

JUMO GmbH & Co. KG

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JUMO Instrument Co. Ltd.

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JUMO Process Control, Inc.

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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/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 330)
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	$R_L \leq (U_B - 8 \text{ V}) \div 0.023 \text{ A} (\Omega)$

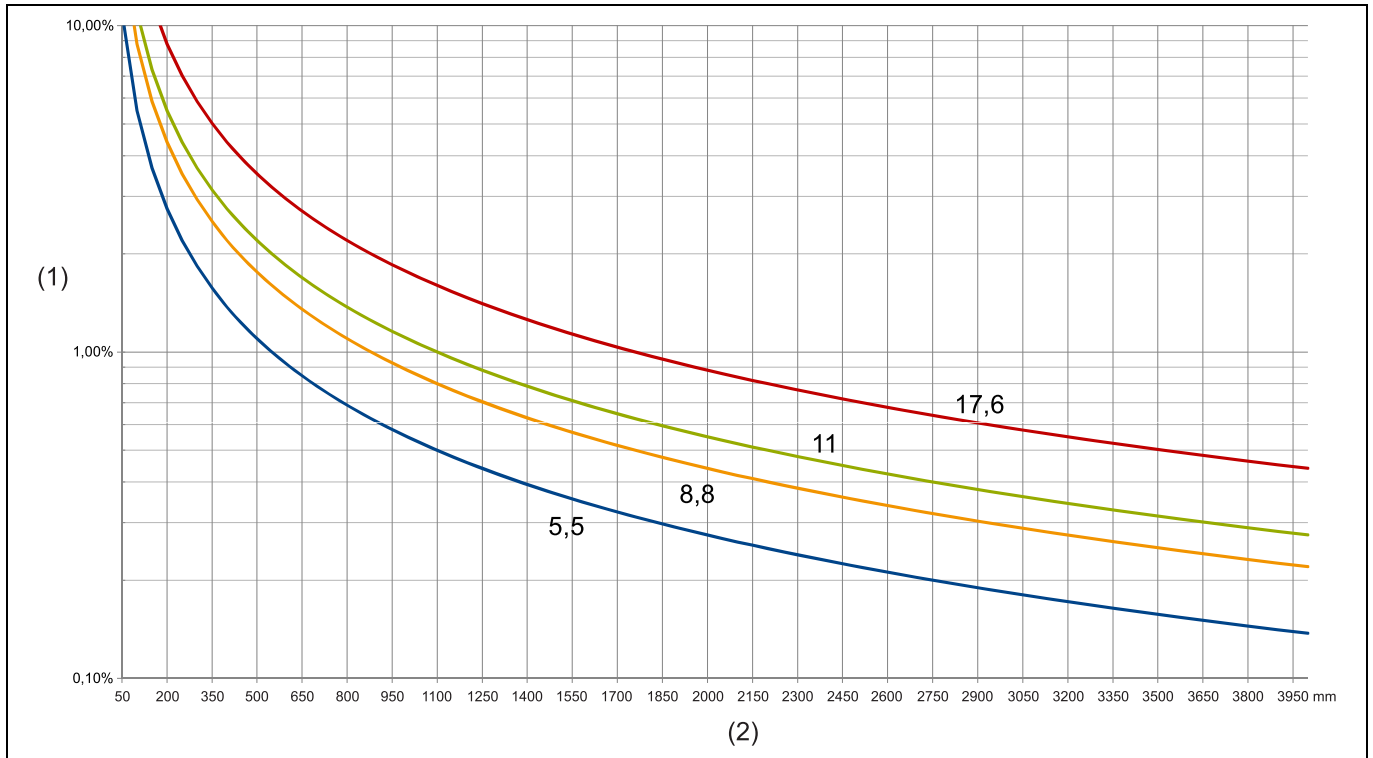
Resistance output	Resistance value (ohm), potentiometric three-wire (output 501)
Resistance value	Depending on the length and resolution, see "Important information about the order details", page 11

	Pt100	Pt1000	Temperature switch, N/C contact, SELV electrical circuit	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	Mass in g
044	Cylinder	AISI 316 series	44	650	-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 Connection housing, cube-shaped, large	PVC or silicone or PUR PBT GF30 PBT GF30 Aluminum, painted Aluminum, painted Aluminum, painted 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 U_B	DC 8 to 30 V, nominal voltage DC 24 V
Power consumption	5 to 800 mW
Current consumption	≤ 23 mA
Voltage supply	AC ≤ 50 V; DC ≤ 75 V in the event of potentiometric output
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".

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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
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 4 g for 25 to 100 Hz and freely oscillating guide tube length up to max. 1 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 +85 °C
Silicone cable, with M12 connector	-40 to +85 °C
PUR cable, with M12 connector	-40 to +85 °C
Round plug M12 × 1	-40 to +125 °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
Connection housing, cube-shaped, large	-40 to +81 °C
Process temperature	
of parts not in contact with medium (e.g. guide tube with float)	-40 to +150 °C (standard) -52 to +180 °C (upon request)

^a According to EN 61326-2-3

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

^c According to EN 61326-1

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

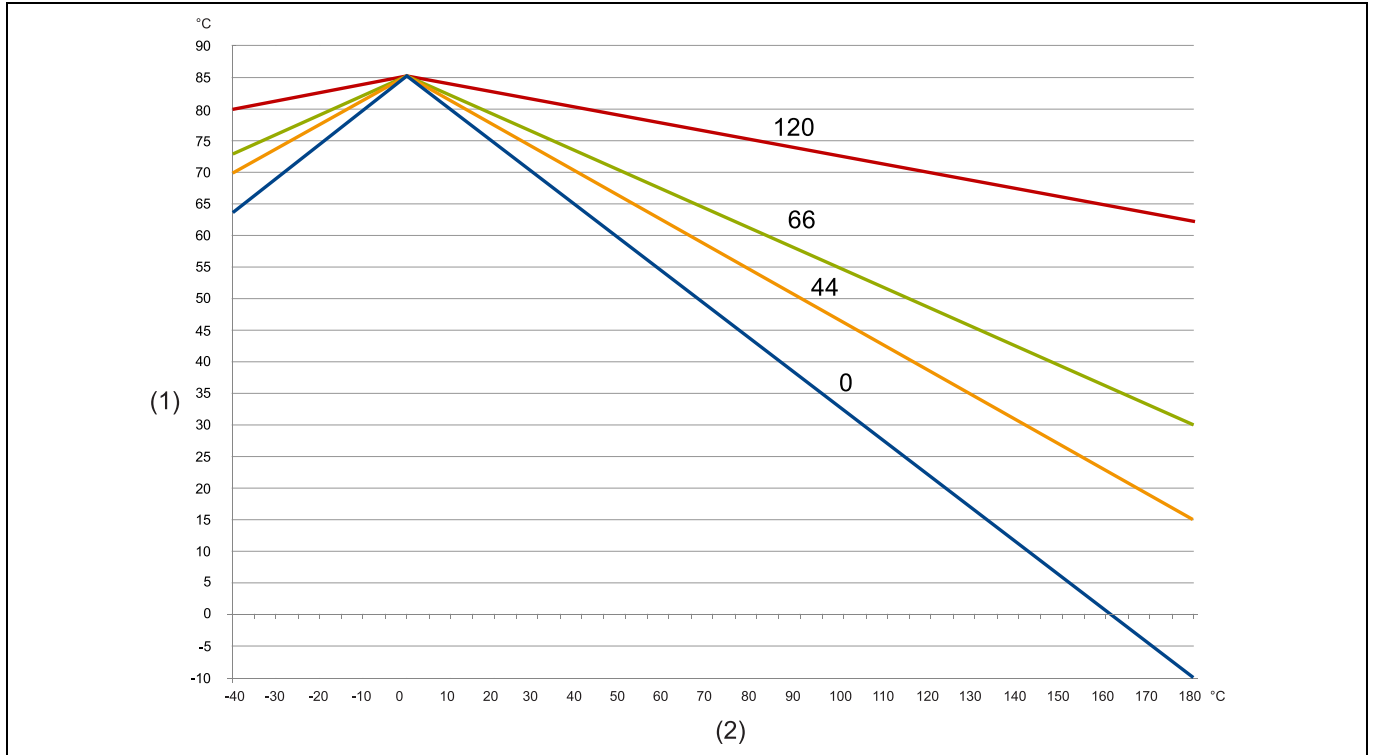


Fig. 0-1 Terminal head BUZ, extension tube lengths in mm

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

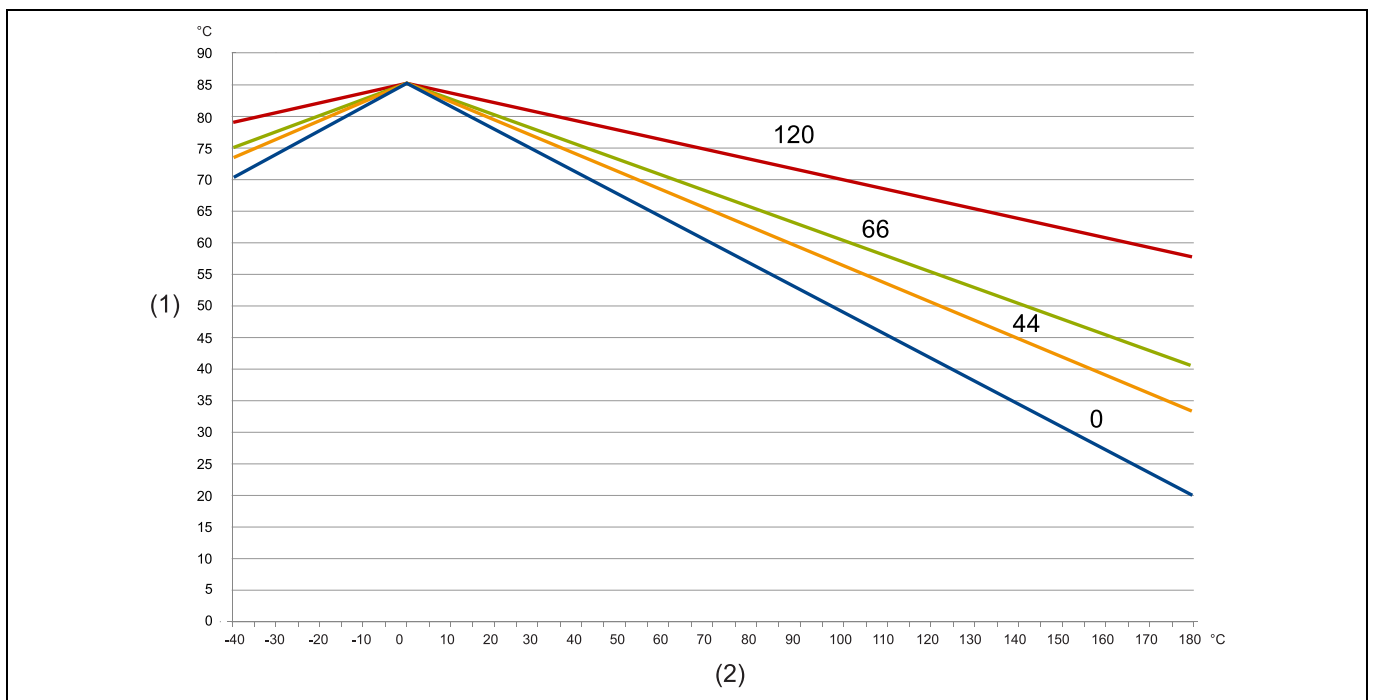


Fig. 0-2 Terminal head BUZ-H and connection housing Ex d, extension tube lengths in mm

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

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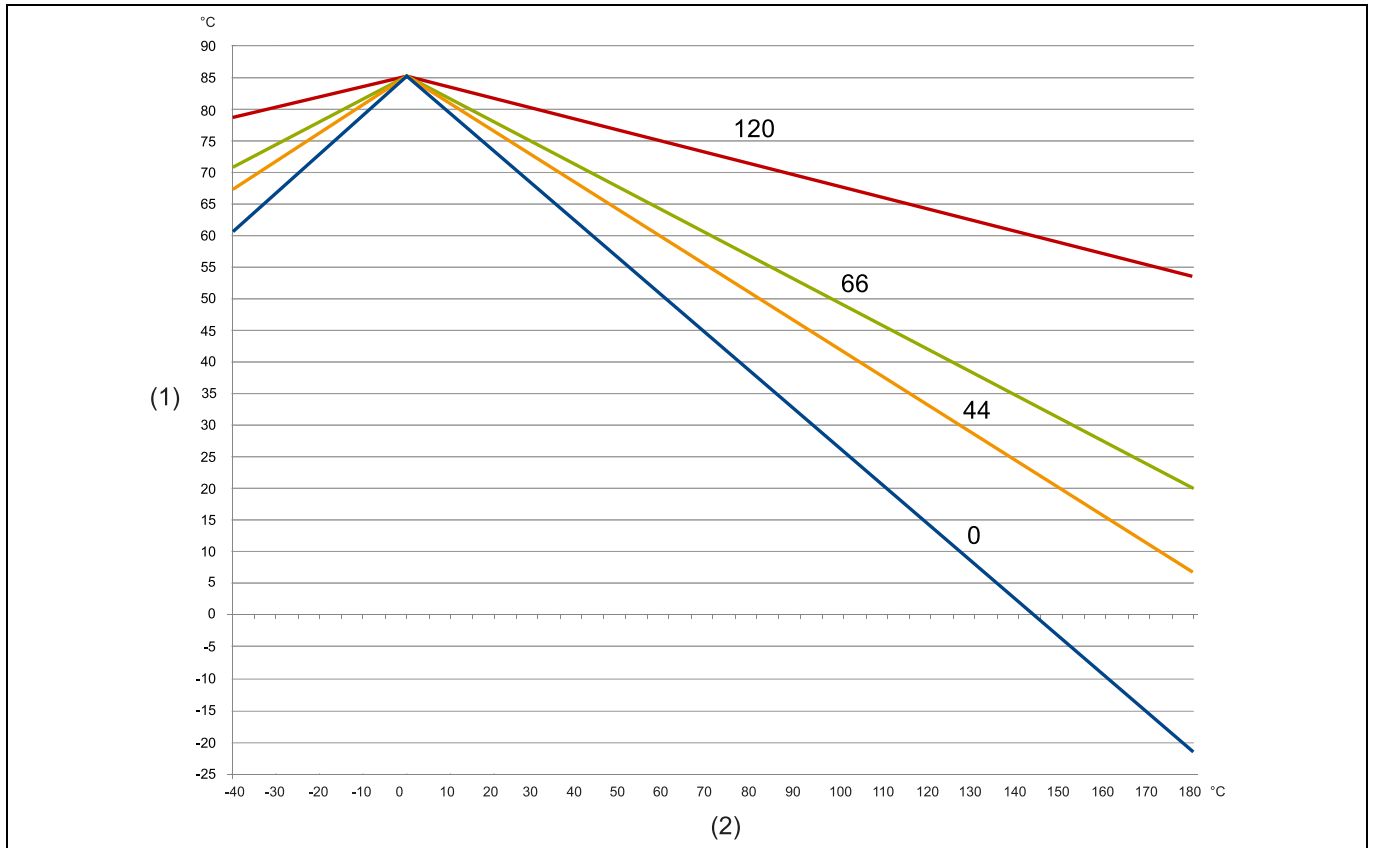


Fig. 0-3 Large connection housing, extension tube lengths in mm

- (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

Approvals/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	In preparation	Class Guidelines CG 0339, November 2016	Type 408320/062 Type 408320/662 Type 408320/962

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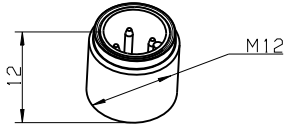
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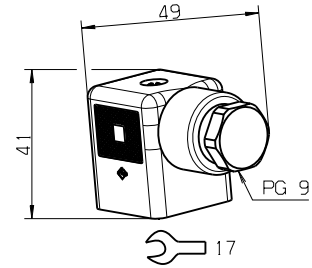
Dimensions

Electrical connection

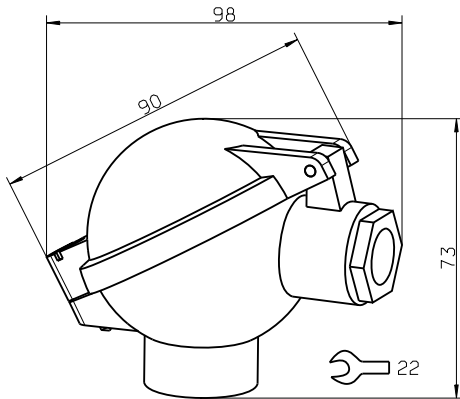
036
 Rundstecker M12 × 1



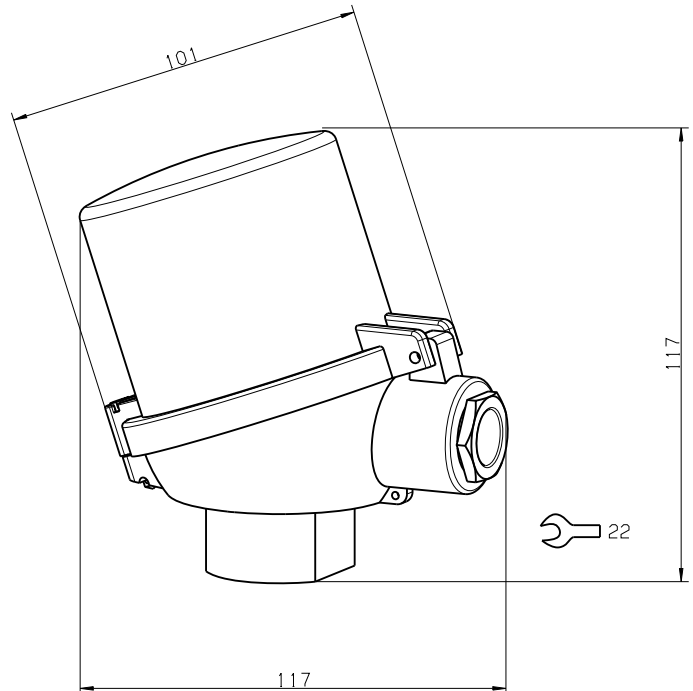
061
 Cable socket DIN EN 175301-803



110
 Terminal head BUZ



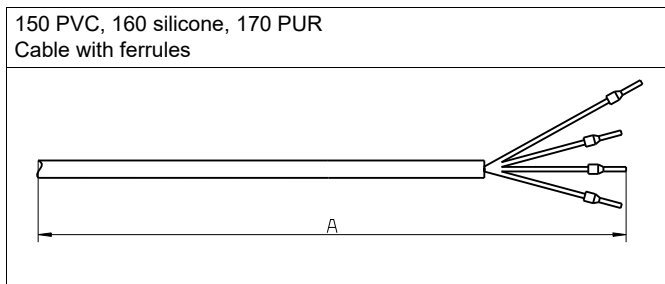
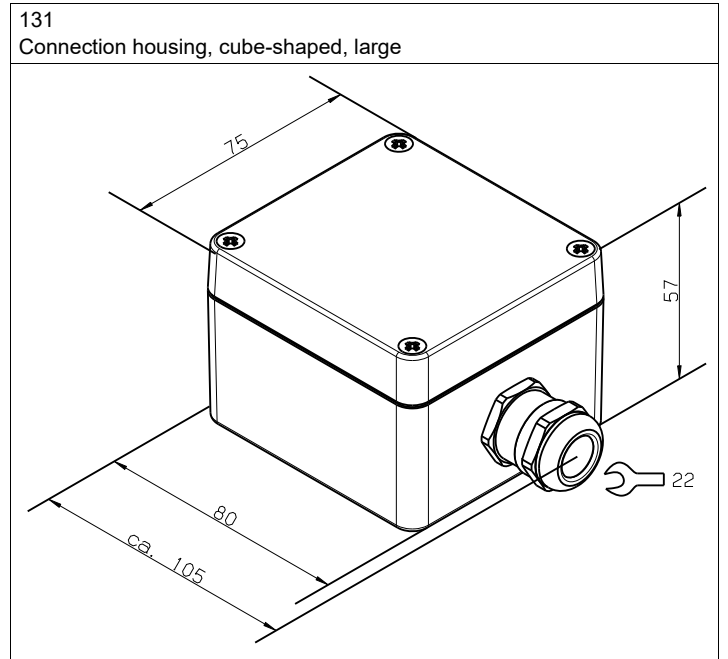
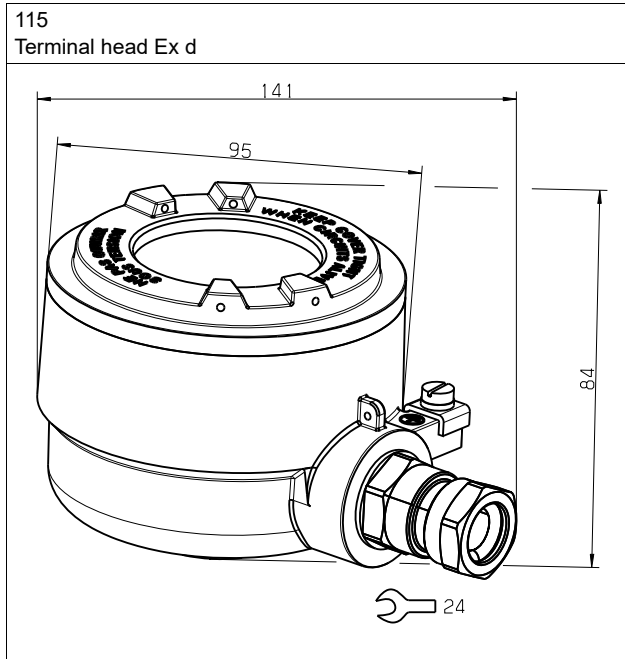
111
 Terminal head BUZ-H



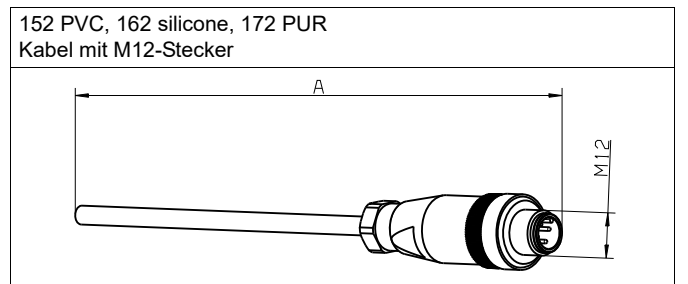
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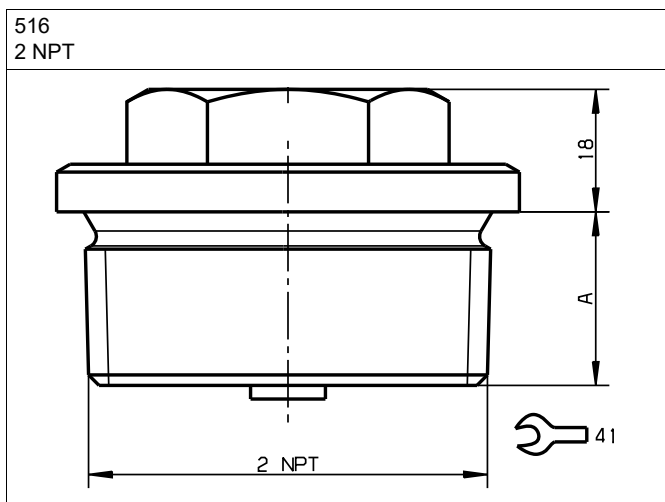


A Cable length, see order details

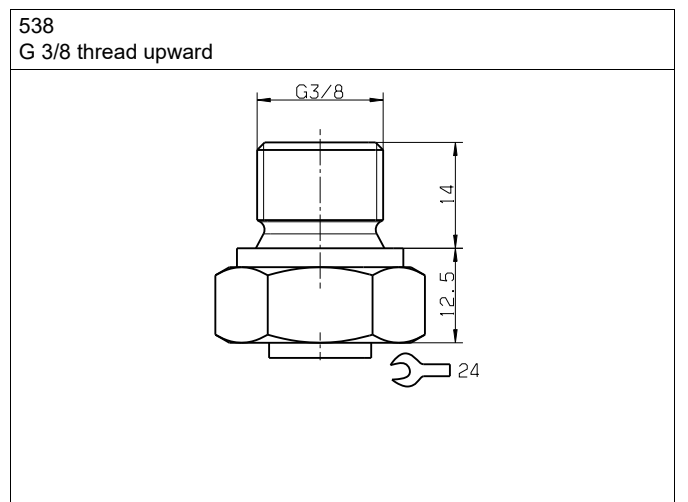


A Cable length, see order details

Process connections



A 25.5



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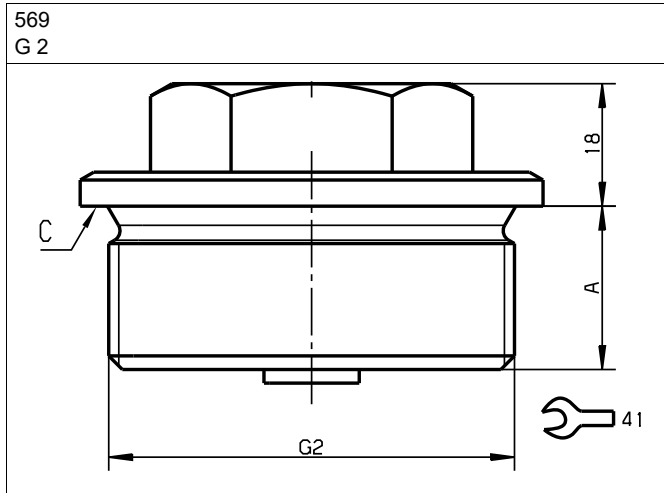
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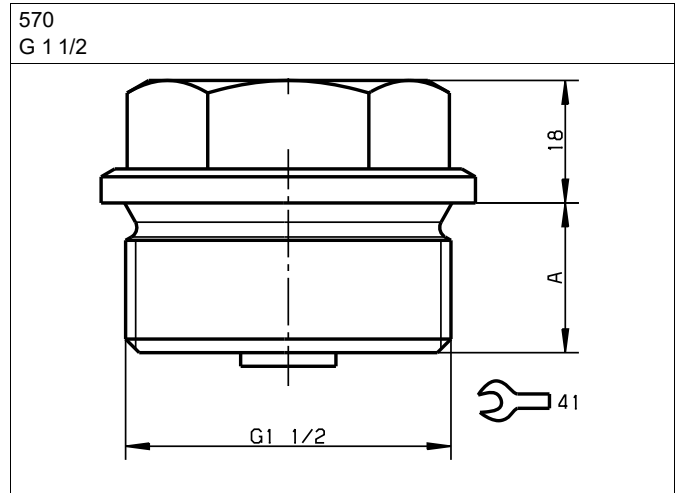
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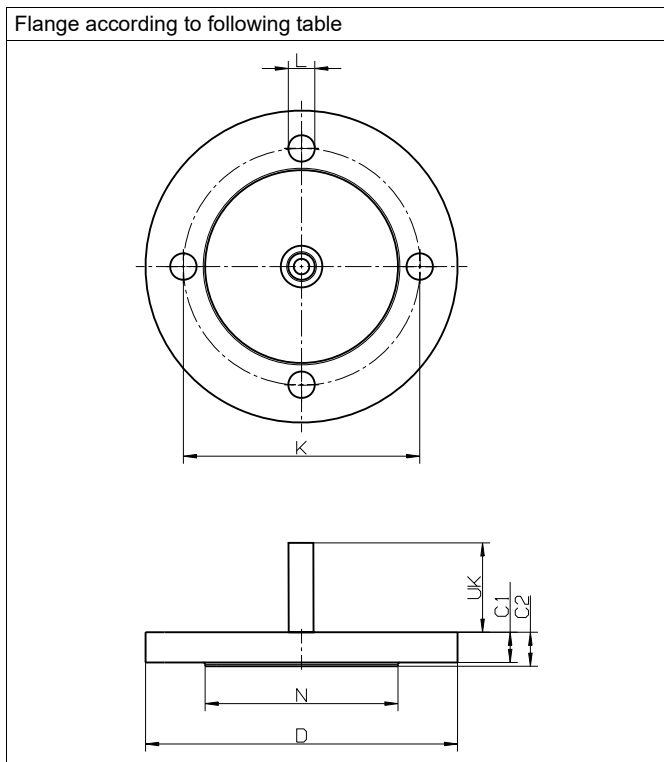
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A 24 (25.5 for Ex d)
C A seal/O-ring with a thickness of at least 2 mm is recommended.



A 22 (25.5 for Ex d)



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

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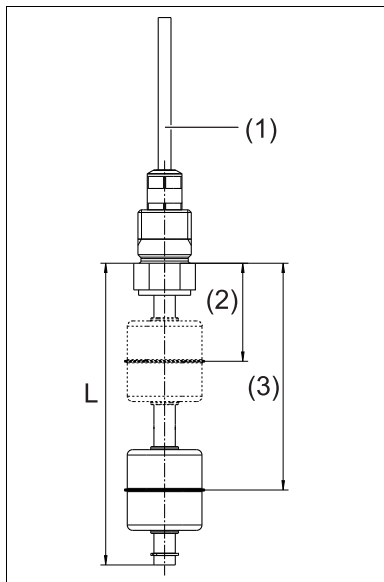
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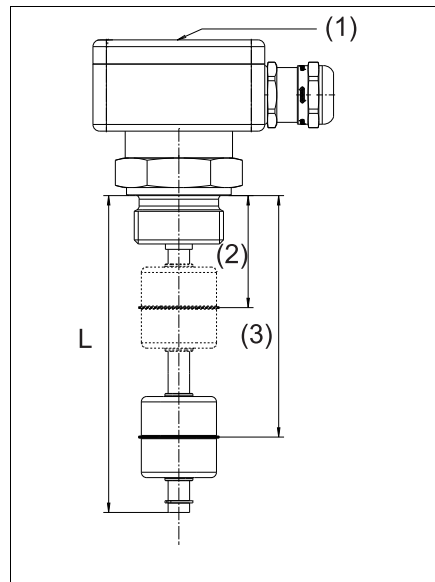
Order code	Flange designation	Hole circle K	Number of holes	Diameter of holes L	Exterior diameter D	Diameter of sealing strip N	Strength of flange C1	Strength of flange including sealing strip C2
714	Flange 2" 300 lbs ANSI B 16.5 RF	127	8	19	165.1	92.1	20.6	22.2
729	Flange DN 50, PN40 EN 1092-1, form 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

Important information about the order details

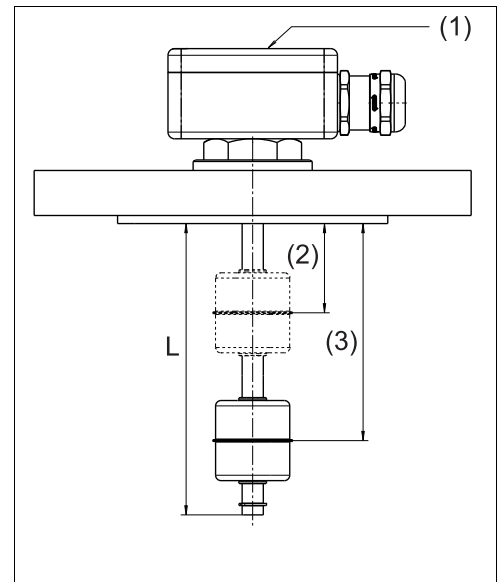
Below are examples for the dimensioning of the guide tube length L, of the measuring range start (3), and the measuring range end (2) depending on the respective process connection.



(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

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
189	55	300	1397	
312	55	423	2095	1047
435	55	546	2794	1397
453	55	564	2894	1447
558	55	669	3493	1746
576	55	687	3592	1796

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
165	52	270	1996	
275	52	380	2994	1497
385	52	490	3992	1996
451	52	556	4590	2295
495	52	600	4990	2495
561	52	666	5588	2794

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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
699	55	810	4291	2145
822	55	933	4990	2495
945	55	1056	5688	2844
963	55	1074	5788	2894
1069	55	1180	6387	3193
1086	55	1197	6487	3243
1209	55	1320	7185	3592
1333	55	1444	7884	3942
1456	55	1567	8582	4291
1473	55	1584	8682	4341
1579	55	1690	9281	4640
1597	55	1708	9381	4690
1720	55	1831	10079	5039
1843	55	1954	10778	5389
1966	55	2077	11477	5738
1984	55	2095	11576	5788
2089	55	2200	12175	6087
2107	55	2218	12275	6137
2230	55	2341	12974	6487
2353	55	2464	13672	6836
2477	55	2588	14371	7185
2494	55	2605	14471	7235
2600	55	2711	15069	7534
2617	55	2728	15169	7584
2741	55	2852	15868	7934
2864	55	2975	16566	8283
2987	55	3098	17265	8632
3005	55	3116	17365	8682
3110	55	3221	17964	8982
3128	55	3239	18063	9031
3251	55	3362	18762	9381
3374	55	3485	19461	9730
3497	55	3608	20159	10079
3515	55	3626	20259	10129
3621	55	3732	20858	10429
3638	55	3749	20958	10479
3761	55	3872	21656	10828
3885	55	3996	22355	11177
4008	55	4119	23053	11526

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
671	52	776	6586	3293
781	52	886	7584	3792
891	52	996	8582	4291
957	52	1062	9181	4590
1001	52	1106	9580	4790
1067	52	1172	10179	5089
1177	52	1282	11177	5588
1287	52	1392	12175	6087
1397	52	1502	13173	6586
1463	52	1568	13772	6886
1507	52	1612	14171	7085
1573	52	1678	14770	7385
1683	52	1788	15768	7884
1793	52	1898	16766	8383
1903	52	2008	17764	8882
1969	52	2074	18363	9181
2013	52	2118	18762	9381
2079	52	2184	19361	9680
2189	52	2294	20359	10179
2299	52	2404	21357	10678
2409	52	2514	22355	11177
2475	52	2580	22954	11477
2519	52	2624	23353	11676
2585	52	2690	23952	11976
2695	52	2800	24950	12475
2805	52	2910	25948	12974
2915	52	3020	26946	13473
2981	52	3086	27544	13772
3025	52	3130	27944	13972
3091	52	3196	28542	14271
3201	52	3306	29540	14770
3311	52	3416	30538	15269
3421	52	3526	31536	15768
3487	52	3592	32135	16067
3531	52	3636	32534	16267
3597	52	3702	33133	16566
3707	52	3812	34131	17065
3817	52	3922	35129	17564
3927	52	4032	36127	18063
3993	52	4098	36726	18363

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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	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	-
Resistance value (ohm) (output 501)					
Potentiometric	Silicone PUR PVC 		-		
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

^a Around 1 cm longer than other stranded wires

		Cable	Cable socket	Connection housing	Round plug M12
Temperature sensor Pt100 ^a		-	-		-
Temperature sensor Pt1000 ^a					
Temperature switch ^a		-	-		-
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

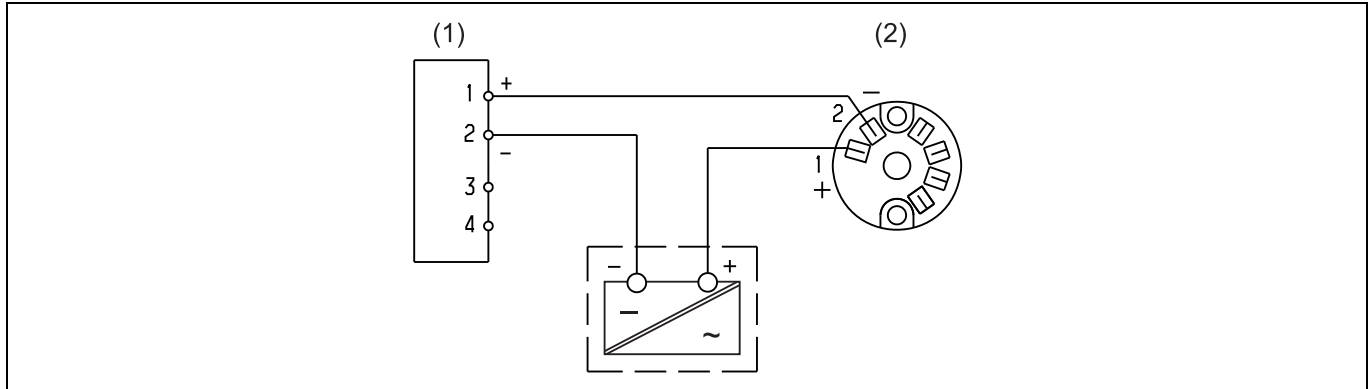
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Connection diagram



(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 U_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 bei Kabelaus- führung 200 pF/m connecting cable
Temperature switch				~ 0	~ 0
Temperature transmitter				for cable version 1 μ H/m connecting cable	bei Kabelaus- führung 200 pF/m connecting cable
Potentiometric output					

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

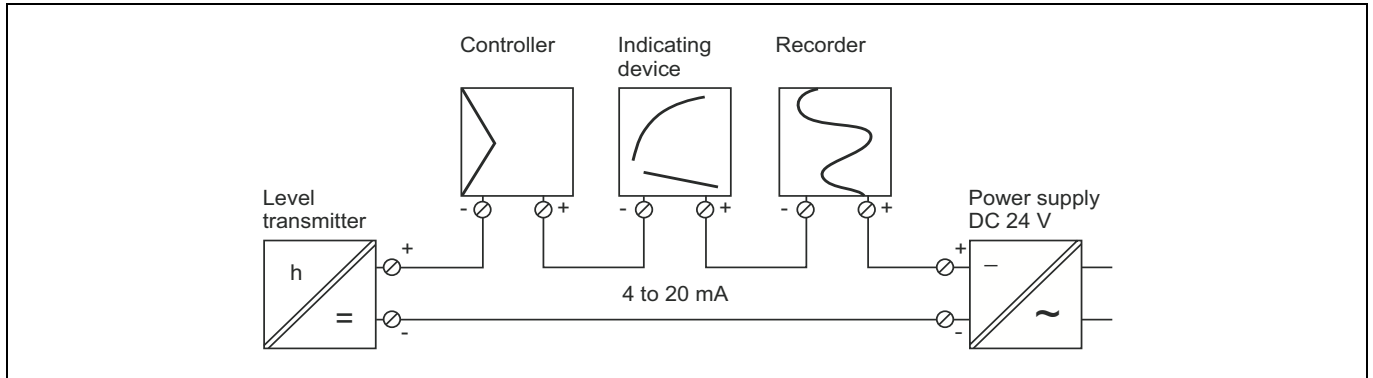
Temperature sensor	Max. voltage U_i in V	Max. current U_i in mA	Max. power P_i in mW	Internal inductance in μ H	Internal capacitance in pF
Pt100	≤ 30	≤ 55	≤ 413	~ 0	~ 0
Pt1000				for cable version 1 μ H/m connecting cable	bei Kabelaus- führung 200 pF/m connecting cable

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

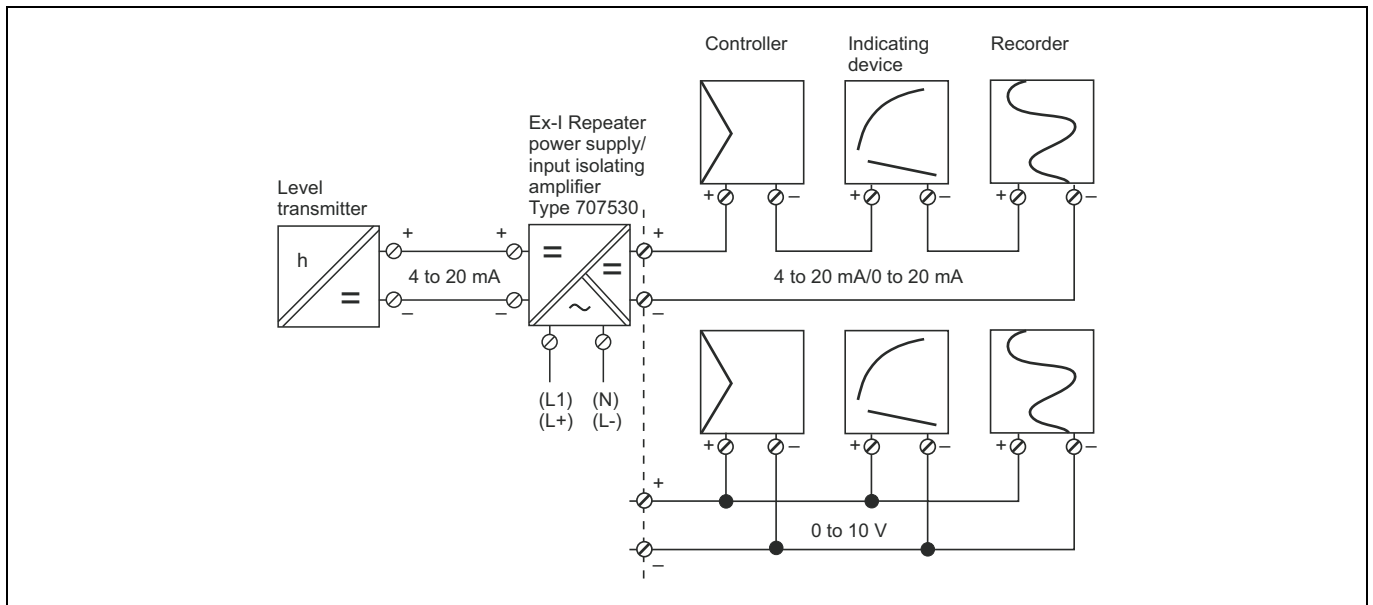


Connection examples

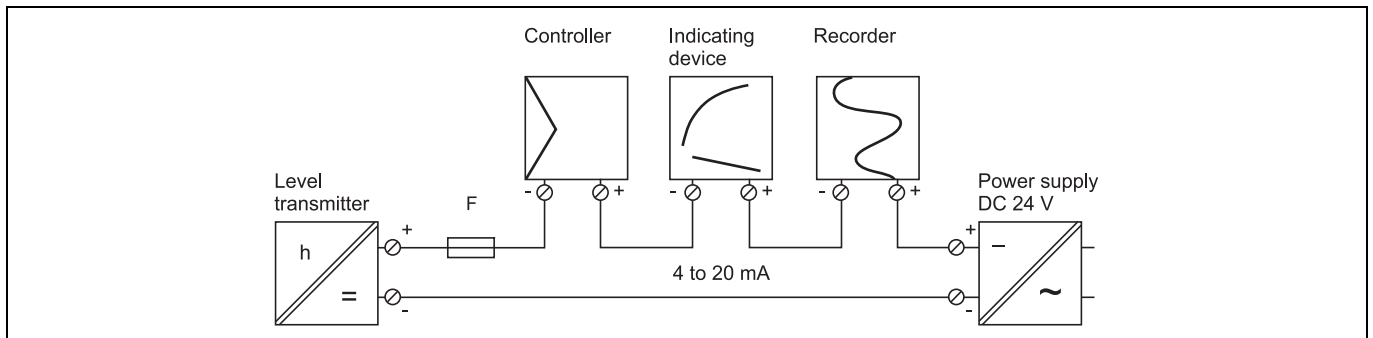
Standard



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
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
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
300 - 4200	Specifications in plain text





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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