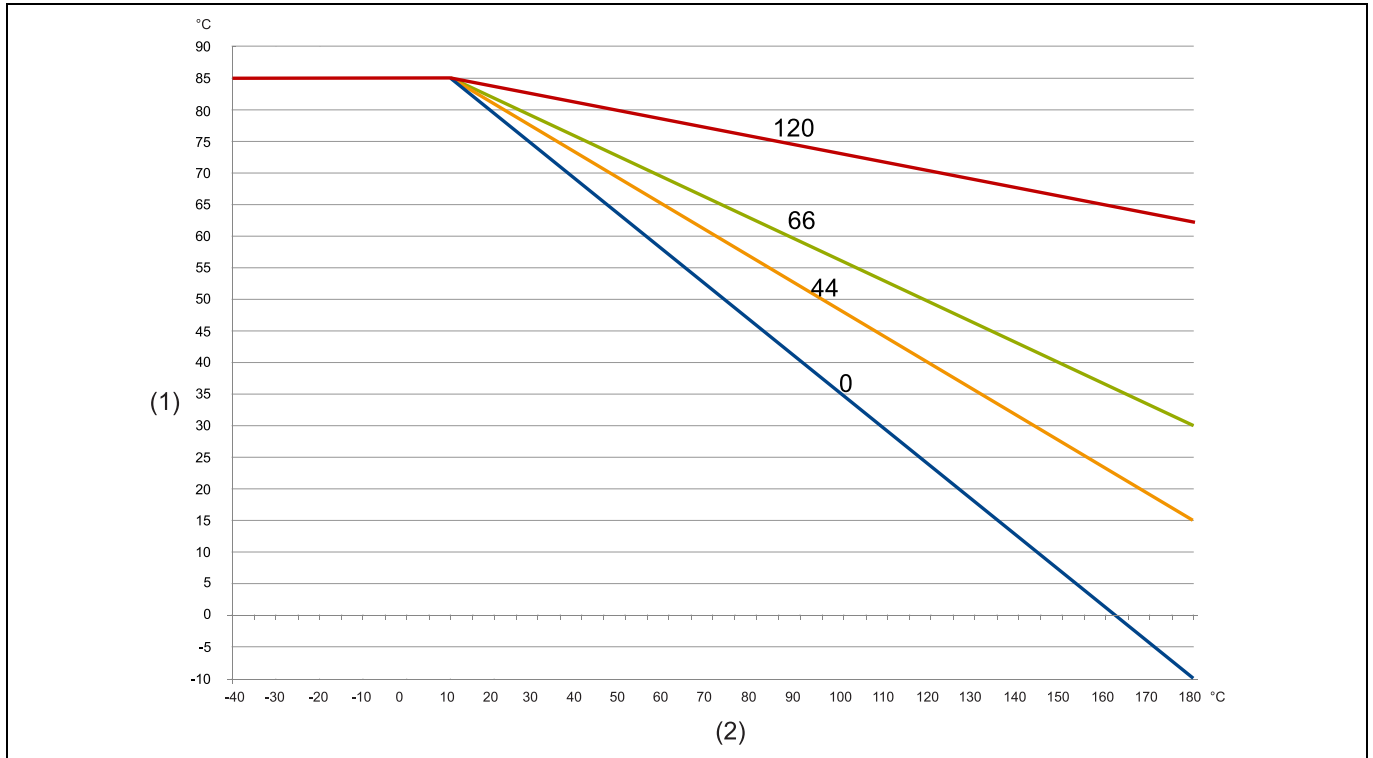
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Maximum ambient temperature depending on the extension tube length and process temperature

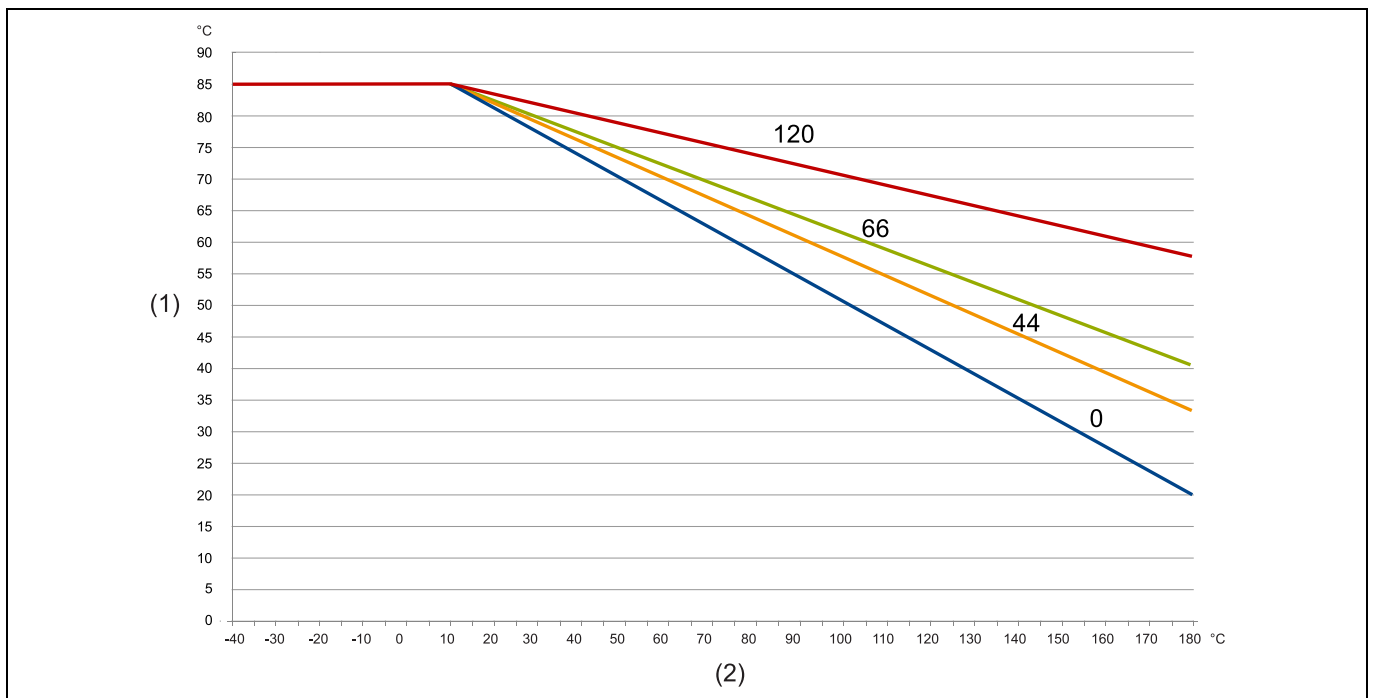
Terminal head BUZ and terminal head Form BEGF with M12 connector, extension tube lengths in mm



(1) Maximum ambient temperature

(2) Media temperature

Terminal head BUZ-H and connection housing Ex d, extension tube lengths in mm



(1) Maximum ambient temperature

(2) Media temperature

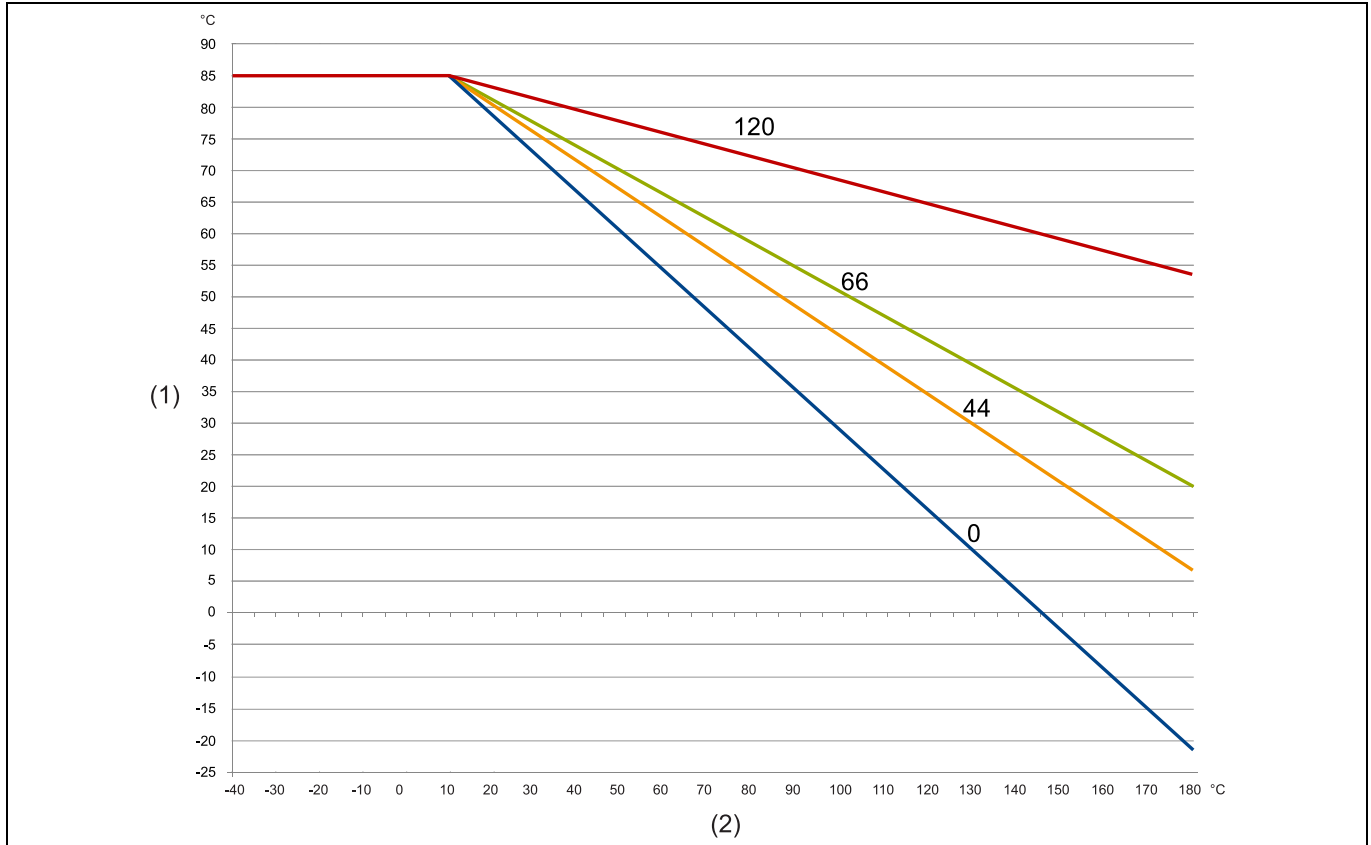
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Large connection housing, extension tube lengths in mm



- (1) Maximum ambient temperature
- (2) Media temperature

Display

Function principle	Current loops fed, only in connection with terminal head BUZ-H (electrical connection 111)
Display	Seven-segment, four-digit "9999", default setting 0 to 100 [%]
Ambient temperature	-20 to +80 °C 0 to 60 °C for Ex i version

Approvals and approval marks

Approval mark	Test facility	Certificate/certification number	Inspection basis	Valid for
ATEX, IEC EX intrinsically safe, Ex i	Eurofins Electrosuisse Product Testing	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 408320/362 Type 408320/662
ATEX, IEC EX flameproof enclosure, Ex d	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 408320/462 Type 408320/962
DNV GL	DNV GL	TAA00001VR	Class Guidelines CG 0339, November 2016	Type 408320/062 Type 408320/662 Type 408320/962

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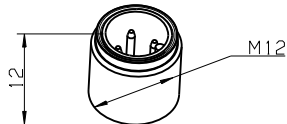
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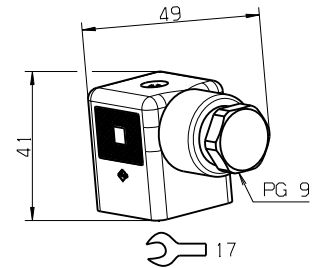
Dimensions

Electrical connection

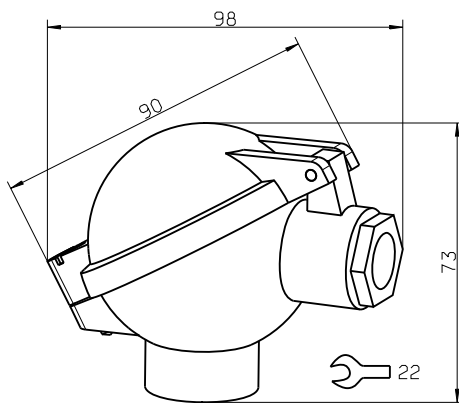
036
 Round plug M12 × 1



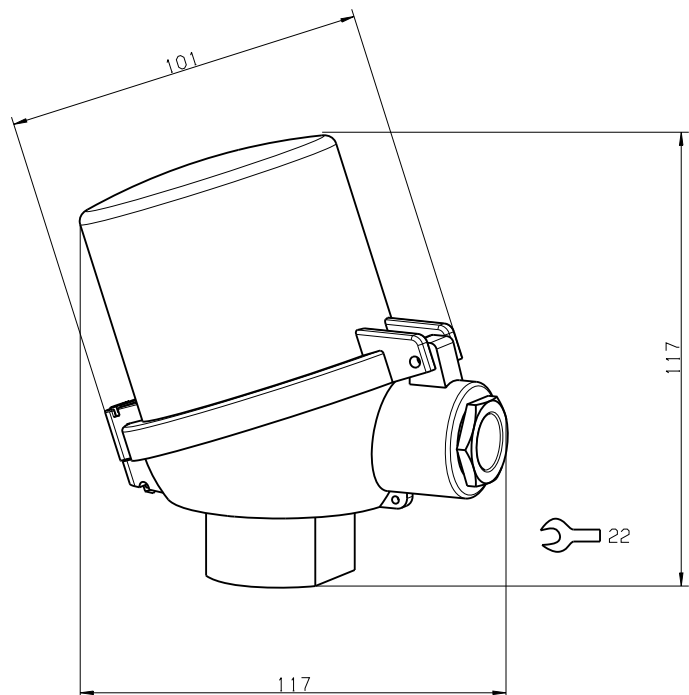
061
 Cable socket DIN EN 175301-803



110
 Terminal head BUZ



111
 Terminal head BUZ-H



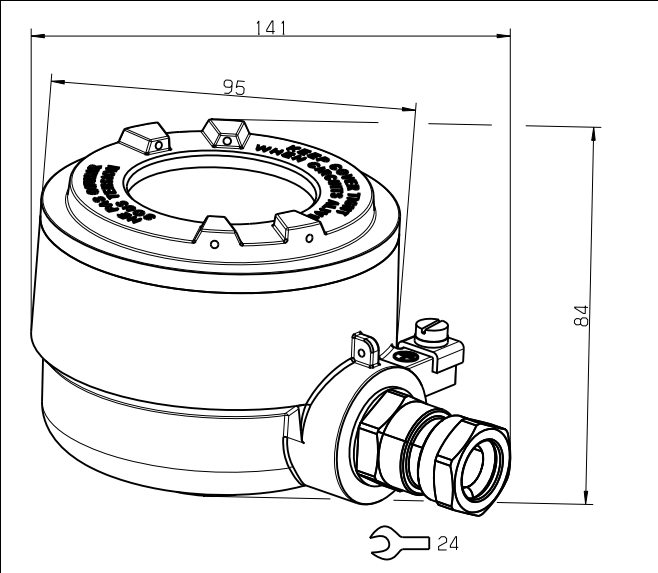
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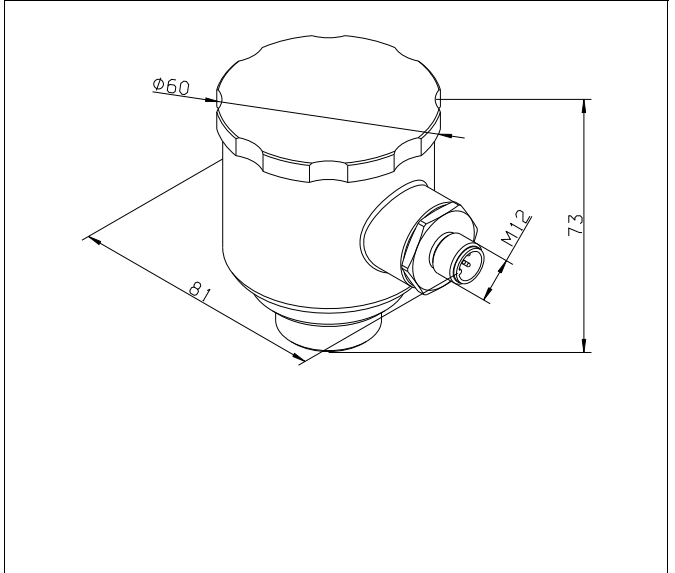
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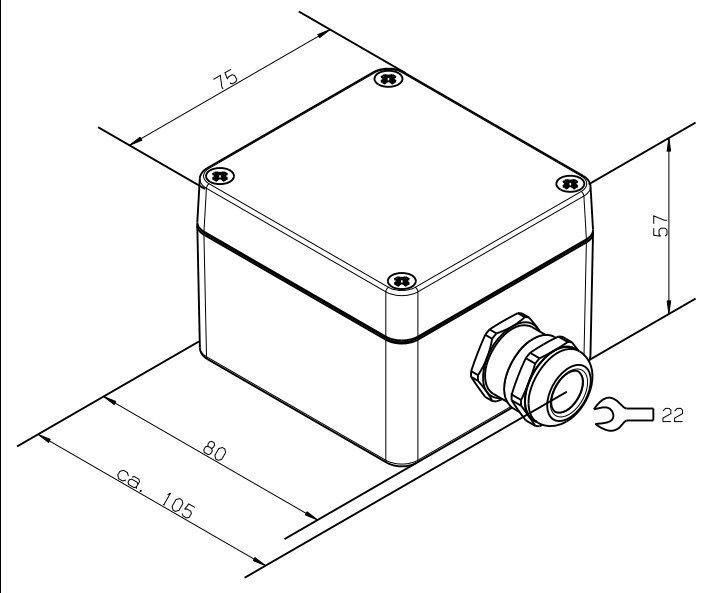
115
Terminal head Ex d



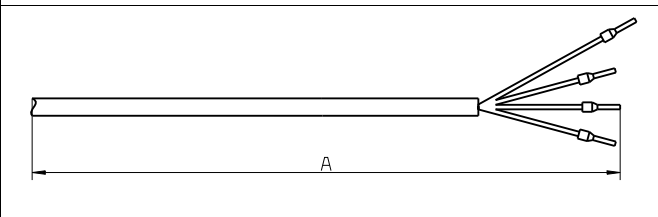
116
Terminal head Form BEGF with M12 connector



131
Connection housing, cube-shaped, large

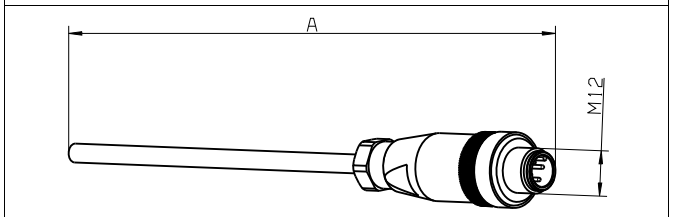


150 PVC, 160 silicone, 170 PUR
Cable with ferrules



A Cable length, see order details

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



A Cable length, see order details

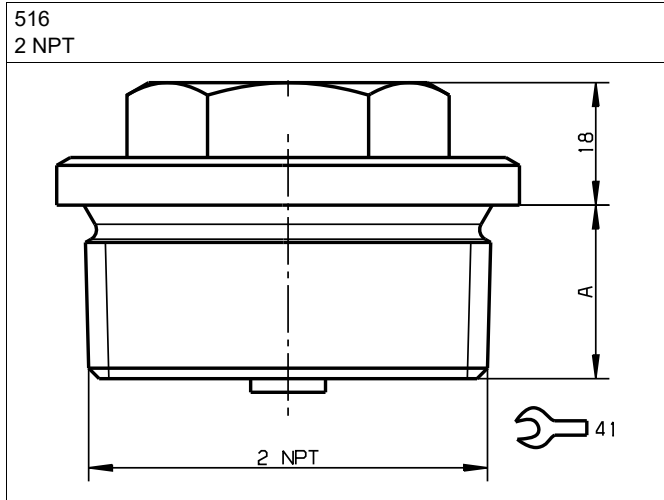
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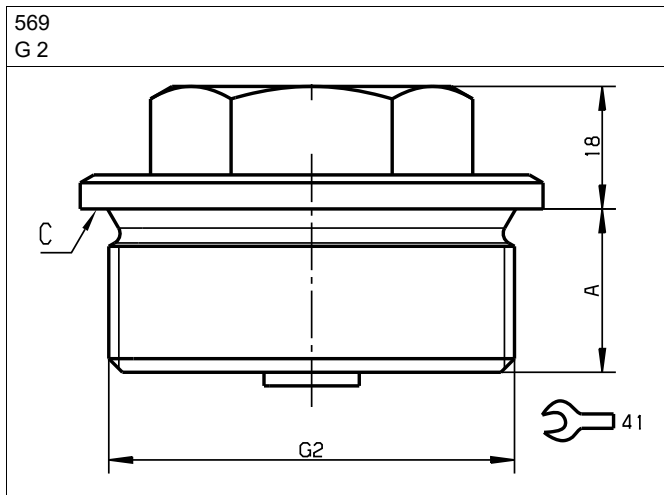
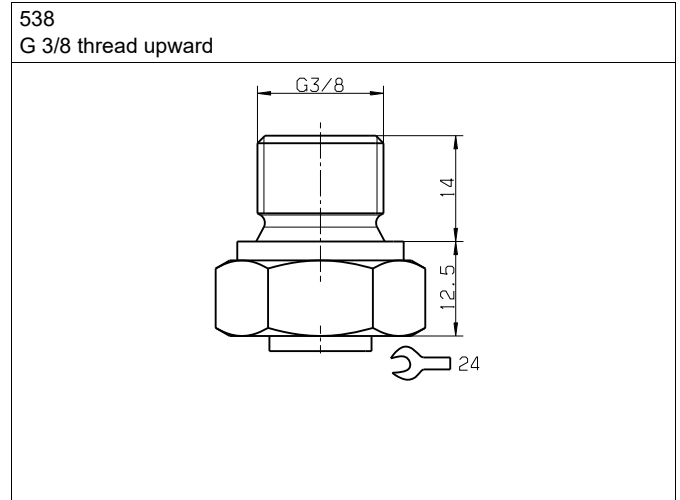
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Process connections

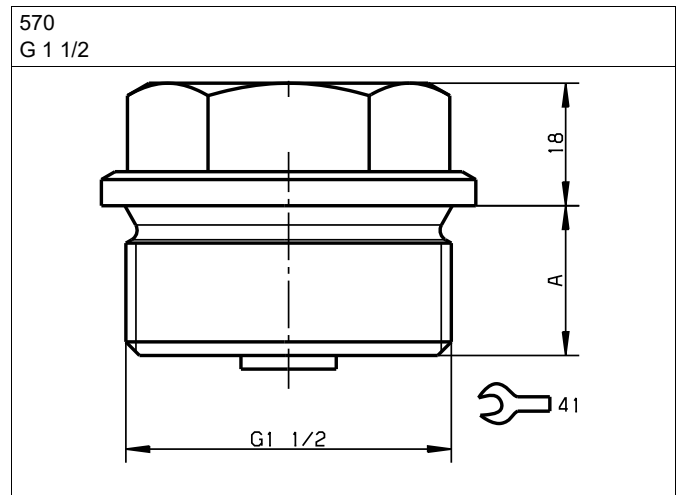


A 25.5



A 24 (25.5 for Ex d)

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



A 22 (25.5 for Ex d)

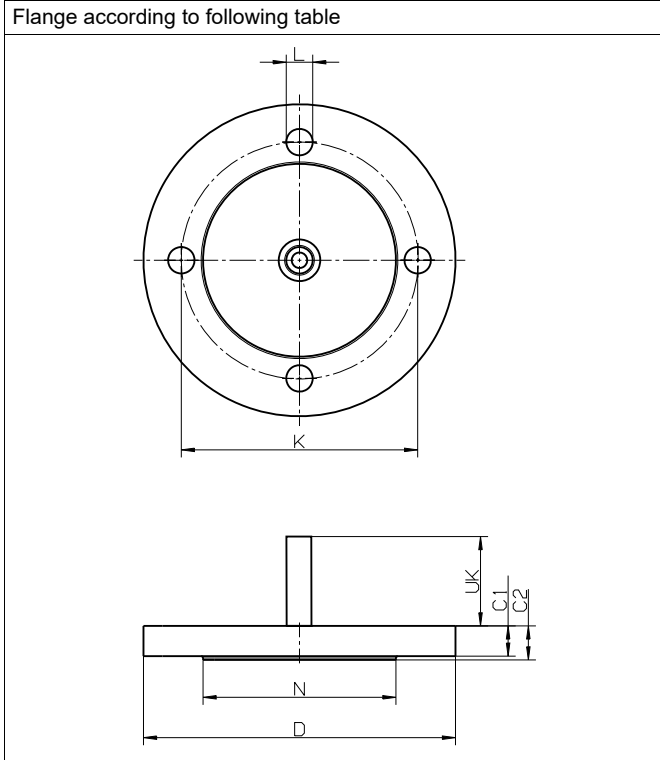
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Flange according to following table



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
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 with sealing strip	125	4	18	165	102	17	20
784	Flange DN 65, PN40 EN 1092-1, form B1 with sealing strip	145	8	18	185	122	19	22
785	Flange DN 80, PN40 EN 1092-1, form B1 with sealing strip	160	8	18	200	138	21	24

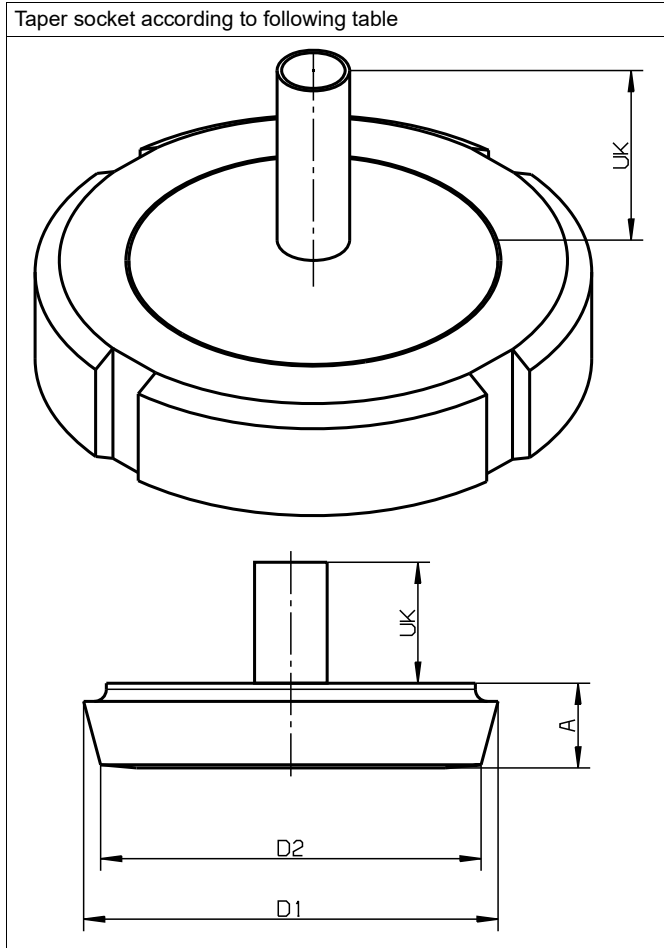
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Taper socket according to following table



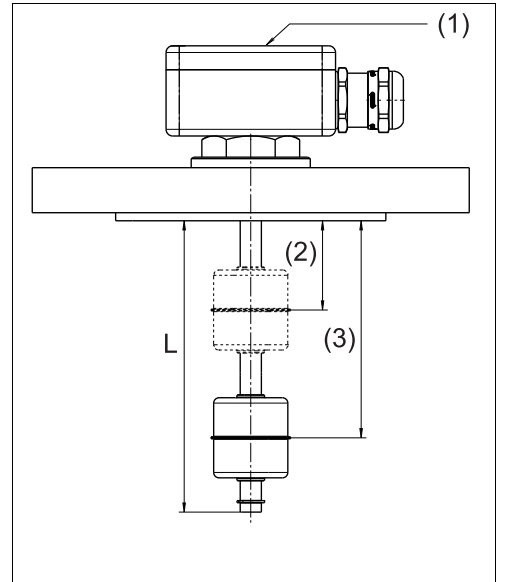
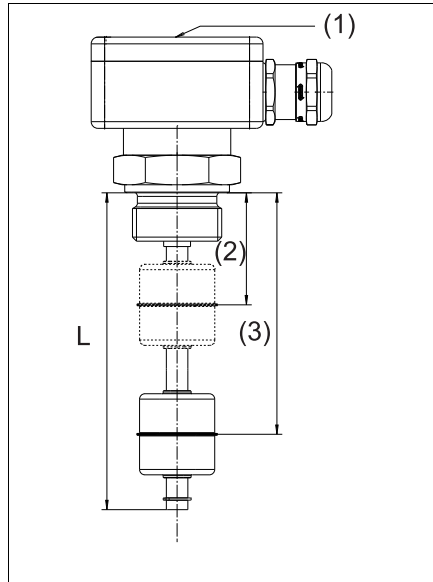
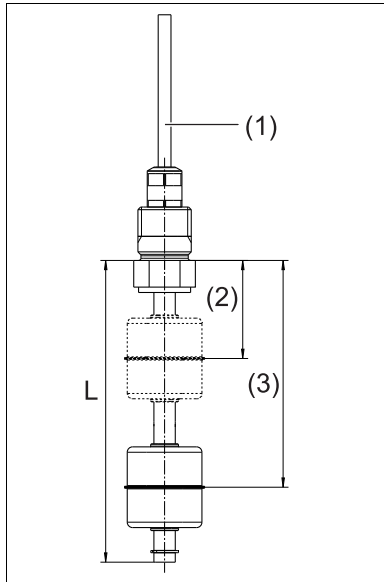
Example of extension tube; also available for other process connections;
 UK = extension tube length + 9 mm

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



Important information about the order details

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



(1) Process connection "thread upward"

(1) Process connection "thread"

(1) Process connection "flange"

- (2) Measuring range end in mm
- (3) Measuring range start in mm
- L Guide tube length in mm

The table below shows the dependencies of the maximum measuring range, the minimum measuring range end (MRE), and guide tube length (L), as well as the overall resistance values, assigned to the resolution. The order code can be specified using the formula below:

Measuring range end (MRE) = measuring range start (MRS) - measuring range

- max. MRS = L - 53 mm for resolution 5.5 and 11 mm
- max. MRS = L - 56 mm for resolution 8.8 and 17.6 mm

Resolution 8.8 and 17.6 mm

Max. measuring range in mm	Min. MRE in mm	Min. L in mm	Resistance value in Ω	
			Resolution 8.8 mm	Resolution 17.6 mm
179	55	290	1397	
302	55	423	2095	1047
425	55	536	2794	1397
443	55	554	2894	1447
548	55	659	3493	1746
566	55	677	3592	1796
689	55	800	4291	2145
812	55	923	4990	2495
935	55	1046	5688	2844
953	55	1064	5788	2894
1059	55	1170	6387	3193
1076	55	1187	6487	3243
1199	55	1310	7185	3592
1323	55	1434	7884	3942
1446	55	1557	8582	4291

Resolution 5.5 and 11 mm

Max. measuring range in mm	Min. MRE in mm	Min. L in mm	Resistance value in Ω	
			Resolution 5.5 mm	Resolution 11 mm
157	52	262	1996	
267	52	372	2994	1497
377	52	482	3992	1996
443	52	548	4590	2295
487	52	592	4990	2495
553	52	658	5588	2794
663	52	768	6586	3293
773	52	878	7584	3792
883	52	988	8582	4291
949	52	1054	9181	4590
993	52	1098	9580	4790
1059	52	1164	10179	5089
1169	52	1274	11177	5588
1279	52	1384	12175	6087
1389	52	1494	13173	6586

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Resolution 8.8 and 17.6 mm

Max. measuring range in mm	Min. MRE in mm	Min. L in mm	Resistance value in Ω	
			Resolution 8.8 mm	Resolution 17.6 mm
1463	55	1574	8682	4341
1569	55	1680	9281	4640
1587	55	1698	9381	4690
1710	55	1821	10079	5039
1833	55	1944	10778	5389
1956	55	2067	11477	5738
1974	55	2085	11576	5788
2079	55	2190	12175	6087
2097	55	2208	12275	6137
2220	55	2331	12974	6487
2343	55	2454	13672	6836
2467	55	2578	14371	7185
2484	55	2595	14471	7235
2590	55	2701	15069	7534
2607	55	2718	15169	7584
2731	55	2842	15868	7934
2854	55	2965	16566	8283
2977	55	3088	17265	8632
2995	55	3106	17365	8682
3118	55	3229	18063	9031
3241	55	3352	18762	9381
3364	55	3475	19461	9730
3487	55	3598	20159	10079
3505	55	3616	20259	10129
3611	55	3722	20858	10429
3628	55	3739	20958	10479
3751	55	3862	21656	10828
3875	55	3986	22355	11177
3998	55	4109	23053	11526
4015	55	4126	23153	11576

Resolution 5.5 and 11 mm

Max. measuring range in mm	Min. MRE in mm	Min. L in mm	Resistance value in Ω	
			Resolution 5.5 mm	Resolution 11 mm
1455	52	1560	13772	6886
1499	52	1604	14171	7085
1565	52	1670	14770	7385
1675	52	1780	15768	7884
1785	52	1890	16766	8383
1895	52	2000	17764	882
1961	52	2066	18363	9181
2005	52	2110	18762	9381
2071	52	2176	19361	9680
2181	52	2286	20359	10179
2291	52	2396	21357	10678
2401	52	2506	22355	11177
2467	52	2572	22954	11477
2511	52	2616	23353	11676
2577	52	2682	23952	11976
2687	52	2792	24950	12475
2797	52	2902	25948	12974
2907	52	3012	26946	13473
2973	52	3078	27544	13772
3017	52	3122	27944	13972
3083	52	3188	28542	14271
3193	52	3298	29540	14770
3303	52	3408	30538	15269
3413	52	3518	31536	15768
3479	52	3584	32135	16067
3523	52	3628	32534	16267
3589	52	3694	33133	16566
3699	52	3804	34131	17065
3809	52	3914	35129	17564
3919	52	4024	36127	18063
3985	52	4090	36726	18363
4029	52	4134	37125	18562

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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.

Connection		Terminal assignment				
		Cable	Cable socket	Connection housing/ Terminal head		Round plug M12
4 to 20 mA, two-wire (output 405)						
Voltage supply DC 8 to 30 V	U _B /S+ 0 V/S-	-	-	1 2	-	1 3
Resistance value (ohm) (output 501)						
Potentiometric		Silicone RD/BU, RD, WH PUR BU, BN, BK PVC GN, BN, WH		-		
Shielding						
Caution: ground the device! Ground all connected devices (such as pumps and valves) to the same potential! Functional bonding conductor		BK ^a				Metallic connector casing
Protection rating ^b		3	3	3	3	3

^a Around 1 cm longer than other stranded wires

^b According to DIN EN 61140

		Cable	Cable socket	Connection housing/ Terminal head	Round plug M12
Temperature sensor Pt100 ^a		Silicone BU, BU	-	 3, 4	-
Temperature sensor Pt1000 ^a					
Temperature switch ^a		-	-	 5, 6	-
Temperature transmitter voltage supply DC 8 to 30 V	U _B /S+ 0 V/S-	-	-	+ -	-

^a Assignment is always to terminals with the highest numbers

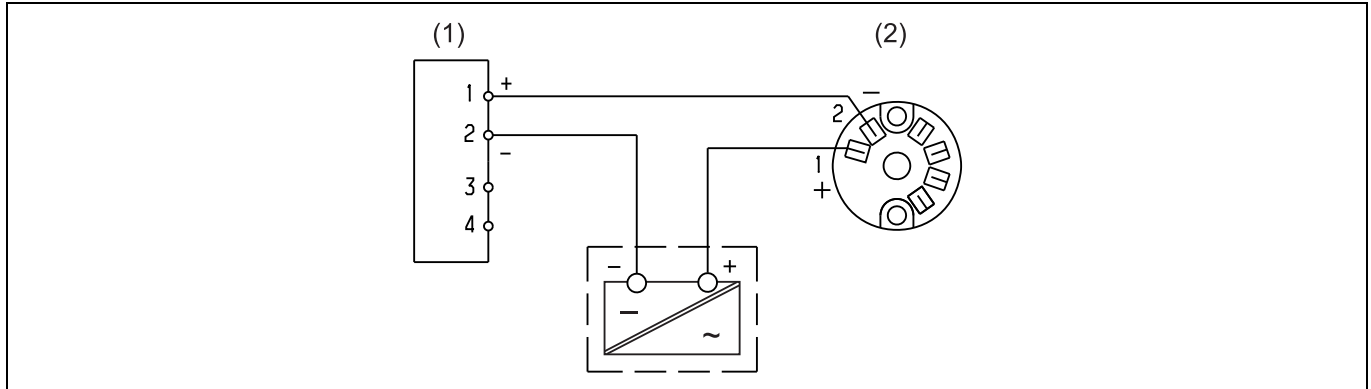
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Connection diagram



(1) Current loop display

(2) Transmitter connection diagram

(1) and (2) already installed in BUZ-H head; electrical connection supplied by the customer to terminal (+) transmitter and terminal (-) current loop display

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

Output	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
4 to 20 mA	≤ 30	≤ 100	≤ 750	~ 10 for cable version 1 μ H/m connecting cable	~ 1000 for cable version 200 pF/m connecting cable
Temperature switch				~ 0 for cable version 1 μ H/m connecting cable	~ 0 for cable version 200 pF/m connecting cable
Temperature transmitter					
Potentiometric output					

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

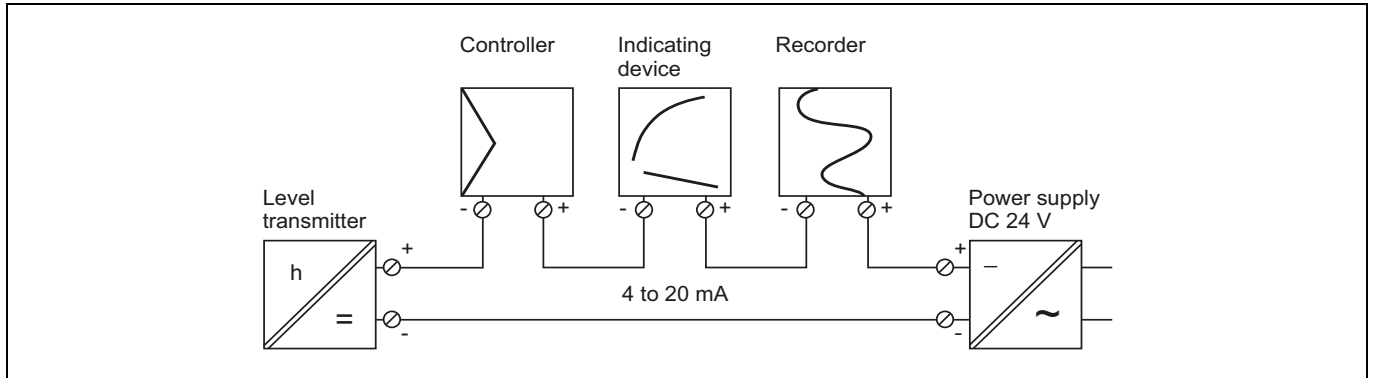
Temperature sensor	Max. voltage U_i in V	Max. current I_i in mA	Max. power P_i in mW	Internal inductance in μ H	Internal capacitance in pF
Pt100	≤ 30	≤ 55	≤ 413	~ 0 for cable version 1 μ H/m connecting cable	~ 0 for cable version 200 pF/m connecting cable
Pt1000					

Legend: cable	BN	Brown	RD	Red
	WH	White	YE	Yellow
	BU	Blue	OG	Orange
	GN	Green	BK	Black

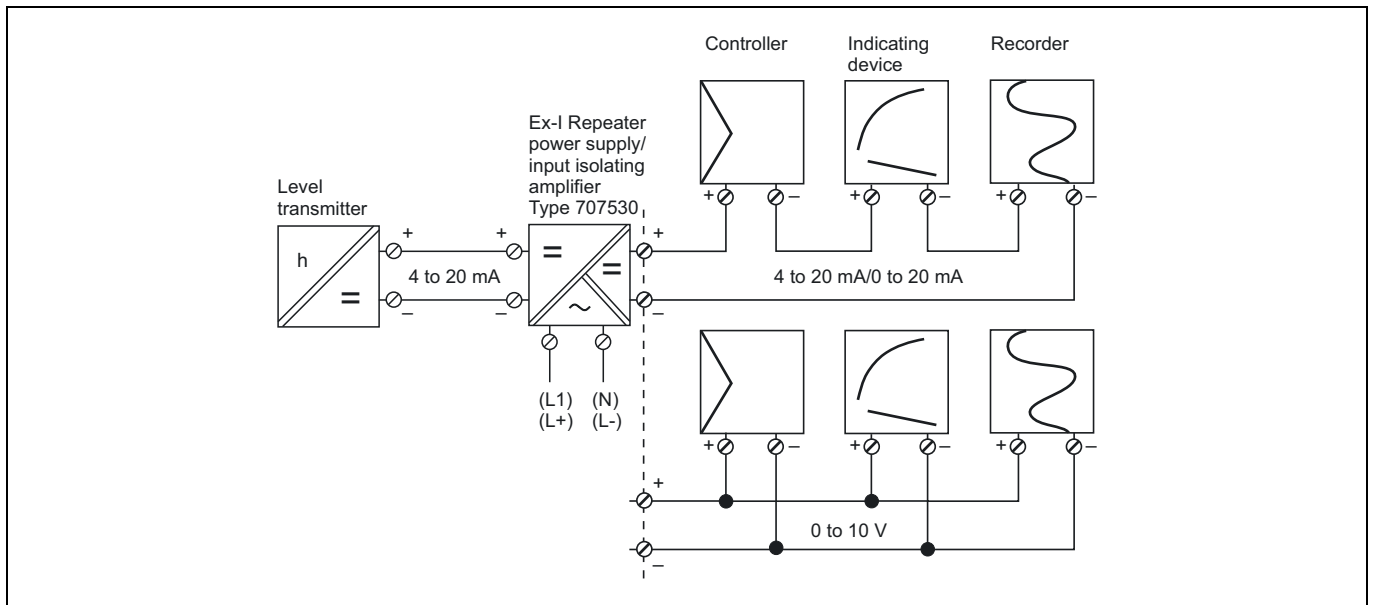


Connection examples

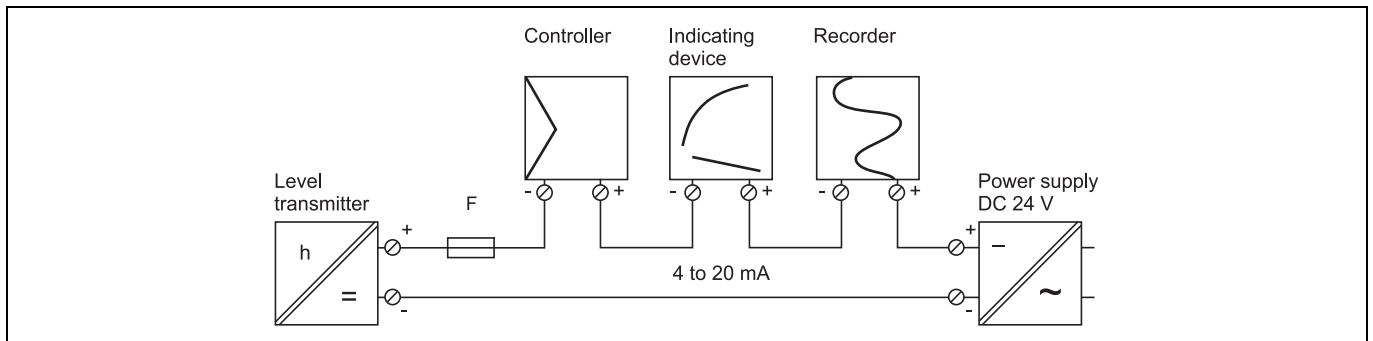
Standard



Ignition protection type Ex i



Ignition protection type 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
408320	JUMO NESOS R20 LT – Level transmitter via float
	(2) Basic type extension
000	None
062	Shipbuilding approval
362	Explosion protection, intrinsically safe, Ex i
462	Explosion protection, pressure resistant, Ex d
662	Shipbuilding approval and explosion protection, intrinsically safe, Ex i
962	Shipbuilding approval and explosion protection, pressure resistant, Ex d
999	Special version
	(3) Electrical connection
036	Round plug M12 × 1
061	Cable socket DIN EN 175301-803, form A
110	Terminal head BUZ
111	Terminal head BUZ-H
115	Terminal head Ex d
116	Terminal head Form BEGF with M12 connector
131	Connection housing, cube-shaped, large
150	Cable, PVC
152	Cable, PVC with M12 connector
160	Cable, silicone
162	Cable, silicone with M12 connector
170	Cable, PUR
172	Cable, PUR with M12 connector
999	Special version
	(4) Cable length
0	None
2000	2000 mm
5000	5000 mm
100 - 5000	Specifications in plain text
	(5) Process connection
516	2 NPT
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)
714	Flange 2" 300 lbs ANSI B 16.5 RF
729	Flange DN 50, PN40 EN 1092-1, form B1
784	Flange DN 65, PN40 EN 1092-1, form B1 with sealing strip
785	Flange DN 80, PN40 EN 1092-1, form B1 with sealing strip
999	According to customer specification
	(6) Guide tube diameter
12	12 mm
14	14 mm
	(7) Guide tube length L
100 - 4200	Specifications in plain text

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(8) Float	
044	Cylinder, CrNi (stainless steel), diameter 44, density 750 kg/m ³
045	Cylinder, CrNi (stainless steel), diameter 44, density 750 kg/m ³ , electropolished
052	Spherical, CrNi (stainless steel), diameter 52, density 680 kg/m ³
053	Spherical, CrNi (stainless steel), diameter 52, density 680 kg/m ³ , electropolished
744	Cylinder, Ti (titanium), diameter 44, density 750 kg/m ³
752	Spherical, Ti (titanium), diameter 52, density 650 kg/m ³
(9) Number of floats	
1	1 piece
2	2 pieces
3	3 pieces
4	4 pieces
(10) Output	
405	4 to 20 mA, two-wire
501	Resistance value (ohm)
(11) Accuracy	
5.5	5.5 mm
8.8	8.8 mm
11.0	11.0 mm
17.6	17.6 mm
(12) Measuring range start 4 mA	
217 - 4156	Specifications in plain text
(13) Measuring range end 20 mA	
52 - 3800	Specifications in plain text
(14) Display (LCD)	
0	Without
1	With
(15) Extra codes	
005	Integrated temperature sensor Pt1000
007	Integrated temperature sensor Pt100
009	Temperature switch, N/C contact
140	Temperature transmitter, analog, output 4 to 20 mA
307	Extension tube

Order code (1) / (2) - (3) - (4) - (5) - (6) - (7) - (8) -

Order example 408320 / 000 - 131 - 0 - 570 - 12 - 044 - 1 -

(9) - (10) - (11) - (12) - (13) - (14) / (15)

 1 - 405 - 8.8 - 1170 - 40 - 0 / 000

Minimum order volume: 1 piece




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Accessories

Designation	Description	Part no.
Ex-i repeater power supply and input isolating amplifier 	<p>The Ex-i repeater power supply and input isolating amplifier is designed for operating intrinsically safe (Ex-i) transmitters and mA current sources installed in Ex areas.</p> <p>Two-wire transmitters are supplied with energy and analog 0/4 to 20 mA measured values are transmitted from the Ex-area to the non-Ex-area. The output of the module can be operated actively or passively. Further technical data and the relevant safety requirements are available in the operating manual 707530.</p>	00577948
Cable box, straight 	<p>The PVC connecting cable is 2 m in length and has a 4-pole, straight M12 × 1 connector with gold-plated contacts on the device side.</p> <p>Not for Ex applications.</p>	00404585
Cable box, angled 	<p>The PVC connecting cable is 2 m in length and has a 4-pole, angled M12 × 1 connector with gold-plated contacts on the device side.</p> <p>Not for Ex applications.</p>	00409334
Mounting element 	<p>Mounting element, head transmitter for installation into a control cabinet (hole spacing 33 mm, C-rail, UL94 V0 material)</p>	00352463