

GROUPS OF PRODUCTS

Temperature Sensors with Replaceable Measuring Insert

A

Replaceable Measuring Inserts for Temperature Sensors

B

Temperature Sensors with Non-Replaceable Measuring Insert

C

Temperature Sensors with Ceramic Protection Tube

D

Temperature Sensors for Measurement of Machinery and Device Parts

E

Temperature Sensors for Surface Measurement

F

Mineral Insulated Sensors

G

Temperature Sensors for Air-conditioning and Ventilation System

H

Temperature Sensor for Heating Systems and Heat Engineering

I

Temperature Sensor for Food Industry

J

Temperature Sensors for Aggressive Environments

K

Temperature Sensors for Liquid Metals and Liquid Metal Alloys

L

Temperature Sensor for Shipbuilding Industry

M

Intrinsically Safe Temperature Sensors Exi

N

Intrinsically Safe Replaceable Measuring Inserts for Temperature Sensors Exi

O

Flameproof Temperature Sensors Exd

P

Flameproof Replaceable Measuring Inserts for Temperature Sensors Exd

R

Accessories for Temperature Sensors

S

Temperature Transmitters

T

<p>Introduction..... 3</p> <p>Temperature Sensors with Replaceable Measuring Insert</p> <p>TOPGB-11, TTJGB-11, TTKGB-11..... 24</p> <p>TOPGN-11, TTJGN-11, TTKGN-11..... 25</p> <p>TOPGN-54, TTJGN-54, TTKGN-54..... 26</p> <p>TOPP-11, TTJP-11, TTKP-11..... 27</p> <p>TOPT-11, TTJT-11, TTKT-11..... 28</p> <p>TTJU-45, TTKU-45..... 29</p> <p>TOPSW-11, 21, TTJSW-11, 21, TTKSW-11, 21..... 30</p> <p>TOPSWT/G-11, TTJSWT/G-11, TTKSWT/G-11..... 31</p> <p>TOPGI-11, 12, TTJGI-11, 12, TTKGI-11, 12..... 32</p> <p>TTJU-11, TTKU-11, TTKUO-11..... 33</p> <p>TTJU-1, TTKU-1..... 34</p> <p>TTJK-1, TTKK-1..... 35</p> <p>Replaceable Measuring Inserts for Temperature Sensors</p> <p>W1P, W1J, W1K..... 36</p> <p>W2P, W2J, W2K..... 37</p> <p>WM1P, WM1J, WM1K..... 38</p> <p>WM2P, WM2J, WM2K..... 39</p> <p>WDJ, WDK..... 40</p> <p>Temperature Sensors with Non-Replaceable Measuring Insert</p> <p>WTOPGN-6, WTTJGN-6, WTTKGN-6..... 41</p> <p>TOPGB-1, TTJGB-1, TTKGB-1..... 42</p> <p>TOPGN-1, TTJGN-1, TTKGN-1..... 43</p> <p>TOPGB-55, TTJGB-55, TTKGB-55..... 44</p> <p>TOPGN-55, TTJGN-55, TTKGN-55..... 45</p> <p>TOPGNN-2..... 46</p> <p>TOPGWN-4, TTJGWN-4, TTKGWN-4..... 47</p> <p>TOPI-6, 8, TTJI-6, 8, TTKI-6, 8..... 48</p> <p>TOPI-3, TTJI-3, TTKI-3..... 49</p> <p>TOPP-1, TTJP-1, TTKP-1..... 50</p> <p>Temperature Sensors with Ceramic Protection Tube</p> <p>TTSCU-22, TTRCU-22, TTKCU-22..... 51</p> <p>TTSC-22, TTRC-22, TTBC-22, TTKC-22..... 52</p> <p>TTSCC-22, TTRCC-22, TTBC-22..... 53</p> <p>TTSC-42, TTRC-42, TTBC-42..... 54</p> <p>TTSCS-22, TTRCS-22, TTBCS-22..... 55</p> <p>TTSC-ACT, TTBC-ACT, TTRC-ACT..... 56</p> <p>Temperature Sensors for Measurement of Machinery and Device Parts</p> <p>TTJE-11, 13, TTKE-11, 13..... 57</p> <p>TOPE-26, TTJE-26, TTKE-26..... 58</p> <p>TOPE-28, TTJE-28, TTKE-28..... 59</p> <p>TOPE-3, 4, TTJE-3, 4, TTKE-3, 4..... 60</p> <p>TOPE-5, TTJE-5, TTKE-5..... 61</p> <p>TOPGE-3, TTJGE-3, TTKGE-3..... 62</p> <p>TOPGE-5, 6, TTJGE-5, 6, TTKGE-5, 6..... 63</p> <p>TOPGE-7..... 64</p> <p>TOPMK-1, TOPMK-2..... 65</p> <p>TOPE-89, TONE-89..... 66</p> <p>TTJE-152, TTKE-152..... 67</p> <p>TOPE-361, 362, TTJ/KE-361, TTJ/KE-362..... 68</p> <p>TOPE-363, 364, 365, 366, TTJ/KE-363, 364, 365, 366..... 69</p> <p>TTPJ-187, TTPK-187..... 70</p> <p>TOPGSP-1..... 71</p> <p>TOPI-M12, TONI-M12..... 72</p> <p>TOPG-M12, TONG-M12..... 73</p> <p>TOPE-408..... 74</p> <p>TOPE-462, TTJE-462, TTKE-462..... 75</p> <p>TTJE-621, TTKE-621..... 76</p> <p>TOPWO-1, TTJWO-1, TTKWO-1..... 77</p> <p>TOPWO-2, TTJWO-1, TTKWO-2..... 78</p> <p>Temperature Sensors for Surface Measurement</p> <p>TOPE-6, TTJE-6, TTKE-6..... 79</p> <p>PTR-24, PTR-25..... 80</p> <p>TTJ/KE-86, TTJ/KE-87..... 81</p> <p>TTJE-306, TTKE-306..... 82</p> <p>TOPE-243, TTJE-243, TTKE-243..... 83</p> <p>TOPE-244, TONE-244..... 84</p> <p>TOP-AL2, TTJ-AL2, TTK-AL2..... 85</p>	<p>Mineral Insulated Sensors</p> <p>XL-PTTK, XL-PTTN..... 86</p> <p>PTTJ, PTTK..... 87</p> <p>PTOP..... 88</p> <p>PTR-1..... 89</p> <p>PTR-3, PTR-2..... 90</p> <p>PTTJ-147, PTTK-147..... 91</p> <p>PTTJ-183, PTTK-183..... 92</p> <p>PTOP-453, PTTJ-453, PTTK-453..... 93</p> <p>PTOP-533, PTTJ-533, PTTK-533..... 94</p> <p>PTOP-186, PTTJ-186, PTTK-186..... 95</p> <p>Temperature Sensors for Air-conditioning and Ventilation System</p> <p>TOPW-1, TOPWE-1..... 96</p> <p>TOPK-849, TONK-849..... 97</p> <p>TOPM-5, TONM-5..... 98</p> <p>TOPO-833, TONO-833..... 99</p> <p>TOPO-831, TONO-831..... 100</p> <p>TOPZ-850, TONZ-850..... 101</p> <p>Temperature Sensor for Heating Systems and Heat Engineering</p> <p>TOP-145..... 102</p> <p>TOP-172..... 103</p> <p>TOP-216..... 104</p> <p>TOP-226..... 105</p> <p>TOP-231..... 106</p> <p>TOPE-L0384..... 107</p> <p>Temperature Sensor for Food Industry</p> <p>TOPE-413..... 108</p> <p>TOPE-414..... 109</p> <p>TOPT-287..... 110</p> <p>TOPGNS, TTJGNS, TTKGNS..... 111</p> <p>TOPA-1..... 112</p> <p>Temperature Sensors for Aggressive Environments</p> <p>TTSC-42, TTRC-42, TTBC-42..... 113</p> <p>TTJC-38, TTKC-38..... 114</p> <p>TOPCV-1, TOPCVE-1..... 115</p> <p>TOPSZ-157, TOPSZE-157..... 116</p> <p>TOPE-142..... 117</p> <p>Temperature Sensors for Liquid Metals and Liquid Metal Alloys</p> <p>TTJC-37, TTKC-37..... 118</p> <p>Temperature Sensor for Shipbuilding Industry</p> <p>TTKLE-1..... 119</p> <p>TOPG-31/M, TONG-31/M..... 120</p> <p>Intrinsically Safe Temperature Sensors Exi</p> <p>TOPGB-Exi, TTJGB-Exi, TTKGB-Exi..... 121</p> <p>TOPGN-Exi, TTJGN-Exi, TTKG-Exi..... 122</p> <p>TOPT-Exi, TTJT-Exi, TTKT-Exi..... 123</p> <p>TOPP-Exi, TTJP-Exi, TTKP-Exi..... 124</p> <p>TOPI-Exi, TTJI-Exi, TTKI-Exi..... 125</p> <p>TOPSW-Exi, TTJSW-Exi, TTKSW-Exi..... 126</p> <p>TOPSWG/T-Exi, TTJSWG/T-Exi, TTKSWG/T-Exi..... 127</p> <p>TOPGWN-Exi, TTJGWN-Exi, TTKGWN-Exi..... 128</p> <p>TTSC-22Exi, TTRC-22Exi, TTBC-22Exi..... 129</p> <p>TOPE - 244Exi..... 130</p> <p>TOPE - 361Exi, TTJE - 361Exi, TTKE - 361Exi..... 131</p> <p>TOPE - 363Exi, TTJE - 363Exi, TTKE - 363Exi..... 132</p> <p>TOPE - 365Exi, TTJE - 365Exi, TTKE - 365Exi..... 133</p> <p>TOPZ-842Exi..... 134</p> <p>Intrinsically Safe Replaceable Measuring Inserts for Temperature Sensors Exi</p> <p>W1/2P-Exi, W1/2J-Exi, W1/2K-Exi..... 135</p> <p>Flameproof Temperature Sensors Exd</p> <p>TOPGB-Exd, TTJGB-Exd, TTKGB-Exd..... 136</p> <p>TOPGN-Exd, TTJGN-Exd, TTKG-Exd..... 137</p> <p>TOPP-Exd, TTJP-Exd, TTKP-Exd..... 138</p> <p>TOPT-Exd, TTJT-Exd, TTKT-Exd..... 139</p> <p>TOPSW-Exd, TTJSW-Exd, TTKSW-Exd..... 140</p> <p>TOPSWT-Exd, TTJSWT-Exd, TTKSWT-Exd..... 141</p> <p>TOPSWG-Exd, TTJSWG-Exd, TTKSWG-Exd..... 142</p> <p>TOPI-Exd, TTJI-Exd, TTKI-Exd..... 143</p>
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Flameproof Replaceable Measuring Inserts for Temperature Sensors Exd

WP-Exd, WJ-Exd WK-Exd.....144

Accessories for Temperature Sensors

Compensation Cables 145
 Plugs and Sockets 146
 Ceramic Protection Tube OC 147
 Coupling for Welding MP, MS 148
 Protection Tube OS-1, OS-2 148
 Protection Tube OS-3..... 149
 Protection Tube OS-4..... 149
 Thermowell OG 150
 Thermowell OSG..... 151
 Thermowell OGG 152
 Thermowell OTG..... 153
 Thermowell SW 154
 Sensor Mounting Fittings 155
 Connection Heads for Temperature Sensors 157

Head Mounted Digital Display LPI-01 160
 Head Mounted Digital Display LPI-02 161

Temperature Transmitters

Temperature Transmitters APAQ-HRF/HRFX, APAQ-LR... 162
 Temperature Transmitters APAQ-HCF/HCFX, APAQ-LC... 163
 Temperature Transmitters APAQ-3HPT, APAQ-3LPT 164
 Temperature Transmitters MINIPAQ-HLP, MINIPAQ-L 165
 Temperature Transmitters IPAQ-H, IPAQ-H PLUS, IPAQ-HX..... 166
 Temperature Transmitters MESO-H, MESO-HX 167
 Temperature Transmitters TxBlock, TxRail 168
 Temperature Transmitters TxIsoBlock, TxIsoRail..... 169
 Temperature Transmitters LTT-03B, LTT-03BU, LTT-03J LTT-03T, LTT-03TU 170
 Temperature Transmitters LTT-01, LTT-01T 171
 Temperature Transmitters FLEX TOP 2202, 2203 172
 Temperature Transmitters FLEX TOP 2211, 2221, 2231 ... 173
 Temperature Transmitters RESEMOUNT 248H, 248R 174

PLATINUM AND NICKEL SENSORS OF INDUSTRIAL RESISTANCE THERMOMETERS

Platinum and nickel resistance sensors are devices which react to temperature change by resistance change of the built-in resistor. In protection tube, besides the thermometric resistor, insulated inner wires and outer clamps for the electrical measuring units connection are included. Mounting elements and connection heads can be included.

PN-EN 60751: 2009 defines dependence between the temperature and resistance for platinum resistors on the basis of the following formulas:

for range – 200°C to 0°C

$$R_t = R_0 [1 + At + Bt^2 + C (t - 100^\circ\text{C}) t^3]$$

for range – 0°C to 850°C

$$R_t = R_0 (1 + At + Bt^2)$$

Constant values for platinum of the quality used for the industrial resistance thermometers are following:

$$A = 3,9083 \times 10^{-3} \text{ } ^\circ\text{C}^{-1}$$

$$B = -5,775 \times 10^{-7} \text{ } ^\circ\text{C}^{-2}$$

$$C = -4,183 \times 10^{-12} \text{ } ^\circ\text{C}^{-4}$$

For resistance thermometers temperature coefficient α is defined as:

$$\alpha = (R_{100} - R_0) / (100 \times R_0) = 0,00385^\circ\text{C}^{-1}$$

R_{100} – resistance for 100°C

R_0 – resistance for 0°C

Exact value 0,00385055°C⁻¹ is used for calculations

Dependence between the temperature and resistance for nickel sensors in full operating range (from -60 to 250°C) is calculated on the basis of the following formula (acc. to DIN 43760):

$$R_t = R_0 (1 + 0,5485 \times 10^{-2}t + 0,665 \times 10^{-5}t^2 + 2,805 \times 10^{-11}t^4 - 2 \times 10^{-17}t^6)$$

where:

R_0 – resistance for temperature 0°C

R_t – resistance for temperature t

t – temperature in °C

For temperature range – 60°C do 180°C component $-2 \times 10^{-17}t^6$ can be omitted.

1. Nominal resistance value for platinum resistors Pt100 dependent on temperature /acc. to PN-EN 60751:2009/

°C	0	1	2	3	4	5	6	7	8	9
-200	18,52									
-190	22,83	22,4	21,97	21,54	21,11	20,68	20,25	19,82	19,38	18,95
-180	27,10	26,67	26,24	25,82	25,39	24,97	24,54	24,11	23,68	23,25
-170	31,34	30,91	30,49	30,07	29,64	29,22	28,8	28,37	27,95	27,52
-160	35,54	35,12	34,70	34,28	33,86	33,44	33,02	32,6	32,18	31,76
-150	39,72	39,31	38,89	38,47	38,05	37,64	37,22	36,8	36,38	35,96
-140	43,88	43,46	43,05	42,63	42,22	41,8	41,39	40,97	40,56	40,14
-130	48,00	47,59	47,18	46,77	46,36	45,94	45,53	45,12	44,7	44,29
-120	52,11	51,7	51,29	50,88	50,47	50,06	49,65	49,24	48,83	48,42
-110	56,19	55,79	55,38	54,97	54,56	54,15	53,75	53,34	52,93	52,52
-100	60,26	59,85	59,44	59,04	58,63	58,23	57,82	57,41	57,01	56,6
-90	64,30	63,9	63,49	63,09	62,68	62,28	61,88	61,47	61,07	60,66
-80	68,33	67,92	67,52	67,12	66,72	66,31	65,91	65,51	65,11	64,7
-70	72,33	71,93	71,53	71,13	70,73	70,33	69,93	69,53	69,13	68,73
-60	76,33	75,93	75,53	75,13	74,73	74,33	73,93	73,53	73,13	72,73
-50	80,31	79,91	79,51	79,11	78,72	78,32	77,92	77,52	77,12	76,73
-40	84,27	83,87	83,48	83,08	82,69	82,29	81,89	81,50	81,1	80,7
-30	88,22	87,83	87,43	87,04	86,64	86,25	85,85	85,46	85,06	84,67
-20	92,16	91,77	91,37	90,98	90,59	90,19	89,8	89,40	89,01	88,62
-10	96,09	95,69	95,30	94,91	94,52	94,12	93,73	93,34	92,95	92,55
0	100,00	99,61	99,22	98,83	98,44	98,04	97,65	97,26	96,87	96,48

°C	0	1	2	3	4	5	6	7	8	9
0	100	100,39	100,78	101,17	101,56	101,95	102,34	102,73	103,12	103,51
10	103,9	104,29	104,68	105,07	105,46	105,85	106,24	106,63	107,02	107,4
20	107,79	108,18	108,57	108,96	109,35	109,73	110,12	110,51	110,9	111,29
30	111,67	112,06	112,45	112,83	113,22	113,61	114	114,38	114,77	115,15
40	115,54	115,93	116,31	116,7	117,08	117,47	117,86	118,24	118,63	119,01
50	119,4	119,78	120,17	120,55	120,94	121,32	121,71	122,09	122,47	122,86
60	123,24	123,63	124,01	124,39	124,78	125,16	125,54	125,93	126,31	126,69
70	127,08	127,46	127,84	128,22	128,61	128,99	129,37	129,75	130,13	130,52
80	130,9	131,28	131,66	132,04	132,42	132,8	133,18	133,57	133,95	134,33
90	134,71	135,09	135,47	135,85	136,23	136,61	136,99	137,37	137,75	138,13
100	138,51	138,88	139,26	139,64	140,02	140,4	140,78	141,16	141,54	141,91
110	142,29	142,67	143,05	143,43	143,8	144,18	144,56	144,94	145,31	145,69
120	146,07	146,44	146,82	147,2	147,57	147,95	148,33	148,7	149,08	149,46
130	149,83	150,21	150,58	150,96	151,33	151,71	152,08	152,46	152,83	153,21
140	153,58	153,96	154,33	154,71	155,08	155,46	155,83	156,2	156,58	156,95
150	157,33	157,7	158,07	158,45	158,82	159,19	159,56	159,94	160,31	160,68
160	161,05	161,43	161,8	162,17	162,54	162,91	163,29	163,66	164,03	164,4
170	164,77	165,14	165,51	165,89	166,26	166,63	167	167,37	167,74	168,11
180	168,48	168,85	169,22	169,59	169,96	170,33	170,7	171,07	171,43	171,8
190	172,17	172,54	172,91	173,28	173,65	174,02	174,38	174,75	175,12	175,49
200	175,86	176,22	176,59	176,96	177,33	177,69	178,06	178,43	178,79	179,16
210	179,53	179,89	180,26	180,63	180,99	181,36	181,72	182,09	182,46	182,82
220	183,19	183,55	183,92	184,28	184,65	185,01	185,38	185,74	186,11	186,47
230	186,84	187,2	187,56	187,93	188,29	188,66	189,02	189,38	189,75	190,11
240	190,47	190,84	191,21	191,56	191,92	192,29	192,65	193,01	193,37	193,74
250	194,1	194,46	194,82	195,18	195,55	195,91	196,27	196,63	196,99	197,35
260	197,71	198,07	198,43	198,79	199,15	199,51	199,87	200,23	200,59	200,95
270	201,31	201,67	202,03	202,39	202,75	203,11	203,47	203,83	204,19	204,55
280	204,9	205,26	205,62	205,98	206,34	206,7	207,05	207,41	207,77	208,13
290	208,48	208,84	209,2	209,56	209,91	210,27	210,63	210,98	211,34	211,7
300	212,05	212,41	212,76	213,12	213,48	213,83	214,19	214,54	214,9	215,25
310	215,61	215,96	216,32	216,67	217,03	217,38	217,74	218,09	218,44	218,8
320	219,15	219,51	219,86	220,21	220,57	220,92	221,27	221,63	221,98	222,33
330	222,68	223,04	223,39	223,74	224,09	224,45	224,8	225,15	225,5	225,85
340	226,21	226,56	226,91	227,26	227,61	227,96	228,31	228,66	229,02	229,37
350	229,72	230,07	230,42	230,77	231,12	231,47	231,82	232,17	232,52	232,87
360	233,21	233,56	233,91	234,26	234,61	234,96	235,31	235,66	236	236,35
370	236,7	237,05	237,4	237,74	238,09	238,44	238,79	239,13	239,48	239,83
380	240,18	240,52	240,87	241,22	241,56	241,91	242,26	242,6	242,95	243,29
390	243,64	243,99	244,33	244,68	245,02	245,37	245,71	246,06	246,4	246,75
400	247,09	247,44	247,78	248,13	248,47	248,81	249,16	249,5	249,85	250,19
410	250,53	250,88	251,22	251,56	251,91	252,25	252,59	252,93	253,28	253,62
420	253,96	254,3	254,65	254,99	255,33	255,67	256,01	256,35	256,7	257,04
430	257,38	257,72	258,06	258,4	258,74	259,08	259,42	259,76	260,1	260,44
440	260,78	261,12	261,46	261,8	262,14	262,48	262,82	263,16	263,5	263,84
450	264,18	264,52	264,86	265,2	265,53	265,87	266,21	266,55	266,89	267,22
460	267,56	267,9	268,24	268,57	268,91	269,25	269,59	269,92	270,26	270,6
470	270,93	271,27	271,61	271,94	272,28	272,61	272,95	273,29	273,62	273,96

°C	0	1	2	3	4	5	6	7	8	9
480	274,29	274,63	274,96	275,3	275,63	275,97	276,3	276,64	276,97	277,31
490	277,64	277,98	278,31	278,64	278,98	279,31	279,64	279,98	280,31	280,64
500	280,98	281,31	281,64	281,98	282,31	282,64	282,97	283,31	283,64	283,97
510	284,3	284,63	284,97	285,3	285,63	285,96	286,29	286,62	286,95	287,29
520	287,62	287,95	288,28	288,61	288,94	289,27	289,6	289,93	290,26	290,59
530	290,92	291,25	291,58	291,91	292,24	292,56	292,89	293,22	293,55	293,88
540	294,21	294,54	294,86	295,19	295,52	295,85	296,18	296,5	296,83	297,16
550	297,49	297,81	298,14	298,47	298,8	299,12	299,45	299,78	300,1	300,43
560	300,75	301,08	301,41	301,73	302,06	302,38	302,71	303,03	303,36	303,69
570	304,01	304,34	304,66	304,98	305,31	305,63	305,96	306,28	306,61	306,93
580	307,25	307,58	307,9	308,23	308,55	308,87	309,2	309,52	309,84	310,16
590	310,49	310,81	311,13	311,45	311,78	312,1	312,42	312,74	313,06	313,39
600	313,71	314,03	314,35	314,67	314,99	315,31	315,64	315,96	316,28	316,6
610	316,92	317,24	317,56	317,88	318,2	318,52	318,84	319,16	319,48	319,8
620	320,12	320,43	320,75	321,07	321,39	321,71	322,03	322,35	322,67	322,98
630	323,3	323,62	323,94	324,26	324,57	324,89	325,21	325,53	325,84	326,16
640	326,48	326,79	327,11	327,43	327,74	328,06	328,38	328,69	329,01	329,32
650	329,64	329,96	330,27	330,59	330,9	331,22	331,53	331,85	332,16	332,48
660	332,79	333,11	333,42	333,74	334,05	334,36	334,68	334,99	335,31	335,62
670	335,93	336,25	336,56	336,87	337,18	337,5	337,81	338,12	338,44	338,75
680	339,06	339,37	339,69	340	340,31	340,62	340,93	341,24	341,56	341,87
690	342,18	342,49	342,8	343,11	343,42	343,73	344,04	344,35	344,66	344,97
700	345,28	345,59	345,9	346,21	346,52	346,83	347,14	347,45	347,76	348,07
710	348,38	348,69	348,99	349,3	349,61	349,92	350,23	350,54	350,84	351,15
720	351,46	351,77	352,08	352,38	352,69	353	353,3	353,61	353,92	354,22
730	354,53	354,84	355,14	355,45	355,76	356,06	356,37	356,67	356,98	357,28
740	357,59	357,9	358,2	358,51	358,81	359,12	359,42	359,72	360,03	360,33
750	360,64	360,94	361,25	361,55	361,85	362,16	362,46	362,76	363,07	363,37
760	363,67	363,98	364,28	364,58	364,89	365,19	365,49	365,79	366,1	366,4
770	366,7	367	367,3	367,6	367,91	368,21	368,51	368,81	369,11	369,41
780	369,71	370,01	370,31	371,61	370,91	371,21	371,51	371,81	372,11	372,41
790	372,71	373,01	373,31	373,61	373,91	374,21	374,51	374,81	375,11	375,41
800	375,7	376	376,3	376,6	376,9	377,19	377,49	377,79	378,09	378,39
810	378,68	378,98	379,28	379,57	379,87	380,17	380,46	380,76	381,06	381,35
820	381,65	381,95	382,24	382,54	382,83	383,13	383,42	383,72	384,01	394,31
830	384,6	384,9	385,19	385,49	385,78	386,08	386,37	386,67	386,96	387,25
840	387,55	387,84	388,14	388,43	388,72	389,02	389,31	389,6	389,9	390,19
850	390,48	-	-	-	-	-	-	-	-	-

2. Tolerance for resistor classes and sensor with resistors Pt

Accuracy class for resistors		Sensor class	Application range for resistors		Formula for calculating allowable deviations
wirewound	thin film		wirewound	thin film	
W 0.1	F 0.1	AA	-50÷250	0÷150	$T = \pm(0,10 + 0,0017 t)^\circ\text{C}$
W 0.15	F 0.15	A	-100÷450	-30÷300	$T = \pm(0,15 + 0,002 t)^\circ\text{C}$
W 0.3	F 0.3	B	-196÷600	-50÷500	$T = \pm(0,3 + 0,005 t)^\circ\text{C}$
W 0.6	F 0.6	C	-196÷600	-50÷600	$T = \pm(0,06 + 0,01 t)^\circ\text{C}$

Measurement temperature °C	ALLOWABLE DEVIATIONS			
	Class AA °C	Class A °C	Class B °C	Class C °C
-196	–	–	±1,28	±2,56
-100	–	±0,35	±0,80	±1,6
-50	±0,185	±0,25	±0,55	±1,1
0	±0,10	±0,15	±0,3	±0,6
100	±0,27	±0,35	±0,8	±1,6
200	±0,44	±0,55	±1,3	±2,6
250	±0,525	±0,65	±1,55	±3,1
300	–	±0,75	±1,8	±3,6
350	–	±0,85	±2,05	±4,1
400	–	±0,95	±2,3	±4,6
450	–	±1,05	±2,55	±5,1
500	–	–	±2,8	±5,6
600	–	–	±3,3	±6,6

3. Nominal resistance value for nickel resistors Ni100 dependent on temperature / acc. to DIN 43760/

°C	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-60	69,5	-73,8	0	0	0	0	0	0	0	0
-50	74,3	73,8	73,3	72,8	72,3	71,9	71,4	70,9	70,5	70
-40	79,1	78,6	78,1	77,7	77,2	76,7	76,2	75,7	75,2	74,7
-30	84,1	83,6	83,1	82,6	82,1	81,6	81,1	80,6	80,1	79,6
-20	89,3	88,8	88,3	87,7	87,2	86,7	86,2	85,7	85,2	84,7
-10	94,6	94	93,5	93	92,5	91,9	91,4	90,9	90,3	89,8
0	100	99,5	98,9	98,4	97,8	97,3	96,76	96,2	95,7	95,1

°C	0	1	2	3	4	5	6	7	8	9
0	100	100,5	101,1	101,7	102,2	102,8	103,3	103,9	104,4	105
10	105,6	106,1	106,7	107,2	107,8	108,4	108,9	109,5	110,1	110,7
20	111,2	111,8	112,4	113	113,5	114,1	114,7	115,3	115,9	116,5
30	117,1	117,7	118,2	118,8	119,4	120	120,6	121,2	121,8	122,4
40	123	123,6	124,2	124,8	125,4	126	126,7	127,3	127,9	128,5
50	129,1	129,7	130,3	131	131,6	132,2	132,8	133,5	134,1	134,7
60	135,3	136	136,6	137,2	137,9	138,5	139,2	139,8	140,4	141,1
70	141,7	142,4	143	143,7	144,3	145	145,6	146,3	146,9	147,6
80	148,3	148,9	149,6	150,2	150,9	151,6	152,2	152,9	153,6	154,3
90	154,9	155,6	156,3	157	157,7	158,3	159	159,7	160,4	161,1
100	161,8	162,5	163,2	163,9	164,6	165,3	166	166,7	167,4	168,1
110	168,8	169,5	170,2	170,9	171,6	172,4	173,1	173,8	174,5	175,2
120	176	176,7	177,4	178,2	178,9	179,6	180,4	181,1	181,8	182,6
130	183,3	184,1	184,8	185,6	186,3	187,1	187,8	188,6	189,4	190,1
140	190,9	191,7	192,4	193,2	194	194,7	195,5	196,3	197,1	197,9
150	198,6	199,4	200,2	201	201,8	202,6	203,4	204,2	205	205,8
160	200,6	207,4	208,2	209	209,8	210,6	211,5	212,3	213,1	213,9
170	214,8	215,6	216,4	217,3	218,1	218,9	219,8	220,6	221,5	222,3
180	223,2	224	224,9	225,7	226,6	227,4	228,3	229,2	230	230,9
190	231,8	232,7	233,5	234,4	235,3	236,2	237,1	238	238,9	239,8
200	240,7	241,6	242,5	243,4	244,3	245,2	246,1	247	247,9	248,9
210	249,8	250,7	251,7	252,6	253,5	254,5	255,4	256,3	257,3	258,2
220	259,2	260,2	261,1	262,1	263	264	265	266	266,9	267,9
230	268,9	269,9	270,9	271,8	272,8	273,8	274,8	275,8	276,8	277,9
240	278,9	279,9	280,9	281,9	282,9	284	285	286	287,1	288,1
250	289,2	0	0	0	0	0	0	0	0	0

4. Tolerance for nickel resistors

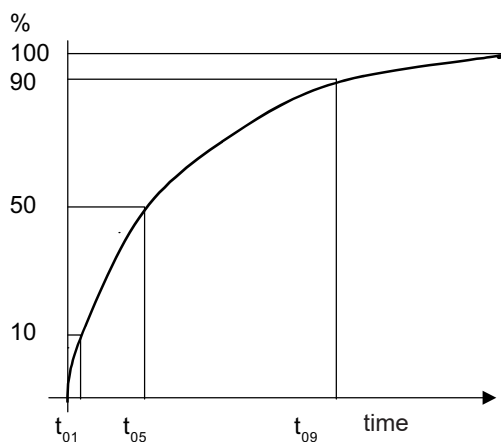
FORMULAS FOR CALCULATING ALLOWABLE DEVIATIONS		
TEMPERATURE RANGE	FORMULA	
-60÷0°C 0÷+300°C	$\pm(0,4 + 0,0028 t)^{\circ}\text{C}$ $\pm(0,4 + 0,007 t)^{\circ}\text{C}$	
t – absolute value of temperature °C		
TEMPERATURE [°C]	TOLERANCE [Ω]	TOLERANCE [°C]
-60	1,00	2,10
0	0,20	0,40
+100	0,80	1,10
+180	1,30	1,70

5. Thermometers dynamic properties – PN-EN 60751:2009

Response time [t] – a time thermometer needs, after temperature jump, to show certain part of temperature jump

Response time [t₀₅] – a time thermometer needs to show 50% of temperature jump

Response time [t₀₉] – a time thermometer needs to show 90% of temperature jump



Response times are defined in the following conditions:

in air:

- flow velocity $V = 3 \pm 0,3$ m/s
- air temperature $T_0 = 10 \pm 30^{\circ}\text{C}$
- temperature jump $\Delta T = 10 \pm 20^{\circ}\text{C}$
- minimum immersion length = (length + 15 diameters of sensing part)

in water:

- flow velocity $V = 0,4 \pm 0,05$ m/s
- initial temperature $T_0 = 5 \pm 30^{\circ}\text{C}$
- temperature jump $\Delta T \leq 10^{\circ}\text{C}$
- minimum immersion length = (length + 5 diameters of sensing part)

Attention! Response time values are defined according to the various norms and in different conditions, there are not mutually comparable.

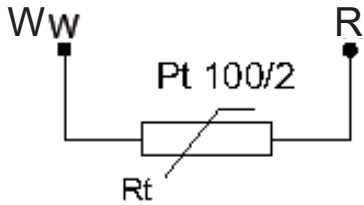
Platinum resistors dynamic properties (acc. to the company catalogues)

WIREWOUND RESISTORS					REMARKS
Resistor dimensions	T ₀₅ [s]		T ₀₉ [s]		
	water	air	water	air	
∅1,5×25	0,20	5,00	0,60	18,00	() values for double and triple RTDs
∅2,5×30	0,25		0,70		
∅2,8×30	0,25	15,00	0,70	50,00	
∅3,0×30	0,25		0,90		
∅3,5×30	0,30		1,10		
∅3,8×17					
∅3,8×30	0,30	30,00	1,10	120,00	
∅4,0×30	0,35		1,40		
∅4,5×18	0,30		1,20		
∅4,5×30	0,35	35 (40)	1,40	125 (140)	
∅4,5×50	0,35		1,40		
∅5,0×60	0,35		1,40		

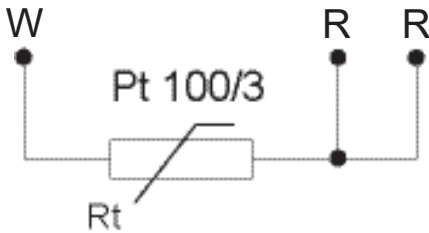
Response time:

- in water with $V = 0,4$ [m/s]
- in air with $V = 1,0$ [m/s]

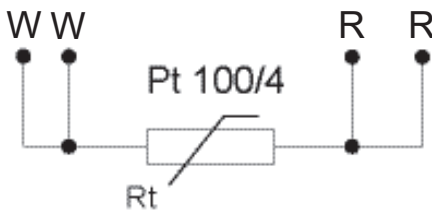
6. Connection schemes and lead wire designations – acc. to PN-EN 60751



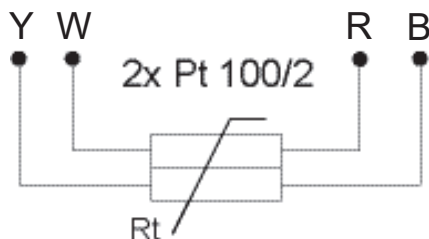
One wire connection to each thermometric resistor tip. Connection scheme used when lead wire resistance can be considered as a constant component in the measurement circuit and when the measurement error caused by lead wire resistance influence can be ignored.



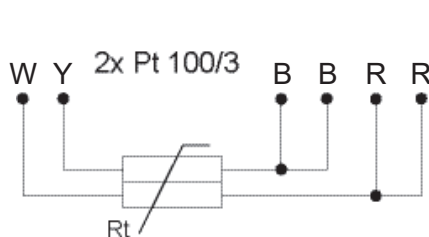
One wire connection to the first thermometric resistor tip and two wire connection to the second resistor tip. Connection scheme used for cooperation with the units having three-wire input. It allows compensation of error resulting from resistance and lead wire resistance changes. Most popular scheme of connection.



Two wire connection to each thermometric resistor tip. This connection scheme allows accurate compensation of resistance and lead wire resistance changes. Used for measurements when the highest accuracy is required.



Two insulated thermometric resistors in one housing with one wire connection to each resistor tip. Used for applications where continuity of the measurement process is required (damaging the circuit of one resistor does not interrupt the measurement process). This scheme of connection does not guarantee the compensation of resistance and lead wire resistance changes. Used when lead wire resistance can be considered as a constant component in the measurement circuit and when the measurement error caused by lead wire resistance influence can be ignored.



Two insulated thermometric resistors in one housing. One wire connection of each resistor to the first tip and two wire connection to the second tip. Used for applications where continuity of the measurement process is required (damaging the circuit of one resistor does not interrupt the measurement process). It allows compensation of the measurement error resulting from resistance and lead wire resistance changes. Connection scheme used for cooperation with the units having three-wire input.

LEGENDA:

- B – black (grey)
- Y – yellow
- R – red
- W – white

THERMOCOUPLE THERMOMETER SENSORS

Thermocouple thermometers are devices which react to temperature change by change of thermoelectromotive force of the built-in thermocouple. In protection tube, besides the thermocouple, outer clamps for the electrical measuring units connection are included. Mounting elements and connection heads can be included.

1. Thermocouples

Thermocouples are two conductors (thermocouple wires) made of different metals. Joined at one end, thermocouples constitute a part of the system that uses thermoelectric effect for temperature measurement (the Seebeck effect). The thermoelectric effect results in creation of the thermoelectromotive force (s.e.m.) due to temperature difference between two junctions: hot (joined thermocouple ends), which is under influence of the measured temperature and cold (not joined, loose thermocouple ends), which is in the known (usually 0°C) temperature.

s.e.m. values (of pressure) between junctions, for 0°C temperature are given below, acc. to PN-EN 60584-1:1997

Thermocouple Fe-CuNi (J)

°C	0	10	20	30	40	50	60	70	80	90
-200	-7,890	-8,095	–	–	–	–	–	–	–	–
-100	-4,633	-5,037	5,426	-5,801	-6,159	-6,500	-6,821	-7,123	-7,403	7,659
0	0,000	-0,501	-9,950	-1,482	-1,961	-2,431	-2,893	-3,344	-3,788	-4,215

°C	0	10	20	30	40	50	60	70	80	90
+0	0	0,507	1,019	1,537	2,059	2,585	3,116	3,650	4,187	4,726
100	5,269	5,814	6,360	6,909	7,459	8,010	8,562	9,115	9,669	10,244
200	10,779	11,334	11,889	12,445	13,000	13,555	14,110	14,665	15,219	15,773
300	16,327	16,881	17,434	17,986	18,538	19,090	19,642	20,194	20,745	21,297
400	21,848	22,400	22,952	23,504	24,057	24,610	25,164	25,720	26,276	26,834
500	27,393	27,953	28,516	29,080	29,647	30,216	30,788	31,362	31,939	32,519
600	33,102	33,689	34,279	34,873	35,470	36,071	36,675	37,284	37,896	38,512
700	31,132	39,755	40,382	41,012	41,645	42,281	42,919	43,559	44,203	44,848

Thermocouple NiCr-NiAl (K)

°C	0	10	20	30	40	50	60	70	80	90
-200	-5,891	-6,035	-6,158	-6,262	-6,344	-6,404	-6,441	-6,458	–	–
-100	-3,554	-3,852	-4,138	-4,411	-4,669	-4,913	-5,141	-5,354	-5,550	-5,730
0	0,000	-0,392	-0,778	-1,156	-1,527	-1,889	-2,243	-2,587	-2,910	-3,243

°C	0	10	20	30	40	50	60	70	80	90
+0	0,000	0,397	0,798	1,203	1,612	2,023	2,436	2,851	3,267	3,682
100	4,096	4,509	4,920	5,328	5,735	6,138	6,540	6,941	7,340	7,738
200	8,138	8,539	8,940	9,343	9,747	10,153	10,561	10,971	11,382	11,795
300	12,209	12,624	13,040	13,457	13,874	14,293	14,713	15,133	15,554	15,957
400	16,397	16,820	17,243	17,667	18,091	18,516	18,941	19,366	19,792	20,218
500	20,644	21,071	21,497	21,924	22,350	22,776	23,203	23,629	24,055	24,480
600	24,905	25,330	25,755	26,179	26,602	27,025	27,447	27,869	28,289	28,710
700	29,129	29,548	29,965	30,382	30,798	31,213	31,628	32,041	32,453	32,865
800	33,275	33,685	34,093	34,501	34,908	35,313	35,718	36,121	36,524	36,925
900	37,326	37,725	38,124	38,522	38,918	39,314	39,708	40,101	40,494	40,885
1000	41,276	41,665	42,053	42,440	42,826	43,211	43,595	43,978	44,359	44,740
1100	45,119	45,797	45,873	46,249	46,623	46,995	47,367	47,737	48,105	48,473
1200	48,838	49,292	49,565	49,926	50,286	50,664	51,000	51,355	51,708	52,060

Thermocouple PtRh10-Pt (S)

°C	0	10	20	30	40	50	60	70	80	90
0-	0	-0,053	-0,103	-0,15	-0,194	-0,236	–	–	–	–
0	0	0,055	0,113	0,173	0,235	0,299	0,365	0,433	0,502	0,573
100	0,646	0,72	0,795	0,872	0,95	1,029	1,11	1,191	1,273	1,357
200	1,441	1,526	1,612	1,698	1,786	1,874	1,962	2,052	2,141	2,232
300	2,323	2,415	2,507	2,599	2,692	2,786	2,88	2,974	3,069	3,164
400	3,259	3,355	3,451	3,548	3,645	3,742	3,84	3,938	4,036	4,134
500	4,233	4,332	4,432	4,532	4,632	4,732	4,833	4,934	5,035	5,137
600	5,239	5,341	5,443	5,546	5,649	5,753	5,857	5,961	6,065	6,170
700	6,275	6,381	6,486	6,593	6,699	6,806	6,913	7,02	7,128	7,236
800	7,345	7,454	7,563	7,673	7,783	7,893	8,003	8,114	8,226	8,337
900	8,449	8,562	8,674	8,787	8,9	9,014	9,128	9,242	9,357	9,427
1000	9,587	9,703	9,819	9,935	10,051	10,168	10,285	10,403	10,52	10,638
1100	10,757	10,875	10,994	11,113	11,232	11,351	11,471	11,590	11,710	11,827
1200	11,951	12,071	12,191	12,312	12,433	12,554	12,675	12,796	12,917	13,038
1300	13,159	13,280	13,402	13,523	13,644	13,766	13,887	14,009	14,130	14,251
1400	14,373	14,494	14,615	14,736	14,857	14,978	15,099	15,220	15,341	15,461
1500	15,582	15,702	15,822	15,942	16,062	16,182	16,301	16,420	16,539	16,658
1600	16,777	16,895	17,013	17,131	17,249	17,366	17,483	17,600	17,717	17,832

Thermocouple PtRh30-PtRh6 (B)

°C	0	10	20	30	40	50	60	70	80	90
600	1,792	1,852	1,913	1,975	2,037	2,101	2,165	2,23	2,296	2,363
700	2,431	2,499	2,569	2,639	2,71	2,782	2,854	2,928	3,002	3,078
800	3,154	3,23	3,308	3,386	3,466	3,546	3,626	3,708	3,79	3,873
900	3,957	4,041	4,127	4,213	4,299	4,387	4,475	4,504	4,653	4,743
1000	4,834	4,926	5,018	5,111	5,205	5,299	5,394	5,489	5,585	5,682
1100	5,78	5,878	5,976	6,075	6,175	6,276	6,377	6,478	6,58	6,683
1200	6,786	6,89	6,995	7,1	7,205	7,311	7,417	7,524	7,632	7,740
1300	7,848	7,957	8,068	8,176	8,286	8,397	8,508	8,62	8,731	8,844
1400	8,956	9,069	9,182	9,296	9,41	9,524	9,639	9,753	9,868	9,984
1500	10,99	10,215	10,331	10,447	10,563	10,679	10,796	10,913	11,029	11,146
1600	11,263	11,38	11,497	11,614	11,731	11,848	11,965	12,082	12,199	12,316
1700	12,433	12,549	12,666	12,782	12,898	13,014	13,13	13,246	13,361	13,476

2. Tolerance for thermocouples (acc. to PN – EN 60584 -2:1997)

TC type	Class 1		Class 2		Class 3	
	0	10	20	30	40	50
	Application range °C	Tolerance °C	Application range °C	Tolerance °C	Application range °C	Tolerance °C
T Cu-CuNi	from -40 to +125 from +125 to 350	±0,5 ±0,004 t	from -40 to +133 from +133 to +350	±1 ±0,0075 t	from -67 to +40 from -200 to -67	±1 ±0,015 t
E NiCr-CuNi	from -40 to +375 from +375 to 800	±1,5 ±0,004 t	from -40 to +333 from +333 to 900	±2,5 ±0,0075 t	from -167 to +40 from -200 to -167	±2,5 ±0,015 t
J Fe-CuNi	from -40 to +375 from +375 to +750	±1,5 ±0,004 t	from -40 to +333 from +333 to +750	±2,5 ±0,0075 t	–	–
K NiCr-NiAl	from -40 to +375 from +375 to +1000	±1,5 ±0,004 t	from -40 to +333 from +333 to +1200	±2,5 ±0,0075 t	from -167 to +40 from -200 to -167	±2,5 ±0,015 t
N NiCrSi-NiSi	from -40 to +375 from +375 to +1000	±1,5 ±0,004 t	from -40 to +333 from +333 to +1200	±2,5 ±0,0075 t	–	–
R PtRh13-Pt S PtRh10-Pt	from 0 to +1100 from +1100 to +1600	±1 ±(1 + 0,003 (t - 1100))	from 0 to +600 from +600 to +1600	±1,5 ±0,0025 t	–	–
B PtRh30-PtRh6	–	–	from +600 to +1700	±0,0025 t	from +600 to 800 from +800 to +1700	±4 ±0,005 t

|t| – absolute value of temperature

3. Thermocouples for very high temperatures (acc. to THERMOCOAX and OMEGA catalogues)

Thermocouple type	Thermocouple material	Operating temperature range	Mineral insulation material øz [mm]
G	W–W 26%Re	inflexible version 0÷2300°C	Nb /1,2; 1,6
C	W 5% Re – W 26%Re		Ta /1,2; 1,6
D	W 3% Re – W 25% Re	flexible version 0÷1800°C	Mo /1,4; 2,0
			Re /1,2

Maximal lengths:

a) inflexible version: up to 500 mm (in special cases up to 800 mm)

b) flexible version: up to 1000 mm

Tungsten-rhenium thermocouple accuracy

Wire diameter [mm]	Temperature range [°C]	Maximum error [°C]
0,0762	0÷425	± 4,5°C
	426÷1760	±1%
1,27	0÷425	± 4,5°C
	426÷1982	±1%
0,254	0÷425	± 4,5°C
	426÷2315	±1%

Thermocouple W3%Re–W25%Re (D)

°C	0	10	20	30	40	50	60	70	80	90
0	0	0,097	0,199	0,305	0,414	0,527	0,644	0,764	0,888	1,015
100	1,145	1,278	1,414	1,553	1,695	1,840	1,987	2,137	2,289	2,444
200	2,602	2,761	2,923	3,085	3,252	3,420	3,590	3,761	3,934	4,109
300	4,266	4,464	4,644	4,825	5,007	5,191	5,376	5,563	5,750	6,939
400	6,129	6,320	6,512	6,704	6,898	7,093	7,288	7,484	7,681	7,878

500	8,076	8,275	8,474	8,674	8,874	9,075	9,276	9,478	9,880	9,883
600	10,085	10,288	10,491	10,695	10,899	11,102	11,307	11,511	11,715	11,919
700	12,124	12,329	12,533	12,738	12,942	13,147	13,362	13,556	13,761	13,965
800	14,170	14,375	14,580	14,784	14,898	15,193	15,397	15,601	15,804	16,003
900	16,211	16,414	16,616	16,819	17,021	17,222	17,424	17,625	17,826	18,026

1000	18,228	18,425	18,825	18,824	19,022	19,220	19,418	19,616	19,812	20,009
1100	20,205	20,401	20,596	20,791	20,985	21,179	21,373	21,566	21,758	21,950
1200	22,142	22,333	22,524	22,714	22,901	23,094	23,282	23,471	23,669	23,848
1300	21,033	24,219	24,405	24,591	24,776	24,980	25,144	26,327	26,510	25,693
1400	25,875	26,056	26,237	26,418	26,597	26,777	26,958	27,134	27,312	27,489

1500	27,668	27,842	28,018	28,193	28,367	28,541	28,715	28,888	29,060	29,232
1600	29,403	29,574	29,744	29,914	30,083	30,251	30,419	30,588	30,753	30,919
1700	31,084	31,249	31,413	31,578	31,739	31,901	32,083	32,223	32,384	32,543
1800	32,702	32,880	33,017	33,173	33,329	33,484	33,638	33,792	33,944	34,098
1900	34,247	34,397	34,548	34,695	34,842	34,988	35,134	35,279	35,423	35,566

2000	35,707	35,847	35,987	36,125	36,263	36,399	36,534	36,668	36,801	36,932
2100	37,062	37,191	37,319	37,445	37,570	37,694	37,816	37,937	38,066	38,173
2200	38,289	38,404	38,517	38,628	38,737	38,845	38,951	39,055	39,157	39,258
2300	39,358	39,452	39,547	39,639	39,729	39,817	39,903	39,986	40,088	40,148
2400	40,233	40,297	40,368	40,437	40,503	40,566	40,627	40,685	40,740	40,792

Thermocouple W5%Re–W26%Re (C)

°C	0	10	20	30	40	50	60	70	80	90
0	0	0,135	0,272	0,412	0,554	0,698	0,845	0,993	1,144	1,296
100	1,451	1,607	1,765	1,926	2,087	2,250	2,415	2,581	2,749	2,918
200	3,089	3,281	3,434	3,609	3,785	3,962	4,140	4,319	4,500	4,681
300	4,863	5,047	5,231	5,416	5,601	5,788	5,975	6,163	6,362	6,541
400	6,731	6,921	7,112	7,304	7,496	7,688	7,881	8,074	8,267	8,481

500	8,655	8,849	9,044	9,239	9,434	9,629	9,824	10,019	10,215	10,410
600	10,606	10,601	10,997	11,192	11,388	11,583	11,778	11,974	12,169	12,364
700	12,558	12,753	12,947	13,142	13,336	13,529	13,723	13,916	14,109	14,302
800	14,494	14,688	14,877	15,069	15,260	15,450	15,840	15,830	16,020	16,208
900	16,397	16,585	16,773	16,960	17,147	17,333	17,519	17,704	17,880	18,073

1000	18,267	18,440	18,623	18,805	18,987	19,168	19,349	19,529	19,709	19,888
1100	20,066	20,244	20,421	20,598	20,774	20,950	21,125	21,299	21,473	21,647
1200	21,819	21,991	22,163	22,334	22,504	22,674	22,843	23,012	23,180	23,347
1300	23,514	23,680	23,848	24,010	24,175	24,330	24,502	24,664	24,826	24,988
1400	25,148	25,308	25,468	25,627	25,785	25,943	26,100	26,266	26,412	26,568

1500	26,722	26,876	27,030	27,183	27,335	27486	27,637	27,788	27,938	28,087
1600	28,238	28,384	28,531	28,678	28,824	28,989	29,114	29,259	29,402	29,546
1700	29,688	29,830	29,971	30,112	20,282	30,391	30,530	30,688	30,805	30,942
1800	31,078	31,214	31,349	31,483	31,817	31,749	31,882	32,013	32,144	32,274
1900	32,404	32,533	32,861	32,788	32,915	33,041	33,168	33,291	33,415	33,538

2000	33,680	33,782	33,902	34,022	34,142	34,260	34,378	34,494	34,610	34,725
2100	34,839	34,953	35,055	35,177	35,288	35,397	35,508	35,614	35,721	35,827
2200	35,932	36,036	36,138	36,240	36,341	36,441	36,539	36,637	36,733	36,828
2300	36,922	37,015	37,107	–	–	–	–	–	–	–

Thermocouple W–W26%Re (G)

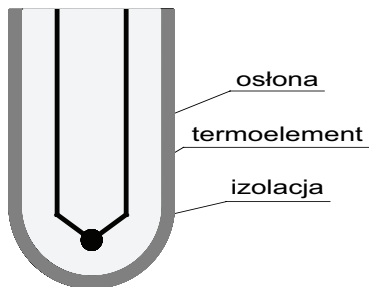
°C	0	10	20	30	40	50	60	70	80	90
1000	14,500	14,700	14,900	15,100	15,300	15,500	15,700	15,900	16,100	16,300
1100	16,500	16,700	16,900	17,100	17,300	17,500	17,700	17,900	18,100	18,300
1200	18,500	18,700	18,900	19,100	19,300	19,500	19,700	19,900	20,100	20,300
1300	20,500	20,700	20,900	21,100	21,300	21,500	21,700	21,900	22,100	22,300
1400	22,500	22,700	22,900	23,100	23,300	23,500	23,700	23,900	24,100	24,300

1500	24,500	24,700	24,900	25,100	25,300	25,500	25,700	25,900	26,100	26,300
1600	26,500	26,700	26,900	27,100	27,300	27,500	27,700	27,900	28,100	28,300
1700	28,500	28,700	28,900	29,100	29,300	29,500	29,700	29,900	30,100	30,200
1800	30,400	30,600	30,800	31,000	31,200	31,300	31,500	31,700	31,900	32,100
1900	32,300	32,400	32,600	32,800	33,000	33,200	33,400	33,500	33,700	33,900

2000	34,100	34,300	34,400	34,600	34,800	34,900	35,100	35,200	35,400	35,600
2100	35,700	35,900	36,000	36,200	36,300	36,500	36,700	36,800	37,000	37,100
2200	37,300	37,400	37,600	37,800	37,900	38,100	38,200	38,300	38,500	38,600
2300	38,800	–	–	–	–	–	–	–	–	–

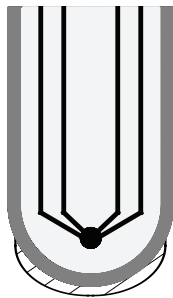
THERMOCOUPLE HOT JUNCTION TYPES

- pipe - ceramic insulation
- mineral insulated - compacted MgO insulation



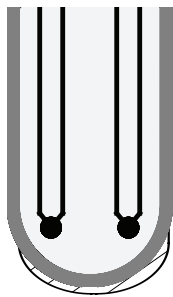
Single sensor

SO - insulated
Hot junction insulated from the sheath.



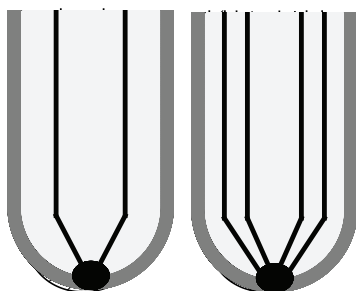
Double sensor

SOA - insulated
One hot junction for two (or more) thermocouples insulated from the sheath.



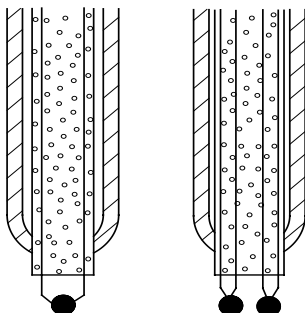
SOB - insulated

Hot junctions of each thermocouple insulated from each other and from the sheath.



Single and double sensors

SP - grounded
Hot junction (junctions) joined (compacted) with the sheath.



SE - exposed

Hot junction (junctions) unsheathed, but insulated from each other and from the sheath.

CORROSION RESISTANT STEELS

Steel symbol	Corrosion resistance in media	Weldability	Examples of application
1.4000 1.4002	<p>Following steels are resistant to:</p> <p>atmospheric corrosion, natural waters (except for sea water, mine water and vapour), hot vapours of petroleum, dilute alkaline solutions (e.g. ammonia), dilute cold (of normal temperature) mineral acids (e.g. nitric acid), dilute cold organic acids (except for formic acid, oxalic acid and acetic acid above 5%) dilute cold saline solutions e.g. nitrates, nitrites, carbonates and others (except for chlorides, sulfates, iodides), lubricants and mineral oils, petrol and other liquid fuels, alcohols, ethyl ethers, food products not containing common salts and other preservatives.</p>	weldable if certain terms are followed (warming up)	in petroleum industry for welded liner of normal and pressure tanks, on fractionating columns, heat exchangers and cracking pipes and for some devices of coke industry, etc.
1.4006		as above, more difficult to weld than 1.4000 and 1.4002	for steam turbine blades, hydraulic press valves, apparatuses of cracking devices, bolts, nuts, household facilities
1.4021 1.4028		welding not recommended	like for steel 1.4006, but in cases when greater hardness and strength are required, e.g. shafts, screws, glands, springs, machine parts and pressure casting dies
1.4034		non-weldable	for cutting tools, measuring tools, carburettor needles, ball bearings, surgical tools and devices, table setting knives, kitchen and butcher knives

Steel symbol	Corrosion resistance in media	Weldability	Examples of application
1.4510	<p>Following steels are resistant to:</p> <p>atmospheric corrosion, natural waters (except for sea water, mine water and vapour), hot vapours of petroleum esp. containing sulphur, molten sulphur and its vapours, dilute alkaline solutions (e.g. sodium hydroxide up to 20% for boiling temperature, up to 30% for normal temperature; ammonium at any concentration and any temperature (up to boiling temperature)), dilute cold organic acids (except for acetic acid above 5%, tartaric acid, oxalic acid and apple acid and others), saline solutions e.g. nitrates, nitrites, carbonates, phosphates, cyanide, chromates (of any concentration and temperature), except for chlorides, sulfates, iodides, etc., petrol and other liquid fuels, soap and food products like milk, cheeses, beer, coffee, tea, edible oils, spirit, vodka etc., moreover resistant to stress corrosion.</p>	weldable if adequate conditions are followed (warming up)	devices for producing nitric acid (absorption towers, heat exchangers for hot nitric oxides and hot nitric acid), tanks, pipelines and tanks for transporting nitric acids; devices and machinery parts for food industry (e.g. dairy, brewing, sugar and fruit and vegetable industries), devices and elements of soap industry, kitchen, canteen, canned food manufacturing and household facilities
1.4016		welding not recommended	like for steel 1.4510 in case of not welded devices
1.4122		welding not recommended	shafts, tangs, spindles, valves, surgical tools

CORROSION RESISTANT STEELS – cont.

Steel symbol	Corrosion resistance in media	Weldability	Examples of application
1.4057	Following steels are more resistant to corrosive environments defined for steels 1.4006, 1.4021, 1.4028; moreover they are resistant to hot oxides and hot dilute nitric acid, cold, dilute organic acids e.g. formic and acetic acid	welding not recommended	for machinery parts of nitric acid industry and mechanically loaded device parts, machinery and device parts of food industry (e.g. dairy, brewing, yeast and paper industries, etc.); pump parts
1.4125		non-weldable	ball bearings for petroleum industry, high quality knives, surgical tools, bearing shell, valves and other parts requiring high corrosion and abrasion resistance

Steel symbol	Corrosion resistance in media	Weldability	Examples of application
1.3965	Following steel is resistant to: atmospheric corrosion (except for industrial atmosphere containing significant quantity of SO ₂) natural waters alkaline solutions mineral acids e.g. nitric acid, pure phosphoric acid (not containing fluoride ions) organic acids e.g. milk acid (up to 15%), cold acetic acid, most organic acids appearing in fruit juices, saline solutions esp. nitrates, nitrites, phosphates, chromates, carbonates, cyanide, in wide range of concentrations and temperature of various nitrogen compounds (in this case the present steel is better than steel 1.4541) and food products esp. milk, cheeses, beer, coffee, tea, edible oils, spirit, vodka, fruit juices, vegetables, etc.	weldable	apparatuses for milk and dairy preserves production: containers, pasteurizers, centrifuges and others; brewing apparatuses: fermentation tanks, barrels, tuns and others; food industry and fatty acid apparatuses; kitchen equipment; suitable for pressing

CORROSION RESISTANT STEELS – cont.

Steel symbol	Corrosion resistance in media	Weldability	Examples of application
1.4301	<p>Following steels are resistant to: atmospheric corrosion, natural waters (including sea water), alkaline solutions, mineral acids except for hydrochloric acid, sulphuric acid, hydrofluoric acid, compositions of nitric and hydrochloric acids, iodine, bromine, moist chlorine, organic acids except for formic acid (of concentration higher than 5%) boiling lactic acid and hot oxalic acid, saline solutions of any concentration and temperature, except for more concentrated chlorides, sulphates, chlorates solutions etc. and all food products</p>	weldable	deep drawn parts for devices (like for 1.4541)
1.4310		weldable	not welded parts; parts that can be oversaturated after welding; heat treated parts, not exposed to intercrystalline corrosion after welding (like for 1.4541)
1.4306		weldable	for part of devices in environments with high risk of intercrystalline corrosion (like for 1.4541)

Steel symbol	Corrosion resistance in media	Weldability	Examples of application
1.4541	like for steels 1.4301, 1.4306, 1.4310	weldable	<p>chemical and nitride industry devices, absorption towers, heat exchangers, tanks for acids, pipelines and other welded apparatuses; lacquer and pharmaceutical industry apparatuses; autoclaves, stirrers, pot stills, pump parts i.a. for operating in acid mine water in carbon industry; in food and fruit and vegetable industry for elements endangered by aggressive preservatives (salt, SO₂)</p>

Steel symbol	Corrosion resistance in media	Weldability	Examples of application
1.4571 1.4436 1.4435	<p>Following steels are resistant to: atmospheres containing sulphur dioxide, all natural waters, sulphuric acid up to 20% for temperature 40°C, up to 5% for temperature 50°C of cold phosphoric acid at any concentration, compositions of nitric and hydrochloric acids, hot sulphuric acid solutions, boiling organic acid solutions, textile and paper bleaching solutions, acid and alkali dyes, pitting corrosion, these steels are not resistant to hydrochloric and hydrofluoric acids.</p>	weldable	<p>for device structure with wall thicker than 20 mm in environments with high risk of intercrystalline corrosion and in presence of some very aggressive chlorides (these steels should not be used in presence of nitric acid); application in some assemblies of urea production is recommended</p>
1.4573		weldable	like for steel 1.4571 for higher corrosion resistance, tower used for urea synthesis

LIST OF ALLOY STEELS – POLISH DESIGNATIONS AND COUNTERPARTS

1.4005**	X 12 CrS 13	–	416	2380	416 S 21
1.4006**	X12Cr13	1H13	410	2302	410 S 21
1.4016*	X6 Cr17	H17	430	2320	430 S 15
1.4021**	X20Cr13	2H13	420	2303	420 S 37
1.4028**	X 30 Cr 13	3H13	420F	2304	420 S 45
1.4034**	X46Cr 13	4H13		(2304)	(420 S 45)
1.4057**	X 17 CrNi 16-2	22H17N2	431	2321	431 S 29
1.4104**	X 14 CrMoS 17	–	430 F	2383	(441 S 29)
1.4105*	X 6 Cr MoS 17	–	430 F		
1.4112**	X90CrMoV 18	–	440 B		
1.4113*	X6 CrMo 17-1	–	434		434 S 17
1.4122**	X 39 CrMo 17-1	3 H 17 M			
1.4125**	X 105 CrMo 17	H18	440 C		
1.4301***	X 5 CrNi 18-10	0H18N9	304	2332	304 S 16
1.4303***	X 4 CrNi 18-12	–	305/308		305 S 17
1.4305***	X 8 CrNiS 18-9	–	303	2346	303 S 31
1.4306***	X2 CrNi 19-11	00H18N10–	304 L	2352	304 S 11
1.4310***	X 10 CrNi 18-8	1H18N9–	301	2331	301 S 22
1.4313**	X3 CrNiMo 13-4		E 415	2384	425 C 11
1.4401***	X 5 CrNiMo 17-12-2	0H17N12M2T	316	2347	316 S 31
1.4404***	X2 CrNiMo 17-12-2	00H17N14M2	316L	2348	316 S 11
1.4435***	X2 CrNiMo 18-14-3	–	316 L	2353	316 S 11
1.4436***	X3 CrNiMo 17-13-3	–	316	2343	316S31
1.4460***/*	X 3 CrNiMoN 27-5-2	–	329	2324	
1.4462***/*	X 2 CrNiMoN 22 5 3	–	UNSS31803	23 77	
1.4539***	X1NiCrMoCu25-20-5	0H22N24M4TCu	UMSN08904	2562	
1.4541***	X6 CrNiTi 18-10	0H18N10T, 1H18N9T	321	2337	321 S 31
1.4550***	X 6 CrNiNb 18-10	0H18N12Nb	347	2338	347 S 31
1.4567***	X3CrNiCu 18-9-4		304 K		
1.4571***	X6 CrNiMoTi 17-12-2	H17N13M2T, H18N10MT–	316 Ti	2350	320 S 31
1.4580***	X6CrNiMoNb 17-12-2	–	316 CB		
1.4713*	X 1 0 CrAlSi 7	–			
1.4742*	X 10 CrAlSi 18	H18JS			
1.4762*	X 10 CrAlSi 25	H24JS	(446)	(2322)	
1.4828***	X 15 CrNiSi 20-12	H20N12S2	309		309 S 24
1.4841***	X 15 CrNiSi 25-21	H25N20S2	314, 310		314 S 25

*ferritic steel, **martensitic steel, ***austenitic steel

AISI = American Iron and Steel Institute

SS = Swedish Standard

BS = British Standard

Attention!

Above table should be considered only as an approximation of assays.

Changeability of materials acc. to the provided norms should be verified each time.

HEAT RESISTANT AND CREEP RESISTANT STEELS

Excellent heat resistance and creep resistance is required from steels and alloys operating in high temperature in range above 600°C.

Heat resistance is alloy resistance to chemical factors activity, mostly air and exhaust fumes and their aggressive components, in temperature above 600°C.

Creep resistance is alloy resistance to deformations and ability to resist mechanical loadings in temperature above 600°C.

Heat resistance is strictly connected with steel tendency for mill scale forming. The mill scale should be a layer precisely adjacent to metallic core that hinders oxidant and metal ions diffusion. These requirements are fulfilled by low-carbon steels with single-phase ferrite or austenite structure containing significant quantity of Cr, Ni and additionally Si and Al. Creep resistance in temperature higher than 600°C depends primarily on resistance to creeping. High creep resistance is characteristic for steels with austenite structure, due to the lower diffusion coefficients than in ferrite, with significant grain size and with dispersive phase extraction, mostly on grain boundaries.

Elements influence on heat and creep resistance.

Chrome is the basic element enhancing creep resistance of steel. Addition of approx. 5% Cr ensures adequate heat resistance in temperature from 600°C to 650°C. Increase of this element concentration causes enhancement of heat resistance up to approx. 1100°C per approx. 30% Cr concentration. Elements like Si and Al, in spite of an analogous influence on heat resistance, are added in limited quantities, approx. 3% and 2,5% respectively, because of a negative influence on steel plastic properties and lower susceptibility to plastic forming of metals.

Elements V and Mo have a negative influence on heat resistance of steels. Vanadium(V) oxides are easily molten, whereas molybdenum oxides are easily oxidised. Ni does not increase steel heat resistance, however in 9% concentration in presence of approx. 18% Cr it initiates creation of long-standing austenite structure, thereby enhancing creep resistance of steel.

Creep resistance is increased by the alloying elements (such as Mo, W, V, Co, Ti, Cr and Si) enhancing energy of atoms bonding in solid solution lattice, thereby increasing temperature of melting and recrystallisation. Creep resistance is also increased due to work hardening and precipitation hardening. Creep resistance is decreased due to traversing and recrystallisation of previously cold deformed steel. Carbon content in these steels is reduced to approx. 0,2% for ensuring proper weldability.

Chemical composition and basic properties of heat resistant and creep resistant steels are included in the norm PN-EN 10095:2002

Heat resistant and creep resistant steels designating

Heat and creep resistant steels are designated similarly to corrosion resistant steels.

Heat resistant and creep resistant steels structure

According to chemical composition these steels can be classified as:

- chromium and chromium-silicon, ferritic-pearlitic structure, hardenable
- high-chromium with addition of aluminium and increased silicon content, ferritic structure with carbide precipitations
- chromium-nickel, ferritic-austenitic structure
- chromium-nickel with addition of silicon, austenitic structure with carbide precipitations

Application

Ferritic steels are used for mechanically unloaded parts of chemical apparatuses, kilns and boilers, parts of gas burners, carburizing boxes, etc. Austenitic steels are used for similar but mechanically loaded applications.

Table 1. Heat resistant and creep resistant steels

Kind	Average content of elements (%)						Heat resistance in air up to temperature °C	Creep resistance (breaking strength – 10000 h of operating in air)		Steel structure
	C	Mn	Si	Cr	Ni	other		in temp. °C		
								MPa		
1.7362 (H5M)	max. 0,15	max. 0,5	max. 0,5	5	max. 0,5	Mo 0,5	650	–	–	ferrite
1.4713	max. 0,12	max. 1,00	0,5 to 1,0	7	–	Al 0,75	800	800	4,3	ferrite
1.4724	max. 0,12	max. 1,00	0,7 to 1,40	13	–	Al 0,95	850	800	4,3	ferrite
1.4742	max. 0,12	max. 1,00	0,7 to 1,40	18	–	Al 0,95	1000	800 900	4,3 1,9	ferrite
1.4749	max. 0,20	max. 1,00	max. 1,00	27	–	N 0,20	1100	800 900	4,3 1,9	ferrite
1.4762	max. 0,12	max. 1,00	0,7 to 1,40	25	–	Al 1,45	1150	800 900	4,3 1,9	ferrite
1.4821	max. 0,20	max. 2,00	0,8 to 1,5	26	4	Nmax. 0,11	1100	800 900	4,3 1,9	ferrite austenite
1.4878	max. 0,10	max. 2,00	max. 1,00	18	10,5	Ti 0,8	850	800	15	austenite
1.4828	max. 0,20	max. 2,00	1,5 to 2,5	20	12	Nmax. 0,11	1000	800 900	18 8,5	austenite
1.4833	max. 0,15	max. 2,00	max. 1,00	23	13	Nmax. 0,11	1000	800 900	18 8,5	austenite
1.4845	max. 0,10	max. 2,00	max. 1,50	25	20,5	Nmax. 0,11	1050	800 900	18 8,5	austenite
1.4841	max. 0,20	max. 2,00	1,5 to 2,5	25	20,5	Nmax. 0,11	1150	800 900	20 10	austenite
1.4864	max. 0,15	max. 2,00	1,0 to 2,0	16	35	Nmax. 0,11	1100	800 900	20 8	austenite
1.4872	max. 0,30	9,0	max. 1,00	25	7	N 0,30	1150	800 900	12 5	austenite

EXPLOSION-PROOF CONSTRUCTION TYPES FOR TEMPERATURE SENSORS

Construction type	Protection method	Designation	Norm number
flameproof construction	explosion closure	d	PN-EN 60079-1
increased safety construction	mechanical – no arcs, sparks and hot surfaces	e	PN-EN 60079-7
intrinsic safety construction	electrical – limited electrical parameters, from which spark does not cause ignition	i	PN-EN 60079-11

PROTECTION METHODS AGAINST EXPLOSIVE ATMOSPHERES – GROUP II

Category	Explosive substance type	Protection level, protection characteristic	Zone	Construction type
1G	gases, vapours, fogs	– very high protection level – two independent protection centers	0	Ex ia or Ex ib, Ex e, Ex d with mech. separation
1D	dusts	– resistant to two independent damages	20	– protection provided by a housing min. IP6X – limitation of surface temperature – no ignition sparks
2G	gases, vapours, fogs	– high protection level	1	Ex ib, or Ex e, or Ex d
2D	dusts	– one protection center – anticipated damages	21	– protection provided by a housing min. IP6X – limitation of surface temperature – no ignition sparks
3G	gases, vapours, fogs	– normal protection level – sufficient protection during normal operating	2	Ex ib, or Ex e, or Ex d
3D	dusts		22	– protection provided by a housing min. IP5X

EXPLOSION ZONES

Gases, vapours, fogs G	Dusts D	Presence of an explosive atmosphere	Value
zone 0	zone 20	Constantly during normal operating	> 1000 hours/year
zone 1	zone 21	Possible during normal operating	10÷1000 hours/year
zone 2	zone 22	Unlikely during normal operating	< 10 hours/year

TEMPERATURE CLASS

Devices of group II: 1/2G, 2G, 3G should be classified to temperature class acc. to the maximum surface temperature reached during device operating.

Temperature class	Maximum surface temperature Ts	Ignition temperature of explosive substance
T1	450°C	>450°C
T2	300°C	> 300°C < 450°
T3	200°C	> 200°C < 300°
T4	135°C	> 135°C < 200°
T5	100°C	> 100°C < 135°
T6	85°C	> 85°C < 100°

Maximum surface temperature Ts is a result of few factors:

- temperature resulting from heat released by the electrical circuits connected with power supply of device Te
- ambient temperature Tamb
- temperature of measured process Tp

Temperature actual value for a given point of a sensor is a sum of temperatures in this point $T_s = T_e + T_{amb} + T_p$
 Sensor manufacturer cannot predict the actual conditions of sensor operating, thereby define their actual temperature class, for this reason the catalogue includes temperature classes correspondent with surface temperatures allowable due to the sensor construction. Sensor actual temperature class might be relatively lower depending on Ts reached during the actual conditions of sensor operating.

On no account should sensor maximum surface temperature be higher than ignition temperature of explosive mixture of gas, vapour or fog with air.

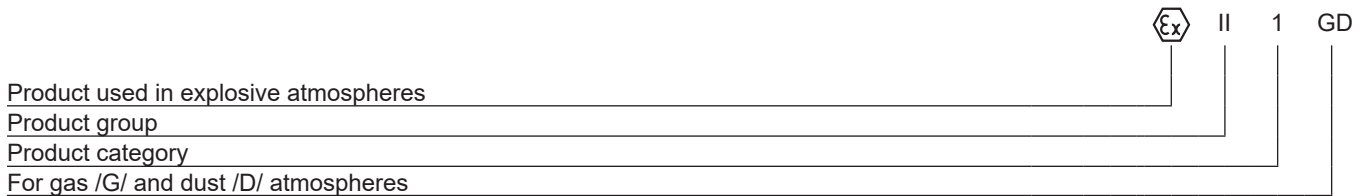
TEMPERATURE CLASS FOR GROUPS OF GASES

Classified in the ordinance of the Minister of the Interior and Administration (Journal of Laws no. 92/90)

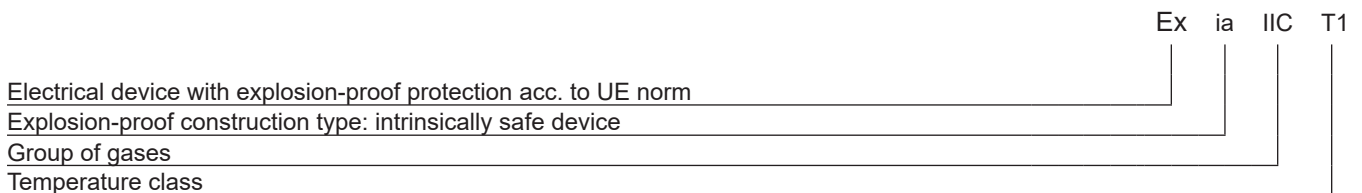
Temperature class	T1	T2	T3	T4	T5	T6
Explosive group						
II A	acetone, propylene, toluene, carbon monoxide, ammonia	ethanol, ethylene alcohol, n-butanol, cyclohexanone, trichloroethylene	petrol, cyclohexane, n-decane, n-hexane, petroleum	acetaldehyde	–	–
II B	city gas, hydrogen cyanide	ethylene oxide, propylene oxide, butadiene, acrylonitrile	hydrogen sulphide, acrylaldehyde, crotonaldehyde	diethyl ether, dioxane	–	–
II C	hydrogen	acetylene	hydrazine	–	carbon disulphide	–

PRODUCT DESIGNATION ACC. TO ATEX

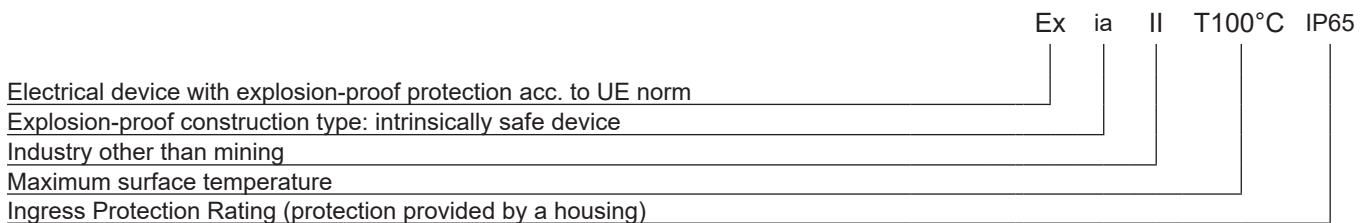
ATEX APPROVED APPLICATION -INDUSTRY OTHER THAN MINING



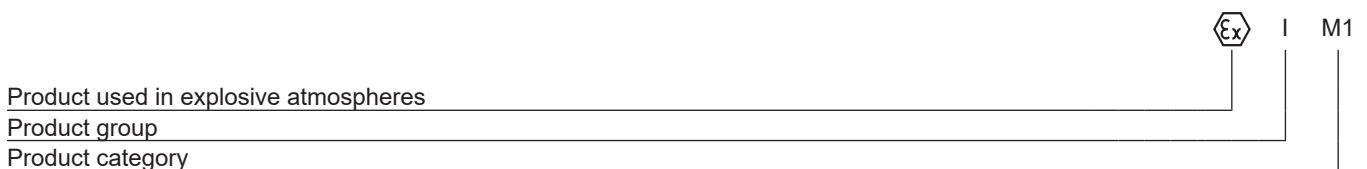
CONSTRUCTION TYPES FOR GASES, FOGS



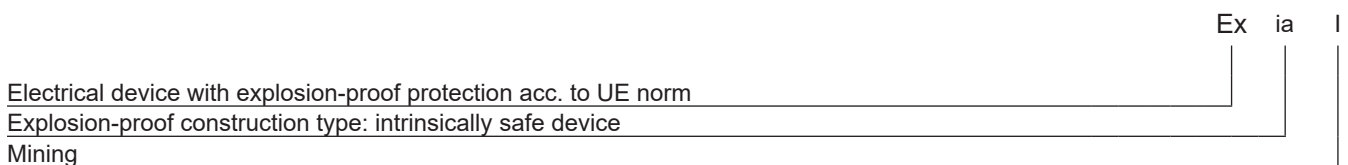
CONSTRUCTION TYPE FOR DUSTS



ATEX APPROVED APPLICATION – MINING



CONSTRUCTION



ALLOWABLE MAXIMUM SURFACE TEMPERATURE

For devices of group II: 1/2D, 2D, 3D maximum surface temperature reached during device operating must be provided.

Maximum surface temperature T_{smax} is a result of few factors:

- temperature T_e resulting from heat released by the electrical circuits connected with power supply
- ambient temperature T_{amb}
- temperature of the measured process T_p or temperature influence in form of conduction and radiation

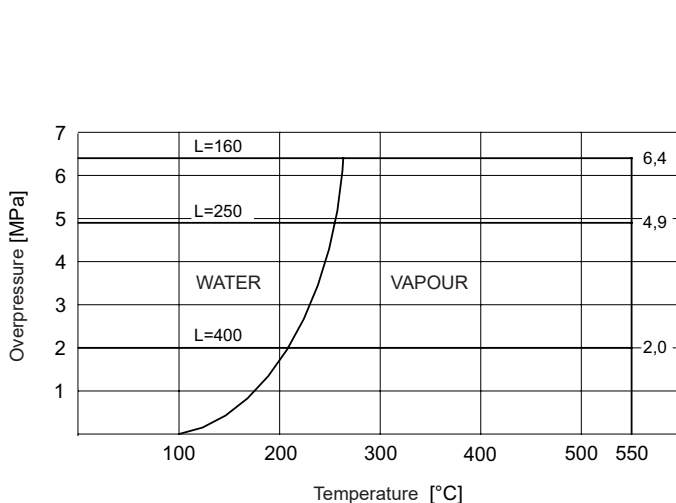
Temperature actual value for a given point of a sensor is a sum of temperatures in this point $T_{smax} = T_e + T_{amb} + T_p$. Sensor manufacturer cannot predict the actual conditions of sensor operating, thereby define their actual temperature class, for this reason the catalogue includes temperature classes allowable due to the sensor construction. Actual maximum surface temperature can be relatively lower than the one defined in the catalogue.

On no account should sensor maximum surface temperature be higher than maximum allowable surface temperature, which:

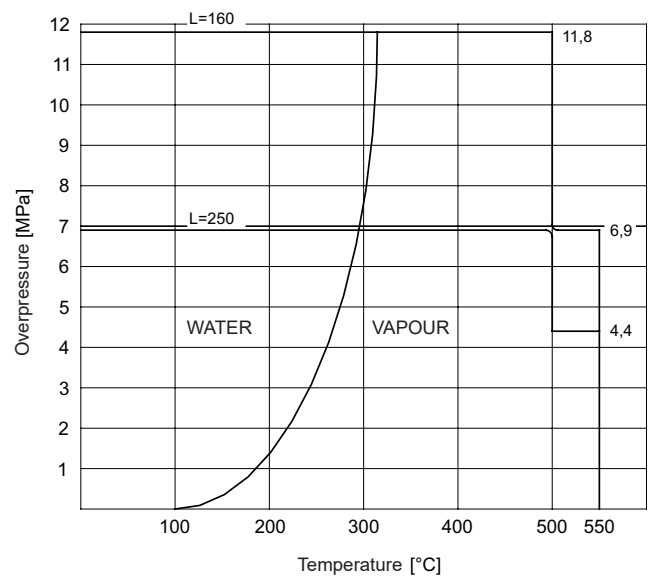
- for dust layers 5+50 will take lower of values:
- $T_{max} = 2/3 T_c$, T_c – ignition temperature of dust cloud
- $T_{max} = T_5 - 75 K$, T_5 – ignition temperature of 5 mm thick dust layer
- for thicker layers should be defined during the research

SHEATH LOADING

Sheath allowable loading during sensor operating depends on: pressure of measured medium, temperature, flow velocity, diameter, length L and sheath material. Values provided on diagrams are counted for water and vapour when sheaths are mounted perpendicularly to pipeline axis.



Sheath diameter [mm]: 6, 8, 9, 10
 Allowable flow velocity: vapour – 25 m/s, water – 3 m/s
 Allowable moment for screwing the fitting -49 Nm



Sheath diameter [mm]: 11, 12, 15
 Allowable flow speed: vapour – 40m/s, water – 5 m/s
 Allowable moment for screwing the fitting -98 Nm

TIME CONSTANTS FOR TEMPERATURE SENSORS

Resistance or insulated thermocouple sensors				
Sensor construction	Time constant [s]			
	water 0,4 m/s		air 1,0 m/s	
	$T_{0,5}$	$T_{0,9}$	$T_{0,5}$	$T_{0,9}$
steel sheath				
6x0,5	12	55	90	260
8x0,6	20	85	125	360
10x1,5	35	100	150	400
12x1,5	45	155	180	450
15x1,5	57	170	190	490
22x2	130	480	480	1200
ceramic sheath				
6x1	20	55	75	180
10x2	30	92	100	270
15x2	42	125	220	580

Mineral insulated thermocouple sensors				
Sensor construction	Time constant [s]			
	water 0,4 m/s		air 1,0 m/s	
	$T_{0,5}$	$T_{0,9}$	$T_{0,5}$	$T_{0,9}$
grounded hot junction				
0,25	0,01	0,06	0,9	2
0,5	0,03	0,10	1,8	6
1	0,06	0,18	3	10
1,5	0,13	0,40	8	25
3	0,22	0,75	23	80
4,5	0,45	1,60	33	110
6	0,55	2,60	55	185
8	0,80	3,90	80	250
insulated hot junction				
0,5	0,06	0,13	1,8	6
1	0,15	0,5	3	10
1,5	0,21	0,6	8	25
3	1,2	2,9	26	88
4,5	2,5	5,9	37	120
6	4	9,6	60	200
8	6,5	14	95	290

$T_{0,5}$ – a time temperature sensor needs to reach 50% of maximum value after temperature change

$T_{0,9}$ – a time temperature sensor needs to reach 90% of maximum value after temperature change

Temperature Sensors with Replaceable Measuring Insert **TOPGB-11, TTJGB-11, TTKGB-11**

Specification

Temperature range / sensing element

- 200÷150°C **Pt100** class B
- 40÷150°C **K, J** class 2

Measuring insert – p. 36

- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- insert length $L_w = L + 43$ mm

Thermowell

- material: stainless steel 1.4541
- length L [mm]: 50÷2000

Connection head

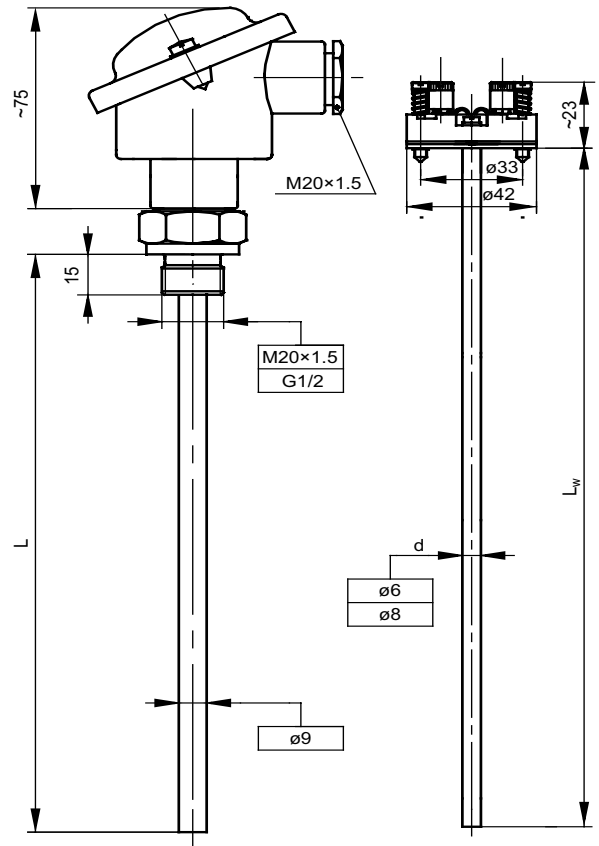
- B, IP55, -40÷100°C

Options

- local display in connection head DANWwin – p. 160
- Pt500, Pt1000, Ni100, Ni1000, T, N
- other threads (inch and metrical) acc. to requirements
- connection heads – stainless steel BEG; aluminium NA, IP65; aluminium NA with snap lock – pp. 157÷158
- Pt100: class A -100÷150°C, class AA -50÷150°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- additional process thermowells – pp. 148÷153
- hot junction type – p. 13
- compensation cables – p. 145



Ordering code

Temperature sensor



- Single: **no designation**
- Double: **2**
- With transmitter: **AP**
- With local display: **APW**
- RTD Pt: **OP**
- Thermocouple Fe-CuNi: **TJ**
- Thermocouple NiCr-NiAl: **TK**
- Hot junction type for TC: **SO, SP, SOA**
- Thermowell length L [mm]: **100, 160, 230** or other*
- Thermowell diameter d [mm]: **9, 11**
- Thread dimension: **M20x1,5; G½** or other*
- RTD / thermocouple class: **A, B* / 1, 2**
- RTD Pt100 connection: **2-, 3-, 4- wire**
- Transmitter type – temperature range: e.g. **Tx – (0÷400)°C***

Ordering example:

2TOPGB-11-160-9-G½-A-3 double sensor with Pt100, class A, 3-wire connection, thermowell diameter 9 mm and length L=160 mm, threaded fitting G½

APWTTJGB-11-160-11-G¾-1-SO-Tx-(0÷150)°C single sensor with thermocouple Fe-CuNi /J/, class 1, insulated hot junction SO, thermowell diameter 11 mm and length L=160 mm, threaded fitting G¾, with transmitter 4÷20 mA, temperature range 0÷150°C and local display LPI-01 in connection head DANwin

Temperature Sensors with Replaceable Measuring Insert **TOPGN-11, TTJGN-11, TTKGN-11**

Specification

Temperature range / sensing element

- 200÷550°C **Pt100** class B
- 40÷550°C **K, J** class 2

Measuring insert – p. 36

- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- insert length $L_w = L + 155$ mm

Thermowell

- material: stainless steel 1.4541
- length L [mm]: 50÷2000

Connection head

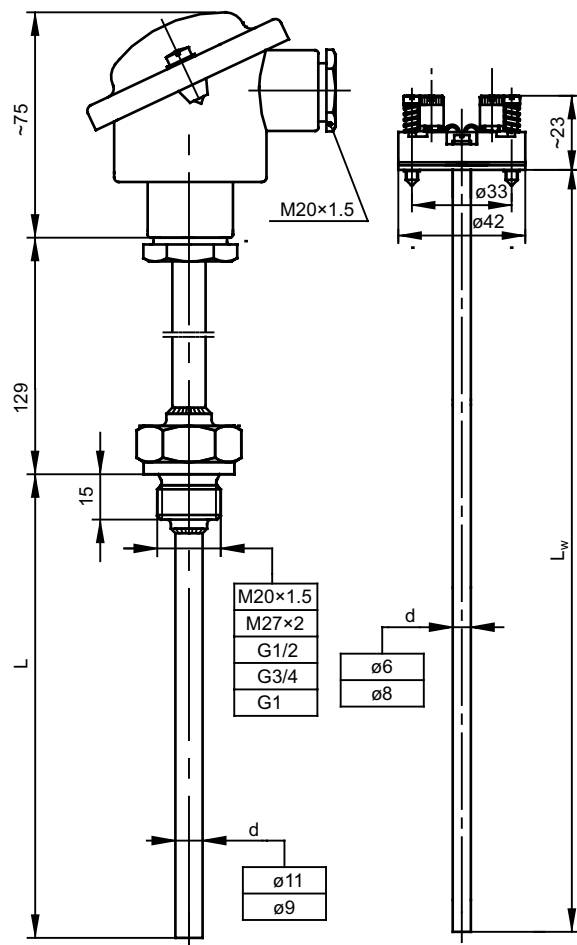
- B, IP55, -40÷100°C

Options

- local display in connection head DANWwin – p. 160
- Pt500, Pt1000, Ni100, Ni1000, T, N
- other threads (inch and metrical) acc. to requirements
- connection heads – stainless steel BEG; aluminium NA, IP65; aluminium NA with snap lock – pp. 157÷158
- Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- additional process thermowells – pp. 148÷153
- hot junction type – p. 13
- compensation cables – p. 145



Ordering code

Temperature sensor



- Single: **no designation**
- Double: **2**
- With mineral insulated measuring insert ø6 mm: **P**
- With transmitter: **AP**
- With local display: **APW**
- RTD Pt: **OP**
- Thermocouple Fe-CuNi: **TJ**
- Thermocouple NiCr-NiAl: **TK**
- Hot junction type for TC: **SO, SOA, SP**
- Thermowell length L [mm]: **160, 250, 400** or other*
- Thermowell diameter d [mm]: **9, 11**
- Thread dimension: **M20x1,5; G½** or other*
- RTD/ thermocouple class: **A, B*** / 1, 2
- RTD Pt100 connection: **2-, 3-, 4- wire**
- Transmitter type – temperature range: e.g. **Tx – (0÷400)°C***

Ordering example:

2TOPGN-11-250-9-G½-A-3 double sensor with Pt100, class A, 3-wire connection, thermowell diameter 9 mm and length L=250 mm, threaded fitting G½

APWTTKGN-11-600-11-SO-G¾-1-Tx-(-40÷500)°C single sensor with thermocouple NiCr-NiAl /K/ class 1, insulated hot junction SO, outer diameter 11 mm, immersion length 600 mm, threaded fitting G¾, transmitter 4÷20 mA, and local display LPI-01 in connection head DANwin

Temperature Sensors with Replaceable Measuring Insert **TOPGN-54, TTJGN-54, TTKGN-54**

Specification

Temperature range / sensing element

- 200÷550°C **Pt100** class B
- 40÷550°C **K, J** class 2

Measuring insert – p. 38

- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- insert length $L_w = L + 108$ mm

Thermowell

- material: stainless steel 1.4541
- length L [mm]: 50÷2000

Connection head

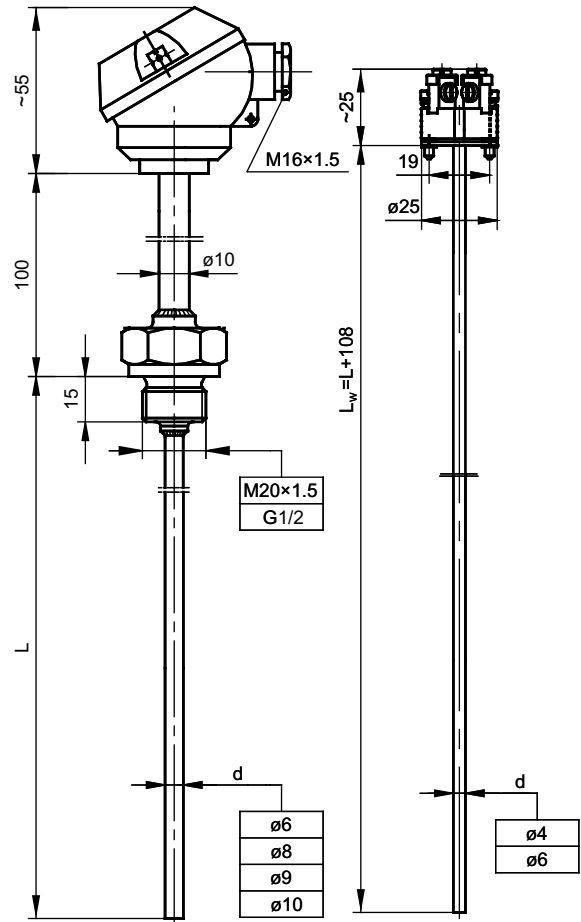
- MA, IP54, -40÷100°C

Options

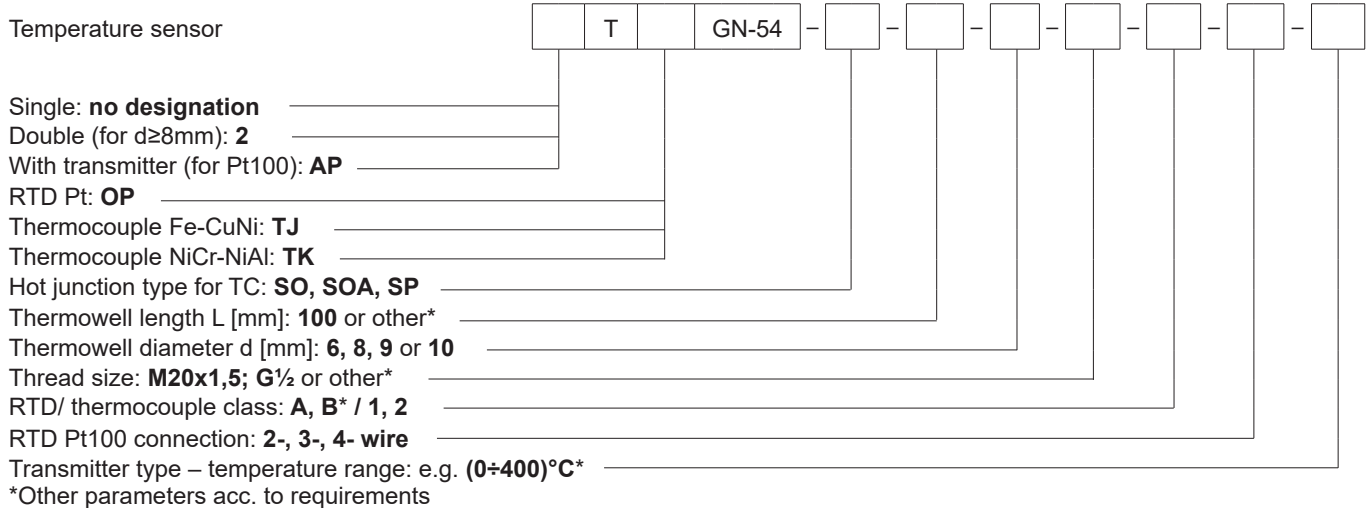
- Pt500, Pt1000, Ni100, Ni1000, T, N
- other threads (inch and metrical) acc. to requirements
- connection heads – stainless steel MBEG – pp. 157÷158
- Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class 1

Additional equipment

- temperature transmitters – p. 170
- additional protection tubes and thermowells – pp. 148÷153
- hot junction type – p. 13
- compensation cables – p. 145



Ordering code



Ordering example:

APTOPGN-54-100-6-G½-A-2-(0÷300)°C single sensor with Pt100, class A, thermowell diameter 6 mm and length L=100 mm, threaded fitting G½, with transmitter LTT-03J, 4÷20 mA

2TTKGN-54-SP-500-8-M20x1,5-2 double sensor with thermocouple NiCr-NiAl /K/, class 2, grounded hot junction SP, thermowell diameter 8 mm and length L=500 mm, threaded fitting M20x1,5

Temperature Sensors with Replaceable Measuring Insert **TOPP-11, TTJP-11, TTKP-11**

Specification

Temperature range / sensing element

-200÷550°C	Pt100	class B
-40÷700°C	J	class 2
-40÷900°C	K	class 2

Measuring insert – p. 36

- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- insert length $L_w = L + 25$ mm

Thermowell

- material: stainless steel 1.4541 for [mm]: $\varnothing 9, 11, 12, 14, 15$
- material: steel 1.4841 for $\varnothing 15$ mm
- material: steel 1.4762 for $\varnothing 15$ mm
- length L [mm]: 50÷2000

Connection head

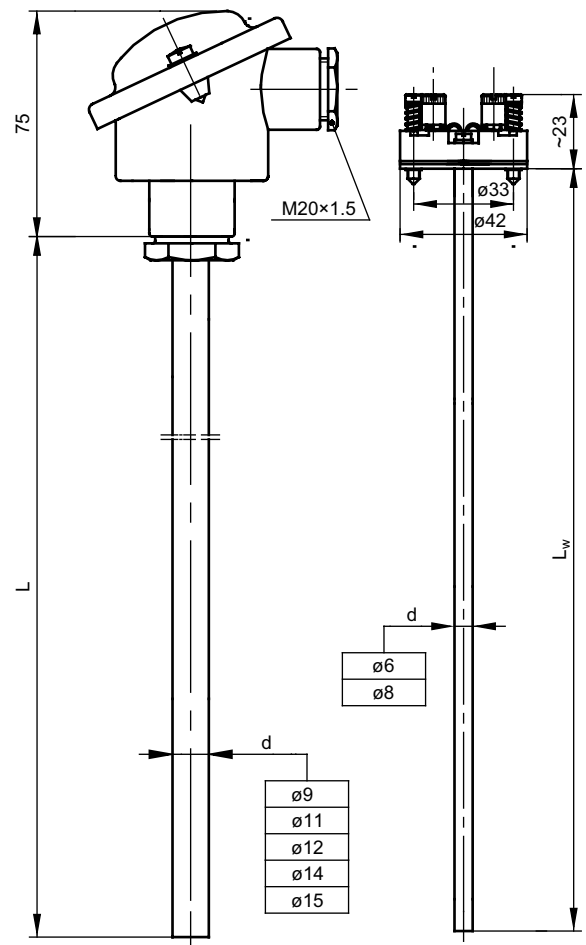
- B, IP55, -40÷100°C

Options

- local display in connection head DANWwin – p. 160
- Pt500, Pt1000, Ni100, Ni1000, T, N
- connection heads – stainless steel BEG; aluminium NA, IP65; aluminium NA with snap lock – pp. 157÷158
- Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class 1

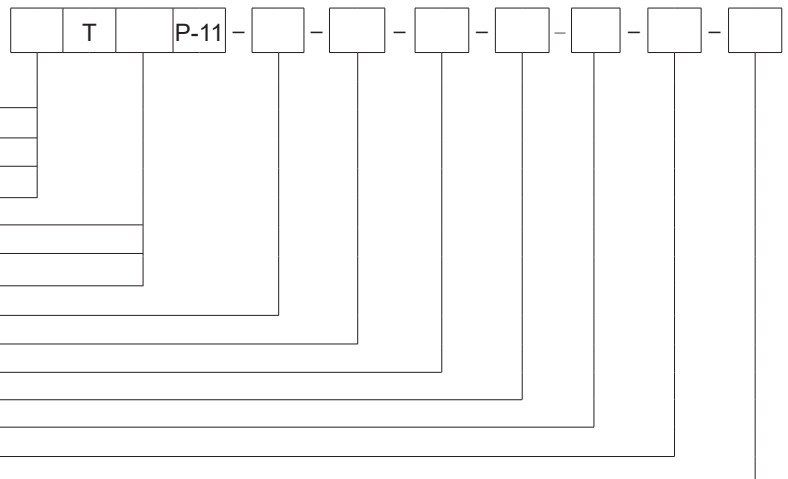
Additional equipment

- temperature transmitters – pp. 162÷174
- additional protection tubes and thermowells – pp. 148÷153
- hot junction type – p. 13
- compensation cables – p. 145
- sensor mounting fittings – pp. 155÷156



Ordering code

Temperature sensor



- Single: **no designation**
- Double (for $d \geq 8$ mm): **2**
- With local display: **APW**
- With transmitter: **AP**
- RTD Pt: **OP**
- Thermocouple Fe-CuNi: **TJ**
- Thermocouple NiCr-NiAl: **TK**
- Hot junction type for TC: **SO, SOA, SP**
- Thermowell length L [mm]: **500** or other*
- Thermowell diameter d [mm]: **9, 11, 12, 14, 15**
- Thermowell material: **1,4541; 1,4841; 1,4762**
- RTD / thermocouple class: **A, B* / 1, 2**
- RTD Pt100 connection: **2-, 3-, 4- wire**
- Transmitter type – temperature range: **Tx (0÷400)°C***

Ordering example:

TOPP-11-500-12- 1,4541-A-3 single sensor with Pt100, class A, 3-wire connection, thermowell material 1,4541, diameter $\varnothing 12$ mm and length $L=500$ mm

APTTKP-11-SO-710-15-1.4762-1- Tx-(0÷150)°C single sensor with thermocouple NiCr-NiAl /K/, class 1, grounded hot junction SO, thermowell material 1.4762, diameter 11 mm and length $L=600$ mm, with transmitter 4÷20 mA

Temperature Sensors with Replaceable Measuring Insert **TOPT-11, TTJT-11, TTKT-11**

Specification

Temperature range / sensing element

- 200÷550°C **Pt100** class B
- 40÷550°C **K, J** class 2

Measuring insert – p. 36

- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- insert length $L_w = L + 155$ mm

Thermowell

- material: stainless steel 1.4541
- flanged, PN16, DN20, 25 with lap acc. to PN-EN 1092*
- diameter [mm]: $\phi 11$
- length L [mm]: 50÷2000

Connection head

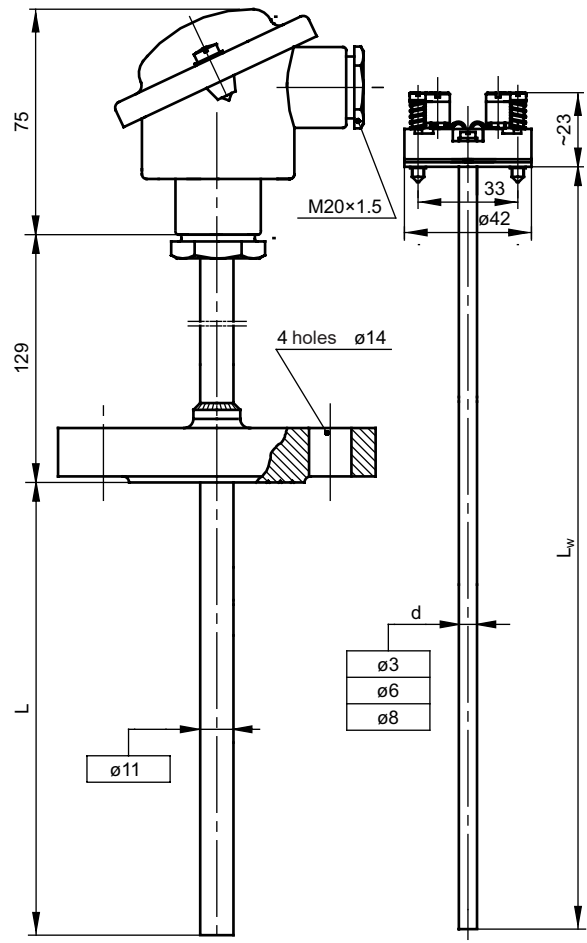
- B, IP55, -40÷100°C

Options

- local display in connection head DANWwin – p. 160
- Pt500, Pt1000, Ni100, Ni1000, T, N
- other flanges acc. to requirements
- connection heads – stainless steel BEG; aluminium NA, IP65; aluminium NA with snap lock – pp. 157÷158
- Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class

Additional equipment

- temperature transmitters – pp. 162÷174
- hot junction type – p. 13
- compensation cables – p. 145



Ordering code

Temperature sensor



- Single: **no designation**
 - Double: **2**
 - With transmitter: **AP**
 - With local display: **APW**
 - RTD Pt: **OP**
 - Thermocouple Fe-CuNi: **TJ**
 - Thermocouple NiCr-NiAl: **TK**
 - Hot junction type for TC: **SO, SOA, SP**
 - Thermowell length L [mm]: **160, 250, 400** or other*
 - RTD / thermocouple class: **A, B* / 1, 2**
 - RTD Pt100 connection: **2-, 3-, 4- wire**
 - Flange: **DN20, DN25, other***
 - Transmitter type – temperature range: **Tx (0÷400)°C***
- *Other parameters acc. to requirements

Ordering example:

TOPT-11-500-A-3-DN20 single sensor with Pt100, class A, 3-wire connection, thermowell diameter 11 mm and length L=500 mm, with welded flange DN20

APTTKT-11-SO-400-1-DN25-Tx-(0÷550)°C – single sensor with thermocouple NiCr-NiAl /K/, class 1, insulated hot junction SO, thermowell diameter 11 mm and length L=400 mm, with transmitter 4±20 mA, with welded flange DN25

Temperature Sensors with Replaceable Measuring Insert **TTJU-45, TTKU-45**

Specification

Temperature range / sensing element

-40÷300°C **K, J** class 2

Measuring insert – p. 37

- mineral insulated $\varnothing 3$ mm
- insert length $L_w=L+445$ mm

Thermowell

- material: stainless steel 1.4541
- due to a special thermowell construction this sensor can be mounted in a door of a rubber mixer
- thermowell tip is covered with tungsten carbide to increase abrasion resistance

Connection head

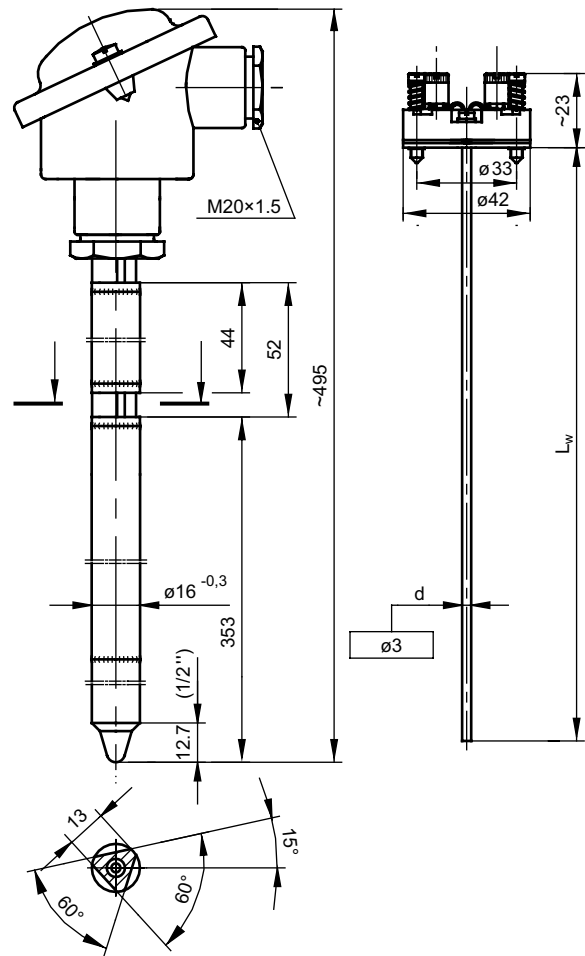
- B, IP55, -40÷100°C

Options

- connection heads – stainless steel BEG; aluminium NA, IP65;
- aluminium NA with snap lock – pp. 157÷158

Additional equipment

- temperature transmitters – pp. 162÷174
- hot junction type – p. 13
- compensation cables – p. 145



Ordering code

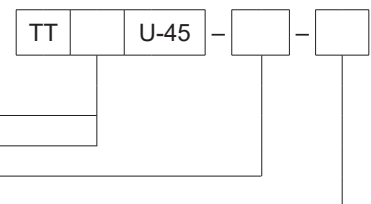
Temperature sensor

Thermocouple Fe-CuNi: **TJ**

Thermocouple NiCr-NiAl: **TK**

Hot junction type for TC: **SO, SP**

Thermocouple class: **1, 2**



Ordering example:

TTJU-45-SO-1 sensor with thermocouple Fe-CuNi /J/, class 1, insulated hot junction SO

Temperature Sensors with Replaceable Measuring Insert **TOPSW-11, 21, TTJSW-11, 21, TTKSW-11, 21**

Specification

Temperature range / sensing element

0÷540°C **Pt100** class B
 0÷540°C **K, J** class 2

Measuring insert – pp. 36, 37

- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- insert length $L_w = L + 173$ mm

Thermowell

- material: boiler steel 1.7335 (15HM)*
- diameter [mm] **ø18** (SW1) or **ø24** (SW2)
- dimension L/L₁ 100/35, 140/65, 200/65, 260/125 (SW1)
 100/35, 140/65, 200/65, 260/125 (SW2)

Connection head

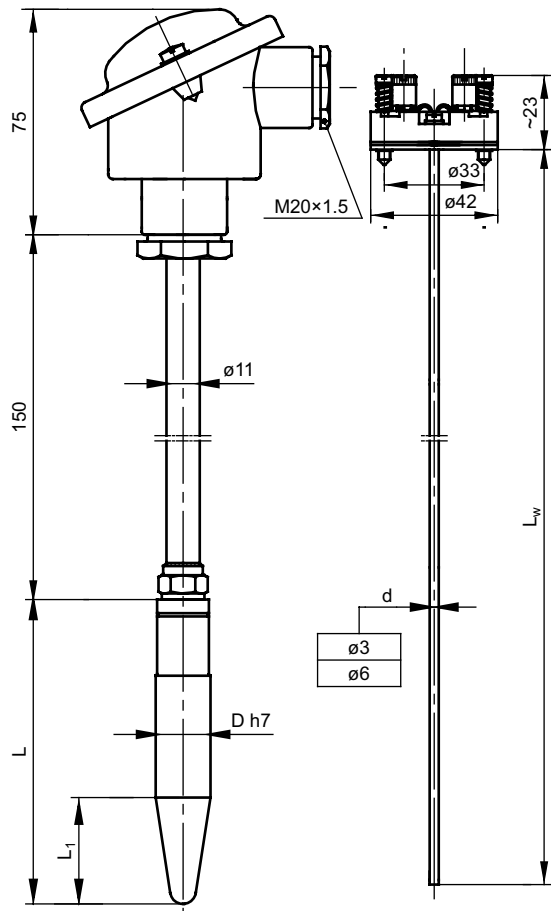
- B, IP55, -40÷100°C

Options

- local display in connection head DANWwin – p. 160
- Pt500, Pt1000, Ni100, Ni1000, T, N
- connection heads – stainless steel BEG; aluminium NA, IP65;
 aluminium NA with snap lock – pp. 157÷158
- Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class 1

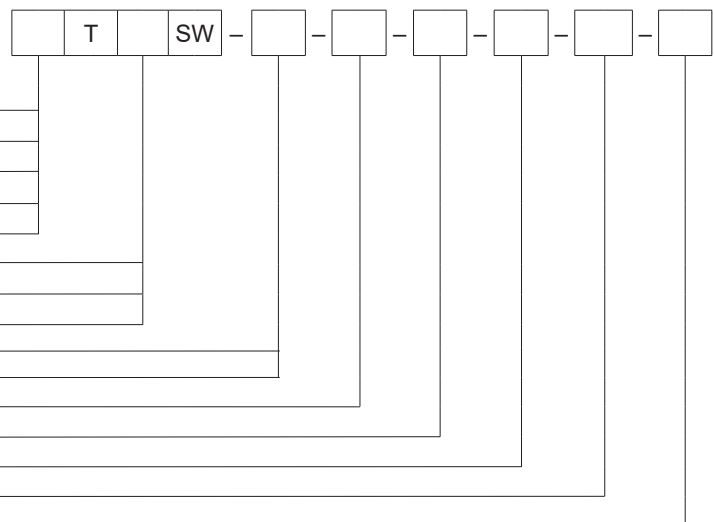
Additional equipment

- temperature transmitters – pp. 162÷174
- hot junction type – p. 13
- compensation cables – p. 145



Ordering code

Temperature sensor



- Single: **no designation**
- Double: **2**
- With mineral insulated measuring insert: **P** (only for SW2)
- With transmitter: **AP**
- With local display: **APW**
- RTD Pt: **OP**
- Thermocouple Fe-CuNi: **TJ**
- Thermocouple NiCr-NiAl: **TK**
- Thermowell diameter 18 mm: **11**
- Thermowell diameter 24 mm: **21**
- Hot junction type for TC: **SO, SOA, SP**
- Thermowell length L [mm]: **100, 140, 200, 260** or other*
- RTD / thermocouple class: **A, B* / 1, 2**
- RTD Pt 100 connection: **2-, 3-, 4- wire**
- Transmitter type – temperature range: **Tx – (0÷400)°C***

*Other parameters acc. to requirements

Ordering example:

TOPSW-11-200-A-3 single sensor with Pt100, class A, 3-wire connection, thermowell material steel 15HM, diameter 18 mm and length L=200 mm

APTTSW-21-SO-140-1-Tx-(0÷540)°C single sensor with thermocouple NiCr-NiAl /K/, class 1, insulated hot junction SO, thermowell diameter 24 mm and length L=140 mm, with transmitter 4÷20 mA

Temperature Sensors with Replaceable Measuring Insert **TOPSWT-11, TTJSWT-11, TTKSWT-11, TOPSWG-11, TTJSWG-11, TTKSWG-11**

Specification

Temperature range / sensing element

-200÷600°C	Pt100	class B
-40÷700°C	J	class 2
-40÷700°C	K	class 2

Measuring insert – pp. 36÷37

- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- insert length $L_w = L + 225$ mm

Thermowell

- material: stainless steel 1.4541
- SWG thread M20x1,5; G½; ½NPT
- SWT flange PN16DN20, DN25, B1 acc. to PN-EN 1092-1*
- thermowell dimensions L_{max} [mm]: 570

Connection head

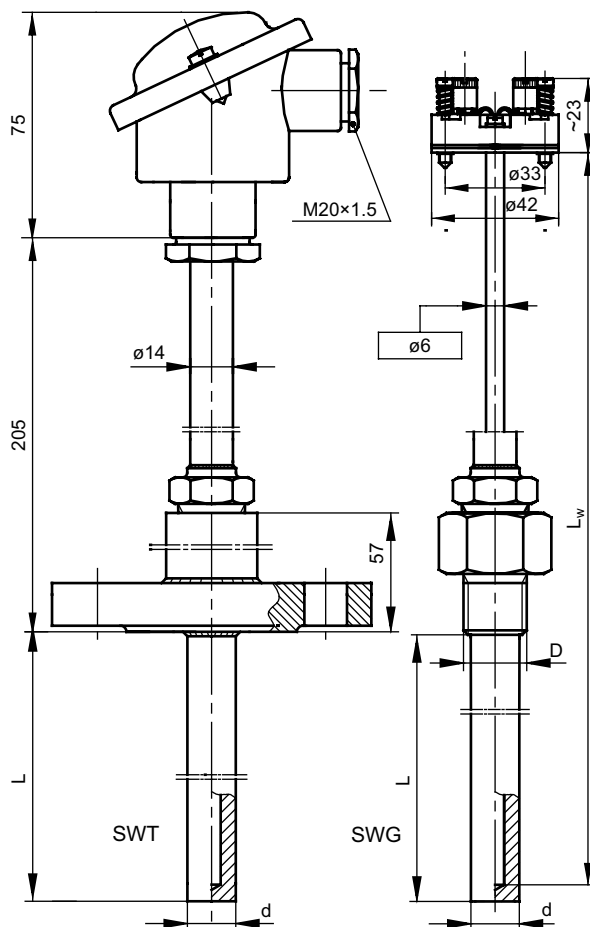
- B, IP55, -40÷100°C

Options

- local display in connection head DANWwin – p. 160
- Pt500, Pt1000, Ni100, Ni1000, T, N
- connection heads – stainless steel BEG; aluminium NA, IP65; aluminium NA with snap lock – pp. 157÷158
- Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- hot junction type – p. 13
- compensation cables – p. 145



Ordering code

Temperature sensor

	T		SW		11								
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Single: **no designation**
 Double: **2**
 With mineral insulated measuring insert: **P**
 With transmitter: **AP**
 With local display: **APW**
 RTD Pt: **OP**
 Thermocouple Fe-CuNi: **TJ**
 Thermocouple NiCr-NiAl: **TK**
 Thermowell SWT: **T**
 Thermowell SWG: **G**
 Hot junction type for TC: **SO, SOA, SP**
 Thermowell dimensions dxL [mm]: **acc. to requirements**
 Thermowell material: **1.4541** or other*
 RTD / thermocouple class: **A, B* / 1, 2**
 RTD Pt100 connection: **2-, 3-, 4- wire**
 Flange type for **SWG**, thread type **D** for **SWG**
 Transmitter type – temperature range: **Tx (0÷400)°C***
 *Other parameters acc. to requirements

Ordering example: **APTTKSWG-11-SO-16x400-1.4541-2-G½- Tx-(0÷550)°C** single sensor with thermocouple NiCr-NiAl /K/, class 2, insulated hot junction SO, thermowell SWG type, material stainless steel 1.4541, dimensions 16x400 mm, threaded fitting G½, with transmitter 4÷20 mA

Temperature Sensors with Replaceable Measuring Insert **TOPGI-1., TTJGI-1., TTKGI-1**

Specification

Temperature range / sensing element

- 200÷600°C **Pt100** class B
 -40÷600°C **K, J** class 2

Measuring insert – pp. 36, 37

- resistance (diameter [mm]: 3; 6; 8)
- thermocouple (diameter [mm]: 3; 4,5; 6; 8)
- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- pipe insert W1, L [mm]: 50÷1500
- mineral insulated insert W2, L_{min} [mm]: 50
- insert length L_w=L+157 mm

Thermowell

- extension pipe material: stainless steel 1.4541
- unsheathed immersion part of the insert
- for mounting in additional protection tubes and thermowells:
 OSG, OTG, OGG, SW, SWT, SWG – pp. 148÷153

Connection head

- B, IP55, -40÷100 °C

Options

- local display in connection head DANWwin – p. 160
- Pt500, Pt1000, Ni100, Ni1000, N, T
- other threads (inch and metrical) acc. to requirements
- connection heads – stainless steel BEG; aluminium NA, IP65;
 aluminium NA with snap lock – p. 157÷158
- Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- hot junction type – p. 13
- compensation cables – p. 145

Ordering code

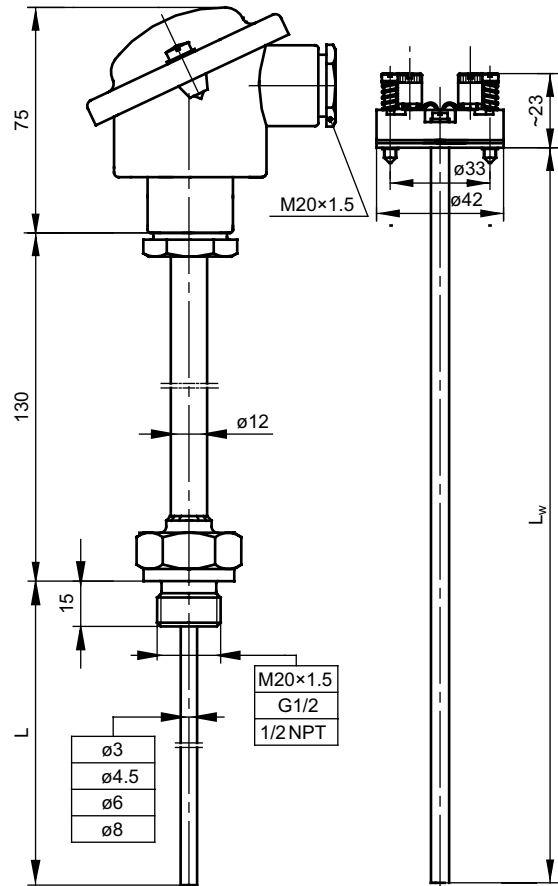
Temperature sensor

	T	GI-1.										
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Single: **no designation**
 Double: **2**
 With transmitter: **AP**
 With local display: **APW**
 RTD Pt: **OP**
 Thermocouple Fe-CuNi: **TJ**
 Thermocouple NiCr-NiAl: **TK**
 With insert W1: **1**
 With insert W2: **2**
 Hot junction type for TC: **SP, SO, SOA**
 Length L [mm]: **100** or other*
 Insert diameter [mm]: **6** or other*
 Thread dimension: **M20x1,5, G½** or other*
 RTD / thermocouple class: **A, B* / 1, 2**
 RTD Pt100 connection: **2-, 3-, 4- wire**
 Transmitter type – temperature range: **Tx - (0÷400)°C***
 *Other parameters acc. to requirements

Ordering example:

TOPGI-11-160-6-M20x1,5-B-2 single sensor with Pt100, class B, 2-wire connection, threaded fitting M20x1,5, insert diameter 6 mm and length L=160 mm



Temperature Sensors with Replaceable Measuring Insert **TTJU-11, TTKU-11, TTJUO-11, TTKUO-11**

Specification

Temperature range / sensing element

- 40÷1200°C **K** class 2
- 40÷700°C **J** class 2

Measuring insert – p. 40

- thermocouple solid wire insert WD – K/J- 15
- insert length $L_w=L+35$ mm

Thermowell

- material: steel 1.4841 max. temp. 1150°C
- material: steel 1.4762 max. temp. 1200°C
- material: steel 15Cr25T max. temp. 1000°C
- length L [mm]: 300÷3000

Connection head

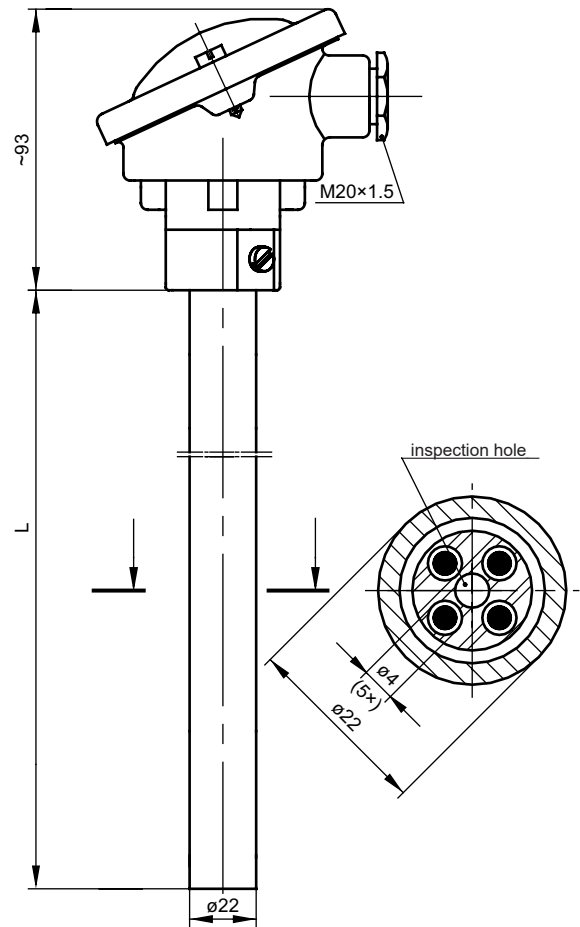
- A, IP53, -40÷100 °C

Options

- with inspection hole $\varnothing 4$ mm
- thermocouple class 1

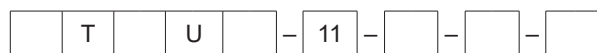
Additional equipment

- temperature transmitters – pp. 162÷174
- compensation cables – p. 145
- sensor mounting fittings – p. 156



Ordering code

Temperature sensor



- With transmitter: **AP**
- Single: **no designation**
- Double: **2**
- Thermocouple Fe-CuNi: **TJ**
- Thermocouple NiCr-NiAl: **TK**
- Inspection hole $\varnothing 4$ mm: **O**
- Sheath length L [mm]: **500** or other*
- Thermocouple class: **1, 2**
- Sheath material: **1.4841, 1.4762** or **15Cr25T**

*Other parameters acc. to requirements

Ordering example:

TTJU-11-500-1-1.4841 single sensor with thermocouple Fe-CuNi /J/, class 1, material steel 1.4841, sheath length L=500 mm

TTKUO-11-500-1-1.4762 single sensor with thermocouple NiCr-NiAl /K/, class 1, material steel 1.4762, with inspection hole $\varnothing 4$ mm, sheath length L=500 mm

Temperature Sensors with Replaceable Measuring Insert **TTKU-1, TTJU-1**

Specification

Temperature range / sensing element

- 40÷700°C **J** class 2
- 40÷1150°C **K** class 2

Measuring insert – p. 40

- thermocouple solid wire insert WD – K/J- 12
- insert length $L_w=L+20$ mm

Thermowell

- material: steel 1.4841 max. temp. 1150°C
- material: steel 15Cr25T max. temp. 1000°C
- length L [mm]: 300÷3000

Connection head

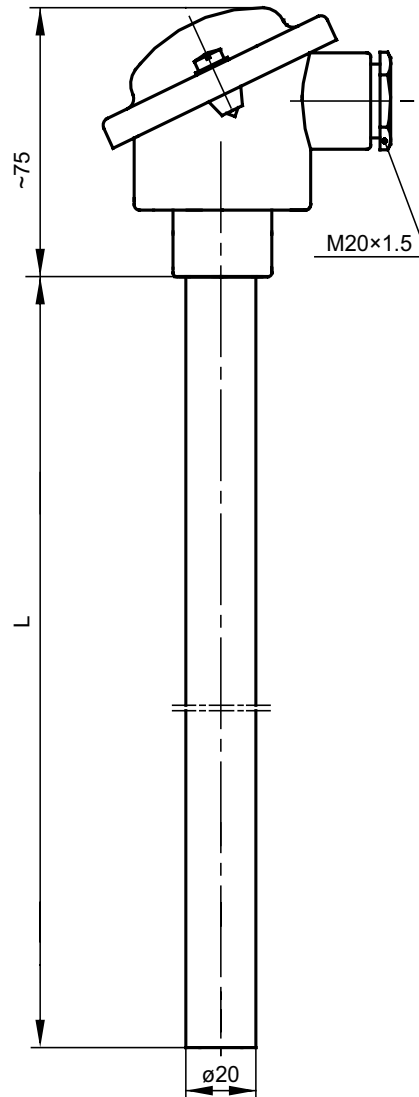
- B, IP54, -40÷100 °C

Options

- double sensor with insert WD-K/J-15
- thermocouple class 1

Additional equipment

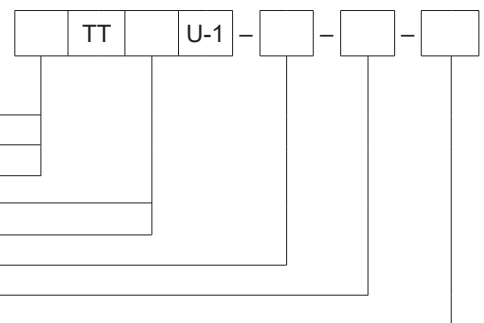
- temperature transmitters – pp. 162÷174
- compensation cables – p. 145
- sensor mounting fittings: UG1-20 – p. 155



Ordering code

Temperature sensor

- With transmitter: **AP**
 - Single: **no designation**
 - Double: **2**
 - Thermocouple Fe-CuNi: **J**
 - Thermocouple NiCr-NiAl: **K**
 - Sheath length L [mm]: **400, 800** or other*
 - Thermocouple class: **1, 2**
 - Sheath material: **1.4841, 15Cr25T**
- *Other parameters acc. to requirements



Ordering example:

TTJU-1-500-1-15Cr25T single sensor with thermocouple Fe-CuNi /J/, class 1, material steel 15Cr25T, sheath diameter 20 mm and length L=500 mm

2TTKU-1-500-1-1.4841 double sensor with thermocouple NiCr-NiAl /K/, class 1, material 1.4841, sheath diameter 20 mm and length L=500 mm

Temperature Sensors with Replaceable Measuring Insert **TTJK-1, TTKK-1**

Specification

Temperature range / sensing element

- 40÷700°C **J** class 2
- 40÷1150°C **K** class 2

Measuring insert – p. 40

- thermocouple solid wire insert WD – K/J- 12
- insert length $L_w=L+L_1+40$ mm

Thermowell

- material: steel 1.4841 max. temp. 1150°C
- material: steel 15Cr25T max. temp. 1000°C
- length L [mm]: 500÷1000
- length L_1 [mm]: 300, 400, 500, 600

Connection head

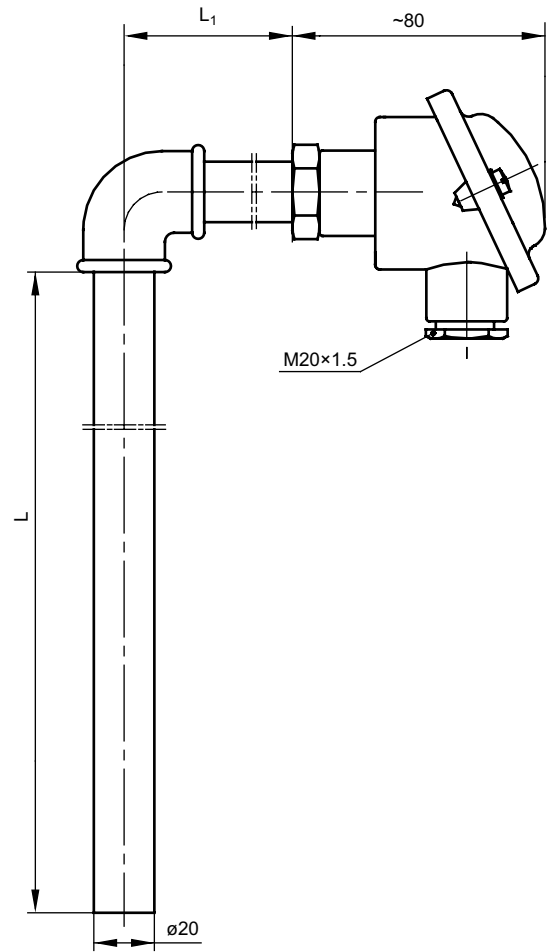
- B, IP54, -40÷100 °C

Options

- thermocouple class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- compensation cables – p. 145
- sensor mounting fittings: UG1-20 – p. 155



Ordering code

Temperature sensor



- Thermocouple Fe-CuNi: **TJ**
- Thermocouple NiCr-NiAl: **TK**
- Sheath length $L \times L_1$ [mm]: **500x400, 800x600** or other*
- Thermocouple class: **1, 2**
- Sheath material: **1.4841 or 15Cr25T**
- *Other parameters acc. to requirements

Ordering example:

TTJK-1-500x400-2-1.4841 single sensor with thermocouple Fe-CuNi /J/, class 2, sheath material steel 1.4841, dimensions $L \times L_1$ -500x400 mm

TTKK-1-630x500-1-15Cr25T single sensor with thermocouple NiCr-NiAl /K/, class 1, sheath material steel 15Cr25T, dimensions $L \times L_1$ -630x500 mm

Replaceable Measuring Inserts for Temperature Sensors **W1P, W1J, W1K**

Specification

Temperature range / sensing element

- 200÷550°C **Pt100** class B
- 40÷700°C **K, J** class 2

Sheath

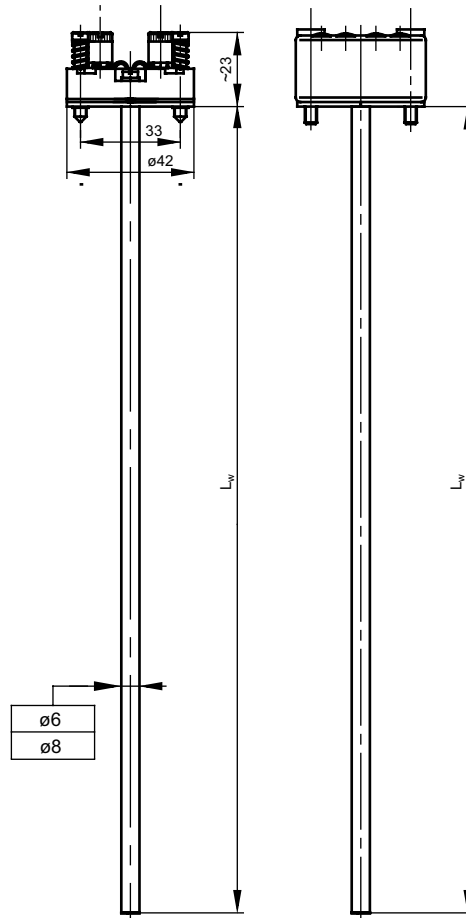
- material: stainless steel 1.4541
- pipe insert W1
- length: L_w [mm]: 145, 205, 275, 315, 405, 555 for $\phi 6$ L_{max} [mm]: 1500
 L_w [mm]: 525, 735, 1025, 1425, 2025 for $\phi 8$ L_{max} [mm]: 2025

Options

- Pt500, Pt1000, Ni100, Ni1000, N, T
- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class 1

Additional equipment

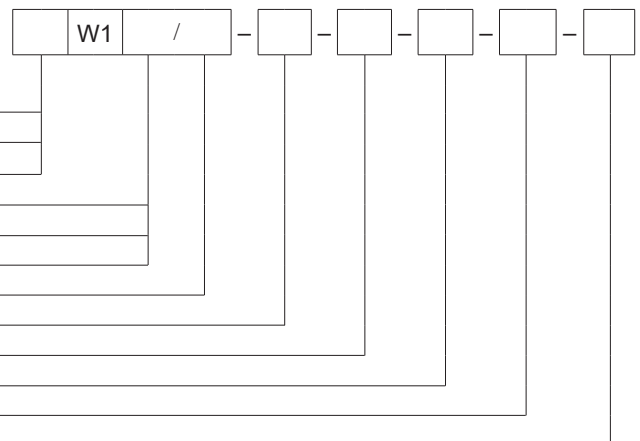
- temperature transmitters – pp. 162÷174
- additional protection tubes and thermowells – pp. 148÷53
- hot junction type – p. 13
- compensation cables – p. 145



Ordering code

Measuring insert

- Single: **no designation**
 - Double: **2**
 - With transmitter: **AP**
 - RTD Pt: **P**
 - Thermocouple Fe-CuNi: **J**
 - Thermocouple NiCr-NiAl: **K**
 - Sheath diameter d [mm]: **6, 8**
 - Hot junction type for TC: **SP, SO, SOA**
 - Insert length L [mm]: **acc. to specification or other***
 - RTD / thermocouple class: **A, B* / 1, 2**
 - RTD connection: **2-, 3-, 4- wire**
 - Transmitter type – temperature range: **Tx - (0÷400)°C***
- *Other parameters acc. to requirements



Ordering example:

2W1P/6-315-A-3 double measuring insert for sensor with Pt100, class A, 3-wire connection, sheath diameter 6 mm and length L=315 mm

Replaceable Measuring Inserts for Temperature Sensors **W2P, W2J, W2K**

Specification

Temperature range / sensing element

-200÷550°C	Pt100	class B
-40÷700°C	J	class 2
-40÷900°C	K	class 2

Sheath

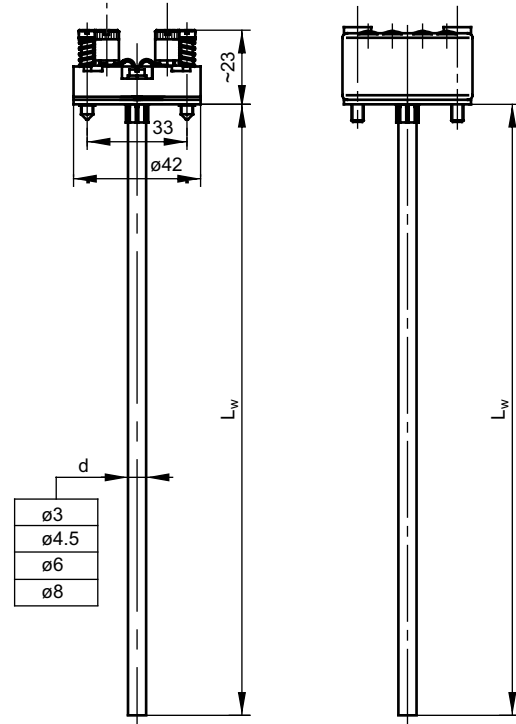
- material: steel 1.4571 for W2P ø3; 6 mm
- material: steel 1.4541 for W2J ø3; 4,5; 6 mm
- material: 2.4816 (Inconel 600) for W2K ø3; 4,5; 6; 8 mm
- mineral insulated insert W2
- length L_w [mm]: min. 100

Options

- Pt500, Pt1000, Ni100, Ni1000, T, N
- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class 1

Additional equipment

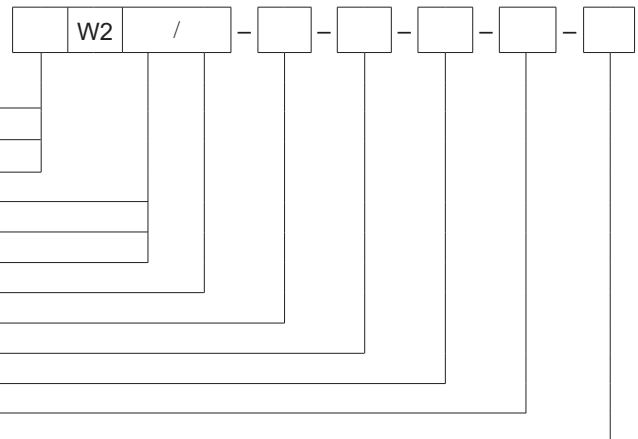
- temperature transmitters – pp. 162÷174
- hot junction type – p. 13
- compensation cables – p. 145



Ordering code

Measuring insert

- Single: **no designation**
- Double: **2**
- With transmitter: **AP**
- RTD Pt: **P**
- Thermocouple Fe-CuNi: **J**
- Thermocouple NiCr-NiAl: **K**
- Sheath diameter d [mm]: **3; 4,5; 6; 8**
- Hot junction type for TC: **SP, SO, SOA**
- Insert length L_w [mm]: **200** or other*
- RTD / thermocouple class: **A, B* / 1, 2**
- RTD connection: **2-, 3-, 4- wire**
- Transmitter type – temperature range: **Tx - (0÷400)°C***



Ordering example:

W2K/6-SO-555-2 single mineral insulated measuring insert for sensor with thermocouple NiCr-NiAl /K/, class 2, insulated hot junction, sheath material Inconel, diameter 6 mm and length $L=555$ mm

Replaceable Measuring Inserts for Temperature Sensors **WM1P, WM1J, WM1K**

Specification

Temperature range / sensing element

-200÷550°C	Pt100	class B
-40÷600°C	K, J	class 2

Sheath

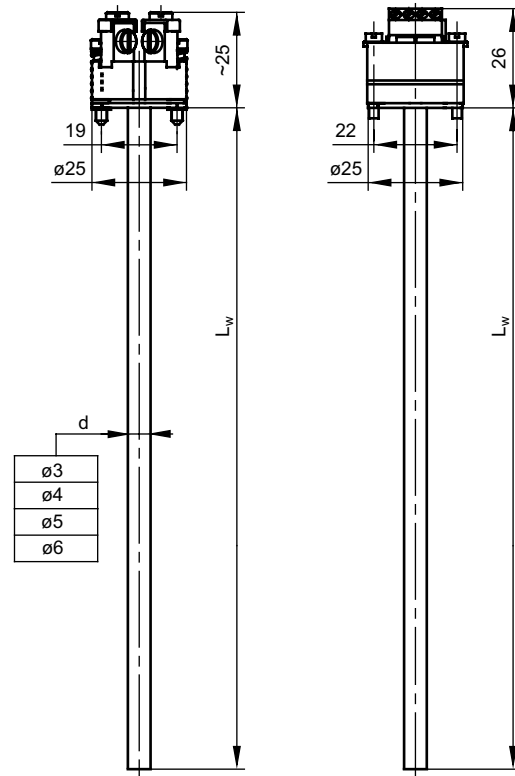
- material: stainless steel 1.4541
- pipe insert WM1
- length L_w [mm]: 100÷1500

Options

- Pt500, Pt1000, Ni100, Ni1000, T, N
- 2-, 3-, 4- wire connection (for Pt100)
- 2-wire connection (for 2xPt100 only ϕ 6 mm)
- for Pt100 with insert diameter smaller than 6 mm, only 2-wire connection
- Pt100: class A -100÷450°C , class AA -50÷250°C; TC: class 1

Additional equipment

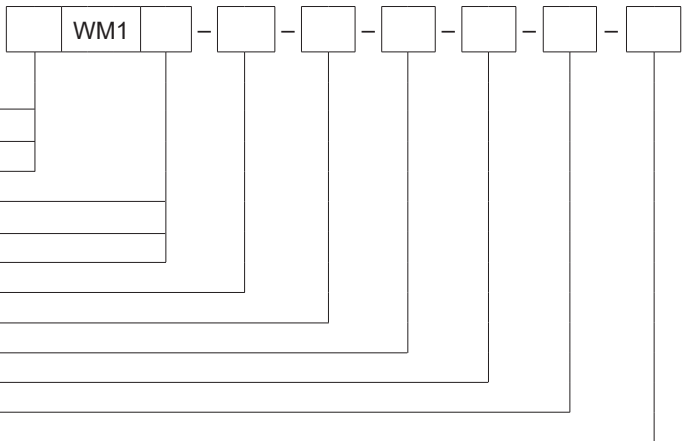
- temperature transmitters – p. 170
- hot junction type – p. 13
- compensation cables – p. 145



Ordering code

Measuring insert

- Single: **no designation**
- Double only for ϕ 6 mm: **2**
- With transmitter: **AP** (Pt100 only)
- RTD Pt: **P**
- Thermocouple Fe-CuNi: **J**
- Thermocouple NiCr-NiAl: **K**
- Sheath diameter d [mm]: **3, 4, 5, 6**
- Hot junction type for TC: **SO, SOA, SP**
- Insert length L_w [mm]: **150** or other*
- RTD / thermocouple class: **A, B* / 1, 2**
- RTD connection: **2-, 3-, 4- wire**
- Transmitter type – temperature range: **LTT - 03J - (0÷400)°C***



Ordering example:

WM1P-5-200-B-2 single measuring insert for sensor with resistor Pt100, class B, 2-wire connection, sheath diameter 5 mm and length $L_w=200$ mm

APWM1P-6-400-B-2-LTT-03J-(0÷400)°C single measuring insert for sensor with resistor Pt100, class B, 2-wire connection, sheath diameter 5 mm and length $L_w=400$ mm, with temperature transmitter 4÷20 mA

Replaceable Measuring Inserts for Temperature Sensors **WM2P, WM2J, WM2K**

Specification

Temperature range / sensing element

-200÷550°C	Pt100	class B
-40÷600°C	J	class 2
-40÷900°C	K	class 2

Sheath

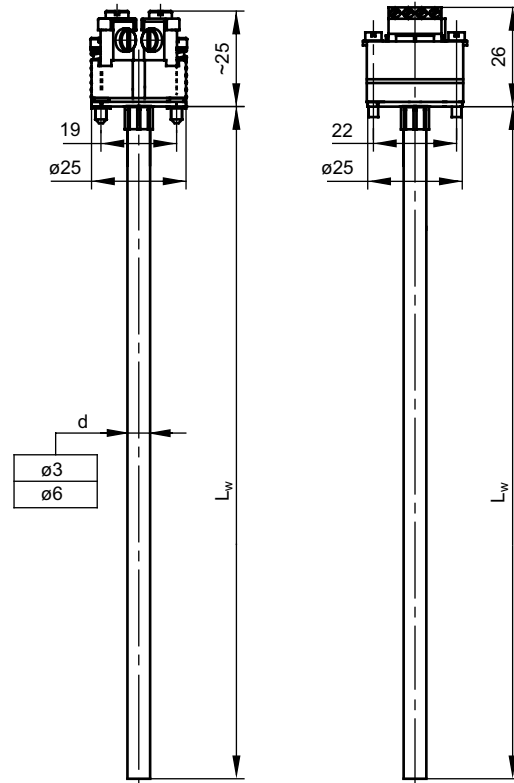
- material: stainless steel 1.4541 for WM2J, 1.4547 for WM2P
- material: 2.4816 (Inconel 600) for WM2K
- mineral insulated insert WM2
- length L_w [mm]: min. 100

Options

- Pt500, Pt1000, Ni100, Ni1000, T, N
- 2-, 3-, 4- wire connection (for Pt100)
- 2-wire connection (for 2xPt100)
- Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class 1

Additional equipment

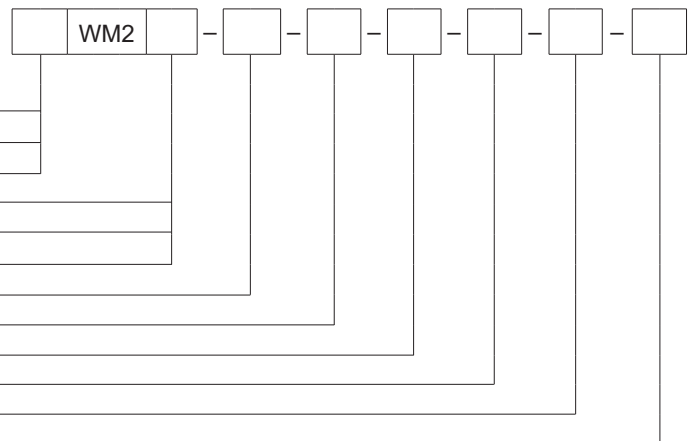
- temperature transmitters – p. 170
- hot junction type – p. 13
- compensation cables – p. 145



B

Ordering code

Measuring insert



- Single: **no designation**
 - Double: **2**
 - With transmitter: **AP**
 - RTD Pt: **P**
 - Thermocouple Fe-CuNi: **J**
 - Thermocouple NiCr-NiAl: **K**
 - Sheath diameter d [mm]: **3, 6**
 - Hot junction type for TC: **SP, SO, SOA**
 - Insert length L_w [mm]: **acc. to requirements**
 - RTD / thermocouple class: **A, B* / 1, 2**
 - RTD connection: **2-, 3-, 4- wire**
 - Transmitter type – temperature range: **LTT-03J- (0÷400)°C***
- *Other parameters acc. to requirements

Ordering example:

APWM2P-6-400-B-2-LTT-03J-(0÷400)°C single measuring insert for sensor with resistor Pt100, class B, 2-wire connection, sheath diameter 6 mm and length $L_w=400$ mm, with temperature transmitter 4÷20 mA

Replaceable Measuring Inserts for Temperature Sensors **WDJ, WDK**

Specification

Temperature range / sensing element

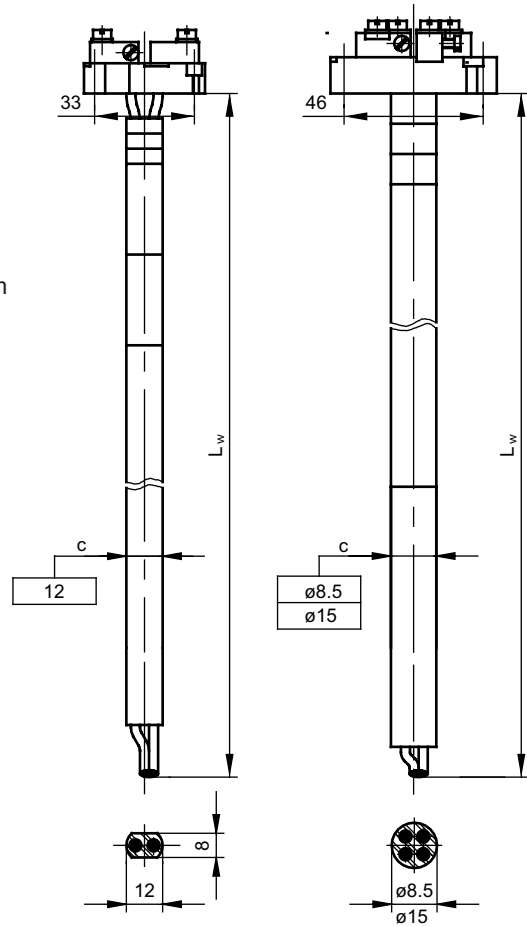
- 40÷750°C **J** class 2
- 40÷1200°C **K** class 2

Sheath

- ceramic mullite 610 ø8,5 mm, thermocouple solid wire ø2 mm
- ceramic mullite 610 ø15 mm, thermocouple solid wire ø3 mm
- high-aluminium ceramic 710 8x12 mm, thermocouple solid wire ø3 mm
- length: L_w [mm]: 300÷3035

Options

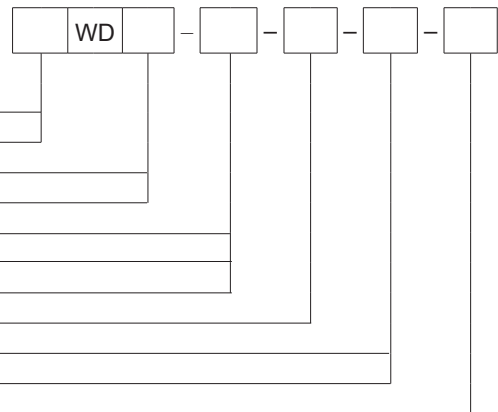
- double design for ø8,5 mm, ø 15 mm
- thermocouple class 1



Ordering code

Measuring insert

- Single: **no designation**
- Double: **2**
- Thermocouple Fe-CuNi: **J**
- Thermocouple NiCr-NiAl: **K**
- Sheath diameter c [mm]: **8,5**
- Sheath diameter c [mm]: **12**
- Sheath diameter c [mm]: **15**
- Insert length L_w [mm]: **1020** or other*
- With terminal block: **K**
- Without terminal block: **no designation**
- Thermocouple class: **1, 2**



*Other parameters acc. to requirements

Ordering example:

WD-K-15-1035-2 single measuring insert for sensor with thermocouple NiCr-NiAl /K/, ceramic sheath diameter 15 mm and length $L_w=1035$ mm

Temperature Sensors with Non-Replaceable Measuring Insert **WTOPGN-6, WTTJGN-6, WTTKGN-6**

Specification

Temperature range / sensing element

-200÷550°C **Pt100** class B
 -40÷550°C **K, J** class 2

Measuring insert

– non-replaceable

Thermowell

– material: stainless steel 1.4541
 – length L [mm]: 80÷1500

Connection head

– XDI-80, IP65, -20÷70°C

Local display

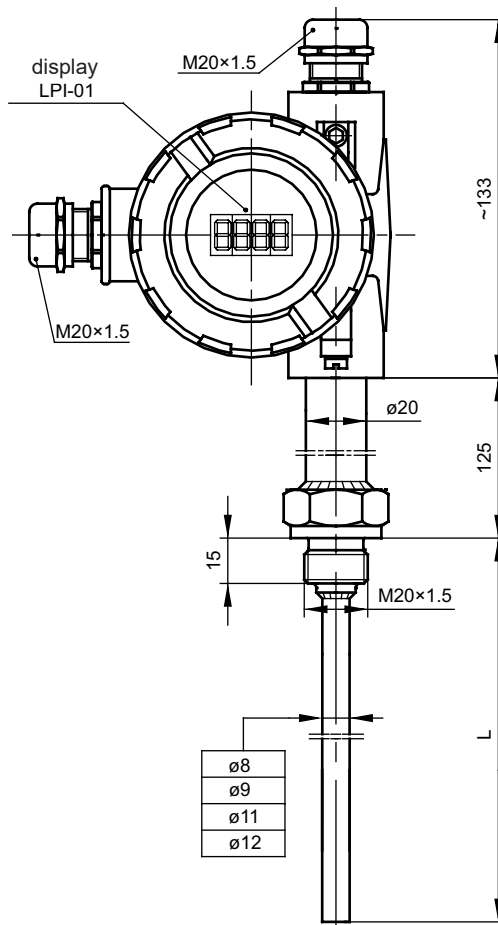
– LPI-01 type + transmitter 4÷20 mA – p. 160

Options

– Pt500, Pt1000, Ni100, Ni1000, T, N
 – other threads (inch and metrical) acc. to requirements
 – Pt100: class A -100÷450°C, class AA -50÷250°C; K, J: class 1

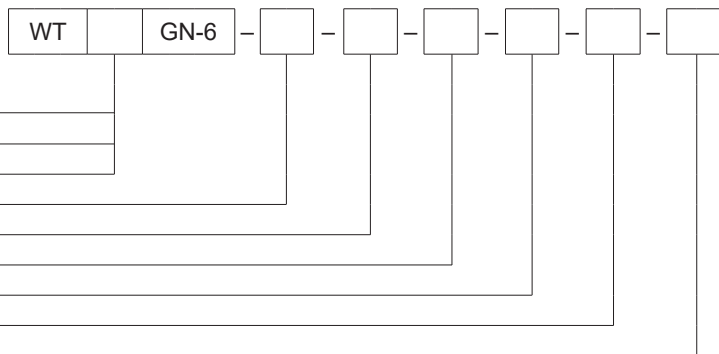
Additional equipment

– temperature transmitters – pp. 162÷174
 – additional protection tubes and thermowells – pp. 148÷153



Ordering code

Temperature sensor



*Other parameters acc. to requirements

Ordering example:

WTOPGN-6-250-9-G½-A-3-LTT03B-(0÷300)°C sensor with Pt100, class A, 3-wire connection, thermowell diameter 9 mm and length L=250 mm, threaded fitting G½, with transmitter LTT03B, temperature range (0÷300)°C and local display

Temperature Sensors with Non-Replaceable Measuring Insert **TOPGB-1, TTJGB-1, TTKGB-1**

Specification

Temperature range / sensing element

- 200÷150°C **Pt100** class B
- 40÷150°C **K, J** class 2

Measuring insert

- non-replaceable

Thermowell

- material: stainless steel 1.4541
- length L [mm]: 50÷1500

Connection head

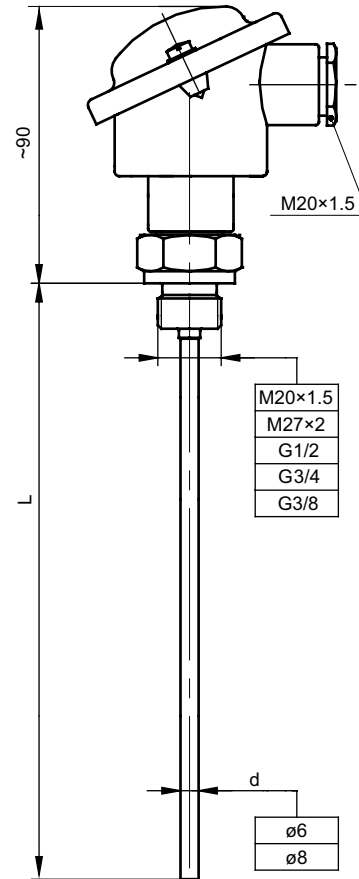
- B, IP55, -40÷100 °C

Options

- local display in connection head DANWwin
- Pt500, Pt1000, Ni100, Ni1000, T, N
- other threads (inch and metrical) acc. to requirements
- connection heads – stainless steel BEG; aluminium NA,IP65; aluminium NA with snap lock – pp. 157÷158
- Pt100: class A -100÷150°C, class AA -50÷150°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- additional protection tubes and thermowells – pp. 148÷153
- hot junction type – p. 13
- compensation cables – p. 145



Ordering code

Temperature sensor



- Single: **no designation**
 - Double: **2**
 - With transmitter: **AP**
 - RTD Pt: **OP**
 - RTD Ni: **ON**
 - Thermocouple Fe-CuNi: **TJ**
 - Thermocouple NiCr-NiAl: **TK**
 - Hot junction type for TC: **SO, SOA, SP**
 - Thermowell diameter d [mm]: **6 or 8**
 - Thermowell length L [mm]: **50, 500**, or other*
 - Thread dimension: **G¹/₂; G³/₄; M20x1,5** or other*
 - RTD / thermocouple class: **A, B* / 1, 2**
 - RTD Pt100 connection: **2-, 3-, 4- wire**
 - Transmitter type – temperature range: **Tx-(0÷400)°C***
- *Other parameters acc. to requirements

Ordering example:

TOPGB-1-6-60-G¹/₂-B-2 single sensor with Pt100, class B, 2-wire connection, thermowell diameter 6 mm and length L=60 mm, threaded fitting G¹/₂

APTTJGB-1-SO-8-600-G³/₄-1-Tx-(0÷150)°C single sensor with thermocouple Fe-CuNi /J/, class 1, insulated hot junction SO, thermowell diameter 8 mm and length L=600 mm, threaded fitting G³/₄, with transmitter 4÷20 mA

Temperature Sensors with Non-Replaceable Measuring Insert **TOPGN-1, TTJGN-1, TTKGN-1**

Specification

Temperature range / sensing element

- 200÷600°C **Pt100** class B
- 40÷600°C **K, J** class 2

Measuring insert

- non-replaceable

Thermowell

- material: stainless steel 1.4541
- length L [mm]: 50÷2000

Connection head

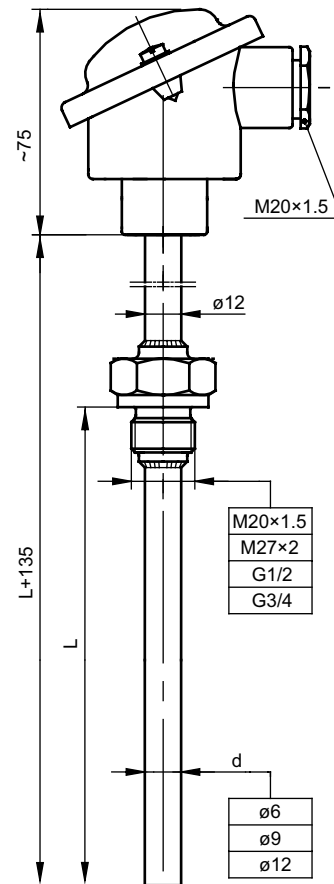
- B, IP54, -40÷100 °C

Options

- local display in connection head DANWwin – p. 160
- Pt500, Pt1000, Ni100, Ni1000, T, N
- other threads (inch and metrical) acc. to requirements
- connection heads – stainless steel BEG; aluminium NA, IP65;
- aluminium NA with snap lock – pp. 157÷158
- Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- additional protection tubes and thermowells – pp. 148÷153
- hot junction type – p. 13
- compensation cables – p. 145



Ordering code

Temperature sensor

	T	GN-1	-	-	-	-	-	-	-	-
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Single: **no designation** _____
 Double: **2** _____
 With transmitter: **AP** _____
 RTD Pt: **OP** _____
 Thermocouple Fe-CuNi: **TJ** _____
 Thermocouple NiCr-NiAl: **TK** _____
 Hot junction type for TC: **SO, SOA, SP** _____
 Thermowell length L [mm]: **100, 200**, or other* _____
 Thermowell diameter d [mm]: **6, 9, 12** _____
 Thread dimension: **G½, G¾, M20x1,5, M27x2** or other* _____
 RTD / thermocouple class: **A, B* / 1, 2** _____
 RTD Pt 100 connection: **2-, 3-, 4- wire** _____
 Transmitter type – temperature range: **Tx – (0÷400)°C*** _____

*Other parameters acc. to requirements

Ordering example:

TOPGN-1-800-12-G½-A-3 single sensor with Pt100, class A, 3-wire connection, thermowell diameter 12 mm and length L=800 mm, threaded fitting G½

APTTJGN-1-SO-600-12-G¾-1-Tx-(0÷600)°C single sensor with thermocouple Fe-CuNi /J/, class 1, insulated hot junction SO, thermowell diameter ø12 mm and length L=600 mm, threaded fitting G¾, with transmitter 4÷20 mA

Temperature Sensors with Non-Replaceable Measuring Insert **TOPGB-55, TTJGB-55, TTKGB-55**

Specification

Temperature range / sensing element

- 200÷150°C **Pt100** class B
- 40÷150°C **K, J** class 2

Measuring insert

- non-replaceable

Thermowell

- material: stainless steel 1.4541
- length L [mm]: 50÷1500

Connection head

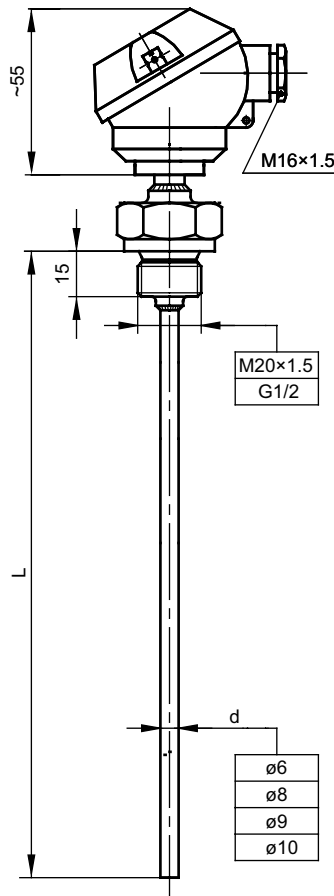
- MA, IP54, -40÷100°C

Options

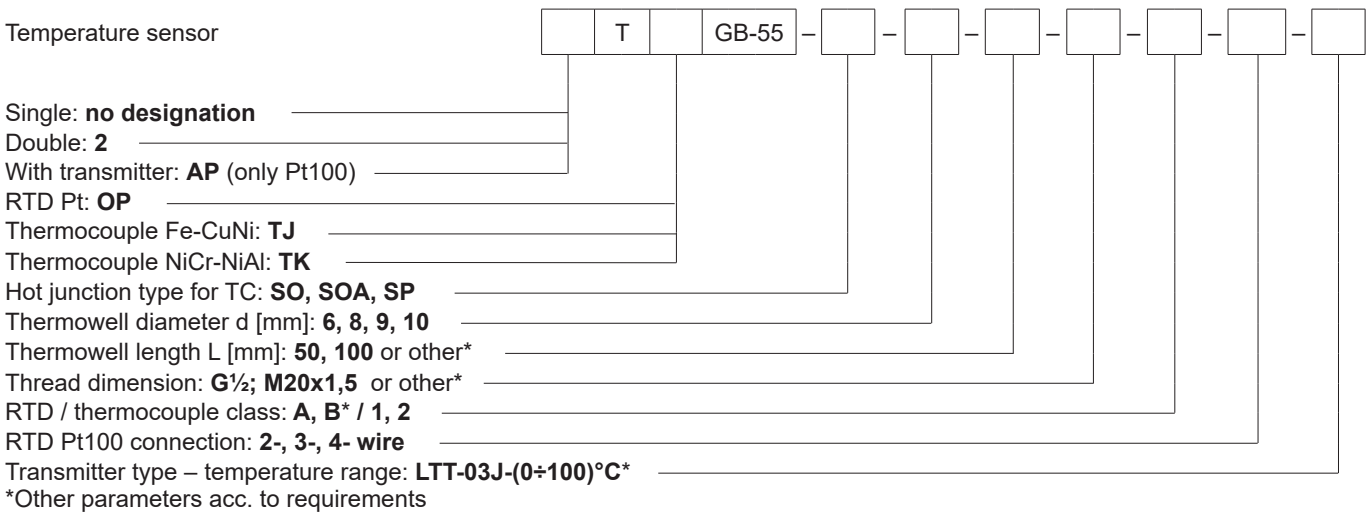
- Pt500, Pt1000, Ni100, Ni1000, T, N
- other threads (inch and metrical) acc. to requirements
- connection heads – stainless steel MBEG – p. 158
- Pt100: class A -100÷150°C, class AA -50÷150°C; TC: class 1

Additional equipment

- temperature transmitters – p. 170
- additional protection tubes and thermowells – pp. 148÷153
- hot junction type – p. 13
- compensation cables – p. 145



Ordering code



Ordering example: **TOPGB-55-6-300-G½-A-3** single sensor with Pt100, class A, 3-wire connection, thermowell diameter ø6 mm and length L=300 mm, threaded fitting G½

TTJGB-55-SO-8-600-M20x1,5-1 single sensor with thermocouple Fe-CuNi /J/ class 1, insulated hot junction SO, thermowell diameter ø8 mm and length L=600 mm, threaded fitting M20x1,5

C

Temperature Sensors with Non-Replaceable Measuring Insert **TOPGN-55, TTJGN-55, TTKGN-55**

Specification

Temperature range / sensing element

-200÷550°C **Pt100** class B
 -40÷600°C **K, J** class 2

Measuring insert

– non-replaceable

Thermowell

– material: stainless steel 1.4541
 – length L [mm]: 50÷1500

Connection head

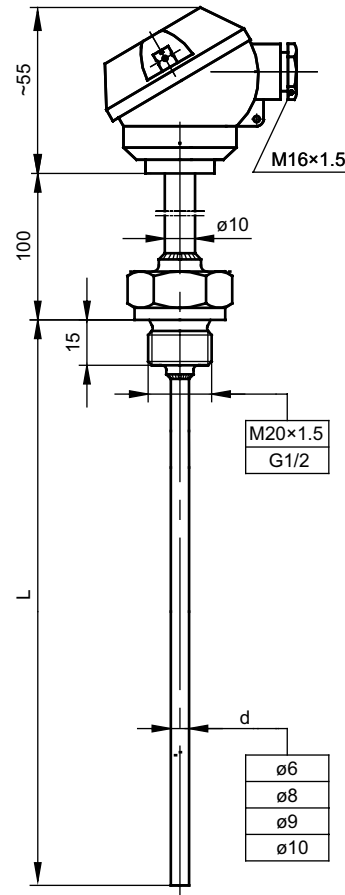
– MA, IP54, -40÷100°C

Options

– Pt500, Pt1000, Ni100, Ni1000, T, N
 – other threads (inch and metrical) acc. to requirements
 – connection heads – stainless steel MBEG – p. 158
 – Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class 1

Additional equipment

– temperature transmitters – p. 170
 – additional protection tubes and thermowells – pp. 148÷153
 – hot junction type – p. 13
 – compensation cables – p. 145



Ordering code

Temperature sensor

	T		GN-55	-	-	-	-	-	-	-	-
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Single: **no designation**
 Double: **2**
 With transmitter: **AP** (only Pt100)
 RTD Pt: **OP**
 Thermocouple Fe-CuNi: **TJ**
 Thermocouple NiCr-NiAl: **TK**
 Hot junction type for TC: **SO, SOA, SP**
 Thermowell diameter d [mm]: **6, 8, 9, 10**
 Thermowell length L [mm]: **500, 1000** or other*
 Thread dimension: **G½, M20x1,5** or other*
 RTD / thermocouple class: **A, B* / 1, 2**
 RTD Pt100 connection: **2-, 3-, 4- wire**
 Transmitter type – temperature range: **LTT03J- (0÷400)°C***
 *Other parameters acc. to requirements

Ordering example:

TOPGN-55-6-300-G½-A-3 single sensor with Pt100, class A, 3-wire connection, thermowell diameter $\phi 6$ mm and length L=300 mm, threaded fitting G½

TTJGN-55-SO-8-600-M20x1,5-1 single sensor with thermocouple Fe-CuNi /J/, class 1, insulated hot junction SO, thermowell diameter $\phi 8$ mm and length L=600 mm, threaded fitting M20x1,5

Temperature Sensors with Non-Replaceable Measuring Insert **TOPGNN-2**

Specification

Temperature range / sensing element

-200÷500°C Pt100 class B

Measuring insert

– non-replaceable

Thermowell

– material: stainless steel 1.4541
 – length L [mm]: 200÷1500

Connection head

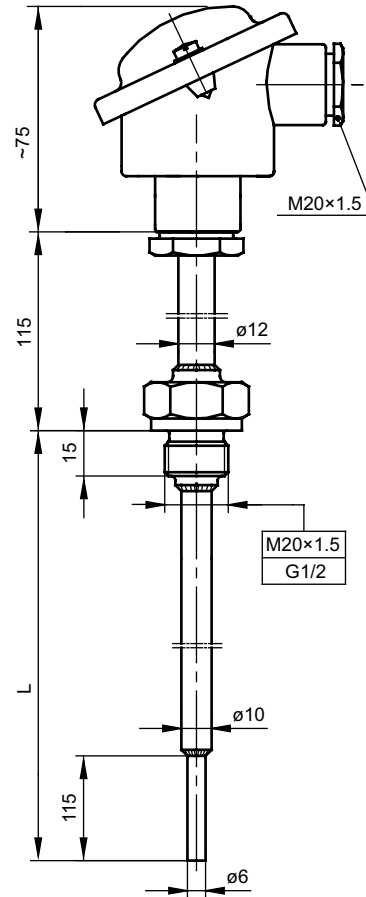
– B, IP55, -40÷100°C

Options

– local display in connection head DANWwin
 – Pt500, Pt1000, Ni100, Ni1000
 – other threads (inch and metrical) acc. to requirements
 – connection heads – stainless steel BEG; aluminium NA, IP65;
 aluminium NA with snap lock – pp. 157÷158
 – Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class 1

Additional equipment

– temperature transmitters – pp. 162÷174



Ordering code

Temperature sensor



Single: **no designation** _____
 Double: **2** _____
 With transmitter: **AP** _____
 Thermowell length L [mm]: **200** or other* _____
 Thread dimension: **M20x1,5; G½** or other* _____
 RTD class: **A, B** _____
 RTD connection: **2-, 3-, 4- wire** _____
 Temperature transmitter - range: **Tx- (0÷400)°C*** _____
 *Other parameters acc. to requirements

Ordering example:

TOPGNN-2-300-G½-A-3 single sensor with Pt100, class A, 3-wire connection, thermowell diameter ø6/10 mm and length L=300 mm, threaded fitting G½

APTOPGNN-2-600-M20x1,5-B-2-Tx-(0÷500)°C single sensor with Pt100, class B, 2-wire connection, thermowell diameters ø6/10 mm and length L=600 mm, threaded fitting M20x1,5, with transmitter 4÷20 mA

Temperature Sensors with Non-Replaceable Measuring Insert **TOPGWN-4, TTJGWN-4, TTKGWN-4**

Specification

Temperature range / sensing element

- 200÷550°C **Pt100** class B
- 40÷550°C **K, J** class 2

Measuring insert

- non-replaceable

Thermowell

- material: stainless steel 1.4541
- length L [mm]: 50÷1500

Connection head

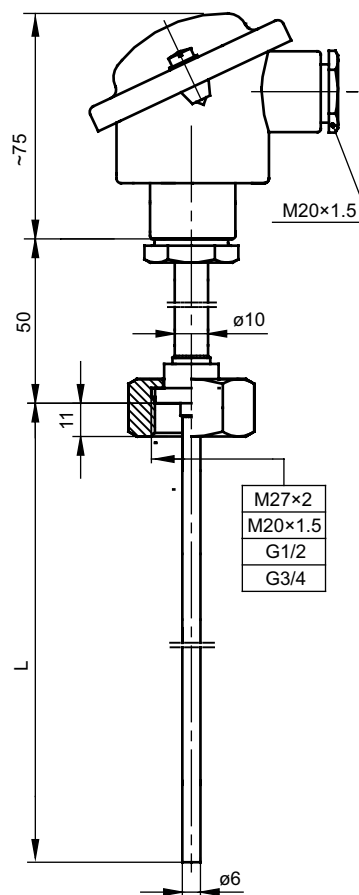
- B, IP55, -40÷100 °C

Options

- local display in connection head DANWwin
- Pt500, Pt1000, Ni100, Ni1000, T, N
- other threads (inch and metrical) acc. to requirements
- connection heads – stainless steel BEG; aluminium NA, IP65; aluminium NA with snap lock – pp. 157÷158
- Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class 1

Additional equipment

- temperature transmitters – p. 162÷174
- additional protection tubes and thermowells – pp. 148÷153
- hot junction type – p. 13
- compensation cables – p. 145



Ordering code

Temperature sensor

	T	GWN-4							
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Single: **no designation**
 Double: **2**
 With transmitter: **AP**
 RTD Pt: **OP**
 Thermocouple Fe-CuNi: **TJ**
 Thermocouple NiCr-NiAl: **TK**
 Hot junction type for TC: **SO, SOA, SP**
 Thermowell length L [mm]: **50, 400** or other*
 Thread dimension: **G½; G¾; M20x1,5; M27x2** or other*
 RTD / thermocouple class : **A, B* / 1, 2**
 RTD Pt100 connection: **2-, 3-, 4- wire**
 Transmitter type – temperature range: **Tx-(0÷400)°C***
 *Other parameters acc. to requirements

Ordering example:

TOPGWN-4-300-G½-A-3 single sensor with Pt100, class A, 3-wire connection, thermowell diameter $\varnothing 6$ mm and length L=300 mm, threaded fitting G½

TTJGWN-4-SO-600-M20x1,5-1 single sensor with thermocouple Fe-CuNi /J/, class 1, insulated hot junction SO, thermowell diameter $\varnothing 6$ mm and L=600 mm, threaded fitting M20x1,5

Temperature Sensors with Non-Replaceable Measuring Insert **TOPI-6, 8, TTJI-6, 8, TTKI-6, 8**

Specification

Temperature range / sensing element

- 200÷600°C **Pt100** class B
- 40÷700°C **K, J** class 2

Measuring insert

- non-replaceable

Sheath

- material: stainless steel 1.4541
- sheath length L
 - 115, 175, 245, 375, 525 [mm] for $\phi 6$ L_{max} =1500 [mm]
 - 495, 705, 995, 1395, 1995 [mm] for $\phi 8$ L_{max} =2000 [mm]

Connection head

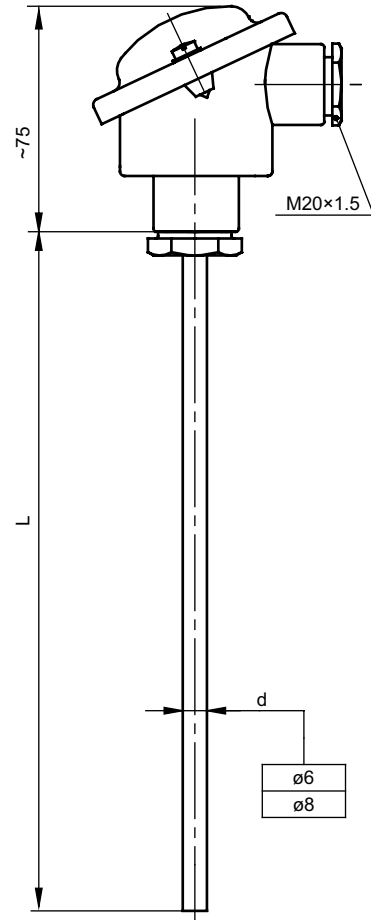
B, IP55, -40÷100 °C

Options

- local display in connection head DANWwin – p. 160
- Pt500, Pt1000, Ni100, Ni1000, T, N
- other threads (inch and metrical) acc. to requirements
- connection heads – stainless steel BEG; aluminium NA, IP65; aluminium NA with snap lock – pp. 157÷158
- Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- additional protection tubes and thermowells – pp. 148÷153
- hot junction type – p. 13
- compensation cables – p. 145
- sensor mounting fittings – p. 155÷156



Ordering code

Temperature sensor



- Single: **no designation**
- Double: **2**
- With transmitter: **AP**
- RTD Pt: **OP**
- Thermocouple Fe-CuNi: **TJ**
- Thermocouple NiCr-NiAl: **TK**
- Sheath diameter d [mm]: **6** or **8**
- Hot junction type for TC: **SO, SOA, SP**
- Sheath length L [mm]: **115, 175, 245, 375, 525** or other*
- RTD / thermocouple class: **A, B*** / **1, 2**
- RTD Pt100 connection: **2-, 3-, 4- wire**
- Transmitter type – temperature range: **Tx-(0÷400)°C***

Ordering example:

TOPI-6-115-B-2 single sensor with Pt100, class B, 2-wire connection, sheath diameter $\phi 6$ mm and length L=115 mm

APTTJI-8-SO-525-1- Tx-(0÷600)°C single sensor with thermocouple Fe-CuNi /JJ/, class 1, insulated hot junction SO, sheath diameter $\phi 8$ mm and length L= 525mm, with transmitter 4÷20 mA

Temperature Sensors with Non-Replaceable Measuring Insert **TOPI-3, TTJI-3, TTKI-3**

Specification

Temperature range / sensing element

- 200÷550°C **Pt100** class B
- 40÷700°C **K, J** class 2

Measuring insert

- non-replaceable

Sheath

- material: stainless steel 1.4541
- length L [mm]: 50÷2000

Connection head

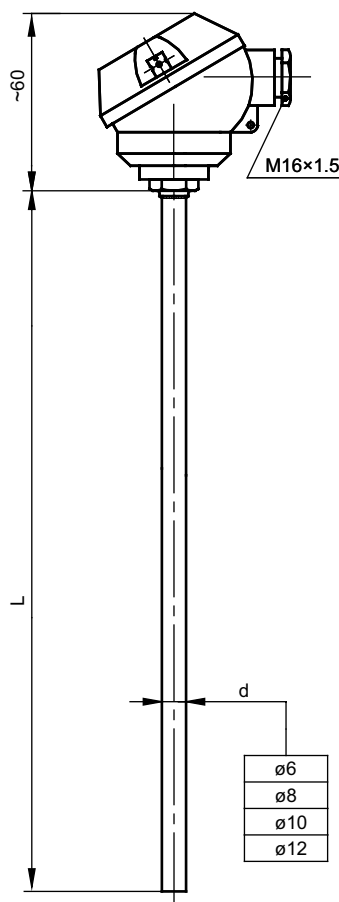
- MA, IP54, -40÷100 °C

Options

- Pt500, Pt1000, Ni100, Ni1000, T, N
- connection heads – stainless steel MBEG – p. 158
- Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class 1

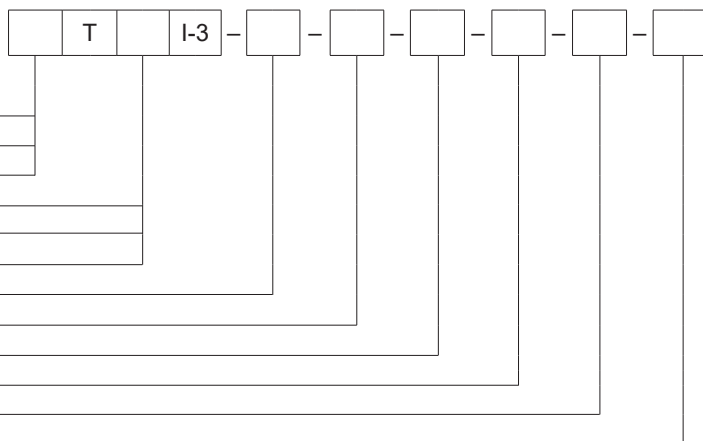
Additional equipment

- temperature transmitters – pp. 162÷174
- additional protection tubes and thermowells – pp. 148÷153
- hot junction type – p. 13
- compensation cables – p. 145
- sensor mounting fittings – pp. 155÷156



Ordering code

Temperature sensor



- Single: **no designation**
 - Double: **2**
 - With transmitter: **AP** (only Pt100)
 - RTD Pt: **OP**
 - Thermocouple Fe-CuNi: **TJ**
 - Thermocouple NiCr-NiAl: **TK**
 - Hot junction for TJ, TK: **SO, SOA, SP**
 - Sheath diameter d [mm]: **6, 8, 10, 12**
 - Sheath length L [mm]: **100, 200, 300** or other*
 - RTD / thermocouple class: **A, B*** / **1, 2**
 - RTD Pt100 connection: **2-, 3-, 4- wire**
 - Transmitter type – temperature range: **LTT03J-(0÷200)°C***
- *Other parameters acc. to requirements

Ordering example:

TOPI-3-6-300-B-2 single sensor with Pt100, class B, 2-wire connection, sheath diameter ø6 mm and length L=300 mm

TTJI-3-SO-8-500-1 single sensor with thermocouple Fe-CuNi /J/, class 1, insulated hot junction SO, sheath diameter ø8 mm and length L=500 mm,

Temperature Sensors with Non-Replaceable Measuring Insert **TOPP-1, TTJP-1, TTKP-1**

Specification

Temperature range / sensing element

- 200÷600°C **Pt100** class B
- 40÷600°C **K, J** class 2

Measuring insert

- non-replaceable

Thermowell

- material: stainless steel 1.4541 for [mm] ø9, 11, 12, 14, 15
- material: steel 1.4841 for ø15 mm
- material: steel 1.4762 for ø15 mm
- length L [mm]: 50÷2000

Connection head

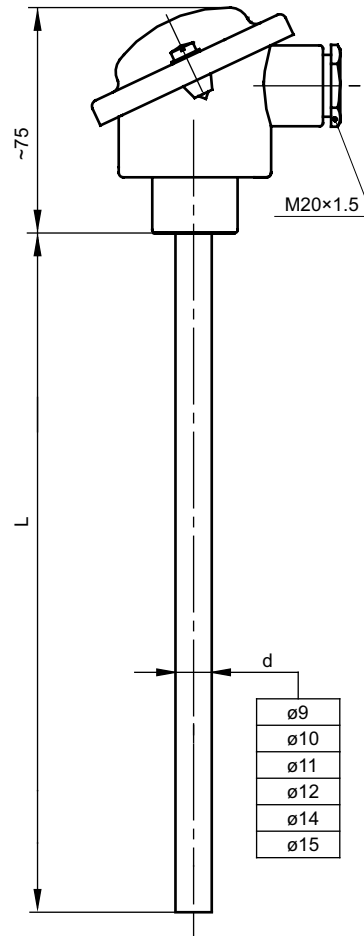
- B, IP54, -40÷100 °C

Options

- local display in connection head DANWwin
- Pt500, Pt1000, Ni100, Ni1000, T, N
- other threads (inch and metrical) acc. to requirements
- connection heads – stainless steel BEG; aluminium NA, IP65; aluminium NA with snap lock – pp. 157÷158
- Pt100: class A -100÷450°C, class AA -50÷250°C; TC: class 1

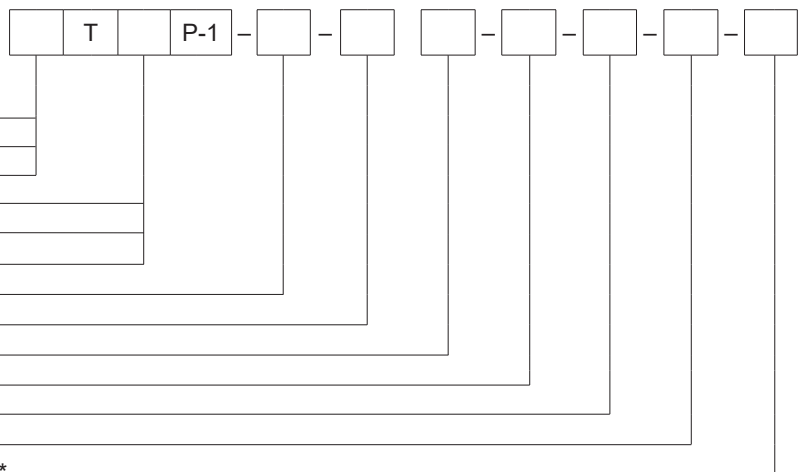
Additional equipment

- temperature transmitters – pp. 162÷174
- additional protection tubes and thermowells – pp. 148÷153
- compensation cables – p. 145
- sensor mounting fittings – pp. 155÷156



Ordering code

Temperature sensor



- Single: **no designation**
 - Double: **2**
 - With transmitter: **AP**
 - RTD Pt: **OP**
 - Thermocouple Fe-CuNi: **TJ**
 - Thermocouple NiCr-NiAl: **TK**
 - Hot junction type for TC: **SO, SOA**
 - Sheath diameter d [mm]: **9, 10, 11, 12, 14, 15**
 - Sheath material: **1,4541; 1,4841; 1,4762**
 - Sheath length L [mm]: **100, 300** or other*
 - RTD / thermocouple class: **A, B* / 1, 2**
 - RTD Pt100 connection: **2-, 3-, 4- wire**
 - Transmitter type – temperature range: **Tx (0÷400)°C***
- *Other parameters acc. to requirements

Ordering example:

TOPP-1-12-500-A-3 single sensor with Pt100, class A, 3-wire connection, sheath diameter ø12 mm and length L=500 mm

APTTKP-1-SO-15-1.4841-700-1-Tx-(0÷150)°C single sensor with thermocouple NiCr-NiAl /K/, class 1, insulated hot junction SO, sheath material steel 1.4841, diameter ø15 mm and length L=700 mm, with transmitter 4÷20 mA

Temperature Sensors with Ceramic Protection Tube **TTSCU-22, TTRCU-22, TTKCU-22**

Specification

Temperature range / sensing element

-40÷1200°C **S, R, K** class 2

Sheath

- outer sheath material:
 steel 1.4841 max. temp. 1150°C
 steel 1.4762 max. temp. 1200°C
 steel 15Cr25T max. temp. 1000°C
- inner ceramic sheath material: mullite 610, ø15 mm
- length L [mm]: 300÷2000

Connection head

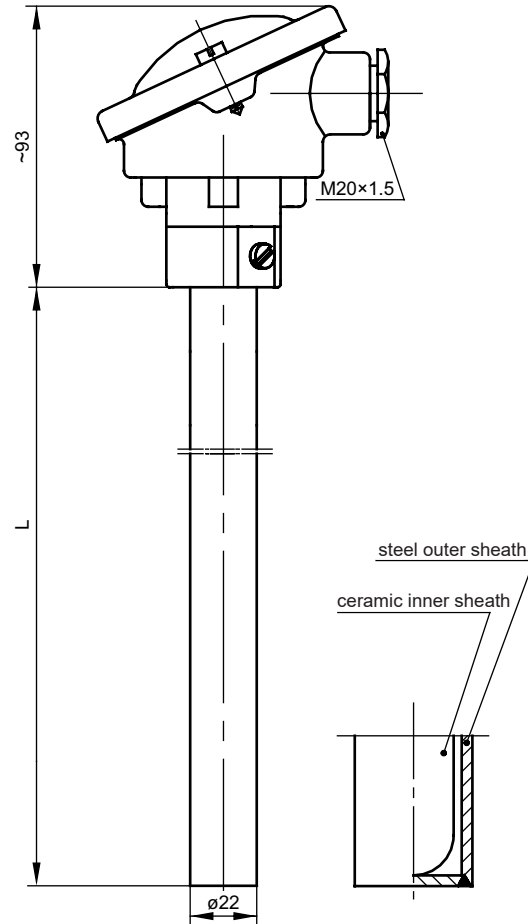
A, IP53, -40÷100 °C

Options

- with transmitter 4÷20 mA in connection head DAW
- double measurement circuit
- thermocouple S, R, K class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- compensation cables – p. 145
- sensor mounting fittings: UZ-11, UZ-21 – p. 156



Ordering code

Temperature sensor



- Single: **no designation**
 - Double: **2**
 - With transmitter: **AP**
 - Thermocouple: **S, R, K**
 - Sheath length L [mm]: **500, 1000** or other*
 - Thermocouple class: **1, 2**
 - Platinum wire diameter d [mm]: **0,35** or **0,5**
 - Transmitter type – temperature range: **Tx (0÷1200)°C***
- *Other parameters acc. to requirements

Ordering example:

TTSCU-22-1000-2-0,5 single sensor with thermocouple PtRh10-Pt /S/, class 2, platinum wire diameter ø0,5 mm, with steel-ceramic sheath ø22/15 mm, length L=1000 mm

APTTRCU-22-500-1-0,5-Tx-(0÷1200)°C single sensor with thermocouple PtRh13-Pt /R/, class 1, platinum wire diameter ø0,5 mm, with steel-ceramic sheath ø22/15 mm, length L=500 mm with transmitter 4÷20 mA

Temperature Sensors with Ceramic Protection Tube **TTSC-22, TTRC-22, TTBC-22, TTKC-22**

Specification

Temperature range / sensing element

-40÷1200°C	K	class 2
0÷1600°C	S, R	class 2
600÷1800°C	B	class 3

Sheath

- holding tube material: stainless steel 1.4841 \varnothing 22 mm
- ceramic tube mullite 610 or corundum 799 \varnothing 15x2,5 mm
- length L [mm]: 300÷2000

Connection head

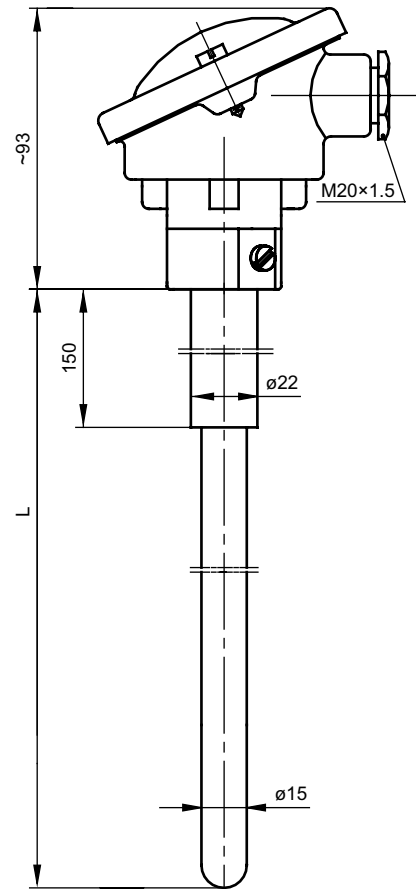
- A, IP53, -40÷100 °C

Options

- thermocouple S, R, K class 1, B class 2
- with transmitter 4÷20 mA in connection head DAW

Additional equipment

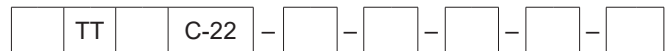
- temperature transmitters – pp. 162÷174
- compensation cables – p. 145
- sensor mounting fittings: UZ-11, UZ-21 – p. 156



Sheath material	Wire diameter [mm]	Thermocouple type	Max. operating temp.
mullite 610	0,35	R, S	1200°C
mullite 610	0,5	R, S	1400°C
corundum 799	0,35	R, S	1500°C
corundum 799	0,5	R, S	1600°C
corundum 799	0,35	B	1600°C
corundum 799	0,5	B	1800°C
mullite 610	2	K	1200°C

Ordering code

Temperature sensor



- Single: **no designation**
- Double: **2**
- With transmitter: **AP**
- Thermocouple: **B, K, R, S**
- Sheath material: **610, 799**
- Sheath length L [mm]: **500, 710, 1000, 1400** or other*
- Thermocouple class: **(1, 2 for K, S, R); (2, 3 for B)**
- Platinum wire diameter d [mm]: **0,35 or 0,5**
- Transmitter type – temperature range: **Tx-(0÷1200)°C***

*Other parameters acc. to requirements

Ordering example:

TTSC-22-799-1000-2-0,35 single sensor with thermocouple PtRh10-Pt /S/, class 2, platinum wire diameter \varnothing 0,35 mm, ceramic sheath corundum 799, diameter \varnothing 15 mm, length L=1000 mm

2TTBC-22-799-800-2-0,5 double sensor with thermocouple PtRh30-PtRh6 /B/, class 2, platinum wire diameter \varnothing 0,5 mm, ceramic sheath corundum 799, diameter \varnothing 15 mm, length L=800 mm

Temperature Sensors with Ceramic Protection Tube **TTSCC-22, TTRCC-22, TTBCS-22, TTKCC**

Specification

Temperature range / sensing element

-40÷1200°C	K	class 2
0÷1600°C	S, R	class 2
600÷1800°C	B	class 3

Sheath

- holding tube material: stainless steel 1.4841 \varnothing 22 mm, 32 mm, L_d =min. 150
- double ceramic sheath mullite 610 or corundum 799
- length L [mm]: 300÷2000

Holding tube diameter [mm]	Outer sheath diameter [mm]	Inner sheath diameter [mm]
32	24	15
22	15	10

Connection head

- A, IP53, -40÷100 °C

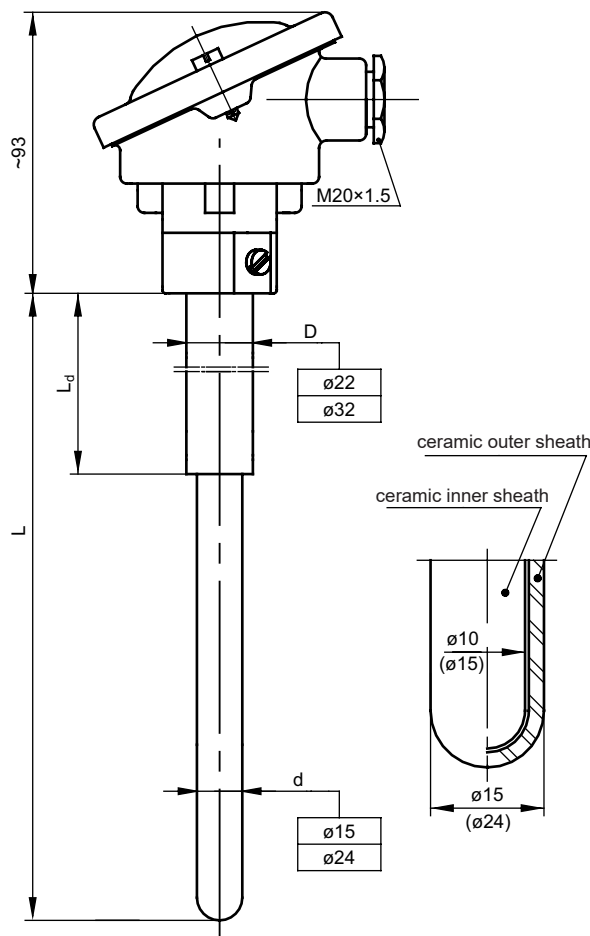
Options

- thermocouple S, R, K class 1, B class 2
- with transmitter in connection head DAW

Additional equipment

- temperature transmitters – pp.162÷174
- compensation cables – p. 145
- sensor mounting fittings: UZ-11, UZ-21 – p. 156

Sheath material	Wire diameter [mm]	Thermocouple type	Max. operating temp.
mullite 610	0,35	R, S	1200°C
mullite 610	0,5	R, S	1400°C
corundum 799	0,35	R, S	1500°C
corundum 799	0,5	R, S	1600°C
corundum 799	0,35	B	1600°C
corundum 799	0,5	B	1800°C
mullite 610	2	K	1200°C



Ordering code

Temperature sensor



- Single: **no designation**
- Double: **2**
- With transmitter: **AP**
- Thermocouple: **B, R, S, K**
- Ceramic sheath material: **610, 799**
- Outer sheath diameter d [mm]: **15, 24**
- Holding tube length L_d [mm]: **200, 400** or other*
- Sheath length L [mm]: **500, 1000** or other*
- Thermocouple class: **(1, 2 for K, S, R); (2, 3 for B)**
- Platinum wire diameter d [mm]: **0,35 or 0,5**
- Transmitter type – temperature range: **Tx-(0÷1200)°C***

Ordering example:

TTSCC-22-799-24-200-1000-1-0,5 single sensor with thermocouple PtRh10-Pt /S/, class 1, platinum wire diameter \varnothing 0,5 mm, with double ceramic sheath corundum 799, outer diameter \varnothing 24 mm, length L=1000 mm, holding tube diameter \varnothing 32 mm and length L=200 mm

Temperature Sensors with Ceramic Protection Tube **TTSC-42, TTRC-42, TTBC-42**

Specification

Temperature range / sensing element

0÷1300°C **S, R** class 2
 600÷1600°C **B** class 3

Sheath

- holding tube material: stainless steel 1.4541
- ceramic sheath material: corundum [mm] 799 \varnothing 5, 6, 8, 10 mm
 mullite 610 \varnothing 10 mm
- length L_{min} [mm]: 300, L_{max} acc. to the chart

Connection head

- B, IP53, -40÷100 °C

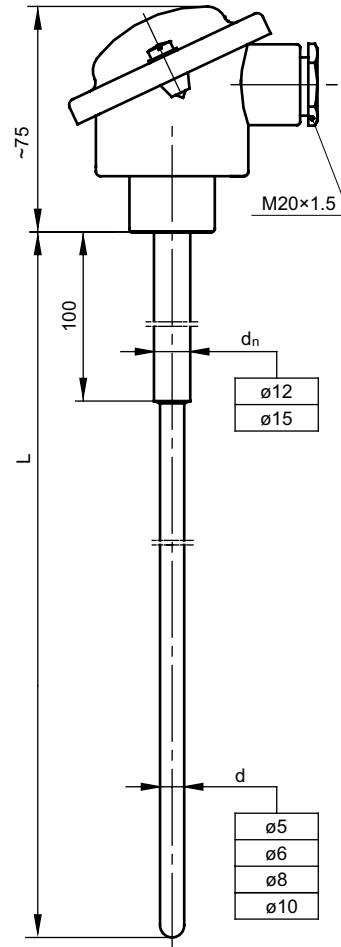
Options

- thermocouple R, S class 1; B class 2

Additional equipment

- temperature transmitters – pp. 162÷174
- sensor mounting fittings: UG1-12, UG1-15, UZ21-15 – p. 156

Sheath diameter d [mm]	Holding tube diameter d_n [mm]	Max. length L_{max} [mm]	Wire diameter [mm]
\varnothing 5	\varnothing 12	500	\varnothing 0,35
\varnothing 6	\varnothing 12	1000	\varnothing 0,35
\varnothing 8	\varnothing 12	1000	\varnothing 0,35 or 0,5
\varnothing 10	\varnothing 15	1400	\varnothing 0,35 or 0,5



Ordering code

Temperature sensor

	TT	C-42	-	-	-	-	-	-	-
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With transmitter: **AP**

Thermocouple: **B, R, S**

Sheath diameter acc. to the chart [mm] d: **5, 6, 8, 10**

Sheath material: **610, 799**

Sheath length L [mm]: **300, 500** or other*

Thermocouple class: (**1, 2** for S, R); (**2, 3** for B)

Platinum wire diameter: **0,35** or **0,5**

Transmitter type – temperature range: **Tx - (0÷1200)°C***

*Other parameters acc. to requirements

Ordering example:

TTSC-42-5-799-300-1-0,35 single sensor with thermocouple PtRh10-Pt /S/, class 1, platinum wire diameter \varnothing 0,35 mm, ceramic sheath corundum 799, diameter \varnothing 5 mm and length L=300 mm

APTTBC-42-8-799-500-2-0,5-Tx-(600÷1600)°C single sensor with thermocouple PtRh30-PtRh6 /B/, class 2, platinum wire diameter \varnothing 0,5 mm, ceramic sheath corundum 799, diameter \varnothing 8 mm and length L=500 mm, with transmitter 4÷20 mA

Temperature Sensors with Ceramic Protection Tube **TTSCS-22, TTRCS-22, TTBCS-22**

Specification

Temperature range / sensing element

0÷1600°C **S, R** class 2
 600÷1700°C **B** class 3

Sheath

- ceramic tube material: corundum 799
- holding tube material: stainless steel 1.4541
- additional platinum sheath /thimble/ material Pt, PtRh10, PtRh20
- thimble wall thickness [mm] g=0,3; 0,4; 0,5 or other*
- length L [mm]: max. 1500

Connection head

- A, IP53, -40÷150 °C

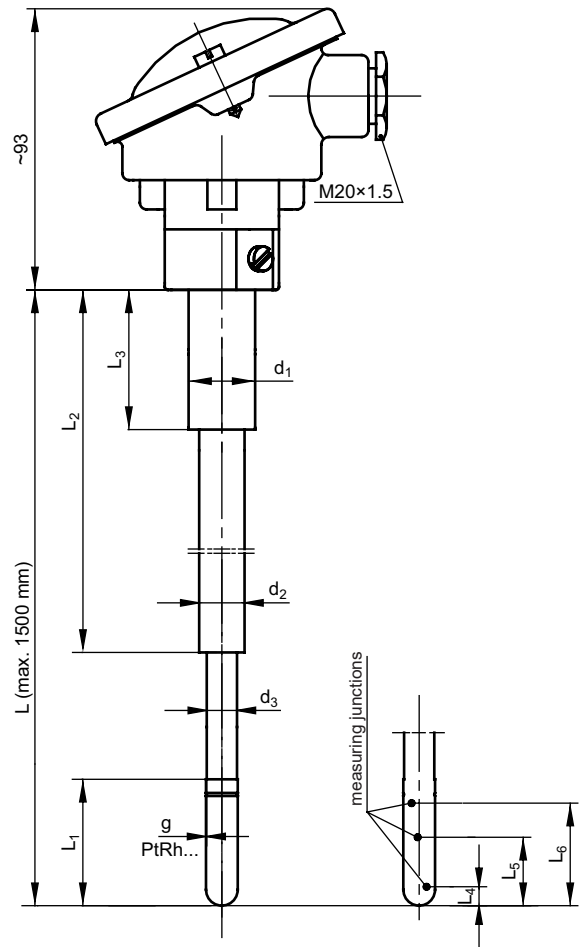
Options

- hot junctions on different depths L_4, L_5, L_6
- dimensions $L_1...L_6$
- other thickness of thimble wall
- $L_1...L_3$ acc. to requirements
- wire diameter $\varnothing 0,35$ mm
- thermocouple R, S class 1; B class 2

Additional equipment

- temperature transmitters – pp. 162÷174
- compensation cables – p. 145
- sensor mounting fittings: UZ-11; UZ-21; – p. 156

d_3 [mm]	d_2 [mm]	d_1 [mm]	wire dia. [mm]
8	15	22	$\varnothing 0,5$
10	15	22	
15	24	32	



Ordering code

Temperature sensor

TT	CS-22	-	-	-	-	-	-	-
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Single: **no designation** _____
 Double: **2** _____
 Triple: **3** _____
 Thermocouple: **B, R, S** _____
 Sensor length L [mm]: **1000** _____
 Thermocouple class: (**1, 2** for S, R); (**2, 3** for B) _____
 Thimble material: **Pt, PtRh10, PtRh20** _____
 Thimble wall c [mm]: **g=0,3; 0,5** or other* _____
 Diameter d_3 [mm]: **acc. to requirements** _____
 Dimensions $L_1...L_6$ [mm]: **acc. to requirements** _____
 *Other parameters acc. to requirements

Ordering example:

3TTSCS-22-800-2-Pt-0,3-10-L₁=100 L₂=700 L₃=150 L₄=20 L₅=40 L₆=80 triple sensor with thermocouple PtRh10-Pt /S/, class 2, platinum wire diameter $\varnothing 0,5$ mm, thimble material platinum Pt, thimble wall thickness 0,3 mm, thimble length L=100 mm, sensor length L=800 mm, hot junction at depths: $L_4=20$ mm, $L_5=40$ mm, $L_6=80$ mm

Temperature Sensors with Ceramic Protection Tube **TTSC-ACT, TTBC-ACT, TTRC-ACT**

Specification

Temperature range / sensing element

0÷1600°C	S, R	class 2
600÷1700°C	B	class 3

Sheath

- ceramic corundum 799
- dusted protective coat
- protective coat material Pt, PtRh10, PtRh20
- protective coat thickness g/g₁[mm]=0,3/ 0,5
- length L [mm]: max. 1500

Connection head

A, IP53, -40÷150°C

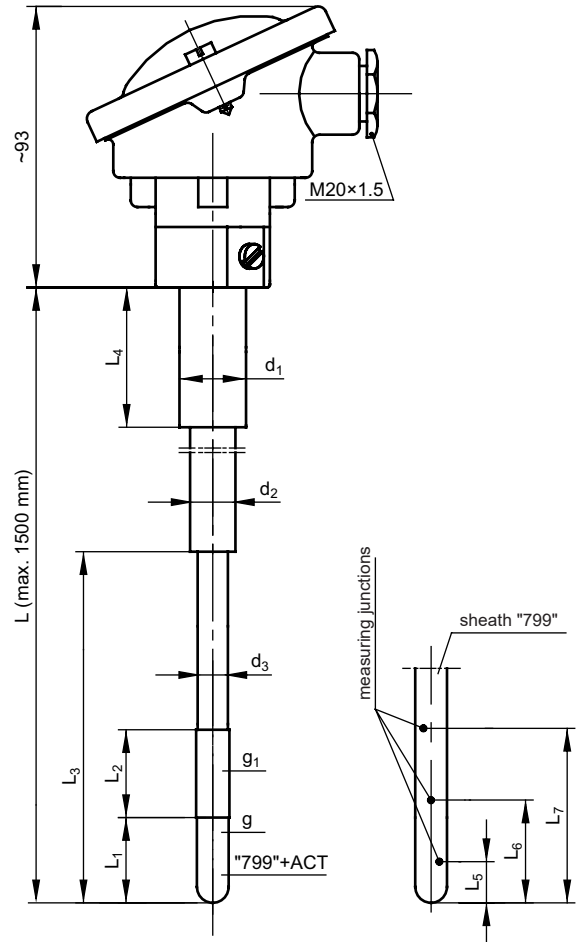
Options

- hot junctions at different depths L₅, L₆, L₇
- dimensions L₁...L₆
- other thickness of protective coat
- L₁...L₄ acc. to requirements
- platinum wire diameter ø0,35 mm
- thermocouple R, S class 1; B class 2

Additional equipment

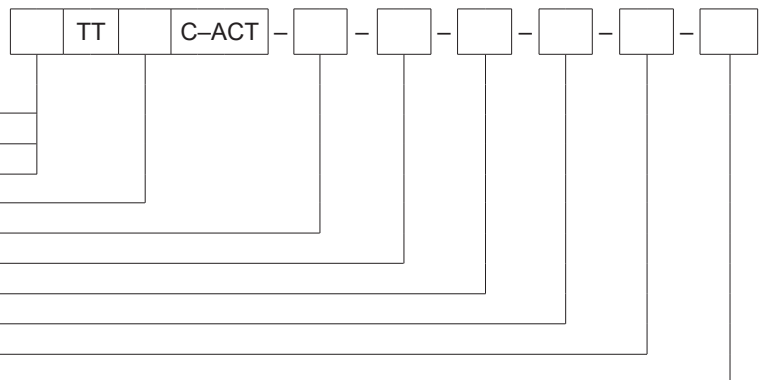
- temperature transmitters – pp. 162÷174
- compensation cables – p. 145
- sensor mounting fittings: UZ-11; UZ-21; – p. 156

d ₃ [mm]	d ₂ [mm]	d ₁ [mm]	wire dia. [mm]
10	15	22	ø0,5
12	20	26	
15	24	32	



Ordering code

Temperature sensor



- Single: **no designation**
- Double: **2**
- Triple: **3**
- Thermocouple: **B, R, S**
- Sensor length L_d [mm]: **1000** or other*
- Thermocouple class: (**1, 2** for S, R); (**2, 3** for B)
- Protective coat material: **Pt, PtRh10, PtRh20**
- Protective coat thickness g/g₁[mm]: **0,3; 0,5** or other*
- Diameter d₃ [mm]: **acc. to requirements**
- Dimensions L₁...L₇ [mm]: **acc. to requirements**
- *Other parameters acc. to requirements

Ordering example:

2TTSC-ACT-1200-1-Pt-0,3/0-10-L₁ = 100 L₂ = 0 L₃ = 200 L₄ = 150 L₅ = 0 L₆ = 40 L₇=90
 double sensor with thermocouple PtRh10-Pt /S/, class 1, platinum wire diameter ø0,5 mm, protective coat material platinum Pt, protective coat thickness 0,3 mm at length L₁=100 mm, sensor length L=1200 mm, hot junction at depths: L₆=40 mm L₇=90 mm

Temperature Sensors for Measurement of Machinery and Device Parts **TTJE-11, 13, TTKE-11,13**

Specification

Temperature range / sensing element

- 40÷300°C **K, J** class 2 thermocouple solid wire
- 40÷400°C **K, J** class 2 thermocouple stranded wire

Sheath

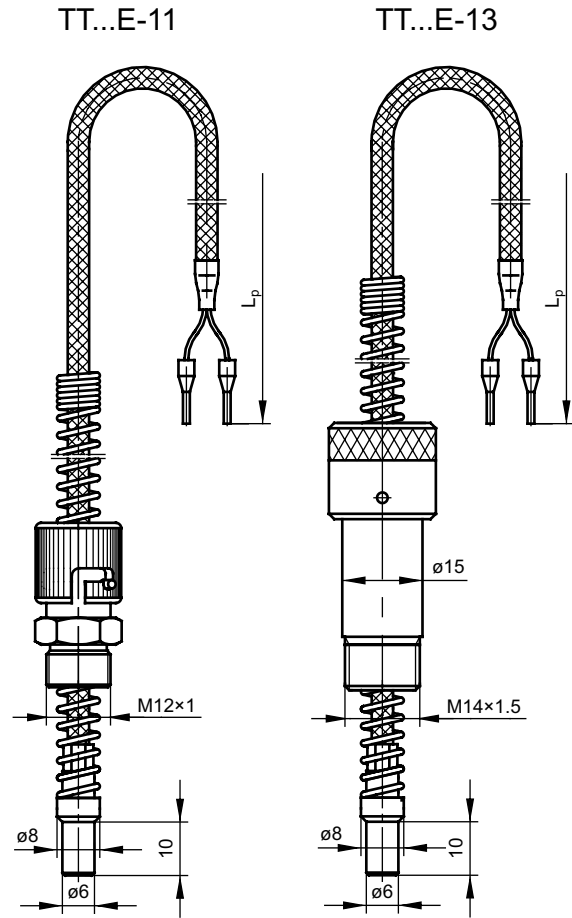
- material: nickel-plated brass
- sheath length [mm]: 10 (standard)
- flat tip

Lead wire

- thermocouple solid wire $\varnothing 0,5$ mm, fiberglass jacket filled with silicone, metallic overbraid
- thermocouple stranded wire 2x0,22 mm² double fiberglass insulation, metallic overbraid
- length L_p [m]: 1,5 (standard)

Options

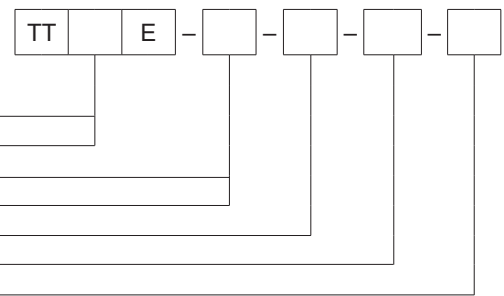
- hot junction: insulated SO, grounded SP
- other threads – inch e.g. G $\frac{3}{4}$; G $\frac{3}{8}$
 metrical e.g. M10x1; M12x1; M12x1,25,
 M12x1,5; M12x1,75; M14x1,5; M16x1,5



Ordering code

Temperature sensor

- Thermocouple Fe-CuNi: **J**
- Thermocouple NiCr-NiAl: **K**
- Connector type: **M12x1: 11**
M14x1,5: 13
- Lead wire type: stranded wire (**L**) or solid wire (**D**)
- Hot junction: **SP, SO**
- Lead wire length L_p [m]: **1,5** or other*



*Other parameters acc. to requirements

Ordering example:

TTJE-11-D-SO-2 m sensor with thermocouple Fe-CuNi /J/, class 2, insulated hot junction, lead wire – solid wire $\varnothing 0,5$ mm, length $L_p=2$ m, bayonet fitting with threaded connector M12x1

TTJE-13-L-SP-1,5 m sensor with thermocouple Fe-CuNi /J/, class 2, grounded hot junction, lead wire – stranded wire fiberglass insulated 2x0,22 mm², length $L_p=1,5$ m, bayonet fitting with threaded connector M14x1,5

Temperature Sensors for Measurement of Machinery and Device Parts **TOPE-26, TTJE-26, TTKE-26**

Specification

Temperature range / sensing element

- 50÷400°C **Pt100** class B
- 40÷400°C **K, J** class 2

Sheath

- material: stainless steel 1.4541
- diameter [mm]: $\varnothing 4$; 5; 6
- length L [mm]: 0÷100
- spring diameter [mm]: 6
- round (K), flat (P) and tapered (S) tips
- bayonet fitting with connector- nickel-plated brass
- standard length of sheath with flat tip L [mm]: 32

Lead wire

- stranded Cu wire or thermocouple stranded wire: 2x0,22 mm²
- fiberglass insulation, metallic overbraid
- length L_p [m]: 1,5 (standard)
- Cu wire resistance ~0,14 Ω/m = ~0,36°C

Options

- Pt500, Pt1000, Ni100, Ni1000, T
- other lead wire insulation types: PVC, silicone, teflon, acc. to requirements
- hot junction: insulated SO, grounded SP
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷300°C, class AA 0÷150°C; TC: class 1
- other threads - inch e.g. G $\frac{1}{4}$; G $\frac{3}{8}$
metrical e.g. M10x1; M12x1,25, M12x1,5; M14; M16x1,5

Ordering code

Temperature sensor

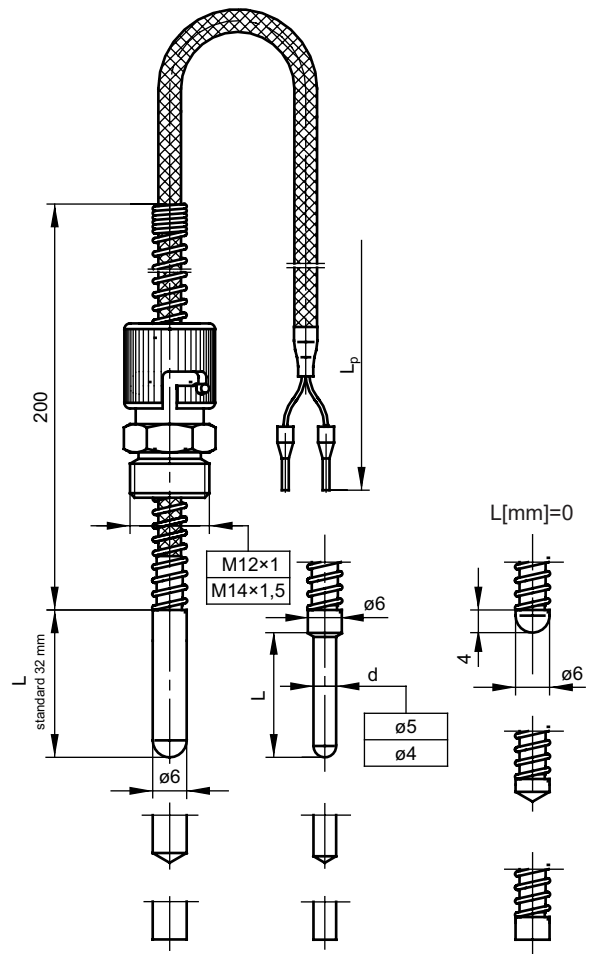


- RTD Pt100: **OP** _____
 - Thermocouple Fe-CuNi: **TJ** _____
 - Thermocouple NiCr-NiAl: **TK** _____
 - Flat tip: **P** _____
 - Round tip: **K** _____
 - Tapered tip: **S** _____
 - Sheath length L [mm]: **32** or other* _____
 - Tip diameter d [mm] : **6** or **8** _____
 - Thread dimension: **M12x1** or other* _____
 - RTD type: **Pt100** or hot junction type: **SO, SP** _____
 - RTD / thermocouple class: **A, B*/ 1,2** _____
 - RTD Pt100 connection: **2, 3, 4- wire** _____
 - Lead wire length L_p [m]: **1,5** or other* _____
- *Other parameters acc. to requirements

Ordering example:

TOPE-26-S-32-6-G $\frac{1}{4}$ -Pt100-B-2-1,5 m single sensor with Pt100, class B, 2-wire connection, sheath with tapered tip, length L=32 mm and diameter $\varnothing 6$ mm with bayonet fitting and threaded connector G $\frac{1}{4}$, lead wire with fiberglass insulation, metallic overbraid, length L_p=1,5 m

TTJE-26-P-10-5- M12x1-SO-2-1,5 m single sensor with thermocouple Fe-CuNi /J/, class 2, sheath with flat tip, length L=10 mm and diameter 5 mm with bayonet fitting and threaded connector M12x1, lead wire with fiberglass insulation, metallic overbraid, length L_p=1,5m



E

Temperature Sensors for Measurement of Machinery and Device Parts **TOPE-28, TTJE-28, TTKE-28**

Specification

Temperature range / sensing element

- 50÷400°C **Pt100** class B
- 40÷400°C **K, J** class 2

Sheath

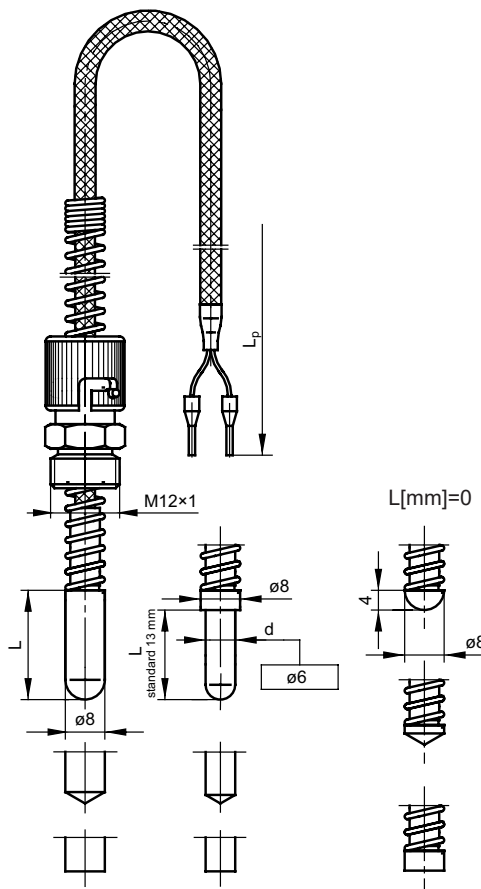
- material: stainless steel 1.4541
- diameter [mm]: $\varnothing 6; 8$
- length L [mm]: 0÷100
- spring diameter [mm]: 8
- round (K), flat (P) and tapered (S) tips
- bayonet fitting with connector- nickel-plated brass
- standard length of sheath with round tip L [mm]: 32

Lead wire

- stranded Cu wire or thermocouple stranded wire: 2x0,22 mm²
- fiberglass insulation, metallic overbraid
- length L_p [m]: 1,5 (standard)
- Cu wire resistance $\sim 0,14 \Omega/m = \sim 0,36^\circ C$

Options

- Pt500, Pt1000, Ni100, Ni1000, T
- other lead wire insulation types: PVC, silicone, teflon, acc. to requirements
- hot junction: insulated SO, grounded SP
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷300°C, class AA 0÷150°C; TC: class 1
- other threads - inch e.g. G $\frac{1}{4}$; G $\frac{3}{8}$
 metrical e.g. M10x1; M12x1,25; M12x1,5, M12; M14x1,5; M16x1,5



Ordering code

Temperature sensor

T	E	-	28	-	-	-	-	-	-	-	-	-	-
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RTD Pt100: **OP** _____
 Thermocouple Fe-CuNi: **TJ** _____
 Thermocouple NiCr-NiAl: **TK** _____
 Flat tip: **P** _____
 Round tip: **K** _____
 Tapered tip: **S** _____
 Sheath length L_o [mm]: **13** or other* _____
 Tip diameter d [mm]: **6** or **8** _____
 Thread dimension: **M12x1** or other* _____
 RTD type: **Pt100** or hot junction type: **SO, SP** _____
 RTD / thermocouple class: **A, B*** / **1, 2** _____
 RTD Pt100 connection: **2, 3, 4-wire** _____
 Lead wire length L_p [m]: **1,5m** or other* _____
 *Other parameters acc. to requirements

Ordering example:

TOPE-28-K-10-6- M14x1,5 -Pt100-B-2-2 m single sensor with Pt100, class B, 2-wire connection, sheath with round tip, length $L=10$ mm and diameter $\varnothing 6$ mm, lead wire length $L_p=2$ m, threaded connector M14x1,5

TTJE-28-P-50-8-M12x1,5-SO-2-1,5 m single sensor with thermocouple Fe-CuNi /J/, class 2, sheath with flat tip, length $L=50$ mm and diameter $\varnothing 8$ mm, lead wire length $L_p=1,5$ m, threaded connector M12x1

Temperature Sensors for Measurement of Machinery and Device Parts **TOPE-3, 4, TTJE-3, 4, TTKE-3, 4**

Specification

Temperature range / sensing element

- 50÷250°C **Pt100** class B
- 40÷400°C **K, J** class 2

Sheath

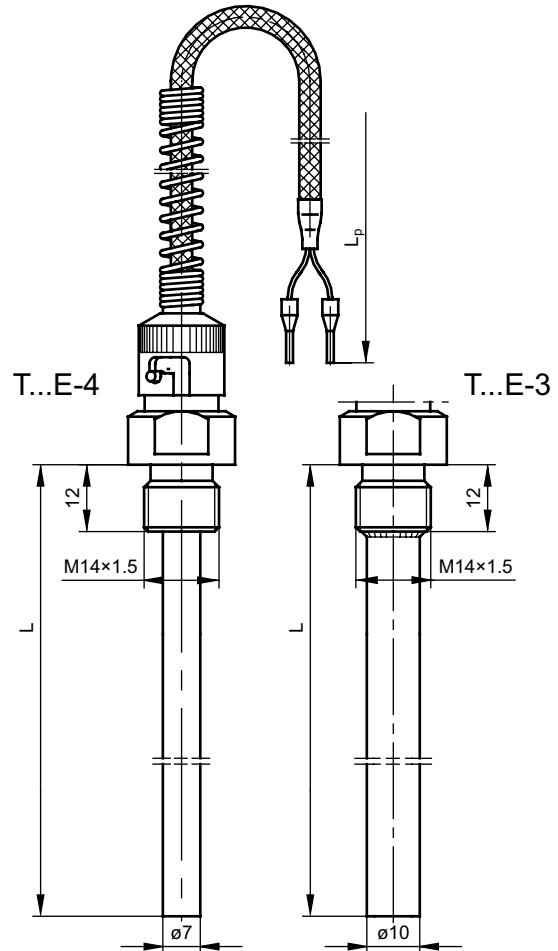
- brass, atmospheric pressure (T...E-4)
- additional sheath, up to 1MPa, stainless steel 1.4541 (T...E-3)
- insulated hot junction SO

Lead wire

- stranded Cu wire 2x0,35 mm² with teflon insulation, metallic overbraid
- thermocouple stranded wire 2x0,22 mm² with double fiberglass insulation, metallic overbraid
- length L_p [m]: 1,5 (standard)
- Cu wire resistance ~0,14 Ω/m = ~0,36°C for 0,22 mm²
 0,105 Ω/m = ~0,2°C for 0,35 mm²

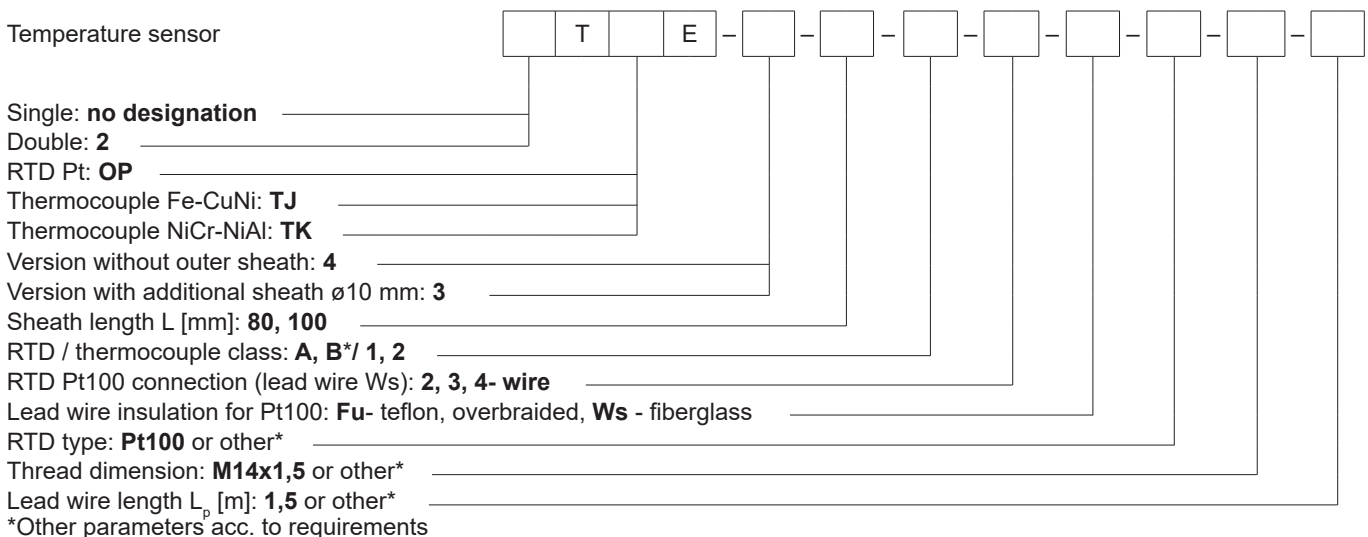
Options

- Pt500, Pt1000, Ni100, Ni1000, T
- stranded Cu wire 2x0,22 or 4x0,22 mm² with double fiberglass insulation, metallic overbraid, operating temperature up to 400°C
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷250°C, class AA 0÷150°C; TC: class 1



Ordering code

Temperature sensor



Ordering example:

TOPE-3-80-B-2-T-Pt100-M14x1,5-1,5 m single sensor with Pt100, class B, 2-wire connection, with additional sheath ø10 mm, length L=80 mm, with threaded connector M14x1,5, teflon lead wire length L_p=1,5 m

TTJE-4-100-2-Ws-M14x1,5-2 m single sensor with thermocouple Fe-CuNi /J/, class 2, sheath diameter ø7 mm, length L=100 mm, lead wire with fiberglass insulation length L_p=2 m, with threaded connector M14x1,5

Temperature Sensors for Measurement of Machinery and Device Parts **TOPE-5, TTJE-5, TTKE-5**

Specification

Temperature range / sensing element

- 50÷250°C **Pt100** class B
- 40÷400°C **K, J** class 2

Sheath

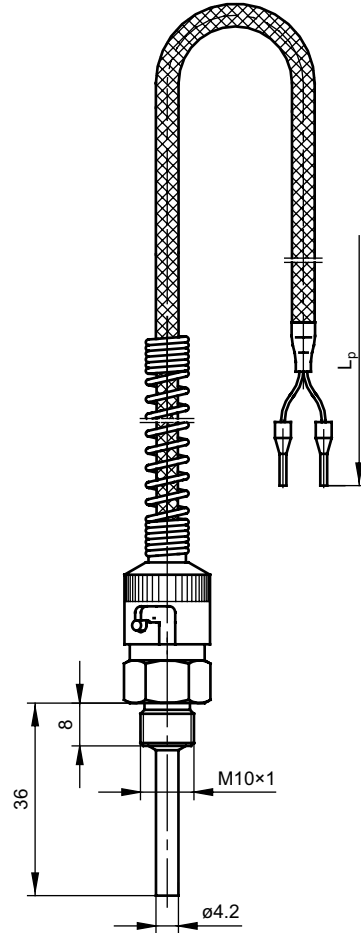
- nickel-plated brass, atmospheric pressure
- insulated hot junction SO

Lead wire

- stranded Cu wire 2x0,35 mm² with teflon insulation, metallic overbraid
- thermocouple stranded wire 2x0,22 mm² with double fiberglass insulation, metallic overbraid
- length L_p [m]: 1,5 (standard)
- Cu wire resistance ~0,14 Ω/m = ~0,36°C for 0,22 mm²
 0,105 Ω/m = ~0,2°C for 0,35 mm²

Options

- Pt500, Pt1000, Ni100, Ni1000, N, T
- stranded Cu wire 2x0,22 or 4x0,22 mm² with double fiberglass insulation, metallic overbraid, operating temperature up to 400°C
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷250°C, class AA 0÷150°C; TC: class 1



Ordering code

Temperature sensor



- Single: **no designation**
 - Double: **2**
 - RTD Pt: **OP**
 - Thermocouple Fe-CuNi: **TJ**
 - Thermocouple NiCr-NiAl: **TK**
 - RTD / thermocouple class: **A, B*/ 1, 2**
 - RTD connection: **2, 3, 4- wire**
 - Lead wire insulation: **Fu-** teflon, overbraided, **Ws** - fiberglass
 - Thread dimension: **M10x1** or other*
 - Lead wire length L_p [m]: **1,5** or other*
- *Other parameters acc. to requirements

Ordering example:

TOPE-5-A-3-Ws-M10x1-1,5 m single sensor with Pt100, class A, 3-wire connection, lead wire with fiberglass insulation 3x0,22 mm² length L_p=1,5 m, threaded connector M10x1

2TOPE-5-B-2-Fu-M10x1-1 m double sensor with Pt100, class B, 2-wire connection, lead wire with teflon insulation and metallic overbraid, lead wire length L_p=1 m, threaded connector M10x1

Temperature Sensors for Measurement of Machinery and Device Parts **TOPGE-3, TTJGE-3, TTKGE-3**

Specification

Temperature range / sensing element

-50÷400°C **Pt100** class B
 -40÷400°C **K, J** class 2

Sheath

– material: stainless steel 1.4541

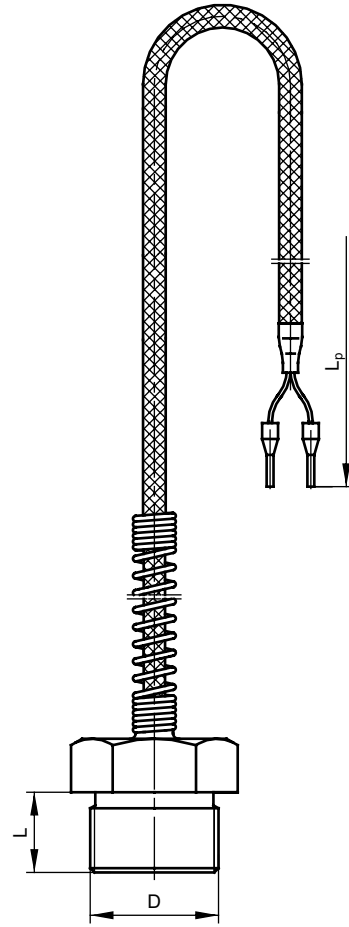
Thread D	Standard length L [mm]
M6	8
M8x1	8
M10x1	8
M12x1,5	12
M14x1,5	12
M20x1,5	15
M24x1,5	15
G½	15

Lead wire

- stranded Cu wire, or thermocouple stranded wire: 2x0,22 mm²
- fiberglass insulation, metallic overbraid
- length L_p [m]: 1,5 or other acc. to requirements
- Cu wire resistance ~0,14 Ω/m = ~0,36°C

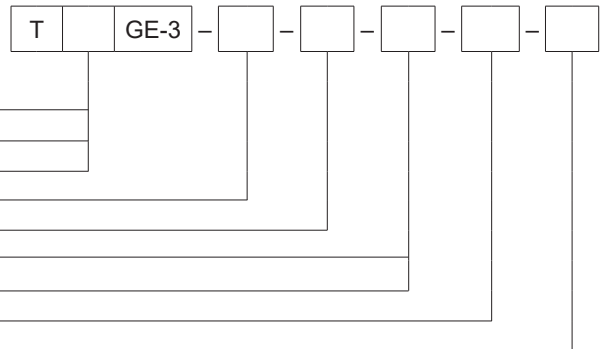
Options

- Pt500, Pt1000, Ni100, Ni1000, N, T
- hot junction: insulated SO, grounded SP
- 3-, 4-wire connection for Pt100
- other lead wire insulation types: PVC, silicone, teflon
- Pt100: class A -30÷300°C, class AA 0÷150°C; TC: class 1



Ordering code

Temperature sensor



- RTD Pt: **OP**
 - Thermocouple Fe-CuNi: **TJ**
 - Thermocouple NiCr-NiAl: **TK**
 - RTD type: **Pt100** or other*
 - RTD / thermocouple class: **A, B*/ 1, 2**
 - RTD Pt100 connection: **2, 3, 4- wire**
 - Hot junction type for TC: **SO, SP**
 - Thread dimension: **D/L [mm]**
 - Lead wire length L_p [m]: **1,5** or other*
- *Other parameters acc. to requirements

Ordering example:

TOPGE-3-Pt100-B-2-M8x1-12-2 m single sensor with Pt100, class B, 2-wire connection, sheath with thread M8x1, thread length 12 mm, lead wire length L_p=2 m

TTJGE-3-2-SO-M20x1,5-15-1,5 m sensor with thermocouple Fe-CuNi /J/, class 2, insulated hot junction, thread M20x1,5, thread length 15 mm, lead wire length L_p=1,5 m

Temperature Sensors for Measurement of Machinery and Device Parts **TOPGE-5, 6, TTJGE-5, 6, TTKGE-5, 6**

Specification

Temperature range / sensing element

-50÷400°C	Pt100	class B
-40÷400°C	K, J	class 2

Sheath

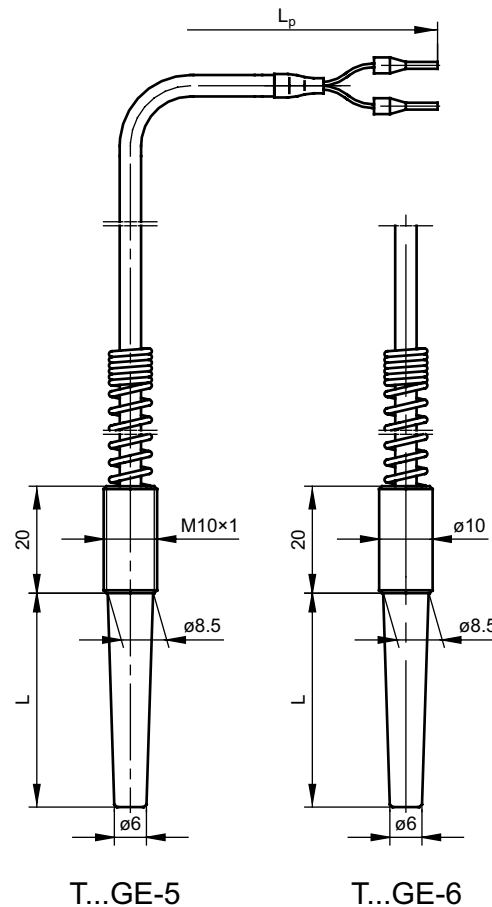
- material: stainless steel 1.4541
- diameter [mm]: $\varnothing 6 / \varnothing 8,5$
- length L[mm]: 30÷100
- with thread M10x1 – T...GE-5, without thread T...GE-6

Lead wire

- stranded Cu wire or thermocouple stranded wire: 2x0,22 mm²
- fiberglass insulation, metallic overbraid
- length L_p [m]: 1,5 (standard)
- Cu wire resistance ~0,14 Ω/m = ~0,36°C

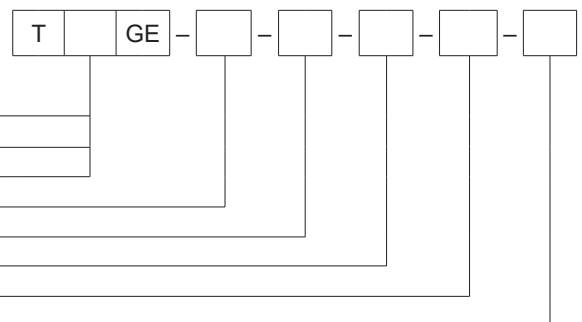
Options

- Pt500, Pt1000, Ni100, Ni1000, N, T
- other lead wire insulation types: PVC, silicone, teflon, acc. to requirements
- hot junction: insulated SO, grounded SP
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷300°C, class AA 0÷150°C; TC: class 1



Ordering code

Temperature sensor



- RTD Pt100: **OP** _____
 - Thermocouple Fe-CuNi: **TJ** _____
 - Thermocouple NiCr-NiAl: **TK** _____
 - Version: **with thread (5), without thread (6)** _____
 - RTD type: **Pt100** or other* _____
 - RTD / thermocouple class: **A, B*/ 1, 2** _____
 - Sheath length L [mm]: **100** or other* _____
 - Lead wire length L_p [m]: **1,5** or other* _____
- *Other parameters acc. to requirements

Ordering example:

TOPGE-5-Pt100-B-50-2 m sensor with Pt100, class B, sheath length L=50 mm, lead wire with fiberglass insulation, length L_p=2 m

TTJGE-6-2-100-1,5 m sensor with thermocouple Fe-CuNi /J/, class 2, sheath length L= 100mm, lead wire with fiberglass insulation, length L_p=1,5 m

Temperature Sensors for Measurement of Machinery and Device Parts **TOPGE-7**

Specification

Temperature range / sensing element

- 50÷180°C **Pt100** class B silicone insulated lead wire
- 50÷400°C **Pt100** class B fiberglass insulated lead wire

Sheath

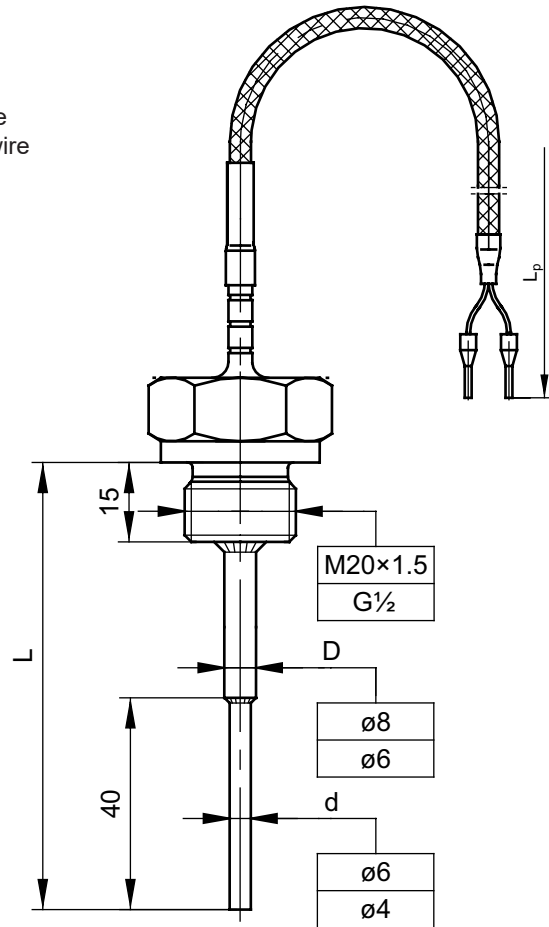
- material: stainless steel 1.4541
- length L [mm]: 55÷250

Lead wire

- stranded Cu wire 2x0,22 mm² or 4x0,22 mm² with silicone insulation
- stranded Cu wire 2x0,22 mm² or 4x0,22 mm² with fiberglass insulation, metallic overbraid
- length L_p [m] 1,5 (standard)
- Cu wire resistance ~0,14 Ω/m = ~0,36°C

Options

- Pt500, Pt1000, Ni100, Ni1000, T
- other lead wire insulation types: PVC, teflon, acc. to requirements
- 3-, 4-wire connection
- Pt100: class A -30÷300°C, class AA 0÷150°C



Ordering code

Temperature sensor



- RTD Pt: **OP** _____
 - RTD Ni: **ON** _____
 - Sheath length L [mm]: **100** or other* _____
 - Sheath diameter D/d [mm]: **6/4** or **8/6** _____
 - Thread dimension: **G½**; **M20x1,5** or other* _____
 - Lead wire insulation: **Si** – silicone; **Ws** – fiberglass* _____
 - RTD class: **A, B*** _____
 - RTD connection: **2, 3, 4-wire** _____
 - Lead wire length L_p [m]: **1,5** or other* _____
- *Other parameters acc. to requirements

Ordering example:

TOPGE-7-100-6/4-G½-Si-B-2-2 m sensor with Pt100, class B, length L=100 mm, sheath narrowing diameter ø4 mm, 2-wire connection, lead wire with silicone insulation length L_p=2 m, threaded connector G½

TOPGE-7-250-8/6-M20x1,5-Ws-A-3-1,5 m sensor with Pt100, class A, length L=250 mm, narrowing diameter ø6 mm, 3-wire connection, lead wire with fiberglass insulation length L_p=1,5 m, threaded connector M20x1,5

Temperature Sensors for Measurement of Machinery and Device Parts **TOPMK-1, TOPMK-2**

Specification

Temperature range / sensing element

-50÷150°C Pt100 class B

Sheath

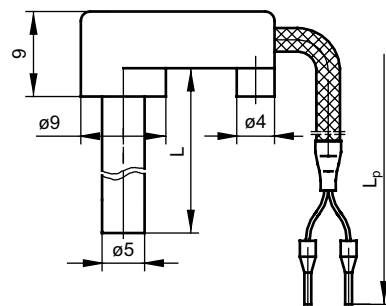
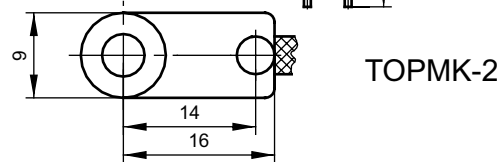
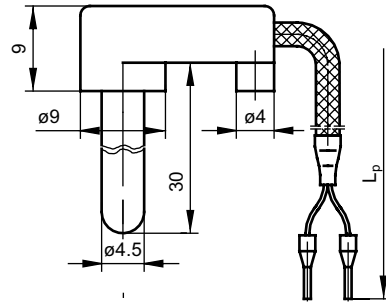
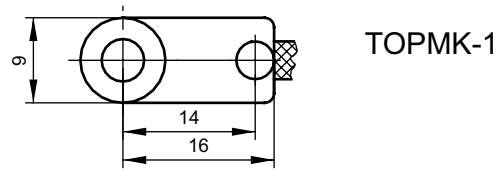
- TOPMK-1 unsheathed resistor
- TOPMK-2 sheathed resistor
- material: stainless steel 1.4541
- diameter [mm]: $\varnothing 5$
- length L [mm]: 30÷100

Lead wire

- stranded Cu wire 2 or 3x0,35 mm² with teflon insulation, metallic overbraid
- length L_p [m]: 1,5 (standard)
- Cu wire resistance ~0,105 Ω /m

Options

- Pt500, Pt1000, Ni100, Ni1000 only TOPMK-2
- other lead wire insulation types: PVC, silicone, armour acc. to requirements
- Pt100: class A -30÷150°C, class AA 0÷150°C



Ordering code

Temperature sensor



- Unsheathed RTD: **1**
- Stainless steel sheath $\varnothing 5$ [mm]: **2**
- RTD class: **A, B***
- Sheath length for TOPMK-2 L [mm]: **50**
- Lead wire length L_p [m]: **2** or other*
- *Other parameters acc. to requirements

Ordering example:

TOPMK-1-B-2 m sensor with Pt100, class B, unsheathed resistor, lead wire length L_p=2 m

TOPMK-2-B-60-3 m sensor with Pt100, class B, sheath length L=60 mm, lead wire length L_p=3 m

Temperature Sensors for Measurement of Machinery and Device Parts **TOPE-89, TONE-89**

Specification

Temperature range / sensing element

- 50÷200°C **Pt100** class B
- 50÷150°C **Ni100**

Sheath

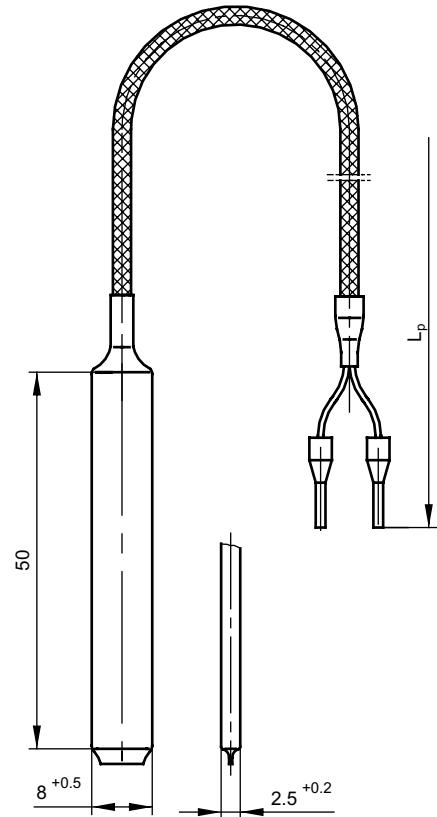
- flexible laminate with heat shrink jacket

Lead wire

- stranded Cu wire 2x0,22 mm² with fiberglass insulation
- length L_p [m]: 0,5 (standard)
- Cu wire resistance ~0,14 Ω/m = ~0,36°C

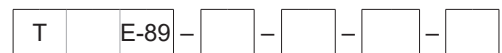
Options

- Pt500, Pt1000, Ni100, Ni1000
- other lead wire insulation types: PVC, silicone, teflon acc. to requirements
- 3-, 4-wire connection
- Pt100: class A -30÷200°C, class AA 0÷150°C



Ordering code

Temperature sensor



- RTD Pt: **OP** _____
- RTD Ni: **ON** _____
- Sensing element: **Pt100** or other* _____
- RTD class: **A, B*** _____
- RTD connection: **2, 3, 4-wire** _____
- Lead wire length [m]: **0,5** or other* _____
- *Other parameters acc. to requirements

Ordering example:

TOPE-89-Pt100-B-2-0,5 m sensor with Pt100, class B, 2-wire connection, lead wire length L_p=0,5 m

Temperature Sensors for Measurement of Machinery and Device Parts **TTJE-152, TTKE-152**

Specification

Temperature range / sensing element

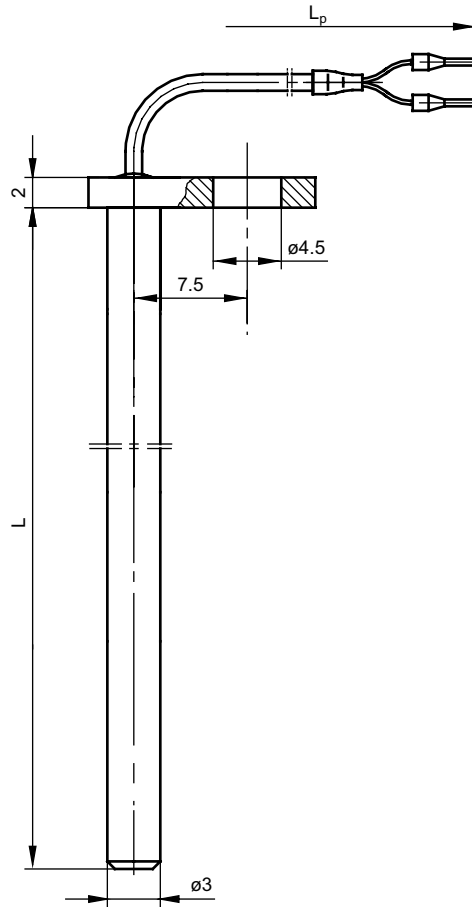
-40÷250°C **K, J** class 2

Sheath

- material: stainless steel 1.4541
- diameter [mm]: $\varnothing 3$
- length L [m]: 20÷200

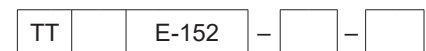
Lead wire

- thermocouple solid wire $\varnothing 0,2$ mm with fiberglass insulation
- length L_p [m]: 1 (standard)
- insulated hot junction SO



Ordering code

Temperature sensor



- Thermocouple Fe-CuNi: **TJ**
- Thermocouple NiCr-NiAl: **TK**
- Sheath length L [mm]: **20, 100** or other*
- Lead wire length L_p [m]: **1** or other*
- *Other parameters acc. to requirements

Ordering example:

TTJE-152-100-3 m sensor with thermocouple Fe-CuNi /J/, class 2, insulated hot junction, sheath length L=100 mm, lead wire L_p =3 m

TTKE-152-30-1 m sensor with thermocouple NiCr-NiAl /K/, class 2, insulated hot junction, sheath length L=30 mm, lead wire L_p =1 m

Temperature Sensors for Measurement of Machinery and Device Parts **TOPE-361, 362, TTJE-361, 362, TTKE-361, 362**

Specification

Temperature range / sensing element

- 50÷400°C **Pt100** class B
- 40÷400°C **K, J** class 2

Sheath

- material: stainless steel 1.4541
- diameter d [mm]: ø3; 4; 5; 6; 8
- length L [mm]: 30÷500

Lead wire

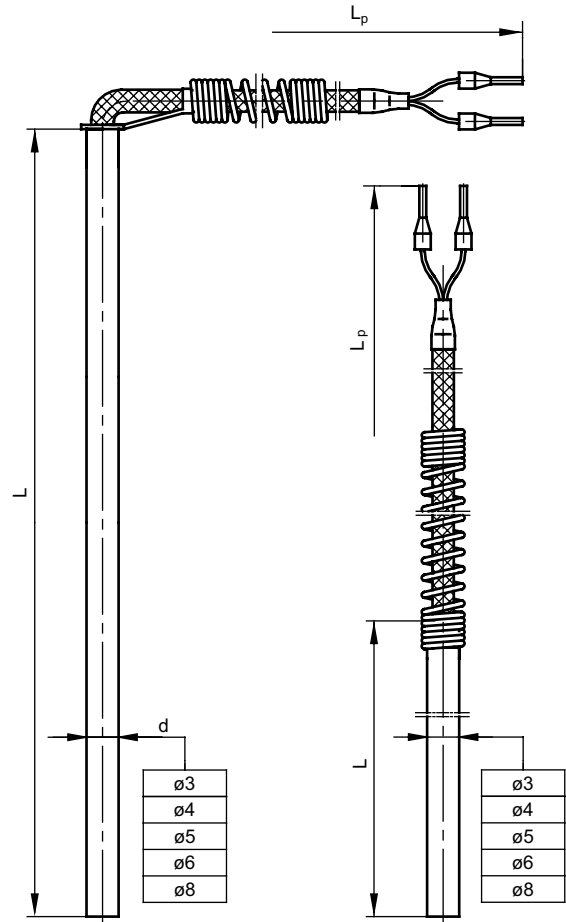
- stranded Cu wire, or thermocouple stranded wire: 2x0,22 mm²
- fiberglass insulation, metallic overbraid
- length L_p [m]: 1,5
- Cu wire resistance ~0,14 Ω/m = ~0,36°C

Options

- Pt500, Pt1000, Ni100, Ni1000
- other lead wire insulation types: silicone, teflon, PVC
- operating temperature of silicone insulation – up to 180°C
- operating temperature of teflon insulation – up to 200°C
- operating temperature of PVC insulation – up to 100°C
- hot junction: insulated SO, grounded SP
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷300°C, class AA 0÷150°C; TC: class 1

Additional equipment

- sensor mounting fittings: UG-1, UG-3, UZK-1; pp. 155÷156
- additional protection tubes OG, OS-4 – pp. 149÷150



Ordering code

Temperature sensor



- RTD Pt: **OP** _____
- Thermocouple Fe-CuNi: **TJ** _____
- Thermocouple NiCr-NiAl: **TK** _____
- Version: **1** – straight, **2** – angular _____
- Sheath length L [mm]: **50, 500** or other* _____
- Sheath diameter d [mm]: **3; 4; 5; 6; 8** _____
- Lead wire insulation: **Si** – silicone; **Ws** – fiberglass, **F** – teflon _____
- RTD type: **Pt100** or other* _____
- RTD / thermocouple class: **A, B*/ 1, 2** _____
- RTD connection for Pt100: **2, 3, 4- wire** _____
- Lead wire length L_p [m]: **1,5** or other* _____

*Other parameters acc. to requirements

Ordering example:

TOPE-361-100-6-Si-Pt100-B-2-4 m sensor with Pt100, class B, 2-wire connection, sheath diameter ø6 mm, sensor length L=100 mm, lead wire with silicone insulation length L_p=4 m

TTJE-361-200-6-Ws-1-3 m sensor with thermocouple Fe-CuNi /J/, class 1, sheath diameter ø6 mm, sensor length L=200 mm, lead wire with fiberglass insulation length L_p=3 m

Temperature Sensors for Measurement of Machinery and Device Parts **TOPE-363, 364, 365, 366,**
TT(J/K)E-363, 364, 365, 366

Specification

Temperature range / sensing element

-50÷400°C **Pt100** class B
 -40÷400°C **K, J** class 2

Sheath

– material: stainless steel 1.4541
 – length L [mm]: 50÷1000

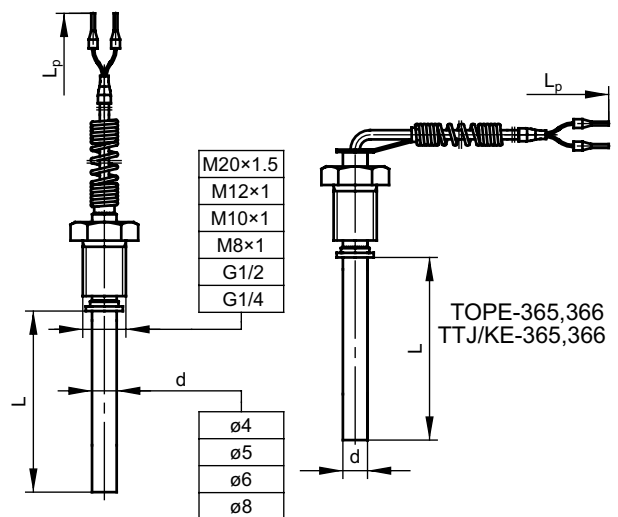
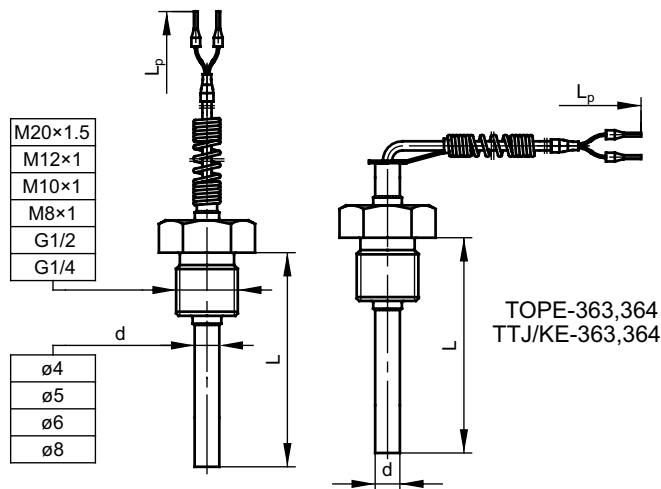
Thread dimension	Max. sheath diameter	
	TOPE 363, 364	TOPE 365, 366
M8x1	5	4
M10; M10x1; G1/8	6	5
M12; M12x1; M12x1,5	8	6
G1/4; M14x1,5	9	6
G3/8; M16x1,5	10	9
G1/2; M20x1,5	14	12

Lead wire

– stranded Cu wire or thermocouple wire: 2x0,22 mm²
 – fiberglass insulation, metallic overbraid
 – length L_p [m]: 1,5 (standard)
 – Cu wire resistance ~0,14 Ω/m = ~0,36°C

Options

– Pt500, Pt1000, Ni100, Ni1000
 – other lead wire insulation types acc. to requirements
 operating temperature of silicone insulation – up to 180°C
 operating temperature of teflon insulation – up to 200°C
 operating temperature of PVC insulation – up to 100°C
 – hot junction: insulated SO, grounded SP
 – 3-, 4-wire connection for Pt100
 – Pt100: class A -30÷300°C, class AA 0÷150°C; TC: class 1
 – other threads (inch and metrical) acc. to requirements



Ordering code

Temperature sensor



RTD Pt: **OP** _____
 Thermocouple Fe-CuNi: **TJ** _____
 Thermocouple NiCr-NiAl: **TK** _____
 Welded connector: **3** – straight version, **4** – angular version _____
 Movable connector: **5** – straight version, **6** – angular version _____
 Sheath length L [mm]: **50, 500** or other* _____
 Sheath diameter d [mm]: **4; 5; 6; 8** _____
 Thread dimension: **M8x1; M10x1; M12x1; M20x1,5; G1/4; G1/2** or other* _____
 Lead wire insulation: **Si** – silicone, **Ws** – fiberglass, **F** – teflon _____
 RTD type: **Pt100** or other* _____
 RTD / thermocouple class: **A, B*/ 1, 2** _____
 RTD Pt100 connection: **2, 3, 4- wire** _____
 Lead wire length L_p [m]: **1,5** or other* _____

*Other parameters acc. to requirements

Ordering example:

TOPE-363-100-4-M8x1-Si-Pt100-B-2-2 m sensor with Pt100, class B, sheath diameter ø4 mm, sensor length L=100 mm, lead wire with silicone insulation, length L_p=2 m, with welded threaded connector M8x1

Temperature Sensors for Measurement of Machinery and Device Parts **TTPJ-187, TTPK-187**

Specification

Temperature range / sensing element

-40÷600°C **K, J** class 2

Sheath

- connector and tip material: stainless steel 1.4541
- mineral insulated thermocouple (J), material: stainless steel 1.4541
- mineral insulated thermocouple (K), material: Inconel 600

D	M10x1; M10x1,5	M8x1; M8x1,25	M6
d	6	5	4
d ₁	3; 4,5	1,5; 2; 3	1,5; 2

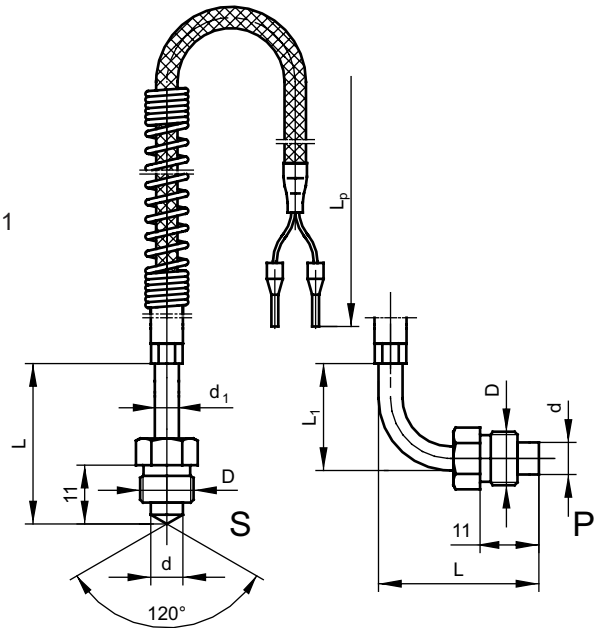
-length L [mm]: 50÷100, L₁ [mm]: 30÷100

Lead wire

- thermocouple stranded wire 2x0,22 mm² with fiberglass insulation, metallic overbraid
- length L_p [m]: 1,5 (standard)

Options

- other lead wire insulation types: silicone, teflon, acc. to requirements
- hot junction: insulated SO, grounded SP
- thermocouple J, K: class 1



Socket for tapered tip

Socket for flat tip

Ordering code

Temperature sensor



- Thermocouple Fe-CuNi: **J** _____
 - Thermocouple NiCr-NiAl: **K** _____
 - Flat tip: **P** _____
 - Tapered tip: **S** _____
 - Hot junction: **SP, SO** _____
 - Thermocouple class: **1, 2** _____
 - Length L or LxL₁ [mm]: **30x50** or other* _____
 - Tip diameter / sheath diameter d / d₁: **5 / 3** or other* _____
 - Thread dimension: **M8** or other* _____
 - Lead wire length L_p [m]: **1,5** or other* _____
- *Other parameters acc. to requirements

Ordering example:

TTPK-187S-SO-2-30x50-5/2-M8x1-1 m sensor with thermocouple NiCr-NiAl /K/, class 2, insulated hot junction, sheath diameter ø2 mm bent 30x50, with tapered tip ø5 mm, threaded connector M8x1, lead wire with fiberglass insulation length L_p=1 m

Temperature Sensors for Measurement of Machinery and Device Parts **TOPGSP-1**

Specification

Temperature range / sensing element

-40÷150°C Pt100 class B

Sheath

- material stainless steel 1.4541
- length [mm]: 50÷1000
- straight sheath: 6 mm standard

Connection type

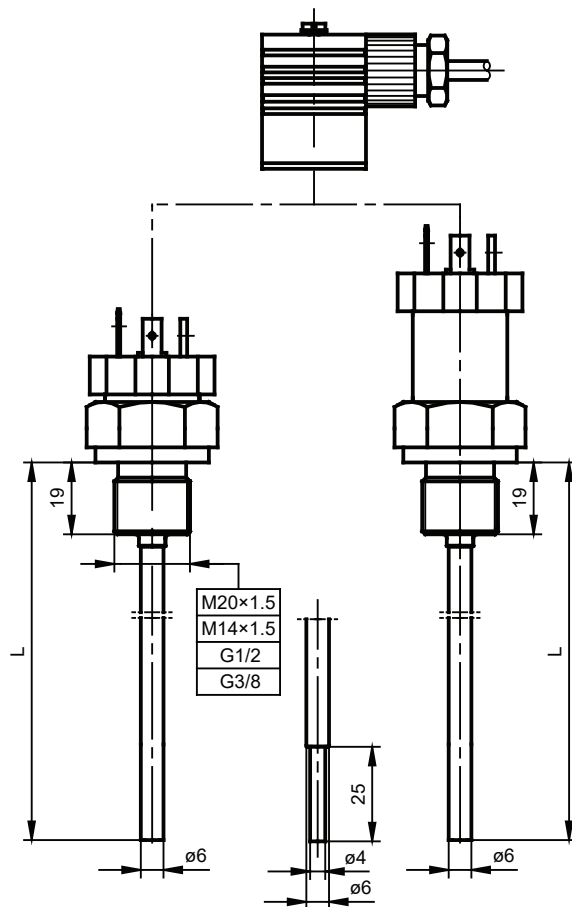
- plug GMD + socket GSP
- operating temperature: -40÷100°C

Options

- Pt500, Pt1000, Ni100, Ni1000
- double measurement circuit, 2-wire connection
- other sheath diameters acc. to requirements
- sheath with narrowing 6/4 mm
- other threads (inch and metrical) acc. to requirements

Additional equipment

- temperature transmitter 4÷20 mA, temperature ranges: 0÷100°C, 0÷150°C



Ordering code

Temperature sensor



Single without transmitter: **no designation**

Single with transmitter: **AP**

Double without transmitter: **2**

Resistor Pt: **OP**

Resistor Ni: **ON**

Sheath length L [mm]: **100**

Tip diameter [mm]: **6** or **6/4**

Thread dimension: **G½** or other*

RTD type: **Pt100** or other*

RTD class: **A, B***

RTD connection: **2, 3, 4-wire**

Transmitter – temperature range: **(0÷100)°C***

*Other parameters acc. to requirements

Ordering example:

TOPGSP-1-160-6-G½-Pt100-A-3 single sensor with Pt100, class A, 3-wire connection, straight sheath length L=160 mm, threaded fitting G½

2TOPGSP-1-200-4-M20x1,5-Pt100-B-2 double sensor with Pt100, class B, 2-wire connection, sheath with narrowing 6/4 mm length L=200 mm, threaded fitting M20x1,5

Temperature Sensors for Measurement of Machinery and Device Parts **TOPI-M12, TONI-M12**

Specification

Temperature range / sensing element

- 200÷250°C **Pt100** class B
- 50÷250°C **Ni100**

Sheath

- material: stainless steel 1.4541
- length L [mm]: 50÷1000
- straight sheath: 6 mm standard

Connection type

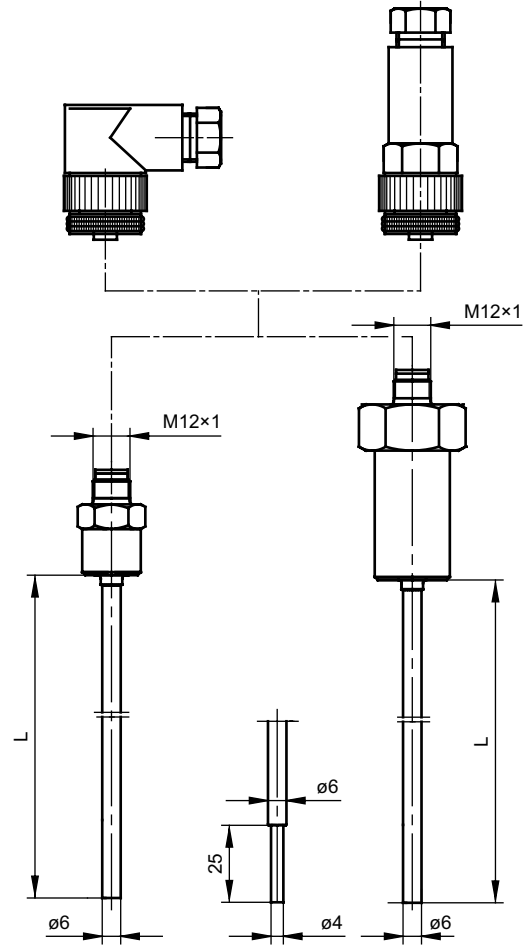
- screwed plug M12-4 pin
- operating temperature -30÷85°C

Options

- Pt500, Pt1000, Ni1000
- double measurement circuit, 2-wire connection
- sheath with narrowing 6/4 mm
- other sheath diameters acc. to requirements
- Pt100: class A -30÷250°C, class AA 0÷150°C

Additional equipment

- temperature transmitter 4÷20 mA, temperature ranges: 0÷100°C, 0÷150°C
- screwed socket, straight or angular with gland PG7 (cable diameter 4÷6 mm) PG9 (cable diameter 6÷8 mm) cable section up to 0,5 mm²
- sensor mounting fittings: UG-1, UG-3, UG-8, UZK-1 – pp. 155÷156
- additional protection tubes and thermowells OG, OS-4 – pp. 149÷150



Ordering code

Temperature sensor

	T		I	M12	-		-		-		-		-		-	
--	---	--	---	-----	---	--	---	--	---	--	---	--	---	--	---	--

Single without transmitter: **no designation**

Single with transmitter: **AP**

Double without transmitter: **2**

Resistor Pt: **OP**

Resistor Ni: **ON**

Sheath length L [mm]: **100** or other*

Tip diameter [mm]: **6** or **6/4**

RTD type: **Pt100** or other*

RTD class: **A, B***

RTD connection: **2, 3, 4-wire**

Additionally: straight (**R**) or angular (**K**) socket, with gland **PG7** or **PG9**: **KPG7**

Transmitter – temperature range: **(0÷100)°C***

*Other parameters acc. to requirements

Ordering example: **TOPI-M12-200-4-Pt100-A-3-RPG7** sensor with Pt100, class A, 3-wire connection, tip diameter ø4 mm, length L=200 mm, with additional straight socket PG7 for cable with insulation diameter 4÷6 mm

E

Temperature Sensors for Measurement of Machinery and Device Parts **TOPG-M12, TONG-M12**

Specification

Temperature range / sensing element

-200÷250°C **Pt100** class B
 -50÷250°C **Ni100**

Sheath

- material: stainless steel 1.4541
- length L [mm]: 50÷1000
- straight sheath: 6 mm standard
- threaded connector, welded to sheath

Connection type

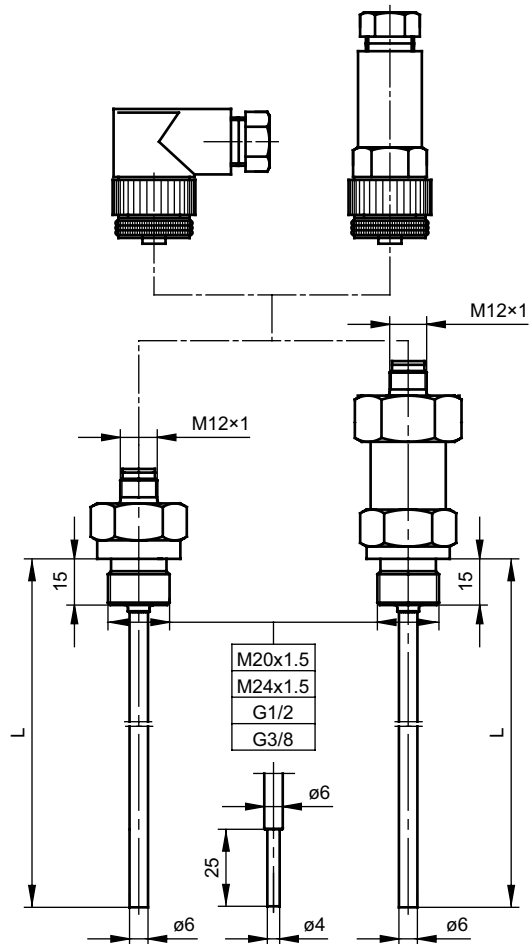
- screwed plug M12-4 pin
- operating temperature -30÷85°C

Options

- Pt500, Pt1000, Ni1000
- double measurement circuit, 2-wire connection
- sheath with narrowing 6/4 mm
- other threads (inch and metrical) acc. to requirements
- other sheath diameters acc. to requirements
- Pt100: class A -30÷250°C, class AA 0÷150°C

Additional equipment

- temperature transmitter 4÷20 mA, temperature ranges: 0÷100°C, 0÷150°C
- screwed socket, straight or angular with gland PG7 (cable diameter 4÷6 mm)
- PG9 (cable diameter 6÷8 mm)
- cable section up to 0,5 mm²
- additional protection tubes and thermowells OGG, OSG – pp. 151÷152



Ordering code

Temperature sensor



Single without transmitter: **no designation**

Single with transmitter: **AP**

Double without transmitter: **2**

Resistor Pt: **OP**

Resistor Ni: **ON**

Sheath length L [mm]: **100** or other*

Tip diameter [mm]: **6** or **6/4**

Thread dimension: **G½** or other*

RTD type: **Pt100** or other*

RTD class: **A, B***

RTD connection: **2, 3, 4-wire**

Additionally: straight (**R**) or angular (**K**) socket, with gland **PG7** or **PG9**: **KPG7**

Transmitter – temperature range: **(0÷100)°C***

*Other parameters acc. to requirements

Ordering example:

TOPG-M12-200-6-G½-Pt100-A-3-KPG7 sensor with Pt100, class A, 3-wire connection, tip diameter ø6 mm, length L=200 mm, with welded threaded connector G½, with additional angular socket PG7 for cable with insulation diameter 4÷6 mm

Temperature Sensors for Measurement of Machinery and Device Parts **TOPE-408**

Specification

Temperature range / sensing element

-50÷250°C **Pt100** class B

Sheath

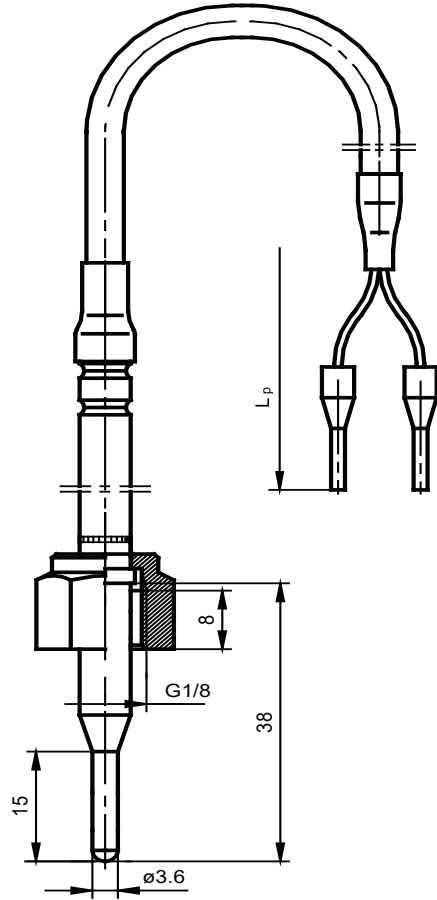
- material: stainless steel 1.4541
- diameter [mm]: $\varnothing 3,6$
- length L [mm]: 38
- thread G $\frac{1}{8}$

Lead wire

- stranded Cu wire 2x0,22 mm² or 4x0,22 mm² with double silicone insulation
- length L_p [m]: 1,5 (standard)
- Cu wire resistance ~0,14 Ω /m = ~0,36°C

Options

- Pt500, Pt1000, Ni100, Ni1000
- other lead wire insulation types: PVC, teflon, acc. to requirements
- 3-, 4-wire connection
- Pt100: class A -30÷250°C, class AA 0÷150°C



Ordering code

Temperature sensor



RTD type: **Pt100** or other* _____
 RTD class: **A, B*** _____
 RTD connection: **2, 3, 4- wire** _____
 Thread dimension: **G $\frac{1}{8}$** or other* _____
 Lead wire length L_p [m]: **1,5** or other* _____

*Other parameters acc. to requirements

Ordering example:

TOPE-408-Pt500-B-2-G $\frac{1}{8}$ -2 m sensor with Pt500, class B, 2-wire connection, lead wire with silicone insulation length L_p=2 m, nut G $\frac{1}{8}$

TOPE-408-Pt100-A-3-G $\frac{1}{4}$ -1,5 m sensor with Pt100, class A, 3-wire connection, lead wire with silicone insulation, length L_p=1,5 m, nut G $\frac{1}{4}$

Temperature Sensors for Measurement of Machinery and Device Parts **TOPE-462, TTJE-462, TTKE-462**

Specification

Temperature range / sensing element

- 50÷400°C **Pt100** class B
- 40÷400°C **K, J** class 2

Sheath

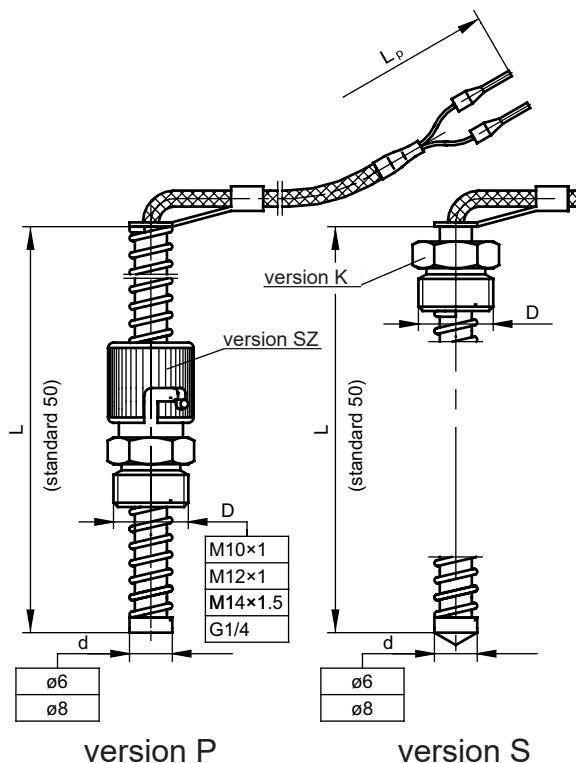
- material stainless steel 1.4541
- flat (**P**) or tapered (**S**) tip
- quick disconnect **SZ** with thread (standard – M12x1)
- thread **K** (standard – M12x1)
- length L [mm]: 50÷150

Lead wire

- stranded Cu wire or thermocouple stranded wire: 2x0,22 mm²
- fiberglass insulation, metallic overbraid
- length L_p [m]: 1,5 (standard)
- Cu wire resistance ~0,14 Ω/m = ~0,36°C

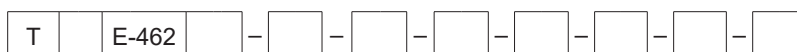
Options

- Pt500, Pt1000, Ni100, Ni1000
- other lead wire insulation types: silicone, teflon, acc. to requirements
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷300°C, class AA 0÷150°C; TC: class 1



Ordering code

Temperature sensor



- RTD Pt: **OP**
 - Thermocouple Fe-CuNi: **TJ**
 - Thermocouple NiCr-NiAl: **TK**
 - Flat tip: **P**
 - Tapered tip: **S**
 - Sheath length L [mm]: **30** or other*
 - Tip diameter d [mm]: **6, 8**
 - With quick disconnect/ thread dimension D: **SZ/M14x1,5**
 - With connector/ thread dimension D: **K/G¹/₄**
 - RTD type: **Pt100** or other, hot junction type: **SO, SP**
 - RTD / thermocouple class: **A, B* / 1, 2**
 - RTD Pt 100 connection: **2, 3, 4- wire**
 - Type and lead wire length L_p [m]: **Ws-2m**
- *Other parameters acc. to requirements

Ordering example:

TOPE-462P-40-8-SZ/M14x1,5-Pt100-A-3-Si-1,5 m sensor with Pt100, class A, 3-wire connection, lead wire with silicone insulation length L_p=1,5 m, sheath diameter ø8 mm and length 40 mm, quick disconnect with thread M14x1,5

Temperature Sensors for Measurement of Machinery and Device Parts **TTJE-621, TTKE-621**

Specification

Temperature range / sensing element

-40÷300°C **K, J** class 2

Sheath

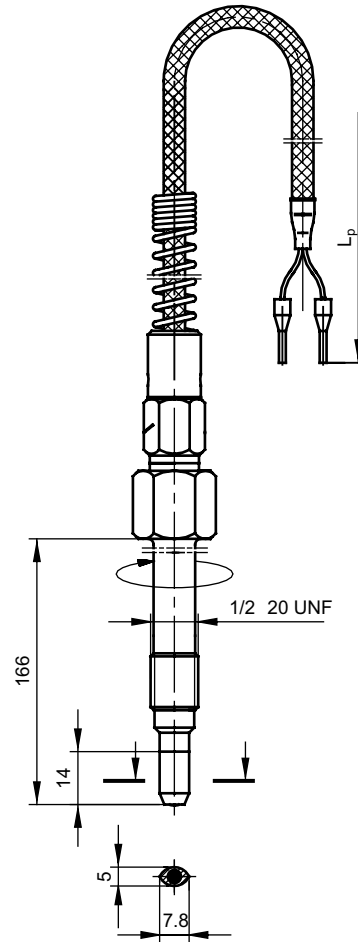
- material: stainless steel 1.4541
- oval tip 5x7,8 mm
- measuring length [mm]: 14
- movable connector 1/2 – UNF
- sheath construction is suitable for temperature measurement of plastic

Lead wire

- thermocouple stranded wire 2x0,22 mm² with double silicone insulation
- length L_p [m]: 2 (standard)

Options

- hot junction: insulated SO, grounded SP
- thermocouple K, J: class 1



Ordering code

Temperature sensor



- Thermocouple Fe-CuNi: **J**
- Thermocouple NiCr-NiAl: **K**
- Hot junction type: **SO** or **SP**
- Lead wire length L_p [m]: **2** or other*
- *Other parameters acc. to requirements

Ordering example:

TTJE-621-SO-2 m sensor with thermocouple Fe-CuNi /J/, insulated hot junction, lead wire length L_p=2 m

TTKE-621-SP-3 m sensor with thermocouple NiCr-NiAl /K/, grounded hot junction, lead wire length L_p=3 m

Temperature Sensors for Measurement of Machinery and Device Parts **TOPWO-1, TTJWO-1, TTKWO-1**

Specification

Temperature range / sensing element

-50÷400°C **Pt100** class B
 -40÷400°C **K, J** class 2

Sheath

– material: stainless steel 1.4541
 – length L [mm]: 50÷1000

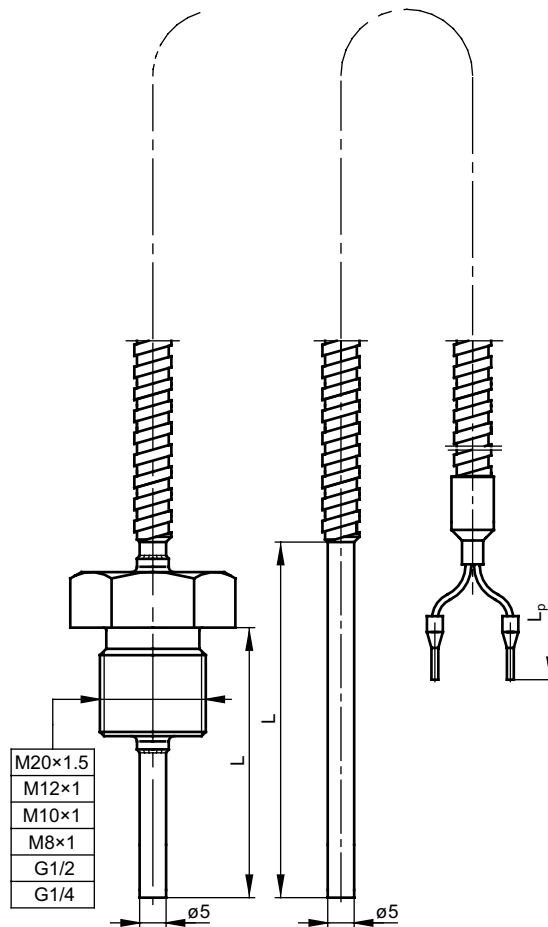
Thread dimension	Max. sheath diameter
M8x1	5
M10; M10x1; G½	6
M12; M12x1,5; M12 x 1	8
G¾; M14x1,5	9
G¾; M16x1,5	10
G½; M20x1,5	14

Lead wire

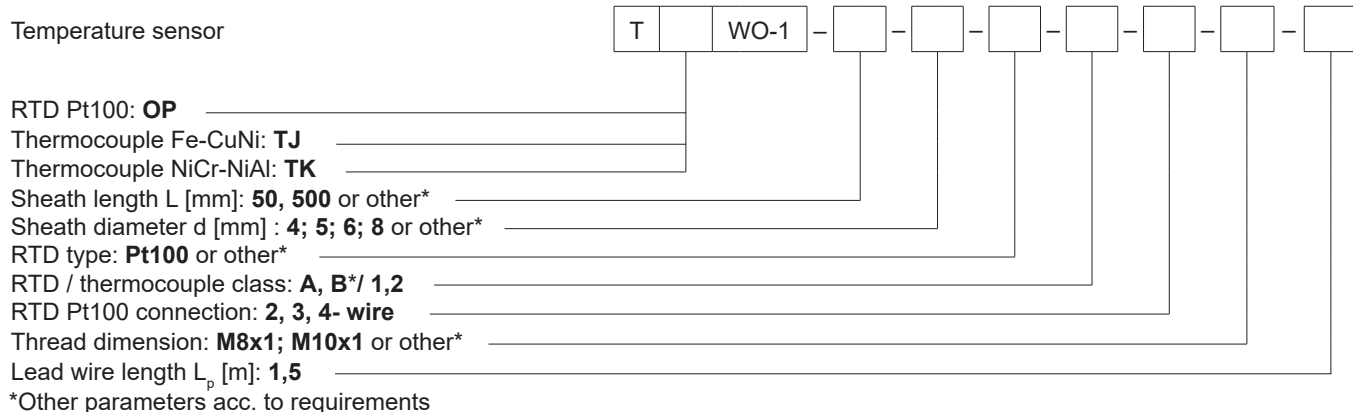
– stranded Cu wire or thermocouple stranded wire: 2x0,22 mm²
 – fiberglass insulation, metallic overbraid
 – flexible protection hose, stainless, ø7/5 mm
 – length L_p [m]: 1,5 (standard)
 – Cu wire resistance ~0,14 Ω/m = ~0,36°C

Options

– Pt500, Pt1000, Ni100, Ni1000
 – 3-, 4-wire connection for Pt100
 – Pt100: class A -30÷300°C, class AA 0÷150°C; TC: class 1



Ordering code



Ordering example: **TOPWO-1-200-5-Pt100-B-2-1,5 m** single sensor with Pt100, class B, 2-wire line, straight sheath without threaded fitting, sheath length L=200 mm, lead wire length L_p=1,5 m

Temperature Sensors for Measurement of Machinery and Device Parts **TOPWO-2, TTJWO-2, TTKWO-2**

Specification

Temperature range / sensing element

- 50÷400°C **Pt100** class B
- 40÷400°C **K, J** class 2

Sheath

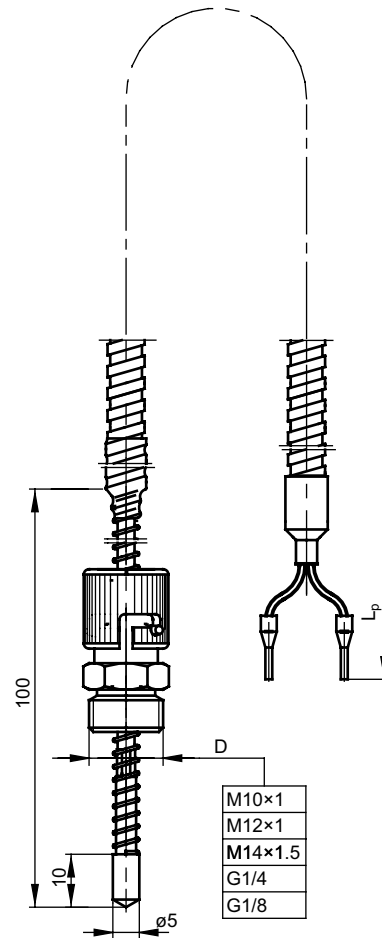
- material: stainless steel 1.4541
- diameter [mm]: $\varnothing 5$
- length L [mm]: 10
- spring diameter [mm]: 5
- round (**K**), flat (**P**), tapered (**S**) tips
- bayonet fitting with connector – nickel-plated brass

Lead wire

- stranded Cu wire or thermocouple stranded wire: 2x0,22 mm²
- fiberglass insulation, metallic overbraid
- flexible protection hose, stainless, $\varnothing 7/5$ mm
- length L_p [m]: 1,5 (standard)
- Cu wire resistance $\sim 0,14 \Omega/m = \sim 0,36^\circ C$

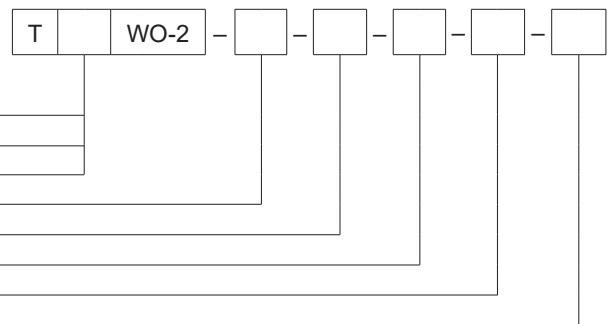
Options

- Pt500, Pt1000, Ni100, Ni1000
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷300°C, class AA 0÷150°C; TC: class 1
- ther threads – inch e.g. G $\frac{1}{4}$; G $\frac{3}{8}$
 metrical e.g. M12x1,25; M12x1,5; M12x1,75; M16x1,5



Ordering code

Temperature sensor



- RTD Pt100: **OP**
- Thermocouple Fe-CuNi: **TJ**
- Thermocouple NiCr-NiAl: **TK**
- Sheath tip – round (K), flat (P), tapered (S): **K, P, S**
- Thread dimension: **M10x1** or other*
- RTD/ thermocouple class: **A, B* / 1, 2**
- RTD connection: **2, 3, 4-wire**
- Lead wire length L_p [m]: **1,5** or other*

*Other parameters acc. to requirements

Ordering example:

TTJWO-2-K-M12x1-2-1,5 m single sensor with thermocouple Fe-CuNi /J/, class 2, with thread M12x1, lead wire length L_p=1,5 m

Temperature Sensors for Surface Measurement **TOPE-6, TTJE-6, TTKE-6**

Specification

Temperature range / sensing element

- 50÷400°C **Pt100** class B
- 40÷400°C **K, J** class 2

Sheath

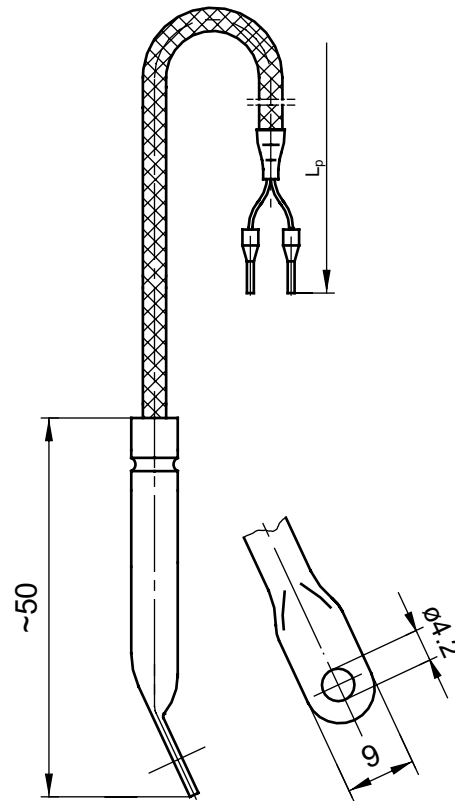
- material stainless steel 1.4541
- diameter [mm]: $\varnothing 6$
- length [mm]: 50
- 9 mm wide tip suitable for mounting to flat surfaces with M4 screw

Lead wire

- stranded Cu wire or thermocouple stranded wire: 2x0,22 mm²
- fiberglass insulation, metallic overbraid
- length L_p [m]: 1,5 (standard)
- Cu wire resistance ~0,14 Ω /m = ~0,36°C

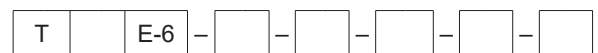
Options

- Pt500, Pt1000, Ni100, Ni1000
- other lead wire insulation types acc. to requirements:
 - operating temperature of silicone insulation – up to 180°C
 - operating temperature of teflon insulation – up to 200°C
 - operating temperature of PVC insulation – up to 100°C
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷300°C, class AA 0÷150°C; TC: class 1



Ordering code

Temperature sensor



- RTD Ni: **ON** _____
 - RTD Pt: **OP** _____
 - Thermocouple Fe-CuNi: **TJ** _____
 - Thermocouple NiCr-NiAl: **TK** _____
 - RTD type: **Pt100** or other* _____
 - RTD / thermocouple class: **A, B*/ 1, 2** _____
 - RTD connection: **2, 3, 4- wire** _____
 - Lead wire insulation: **Si** – silicone; **Ws** – fiberglass _____
 - Lead wire length L_p [m]: **1,5** or other* _____
- *Other parameters acc. to requirements

Ordering example:

TOPE-6-Pt500-B-2-Si-2 m RTD sensor with Pt500, class B, 2-wire connection, silicone insulated lead wire length L_p=2 m

TTJE-6-2-Ws-1,5 m sensor with thermocouple Fe-CuNi /J/, class 2, fiberglass insulated lead wire length L_p=1,5 m

Temperature Sensors for Surface Measurement **PTR-24, PTR-25**

Specification

Temperature range / sensing element

- 40÷400°C **K** class 2 PTR – 24
- 40÷800°C **K** class 2 PTR – 25

Sheath

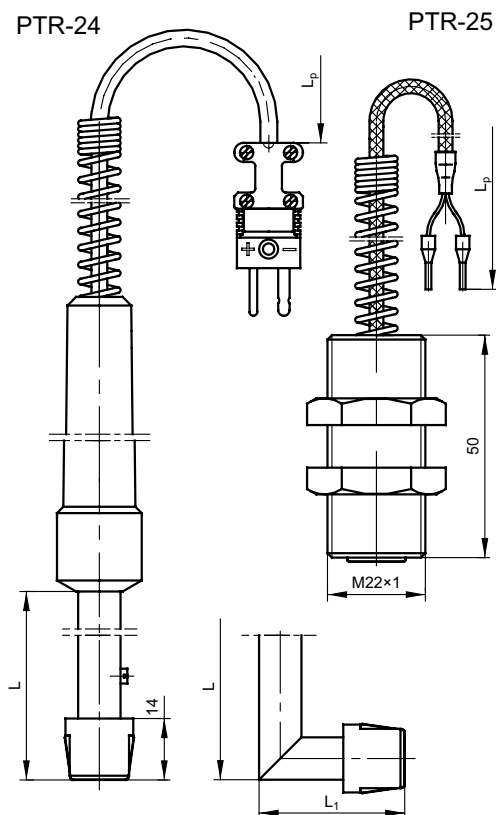
- material stainless steel 1.4541
- diameter [mm]: $\varnothing 15$ for PTR-24
 M22x1 for PTR-25
- length L [mm]: 100÷1000 for PTR-24
 50 for PTR-25
- PVC hand grip max. operating temperature +80°C – PTR-24

Lead wire

- for PTR-24: stranded wire: 2x0,22 mm² with double silicone insulation
- for PTR-25: stranded wire: 2x0,22 mm² with double fiberglass insulation, metallic overbraid
- fiberglass insulation, metallic overbraid
- length L_p [m]: 1,5 (standard)

Options

- for PTR-24 angular version 90°, L₁ [mm]: 50÷100



Ordering code

Temperature sensor

Version with hand grip: **4** _____

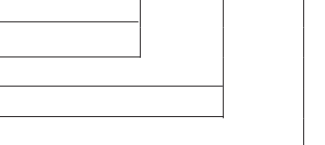
Version with lead wire: **5** _____

Straight probe length L [mm]: **100** or other* _____

Angular probe length LxL₁: **200x50** or other* _____

Lead wire length L_p [m]: **1,5** or other* _____

*Other parameters acc. to requirements



Ordering example:

PTR-24–300–1,5 m sensor with thermocouple NiCr-NiAl /K/, class 2, lead wire length L_p=1,5 m, with hand grip and mini plug

PTR-25–2 m sensor with thermocouple NiCr-NiAl /K/, class 2, lead wire length L_p=2 m

Temperature Sensors for Surface Measurement **TTJ/KE-86, TTJ/KE-87**

Specification

Temperature range / sensing element

-40÷400°C **K, J** class 2

Sheath

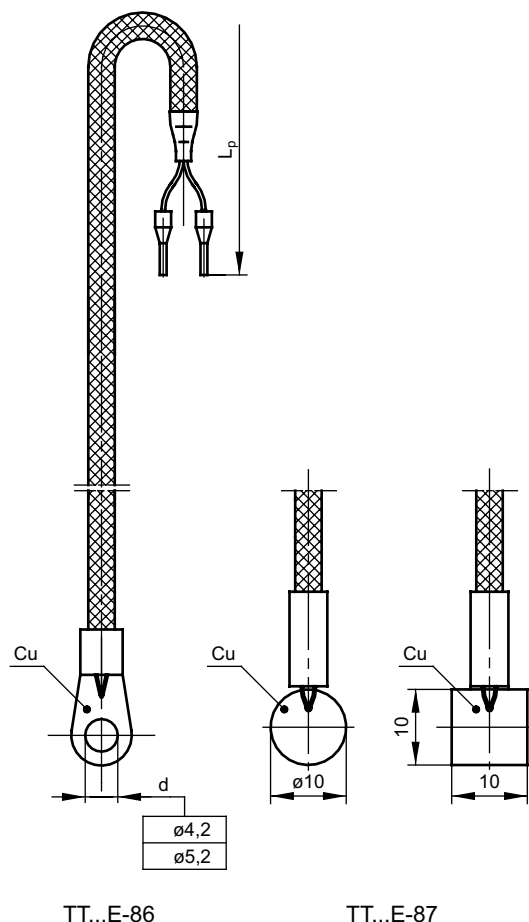
- TTJE/KE-86: cable tip with eyelet, clamped hot junction, surface mounting with M4 or M5 screw
- TTJE/KE-87: square or round plate, brazed hot junction

Lead wire

- thermocouple stranded wire: 2x0,22 mm²
- fiberglass insulation, metallic overbraid
- length L_p [m]: 1,5 (standard)

Options

- other lead wire insulation types acc. to requirements:
 operating temperature of silicone insulation – up to 180°C
 operating temperature of teflon insulation – up to 200°C



Ordering code

Temperature sensor

TT	E-8	-	-
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Thermocouple Fe-CuNi: **J** _____

Thermocouple NiCr-NiAl: **K** _____

Version with eyelet tip: **6** _____

Version with plate: **7** _____

Mounting with screw M4 (TTJE/KE-86): **4** _____

Mounting with screw M5 (TTJE/KE-86): **5** _____

Round plate diameter (for TTJE/KE-87) [mm]: **10** or other* _____

Square plate dimensions (for TTJE/KE-87): **10x10** _____

Lead wire length L_p [m]: **1,5** or other* _____

*Other parameters acc. to requirements

Ordering example: **TTJE-86-5-2 m** sensor with thermocouple Fe-CuNi /J/, class 2, mounted with M5 screw, lead wire L_p=2 m

TTKE-87-10x10-3 m sensor with thermocouple NiCr-NiAl /K/, class 2, measuring surface 10x10 mm, lead wire length L_p=3 m

Temperature Sensors for Surface Measurement **TTJE-306, TTKE-306**

Specification

Temperature range / sensing element

-40÷400°C **K, J** class 2

Sheath

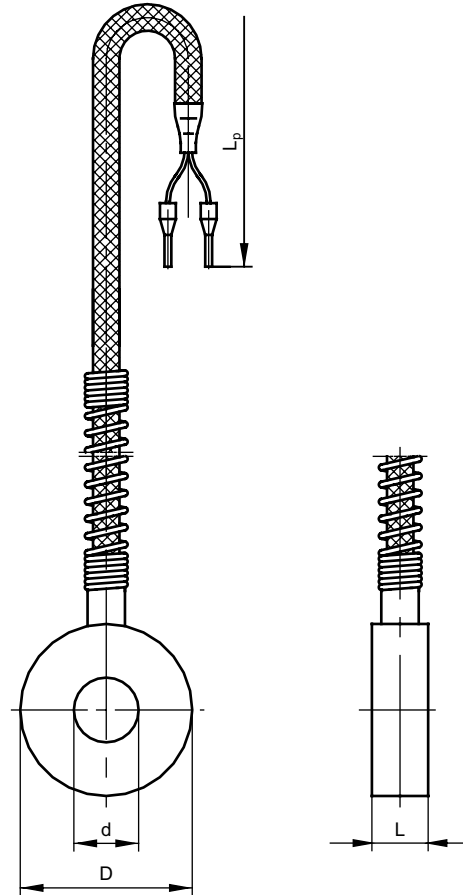
- material stainless steel 1.4541
- ring dimensions:
 $d_{min}=4$ mm, $D=10\div 25$ mm, $L_{min}=4$ mm

Lead wire

- thermocouple stranded wire: $2 \times 0,22$ mm²
 fiberglass insulation, metallic overbraid for $L \geq 5$ mm
- thermocouple solid wire: $2 \times 0,2$ mm²
 fiberglass insulation, metallic overbraid for $L < 5$ mm
- length L_p [m]: 1,5 (standard)

Options

- other lead wire insulation types acc. to requirements:
 operating temperature of silicone insulation – up to 180°C
 operating temperature of teflon insulation – up to 200°C



Ordering code

Temperature sensor

TT	E-306	-	-	-
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Thermocouple Fe-CuNi: **J**

Thermocouple NiCr-NiAl: **K**

Ring dimensions d/DxL: **5/10x5** or other*

Thermocouple class: **1, 2**

Lead wire length L_p [m]: **1,5** or other*

*Other parameters acc. to requirements

Ordering example:

TTKE-306-4,5/8x5-2-2 m single sensor with thermocouple NiCr-NiAl /K/, class 2, ring dimensions $d=4,5$ mm, $D=8$ mm, $L=5$ mm, lead wire length $L_p=2$ m

Temperature Sensors for Surface Measurement **TOPE-243, TTJE-243, TTKE-243**

Specification

Temperature range / sensing element

-50÷400°C **Pt100** class B
 -40÷400°C **K, J** class 2

Pipe band clamp

- material, stainless steel 1.4301
- pipe band clamp diameter $\varnothing 16 \div 180$ mm
- width b: 9 for $D < 110$
 12 for $D > 110$

Sheath

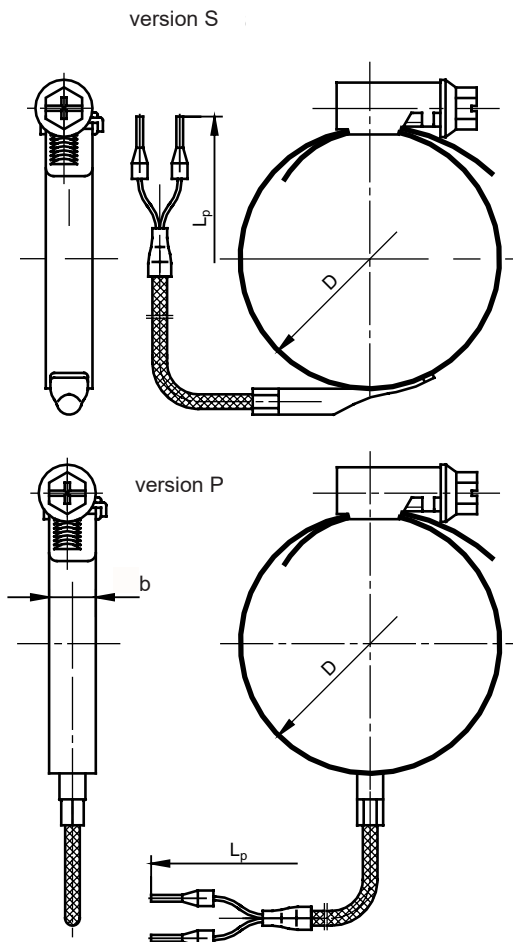
- material stainless steel 1.4541:
 welded tangentially to band clamp (S)
 welded perpendicularly to band clamp (P)

Lead wire

- stranded Cu wire or thermocouple stranded wire: $2 \times 0,22$ mm²
- fiberglass insulation, metallic overbraid
- length L_p [m]: 1,5 (standard)
- Cu wire resistance $\sim 0,14 \Omega/m = \sim 0,36^\circ\text{C}$

Options

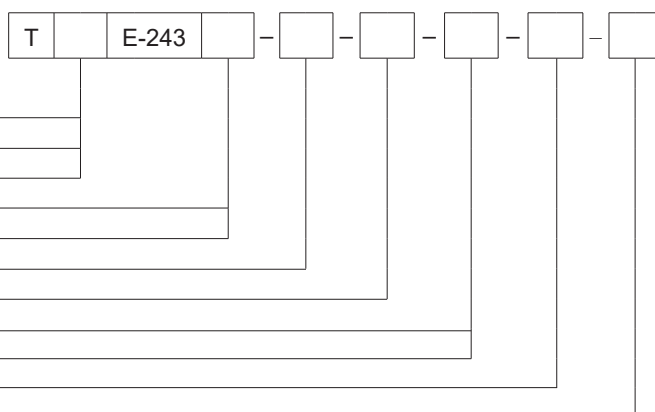
- Pt500, Pt1000, Ni100, Ni1000
- other lead wire insulation types acc. to requirements:
 operating temperature of silicone insulation – up to 180°C
 operating temperature of teflon insulation – up to 200°C
- 3, 4-wire connection for Pt100
- Pt100: class A -30÷300°C, class AA 0÷150°C; TC: class 1



Ordering code

Temperature sensor

- RTD Pt: **OP** _____
- Thermocouple Fe-CuNi: **TJ** _____
- Thermocouple NiCr-NiAl: **TK** _____
- Band clamp tangential to sheath: **S** _____
- Band clamp perpendicular to sheath: **P** _____
- Pipeline diameter D [mm]: **40** _____
- RTD type: **Pt100** _____
- RTD / thermocouple class: **A, B*/ 1, 2** _____
- RTD connection for Pt100: **2, 3, 4-wire** _____
- Lead wire length L_p [m]: **1,5** _____
- Lead wire insulation other than fiberglass: Silicone (**Si**), teflon (**F**) _____
- *Other parameters acc. to requirements



Ordering example:

TTJE-243S-25÷40-2-1,5 m-Si single sensor with thermocouple Fe-CuNi /JJ/, class 2, with sheath welded tangentially to band clamp, band clamp diameter 25÷40 mm, lead wire with silicone insulation length $L_p=1,5$ m

TOPE-243P-80÷100-Pt100-B-2-1,5 m-Ws single sensor with Pt100, class B, 2-wire connection, sheath welded perpendicularly to band clamp, lead wire with fiberglass insulation length $L_p=1,5$ m

Temperature Sensors for Surface Measurement **TOPE-244, TONE-244, TTJE-244, TTKE-244**

Specification

Temperature range / sensing element

-50÷250°C	Pt100	class B
-40÷400°C	K, J	class 2

Sheath

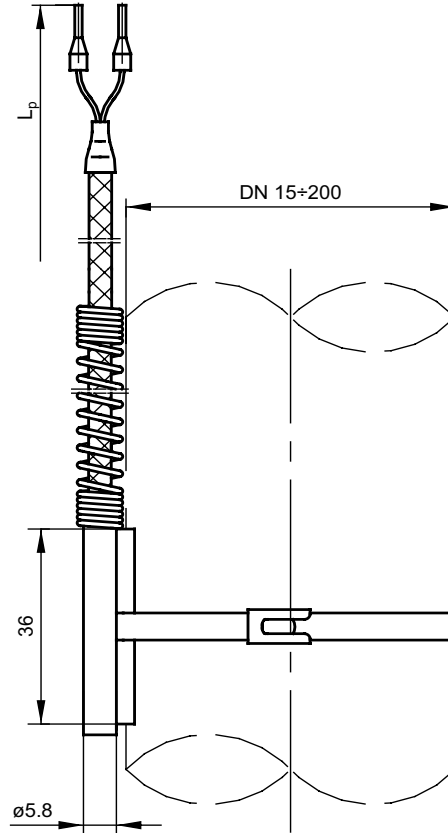
- material brass, length [mm]: 36
- radiator enhancing surface of heat reception with band clamp for mounting on a pipeline DN 15÷200 mm
- insulated hot junction SO

Lead wire

- stranded Cu wire 2x0,35 mm² with teflon insulation, metallic overbraid
- length L_p [m]: 1,5 (standard)
- Cu wire resistance ~0,102 Ω/m = ~0,26°C

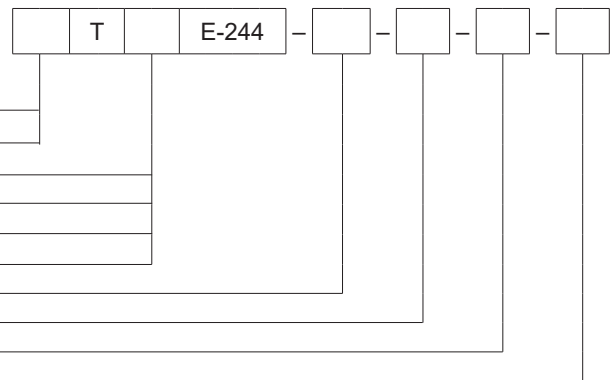
Options

- Pt500, Pt1000, Ni100, Ni1000
- other lead wire insulation types acc. to requirements:
 operating temperature of silicone insulation – up to 180°C
 operating temperature of fiberglass insulation – up to 400°C
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷250°C, class AA 0÷150°C; TC: class 1



Ordering code

Temperature sensor



- Single: **no designation**
 - Double: **2**
 - RTD Pt100: **OP**
 - RTD Ni: **ON**
 - Thermocouple Fe-CuNi: **TJ**
 - Thermocouple NiCr-NiAl: **TK**
 - RTD type: **Pt100** or other*
 - RTD / thermocouple class: **A, B*/ 1, 2**
 - RTD Pt connection: **2, 3, 4- wire**
 - Lead wire length L_p [m]: **1,5** or other*
- *Other parameters acc. to requirements

Ordering example:

TOPE-244-Pt500-B-3-2 m RTD sensor with Pt500, class B, 3-wire connection, lead wire with teflon insulation, metallic overbraid, length L_p=2 m

2TONE-244-Ni100-2-1,5 m double RTD sensor with Ni100, 2-wire connection, lead wire with teflon insulation, metallic overbraid, length L_p=1,5 m

Temperature Sensors for Surface Measurement **TOP-AL2, TTJ-AL2, TTK-AL2,**

Specification

Temperature range / sensing element

-50÷400°C	Pt100	class B
-40÷400°C	K, J	class 2

Sheath

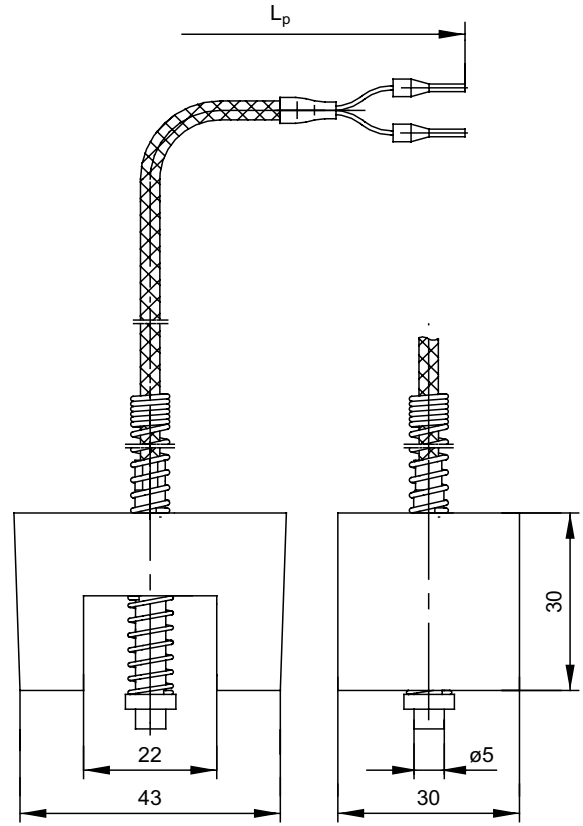
- material stainless steel 1.4541
- mounting: magnet Alnico 22-36
- length L [mm]: 50÷1000

Lead wire

- stranded Cu wire or thermocouple stranded wire: 2x0,22 mm²
- fiberglass insulation, metallic overbraid
- length L_p [m]: 1,5 (standard)
- Cu wire resistance ~0,14 Ω/m = ~0,36°C

Options

- Pt500, Pt1000, Ni100, Ni1000
- other lead wire insulation types acc. to requirements
- operating temperature of silicone insulation – up to 180°C
- operating temperature of teflon insulation – up to 200°C
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷300°C, class AA 0÷150°C; TC: class 1
- grounded hot junction: SP



Ordering code

Temperature sensor

T - AL2 - - - -

Thermocouple Fe-CuNi: **TJ**

Thermocouple NiCr-NiAl: **TK**

RTD Pt: **OP**

RTD type: **Pt100**

RTD / thermocouple class: **A, B*/ 1, 2**

RTD Pt connection or hot junction type: **2, 3, 4- wire** or **SO, SP**

Lead wire length L_p [m]: **1,5** or other*

*Other parameters acc. to requirements

- Ordering example:
- TOP-AL2-Pt100-A-3-1 m** single sensor with Pt100, class A, 3-wire connection, lead wire length L_p=1 m
 - TTJ-AL2-2-SO-1,5 m** single sensor with thermocouple Fe-CuNi /J/, class 2, lead wire length L_p=1,5 m

Mineral Insulated Thermocouple Sensors **XL-PTTK, XL-PTTN**

Specification

Temperature range / sensing element

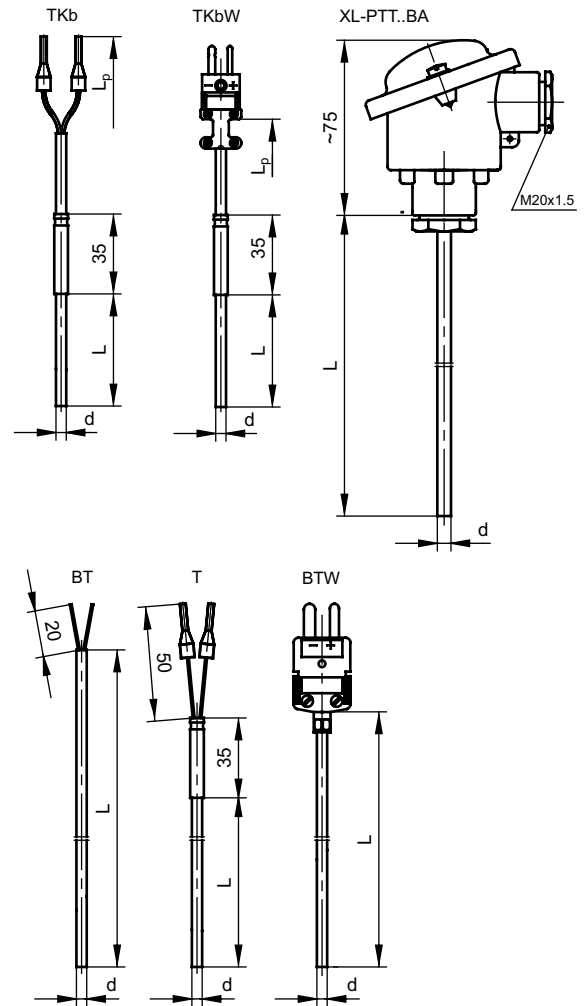
- 40÷1250°C **K, N** class 1
- accuracy for class 1 max. 2,5°C – for temperature up to 1250°C
- short-term operating temperature up to 1335°C for 1,5 hour

Sheath

- material OMEGA LAND XL
- diameter d [mm]: ø6 or ø3
- length L [mm]: acc. to requirements
- corrosion resistance during high temperature oxidation process of carburising and chlorination (ammonia and nitrides presence)
- min. bending radius 3xd [mm]

Constructional version

- with head mounted transmitter type AP
- with connection head type BA (IP55, -40÷100°C)
- with exposed wire ends 20 mm type BT
- with sleeve and stranded wires 50 mm type T
- with plug type M (miniature)* type BTWM
- with plug type S (standard)* type BTWS
- with compensation cable type TKb
- with compensation cable and plug type M type TKbWM
- with compensation cable and plug type S type TBbWS



Lead wire

- stranded wire 2x0,22 mm² with double silicone insulation
- stranded wire 2x0,22 mm² with double fiberglass insulation, metallic overbraid
- length L_p [m]: acc. to requirements

Options

- connection heads – stainless steel BEG; aluminium NA, IP65; aluminium NA with snap lock – pp. 157÷158
- version BTW, TKbW, socket acc. to requirements
- hot junction: insulated SO, grounded SP

Additional equipment

- temperature transmitters – pp. 162÷174
- sensor mounting fittings: UG-1, UG-3, UG-8, UZK-1 – pp. 155÷156

*BTW M for sheath [mm]: ø3
 *BTW S for sheath [mm]: ø6

Ordering code

Temperature sensor



- With transmitter: **AP**
- Thermocouple NiCrSi-NiSi: **N**
- Thermocouple NiCr-NiAl: **K**
- Constructional version: **BA, BT, T, BTWM, BTWS, TKb** or other*
- Sheath diameter: **dx10**
- Hot junction type: **SP, SO**
- Sheath length L [mm]: **acc. to requirements**
- Lead wire length L_p [m]: **acc. to requirements**
- Lead wire insulation: **Si** – silicone, **Ws** – fiberglass or transmitter temperature range
- Additional equipment – socket: **G**
- *Other parameters acc. to requirements

Ordering example: **XL-PTTK-TKbWM-60-SO-500-3 m-Ws-G**
XL-PTTN-BA-60-SO-6500

Mineral Insulated Thermocouple Sensors PTTJ, PTTK

Specification

Temperature range / sensing element

-40÷700°C	J	class 2
-40÷1200°C	K	class 2

Sheath

- material stainless steel 1.4541 for J, Inconel 600 for K
- diameter d [mm]: ø1; 1,5; 2; 3; 4,5; 6; 8
- length L [mm]: acc. to requirements
- min. bending radius 3xd [mm]

Max. range of continuous operation dependent on sheath diameter

Thermocouple class 2	Sheath diameter d [mm]						
	ø1	ø1,5	ø2	ø3	ø4,5	ø6	ø8
J	315°C	315°C	400°C	450°C	550°C	700°C	–
K	760°C	760°C	800°C	900°C	1000°C	1200°C	1200°C

Constructional version

- with head mounted transmitter type AP
- with connection head type BA (IP55, -40÷100°C)
- with exposed wire ends 20 mm type BT
- with sleeve and stranded wires 50 mm type T
- with plug type M (miniature)* type BTWM
- with plug type S (standard)* type BTWS
- with socket LEMO type BTL
- with compensation cable type TKb
- with compensation cable and plug type M type TKbWM
- with compensation cable and plug type S type TKbWS
- with compensation cable and plug LEMO type TKbL

Lead wire

- stranded wire 2x0,22 mm² with double silicone insulation
- stranded wire 2x0,22 mm² with double fiberglass insulation, metallic overbraid
- length L_p [m]: acc. to requirements

Options

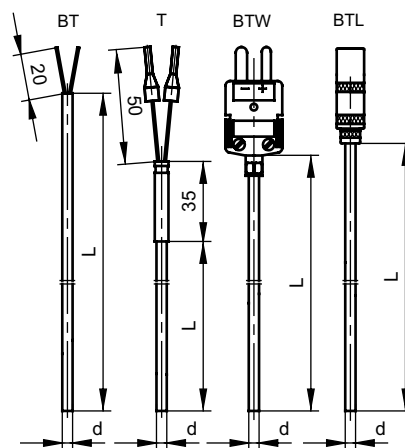
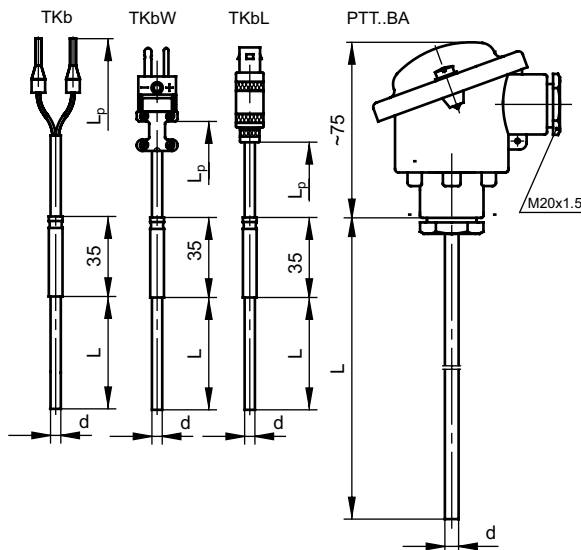
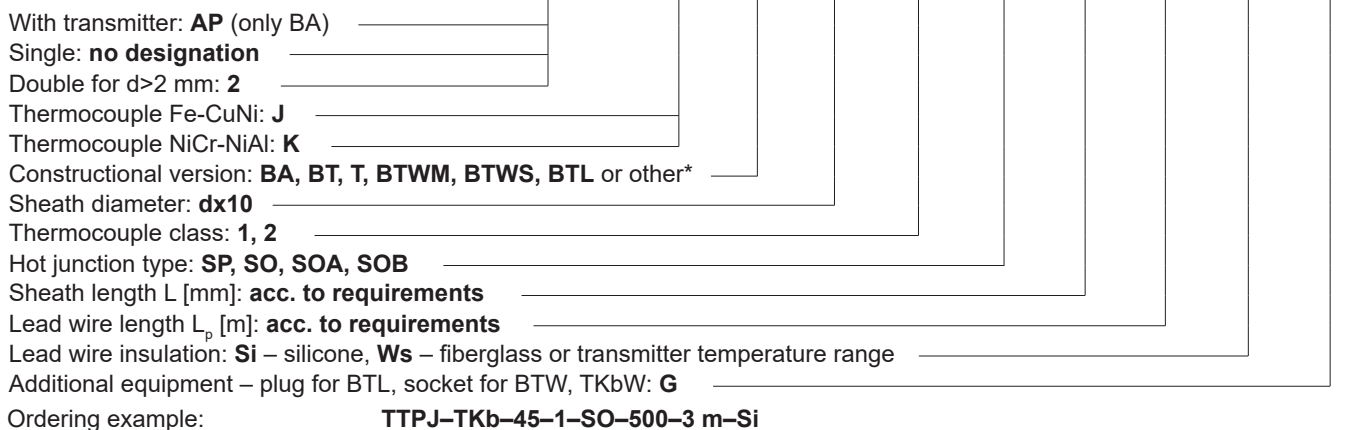
- connection heads – aluminium NA, IP65; aluminium NA with snap lock – p. 157
- hot junction: SO, SP, SOA, SOB – p. 13
- thermocouple J, K: class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- version BTW, TKbW, BTL, TKbL acc. to requirements
- sensor mounting fittings:
 UG-1, UG-3, UG-8, UZK-1 – pp. 155÷156

Ordering code

Temperature sensor



*BTW M for sheath [mm]: ø1; 1,5; 2; 3
 *BTW S for sheath [mm]: ø1; 1,5; 2; 3; 4,5; 6

Mineral Insulated RTD Sensor PTOP

Specification

Temperature range / sensing element

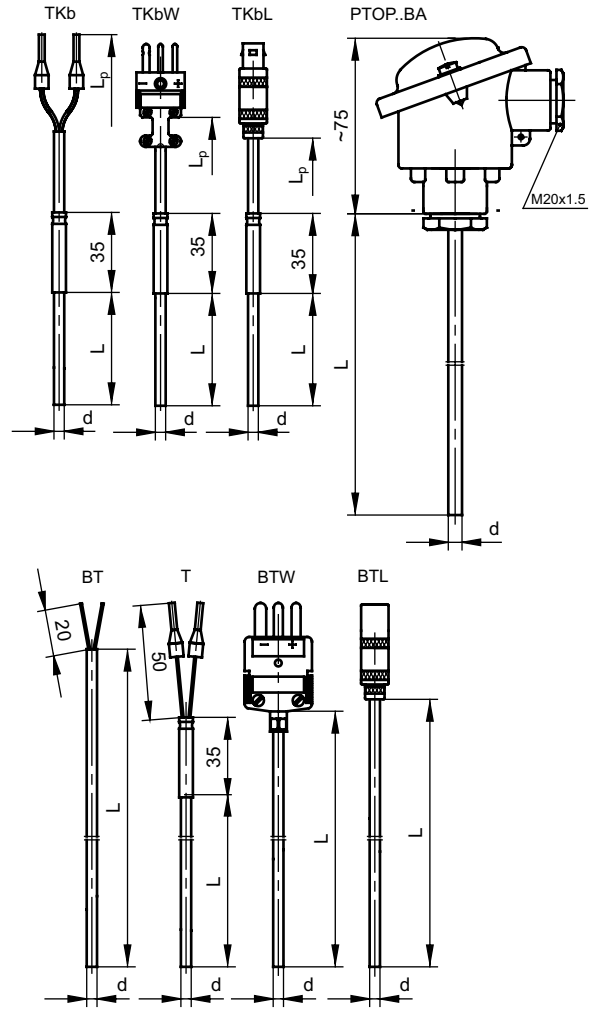
-200÷550°C **Pt100** class B \varnothing 6 mm
 -50÷500°C **Pt100** class B \varnothing 3 mm

Sheath

- material stainless steel 1.4571
- diameter d [mm]: \varnothing 3 or \varnothing 6
- length L [mm]: acc. to requirements
- min. bending radius 3xd [mm]

Constructional version

- with head mounted transmitter type AP
- with connection head type BA (IP55,-40÷100°C)
- with exposed wire ends 20 mm type BT
- with sleeve and stranded wires 50 mm type T
- with plug type M (miniature)¹ type BTWM
- with plug type S (standard)² type BTWS
- with socket LEMO³ type BTL
- with compensation cable type TKb
- with compensation cable and plug type M⁴ type TKbWM
- with compensation cable and plug type S⁴ type TKbWS
- with compensation cable and plug LEMO⁵ type TKbL



Lead wire

- stranded wire 3x0,22 mm², 4x0,22 mm² with double silicone insulation
- stranded wire 3x0,22 mm², 4x0,22 mm² with double fiberglass insulation, metallic overbraid
- length L_p [m]: acc. to requirements

Options

- connection heads – aluminium NA, IP65; NA with snap lock – p. 157
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷200°C, class AA 0÷150°C

Additional equipment

- temperature transmitters – pp. 162÷174
- version BTW, TKbW, BTL, TKbL acc. to requirements
- sensor mounting fittings:
 UG-1, UG-3, UG-8, UZK-1 – pp. 155÷156

¹ BTW with plug M (MTP-U-M) for sheath [mm]: \varnothing 3
² BTW with plug S (OTP-U-M) for sheath [mm]: \varnothing 6
³ BTL with socket PCA.3S for for sheath [mm]: \varnothing 6
 BTL with socket PCA.1S for for sheath [mm]: \varnothing 3
⁴ TKbW with plug M (MTP-U-M) for sheath [mm]: \varnothing 3, 6
⁵ TKbL with plug FFA.1S for sheath [mm]: \varnothing 3, 6

Ordering code

Temperature sensor

	PTOP	-		-		-		-		-		-		-		-		-	
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Single: **no designation** _____
 Double: **2** _____
 With transmitter: **AP** (only BA) _____
 Constructional version: **BT, BTW, BTL** or other* _____
 Sheath diameter: **dx10** _____
 RTD class: **A, B** _____
 RTD connection: **2, 3, 4-wire** _____
 Sheath length L [mm]: **acc. to requirements** _____
 Lead wire length L_p [m]: **acc. to requirements** _____
 Lead wire insulation: **Si** – silicone, **Ws** – fiberglass _____
 Transmitter type – temperature range (for BA): **Tx - (0÷400)°C** _____
 Additional equipment – socket: for TKbWM, TKbL, BTWS, plug for BTL: **G** _____
 *Other parameters acc. to requirements

Ordering example: **PTOP-TKb-60-A-3-500-3 m-Si**

G

Mineral Insulated RTD Sensor **PTR-1**

Specification

Temperature range / sensing element

-50÷500°C **Pt100** class B

Sheath

- material stainless steel 1.4571
- diameter d [mm]: $\varnothing 3$ or $\varnothing 6$
- length L [mm]: 100÷1500 acc. to requirements
- min. bending radius 3xd [mm]

Constructional version

- PVC hand grip max. operating temperature 80°C

Lead wire

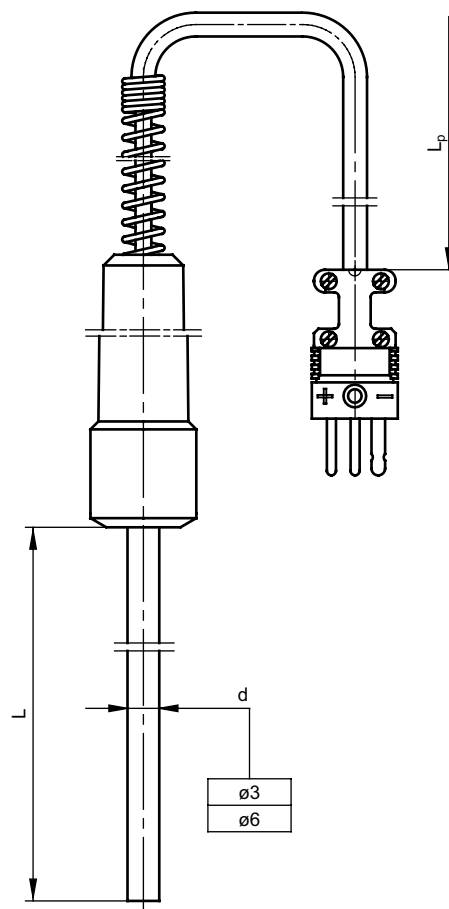
- stranded Cu wire 2 or 3x0,22 mm² with double silicone insulation
- length L_p [m]: 1,5 (standard)

Options

- other lead wire insulation types: teflon, armour, fiberglass
- Pt100: class A -30÷200°C, class AA 0÷150°C

Additional equipment

- flat miniature plug type SMPW (2 pin) or MTP (3 pin) – p. 146



Ordering code

Temperature sensor



Sheath diameter: **dx10**

RTD class: **A, B***

RTD connection: **2, 3, 4-wire**

Sensor length L [mm]: **100, 200** or other*

Lead wire length L_p [m]: **1,5** or other*

Additional equipment – miniature plug: **SMP, MTP**

*Other parameters acc. to requirements

Ordering example:

PTR-1-60-B-2-250-1,5 m sensor with Pt100, class B, 2-wire connection, sheath diameter $\varnothing 6$ mm and length L=250 mm, lead wire length L_p=1,5 m

PTR-1-30-B-3-500-2 m-MTP sensor with Pt100, class B, 3-wire connection, sheath diameter $\varnothing 3$ mm and length L=500 mm, lead wire length L_p=2 m, with miniature plug 3-pin

Mineral Insulated Thermocouple Sensors **PTR-2, PTR-3**

Specification

Temperature range / sensing element

- 40÷700°C **J** class 2
- 40÷1200°C **K** class 2

Thermowell

- material stainless steel 1.4541 for J Inconel 600 for K
- diameter d [mm]: ø3; 4,5; 6
- length L [mm]: 100÷1500 acc. to requirements
- min. bending radius 3xd [mm]

Max. range of continuous operation dependent on sheath diameter

Thermocouple class 2	Sheath diameter d [mm]		
	ø3	ø4,5	ø6
J	450°C	550°C	700°C
K	900°C	1000°C	1200°C

Constructional version

- PVC hand grip max. operating temperature 80°C

Lead wire

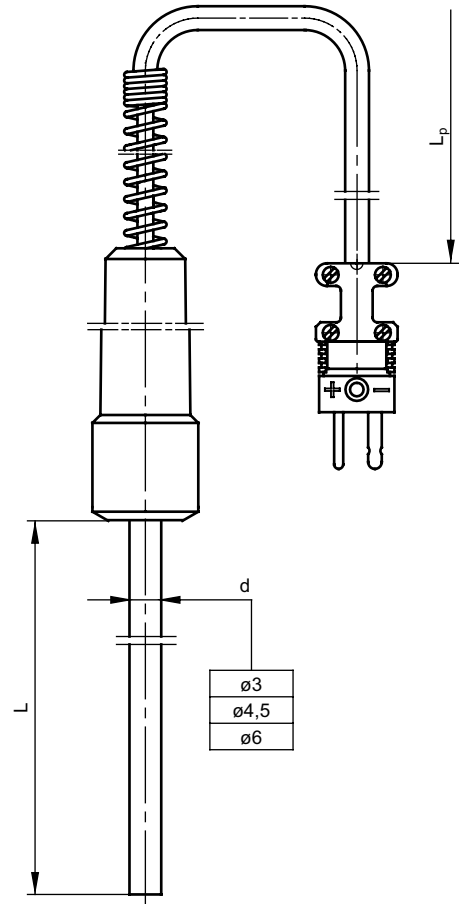
- stranded wire 2x0,22 mm² with double silicone insulation (standard)
- length L_p [m]: 1,5 (standard)

Options

- hot junction: SO, SP – p. 13
- thermocouple J, K: class 1
- other lead wire insulation types: teflon, armour, fiberglass

Additional equipment

- miniature plug SMPW – p. 146
- compensation cables – p. 145



Ordering code

Temperature sensor

PTR - - - - - - - -

Thermocouple NiCr-NiAl: **2** _____

Thermocouple Fe-CuNi: **3** _____

Sheath diameter: **dx10** _____

Thermocouple class: **1, 2** _____

Hot junction type: **SP, SO** _____

Sensor length L [mm]: **100, 200** or other* _____

Lead wire length L_p [m]: **1,5** or other* _____

Mini plug: **W** _____

*Other parameters acc. to requirements

Ordering example: **PTR-2-45-2-SO-250-1,5 m** mineral insulated sensor with thermocouple NiCr-NiAl /K/, class 2, insulated hot junction, sheath diameter ø4,5 mm, length L=250 mm, lead wire length L_p=1,5 m

PTR-3-30-1-SP-500-2m-W mineral insulated sensor with thermocouple Fe-CuNi /J/, class 1, grounded hot junction, sheath diameter ø3 mm, length L=500 mm, lead wire length L_p=2 m, with miniature plug

G

Mineral Insulated Thermocouple Sensors **PTTJ-147, PTTK-147**

Specification

Temperature range / sensing element

- 40÷700°C **J** class 2
- 40÷800°C **K** class 2

Sheath

- three-stepped [mm]: $\varnothing 4 / 5 / 7$
- material stainless steel 1.4541
- length L [mm]: 600÷1000
- three-stepped sheath, at length 200 mm covered with tungsten carbide to enhance abrasion resistance

Constructional version

- PVC hand grip max. operating temperature 80°C
- thread M10x1 for sensor mounting in a housing e.g. of a tank

Lead wire

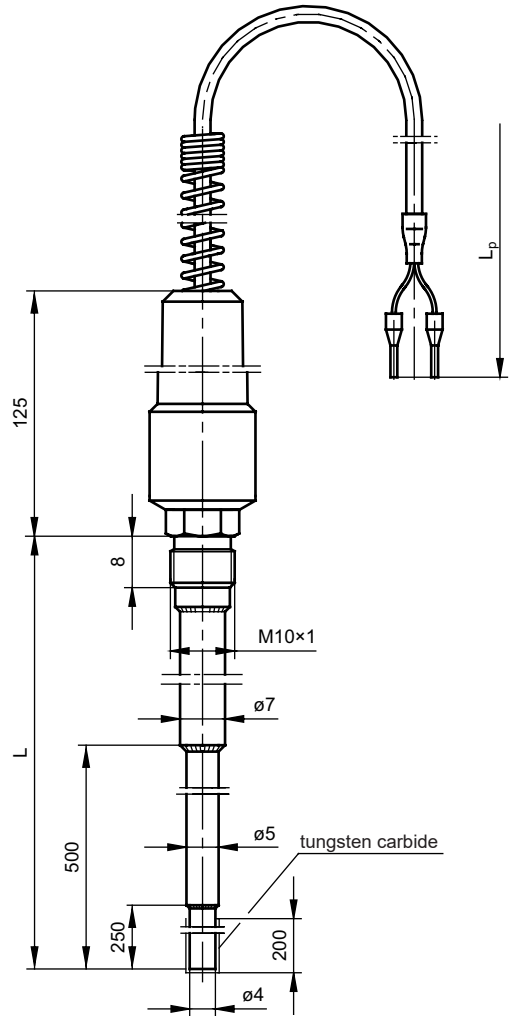
- stranded wire 2x0,22 mm² with double silicone insulation (standard)
- length L_p [m]: 1,0 (standard) or acc. to requirements

Options

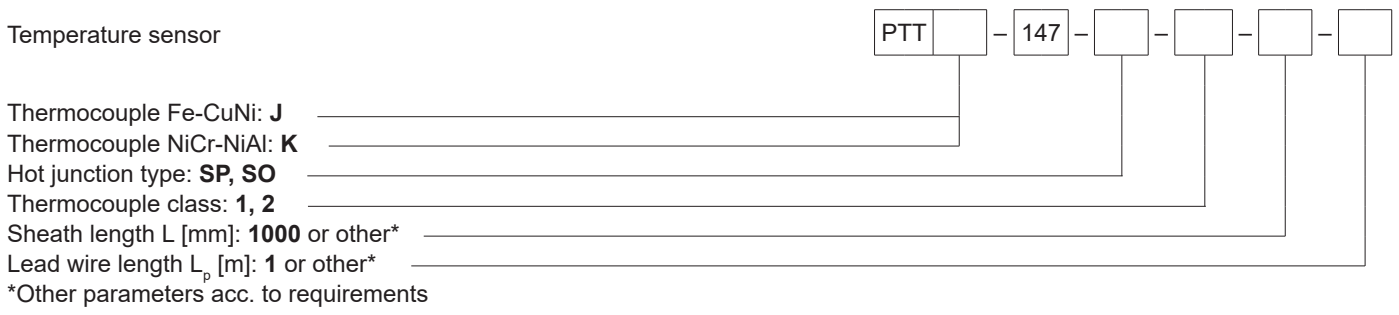
- hot junction: SO, SP – p. 13
- thermocouple K, J: class 1
- other lead wire insulation types: teflon, armour, fiberglass

Additional equipment

- miniature plug SMPW – p. 146
- compensation cables – p. 145



Ordering code



Ordering example: **PTTK-147-SO-1-1000-1 m** mineral insulated sensor with thermocouple NiCr-NiAl /K/, class 1, insulated hot junction, sheath length L=1000 mm, lead wire length L_p=1 m

Mineral Insulated Thermocouple Sensors **PTTJ-183, PTTK-183**

Specification

Temperature range / sensing element

- 40÷400°C **J** class 2
- 40÷400°C **K** class 2

Sheath

- material stainless steel 1.4541 for J, Inconel 600 for K
- mineral insulated thermocouple $\varnothing 4,5$ mm, with sleeve and nut M14x1,5 for sensor mounting
- length L [mm]: min. 20

Lead wire

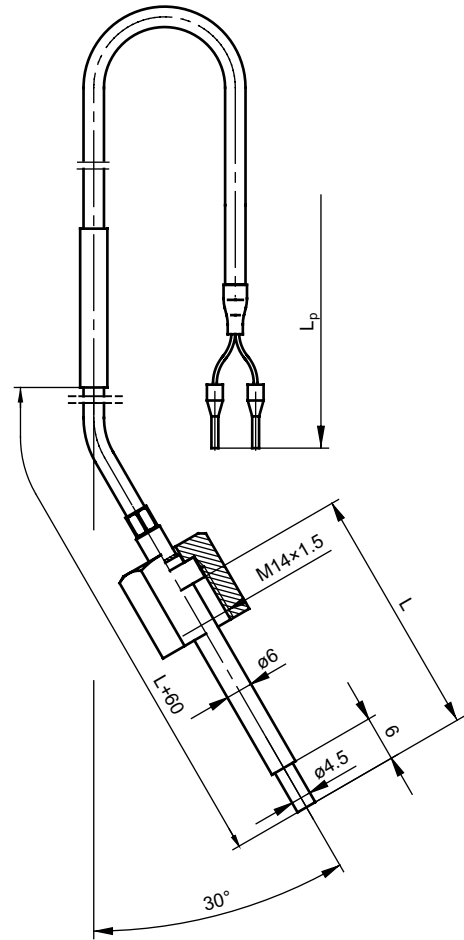
- stranded wire 2x0,22 mm² with double silicone insulation (standard)
- length L_p [m]: 1,5 (standard)

Options

- hot junction: SO, SP – p. 13
- other lead wire insulation types: teflon, armour, fiberglass

Additional equipment

- miniature plug SMPW – p. 146
- compensation cables – p. 145



Ordering code

Temperature sensor



- Thermocouple Fe-CuNi: **J** _____
 - Thermocouple NiCr-NiAl: **K** _____
 - Thermocouple class: **1, 2** _____
 - Sheath length L [mm]: **20** or other* _____
 - Lead wire length L_p [m]: **2** or other* _____
 - Additional equipment - mini plug: **W** _____
- *Other parameters acc. to requirements

Ordering example:

PTTK-183-2-50-3 m mineral insulated sensor with thermocouple NiCr-NiAl /K/, class 2, sheath length L=50 mm, lead wire length L_p=3 m

G

Mineral Insulated Sensors **PTTJ-453, PTTK-453, PTOP-453**

Specification

Temperature range / sensing element

-50÷550°C	Pt100	class B
-40÷700°C	J	class 2
-40÷1000°C	K	class 2

Sheath

- material: stainless steel 1.4541 for J, 1.4571 for Pt100, Inconel 600 for K
- diameter d/D [mm]: ø3/4; 4,5/6; 6/8
- sensor length L [mm]: 250÷1000
- sheath length L₁ [mm]: 50÷300
- strengthening sheath material: stainless steel 1.4541
- min. bending radius 3xd [mm] for length L₁

Max. range of continuous operation dependent on sheath diameter

Sensor class 2, class B	Sheath diameter d [mm]		
	ø3	ø4,5	ø6
J	450°C	550°C	700°C
K	900°C	1000°C	1100°C
Pt100	400°C	-	550°C

Connection head

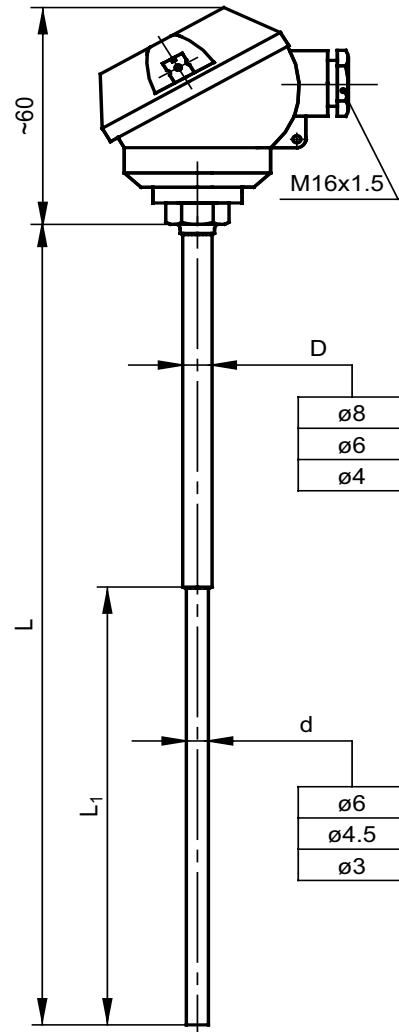
- MA, IP54 -40÷100°C

Options

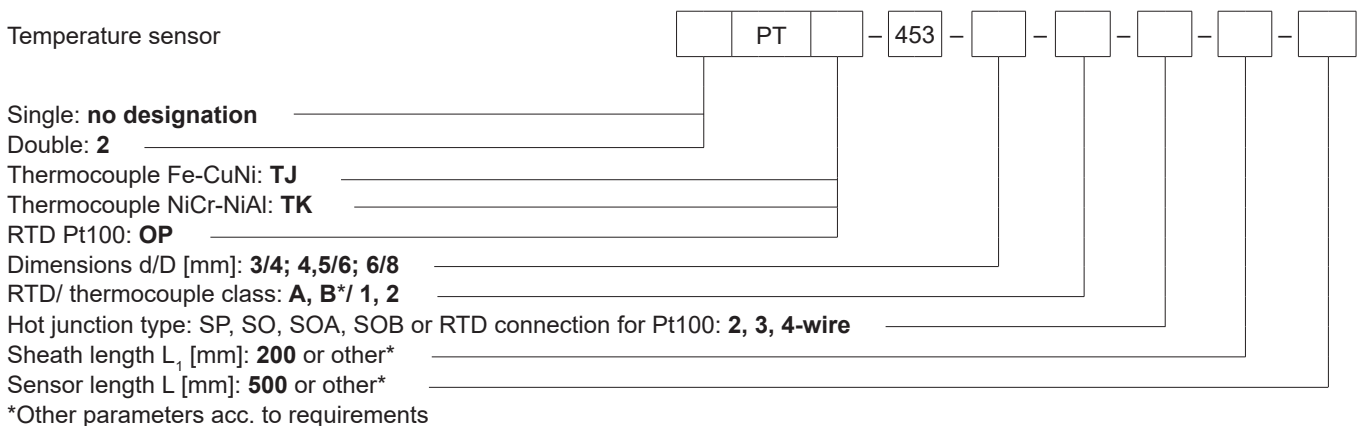
- hot junction type: SO, SP – p. 13
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷200°C, class AA 0÷150°C; TC: class 1

Additional equipment

- sensor mounting fittings: UG-1, UG-3, UG-8, UZK-1 – pp. 155÷156



Ordering code



Ordering example:

PTTK-453-3/4-1-SO-100-300 single sensor with thermocouple NiCr-NiAl /K/, class 1, insulated hot junction, sheath diameter ø3 mm, support sheath diameter ø4 mm, sheath length L₁=100 mm, sensor length L=300 mm

Mineral Insulated Sensors **PTTJ-533, PTTK-533, PTOp-533**

Specification

Temperature range / sensing element

-50÷500°C	Pt100	class B
-40÷450°C	J	class 2
-40÷900°C	K	class 2

Sheath

- material: stainless steel 1.4541 for J 1.4571 for Pt100
 Inconel 600 for K
- sheath diameter d [mm]: $\varnothing 3$
- length L_1, L_2, L_3 [mm]: acc. to requirements
- min. bending radius $3xd$ [mm] for lengths L_1, L_2, L_3 [mm]
- holding tube $\varnothing 22$ mm material: steel 1.4841

Connection head

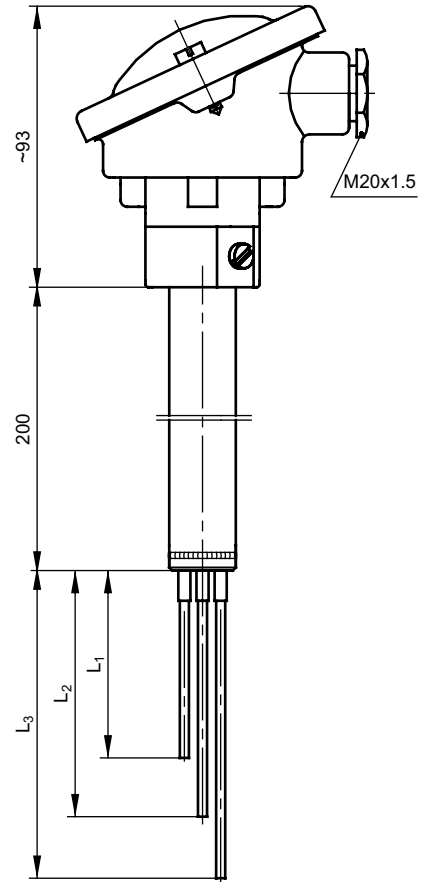
- A, IP53 -40÷100°C

Options

- hot junction type: SO, SP
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷200°C, class AA 0÷150°C; TC: class 1

Additional equipment

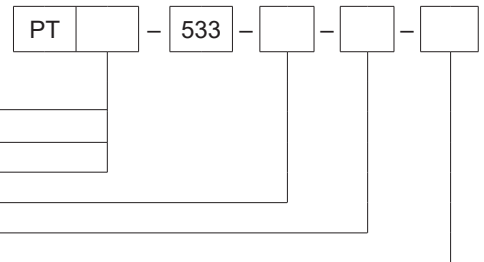
- compensation cables – p. 145
- sensor mounting fittings: UZ-11 or UZ-21 – p. 156



Ordering code

Temperature sensor

- Thermocouple Fe-CuNi: **TJ**
- Thermocouple NiCr-NiAl: **TK**
- RTD Pt100: **OP**
- Sensing elements: **2, 3**
- Sensors length $L_1/L_2/L_3$ [mm]: **acc. to requirements**
- RTD/ thermocouple class: **A, B*/ 1, 2**



Ordering example:

PTTK-533-3-1000/1500/2000-1 thermocouple sensor with three mineral insulated thermocouples NiCr-NiAl /K/, class 1, length $L_1=1000$ mm, $L_2=1500$ mm, $L_3=2000$ mm

PTTJ-533-2-500/1500-2 thermocouple sensor with two mineral insulated thermocouples Fe-CuNi /J/, class 2, length $L_1=500$ mm, $L_2=1500$ mm

Mineral Insulated Sensors **PTOP-186, PTTJ-186, PTTK-186**

Specification

Temperature range / sensing element

-50÷400°C **Pt100** class B
 -40÷400°C **K, J** class 2

Sheath

- material stainless steel 1.4541 /J/, 2.4816 /K/, 1.4571 /Pt/
- length L [mm]: acc. to requirements (for Pt100 min. 30 mm)
- fitting elements: nickel-plated brass and stainless steel

Dimensions:

D	M14x1,5; M12; M12x1; M12x1,5	M10 M10x1	M8x1; M8	M6
d	1; 1,5; 2; 3; 4,5; 6	1; 1,5; 2; 3; 4,5	1; 1,5; 2; 3	1; 1,5; 2

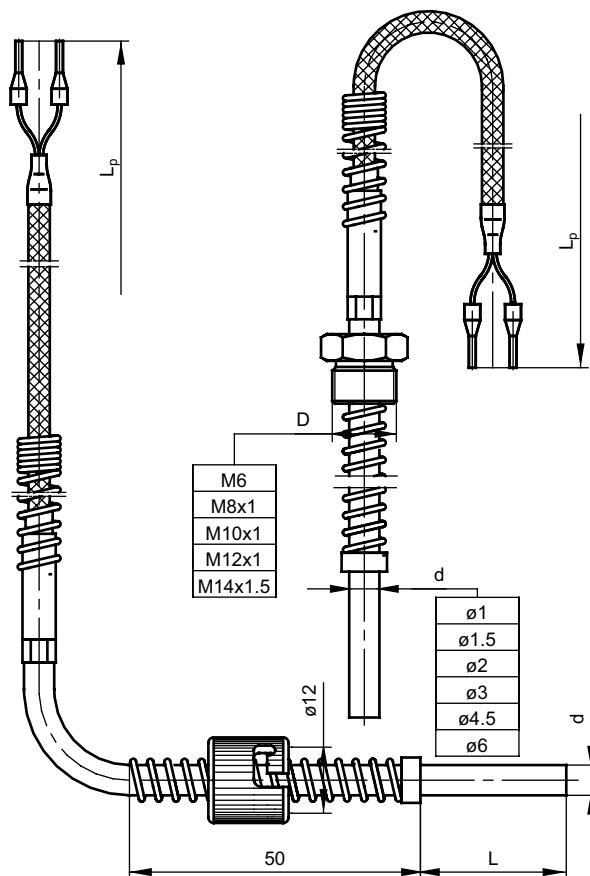
For Pt100 sheath diameter d=3 and 6 mm

Lead wire

- stranded wire 2 or 4x0,22 mm² with double fiberglass insulation, metallic overbraid
- length L_p [m]: 1,5 (standard)

Options

- hot junction type: SO, SP – p. 13
- other lead wire insulation types: silicone
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷200°C, class AA 0÷150°C; TC: class 1



Ordering code

Temperature sensor

PT		-	186		-								
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RTD Pt100: **OP** _____

Thermocouple NiCr-NiAl: **TK** _____

Thermocouple Fe-CuNi: **TJ** _____

Straight type: no designation, angular type: **K** _____

Sheath diameter x10: **30** or other* (for Pt100 only 30 and 60) _____

Length L: **acc. to requirements** _____

RTD/ thermocouple class: **A, B*/ 1, 2** _____

RTD connection: **2, 3, 4-wire** _____

Hot junction type for TC: grounded **SP** or insulated **SO** _____

Threaded connector: **M8** or other* _____

Quick disconnect without connector, inside diameter ø12 mm: **SZ12** _____

Quick disconnect with connector M12x1: **SZM12x1** or other* _____

Lead wire length L_p [m]: **1,5** or other* _____

*Other parameters acc. to requirements

Ordering example:

PTTK-186-30-30-2-SO-M8x1-2 m straight sensor with thermocouple NiCr-NiAl /K/, class 2, sheath diameter 3 mm and length 30 mm, insulated hot junction (SO), threaded connector M8x1, lead wire length L_p=2 m

PTOP-186K-30-60-B-2-SZM12x1-2 m single angular sensor with Pt100, class B, sheath diameter 3 mm and length 60 mm, with quick disconnect and connector M12x1, lead wire length L_p=2 m

Temperature Sensors for Ventilation System **TOPW-1, TOPWE-1**

Specification

Temperature range / sensing element

-50÷400°C **Pt100** class B

Sheath

- material: stainless steel 1.4541
- diameter [mm]: $\varnothing 6$
- length L [mm]: 50÷1000
- perforated sheath

Connection head

- MA, IP54 -40÷100°C

Constructional version

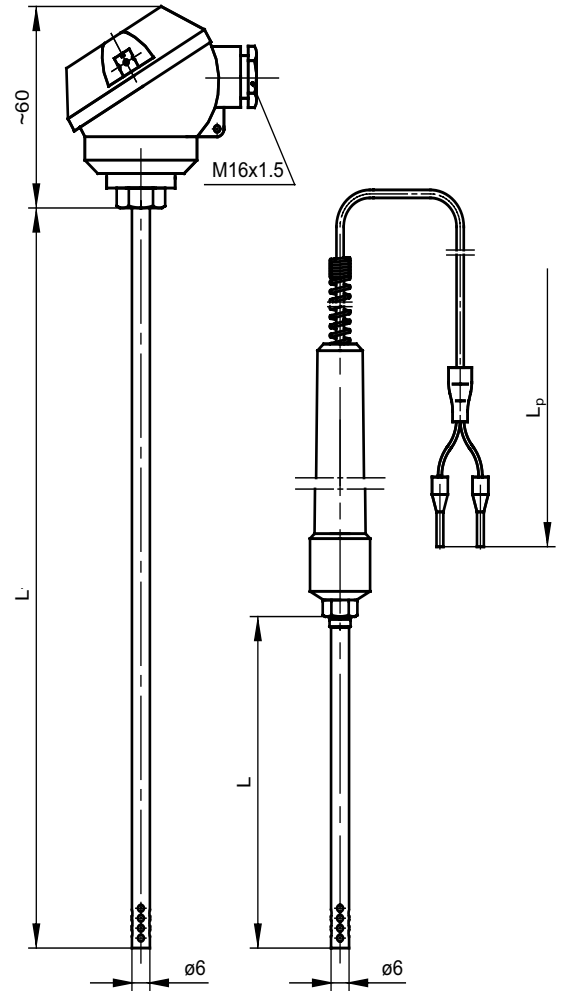
- PVC hand grip max. operating temperature 80°C
- stranded Cu wire 2 or 4x0,22 mm² with double silicone insulation
- length L_p [m]: 1,5 (standard)

Options

- with transmitter 4÷20 mA (LTT-03J)
- Pt500, Pt1000, Ni100, Ni1000
- 2-wire connection, double; 3-, 4-wire connection, single
- Pt100: class A -30÷300°C, class AA 0÷150°C

Additional equipment

- sensor mounting fittings: UG-1, UG-3, UG-8, UZK-1 – pp. 155÷156
- flat miniature plug type SMPW (2-pin) or MTO (3-pin) – p. 146



Ordering code

Temperature sensor



- Single: **no designation**
 - Double: **2**
 - With transmitter: **AP** (applies to TOPW-1, Pt100)
 - Version with connection head: **no designation**
 - Version with lead wire: **E**
 - Sheath length L [mm]: **50**, 100 or other*
 - RTD class: **A, B***
 - RTD connection: **2, 3, 4-wire**
 - Transmitter type – temperature range: **LTT03J - (0÷100)°C**
 - Lead wire length for TOPWE, L_p [m]: **1,5** or other*
- *Other parameters acc. to requirements

Ordering example:

TOPWE-1-200-A-3-2 m single RTD sensor with Pt100, class A, 3-wire connection, sheath diameter $\varnothing 6$ mm, length L=200 mm, lead wire length L_p=2 m

APT0PW-1-300-B-2-(0÷200)°C single RTD sensor with Pt100, class B, 2-wire connection, sheath diameter $\varnothing 6$ mm, length L=300 mm, head mounted transmitter 4÷20 mA

Temperature Sensors for Ventilation System **TOPK-849, TONK-849**

Specification

Temperature range / sensing element

-40÷85°C **Pt100** class B

Sheath

- material: stainless steel 1.4541
- diameter [mm]: $\varnothing 6$
- length L [mm]: 50÷1000
- perforated sheath – P, closed-end sheath – Z

Housing

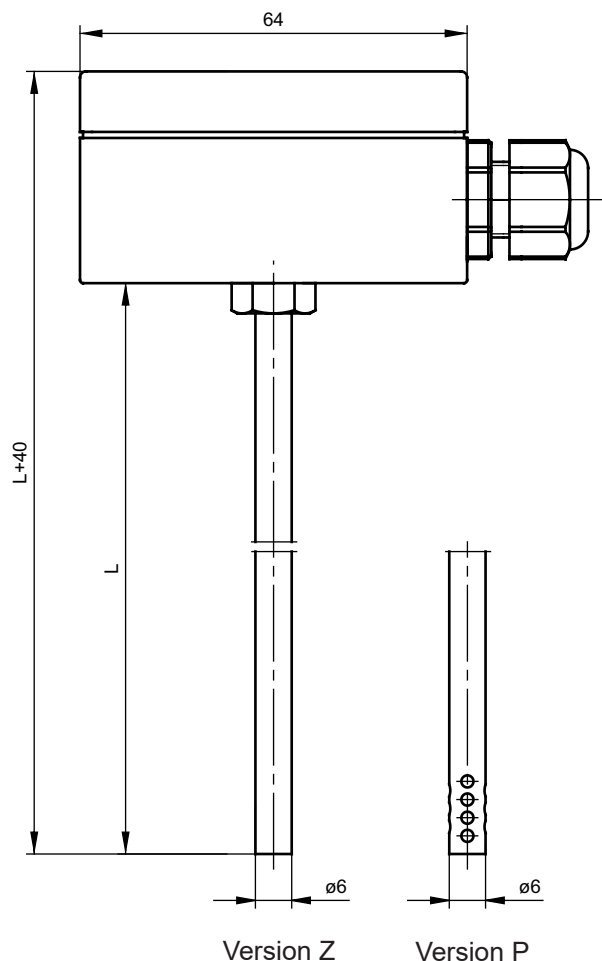
- material: polycarbonate, IP67
- humidity max. 85% RH

Options

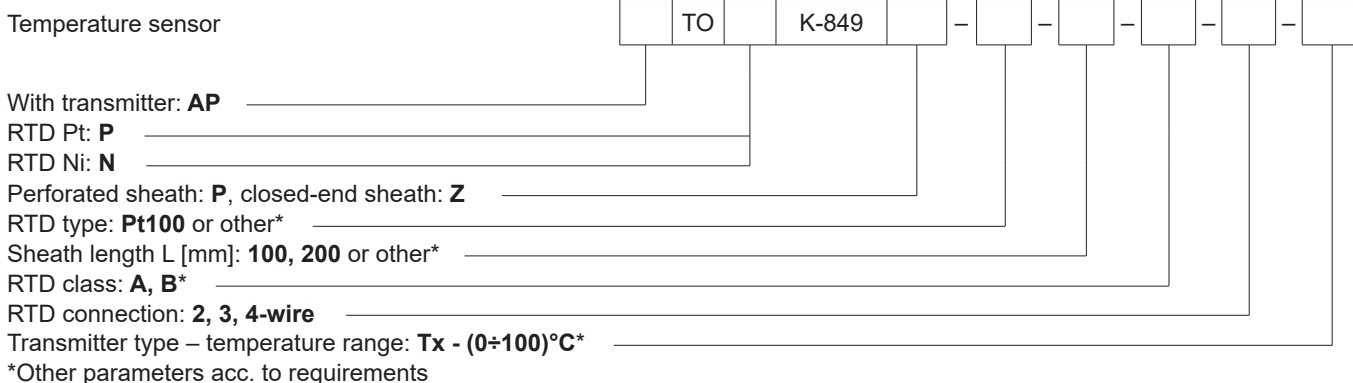
- Pt500, Pt1000, Ni100, Ni1000
- 2-, 3-, 4-wire connection
- Pt100: class A or class AA

Additional equipment

- temperature transmitter – pp. 162÷174
- sensor mounting fittings:
 UG-1, UG-3, UG-8, UZK-1 – pp. 155÷156



Ordering code



Ordering example:

TOPK-849P-Pt100-50-A-4 RTD sensor with Pt100 for measurement in ventilation channels, class A, 4-wire connection, perforated sheath

APTOK-849Z-Pt100-100-A-3-LTT03B- (0÷50)°C RTD sensor with Pt100, class A, transmitter LTT-03B, output signal 4÷20 mA, closed-end sheath, length 100 mm

Temperature Sensors for Wall Surface Measurement **TOPM-5, TONM-5**

Specification

Temperature range / sensing element

-40÷85°C **Pt100** class B

Sheath

- measuring plate
- material: aluminium
- diameter [mm]: $\varnothing 40$
- tangent surface temperature measurement
- mounting holes span 57 mm

Housing

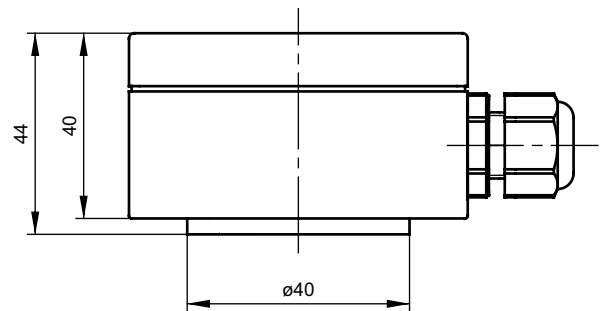
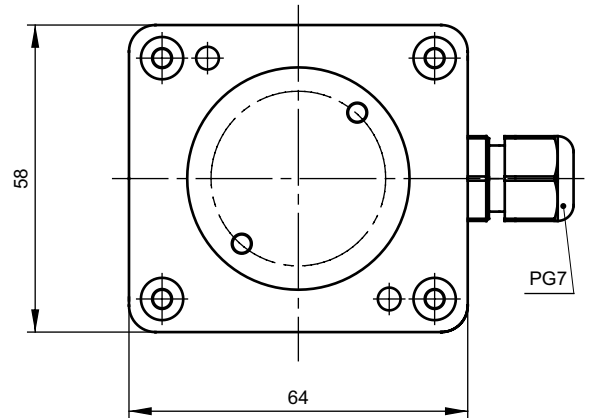
- polycarbonate, IP67

Options

- Pt500, Pt1000, Ni100, Ni1000
- 2-, 3-, 4-wire connection
- Pt100: class A or class AA

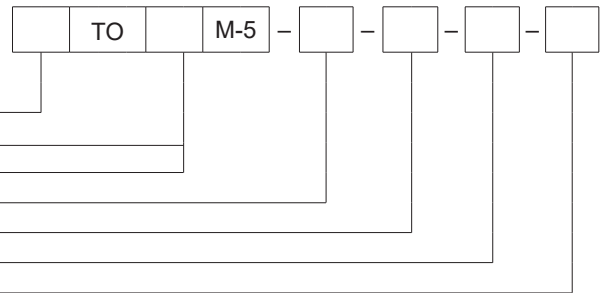
Additional equipment

- temperature transmitter – pp. 162÷174



Ordering code

Temperature sensor



- With transmitter: **AP**
 - RTD Pt: **P**
 - RTD Ni: **N**
 - RTD type: **Pt100** or other*
 - RTD class: **A, B***
 - RTD connection: **2, 3, 4-wire**
 - Transmitter type – temperature range: **Tx - (0÷100)°C***
- *Other parameters acc. to requirements

Ordering example:

TONM-5-Ni100-2 RTD sensor with Ni100, 2-wire connection

APT0PM-5-Pt100-A-3-LTT-03BU-(0÷50)°C RTD sensor with Pt100, class A, 3-wire connection, with transmitter LTT-03BU, output signal 0÷10 V

Temperature Sensors for HVAC Application **TOPO-833, TONO-833**

Specification

Temperature range / sensing element

-40÷60°C **Pt100** class B

Sheath

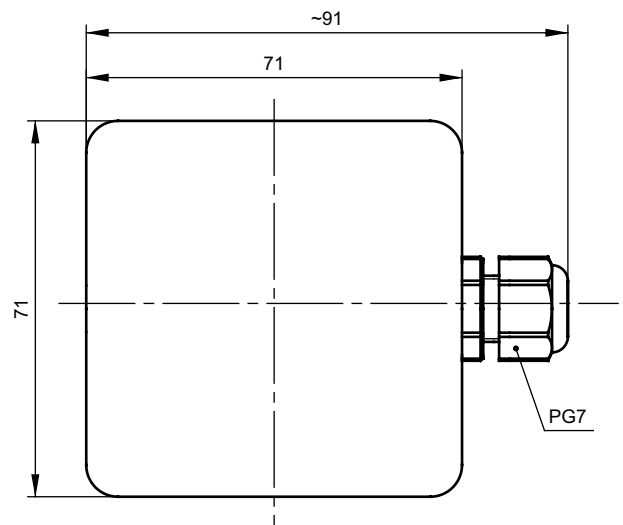
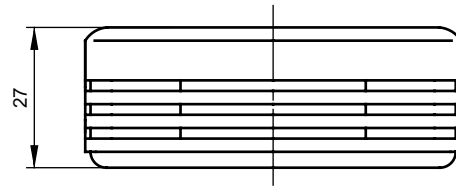
– non - unsheathed measuring resistor inside perforated housing

Housing

- material: ABS, IP-20
- humidity max. 85% RH
- mounting holes span 48 mm

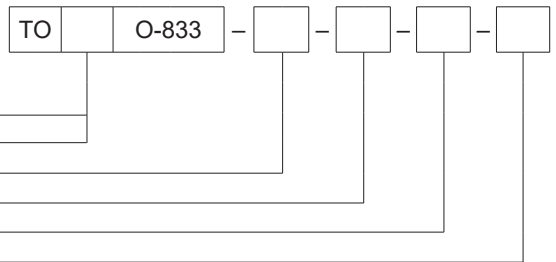
Options

- Pt500, Pt1000, Ni100, Ni1000
- 2-, 3-, 4-wire connection
- Pt100: class A or class AA
- with gland PG-7



Ordering code

Temperature sensor



RTD Pt: **P**

RTD Ni: **N**

RTD type: **Pt100** or other*

RTD class: **A, B***

RTD connection: **2, 3, 4-wire**

With gland: **P7**

*Other parameters acc. to requirements

Ordering example:

TOPO-833-Pt100-A-3 sensor with Pt100, class A, 3-wire connection, without gland

TOPO-833-Pt100-A-3-P7 sensor with Pt100, class A, 3-wire connection, with gland PG-7

Temperature Sensors for HVAC Application **TOPO-831, TONO-831**

Specification

Temperature range / sensing element

-40÷85°C **Pt100** class B

Sheath

- material: stainless steel 1.4541
- diameter [mm]: $\varnothing 6$
- perforated sheath

Housing

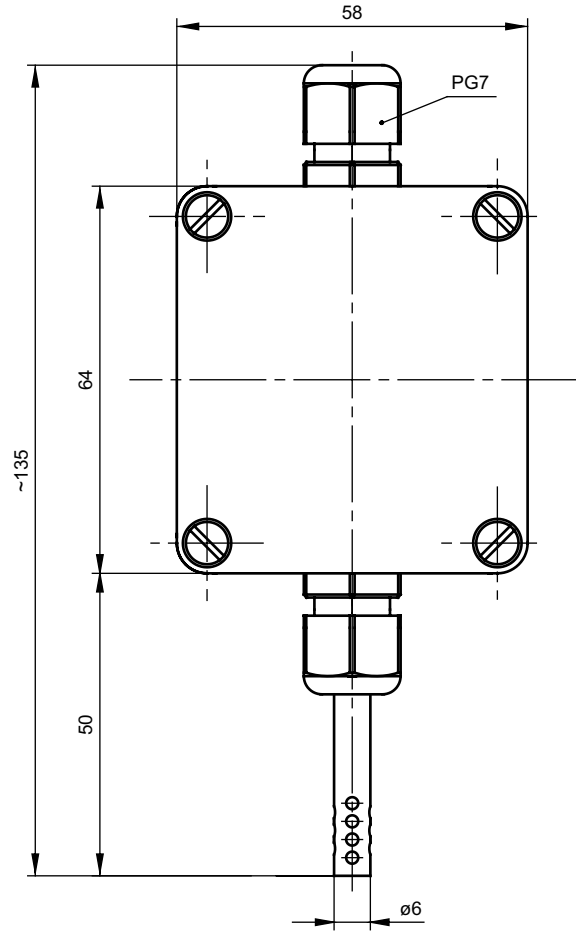
- polycarbonate, IP67
- humidity max. 85% RH
- mounting holes span 57 mm

Options

- Pt500, Pt1000, Ni100, Ni1000
- 2-, 3-, 4-wire connection
- Pt100: class A or class AA

Additional equipment

- temperature transmitters – pp. 162÷174



Ordering code

Temperature sensor



With transmitter: **AP**

RTD Pt: **P**

RTD Ni: **N**

RTD type: **Pt100** or other*

RTD class: **A, B***

RTD connection: **2, 3, 4-wire**

Transmitter type – temperature range: **Tx - (0÷100)°C***

*Other parameters acc. to requirements

Ordering example:

TOPO-831-Pt100-B-2 RTD sensor with Pt100, class B, 2-wire connection, for indoor temperature measurement

APTOPO-831-Pt100-A-3-HRF-(0÷50)°C RTD sensor with Pt100, class A, 3-wire connection, with transmitter APAQ-HRF, 4÷20 mA

Temperature Sensors for HVAC Application **TOPZ-850, TONZ-850**

Specification

Temperature range / sensing element

-40÷85°C **Pt100** class B

Sheath

- material: stainless steel 1.4541
- diameter [mm]: $\varnothing 6$
- closed-end sheath

Housing

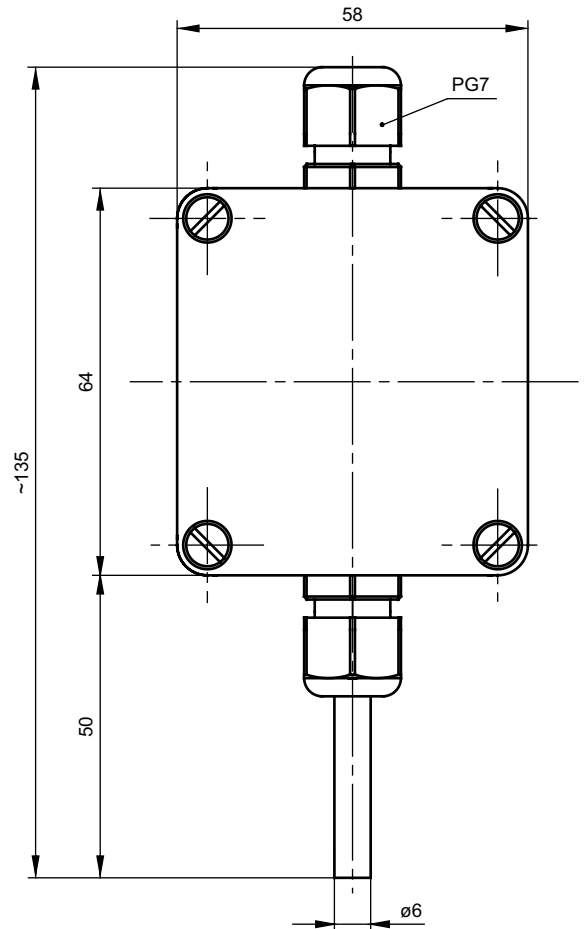
- polycarbonate, IP67
- humidity max. 85% RH
- mounting holes span 57 mm

Options

- Pt500, Pt1000, Ni100, Ni1000
- 2-, 3-, 4-wire connection
- Pt100: class A or class AA

Additional equipment

- temperature transmitters – pp. 162÷174



Ordering code

Temperature sensor



With transmitter: **AP**

RTD Pt: **P**

RTD Ni: **N**

RTD type: **Pt100** or other*

RTD class: **A, B***

RTD connection: **2, 3, 4-wire**

Transmitter type – temperature range: **Tx - (0÷100)°C***

*Other parameters acc. to requirements

Ordering example:

TOPZ-850-Pt100-A-4 RTD sensor with Pt100, class A, 4-wire connection

APTOPZ-850-Pt100-A-3-LTT03B-(0÷50)°C RTD sensor with Pt100, class A, 3-wire connection, with transmitter LTT-03B (output signal 4÷20 mA)

Temperature Sensor for Heating Systems and Heat Engineering **TOP-145**

Specification

Temperature range / sensing element

-50÷150°C **Pt100** class B

Sheath

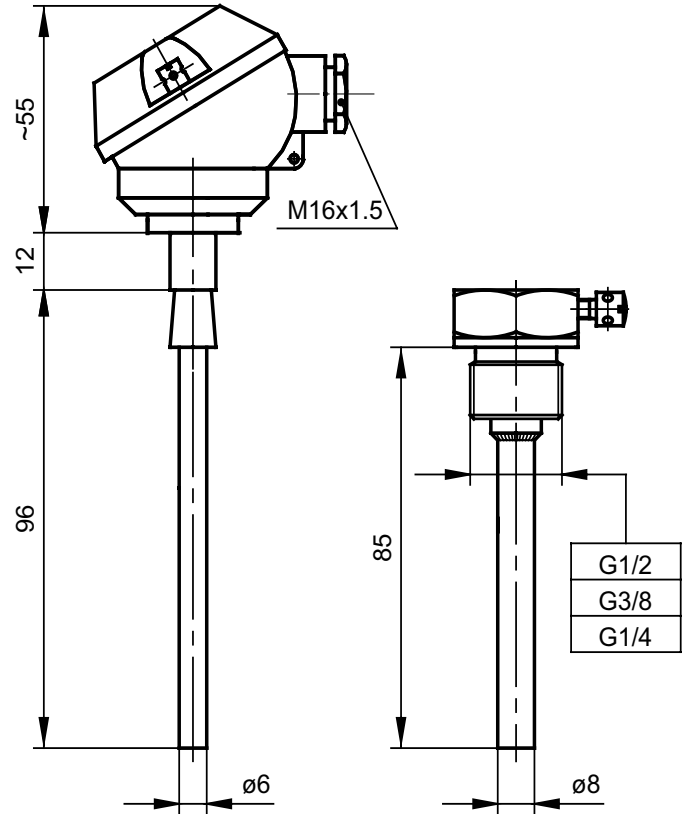
- material: stainless steel 1.4541
- length L [mm]: 85 mm

Connection head

- MA, IP54, -40÷100°C

Options

- Pt500, Pt1000, Ni100, Ni1000
- double measurement circuit, 2-wire connection
- other threads (inch and metrical) acc. to requirements
- Pt100: class A or class AA



Ordering code

Temperature sensor



Single: **no designation**

Double: **2**

RTD class: **A, B***

RTD connection: **2, 3, 4-wire**

Thread dimension: **G½; G¼; G¾** or other*

*Other parameters acc. to requirements

Ordering example:

TOP-145-A-3-G½ RTD sensor with Pt100, class A, 3-wire connection, outer thermowell with thread G½

Temperature Sensor for Heating Systems and Heat Engineering **TOP-172**

Specification

Temperature range / sensing element

-50÷180°C **Pt100, Pt500** class B
 0÷150°C temperature range for sensor pair
 3÷150°C range of temperature difference

Sheath

– sheath material brass $\varnothing 5,8$ mm, L=48 mm

Constructional version

– sensor pair Pt100 and Pt500 with Central Office of Measures (GUM) approval type **PTL05304**

Lead wire

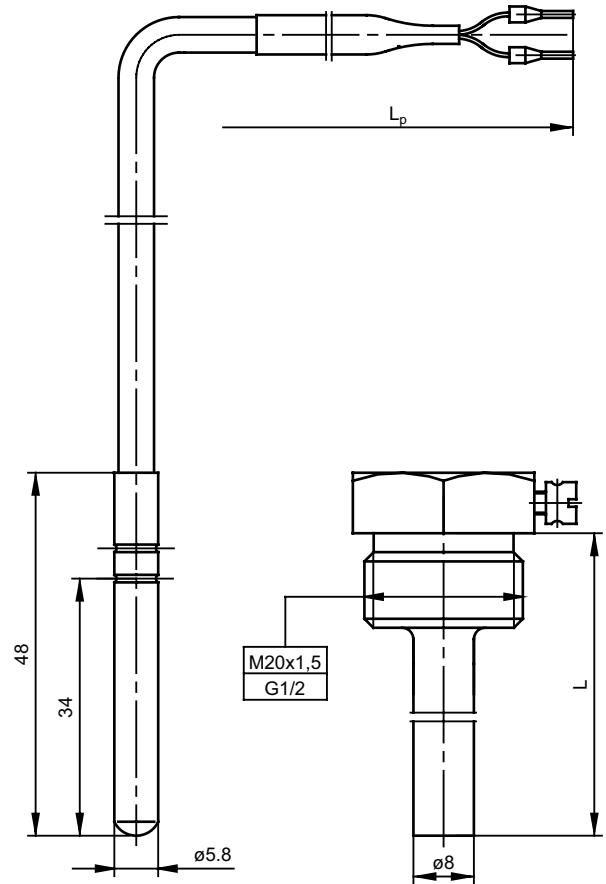
– stranded Cu wire 2x0,25 mm² with double silicone insulation
 – length: 3 m (standard) or other for sensor pair: Pt100 1,5-3 m at 0,5 m intervals; Pt500 1,5 m-15 m at 0,5 m intervals

Options

– Ni100, Ni1000, Pt1000
 – 3-, 4-wire connection, stranded Cu wire 3, 4x0,22 mm²
 – Pt100: class A -30÷180°C, class AA 0÷150°C

Additional equipment

– outer thermowell for sensor mounting in pipelines
 – material: stainless steel 1.4541, length L [mm]: 30÷125 at 5 mm intervals



Ordering code

Temperature sensor



RTD type: **Pt100** or other*

RTD class: **A, B*** (inapplicable to sensor pair) / RTD connection: **2, 3, 4-wire**

Lead wire length L_p [m]: **3** or other*

Additional equipment – thermowell OG; length L [mm]: **30÷125**

Thread dimension of thermowell OG: **M20x1,5; G½** or other*

Paired sensors: **pair**

*Other parameters acc. to requirements

Ordering example:

TOP-172-Pt100-A-3-3 m RTD sensor with Pt100, class A, 3-wire connection, lead wire length $L_p=3$ m

TOP-172-Pt500-15 m-65-G½-pair RTD paired sensors with Pt500, outer thermowell OG length L=65 mm, threaded fitting G½, lead wire length $L_p=15$ m

Temperature Sensor for Heating Systems and Heat Engineering **TOP-216**

Specification

Temperature range / sensing element

- 50÷200°C **Pt100, Pt500, Pt1000** class B
- 0÷150°C temperature range for sensor pair
- 3÷150°C range of temperature difference

Thermowell

- material: stainless steel 1.4541
- diameter: d=6 mm for TOP 216A; d=8 mm for TOP 216B
- thermowell length 70÷700 at 5 mm intervals for sensor pair
- extension length D 50÷200 mm
- minimum immersion length 70 mm

Constructional version

- sensor pair Pt100 and Pt500 and Pt1000 with Central Office of Measures (GUM) approval type **RPT 0337**

Connection head

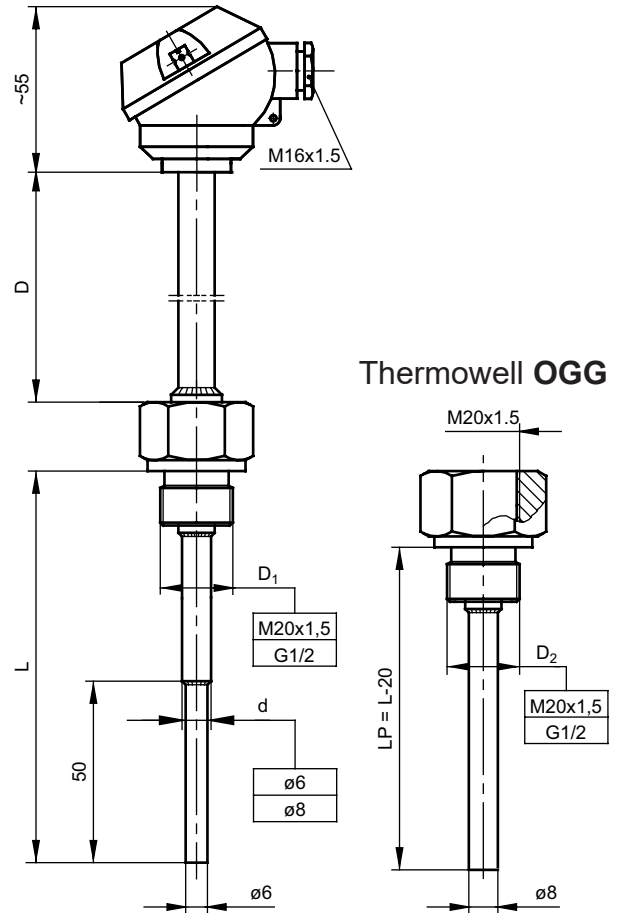
- MA, IP54 -40÷100°C

Options

- Ni100, Ni1000
- double measurement circuit, 2-wire connection
- other threads (inch and metrical)
- Pt100: class A -30÷200°C, class AA 0÷150°C

Additional equipment

- additional outer thermowell OGG for variant A
- material: stainless steel 1.4541, length L_p [mm]: L - 20



Ordering code

Temperature sensor TOP-216 - - - - - - - - - -

Thermowell 6 mm: **A** _____

Strengthen thermowell ø8/6 mm: **B** _____

Without extension D = 0: **no designation** _____

With extension (D), extension length [mm]: **50÷200** _____

Length L (or L_p – with OGG thermowell): **70÷700** _____

Thread dimension D1: **M20x1,5; G½** (M20x1,5 for version OGG) _____

RTD type: **Pt100** or other* _____

RTD class: **A, B*** (inapplicable to sensor pair) _____

RTD connection: **2, 3, 4-wire** _____

Additional equipment (only for variant A): thermowell **OGG**/ thread dimension **D₂** (M20x1,5) or other* _____

Paired sensors: pair _____

*Other parameters acc. to requirements

Ordering example: **TOP-216-A-D50-400-M20x1,5-Pt100-4-OGG/M20x1,5-pair** RTD paired sensors with Pt100, 4-wire connection, with extension D=50 mm, additional outer thermowell OGG length L_p=400 mm, threaded fitting M20x1,5

Temperature Sensor for Heating Systems and Heat Engineering **TOP-226**

Specification

Temperature range / sensing element

- 50÷180°C **Pt100, Pt500, Pt1000** class B
- 0÷150°C temperature range for sensor pair
- 3÷150°C range of temperature difference

Sheath

- material: stainless steel 1.4541
- stepped outer sheath: $\varnothing 8$ mm / 10 mm for $L > 100$ mm
- straight sheath $\varnothing 8$ mm for $L \leq 100$ mm
- sheath length 70÷700 at 5 mm intervals for sensor pair
- minimum immersion length 70 mm

Constructional version

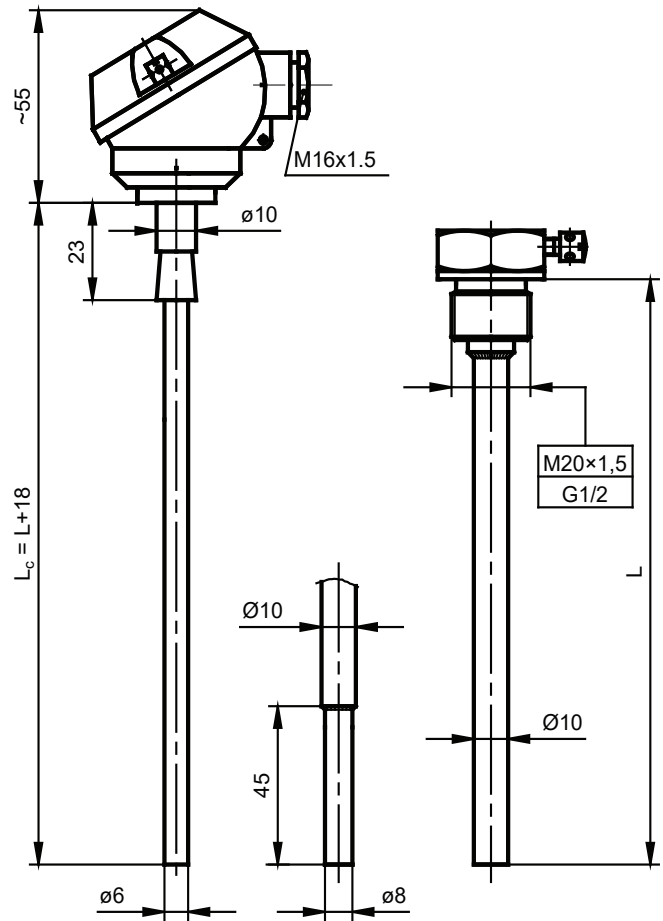
- sensor pair Pt100 and Pt500 and Pt1000 with Central Office of Measures (GUM) approval type **RPT 0338**

Connection head

- MA, IP54 -40÷100°C

Options

- Ni100, Ni1000
- double measurement circuit, 2-wire connection
- other threads (inch and metrical)
- sensor without outer thermowell OG, $L_c = L + 20$ mm
- Pt100: class A -30÷180°C, class AA 0÷150°C



Ordering code

Temperature sensor



Outer sheath length L [mm]: **70÷700**

Thread dimension D_1 : **M20x1,5; G1/2** or other*

RTD type: **Pt100** or other*

RTD class: **A, B*** (inapplicable to sensor pair)

RTD connection: **2, 3, 4-wire**

Paired sensors: **pair**

*Other parameters acc. to requirements

Ordering example:

TOP-226-250-G1/2-Pt100-2-pair RTD sensor pair with Pt100, 2-wire connection, sheath length L=250 mm, threaded fitting G1/2

Temperature Sensor for Heating Systems and Heat Engineering **TOP-231**

Specification

Temperature range / sensing element

-50÷180°C **Pt100** class B

Sheat

– sheath material: brass $\varnothing 5,2$ mm, L=55 mm

Lead wire

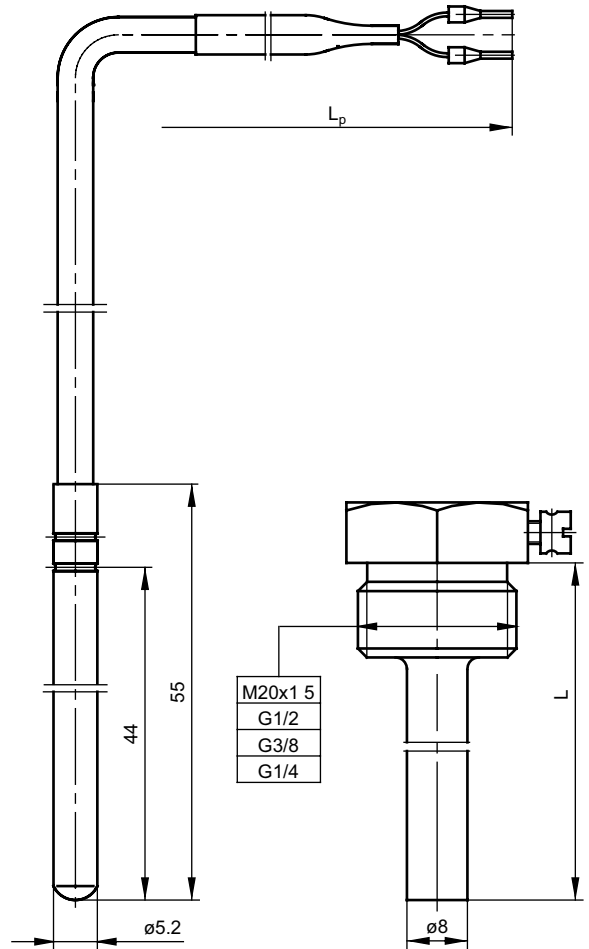
– stranded Cu wire 2x0,22 mm² with double silicone insulation
 – length L_p [m]: 1,5 m (standard) or other*

Options

– Pt100, Pt500, Pt1000, Ni100, Ni1000
 – 3-, 4-wire connection, stranded Cu wire 3, 4x0,22 mm²
 – Pt100: class A -30÷180°C, class AA 0÷150°C

Additional equipment

– outer thermowell for sensor mounting in pipelines
 – material: stainless steel 1.4541, length L [mm]: 50, 70, 100, 120 or other*



Ordering code

Temperature sensor



Thin-film RTD type: **Pt100** or other*

RTD class: **A, B***

RTD connection: **2, 3, 4-wire**

Lead wire length L_p [m]: **1,5** or other*

Additional equipment: thermowell OG; length L [mm]: **100**

Thread dimension of thermowell OG: **G½; G¼; G¾; M20x1,5**

*Other parameters acc. to requirements

Ordering example:

TOP-231-Pt100-A-4-3 m-70-G½ RTD sensor with Pt100, class A, 4-wire connection, thermowell OG diameter $\varnothing 8$ mm, length L=70 mm, threaded fitting G½, lead wire length L_p=3 m

TOP-231-Pt500-B-4-15 m RTD sensor with Pt500, class B, 4-wire connection, without outer thermowell OG, lead wire length L_p=15 m

Temperature Sensor for Heating Systems and Heat Engineering **TOPE-L0384**

Specification

Temperature range / sensing element

- 50÷180°C **Pt100, Pt500** class B
- 0÷150°C temperature range for sensor pair
- 3÷150°C range of temperature difference

Sheath

- material stainless steel 1.4541
- with narrowing
- mounting in special seats of a valve, tees

Constructional version

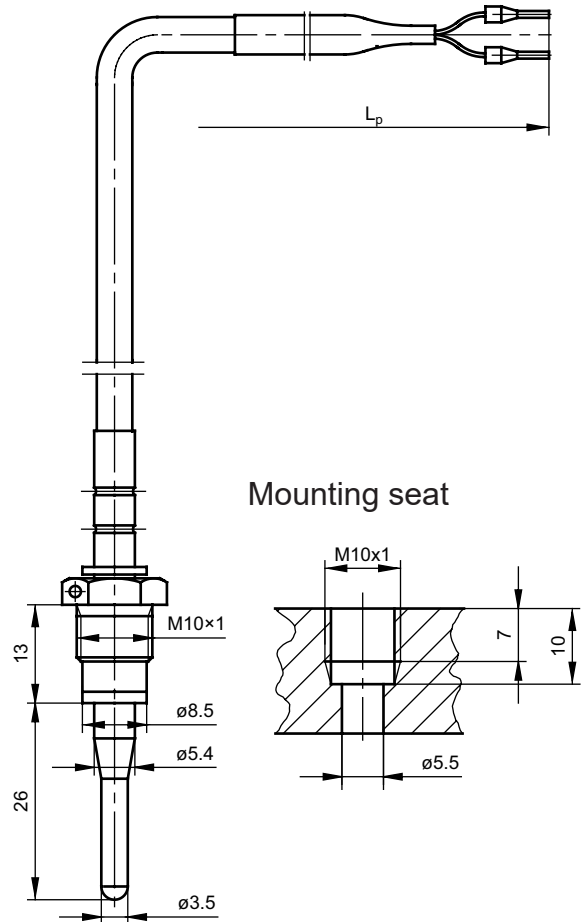
- sensor pair Pt100 and Pt500 with Central Office of Measures approval type **PTL 05305**

Lead wire

- stranded Cu wire 2x0,25 mm² with double silicone insulation
- length L_p [m]: 3 (standard) for sensor pair: Pt100 1,5-3 m at 0,5 m intervals; Pt500 1,5 m-15 m at 0,5 m intervals

Options

- Ni100, Ni1000, Pt1000
- 3-, 4-wire connection, stranded Cu wire 3, 4x0,22 mm²
- Pt100: class A -30÷180°C, class AA 0÷150°C



Ordering code

Temperature sensor

TOPE-L0384 - - - - -

RTD Pt type: **Pt100** or other* _____

RTD class: **A, B*** (inapplicable to sensor pair) _____

RTD connection: **2, 3, 4-wire** (inapplicable to sensor pair) _____

Lead wire length L_p [m]: **3** or other* _____

Paired sensors: **pair** _____

*Other parameters acc. to requirements

Ordering example:

TOPE-L0384-Pt500-A-3-2 m RTD sensor with Pt500, class A, 3-wire connection, lead wire length L_p=2 m

TOPE-L0384-Pt100-3 m-pair RTD sensor pair with Pt100, lead wire length L_p=3 m

Temperature Sensor for Food Industry **TOPE-413**

Specification

Temperature range / sensing element

-50÷200°C **Pt100** class B

Sheath

- material stainless steel 1.4541
- pointed tip suitable for temperature measurement of loose materials and plastic
- sheath length L [mm]: 50÷1000 (standard 100 mm)

Constructional version

- steel or teflon hand grip
- suitable for food industry
- National Institute of Hygiene (PZH) attestation

Lead wire

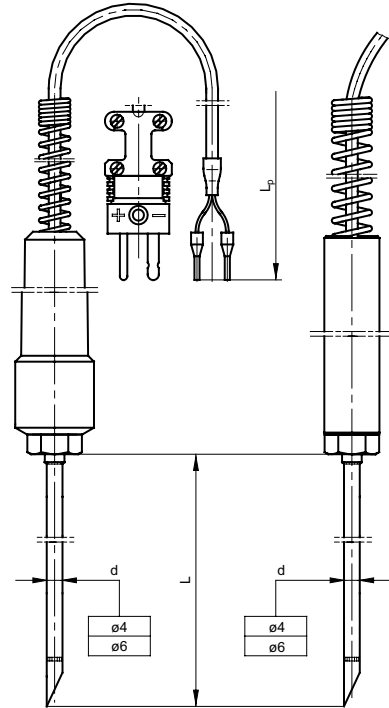
- stranded Cu wire 2 or 4x0,22 mm² with double silicone insulation
- length L_p [m]: 1,5 m (standard)

Options

- Pt100, Pt500, Pt1000, Ni100, Ni1000
- Pt100: class A -30÷200°C, class AA 0÷150°C
- other lead wire insulation type: PVC, teflon, armour

Additional equipment

- miniature plug SMPW – p. 14



J

Ordering code

Temperature sensor



- Steel hand grip: **M**
 - Teflon hand grip: **T**
 - RTD type: **Pt100** or other*
 - Sheath diameter d [mm]: **4, 6**
 - Sheath length L [mm]: **100** or other*
 - RTD class: **A, B***
 - RTD connection: **2, 3, 4-wire**
 - Lead wire length L_p [m]: **1,5** or other*
 - Additional equipment - mini plug: **W**
- *Other parameters acc. to requirements

Ordering example:

TOPE-413-M-Pt100-4-200-B-2-2 m-W RTD sensor with Pt100, class B, 2-wire connection, sheath diameter 4 mm, sheath length L=200 mm, steel hand grip, silicone insulated lead wire length L_p=2 m, with mini plug

Temperature Sensor for Food Industry **TOPE-414**

Specification

Temperature range / sensing element

-50÷200°C **Pt100** class B

Sheath

- material stainless steel 1.4541
- sheath length L [mm]: 50÷1000 (standard 100 mm)
- pointed tip suitable for temperature measurement of loose materials and plastic

Constructional version

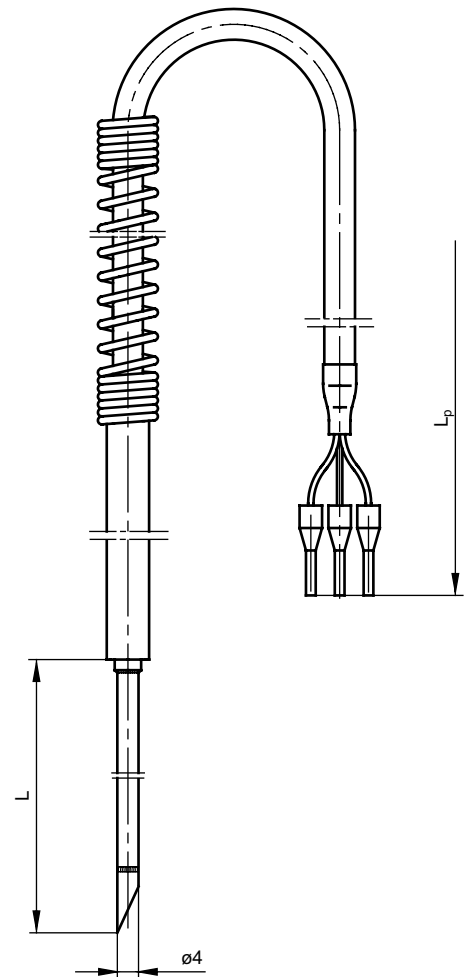
- stainless steel hand grip
- suitable for food industry
- National Institute of Hygiene (PZH) attestation

Lead wire

- stranded Cu wire 3x0,25 mm² with double silicone insulation and inside metallic overbraid
- length L_p [m]: 1,5 m (standard) or other*

Options

- Pt100, Pt500, Pt1000, Ni100, Ni1000
- Pt100: class A -30÷200°C, class AA 0÷150°C
- double execution, stranded Cu wire 6x0,22 mm²



Ordering code

Temperature sensor



RTD type: **Pt100** or other*

RTD class: **A, B***

Sheath length L [mm]: **100** or other*

Lead wire length L_p [m]: **1,5** or other*

*Other parameters acc. to requirements

Ordering example:

TOPE-414-Pt100-200-A-2 m RTD sensor with Pt100, class A, 3-wire connection, sheath length L=200 mm, lead wire length L_p=2 m

Temperature Sensor for Food Industry **TOPT-287**

Specification

Temperature range / sensing element

-40÷200°C **Pt100** class B

Thermowell

- material: stainless steel 1.4541
- process connection flange Clamp acc. to PN-ISO2852
- length L [mm]: 30÷1000

Process connection dimension	Connection head type	Diameter	
		D	d
1"	MBEG, MAA	10	6
1 1/2"	MBEG, MAA	10	8
2"	BEG, BA	12	9
3"	BEG, BA	12	11

Constructional version

- National Institute of Hygiene (PZH) attestation

Connection head

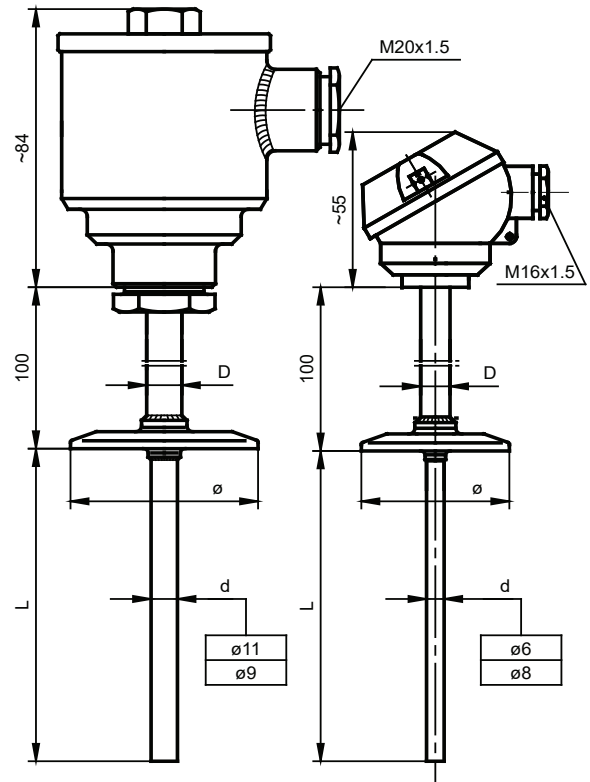
- MAA, BA; IP 54 -40÷100°C
- MBEG, BEG – material: stainless steel 1.4541, IP65 -40÷100°C

Options

- Ni100, Ni1000, Pt1000
- Pt100: class A -30÷200°C, class AA 0÷150°C

Additional equipment

- temperature transmitters – pp. 162÷174



DN	ø mm
1" i 1 1/2"	50,5
2"	64
3"	91

J

Ordering code

Temperature sensor



Single: **no designation**

Double: **2**

With transmitter: **AP**

Process connection dimension: **1, 1 1/2, 2, 3**

Connection head type: **MAA, BA, MBEG, BEG**

Sheath length L [mm]: **50, 100, 200, 300** or other*

Sheath diameter d [mm]: **6, 8, 9, 11**

RTD type: **Pt100** or other*

RTD class: **A, B***

RTD connection: **2, 3, 4-wire**

Temperature range of transmitter: **lower and upper temperature**

*Other parameters acc. to requirements

Ordering example:

TOPT-287-2-B-300-9-Pt100-A-3 RTD sensor with Pt100, class A, 3-wire connection, sheath length L=300 mm, sheath diameter 9 mm, connection head type BA and flange clamp 2"

APTOPT-287-3-BEG-400-11-Pt100-A-4-(0÷200)°C RTD sensor with Pt100, class A, 4-wire connection, thermowell length L=400 mm, thermowell diameter 11 mm, stainless steel connection head type BEG and flange Clamp 3", temperature transmitter 4÷20 mA

Temperature Sensor for Food Industry **TOPGNS, TTJGNS, TTKGNS**

Specification

Temperature range / sensing element

-200÷400°C **Pt100** class B
 -40÷400°C **J, K** class 2

Thermowell

- material: stainless steel 1.4541
- length L [mm]: 30÷1000

Constructional version

- National Institute of Hygiene (PZH) attestation
- insulated hot junction for J, K

Connection head

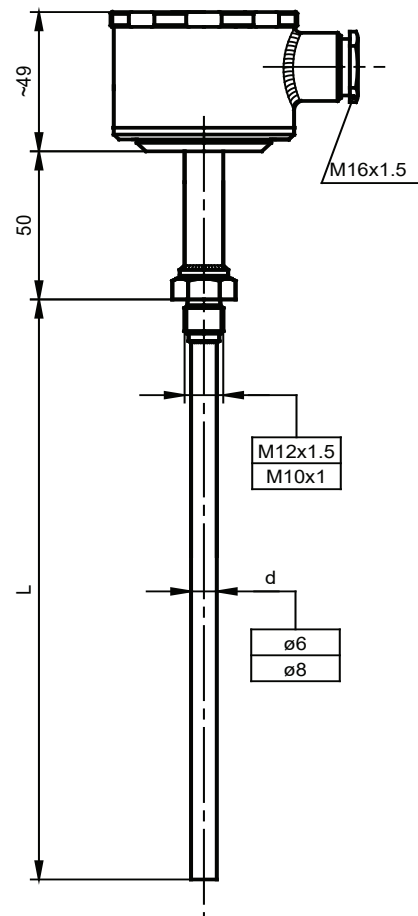
- MBEG – material: stainless steel 1.4541, IP65 -40÷100°C

Options

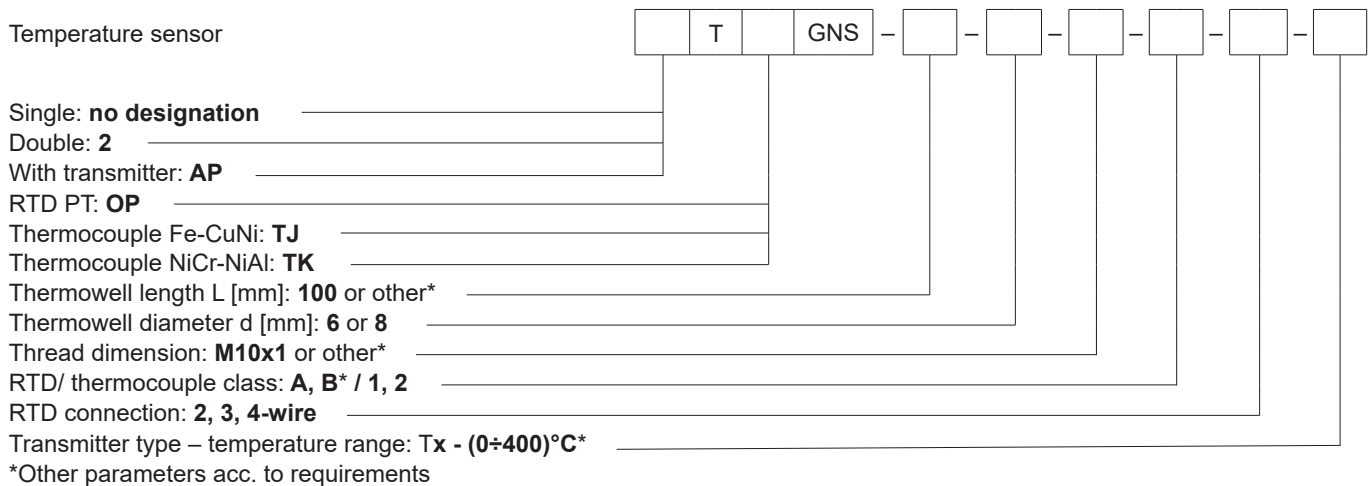
- Ni100, Ni1000, Pt1000
- Pt100: class A -30÷300°C, class AA 0÷150°C; TC: class 1
- other threads (inch and metrical) acc. to requirements

Additional equipment

- temperature transmitters – pp. 162÷174



Ordering code



Ordering example:

TOPGNS-200-6-M10x1-A-3 RTD sensor with Pt100, class A, 3-wire connection, thermowell diameter ø6 mm, thermowell length L=500 mm, with threaded fitting M10x1

TTJGNS-500-8-M20x1,5-2 sensor with thermocouple Fe-CuNi /J/, class 2, thermowell diameter ø8 mm, thermowell length L=500 mm, with threaded fitting M20x1,5

Temperature Sensor for Food Industry **TOPA-1**

Specification

Temperature range / sensing element

-50÷150°C **Pt100** class B

Sheath

- material: stainless steel 1.4541
- diameter [mm]: $\varnothing 3$
- length L [mm]: 50 (standard)
- thread M5

Constructional version

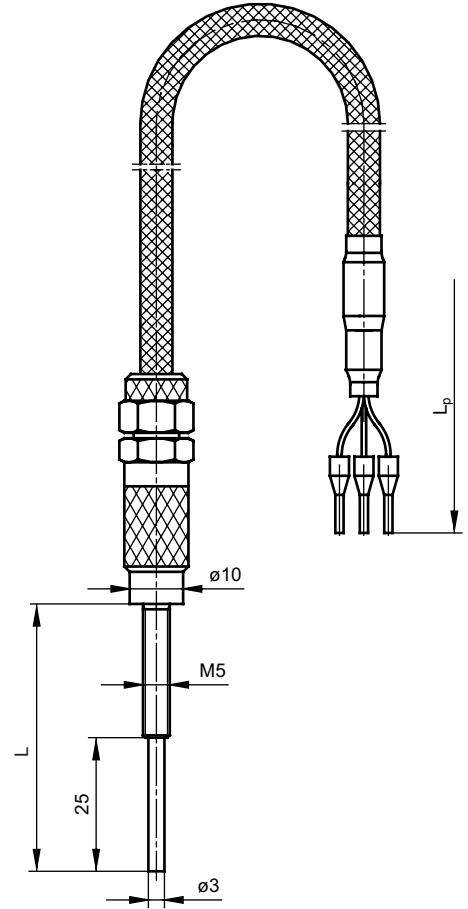
- temperature measurement in autoclaves
- National Institute of Hygiene (PZH) attestation

Lead wire

- stranded Cu wire 3x0,25 mm² teflon insulated with shield
- length L_p [m]: 3 m (standard)

Options

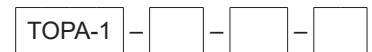
- Ni100, Ni1000, Pt1000
- Pt100: class A, class AA 0÷150°C



J

Ordering code

Temperature sensor



Sheath length L [mm]: **50** or other* _____

RTD class: **A, B*** _____

Lead wire length L_p [m]: **3** or other* _____

*Other parameters acc. to requirements

Ordering example:

TOPA-1-50-A-3 m RTD sensor with Pt100, class A, 3-wire connection, sheath length L=50 mm, lead wire length L_p=3 m

Temperature Sensors for Aggressive Environments **TTSC-42, TTRC-42, TTBC-42**

Specification

Temperature range / sensing element

0÷1600°C **R, S** class 2
 600÷1700°C **B** class 3

Sheath

- holding tube stainless steel 1.4541
- ceramic protection tube monocrystal Al₂O₃ 99,99%
- diameter d [mm]: 5, 6, 8, 10 (standard 10 mm)

Sheath diameter d [mm]	Holding tube diameter d _n [mm]	Max. length L _{max} [mm]	Platinum wire diameter [mm]
ø5	ø12	500	ø0,35
ø6	ø12	500	ø0,35
ø8	ø12	1000	ø0,35 or 0,5
ø10	ø15	1400	ø0,35 or 0,5

Connection head

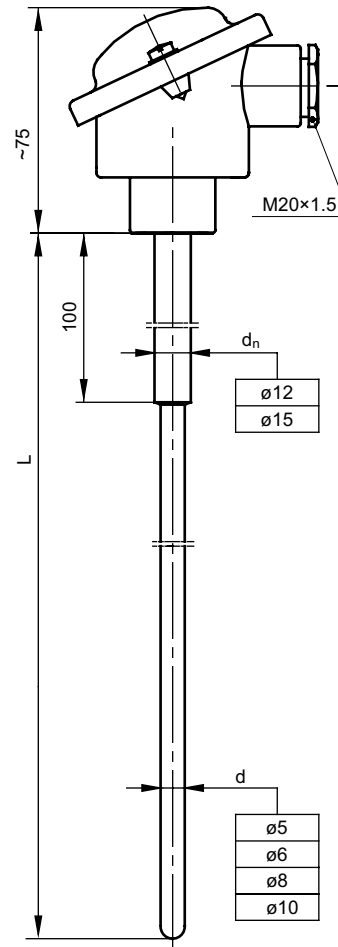
- B, IP54, -40÷100°C

Options

- thermocouple R, S class 1; B class 2

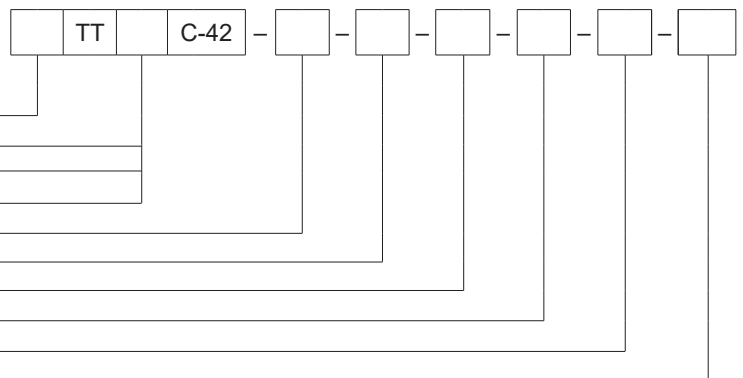
Additional equipment

- temperature transmitters – pp. 162÷174
- sensor mouting fittings: UG1-12, UG1-15 – p. 155
- compensation cables – p. 145



Ordering code

Temperature sensor



- With transmitter: **AP** _____
- Thermocouple PtRh10-Pt: **S** _____
- Thermocouple PtRh13-Pt: **R** _____
- Thermocouple PtRh30-PtRh6: **B** _____
- Sheath diameter d [mm]: **5, 6, 8, 10** _____
- Ceramic sheath material: **SAP** _____
- Sheath length L [mm]: **500** or other* _____
- Thermocouple class: **1, 2** for **S, R**; **2, 3** for **B** _____
- Platinum wire diameter: **0,35** or **0,5** _____
- Transmitter type – temperature range: **Tx-(0÷1200)°C*** _____
- *Other parameters acc. to requirements

Ordering example:

TTSC-42-8-SAP-300-1-0,35 single sensor with thermocouple PtRh10-Pt /S/, class 1, platinum wire diameter ø0,35 mm, ceramic sheath SAP diamter ø8 mm, length L=300 mm

APTTBC-42-10-SAP-500-2-0,5-Tx-(600÷1600)°C single sensor with thermocouple PtRh30-PtRh6 /B/, class 2, platinum wire diameter ø0,5 mm, ceramic sheath SAP diamtereø10 mm, length L=500 mm, with transmitter 4÷20 mA

Temperature Sensors for Aggressive Environments **TTJC-38, TTKC-38**

Specification

Temperature range / sensing element

0÷700°C **J** class 2
 0÷1200°C **K** class 2

Sheath

- material: ceramic SILIT SK
- diameter d [mm]: 25
- length L [mm]: 300, 500, 700, 900, 1100
- length L₁ [mm]: L+150 (standard)
- length L₂ [mm]: 200÷1000
- fitting assembly and extension pipe: stainless steel 1.4541

Connection head

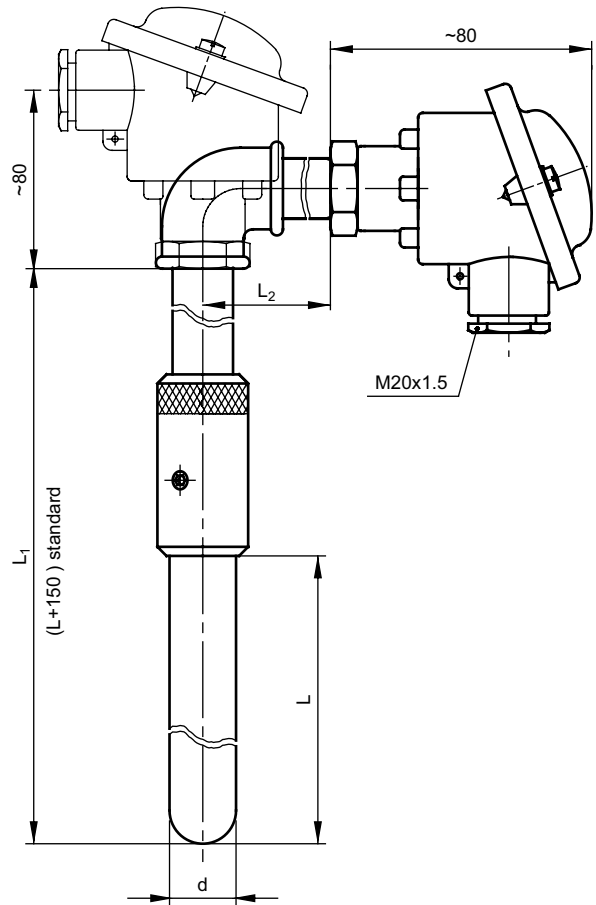
- B, IP54, -40÷100°C

Options

- thermocouple J, K class 1

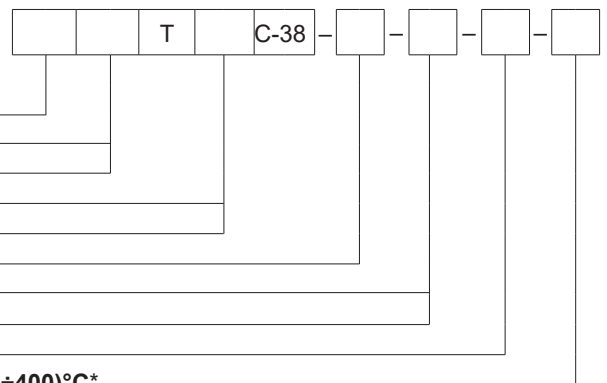
Additional equipment

- temperature transmitters – pp. 162÷174
- compensation cables – p. 145



Ordering code

Temperature sensor



- With transmitter: **AP**
- Single: **T**
- Double: **2T**
- Thermocouple NiCr-NiAl: **K**
- Thermocouple Fe-CuNi: **J**
- Sensor type: angular – **K**, straight – **P**
- Immersion length L/L₁ [mm]: **300/450** or other*
- Extension length L₂: **500** or other* (for angular version)
- Thermocouple class: **1, 2**
- Transmitter type – temperature range for output signal 4÷20mA: **Tx-(0÷400)°C***

*Other parameters acc. to requirements

Ordering example:

APTTJC-38-K-500/650-200-2-Tx-(0÷1000)°C sensor with thermocouple Fe-CuNi /J/, class 2, angular type (K), immersion length L=500 mm, standard extension and horizontal pipe 200 mm (500/650-200), with transmitter (AP) type Tx for temperature range (0÷1000)°C

Temperature Sensors for Aggressive Environments **TOPCV-1, TOPCVE-1**

Specification

Temperature range / sensing element

0÷100°C **Pt100** class B

Sheath

- material: stainless steel 1.4541 shielded with heat-resistant PVC
- length L [mm]: 200÷2000

Connection head for TOPCV-1

- NS, IP54, -30÷130°C

Lead wire for TOPCVE-1

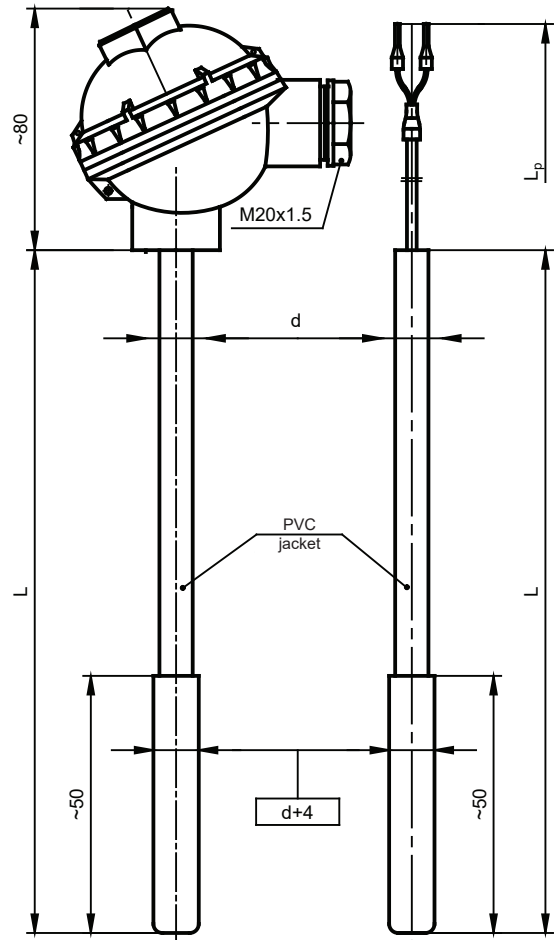
- stranded Cu wire 2 or 4x0,22 mm² with double teflon insulation
- length L_p [mm]: 1,5 (standard)

Options

- Pt500, Pt1000, Ni100, Ni1000
- Pt100: class AA 0÷100°C

Additional equipment

- temperature transmitters – pp. 162÷174



Ordering code

Temperature sensor



- Single: **no designation**
 - Double: **2**
 - With transmitter: **AP**
 - With connection head: **no designation**
 - With lead wire: **E**
 - Sheath length L [mm]: **500** or other*
 - Sheath diameter d [mm]: **9, 11**
 - RTD class: **A, B***
 - RTD connection: **2, 3, 4-wire**
 - Lead wire length (for TOPCVE) L_p [m]: **1,5** or other*
- *Other parameters acc. to requirements

Ordering example:

TOPCV-1-200-9-B-2 single RTD sensor with Pt100, class B, 2-wire connection, sheath diameter ø9 mm, sheath length L=200 mm

TOPCVE-1-500-11-A-3-2 single RTD sensor with Pt100, class A, 3-wire connection, sheath diameter ø11 mm, sheath length L=500 mm, lead wire length L_p=2 m

Temperature Sensors for Aggressive Environments **TOPSZ-157, TOPSZE-157**

Specification

Temperature range / sensing element

0÷500°C **Pt100** class B with connection head
 0÷180°C **Pt100** class B with lead wire

Sheath

- borosilicate glass SIMAX [mm]: $\varnothing 15$ or $\varnothing 10$
- length L [mm]: 300÷680 for sheath $\varnothing 15$
 300÷480 for sheath $\varnothing 10$
- length L_1 [mm]: 300÷700 for $\varnothing 15$
 300÷500 for $\varnothing 10$
- holding tube [mm]: teflon $\varnothing 15, 22$

Connection head for TOPSZ-157

- NS, IP54, -30÷130°C

Lead wire for TOPSZE-157

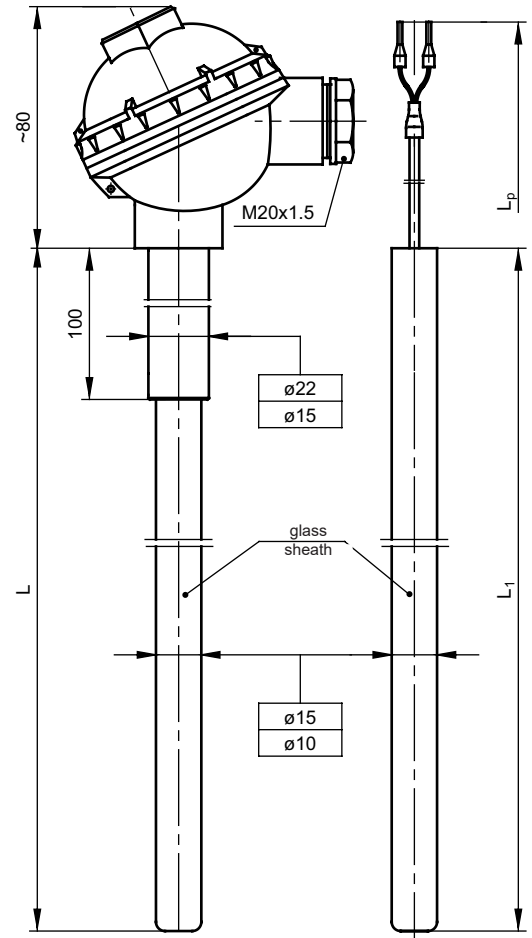
- stranded Cu wire 2 or 4x0,22 mm² with double teflon insulation
- length L_p [m]: 1,5 (standard) or other

Options

- Pt500, Pt1000, Ni100, Ni1000
- Pt100: class A -50÷450°C, class AA -50÷250°C

Additional equipment

- temperature transmitters – pp. 162÷174



Ordering code

Temperature sensor



- Single: **no designation**
 - Double: **2**
 - With transmitter: **AP**
 - With connection head: **no designation**
 - With lead wire: **E**
 - Sheath length L or L_1 [mm]: **300** or other*
 - Sheath diameter d [mm]: **10, 15**
 - RTD class: **A, B***
 - RTD connection: **2, 3, 4-wire**
 - Lead wire length (for TOPSZE) L_p [m]: **1,5** or other*
- *Other parameters acc. to requirements

Ordering example:

TOPSZ-157-480-15-A-3 RTD head sensor Pt100, class A, 3-wire connection, sheath diameter $\varnothing 15$ mm, sheath length L=480 mm

TOPSZE-157-300-10-B-2-1,5 m RTD sensor with Pt100, class B, 2-wire connection, sheath diameter $\varnothing 10$ mm, sheath length $L_1=300$ mm, lead wire length $L_p=1,5$ m

Temperature Sensors for Aggressive Environments **TOPE-142**

Specification

Temperature range / sensing element

-50÷250°C **Pt100** class B

Sheath

- sheath and hand grip material: teflon
- diameter [mm]: $\varnothing 6/\varnothing 10$
- length L [mm]: max. 115

Lead wire

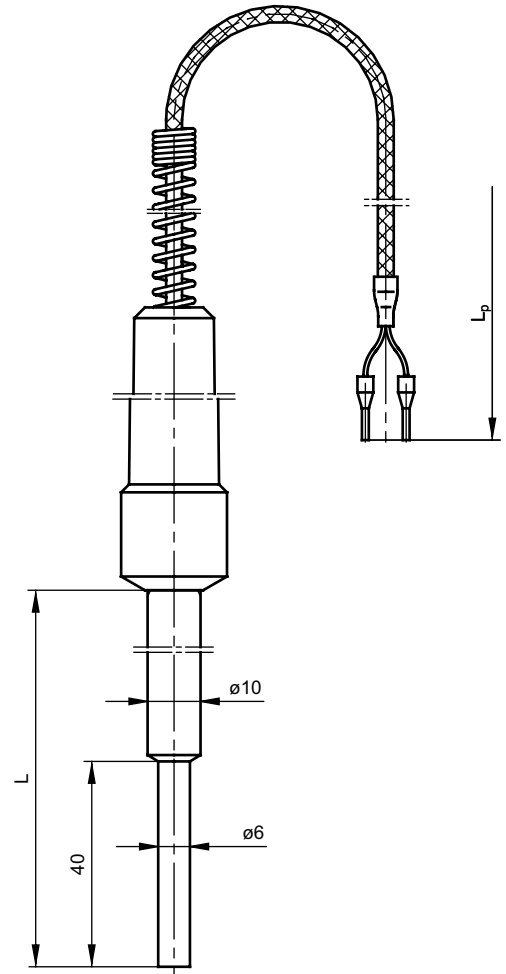
- stranded Cu wire 2 or 4x0,22 mm² with double teflon insulation
- length L_p [m]: 1,5 (standard)

Options

- Pt500, Pt1000, Ni100, Ni1000
- Pt100: class A -30÷250°C, class AA 0÷150°C

Additional equipment

- miniature plug type SMPW (2-pin) or MTP (3-pin) – p. 146



Ordering code

Temperature sensor



Sheath length L [mm]: **100** or other* _____

RTD class: **A, B*** _____

RTD connection: **2, 3, 4-wire** _____

Lead wire length L_p [m]: **1,5** or other* _____

Additional equipment – plug: **W** _____

*Other parameters acc. to requirements

Ordering example:

TOPE-142-115-B-2-2 m RTD sensor with Pt100, class B, 2-wire connection, stepped sheath $\varnothing 6/\varnothing 10$ mm, length L=115 mm, lead wire length L_p=2 m

TOPE-142-100-A-3-2 m-W RTD sensor with Pt100, class A, 3-wire connection, stepped sheath $\varnothing 6/\varnothing 10$ mm, length L=100 mm, lead wire length L_p=2 m, with miniature plug

Temperature Sensors for Liquid Metals and Liquid Metal Alloys **TTJC-37, TTKC-37**

Specification

Temperature range / sensing element

0÷700°C **J** class 2
 0÷1200°C **K** class 2

Sheath

- ceramics: HEXOLOY, REFRAZ or SYALON
- thermal shock resistance
- fitting assembly and extension pipe: stainless steel 1.4541
- length L_2 [mm]: 300÷1000
- ceramic sheath dimensions acc. to the chart

Ceramics type and designation	d	L	Remarks**
HEXOLOY H..	19 or 25,4	300	1650°C
		500	
REFRAZ R	22	700	1450°C
		900	
SYALON SN	22	1100	1300°C

** max. operating temperature

Connection head

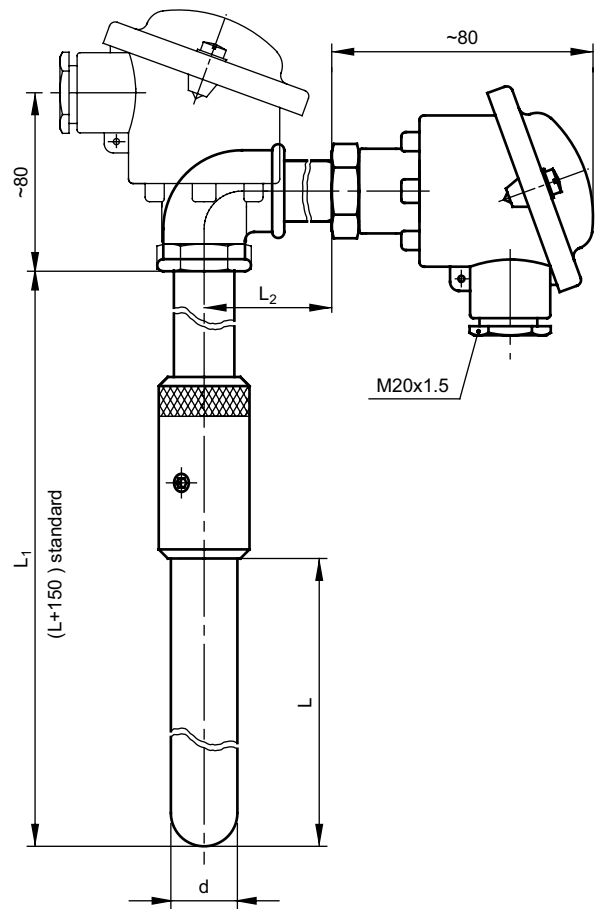
- B, IP54, -40÷100°C

Options

- thermocouple K, J: class 1
- straight version with thermocouples R, S, B*

Additional equipment

- temperature transmitters – pp. 162÷174
- compensation cables



Ordering code

L Temperature sensor

TT	C-37	-	-	-	-	-
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With transmitter: **AP** _____

Single: **no designation** _____

Double: **2** _____

Thermocouple NiCr-NiAl: **K** _____

Thermocouple Fe-CuNi: **J** _____

Sensor type: angular – **K**, straight – **P** _____

Sheath material: **REFRAZ – R, SYALON – SN, HEXOLOY** (diameter) – **H19** or **H25** _____

Immersion length L/L_1 : **500/650** or other* _____

Extension length L_2 : **500** or other* _____

Thermocouple class: **1, 2** _____

Transmitter type – temperature range: **LTT01-(0÷400)°C*** _____

*Other parameters acc. to requirements

Ordering example: **TTKC-37-K-R-500/650-200-2** sensor with thermocouple NiCr-NiAl /K/, class 2, angular type (K), sheath material REFRAZ (R), immersion length L=500 mm, standard extension and horizontal pipe 200 mm (500/650-200)

Temperature Sensor for Shipbuilding Industry **TTKLE-1**

Specification

Temperature range / sensing element

-40÷800°C **K** class 2

Sheath

- material: stainless steel 1.4541
- length L [mm]: 100÷500

Connection head

- material: stainless steel 1.4541, IP65, 100°C

Lead wire

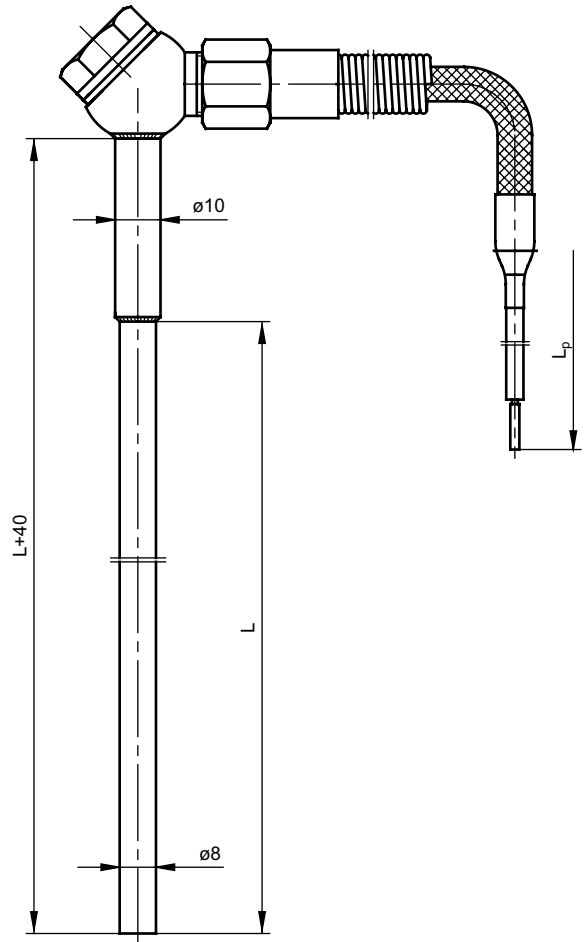
- stranded Cu wire 2x1,5 mm² with double silicone insulation, metallic overbraid
- length L_p [m]: 2,0 (standard) or other

Options

- nut G½ and ring for mounting in sheath

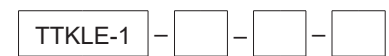
Additional equipment

- compensation cables – p. 145



Ordering code

Temperature sensor



Sheath length L [mm]: **100** or other* _____

Lead wire length L_p [m]: **2** or other* _____

Additional equipment – ring and nut G½: **G** _____

*Other parameters acc. to requirements

Ordering example:

TTKLE-1-200-3 m sensor with thermocouple NiCr-NiAl /K/, class 2, sheath length L=200 mm, lead wire length L_p=3 m

TTKLE-1-300-2 m-G sensor with thermocouple NiCr-NiAl /K/, class 2, sheath length L=300 mm, lead wire length L_p=2 m, with ring and nut G½

Temperature Sensor for Shipbuilding Industry **TOPG-31/M, TONG-31/M**

Specification

Temperature range / sensing element

- 50÷550°C **Pt100** class B
- 50÷150°C **Ni100**

Measuring insert

- 2-, 3-, 4-wire connection (for Pt100)
- 2-, 3-wire connection (for 2xPt100)
- insert length L+96 mm

Thermowell

- material: stainless steel 1.4541
- length L [mm]: 50÷500

Connection head

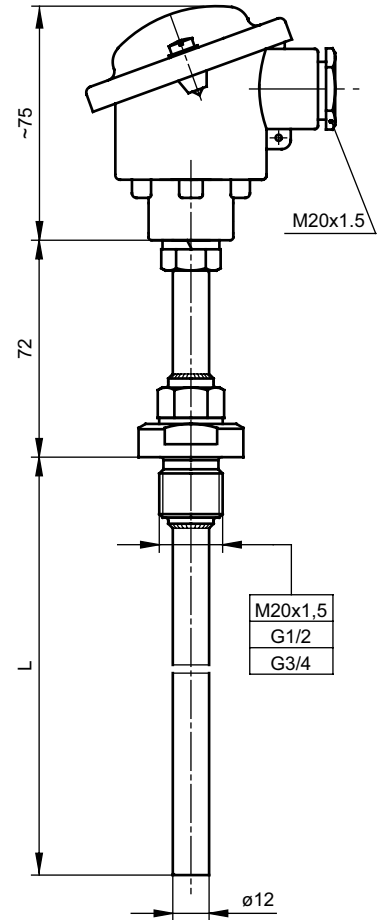
- B, IP55, -40÷100°C

Options

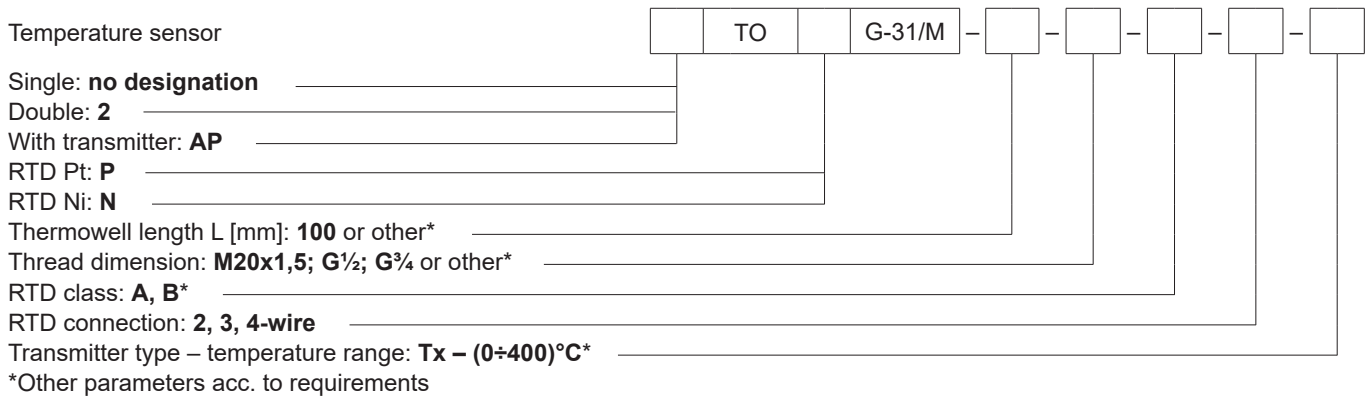
- other threads (inch and metrical) acc. to requirements
- Pt100: class A -50÷450; class AA -50÷250

Additional equipment

- temperature transmitters – pp.162÷174
- additional protection tubes and thermowells



Ordering code



Ordering example: **TOPG-31/M-250-G½ -A-3** RTD sensor with Pt100, class A, 3-wire connection, thermowell length L=250 mm, threaded fitting G½

APTOPG-31/M-600-M20x1,5-A-3-Tx-(0÷500)°C RTD sensor with Pt100, class A, 3-wire connection, thermowell length L=600 mm, threaded fitting M20x1,5, head mounted transmitter 4±20 mA

M

Intrinsically Safe Temperature Sensors with Replaceable Measuring Insert **TOPGB-1..Exi, TTKGB-1..Exi, TTJGB-1..Exi**

Specification

Temperature range / sensing element

-20÷150°C	Pt100	class B
-40÷150°C	J, K,	class2

Measuring insert – p. 135

- diameter 6 mm
- 2-, 3-, 4-wire connection (for Pt100)
- 2-, 3-wire connection (for 2xPt100)
- measuring insert length L+43 mm

Thermowell

- stainless steel 1.4541
- diameter d [mm]: ø9
- length L [mm]: 50÷2000

Connection head – p. 159

- aluminium XE-DANA (S1-standard), XE-DAND (S2), XE-DANAW(W1), XE-DANDW(W2) or stainless XE-BE(N1), IP65
- cable gland ATEX II GD IP65 (for cable 5÷10 mm)
- operating temperature up to 90°C

Constructional version

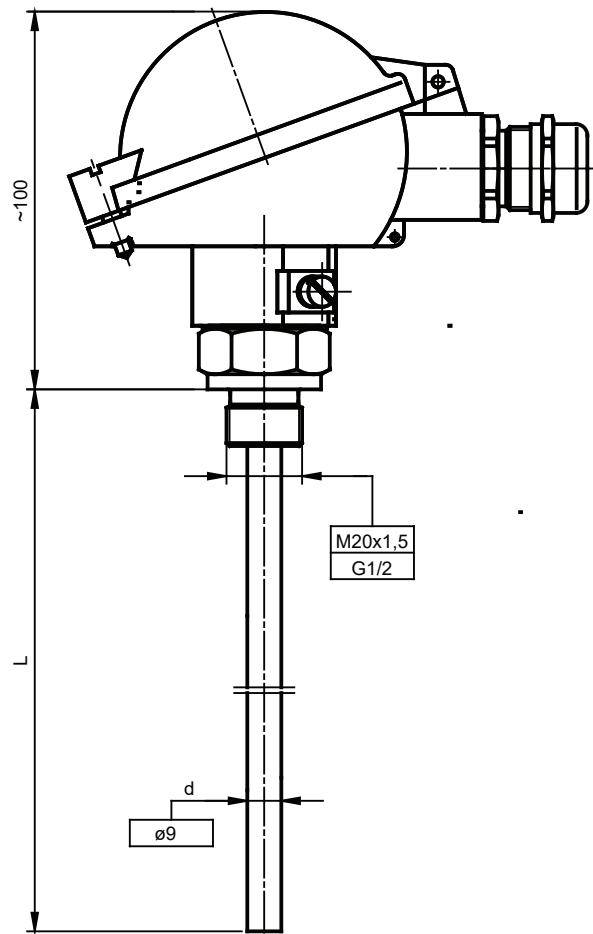
- Exi acc. to ATEX
- EC-Type Examination Certificate: WE KDB 07ATEX055
 I M1 Ex ia I (only with connection head N1)
 II 1/2G Ex ia IIC T6; II 1D Ex iaD 20 T85°C

Options

- Pt500, Pt1000, T, N
- other threads (inch and metrical) acc. to requirements
- Pt100: class A -50÷150°C, class AA 0÷150°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174



Ordering code

Temperature sensor

		T	GB-1	Exi															
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Without transmitter: **no designation**
 With transmitter: **AP**
 With two transmitters: **2AP**
 Single: **no designation**
 Double: **2**
 Sensing element Pt: **OP**
 Fe-CuNi: **TJ**; NiCr-NiAl: **TK**
 Cu-CuNi: **TT**; NiCrSi-NiSi: **TN**
 Replaceable pipe insert: **1**
 Replaceable mineral insulated insert: **2**
 Connection head type **S1, S2, W1, W2** (S1) for group II or **N1**, for I and II
 Length L [mm]: **200** or other*
 Thermowell diameter [mm]: **9**
 Thread dimension: **G½** or other*
 RTD type for Pt: **Pt100, Pt500, Pt1000** or hot junction for TC: **SO, SP, SOA**
 RTD/ thermocouple class: **A, B* / 1, 2**
 RTD connection for Pt: **2, 3, 4-wire**
 Transmitter type – temperature range: **FT2221-(0÷200)°C***
 *Other parameters acc. to requirements

Ordering example: **2TTKGB-12Exi-S1-160-9-G½-SOA-2**

Intrinsically Safe Temperature Sensors with Replaceable Measuring Insert **TOPGN-1..Exi, TTKGN-1..Exi, TTJGN-1..Exi**

Specification

Temperature range / sensing element

-200÷550°C	Pt100	class B
-40÷550°C	J, K	class 2

Measuring insert – p. 135

- diameter 6 or 8 mm
- 2-, 3-, 4-wire connection (for Pt100)
- 2-, 3-wire connection (for 2xPt100)
- measuring insert length L+155 mm

Thermowell

- stainless steel 1.4541
- diameter d [mm]: ø9, 11, 14
- length L [mm]: 50÷2000

Connection head – p. 159

- aluminium XE-DANA (S1–standard), XE-DAND (S2), XE-DANAW(W1), XE-DANDW(W2) or stainless XE-BE(N1), IP65
- cable gland ATEX II GD IP65 (for cable 5÷10 mm)
- operating temperature up to 90°C

Constructional version

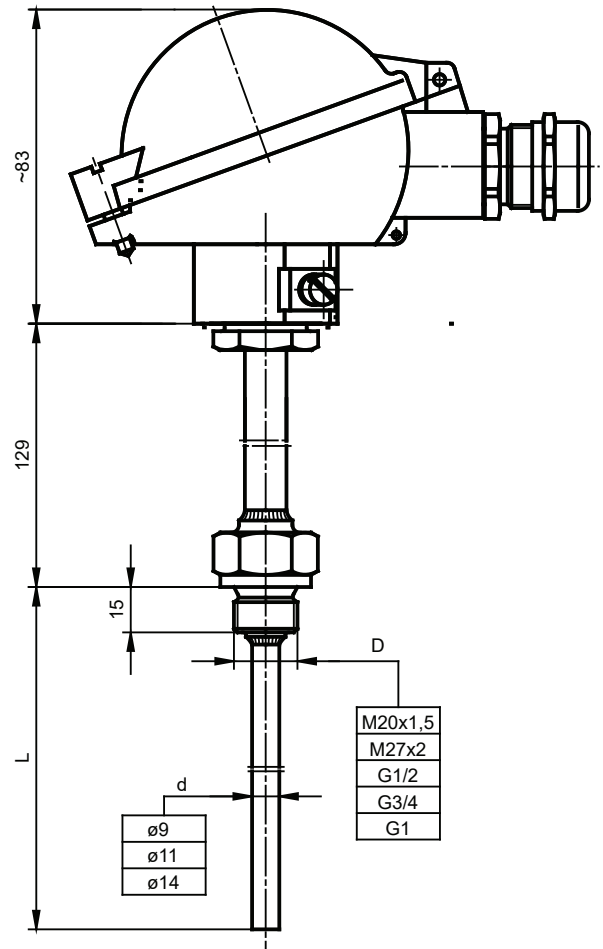
- Exi acc. to ATEX
- EC-Type Examination Certificate: WE KDB 07ATEX055
 I M1 Ex ia I (only with connection head N1)
 II 1/2G Ex ia IIC T6; II 1D Ex iaD 20 T85°C

Options

- Pt500, Pt1000, T, N
- other threads (inch and metrical) acc. to requirements
- Pt100: class A -50÷400°C, class AA 0÷150°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174



Ordering code

Temperature sensor



Without transmitter: **no designation**

With transmitter: **AP**

With two transmitters: **2AP**

Single: **no designation**

Double: **2**

Sensing element Pt: **OP**

Fe-CuNi: **TJ**; NiCr-NiAl: **TK**

Cu-CuNi: **TT**; NiCrSi-NiSi: **TN**

Replaceable pipe insert: **1**

Replaceable mineral insulated insert: **2**

Connection head type **S1, S2, W1, W2** (S1) for group II or **N1**, for I and II

Length L [mm]: **160** or other*

Thermowell diameter [mm]: **9** or other*

Thread dimension: **G¾** or other*

RTD type for Pt: **Pt100, Pt500, Pt1000** or hot junction type for TC: **SO, SP, SOA**

RTD/ thermocouple class: **A, B* / 1, 2**

RTD connection for Pt: **2, 3 or 4-wire**

Transmitter type – temperature range: **FT2202-(0÷50)°C***

*Other parameters acc. to requirements

Ordering example:

2TTKGN-12Exi-S1-160-9-G¾-SOA-2

Intrinsically Safe Temperature Sensors with Replaceable Measuring Insert **TOPT-1..Exi, TTKT-1..Exi, TTJT-1..Exi**

Specification

Temperature range / sensing element

- 20÷550°C **Pt100** class B
- 40÷550°C **J, K** class 2

Measuring insert – p. 135

- diameter 6 mm
- 2-, 3-, 4-wire connection (for Pt100)
- 2-, 3-wire connection (for 2xPt100)
- measuring insert length L+155 mm

Thermowell

- stainless steel 1.4541; flange PN16, DN20 or DN25* with lap B1
- diameter d [mm]: $\varnothing 11$
- length L [mm]: 50÷2000

Connection head – p. 159

- aluminium XE-DANA (S1–standard), XE-DAND (S2), XE-DANAW(W1), XE-DANDW(W2) or stainless XE-BE(N1), IP65
- cable gland ATEX II GD IP65 (for cable 5÷10 mm)
- operating temperature up to 90°C

Constructional version

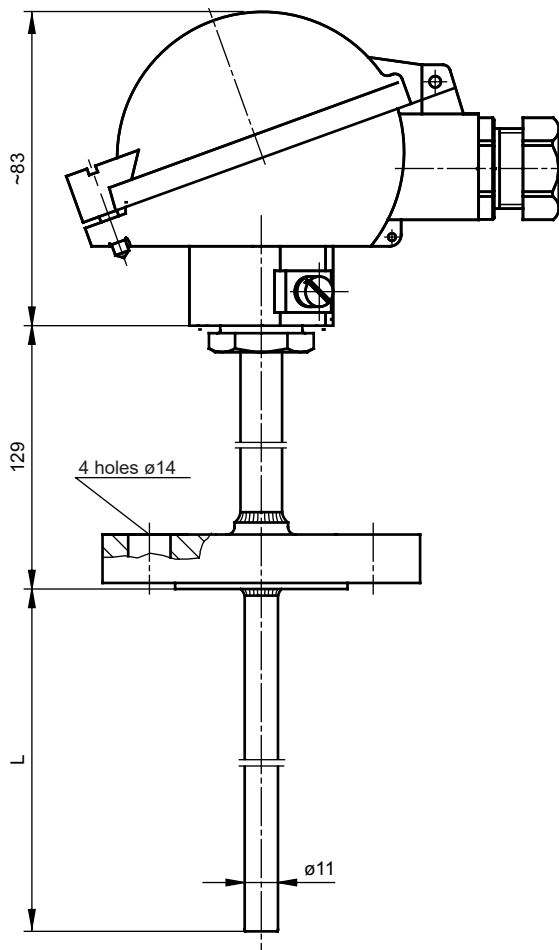
- EC-Type Examination Certificate: WE KDB 07ATEX055
- I M1 Ex ia I (only with connection head N1)
- II 1/2G Ex ia IIC T6; II 1D Ex iaD 20 T85°C

Options

- Pt500, Pt1000, T, N
- Pt100: class A -50÷400°C, class AA 0÷150°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174



Ordering code

Temperature sensor



- Without transmitter: **no designation**
- With one transmitter: **AP**
- With two transmitters: **2AP**
- Single: no designation
- Double: **2**
- Sensing element Pt: **OP**
- Fe-CuNi: **TJ**; NiCr-NiAl: **TK**
- Cu-CuNi: **TT**; NiCrSi-NiSi: **TN**
- Replaceable pipe insert: **1**
- Replaceable mineral insulated insert: **2**
- Connection head type **S1, S2, W1, W2** (S1) for group II or **N1** for group I and II
- Length L [mm]: **160** or other*
- Flange dimensions: **DN20** or other*
- RTD type for Pt: **Pt100, Pt500, Pt1000** or hot junction type or TC: **SO, SP, SOA**
- RTD/ thermocouple class: **A, B*** / **1, 2**
- RTD connection for Pt: **2, 3, 4-wire**
- Transmitter type – temperature range: **248HAI – (0÷50)°C***

Ordering example: **2TTTT-12Exi-S1-160-DN20-SOA-2**

Intrinsically Safe Temperature Sensors with Replaceable Measuring Insert **TOPP-1..Exi, TTKP-1..Exi, TTJP-1..Exi**

Specification

Temperature range / sensing element

-200÷550°C **Pt100** class B
-40÷700°C **J, K** class 2

Measuring insert – p. 135

- diameter 6 or 8 mm
- 2-, 3-, 4-wire connection (for Pt100)
- 2-, 3-wire connection (for 2xPt100)
- measuring insert length L+25 mm

Thermowell

- stainless steel 1.4541; 1.4841 or 1.4762 (only ø15 mm)
- diameter d [mm]: 12, 14, 15
- length L [mm]: 100÷3000

Connection head – p. 159

- aluminium XE-DANA (S1–standard), XE-DAND (S2), XE-DANAW(W1), XE-DANDW(W2) or stainless XE-BE(N1), IP65, operating temperature up to 90°C
- cable gland ATEX II GD IP65 (for cable 5÷10 mm)

Constructional version

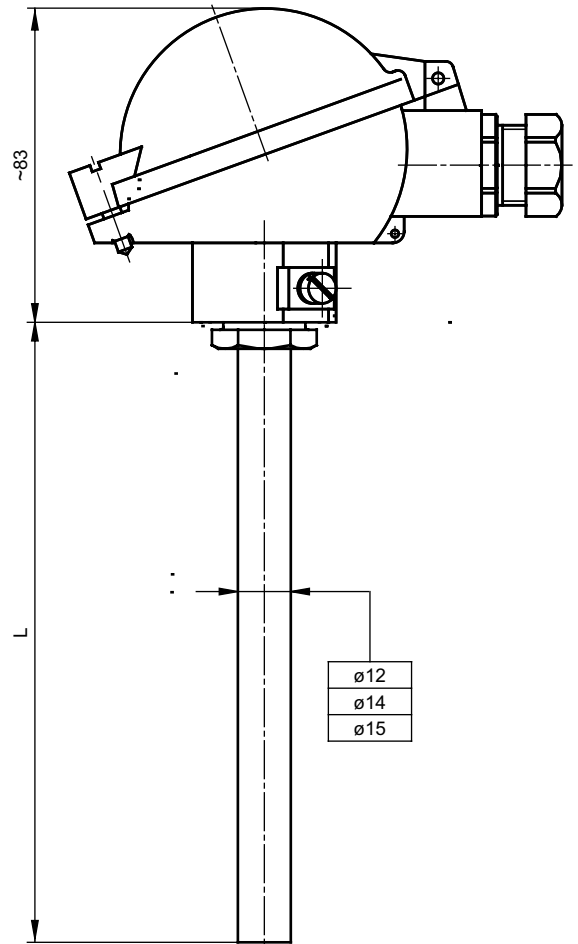
- Exi acc. to ATEX
- EC-Type Examination Certificate: WE KDB 07ATEX055
I M1 Ex ia I (only with connection head N1)
II 1/2G Ex ia IIC T6; II 1D Ex iaD 20 T85°C

Options

- Pt500, Pt1000, T, N
- Pt100: class A -50÷400°C, class AA 0÷150°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- compensation cables – p. 145



Ordering code

Temperature sensor



Without transmitter: **no designation**

With one transmitter: **AP**

With two transmitters: **2AP**

Single: **no designation**

Double: **2**

Sensing element Pt: **OP**

Fe-CuNi: **TJ**; NiCr-NiAl: **TK**

Cu-CuNi: **TT**; NiCrSi-NiSi: **TN**

Replaceable pipe insert: **1**

Replaceable mineral insulated insert: **2**

Connection head type **S1, S2, W1, W2** (S1) for group II or **N1** for group I and II

Length L [mm]: **500** or other*

Thermowell diameter [mm]: **15** or other*

RTD type for Pt: **Pt100, Pt500, Pt1000** or hot junction type for TC: **SO, SP, SOA**

RTD/ thermocouple class: **A, B*** / 1, 2

RTD connection for Pt: **2, 3, 4-wire**

Thermowell material: **1.4541**

Transmitter type – temperature range: **248HAI – (-20÷30)°C***

*Other parameters acc. to requirements

Ordering example:

2TTKP-12Exi-S1-500-15-SOA-2-1.4841

Intrinsically Safe Temperature Sensors without Outer Thermowell **TOPI-...Exi, TTKI-...Exi, TTJI-...Exi**

Specification

Temperature range / sensing element

-200÷600°C	Pt100	class B
-40÷700°C	J	class 2
-40÷1200°C	K, N	class 2

Measuring insert

- pipe insert diameter 6 or 8 mm
- mineral insulated insert diameter [mm]: 3; 4,5; 6

Sheath

- pipe insert sheath material – 1.4541 (Pt, K, J)
- mineral insulated insert sheath material – 1. 4541 (T, J)
 1.4571 (Pt); 2.4816 (N, K)
- sheath length L [mm]: min. 100

Connection head – p. 159

- aluminium XE-DANA (S1–standard), XE-DAND (S2), XE-DANAW(W1), XE-DANDW(W2) or stainless XE-BE(N1), IP65
- cable gland ATEX II GD IP65 (for cable 5÷10 mm)
- operating temperature up to 90°C

Constructional version

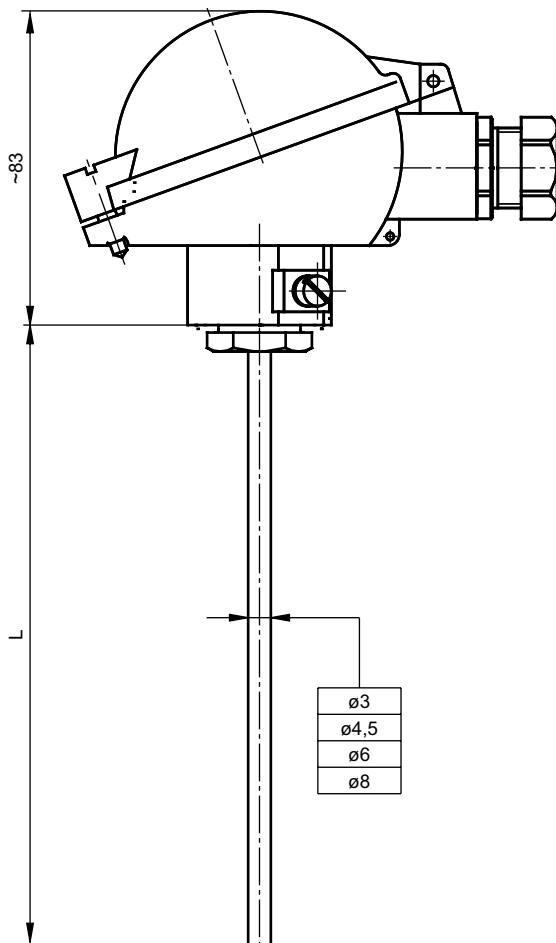
- Exi acc. to ATEX
- EC-Type Examination Certificate: WE KDB 07ATEX055
 I M1 Ex ia I (only with connection head N1)
 II 1/2G Ex ia IIC T6; II 1D Ex iaD 20 T85°C

Options

- Pt500, Pt1000, T, N
- Pt100: class A -50÷400°C, class AA 0÷150°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- compensation cables – p. 145
- sensor mounting fittings – pp. 155÷156
- additional protection tubes and thermowells – pp. 148÷153



Ordering code

Temperature sensor

			T	I	-		Exi	-		-		-		-		-	
Without transmitter: no designation	With one transmitter: AP	With two transmitters: 2AP	Single: no designation	Double: 2	Sensing element Pt: OP	Fe-CuNi: TJ ; NiCr-NiAl: TK	Cu-CuNi: TT ; NiCrSi-NiSi: TN	Insert diameter: 3; 4 (ø4,5 mm); 6; 8	Pipe insert: 1	Mineral insulated insert: 2	Connection head type S1, S2, W1, W2 (S1) for group II or N1 for group I and II	Length L [mm]: 200 or other*	RTD type for Pt: Pt100, Pt500, Pt1000 or hot junction type for TC: SO, SP, SOA	RTD/ thermocouple class: A, B* / 1, 2	RTD connection for Pt: 2, 3, 4-wire	Transmitter type – temperature range: HRFX - (0÷100)°C*	

*Other parameters acc. to requirements

Ordering example: **2TTKI-42Exi-S1-160-SOA-2**

Intrinsically Safe Temperature Sensors with Replaceable Measuring Insert **TOPSW-...Exi, TTKSW-...Exi, TTJSW-...Exi**

Specification

Temperature range / sensing element

-200÷550°C	Pt100	class B
-40÷550°C	J, K	class 2

Measuring insert – p. 135

- diameter $\varnothing 3$ mm (for thermowell $\varnothing 18$) $\varnothing 6$ mm (for thermowell $\varnothing 24$)
- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- insert length L+173 mm

Thermowell

- material: boiler steel 1.7335 (15HM) or acc. to requirements
- diameter [mm] $\varnothing 18$ (SW1) or $\varnothing 24$ (SW2)
- dimensions L/L₁ 100/35, 140/65, 200/65, 260/125 (SW1)
 100/35, 140/65, 200/65, 260/125 (SW2)

Connection head – p. 159

- aluminium XE-DANA (S1–standard), XE-DAND (S2), XE-DANAW(W1), XE-DANDW(W2) or stainless XE-BE(N1), IP65, operating temperature up to 90°C
- cable gland ATEX II GD IP65 (for cable 5÷10 mm)

Constructional version

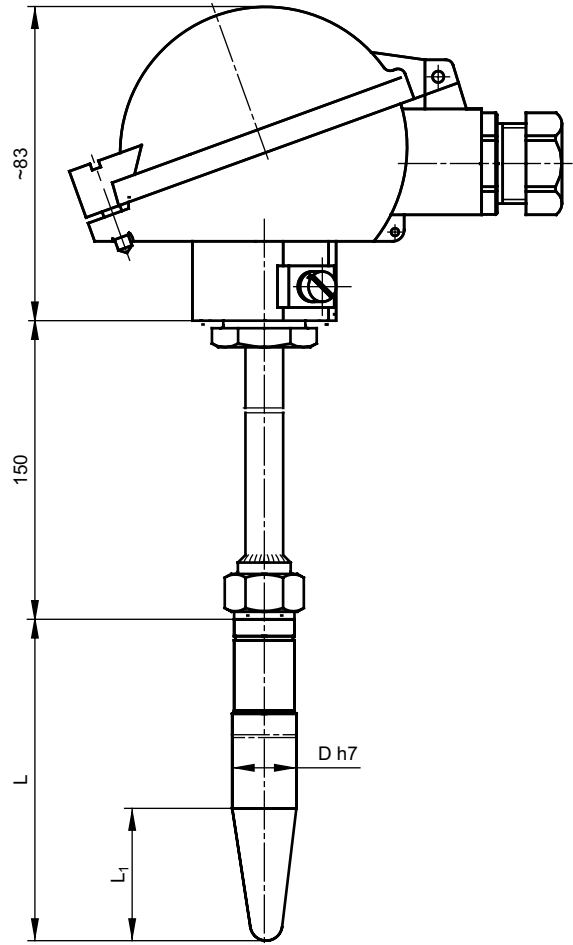
- Exi acc. to ATEX
- EC-Type Examination Certificate: WE KDB 07ATEX055
 I M1 Ex ia I (only with connection head N1)
 II 1/2G Ex ia IIC T6; II 1D Ex iaD 20 T85°C

Options

- Pt500, Pt1000, T, N
- Pt100: class A -50÷400°C, class AA 0÷150°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162-174



Ordering code

Temperature sensor

		T	SW	-		Exi	-		-		-		-		-		-	
--	--	---	----	---	--	-----	---	--	---	--	---	--	---	--	---	--	---	--

Without transmitter: **no designation**
 With one transmitter: **AP**
 With two transmitters: **2AP**
 Single: **no designation**
 Double: **2**
 Sensing element Pt: **OP**
 Fe-CuNi: **TJ**; NiCr-NiAl: **TK**
 Cu-CuNi: **TT**; NiCrSi-NiSi: **TN**
 Thermowell $\varnothing 18$ (only with mineral insulated insert): **1**
 Thermowell $\varnothing 24$ (with mineral insulated or pipe insert): **2**
 Replaceable pipe insert: **1**
 Replaceable mineral insulated insert: **2**
 Connection head type **S1, S2, W1, W2** (S1) for group II or **N1** for group I and II
 Length L [mm]: **140** or other*
 Diameter [mm]: **18, 24** or other*
 RTD type for Pt: **Pt100, Pt500, Pt1000** or hot junction type for TC: **SO, SP, SOA**
 RTD/ thermocouple class: **A, B* / 1, 2**
 RTD connection for Pt: **2, 3,4-wire**
 Transmitter type – temperature range: **FT2201 - (0÷100)°C***

Ordering example: **APTOPSW-12Exi-S1-140-Pt100-B-3-FT2202Ex-(0÷100)°C**

Intrinsically Safe Temperature Sensors with Replaceable Measuring Insert **TOPSWG/T-1...Exi,**
TTKSWG/T-1...Exi,
TTJSWG/T-1...Exi

Specification

Temperature range / sensing element

-200÷600°C **Pt100** class B
 -40÷700°C **J, K** class 2

Measuring insert – p. 135

- diameter 6 or 8 mm
- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- insert length L+225 mm

Thermowell

- bored
- stainless steel 1.4541*
- SWG thread M20x1,5; G½; ½NPT
- SWT flange PN16DN20 or DN25, B1 acc. to PN-EN 1092-1*
- thermowell dimensions L [mm]: 50÷1000

Connection head

- aluminium XE-DANA (S1–standard), XE-DAND (S2), XE-DANAW(W1), XE-DANDW(W2) or stainless XE-BE(N1), IP65, operating temperature up to 90°C
- cable gland ATEX II GD IP65 (for cable 5÷10 mm)

Constructional version

- Exi acc. to ATEX
- EC-Type Examination Certificate: WE KDB 07ATEX055
 I M1 Ex ia I (only with connection head N1)
 II 1/2G Ex ia IIC T6; II 1D Ex iaD 20 T85°C

Options

- Pt500, Pt1000, T, N
- other threads (inch and metrical) acc. to requirements
- Pt100: class A -50÷400°C, class AA 0÷150°C; TC: class 1

Additional equipment

- temperature transmitters – p. 162÷174

Ordering code

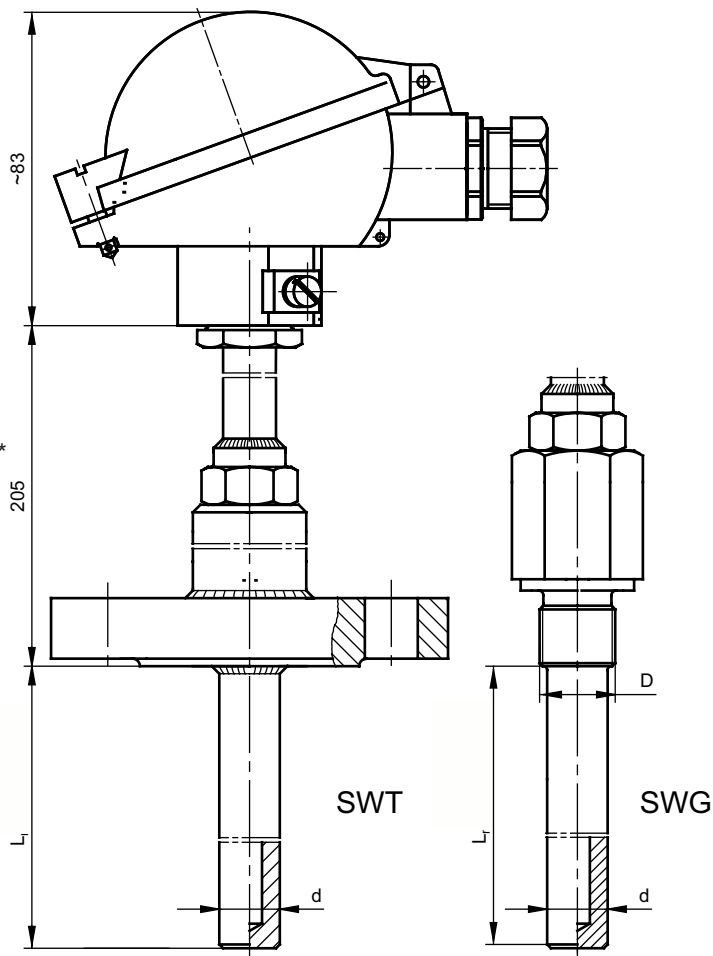
Temperature sensor



- Without transmitter: **no desig.**
- With one transmitter: **AP**
- With two transmitters: **2AP**
- Single: **no designation**
- Double: **2**
- Sensing element Pt: **OP**
- Fe-CuNi: **TJ**; NiCr-NiAl: **TK**
- Cu-CuNi: **TT**; NiCrSi-NiSi: **TN**
- Flanged thermowell: **T**
- Threaded thermowell: **G**
- Replaceable pipe insert: **1**
- Replaceable mineral insulated insert: **2**
- Connection head type **S1, S2, W1, W2** (S1) for group II or **N1** for group I and II
- Thermowell dimensions [mm]: **12/16x150** or other*
- Thread or flange designation: **G¾** or **PN40DN50B1** or other*
- RTD type for Pt: **Pt100, Pt500, Pt1000** or hot junction type for TC: **SO, SP, SOA**
- RTD/ thermocouple class: **A, B* / 1, 2**
- RTD connection for Pt: **2, 3, 4-wire**
- Transmitter type – temperature range: **248HAI – (0÷100)°C***

*Other parameters acc. to requirements

Ordering example: **AP2TOPSWG-12Exi-W2-15/20x160-G3/4-Pt100-B-2-248HAI- (0÷400)°C**



Intrinsically Safe Temperature Sensors with Replaceable Measuring Insert **TOPGWN-5...Exi,**
TTJGWN-5...Exi,
TTKGWN-5...Exi

Specification

Temperature range / sensing element

-20÷550°C	Pt100	class B
-40÷550°C	J, K	class 2

Measuring insert – p. 135

- diameter d_1 : 3; 4,5; 6; 8 mm
- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- insert length $L+177$ mm or L_1+146 mm

Thermowell

- stainless steel 1.4541
- with additional thermowell $d \times L$ with thread D_1
- without additional thermowell, nut with thread D_2
- thermowell diameter d [mm]: 9, 10, 11, 12, 14
- thermowell length $L / (L_1)$ [mm]: 50÷2000

Connection head – p. 159

- aluminium XE-DANA (S1–standard), XE-DAND (S2), XE-DANAW(W1), XE-DANDW(W2) or stainless XE-BE(N1), IP65, operating temperature up to 90°C
- cable gland ATEX II GD IP65 (for cable 5÷10 mm)

Constructional version

- Exi acc. to ATEX
- EC-Type Examination Certificate: WE KDB 07ATEX055
 I M1 Ex ia I (only with connection head N1)
 II 1/2G Ex ia IIC T6; II 1D Ex iaD 20 T85°C

Options

- Pt500, Pt1000, T, N
- other threads (inch and metrical) acc. to requirements
- Pt100: class A -50÷400°C, class AA 0÷150°C; TC: class 1

Additional equipment

- temperature transmitters – p. 162÷174

Ordering code

Temperature sensor



Without transmitter: **no designation**

With one transmitter: **AP**

With two transmitters: **2AP**

Single: **no designation**

Double: **2**

Sensing element Pt: **OP**

Fe-CuNi: **TJ**; NiCr-NiAl: **TK**

Cu-CuNi: **TT**; NiCrSi-NiSi: **TN**

Pipe insert (diameter 6, 8): **1**

Mineral insulated insert (diameter 3; 4,5; 6): **2**

Connection head type **S1, S2, W1, W2** (S1) for group II or **N1** for group I and II

Thermowell length/ diameter (for version with outer thermowell) L/d [mm]: **220/12** or other*

Insert length/ diameter (for version without outer thermowell) d_1/L_1 [mm]: **6/230** or other*

Thread nut dimension D_2 (without thermowell) or connector dimension D_1 (with thermowell): **G $\frac{3}{4}$** (*)

RTD type for Pt: **Pt100, Pt500, Pt1000** or hot junction type for TC: **SO, SP, SOA**

RTD/ thermocouple class: **A, B* / 1, 2**

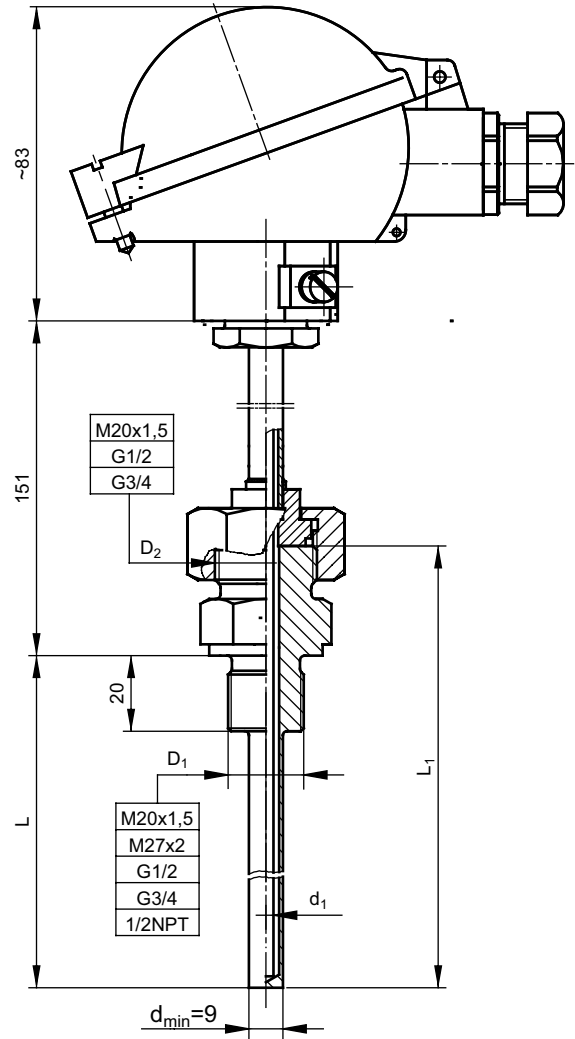
RTD connection for Pt: **2, 3, 4-wire**

Transmitter type – temperature range: **LTT01 - (0÷400)°C***

*Other parameters acc. to requirements

Ordering example:

2TTKGWN-52Exi-S1-160-10-G $\frac{3}{4}$ -SOA-2



Intrinsically Safe High Temperature Sensors **TTSC-22Exi, TTRC-22Exi, TTBC-22Exi**

Specification

Temperature range / sensing element

0÷1500°C	S, R	class 2
-400÷1600°C	B	class 3

Sheath

- ceramic protection tube material: corundum 799
- holding tube ø22 mm, material heat resistant steel 1.4841 (max. temp. 1100°C)
- steel-ceramic, L [mm]: 200÷2000

Connection head – p. 159

- aluminium XE-DANA (S1–standard), XE-DAND (S2), XE-DANAW(W1), XE-DANDW(W2), IP65, operating temperature up to 90°C
- cable gland ATEX II GD IP65 (for cable 5÷10 mm)

Constructional version

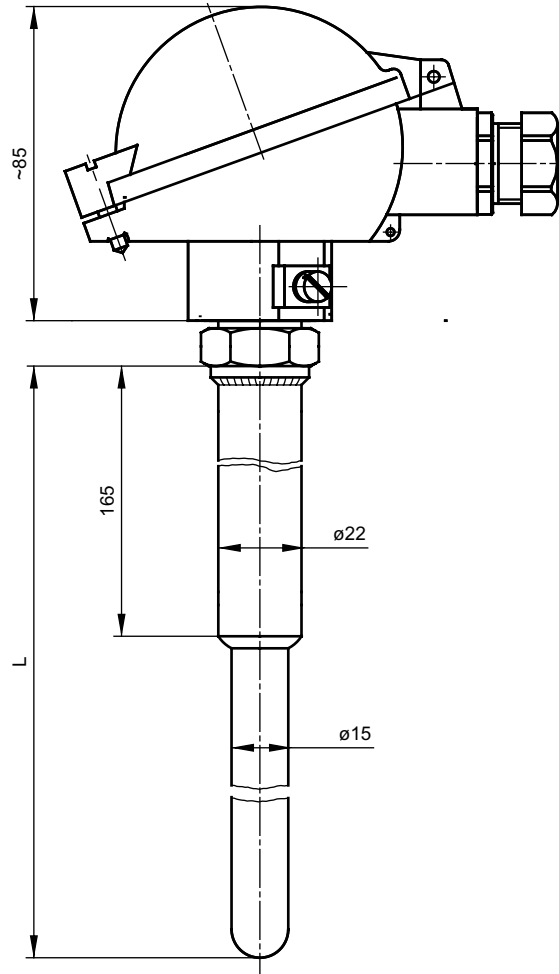
- Exi acc. to ATEX
- EC-Type Examination Certificate: **WE KDB 07ATEX055**
 II 2G Ex ia IIC T6; II 2D Ex iaD 21 T85°C

Options

- hot junction – SO (single); SOB (double)
- thermocouple R, S class 1, B class 2

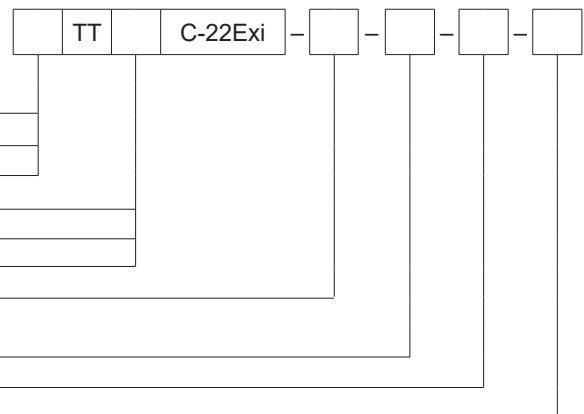
Additional equipment

- temperature transmitters – pp. 162÷174
- compensation cables – p. 145
- fittings – p. 156



Ordering code

Temperature sensor



- Single without transmitter: **no designation**
- Double without transmitter: **2**
- Single with transmitter: **AP**
- Thermocouple type Pt Rh10-Pt: **S**
- Thermocouple type Pt Rh13-Pt: **R**
- Thermocouple type Pt Rh30-Pt Rh6: **B**
- Connection head type **S1, S2, W1, W2** (standard **S1**)
- (S-standard, W-with high cover; digit - number of cable glands)
- Sheath length L [mm]: **1000** or other*
- Thermocouple class: **1, 2** (for S, R) or **3, 2** (for B)
- Transmitter type – temperature range: **FT2211-(0÷1000)°C***

*Other parameters acc. to requirements

Ordering example:

2TTSC-22Exi-S2-1000-2 sensor with thermocouple Pt Rh10-Pt /S/, class 2, ceramic sheath length L=1000 mm, connection head XE-DANA with two cable glands

Intrinsically Safe Temperature Sensor for Surface Measurement **TOPE - 244Exi**

Specification

Temperature range / sensing element

-40÷400°C Pt100 class B

Sheath

- material brass, length [mm]: 48
- radiator enhancing surface of heat reception
- band clamp for mounting on a pipeline DN 15÷200 mm

Lead wire

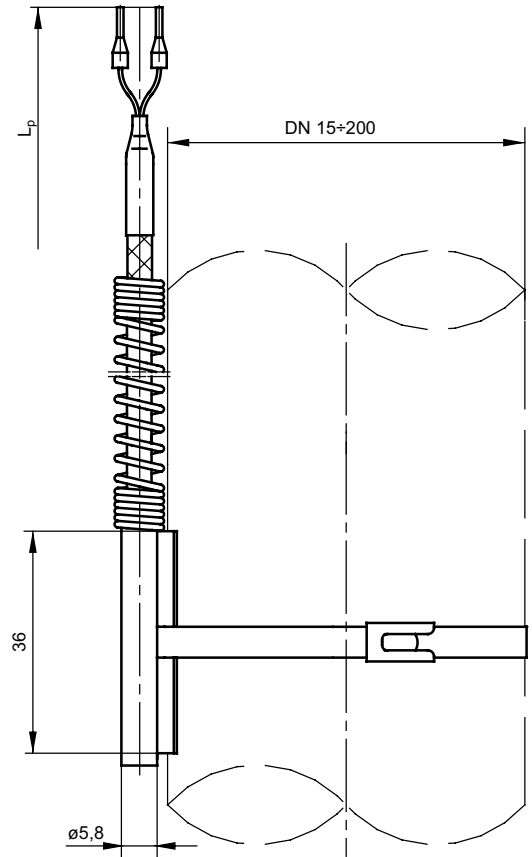
- Ws - stranded wire 0,22 mm² with fiberglass insulation, metallic overbraid
- Si - stranded wire 0,22 mm² with silicone insulation
- length L_p [m]: 1,5 (standard)
- Cu wire resistance ~0,14 Ω/m = ~0,36°C

Constructional version

- Exi acc. to ATEX
- EC-Type Examination Certificate: **WE KDB 07ATEX055**
- II 2G Ex ia IIC T6
- II 2D Ex iaD 21 T85°C

Options

- Pt500, Pt1000
- operating temperature of silicone insulation – up to 180°C
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷250°C, class AA 0÷150°C



Ordering code

Temperature sensor



Fiberglass insulation: **Ws**

Silicone insulation: **Si**

RTD type: **Pt500** or other*

RTD class: **A, B***

RTD connection: **2, 3, 4- wire**

Lead wire length L_p [m]: **1,5** or other*

*Other parameters acc. to requirements

Ordering example:

TOPE-244Exi-Ws-Pt100-B-3-1,5 m single RTD sensor with Pt100, class B, 3-wire connection, with band clamp for mounting on a pipe DN 15÷200 mm, fiberglass insulated lead wire length L_p=1,5 m

Intrinsically Safe Temperature Sensor for Measurement of Machinery and Device Parts **TOPE - 361Exi, TTJE - 361Exi, TTKE - 361Exi**

Specification

Temperature range / sensing element

-40÷550°C	Pt100	class B
-40÷1000°C	K	class 2
-40÷700°C	J	class 2

Sheath

- standard (pipe) execution, material stainless steel 1.4541 length L [mm]: 50÷1000; operating temp.: -40÷400°C
- mineral insulated execution with sleeve, material: 1.4571 (for Pt), 1.4541 (for T, J), 2.4816 (for N, K) length L_{min} [mm]: 50
- operating temperature:

Sensor class 2, class B	Mineral insulated sheath diameter d [mm]			
	ø3	ø4,5	ø6	ø8
T	350°C	-	-	-
J	450°C	550°C	700°C	-
K, N	800°C	900°C	1000°C	1000°C
Pt100	400°C	-	550°C	-

Lead wire

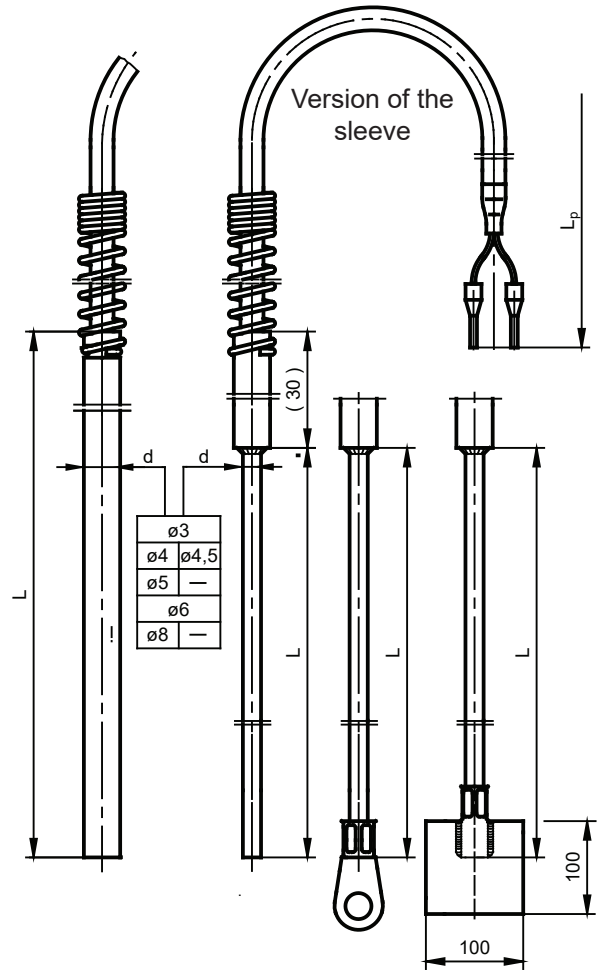
- Ws - stranded wire 0,22 mm² with fiberglass insulation, metallic overbraid, operating temp. up to 400°C
- Si - stranded wire 0,22 mm² with silicone insulation, operating temp. up to 180°C (inapplicable to pipe sheath d<6)
- lead wire length L_p [m]: 1,5 (standard)
- Cu wire resistance ~0,14 Ω/m = ~0,36°C

Constructional version

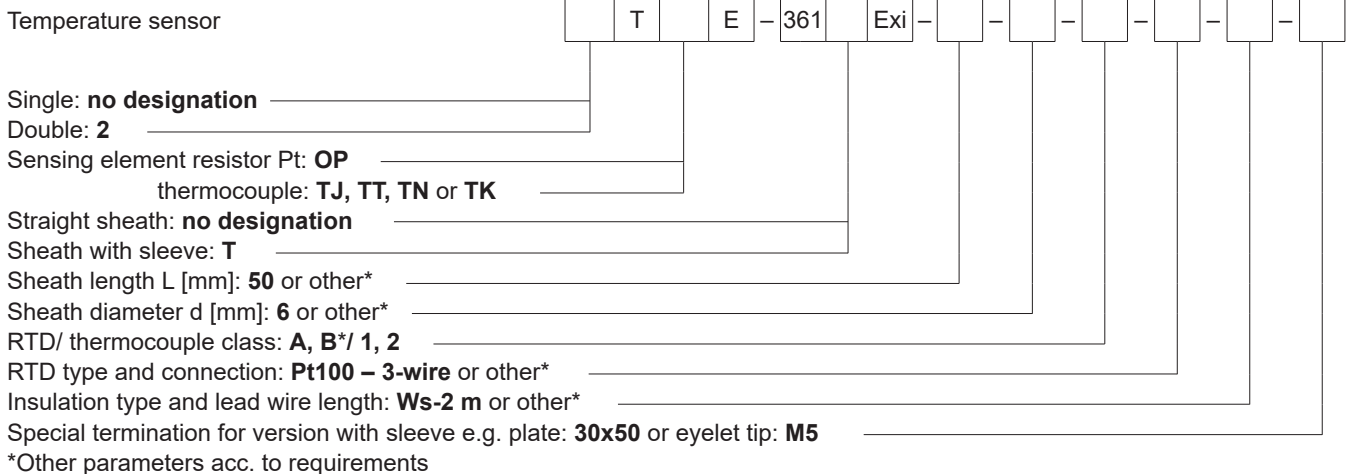
- Exi acc. to ATEX
- EC-Type Examination Certificate: **WE KDB 07ATEX055**
 II 2G Ex ia IIC T6; II 2D Ex iaD 21 T85°C
- insulated hot junction SO

Options

- Pt500, Pt1000, T, N
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷250°C, class AA 0÷150°C; TC class 1
- TC sensor with sleeve terminations, eyelet tip or plate
- sensor mounting fittings – UG-1, UG-3, UG-8, UZK-1 – pp. 155÷156



Ordering code



Ordering example: **TTKE-361TExi-400-6-2-Si-1,5 m-M5**

Intrinsically Safe Temperature Sensor for Measurement of Machinery and Device Parts **TOPE - 363Exi,
 TTKE - 363Exi,
 TTJE - 363Exi**

Specification

Temperature range / sensing element

-50÷400°C	Pt100	class B
-40÷400°C	J, K, N	class 2
-40÷350°C	T	class 2

Sheath

- material: stainless steel 1.4541
- welded threaded connector
- length L [mm]: 50÷1000

Lead wire

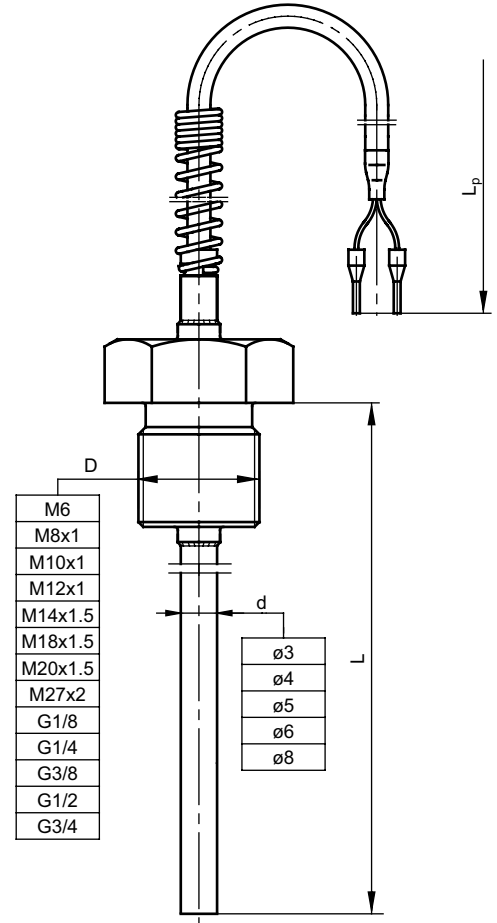
- Ws - stranded Cu wire or stranded thermocouple wire 0,22 mm² with fiberglass insulation, metallic overbraid, operating temp. up to 400°C
- Si - stranded Cu wire or stranded thermocouple wire 0,22 mm² with silicone insulation, operating temp. up to 180°C, for d>5
- length L_p [m]: 1,5 (standard)
- Cu wire resistance ~0,14 Ω/m = ~0,36°C

Constructional version

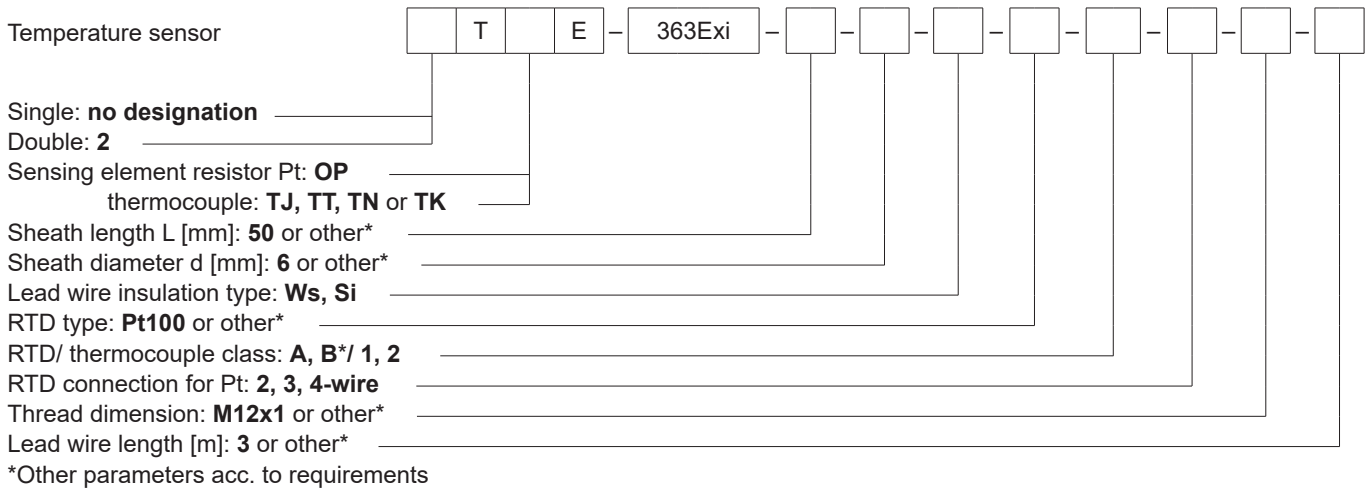
- Exi acc. to ATEX
- EC-Type Examination Certificate: **WE KDB 07ATEX055**
 II 2G Ex ia IIC T6
 II 2D Ex iaD 21 T85°C
- thermocouple sensor with insulated hot junction

Options

- Pt500, Pt1000
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷250°C, class AA 0÷150°C; TC class 1



Ordering code



Ordering example: **TOPE-363Exi-80-6-Ws-Pt100-B-3-M12x1-3 m** RTD sensor with Pt100, class B, 3-wire connection, sheath length L=80 mm and diameter 6 mm, with welded connector M12x1, fiberglass insulated lead wire, metallic overbraid, length L_p=3 m

N

Intrinsically Safe Temperature Sensor for Measurement of Machinery and Device Parts **TOPE - 365Exi, TTKE - 365Exi, TTJE - 365Exi**

Specification

Temperature range / sensing element

-50÷400°C	Pt100	class B
-40÷400°C	J, K,	class 2

Sheath

- material: stainless steel 1.4541
- movable threaded connector or nut
- length L [mm]: 50÷1000

Lead wire

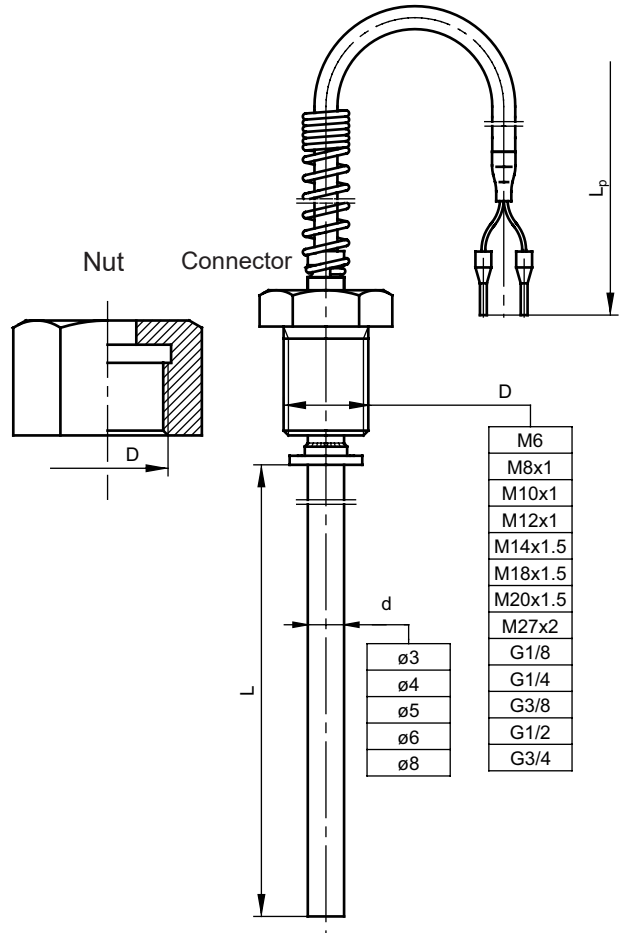
- Ws - stranded Cu wire or stranded thermocouple wire 0,22 mm² with fiberglass insulation, steel overbraid, operating temp. up to 400°C
- Si - stranded Cu wire or stranded thermocouple wire 0,22 mm² with silicone insulation, operating temp. up to 180°C, for d>5
- lead wire length L_p [m]: 1,5 (standard)
- Cu wire resistance ~0,14 Ω/m = ~0,36°C

Constructional version

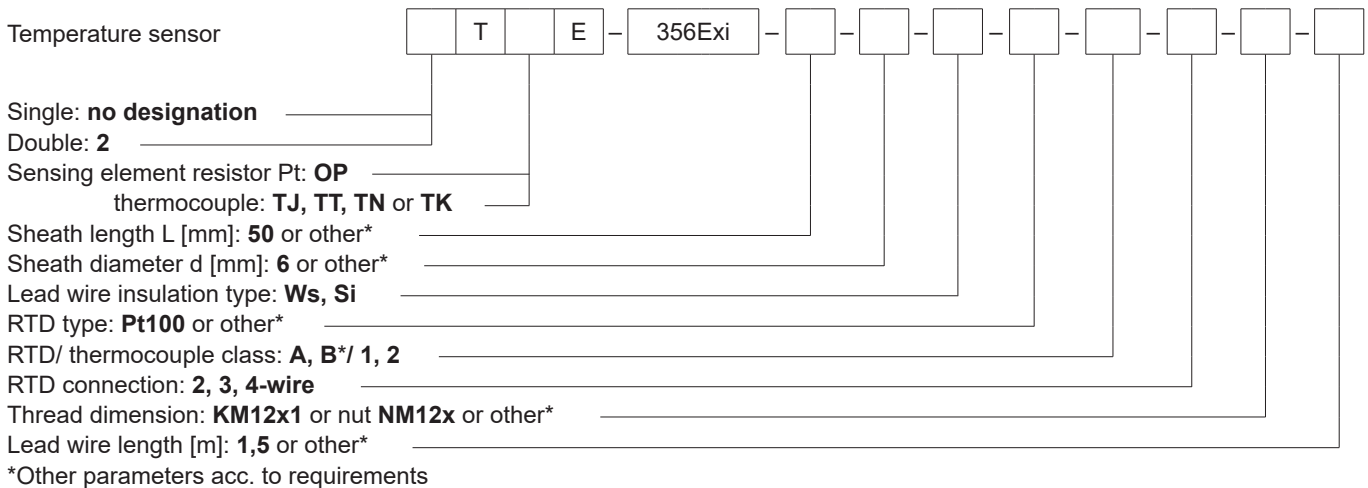
- Exi acc. to ATEX
- EC-Type Examination Certificate: **WE KDB 07ATEX055**
 II 2G Ex ia IIC T6
 II 2D Ex iaD 21 T85°C
- thermocouple sensor with insulated hot junction

Options

- Pt500, Pt1000, T, N
- 3-, 4-wire connection for Pt100
- Pt100: class A -30÷250°C, class AA 0÷150°C; TC class 1



Ordering code



Ordering example: **TOPE-365Exi-80-6-Si-Pt100-A-4-KM20x1,5-1,5 m** RTD sensor with Pt100, class A, 4-wire connection, sheath length 80 mm and diameter 6 mm, with movable connector M20x1,5, silicone insulated lead wire length L=1,5 m

Intrinsically Safe Temperature Sensor for HVAC Application **TOPZ-842Exi**

Specification

Temperature range / sensing element

-50÷85°C **Pt100** class B

Sheath

- material stainless steel 1.4541
- length L [mm]: 50÷500 (standard 50 mm)

Housing

- aluminium alloy (max. 0,5%Mg), IP65
- cable gland ATEX II GD II IP65 (for cable 1÷5 mm)

Constructional version

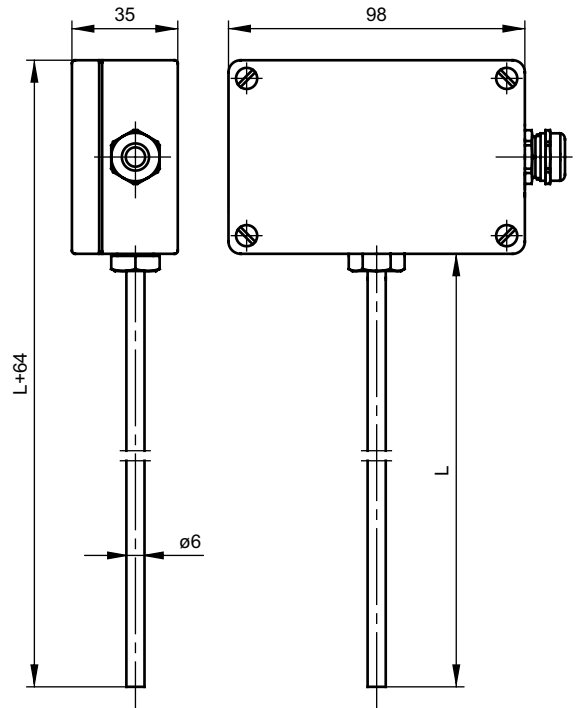
- Exi acc. to ATEX
- EC-Type Examination Certificate: **WE KDB 07ATEX055**
 II 2G Ex ia IIC T6
 II 2D Ex iaD 21 T85°C

Options

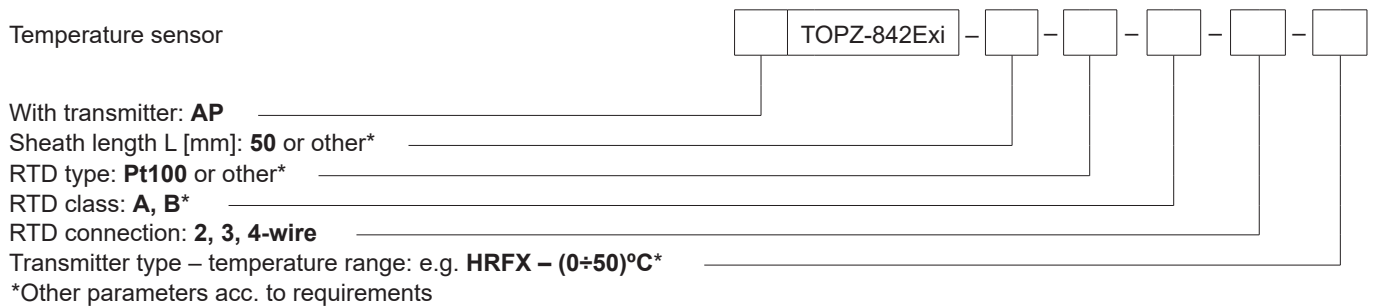
- Pt500, Pt1000
- 3-, 4-wire connection
- Pt100: class A -30÷85°C, class AA 0÷85°C

Additional equipment

- temperature transmitters – p. 162÷174



Ordering code



Przykład zamówienia: **TOPZ-842Exi-50-Pt1000-A-3** sensor with Pt1000, class A, 3-wire connection, sheath length L=50 mm

N

Intrinsically Safe Replaceable Measuring Inserts for Temperature Sensors **W..P-Exi, W..J-Exi,
 W..K-Exi, W...N-Exi, W...T-Exi**

Specification

Temperature range / sensing element

-200÷600°C	Pt100	class B
-40÷700°C	J	class 2
-40÷1200°C	K, N,	class 2
-40÷350°C	T	class 2

Sheath I, pipe execution

- material: stainless steel 1.4541, sheath diameter $\varnothing 6, 8$ [mm]
- operating temperature: max. 600°C
- standard sheath lengths L_w [mm]:*
 115, 175, 245, 375, 525 [mm] for $\varnothing 6$, $L_{max}=1500$ mm
 495, 705, 995, 1395, 1995 [mm] for $\varnothing 8$, $L_{max}=2025$ mm

Sheath II, mineral insulated execution: max. operating temp.

sheath diameters [mm]	$\varnothing 3$	$\varnothing 4,5$	$\varnothing 6$	$\varnothing 8$
thermocouple (J) material 1.4541	450°C	550°C	700°C	–
thermoc. (K, N) material INCONEL	900°C	1000°C	1200°C	1200°C
RTD Pt100 material 1.4571	400°C	–	600°C	–

length L_w [mm]: acc. to requirements (min 50)°C

Constructional version

- for intrinsically safe (Exi) temperature sensors produced by Limatherm Sensor acc. to ATEX

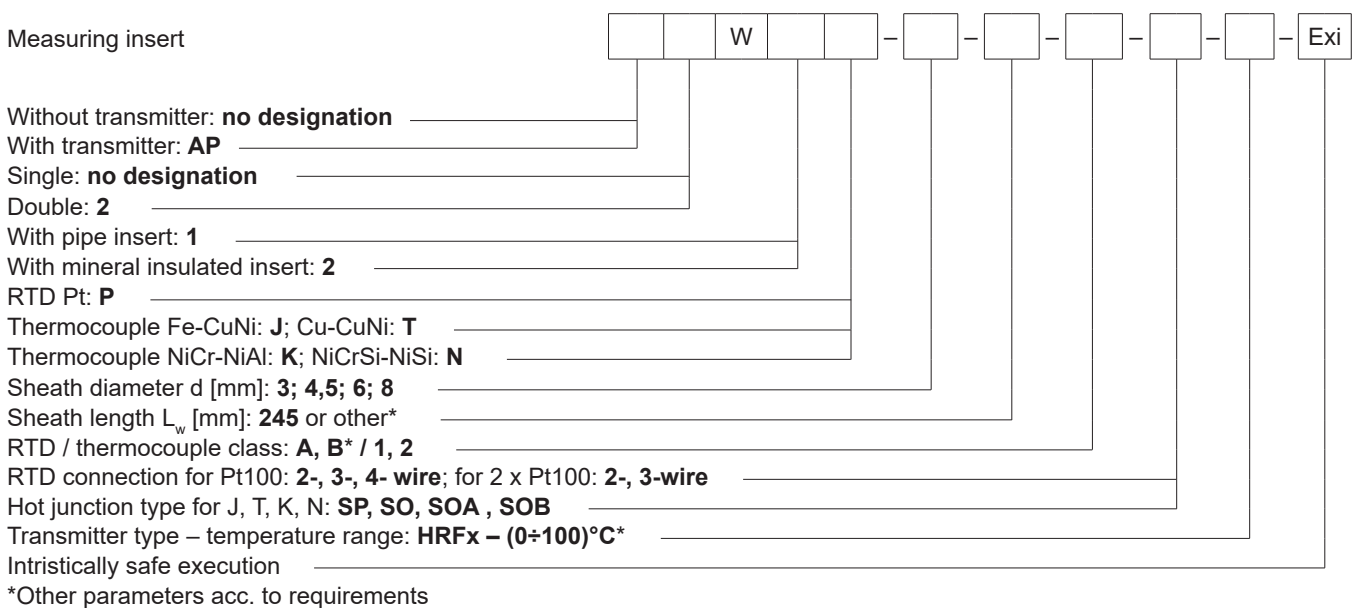
Options

- Pt500, Pt1000
- Pt100: class A -50÷400°C, class AA 0÷150°C; TC: class 1
- hot junction type – p. 13

Additional equipment

- temperature transmitters – p. 162÷174

Ordering code



Ordering example: **APW2K-3-5000-1-SO-FlexTop2211- (0÷800)°C-Exi**

Flameproof Temperature Sensors with Replaceable Measuring Insert **TOPGB-Exd, TTKGB-Exd, TTJGB-Exd**

Specification

Temperature range / sensing element

-200÷150°C	Pt100	class B
-40÷150°C	J, K,	class2

Measuring insert – p. 144

- 2-, 3-, 4-wire connection (for Pt100)
- 2-, 3-wire connection (for 2xPt100)
- measuring insert length L+67 mm

Thermowell

- material: stainless steel 1.4541
- diameter d [mm]: ø9, 11, 12, 14
- length L [mm]: 50÷2000

Connection head – p. 159

- aluminium XD-AD (AS1 – one cable gland, AS2 – two cable glands),
- aluminium, cover with window XD-ADwin (AS3 – one cable gland, AS4 – two cable glands)
- stainless steel XD-SD (NS1 – one cable gland, NS2 – two cable glands)
- cable gland: ATEX II 2 GD; ATEX I M2; IP 66÷68
- cable diameter: 3÷14,3 mm (standard 6,1÷11,7)

Constructional version

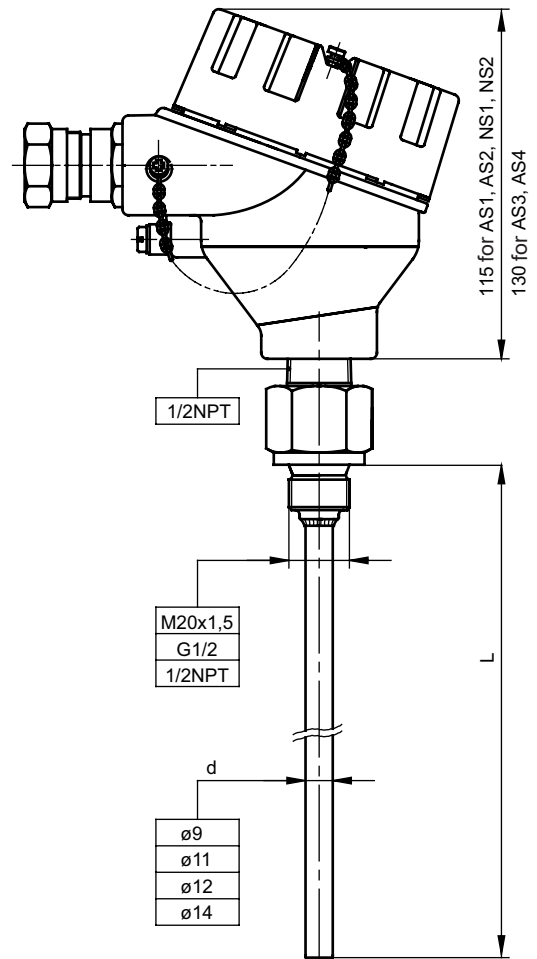
- Exd acc. to ATEX
- EC-Type Examination Certificate: **WE KDB 08ATEX135**
- I M2 Ex d I; (only with connection head NS1, NS2)
- II 2GD Ex d IIC T6; Ex tD A21 IP68 T85°C

Options

- Pt500, Pt1000, T, N
- other threads (inch and metrical) acc. to requirements
- Pt100: class A -50÷150°C, class AA 0÷150°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- local display LPI-02 (connection head AS3 or AS4) – p. 161



Ordering code

Temperature sensor



Single without transmitter: **no designation**

Double without transmitter: **2**

Single with transmitter: **AP**

Sensing element Pt: **OP**

Fe-CuNi: **TJ**; NiCr-NiAl: **TK**

Cu-CuNi: **TT**; NiCrSi-NiSi: **TN**

Connection head type - aluminium: **AS1, AS2, AS3, AS4** or stainless steel: **NS1, NS2**

Immersion length L [mm] / thermowell diameter d [mm]: **300/9** or other*

Thread dimension: **M20x1,5; G 1/2; 1/2 NPT** or other*

RTD type and class: **aA**, aB**** or thermocouple class: **1, 2**

RTD connection: **2, 3, 4-wire**; or hot junction type for TC: **SO, SOA, SOB, SP**

Transmitter type – temperature range: **TxBlock-(0÷100)°C***

Cable diameter for cable gland: **a** (3,2 mm÷8,7 mm), **b** – standard (6,1 mm÷11,7 mm), **c** (6,5 mm÷14 mm)

*Other parameters acc. to requirements

** a=1 for Pt100, a=5 for Pt500, a=10 for Pt1000

Ordering example:

TOPGB-Exd-AS2-200/11-1/2NPT-1A-3-b

Flameproof Temperature Sensors with Replaceable Measuring Insert **TOPGN-Exd, TTKGN-Exd, TTJGN-Exd**

Specification

Temperature range / sensing element

-200÷550°C	Pt100	class B
-40÷550°C	J, K,	class2

Measuring insert – p. 144

- 2-, 3-, 4-wire connection (for Pt100)
- 2-, 3-wire connection (for 2xPt100)
- measuring insert length L+164 mm

Thermowell

- material: stainless steel 1.4541
- diameter d [mm]: ø9, 11, 12, 14
- length L [mm]: 50÷2000

Connection head – p. 159

- aluminium XD-AD (AS1 – one cable gland, AS2 – two cable glands),
- aluminium, cover with window XD-ADwin (AS3 – one cable gland, AS4 two cable glands)
- stainless steel XD-SD (NS1 – one cable gland, NS2 – two cable glands)
- cable gland: ATEX II 2 GD; ATEX I M2; IP 66÷68
- cable diameter: 3÷14,3 mm (standard 6,1÷11,7)

Constructional version

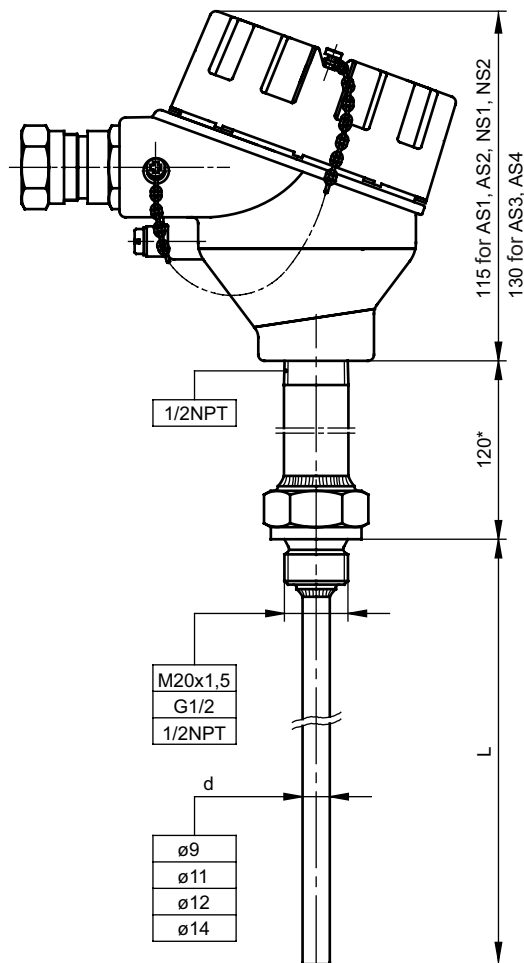
- Exd acc. to ATEX
- EC-Type Examination Certificate: **WE KDB 08ATEX135**
- I M2 Ex d I; (only with connection head NS1, NS2)
- II 2GD Ex d IIC T6; Ex tD A21 IP68 T85°C

Options

- Pt500, Pt1000, T, N
- other threads (inch and metrical) acc. to requirements
- Pt100: class A -50÷400°C, class AA -50÷250°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- local display LPI-02 (connection head AS3 or AS4) – p. 161



Ordering code

Temperature sensor



Single without transmitter: **no designation**

Double without transmitter: **2**

Single with transmitter: **AP**

Sensing element Pt: **OP**

Fe-CuNi: **TJ**; NiCr-NiAl: **TK**

Cu-CuNi: **TT**; NiCrSi-NiSi: **TN**

Connection head type - aluminium: **AS1, AS2, AS3, AS4** or stainless steel: **NS1, NS2**

Immersion length L [mm] / thermowell diameter d [mm]: **300/9** or other*

Thread dimension: **M20x1,5; G½; ½NPT** or other*

RTD type and class: **aA**, aB**** or thermocouple class: **1, 2**

RTD connection: **2, 3, 4-wire**; or hot junction type for TC: **SO, SOA, SOB, SP**

Transmitter type – temperature range: **TxBLOCK-(0÷100)°C***

Cable diameter for cable gland: **a** (3,2 mm÷8,7 mm), **b** – standard (6,1 mm÷11,7 mm), **c** (6,5 mm÷14 mm)

*Other parameters acc. to requirements

** a=1 for Pt100, a=5 for Pt500, a=10 for Pt1000

Ordering example:

TOPGN-Exd-AS3-500/12-G½-1B-2-a
APTTJGN-Exd-AS1-620/9-M20x1.5-SO-Tx-(0÷150)°C-b

Flameproof Temperature Sensors with Replaceable Measuring Insert **TOPP-Exd, TTKP-Exd, TTJP-Exd**

Specification

Temperature range / sensing element

-200÷550°C	Pt100	class B
-40÷700°C	J	class2
-40÷900°C	K	class2

Measuring insert – p. 144

- 2-, 3-, 4-wire connection (for Pt100)
- 2-, 3-wire connection (for 2xPt100)
- measuring insert length L+62 mm

Thermowell

- material: stainless steel 1.4541 d [mm]: ø12, 14 (up to 700°C)
- material: steel 1.4841 d [mm]: ø10, 15 (up to 900°C)
- material: steel 1.4762 d [mm]: ø15 (up to 900°C)
- length L [mm]: 100÷2000

Connection head – p. 159

- aluminium XD-AD (AS1 – one cable gland, AS2 – two cable glands),
- aluminium, cover with window XD-ADwin (AS3 – one cable gland, AS4 two cable glands)
- stainless steel XD-SD (NS1 – one cable gland, NS2 – two cable glands)
- cable gland: ATEX II 2 GD; ATEX I M2; IP 66÷68
- cable diameter: 3÷14,3 mm (standard 6,1÷11,7)

Constructional version

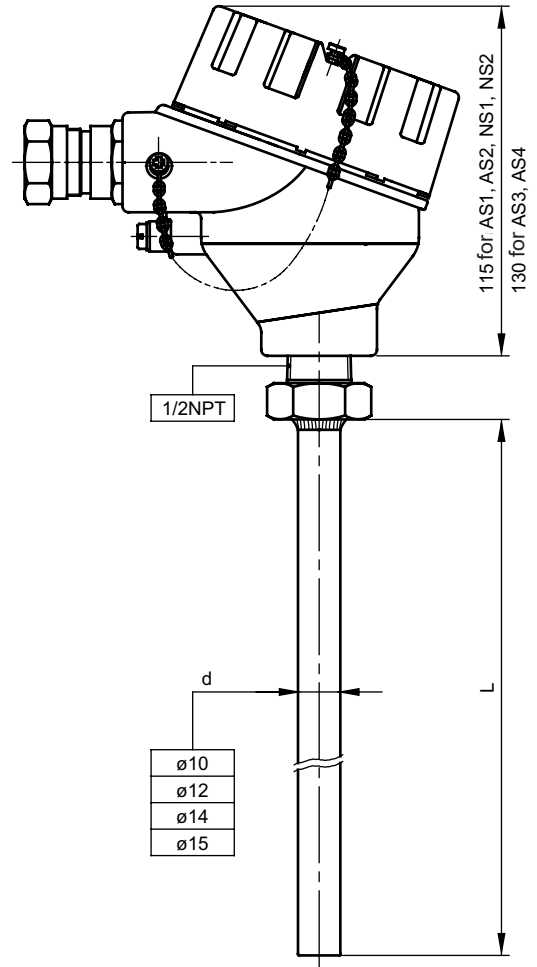
- Exd acc. to ATEX
- EC-Type Examination Certificate: **WE KDB 08ATEX135**
- I M2 Ex d I; (only with connection head NS1, NS2)
- II 2GD Ex d IIC T6; Ex tD A21 IP68 T85°C

Options

- Pt500, Pt1000, T, N
- Pt100: class A -50÷400°C, class AA 0÷150°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- local display LPI-02 (connection head AS3 or AS4) – p. 161



Ordering code

Temperature sensor



Single without transmitter: **no designation**

Double without transmitter: **2**

Single with transmitter: **AP**

Sensing element Pt: **OP**

Fe-CuNi: **TJ**; NiCr-NiAl: **TK**

Cu-CuNi: **TT**; NiCrSi-NiSi: **TN**

Connection head type - aluminium: **AS1, AS2, AS3, AS4** or stainless steel: **NS1, NS2**

Thermowell material: **1.4541, 1.4841, 1.4762**

Immersion length L [mm] / thermowell diameter d [mm]: **1000/15** or other*

RTD type and class: **aA**, aB**** or thermocouple class: **1, 2**

RTD connection: **2, 3, 4-wire**; or hot junction type for TC: **SO, SOA, SOB, SP**

Transmitter type – temperature range: **TxBlock-(0÷100)°C***

Cable diameter for cable gland: **a** (3,2 mm÷8,7 mm), **b** – standard (6,1 mm÷11,7 mm), **c** (6,5 mm÷14 mm)

*Other parameters acc. to requirements

** a = 1 for Pt100, a = 5 for Pt500, a = 10 for Pt1000

Ordering example:

TOPP-Exd-AS4-1.4541-600/12-1A-3-a
APTTKP-Exd-NS1-1.4841-900/15-1-SO-Tx-(0÷800)°C-b

Flameproof Temperature Sensors with Replaceable Measuring Insert TOPT-Exd, TTKT-Exd, TTJT-Exd

Specification

Temperature range / sensing element

-200÷550°C	Pt100	class B
-40÷550°C	J, K,	class2

Measuring insert – p. 144

- 2-, 3-, 4-wire connection (for Pt100)
- 2-, 3-wire connection (for 2xPt100)
- measuring insert length L+164 mm

Thermowell

- material: stainless steel 1.4541; flange PN16, DN20 or DN25* with lap B1
- diameter d [mm]: ø11, 12, 14
- length L [mm]: 50±2000

Connection head – p. 159

- aluminium XD-AD (AS1 – one cable gland, AS2 – two cable glands),
- aluminium, cover with window XD-ADwin (AS3 – one cable gland, AS4 – two cable glands)
- stainless steel XD-SD (NS1 – one cable gland, NS2 – two cable glands)
- cable gland: ATEX II 2 GD; ATEX I M2; IP 66÷68
- cable diameter: 3÷14,3 mm (standard 6,1±11,7)

Constructional version

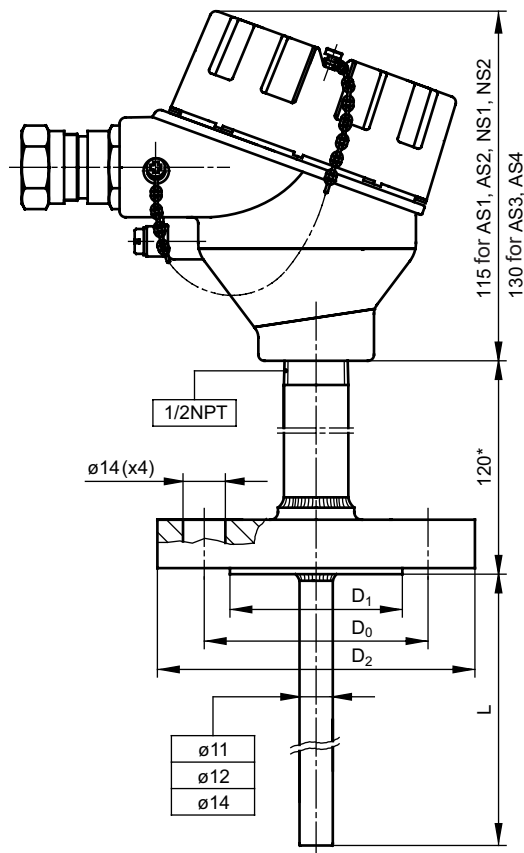
- Exd acc. to ATEX
- EC-Type Examination Certificate: **WE KDB 08ATEX135**
- I M2 Ex d I; (only with connection head NS1, NS2)
- II 2GD Ex d IIC T6; Ex tD A21 IP68 T85°C

Options

- Pt500, Pt1000, T, N
- Pt100: class A -50÷400°C, class AA 0÷150°C; TC: class 1

Additional equipment

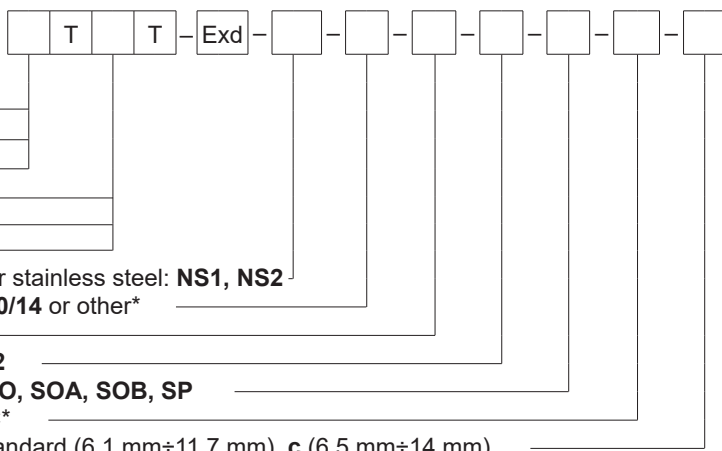
- temperature transmitters – pp. 162÷174
- local display LPI-02 (connection head AS3 or AS4) – p. 161



flange	D ₂ [mm]	D ₀ [mm]	D ₁ [mm]
DN20	ø105	ø75	ø58
DN25	ø115	ø85	ø68

Ordering code

Temperature sensor



Single without transmitter: **no designation**

Double without transmitter: **2**

Single with transmitter: **AP**

Sensing element Pt: **OP**

Fe-CuNi: **TJ**; NiCr-NiAl: **TK**

Cu-CuNi: **TT**; NiCrSi-NiSi: **TN**

Connection head type - aluminium: **AS1, AS2, AS3, AS4** or stainless steel: **NS1, NS2**

Immersion length L [mm] / thermowell diameter d [mm]: **300/14** or other*

Flange type: **D20 PN16B1** or other*

RTD type and class: **aA**, aB**** or thermocouple class: **1, 2**

RTD connection: 2, 3, 4-wire; or hot junction type for TC: **SO, SOA, SOB, SP**

Transmitter type – temperature range: **TxBLOCK-(0÷100)°C***

Cable diameter for cable gland: **a** (3,2mm±8,7 mm), **b** – standard (6,1 mm±11,7 mm), **c** (6,5 mm±14 mm)

*Other parameters acc. to requirements

** a=1 for Pt100, a=5 for Pt500, a=10 for Pt1000

Ordering example:

TOPT-Exd-NS1-600/11-DN20PN16B1-1A-3-a
APTJT-Exd-AS1-900/12-DN25PN20B1-2-SO-FT2211(0÷200)°C-b

Flameproof Temperature Sensors with Replaceable Measuring Insert **TOPSW-Exd, TTKSW-Exd, TTJSW-Exd**

Specification

Temperature range / sensing element

-200÷550°C	Pt100	class B
-40÷550°C	J, K,	class2

Measuring insert – p. 144

- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- insert length L+159 mm

Thermowell

- material: steel 1.7335 (15HM) or 1.4541
- diameter [mm] ϕ 18h7, 24h7, 32h7
- dimensions L/L₁[mm] 100/ 35, 140/ 65, 200/ 65, 260/ 125 (for ϕ 18)
 100/ 35, 140/ 65, 200/ 65, 260/ 125 (for ϕ 24, 32)

Connection head – p. 159

- aluminium XD-AD (AS1 – one cable gland, AS2 – two cable glands),
- aluminium, cover with window XD-ADwin (AS3 – one cable gland, AS4 – two cable glands)
- stainless steel XD-SD (NS1 – one cable gland, NS2 – two cable glands)
- cable gland: ATEX II 2 GD; ATEX I M2; IP 66÷68
- cable diameter: 3÷14,3 mm (standard 6,1÷11,7)

Constructional version

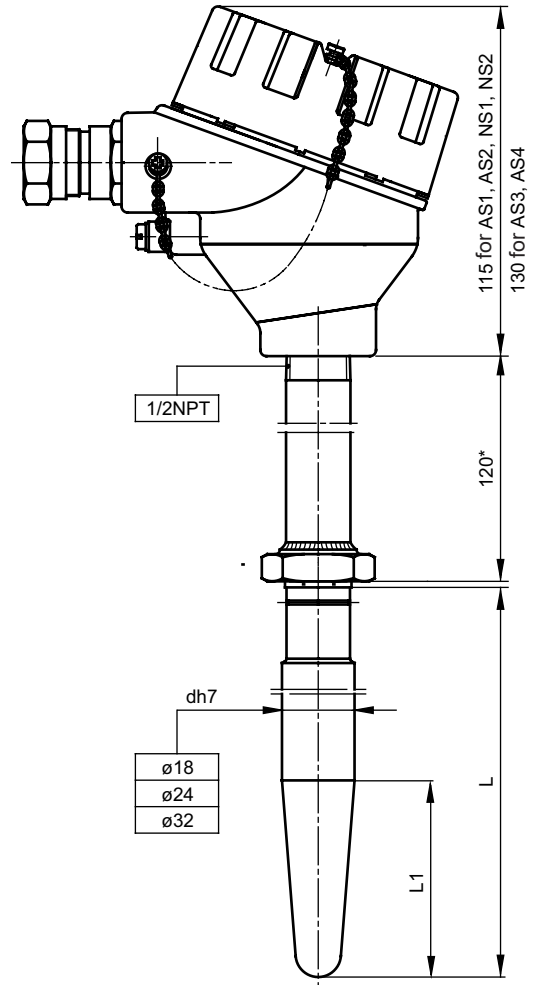
- Exd acc. to ATEX
- EC-Type Examination Certificate: **WE KDB 08ATEX135**
- I M2 Ex d I; (only with connection head NS1, NS2)
- II 2GD Ex d IIC T6; Ex tD A21 IP68 T85°C

Options

- Pt500, Pt1000, T, N
- Pt100: class A -50÷400°C, class AA 0÷150°C; TC: class 1

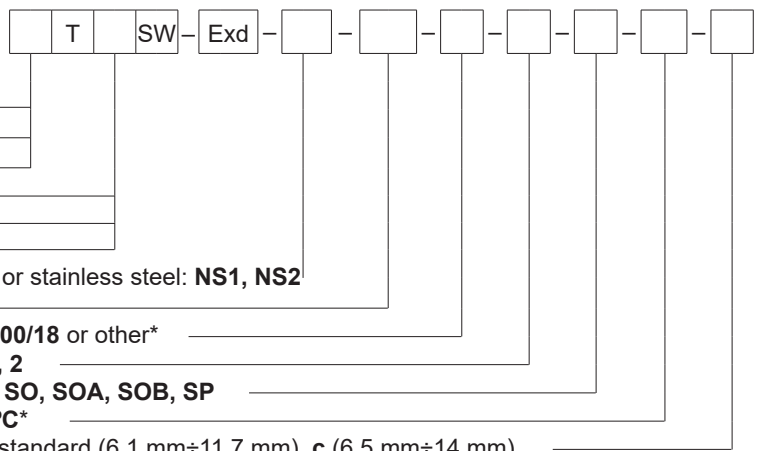
Additional equipment

- temperature transmitters – pp. 162÷174
- local display LPI-02 (connection head AS3 or AS4) – p. 161



Ordering code

Temperature sensor



- Single without transmitter: **no designation**
- Double without transmitter: **2**
- Single with transmitter: **AP**
- Sensing element Pt: **OP**
- Fe-CuNi: **TJ**; NiCr-NiAl: **TK**
- Cu-CuNi: **TT**; NiCrSi-NiSi: **TN**
- Connection head type - aluminium: **AS1, AS2, AS3, AS4** or stainless steel: **NS1, NS2**
- Thermowell material: **1.4541, 1.7335**
- Immersion length L [mm] / thermowell diameter d [mm]: **200/18** or other*
- RTD type and class: **aA**, aB**** or thermocouple class: **1, 2**
- RTD connection: **2, 3, 4-wire**; or hot junction type for TC: **SO, SOA, SOB, SP**
- Transmitter type – temperature range: **TxBLOCK-(0÷100)°C***
- Cable diameter for cable gland: **a** (3,2 mm÷8,7 mm), **b** – standard (6,1 mm÷11,7 mm), **c** (6,5 mm÷14 mm)

*Other parameters acc. to requirements
 ** a = 1 for Pt100, a = 5 for Pt500, a = 10 for Pt1000

Ordering example:

TOPSW-Exd-AS3-1.7335-200/18-1B-2-a
APTKSW-Exd-NS1-1.4541-140/24-1-SO-(0÷250)°C-b

Flameproof Temperature Sensors with Replaceable Measuring Insert **TOPSWT-Exd, TTKSWT-Exd, TTJSWT-Exd**

Specification

Temperature range / sensing element

-200÷550°C	Pt100	class B
-40÷550°C	J, K	class 2

Measuring insert – p. 144

- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- insert length L+215 mm

Thermowell

- material: stainless steel 1.4541; flange PN16, DN20 or DN25*
- bored thermowell with welded flange
- diameter d [mm]: min. $\phi 16$
- length L [mm]: 100÷570

Connection head – p. 159

- aluminium XD-AD (AS1 – one cable gland, AS2 – two cable glands),
- aluminium, cover with window XD-ADwin (AS3 – one cable gland, AS4 – two cable glands)
- stainless steel XD-SD (NS1 – one cable gland, NS2 – two cable glands)
- cable gland: ATEX II 2 GD; ATEX I M2; IP 66÷68
- cable diameter: 3÷14,3 mm (standard 6,1÷11,7)

Constructional version

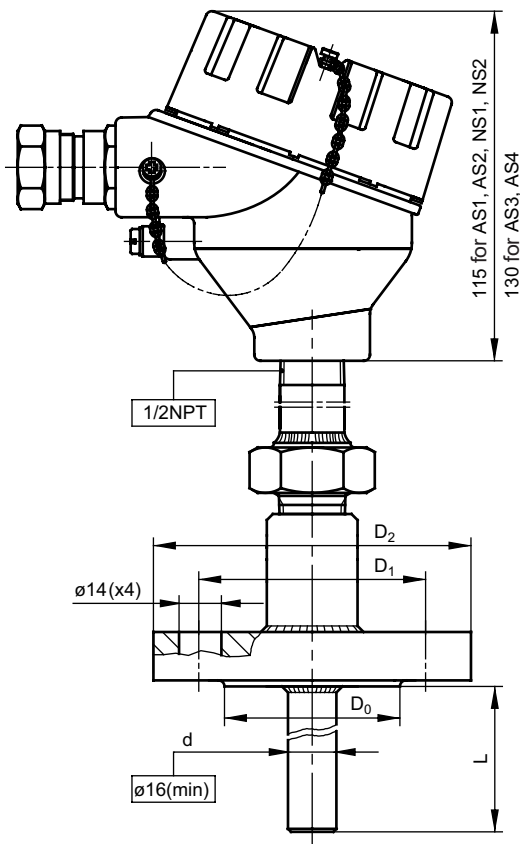
- Exd acc. to ATEX
- EC-Type Examination Certificate: **WE KDB 08ATEX135**
- I M2 Ex d I; (only with connection head NS1, NS2)
- II 2GD Ex d IIC T6; Ex tD A21 IP68 T85°C

Options

- Pt500, Pt1000, T, N
- Pt100: class A -50÷400°C, class AA 0÷150°C; TC: class 1

Additional equipment

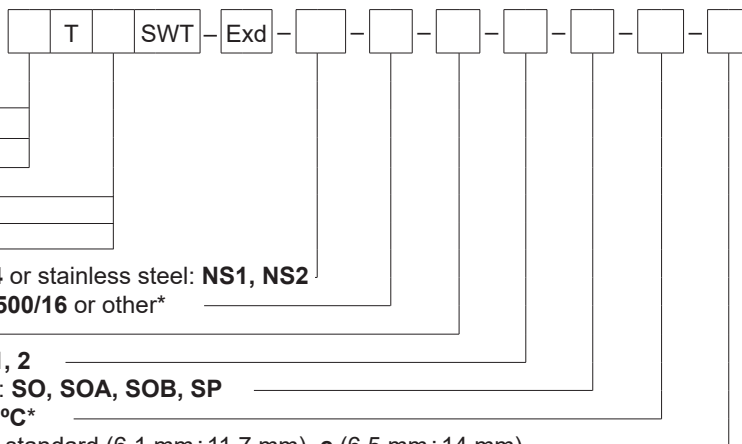
- temperature transmitters – pp. 162÷174
- local display LPI-02 (connection head AS3 or AS4) – p. 161



flange	D ₂ [mm]	D ₀ [mm]	D ₁ [mm]
DN20	$\phi 105$	$\phi 75$	$\phi 58$
DN25	$\phi 115$	$\phi 85$	$\phi 68$

Ordering code

Temperature sensor



Single without transmitter: **no designation**

Double without transmitter: **2**

Single with transmitter: **AP**

Sensing element Pt: **OP**

Fe-CuNi: **TJ**; NiCr-NiAl: **TK**

Cu-CuNi: **TT**; NiCrSi-NiSi: **TN**

Connection head type - aluminium: **AS1, AS2, AS3, AS4** or stainless steel: **NS1, NS2**

Immersion length L [mm] / thermowell diameter d [mm]: **500/16** or other*

Flange type: **DN20 PN16** or other*

RTD type and class: **aA**, aB**** or thermocouple class: **1, 2**

RTD connection: **2, 3, 4-wire**; or hot junction type for TC: **SO, SOA, SOB, SP**

Transmitter type – temperature range: **TxBLOCK-(0÷100)°C***

Cable diameter for cable gland: **a** (3,2 mm÷8,7 mm), **b** – standard (6,1 mm÷11,7 mm), **c** (6,5 mm÷14 mm)

*Other parameters acc. to requirements

** a = 1 for Pt100, a = 5 for Pt500, a = 10 for Pt1000

Ordering example:

TOPSWT-Exd-AS3-400/16-DN251B-3-b
APTKSWT-Exd-AS1-570/18-DN20-1-SO-FlexTop2231-(0÷100)°C-FlexTop2231-c

Flameproof Temperature Sensors with Replaceable Measuring Insert **TOPSWG-Exd, TTKSWG-Exd, TTJSWG-Exd**

Specification

Temperature range / sensing element

-200÷550°C	Pt100	class B
-40÷550°C	J, K	class 2

Measuring insert – p. 144

- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- insert length L+215 mm

Thermowell

- material: stainless steel 1.4541
- bored thermowell with threaded connector
- diameter d [mm]: min. ø16
- length L [mm]: 100÷570

Connection head – p. 159

- aluminium XD-AD (AS1 – one cable gland, AS2 – two cable glands),
- aluminium, cover with window XD-ADwin (AS3 – one cable gland, AS4 – two cable glands)
- stainless steel XD-SD (NS1 – one cable gland, NS2 – two cable glands)
- cable gland: ATEX II 2 GD; ATEX I M2; IP 66÷68
- cable diameter: 3÷14,3 mm (standard 6,1÷11,7)

Constructional version

- Exd acc. to ATEX
- EC-Type Examination Certificate: **WE KDB 08ATEX135**
- I M2 Ex d I; (only with connection head NS1, NS2)
- II 2GD Ex d IIC T6; Ex tD A21 IP68 T85°C

Options

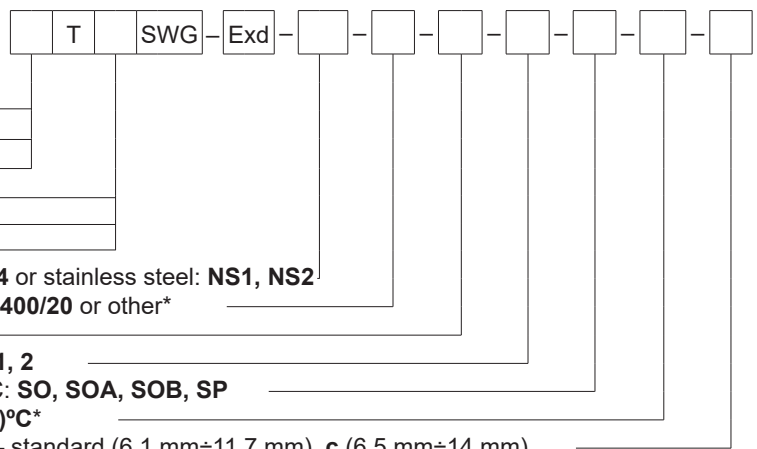
- Pt500, Pt1000, T, N
- another inch and metric threads according to agreement
- Pt100: class A -50÷400°C, class AA 0÷150°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- local display LPI-02 (connection head AS3 or AS4) – p. 161

Ordering code

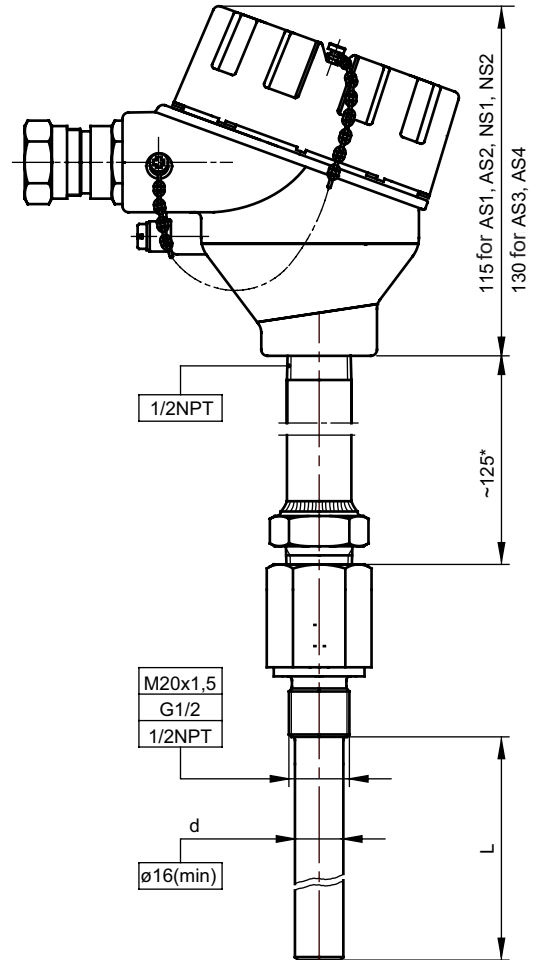
Temperature sensor



Single without transmitter: **no designation**
 Double without transmitter: **2**
 Single with transmitter: **AP**
 Sensing element Pt: **OP**
 Fe-CuNi: **TJ**; NiCr-NiAl: **TK**
 Cu-CuNi: **TT**; NiCrSi-NiSi: **TN**
 Connection head type - aluminium: **AS1, AS2, AS3, AS4** or stainless steel: **NS1, NS2**
 Immersion length L [mm] / thermowell diameter d [mm]: **400/20** or other*
 Thread dimension: **M20x1,5; G½; ½NPT** or other*
 RTD type and class: aA**, aB** or thermocouple class: **1, 2**
 RTD connection: **2, 3, 4-wire**; or hot junction type for TC: **SO, SOA, SOB, SP**
 Transmitter type – temperature range: **TxBlock-(0÷100)°C***
 Cable diameter for cable gland: **a** (3,2 mm÷8,7 mm), **b** – standard (6,1 mm÷11,7 mm), **c** (6,5 mm÷14 mm)

*Other parameters acc. to requirements
 ** a = 1 for Pt100, a = 5 for Pt500, a = 10 for Pt1000

Ordering example: **TOPSWG-Exd-AS1-350/18-½NPT-1B-2-a**
APTTKSWG-Exd-NS2-570/16-G½-2-SO-Tx-0÷300)°C-b



P

Flameproof Temperature Sensors with Replaceable Measuring Insert **TOPI-Exd, TTKI-Exd, TTJI-Exd**

Specification

Temperature range / sensing element

-200÷550°C	Pt100	class B
-40÷700°C	J	class2
-40÷900°C	K	class2

Measuring insert – p. 144

- 2-, 3-, 4- wire connection (for Pt100)
- 2-, 3- wire connection (for 2xPt100)
- insert length L+42 mm

Sheath

- sheath material: stainless steel 1.4541 (J); 1.4571 (Pt); 2.4816 (K)
- diameter d [mm]: min. ø3; 4,5; 8 for J, K; ø3; 6 for RTD
- length L [mm]: min. 100

Connection head – p. 159

- aluminium XD-AD (AS1 – one cable gland, AS2 – two cable glands),
- aluminium, cover with window XD-ADwin (AS3 – one cable gland, AS4 – two cable glands)
- stainless steel XD-SD (NS1 – one cable gland, NS2 – two cable glands)
- cable gland: ATEX II 2 GD; ATEX I M2; IP 66÷68
- cable diameter: 3÷14,3 mm (standard 6,1÷11,7)

Constructional version

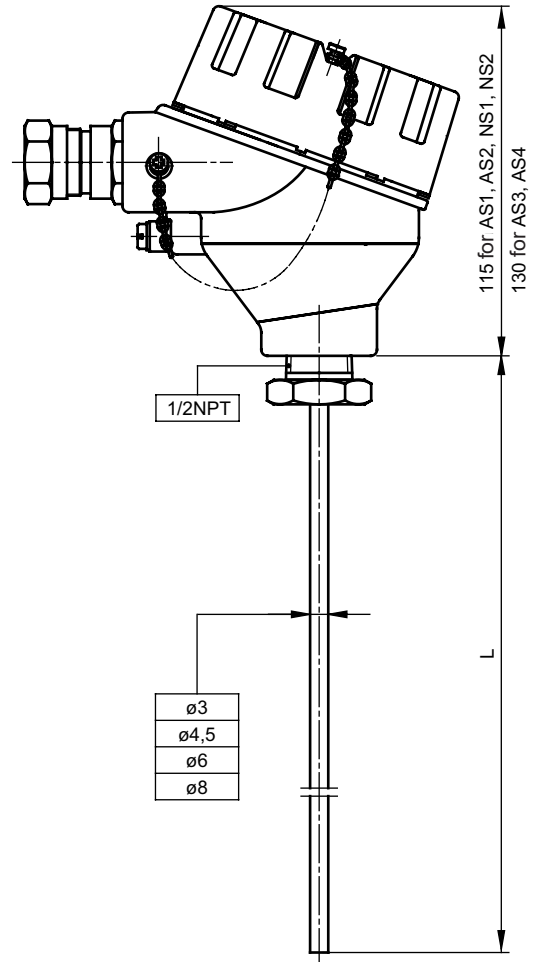
- Exd acc. to ATEX
- EC-Type Examination Certificate: **WE KDB 08ATEX135**
- I M2 Ex d I; (only with connection head NS1, NS2)
- II 2GD Ex d IIC T6; Ex tD A21 IP68 T85°C

Options

- Pt500, Pt1000, T, N
- Pt100: class A -50÷400°C, class AA 0÷150°C; TC: class 1

Additional equipment

- temperature transmitters – pp. 162÷174
- local display LPI-02 (connection head AS3 or AS4) – p. 161



Ordering code

Temperature sensor



Single without transmitter: **no designation**

Double without transmitter: **2**

Single with transmitter: **AP**

Sensing element Pt: **OP**

Fe-CuNi: **TJ**; NiCr-NiAl: **TK**

Cu-CuNi: **TT**; NiCrSi-NiSi: **TN**

Connection head type - aluminium: **AS1, AS2, AS3, AS4** or stainless steel: **NS1, NS2**

Immersion length L [mm]: **2000** or other*

Sheath diameter d [mm]: **6** or other*

RTD type and class: aA**, aB** or thermocouple class: **1, 2**

RTD connection: 2, 3, 4-wire; or hot junction type for TC: **SO, SOA, SOB, SP**

Transmitter type – temperature range: **TxBLOCK-(0÷100)°C***

Cable diameter for cable gland: **a** (3,2 mm÷8,7 mm), **b** – standard (6,1 mm÷11,7 mm), **c** (6,5 mm÷14 mm)

*Other parameters acc. to requirements

** a = 1 for Pt100, a = 5 for Pt500, a = 10 for Pt1000

Ordering example:

TOPI-Exd-AS3-500-6-1B-2-a

APTTNI-Exd-AS1-800-6-SP-Tx-(0÷150)°C-b

Flameproof Replaceable Measuring Inserts for Temperature Sensors **WP-Exd, WJ-Exd, WK-Exd**

Specification

Temperature range / sensing element

-200÷600°C	Pt100	class B
-40÷700°C	J	class 2
-40÷1200°C	K, N,	class 2
-40÷350°C	T	class 2

Sheath II, mineral insulated execution: max. operating temp.

Sheath diameters d_c [mm]:	$\varnothing 3$	$\varnothing 4,5$	$\varnothing 6$	$\varnothing 8$
Thermocouple T material: 1.4541:	350°C	350°C	350°C	–
Thermocouple J material: 1.4541:	450°C	550°C	700°C	–
Thermocouple N material: INCONEL600:	900°C	1000°C	1200°C	1200°C
Thermocouple K material: INCONEL600:	900°C	1000°C	1200°C	1200°C
RTD Pt100 material: 1.4541:	600°C	–	600°C	–

Length L_w [mm]: acc. to requirements

Constructional version

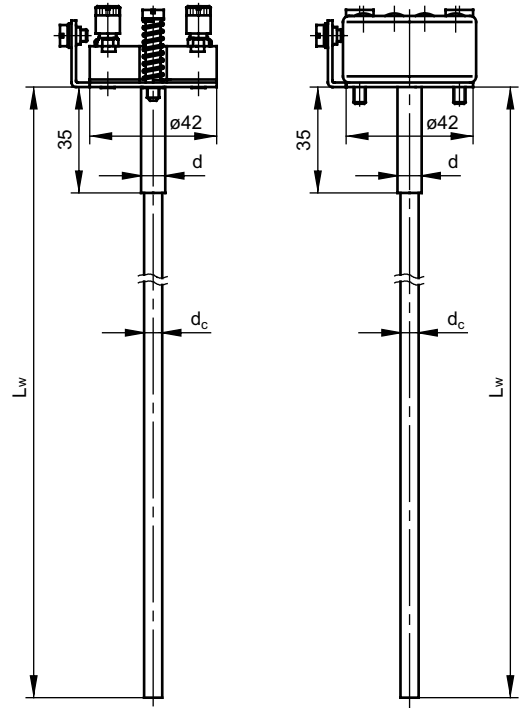
– for flameproof (Exd) temperature sensors produced by Limatherm Sensor

Options

- Pt500, Pt1000
- Pt100: class A -100÷450°C, class AA -50÷150°C; TC: class 1
- hot junction type: SO, SP, SOA, SOB – p. 13

Additional equipment

– temperature transmitters – p. 162÷174

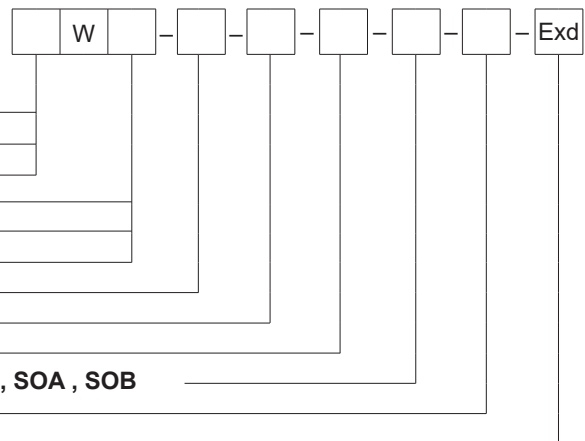


Diameter d_c w [mm]	Diameter d w [mm]
$\varnothing 3$	$\varnothing 6$ ^{+0,06} / _{-0,03}
$\varnothing 4,5$	$\varnothing 6$ ^{+0,06} / _{-0,03}
$\varnothing 6$	$\varnothing 8$ ^{+0,06} / _{-0,02}
$\varnothing 8$	$\varnothing 10$ ^{+0,06} / _{-0,03}

Ordering code

Temperature sensor

- Single without transmitter: **no designation**
- Double without transmitter: **2**
- Single with transmitter: **AP**
- RTD: **P1** for Pt100; **P5** for Pt500; **P10** for Pt1000
- Thermocouple Fe-CuNi: **J**; Cu-CuNi: **T**
- Thermocouple NiCr-NiAl: **K**; NiCrSi-NiSi: **N**
- Outer sheath diameter d_c : acc. to specification **3; 4,5; 6; 8**
- Sheath length L_w [mm]: **1000** or other*
- RTD / thermocouple class: **A, B*** / **1, 2**
- RTD connection: **2-, 3-, 4- wire** or hot junction type for TC: **SP, SO, SOA, SOB**
- Transmitter type – temperature range: **TxBLOCK – (0÷100)°C***
- For sensors with flameproof sheath
- *Other parameters acc. to requirements



Ordering example:

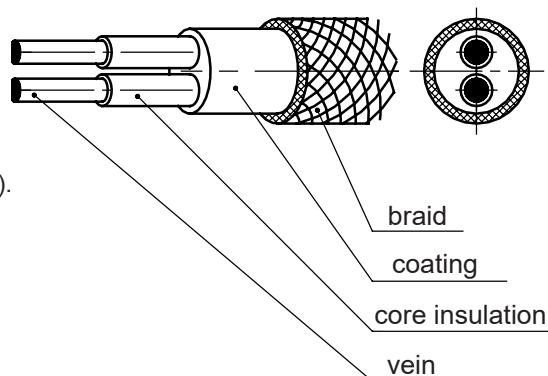
WP1-6-500-A-3-Exd
APWK-3-1000-1-SO-TxBLOCK-(0÷300)°C-Exd

Compensation Cables

Specification

Characteristic

- insulation resistance: min. 10 MΩ x km
- range of execution: up to 25 pairs
- voltage testing: 1000V
- cable structure and colours acc. to EU ICE 584-3
- based on IEC norm cables are produced as compensation (second letter of symbol designation C) or extension (second letter X).
- extension cables are made of the same materials as thermo couple, less expensive with lower class of temperature tolerance are compensation cables made of substitute materials



Ordering code

Compensation cable

Cable and thermocouple type:

K, compensation cable: **KCA; KCB**

K, extension cable: **KX**

J, extension cable: **JX**

R/S, compensation cable: **RC/SC**

T, extension cable: **TX**

B, compensation cable: **BC**

E, extension cable: **EX**

N, compensation cable: **NC**

N, extension cable: **NX**

Conductor insulation: **PVC** (-20÷105°C): **Yc**

Silicone (-50÷200°C): **Si**

Teflon (-50÷260°C): **F**

Fiberglass (-50÷400°C): **Ws**

Conductor type: Solid wire: **D**

Stranded wire: **L**

Conductor insulation: PVC (-20÷105°C): **Yc**

Silicone (-50÷200°C): **Si**

Teflon (-50÷260°C): **F**

Fiberglass (-50÷400°C): **Ws**

Braid: without braid: **no designation**

zinc-plated copper wire: **ek**

steel wire: **u**

Number of conductor pairs: **1÷25x**

Conductor cross section: 0,22 mm²: **2x0,22**

0,50 mm²: **2x0,50**

0,75 mm²: **2x0,75**

1,00 mm²: **2x1,00**

1,50 mm²: **2x1,50**

Cable structure and colours acc. to EU IEC 584-3

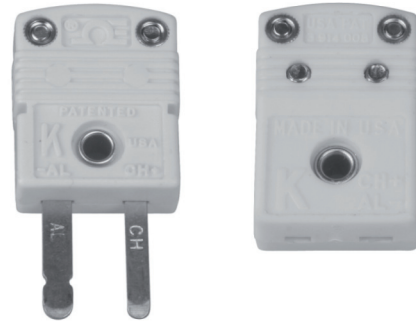
Type	Compensation cable	Extension cable	Composition		Insulation colour	
			Conductor +	Conductor -	Conductor +	Conductor -
T		TX	Cu	CuNi	Brown	White
J		JX	Fe	CuNi	Black	White
E		EX	NiCr	CuNi	Violet	White
K		KX	NiCr	NiAl	Green	White
K	KCA		Fe	410 Alloy	Green	White
N		NX	Nicrosil	Nisil	Pink	White
R	RCA		Cu	11 Alloy	Orange	White
S	SCA		Cu	11 Alloy	Orange	White
B	BC		Cu	Cu	Grey	White

Plugs and Sockets

Specification

Plug SMPW-*–M

Miniature plug for thermocouple sensors
operating temperature: -20÷220°C
lead wire diameter max. $\varnothing 4$ mm
* thermocouple type: J, K, N, R, S, T, B



Socket SMPW-*–F

Miniature socket for thermocouple sensors
operating temperature: -20÷220°C
lead wire diameter max. $\varnothing 4$ mm
* thermocouple type: J, K, N, R, S, T, B

Plug OSTW-*–M

Standard plug for thermocouple sensors
operating temperature: -20÷220°C
lead wire diameter max. $\varnothing 8$ mm
* thermocouple type: J, K, N, R, S, T, B



Socket OSTW-*–F

Standard socket for thermocouple sensors
operating temperature: -20÷220°C
lead wire diameter max. $\varnothing 8$ mm
* thermocouple type: J, K, N, R, S, T, B

Plug FFA.1S

LEMO plug for sensors
operating temperature: -50÷250°C
lead wire diameter max. $\varnothing 6$ mm



Socket PCA.1S

LEMO socket for sensors
operating temperature: -50÷250°C
lead wire diameter max. $\varnothing 6$ mm

Plug MTP–U–M.

Miniature plug for RTD sensors
operating temperature: -20÷220°C
lead wire diameter max. $\varnothing 4$ mm



Socket MTP–U–F

Miniature socket for RTD sensors
operating temperature: -20÷220°C
lead wire diameter max. $\varnothing 4$ mm

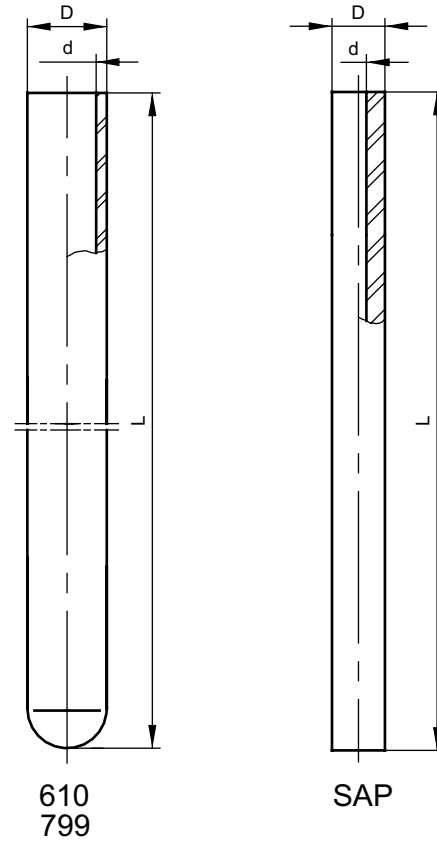
Protection tube **OC**

Specification

Material*

Ceramics: mullite 610 or corundum 799 acc. to PN-EN-60672:2002, and monocrystal SAP

Properties/ kind	610	799	SAP
Content of Al ₂ O ₃ [%]	60	99,7	99,999
Density [g/cm ³]	2,6	3,7	3,98
Bending resistance [MPa]	120	300	—
Resistance to temperature changes [K]	150	150	nonresistant
Thermal conductivity [W/mxK]	10	25	33,5
Mosh hardness	8	9	9
Temperature of application [°C]	1400	1700	2000



Dimensions*

D/d	5/3	6/4	8/5	10/6	15/10	24/18(19)
610	—	—	—	x	x	x
799	x	x	x	x	x	x
L_{max}	520	1430		2030		

SAP

D/d	4,8/3,4	8/5	10/3
L_{max}	180 ÷ 1645	370 ÷ 1500	430 ÷ 1320

*Other parameters acc. to requirements

Ordering code

Protection tube



Protection tube dimension D [mm]: **15** or other

Material: **799** or other

Protection tube length L [mm]: **1030** or other

Ordering example:

Protection tube OC-10-799-1030

Coupling for welding **MP, MS**

Specification

Material*

Stainless steel 1.4541
 Carbon steel 15 HM

Dimensions*

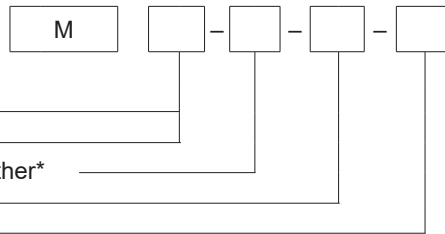
thread D: M20x1,5mm, G½
 length L [mm]: 50÷200

Type

straight: MP
 slanted (45°): MS

Ordering code

Coupling

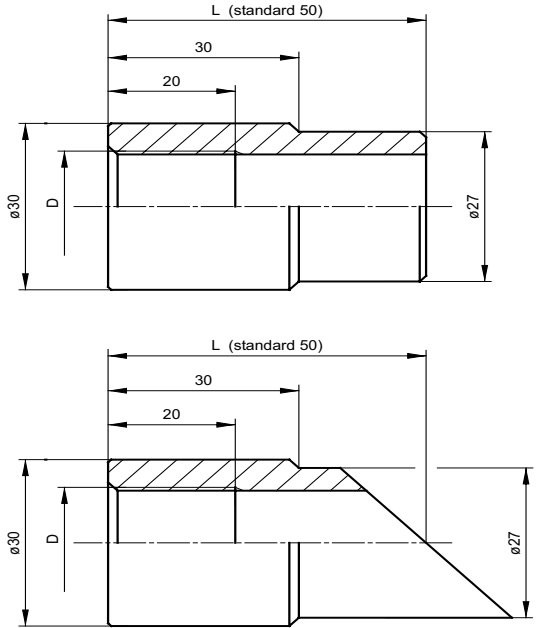


Straight: **P**
 Slanted: **S**
 Thread dimension D: **M20x1,5** or other*
 Length L [mm]: **50**
 Material: **1.4541, 15 HM**

*Other parameters acc. to requirements

Ordering example:

Coupling MP-50-15HM



Protection tube **OS-1, OS-2**

Dane techniczne

Material*

Stainless steel 1.4541 acc. to PN-EN 10088
 Max. operating temperature in air 800°C

Dimensions*

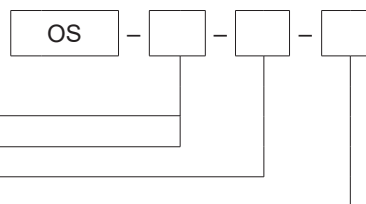
D	4	5	6	8	9	10	11	12	15
g	0,4	0,5	0,5	0,6	1	1,5	2	1,5	2
L[mm]	50÷2000								

Protection tube length L [mm] = 5÷2000

*Other parameters acc. to requirements

Ordering code

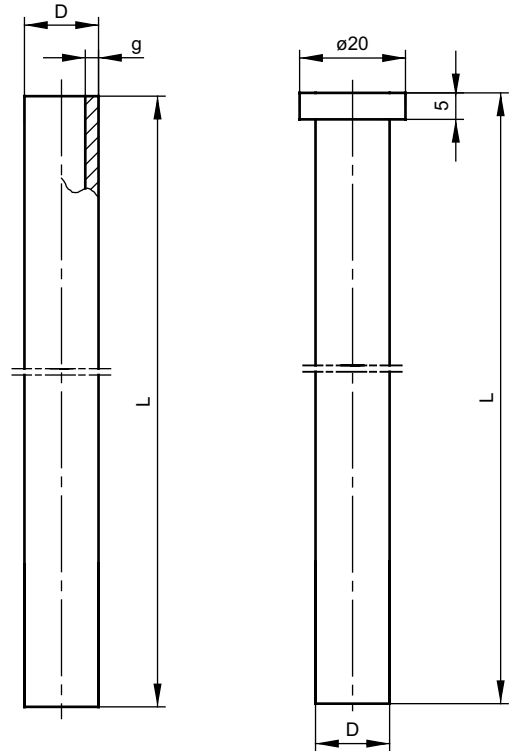
Protection tube



Straight protection tube: **1**
 Protection tube with flange: **2**
 Tube dimensions D [mm]: **6** or other
 Protection tube length L [mm]: **100** or other

Ordering example:

Protection tube OS-1-9-250



Protection tube **OS-3**

Specification

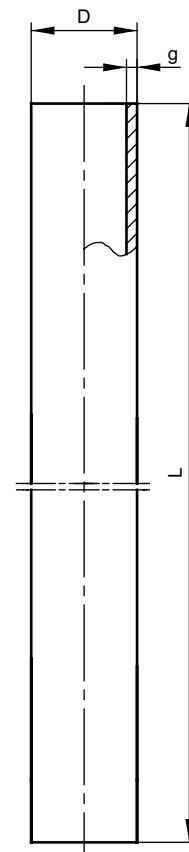
Material*

Heat resistant steel 1.4841
 Creep resistant steel 1.4762; 15Cr25Ti

Dimensions*

Kind	Dxg			
	10x1	15x2	20x2	22x2
1.4841	X	X	X	X
1.4762	-	X	-	X
15Cr25T	-	-	X	X

Protection tube length L [mm] = 200÷3000
 *Other parameters acc. to requirements



Ordering code

Protection tube



Tube dimension D [mm]: **20** or other
 Protection tube length L [mm]: **1000** or other
 Material: **1.4841** or other

Ordering example: **Protection tube OS-3-10-300-1.4841**

Protection tube **OS-4**

Specification

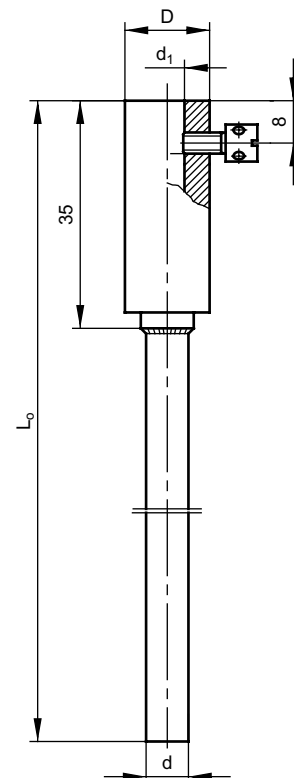
Material*

Stainless steel 1.4541

Dimensions*

D	16				20	
	8	9	10	11	12	14
d	6,8	7		8,8	10	
d ₁	6,8		7		8,8	10

Protection tube length L [mm] = 50÷2000
 *Other parameters acc. to requirements



Ordering code

Protection tube



Tube dimension d [mm]: **12** or other
 Protection tube length L_o [mm]: **500** or other

Ordering example: **Protection tube OS-4-10-100**

Thermowell OG

Specification

Material*

Stainless steel 1.4541

Dimensions*

Thread M: G $\frac{1}{4}$; G $\frac{3}{8}$; G $\frac{1}{2}$; G $\frac{3}{4}$

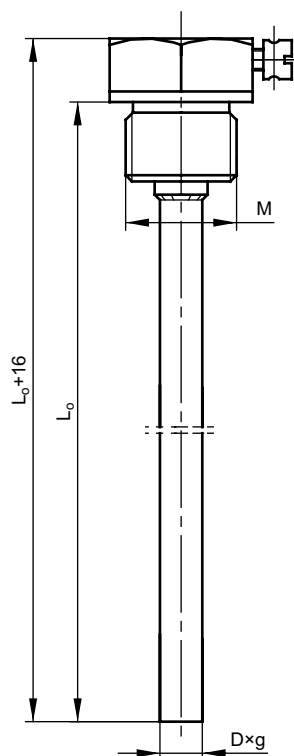
M14x1,5; M16x1,5; M18x1,5

M20x1,5; M27x2

M _{min}	G $\frac{1}{4}$		M16	M20		
D	8	9	10	11	12	14
g	0,6	1,0	1,5	2	1,5	2

Thermowell length L_o [mm] = 50÷2000

*Other parameters acc. to requirements



Ordering code

Thermowell



Tube dimension D [mm]: **11** or other

Thread dimension M: **M20x1,5** or other

Thermowell length L [mm]: **100** or other

Attention!

For matching thermowell with sensor length L, L_o = L - 14

Ordering example:

Thermowell OG-8-G $\frac{1}{2}$ -60

Thermowell **OSG**

Specification

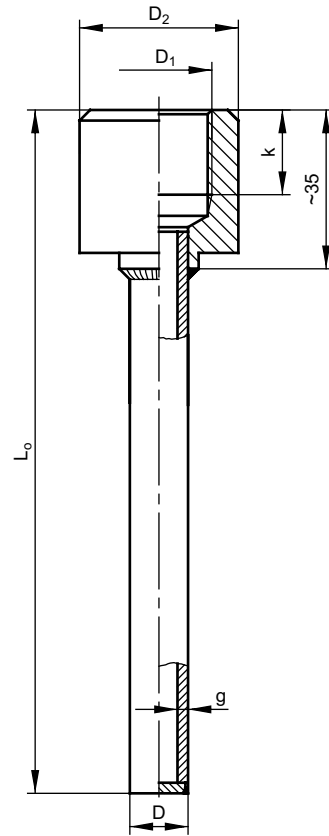
Material*

Stainless steel 1.4541

Dimensions*

Dxg	D ₁	D ₂	k
	M10x1 M12x1 (1,5)	18	12
	G ¹ / ₄ M14x1,5	20	12
8x0,6 9x1	M16x1,5 G ³ / ₈	25	16
10x1,5 11x2	M18x1,5 M20x1,5 G ¹ / ₂	30	16
12x1,5 14x2 15x2			
	M27x2 G ³ / ₄	36	20

Thermowell length L_o [mm] = 50÷2000
 *Other parameters acc. to requirements

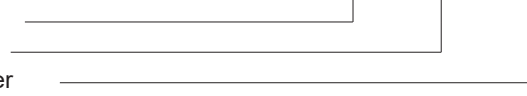


Ordering code

Thermowell



Tube dimension D [mm]: **15** or other
 Thread dimension D₁: **G¹/₂** or other
 Thermowell length L [mm]: **700** or other



Ordering example: **Thermowell OSG-10-M12x1-50**

Thermowell **OGG**

Specification

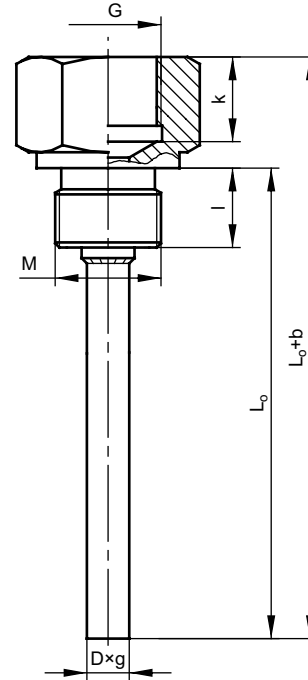
Material*

Stainless steel 1.4541

Dimensions*

Dxg	G	k	M _{min}	SW	l	b
8x0,6 9x1 10x1,5 11x2 12x1,5 14x2 15x2	M10x1	11	M15x1,5 G ^{3/8}	24	15	15
	M12x1(1,5)					18
	G ^{1/4} M14x1,5	14	M18x1,5	27	15	18
	M16x1,5 G ^{3/8}	14	M20x1,5 G ^{1/2}	27	15	18
	M18x1,5 M20x1,5 G ^{1/2}	16	M27x2 G ^{3/4}	36	20	29

Thermowell length L_o [mm] = 50±2000
 Dimensions for G≥M acc. to requirements
 *Other parameters acc. to requirements



Ordering code

Thermowell



Tube dimension D [mm]: **14** or other
 Thread dimension M: **M20x1,5** or other
 Thread dimension G: **G^{1/4}** or other
 Thermowell length L_o [mm]: **150** or other

Ordering example: **Thermowell OGG-12-M20x1,5-G^{1/2}-100**

Attention!

To order thermowell for sensor with immersion length L, L_o = L - 20 for G ≥ M18x1,5
 L_o = L - 16 for M12x1 < G < M18x1,5
 L_o = L - 13 for G = M10x1

Thermowell **OTG**

Specification

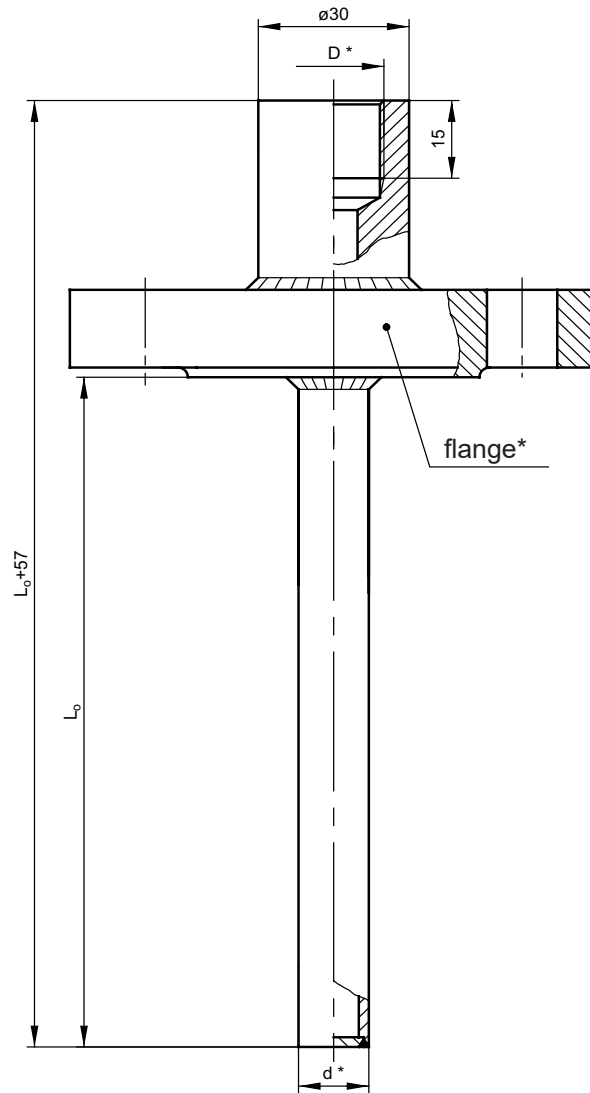
Material*

Stainless steel 1.4541

Dimensions*

dxg	D
	M12x1(1,5) G $\frac{1}{4}$
8x0,6	
9x1	M14x1,5
10x1,5	M16x1,6
11x2	G $\frac{3}{8}$
12x1,5	M18x1,5
14x2	M20x1,5
15x2	G $\frac{1}{2}$ $\frac{1}{2}$ NPT

Other flange dimensions acc. to requirements
 Thermowell length L_o [mm] = 50+2000
 *Other parameters acc. to requirements



Ordering code

Thermowell



Tube dimension d [mm]: **10** or other

Flange dimension: **DN20 PN16** or other

Thread dimension D [mm]: **M18x1,5** or other

Thermowell length L_o [mm]: **300** or other

Ordering example:

Thermowell OTG-10x1,5-DN25PN40B1-G $\frac{1}{2}$ -200

Attention!

For matching thermowell with sensor length L, $L_o = L - 55$

Thermowell **SW**

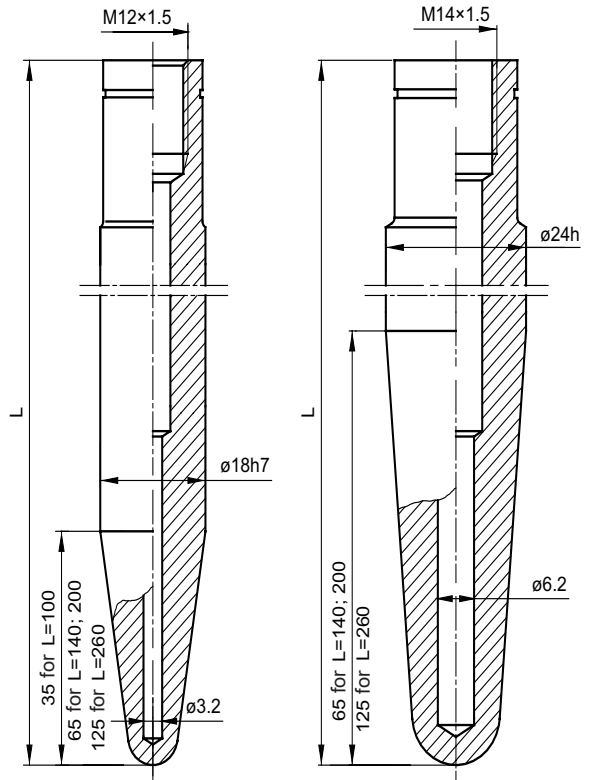
Specification

Material*

Stainless steel 1.4541 or 1.4571
 Forged structural steel for operating in high temperature
 1.7335 or 1.7380

Thermowell allowable load

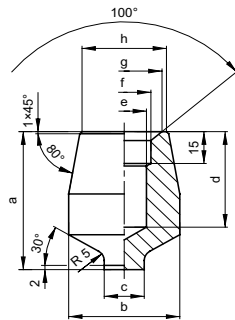
Type	Material	Length L[mm]	Allowable load				
			Steam and gas		Water		
			T [°C]	p[MPa]	T [°C]	p[MPa]	
AM-0332	1.7335	100	540	15,7	370	44,1	
		140, 200		13,8			
	1.7380	100, 140	570	13,4			
		200		11,5			
	1.4541 1.4571	100, 140 200	500	15 15*			30,0
AM-0333	1.7335	100, 140		500	22,0	370	44,1
		200, 260	540	13,8			
	1.7380	140, 200	540	22,0			
		260		570	11,5		
	1.4541 1.4571	140	500	20	35,0		
		200, 260		20*			



Thermowell AM-0332

Thermowell AM-0333

Flow parameters: water – 5 m/s, steam – 60 m/s* - 25 m/s



Execution	a	b	c	d	e	f	g	h
AM-0862-18	55	ø40	ø12	40	ø14	ø18H8	ø28	ø30
AM-0862-24	65	ø50	ø18	45	ø20	ø24H8	ø34	ø38

Socket weld
 AM-0862

Ordering code

Thermowell



Type ø18 mm: **AM0332**
 ø24 mm: **AM0333**

Material e.g.: **1.4541** or other

Length L[mm]: **140** or other

Without connector: **no designation**

Additionally connector for welding: **KS**

Ordering example:

Thermowell SW-AM0333-1.4541-140-KS

Sensor Mounting Fittings

Specification

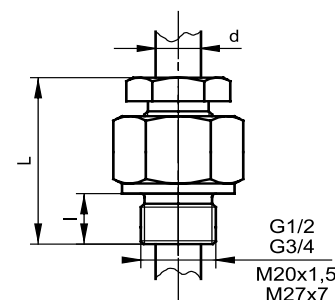
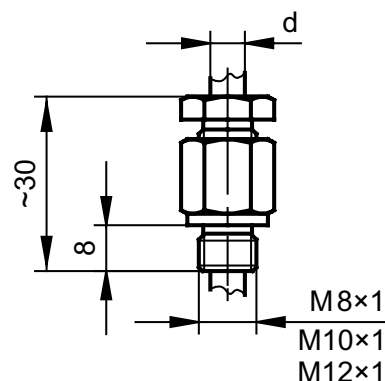
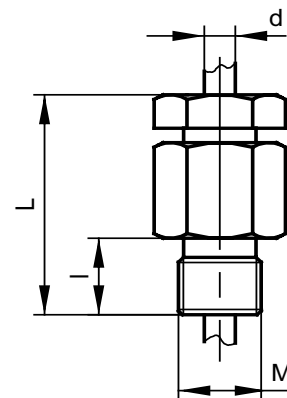
Characteristic

Compression fittings and mounting brackets are used as the additional accessories for temperature sensors without threaded fittings and flanges. Used for sensor mounting in place of measurement, they allow immersion length adjustment since they can be mounted anywhere along the sheath. Compression fittings assure an excellent seal up to 0,1 Mpa.

UG-1 compression fitting		
Material: zinc-plated steel A10		
Seal: ceramic rope		
Type	Thread	d (mm)
UG-1-6	M16x1,5	6,0
UG-1-8	M16x1,5	8,0
UG-1-12	M20x1,5	12,0
UG-1-15	M24x2	15,0
UG-1-20	M30x2	20,0

UG-3 compression fitting		
Material: stainless steel 1.4541 (1H18N9T)		
Seal: stainless steel ring 1.4541		
Type	Thread	d (mm)
UG-3-1; 1,5; 2	M8x1	1; 1,5; 2,0
UG-3-3	M10x1	3,0
UG-3-45		4,5
UG-3-6		6,0
UG-3-8	M12x1	8,0

UG-8 compression fitting				
Material: stainless steel 1.4541 (1H18N9T)				
Seal: stainless steel ring 1.4541				
d	D	L	I	SW
ø6	M20x1,5 G½	50	15	30
ø8				
ø10				
ø12				
ø14	M27x2 G¾	55	20	36
ø15				



Ordering code

Compression fitting



Fitting type: **1, 3, 8**

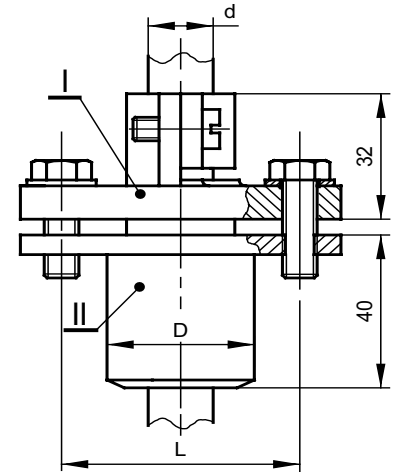
Tube diameter d [mm]: **6** or other

Thread dimension D: **G½** or other

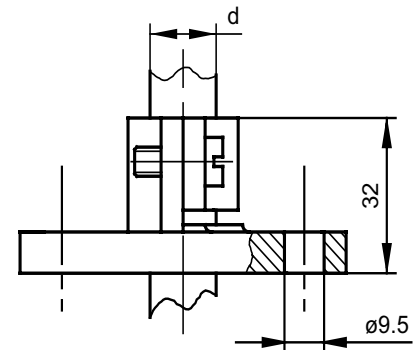
Sensor Mounting Fittings

Specification

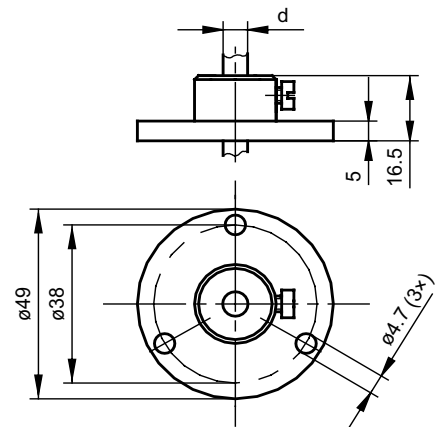
UZ-11 mounting bracket			
Material: flange I – cast steel L II 600, flange II – steel St3S			
Seal: teflon ring PTFE – up to 200°C in air			
Option: ceramic rope – up to 650°C in air – type UZ-11T			
Type	L (mm)	d (mm)	D (mm)
UZ-11-15	55	16	35
UZ-11-22	70	23	40
UZ-11-32		33	50



UZ-21 mounting bracket			
Material: flange I – cast steel L II 600			
clamping ring – cast steel L II 600			
Type	Sheath diameter	L (mm)	d (mm)
UZ-21-15	ø15	55	16
UZ-21-22	ø22	70	23
UZ-21-32	ø32	70	33
UZ-21-26-29	ø26-29	70	29

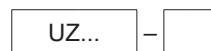


UZK-1 flanged fitting	
Material: aluminium (nickel plated)	
Mounting: self-tapping screw ST 4,8x9,5 – C – Z acc. to PN-EN ISO 7049:1999	
For tube d [mm] = 6, 8	



Ordering code

Fitting



Mounting bracket: **UZ-21, UZ-11, UZ-11T**
 Flanged fitting: UZK-1 only for d [mm]: **6÷10**
 Tube diameter d [mm]: **22** or other

Ordering example: **Mounting bracket UZ-11-22**

Connection Heads for Temperature Sensors

Specification

MAA

body and cover material: aluminium alloy
coating: creodur lacquer
operating temperature:
-40÷100°C oil-proof rubber seal
-40÷150°C silicone seal
inner dimensions: $\varnothing 25 \times 22$ mm
protection tube entry: M10x1



NAA

body and cover material: aluminium alloy
coating: polyester lacquer
operating temperature:
-40÷100°C oil-proof rubber seal
-40÷150°C silicone seal
inner dimensions: $\varnothing 42 \times 28$ mm
protection tube entry: M24x1,5



BA

body and cover material: aluminium alloy
coating: polyester lacquer
operating temperature:
-40÷100°C oil-proof rubber seal
-40÷150°C silicone seal
inner dimensions: $\varnothing 42 \times 24$ mm
protection tube entry: M24x1,5; $\varnothing 15,8$; M12x1; M20x1,5; G $\frac{1}{2}$



DAA

body and cover material: aluminium alloy
coating: creodur lacquer
operating temperature:
-40÷100°C oil-proof rubber seal
-40÷150°C silicone seal
inner dimensions: $\varnothing 56 \times 22$ mm or $\varnothing 42 \times 40$ mm
protection tube entry: $\varnothing 22,5$; $\varnothing 32,5$ mm



NS

body and cover material: polyamide (PA) or noryl (PPO)
operating temperature: 80°C (PA) or 130°C (PPO)
inner dimensions: $\varnothing 42 \times 25$ mm
protection tube entry: M12x1 (PA); M24x1,5 (PPO)



Connection Heads for Temperature Sensors

Specification

DANAWwin

cover with window
coating: polyester lacquer
operating temperature:
-40÷80°C
connection head height: ~114 mm
protection tube entry: M10x1



BEG

body and cover material: stainless steel 1.4541
operating temperature:
-40÷100°C oil-proof rubber seal
-40÷150°C silicone seal
connection head height: 82 mm
protection tube entry: M24x1,5



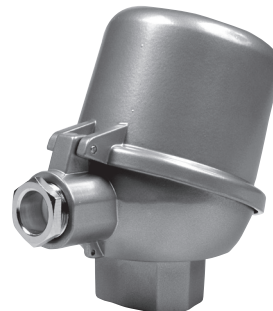
DAAW

body and cover material: aluminium alloy
coating: polyester lacquer
operating temperature:
-40÷100°C oil-proof rubber seal
-40÷150°C silicone seal
connection head height: 127 mm
protection tube entry[mm]: ø22,5; ø32,5



DANAW

body and cover material: aluminium alloy
coating: creodur lacquer
operating temperature:
-40÷100°C oil-proof rubber seal
-40÷150°C silicone seal
connection head height: 114 mm
protection tube entry: M24x1,5



XD-I80win

body and cover material: aluminium alloy
cover with window
coating: creodur lacquer
operating temperature: -40÷80°C
silicone seal
dimensions: ø90x110 mm
protection tube entry: ½NPT



Connection Heads for Temperature Sensors

Specification

XE-DANA

body and cover material: aluminium alloy; <6% Mg
coating: polyester lacquer
equipped with inner and outer ground clamp
operating temperature: -40÷100°C
height: approx. 83 mm
protection tube entry: M24x1,5
cable gland: M20x1,5 (standard without cable gland)
Certificate: FTZU 03 ATEX 0073 U



XE-DANAW

body and cover material: aluminium alloy; <6% Mg
coating: polyester lacquer
equipped with inner and outer ground clamp
high cover for transmitter mounting
operating temperature: -40÷100°C
height: approx. 114 mm
protection tube entry: M24x1,5
cable gland: M20x1,5 (standard without cable gland)
Certificate: FTZU 03 ATEX 0073 U



XE-DAND

body and cover material: aluminium alloy; <6% Mg
coating: polyester lacquer
equipped with inner and outer ground clamp
operating temperature: -40÷100°C
height: approx. 83 mm
protection tube entry: M24x1,5
cable gland: M20x1,5 (standard without cable gland)
Certificate: FTZU 03 ATEX 0264 U



XE-DANDW

body and cover material: aluminium alloy; <6% Mg
coating: polyester lacquer
equipped with inner and outer ground clamp
operating temperature: -40÷100°C
height: approx. 114 mm
protection tube entry: M24x1,5
2 cable glands: M20x1,5 (standard without cable gland)
Certificate: FTZU 03 ATEX 0264 U



XD-AD

body and cover material: aluminium alloy; <6% Mg
coating: creodur lacquer
equipped with inner and outer ground clamp
operating temperature: -40÷100°C
height: approx. 115 mm
protection tube entry: ½NPT
cable glands: M20x1,5 (standard without cable gland)
Certificate: FTZU 03 ATEX 0074 U



XD-ADwin

body and cover material: aluminium alloy; <6% Mg
cover with window
coating: creodur lacquer
equipped with inner and outer ground clamp
operating temperature: -40÷100°C
height: approx. 130 mm
protection tube entry: ½NPT
cable glands: M20x1,5 (standard without cable gland)
Certificate: FTZU 03 ATEX 0074 U



Head Mounted Digital Display LPI -01

Specification

Characteristic

- for temperature sensors with connection head type DANAWwin
- 4-digit LED display, height 9,5 mm
- display screen size: 30x14 mm
- programmable via keypad
- set parameters: zero, span, decimal point
- Ingress Protection Rating of a housing IP20
- degree displaying: C°, F°, K, %, 4s values, 2s degrees
- cooperation with HART Communication Protocol

Input/output signal

4÷20 mA

Power supply

10÷30V DC

Range of programming / displaying

-1999÷9999

Voltage drop

3,3V at 4 mA; 3,7V at 20 mA

Set points

zero 4 mA
 span 20 mA

Accuracy

0,1% range and +/- 1 digit

Temperature drift

20 ppm/°C for temperature 20°C

Electrical connection

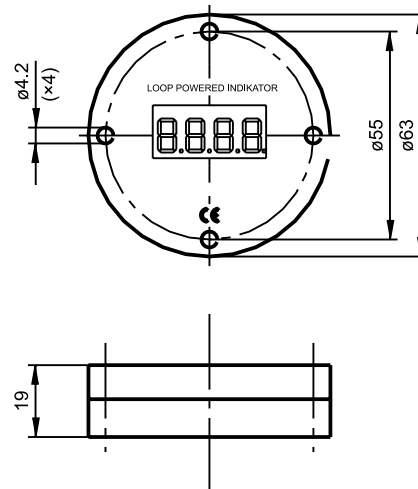
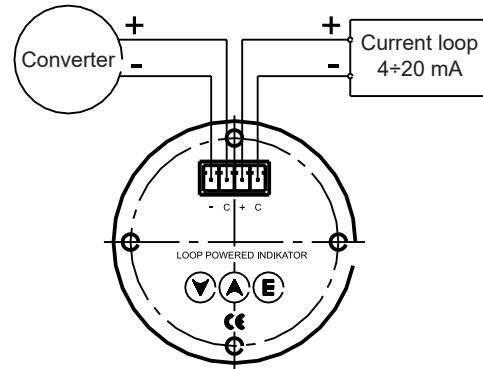
2-wire <1 mm²

Dimensions [mm]

ø64 x 19

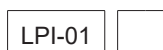
Operating conditions

- ambient temperature: -20÷80°C
- humidity: 25 to 95% RH non-condensing
- storage temperature: -30÷80°C



Ordering code

Digital display



Temperature range e.g. (0÷100)°C

Ordering example: Digital display LPI-01 –(0 ÷100)°C

S

Head Mounted Digital Display LPI -02

Specification

Characteristic

- for temperature sensors with connection head type XD-ADwin
- 4-digit LED display, height 9,5 mm
- display screen size: 30x14 mm
- programmable via keypad
- set parameters: zero, span, decimal point
- Ingress Protection Rating of a housing IP20
- degree displaying: C°, F°, K, %, 4s values, 2s degrees
- cooperation with HART Communication Protocol

Input/output signal

4÷20 mA

Power supply

10÷30V DC

Range of programming / displaying

-1999÷9999

Voltage drop

3,3V at 4 mA; 3,7V at 20 mA

Set points

zero 4 mA
 span 20 mA

Accuracy

0,1% range and +/- 1 digit

Temperature drift

20 ppm/°C for temperature 20°C

Electrical connection

2-wire <1 mm²

Dimensions [mm]

ø73 x 19

Operating conditions

- ambient temperature: -20÷80°C
- humidity: 25 to 95% RH non-condensing
- storage temperature: -30÷80°C

Ordering code

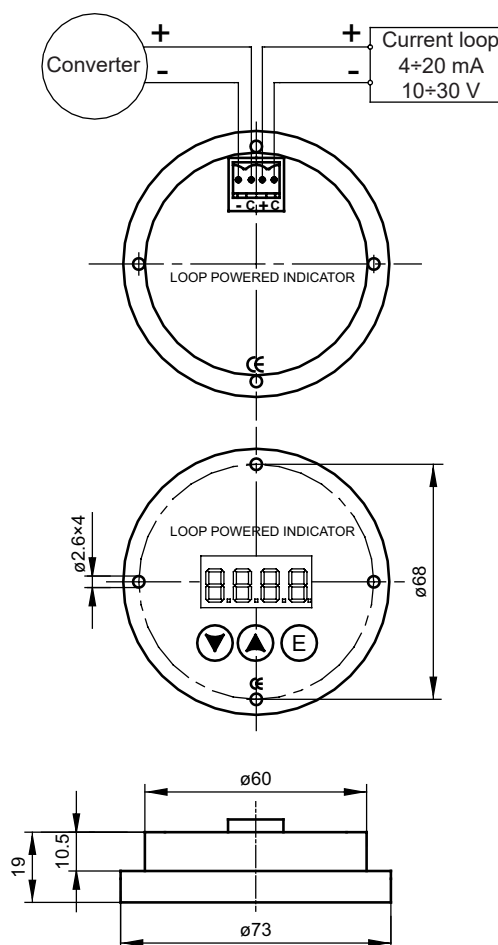
Digital display

LPI-02

Temperature range e.g. (0÷100)°C

Ordering example:

Digital display LPI-02 –(0 ÷100)°C



Temperature transmitters **APAQ-HRF/HRFX, APAQ-LR**

Specification

Characteristic

- analogue transmitter
- mounting in connection head type BA: APAQ-HRF/HRFX
- mounting on a 35 mm rail: APAQ-LR
- resistance / power transmitter
- manual linearisation of output signal against temperature
- intrinsically safe version APAQ-HRFX,
ATEX II 1G Ex ia IIB T4 / T5 / T6

Input

Pt100, 3-wire

Output

4÷20 mA

Sensor current

~ 1,1 mA

Measuring range

-50÷550°C, span 50°C, 100°C, 150°C, 200°C, 300°C, 400°C, 500°C

Zero point adjustment

-50÷50°C

Accuracy

0,2% of range

Response time

0,2 s

Galvanic isolation

not present

Max. lead wire resistance

15Ω per wire

Lead wire connection

< 2,5 mm²

Power supply

6,5÷32V DC, 8,5÷30V DC wersja Ex

Operating conditions

temperature: -40÷85°C, -20÷70°C for APAQ-LR
 humidity: up 95% RH non-condensing

Ordering code

Temperature transmitter

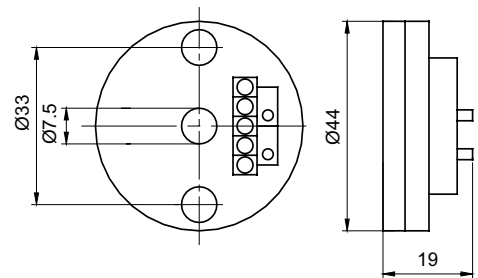
35mm rail mount: **LR**

Head mount: **HRF**

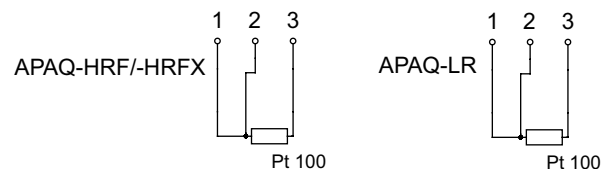
Ex version for HRF: **HRFX**

Temperature range: **(0÷300)°C** or other

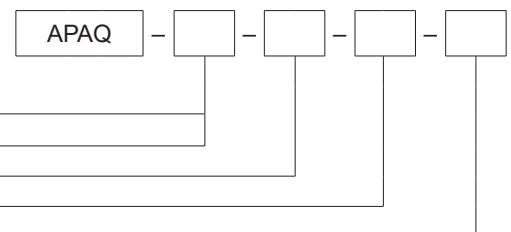
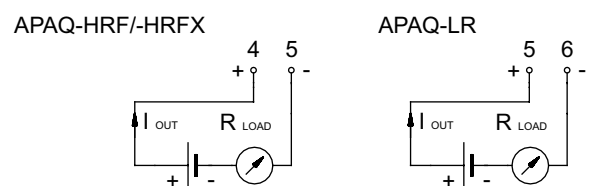
With adapter for 35mm rail mounting for APAQ HRF and HRFX: **A**



Input connections



Output connections



Ordering example: Transmitter **APAQ-HRF-(0÷300)°C-A**

Temperature transmitters **APAQ-HCF/HCFX, APAQ-LC**

Specification

Characteristic

- analogue transmitter
- mounting in connection head BA: APAQ-HCF/HRCX
- mounting on a 35 mm rail: APAQ-LC
- voltage / power transmitter
- manual linearisation of output signal against voltage
- intrinsically safe version APAQ-HCFX, II 1G Ex ia IIB T4-T6

Input / measuring range

Input TC	Range	Min. span
J	0÷950	170°C
K	1370	220°C
L	900	165°C
N	1300	290°C
T	400	200°C
Voltage	0÷50 mV	10

Input impedance

> 5 MW

Output

4÷20 mA

Measuring range

0÷50 mV; min. 10 mV

Zero point adjustment

10% of range span

Accuracy

0,5÷1% of range, cold junction compensation ±1°C

Response time

0,2s

Galvanic isolation

not present

Max. lead wire resistance

500Ω for the entire loop

Lead wire connection

< 2,5 mm²

Ordering code

Temperature transmitter

35 mm DIN rail mount: **LC**

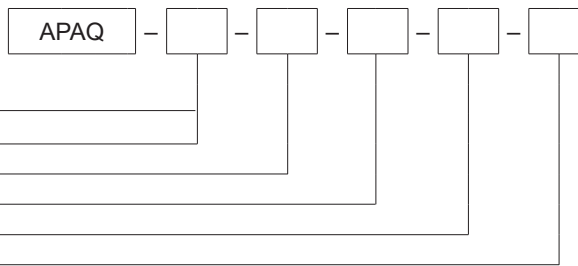
Head mount: **HCF**

Ex version for HCF: **X**

Temperature range: **(0÷600)°C** or other

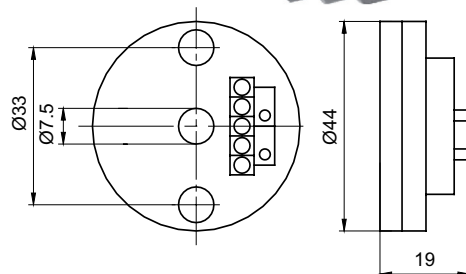
Input type: **J** or other

With adapter for 35 mm rail mounting for APAQ-HCF: **A**



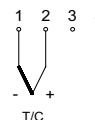
Ordering example:

Transmitter APAQ-HCF-(0÷600)°C-K



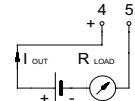
Input connections

APAQ-HCF/-HCFX/APAQ-LC

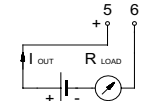


Output connections

APAQ-HCF/-HCFX



APAQ-LC



Power supply

6,5÷32V DC; 8,5÷30V DC Ex version

Operating conditions

temperature: -40÷85°C, -20÷70°C for APAQ-LC

humidity: up 95% RH non-condensing

Temperature transmitters **APAQ-3HPT, APAQ-3LPT**

Specification

Characteristic

- analogue transmitter
- mounting in connection head BA: APAQ-3HPT
- mounting on a 35 mm rail: APAQ-3LPT
- resistance / voltage transmitter
- manual linearisation of output signal against temperature

Input

Pt100. Pt1000, 3-wire

Output

0÷10V input resistance min. 10kΩ

Measuring range

-50÷200°C; span: 50°C, 100°C, 150°C, 200°C

Zero point adjustment

-50÷50°C

Accuracy

0,2%

Response time

0,2s

Galvanic insulation

not present

Max. lead wire resistance

10Ω for a wire

Lead wire connection

< 2,5 mm²

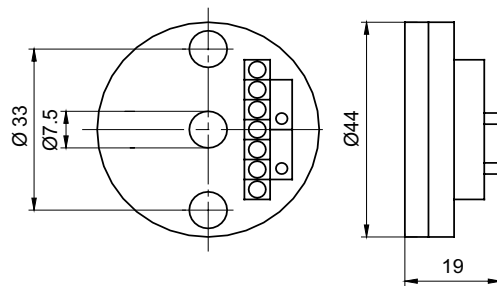
Power supply

15÷30V DC

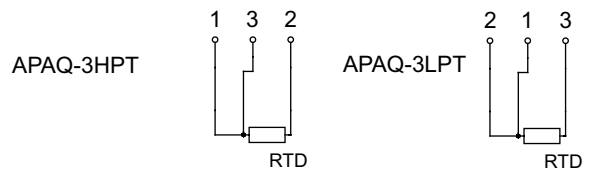
Operating conditions

temperature: -40÷85°C; -20÷70°C for APAQ-3LPT

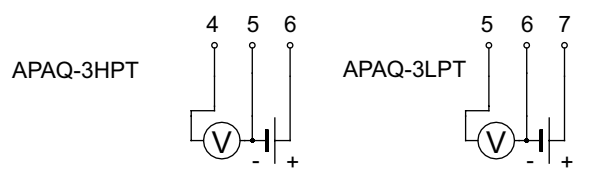
humidity: up 95% RH non-condensing



Input connections



Output connections



Ordering code

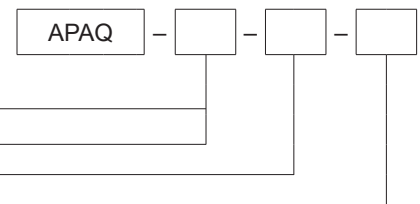
Temperature transmitter

35 mm rail mount: **3LPT**

Head mount: **3HPT**

Ex version for HRF: **HRFX**

Temperature range: **(0÷300)°C** or other



Ordering example:

Transmitter APAQ-3HPT-(0÷300)°C-A

Temperature transmitters MINIPAQ-HLP, MINIPAQ-L

Specification

Characteristic

- universal transmitter
- mounting in connection head BA: MINIPAQ-HLP
- mounting on a 35 mm rail: MINIPAQ-L
- configurable range

Input

RTD: Pt100 3–, 4– wire
 TC: E, J, K, L, T, U, B, R, S, N

Output

4÷20 mA linearized against temperature

Measuring range

-200÷1000°C Pt100 minimal 10°C
 – acc. to operating range for TC, mV minimal 2 mV

Zero point adjustment

in full range

Accuracy

0,15 % of temperature range

Response time

0,2s

Galvanic isolation

not present

Max. lead wire resistance

500Ω the entire TC loop
 25Ω per RTD wire

Lead wire connection

<2,5 mm²

Power supply

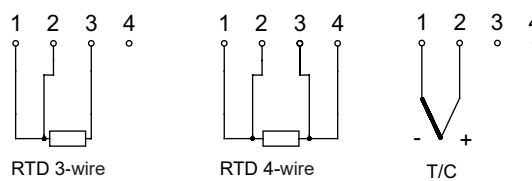
8÷36V DC

Operating conditions

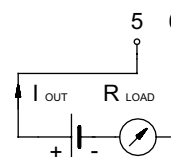
temperature: -20÷85°C
 humidity: do 95% RH non-condensing



Input connections



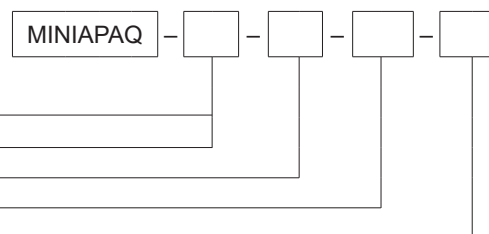
Output connections



Ordering code

Temperature transmitter

35 mm rail mount: **L**
 Head mount: **HLP**
 Temperature range, input: **(0÷300)°C** or other
 Input type: **J** or other
 With adapter for 35 mm rail mounting: **A**



Ordering example: **Transmitter MINIPAQ-HLP-(0÷600)°C-J**

Temperature transmitters **IPAQ-H, IPAQ-H PLUS, IPAQ-HX**

Specification

Characteristic

- universal transmitter
- mounting in connection head BA
- sensor error correction
- monitoring of sensor circuit interruption
- higher accuracy IPAQ-H PLUS
- intrinsically safe IPAQ-HX,
ATEX II 1G Ex ia IIC T4 – T6

Input

RTD 3-, 4-wire
 TC B, E, J, K, L,N, R, S, T, U acc. to operating range
 Pt100 -200÷1000°C
 Pt1000 -200÷200°C
 Ni100 -60÷250°C
 Ni1000 -10÷150°C
 resistance 0÷2000Ω
 voltage -10÷500 mV

Output

4÷20 mA, 20÷4 mA

Measuring range

- Pt100 min. -10°C
- TC, mV: min. 2 mV
- resistant inputs: min. 10Ω

Zero point adjustment

in full range

Accuracy

PLUS – 0,05 % H – 0,1% for RTD,mV, resistance
 PLUS – 0,1 % H – 0,2% for TC

Response time

0,2 s

Galvanic isolation

3750V AC for 1 min PLUS; 1500V AC for 1 min H

Max. lead wire resistance

500Ω for the entire TC loop; 25Ω per RTD wire

Lead wire connection

< 2,5 mm²

Ordering code

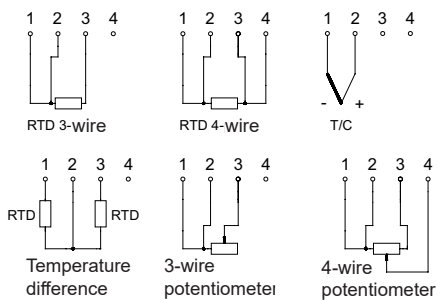
Temperature transmitter

Standard: **none** _____
 Accurate: **plus** _____
 Ex version: **X** _____
 Temperature range: **(0÷1000)°C** or other _____
 Input type: **S** or other _____
 With adapter for 35mm rail mounting: **A** _____

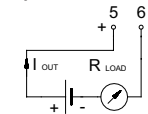
Ordering example: **Transmitter IPAQ-H PLUS-(0÷1000)°C-S**



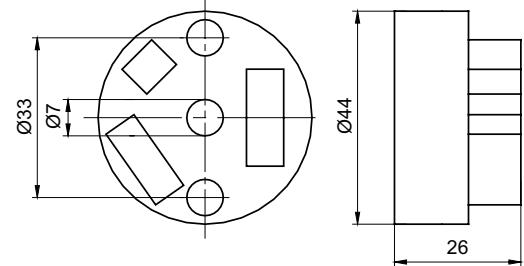
Input connections



Output connections



Dimensions[mm]

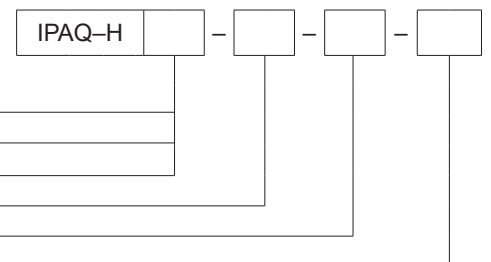


Power supply

6,5÷36V DC; 8÷30V DC Ex version

Operating conditions

temperature: -40÷85°C
 humidity: up to 95% RH non-condensing



T

Temperature transmitters **MESO-H, MESO-HX**

Specification

Characteristic

- with HART Communication Protocol
- mounting in connection head BA
- 50-point linearisation
- intrinsically safe MESO-HX
 ATEX II 1G Ex ia IIC T4 / T5 / T6

Input

- RTD: 3-, 4-wire
- TC: B, E, J, K, L,N, R, S, T, U acc. to operating range
- Pt100: -200÷1000°C
- Pt1000: -200÷200°C
- Ni100: -60÷250°C
- Ni1000: -10÷150°C
- resistance: 0÷2000Ω
- voltage: -10÷500 mV

Output

4÷20 mA; 20÷4 mA

Measuring range

- Pt100 min. -10°C
- TC, mV: min. 2 mV
- resistance inputs: min. 10Ω

Zero point adjustment

in full range

Accuracy

0,1% of range

Response time

1s

Galvanic isolation

1500V AC for 1 min.

Max. lead wire resistance

500Ω for TC
 25Ω per RTD wire

Lead wire connection

<2,5 mm²

Power supply

10÷42V DC; 12÷30V DC Ex version

Operating conditions

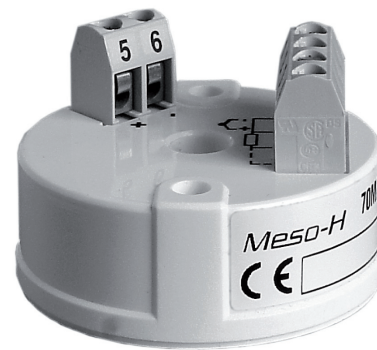
temperature: -40÷85°C
 humidity: up to 98% RH non-condensing

Ordering code

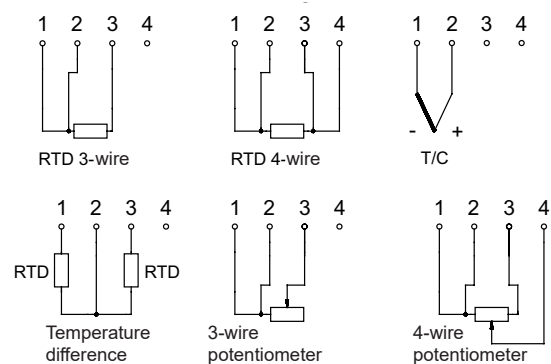
Temperature transmitter

Ex version: **X** _____
 Temperature range, input: **(0÷1000)°C** or other _____
 With adapter for 35mm rail mounting: **A** _____

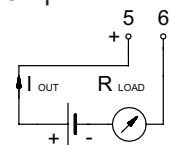
Ordering example: **Transmitter MESO-HX**



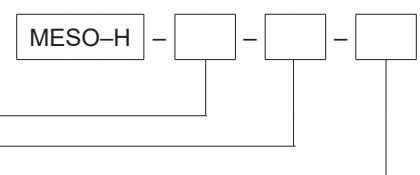
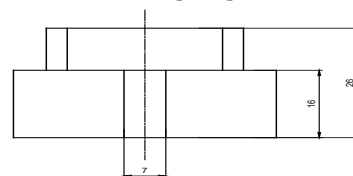
Input connections



Output connections



Dimensions[mm]



Temperature transmitters TxBlock, TxRail

Specification

Characteristic

- universal transmitter
- mounting in connection head BA: TxBlock
- mounting on a 35 mm rail: TxRail
- sensor error correction
- configuration with a PC via TxConfig USB interface (option)
- easy parameters configuration

Input

resistance: Pt100, 3-wire
 thermocouple: J, K, T, N, E, R, S, B (only TxBlock)
 voltage: – 0÷50 mV

Input type	Range	Min. span
Pt100	-200÷530°C	40°C
J	0÷760°C	100°C
K	0÷1370°C	100°C
T	0÷400°C	100°C
N	0÷1300°C	400°C
E	0÷720°C	100°C
R	0÷1760°C	400°C
S	0÷1760°C	400°C
B	500÷1820°C	400°C
voltage	0÷50 mV	5 mV

Output

4÷20 mA

Accuracy

0,2% of range for Pt100 imV
 0,3% of range for TC
 temperature drift 0,003% span/°C

Response time

100 ms

Max. lead wire resistance

11Ω per wire

Lead wire connection

< 2,5 mm²

Power supply

15÷30V DC

Operating conditions

temperature: -40÷85°C
 humidity: up to 95% RH non-condensing

Ordering code

Temperature transmitter

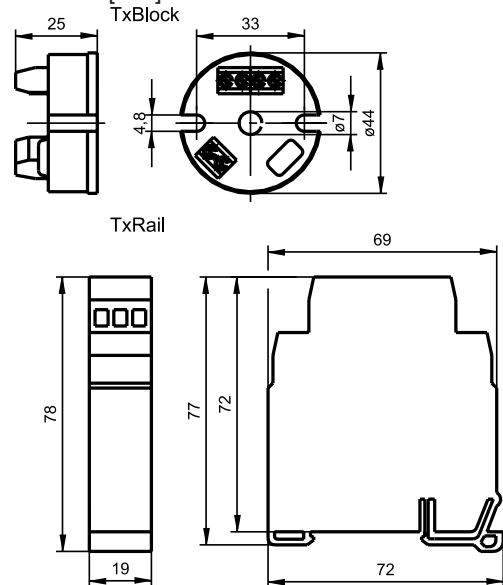
Head mount: **Block** _____
 35 mm rail mount: **Rail** _____
 Temperature range: **(0÷100)°C** or other _____
 Input type: **Pt100** _____
 With adapter for 35 mm rail mounting for TxBlock: **A** _____

Ordering example: **Transmitter TxBlock–(0÷100)°C–Pt100**

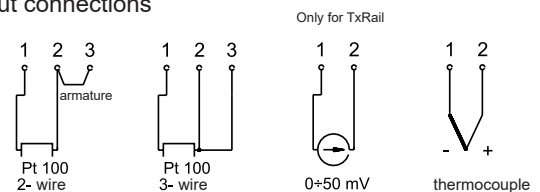
Quality Certificate or Calibration Certificate of Limatherm Sensor Accredited Laboratory for Temperature Measurements on request.



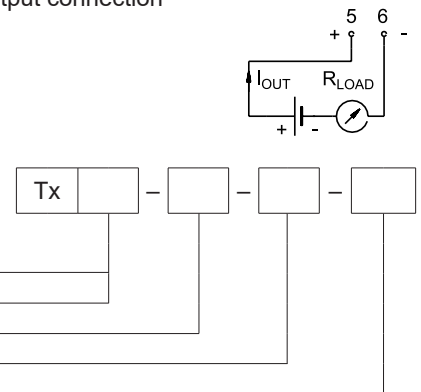
Dimensions [mm]



Input connections



Output connection



Temperature transmitters TxIsoBlock, TxIsoRail

Specification

Characteristic

- universal transmitter
- mounting in connection head BA: TxIsoBlock
- mounting on a 35 mm rail: TxIsoRail
- galvanic isolation input/output
- sensor error correction
- configuration with a PC via TxConfig USB interface (option)
- easy parameters configuration

Input

resistance: Pt100, 3-wire
 thermocouple: J, K, T, N, E, R, S, B
 voltage: – 0÷50mV; (0÷10V only TxIsoRail)*
 current:** – 0÷20mA; 4÷20 mA only TxIsoRail**

Input type	Range	Min. span
Pt100	-200÷530°C	40°C
J	-100÷760°C	100°C
K	-150÷1370°C	100°C
T	-160÷400°C	100°C
N	-270÷1300°C	400°C
E	-90÷720°C	100°C
R	-50÷1760°C	400°C
S	-50÷1760°C	400°C
B	500÷1820°C	400°C
voltage	0÷50 mV	5 mV
voltage*	0÷10 V	1V
current**	0÷20 mA	2 mA
current**	4÷20 mA	2 mA

Output

4÷20 mA

Accuracy

0,2% of range for Pt100 imV
 0,3% of range for TC
 temperature drift 0,003% span/°C

Response time

100 ms

Galvanic isolation

1500V input/output

Max. lead wire resistance

11Ω per wire

Lead wire connection

< 2,5 mm²

Power supply

15÷30V DC

Operating conditions

temperature: -40÷85°C
 humidity: up to 95% RH non-condensing

Ordering code

Temperature transmitter

Head mount: **Block**

35 mm rail mount: **Rail**

Temperature range: **(0÷1000)°C** or other

Input type: **S** or other

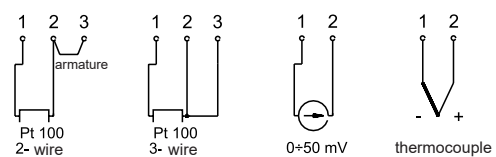
With adapter for 35 mm rail mounting for TxBlock: **A**

Ordering example:

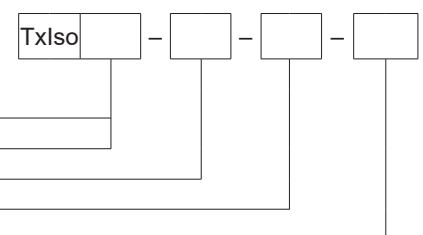
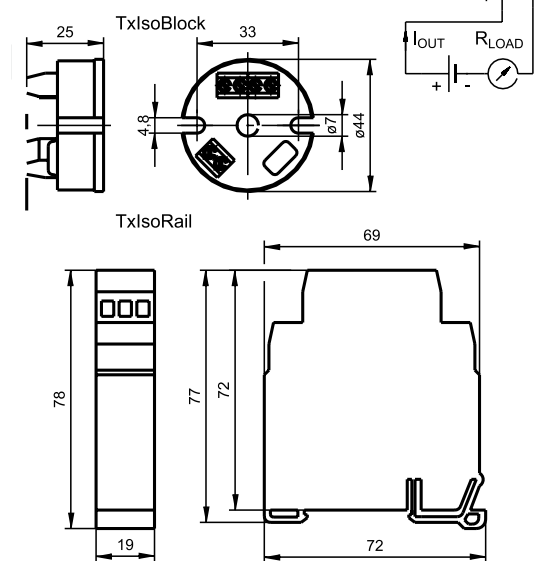
Transmitter TxIsoBlock–(0÷1000)°C–S



Input connections



Dimensions [mm]



Temperature transmitters **LTT-03B, LTT-03BU, LTT-03J, LTT-03T, LTT-03TU**

Specification

Characteristic

- programmable transmitter
- accurate calibration
- mounting in connection head BA: LTT-03B, LTT-03BU
- mounting on a 35 mm rail: LTT-03T, LTT-03TU
- mounting in connection head MA (miniature): LTT-03J

Input

- Pt100 3-wire for LTT-03B, LTT-03BU
- Pt100 2-wire for LTT-03J

Output

- 4÷20 mA for LTT-03B, LTT-03J
- 0÷10V for LTT-03BU

Measuring range

-200÷800°C

Range span

Min. range span 25°C
 with range span <75°C constant zero point range -40°C, -20°C, 0°C, 20°C.
 With span ≥75°C zero point in range (-50÷50°C)

Accuracy

≤0,1% of range

Response time

< 10 ms

Galvanic isolation

not present

Max. lead wire resistance

11Ω per wire LTT-03B, BU
 0 Ω per wire non-condensing, 2-wire connection

Lead wire connection

LTT-03B, BU ≤1,75 mm²
 LTT-03J < 1,5 mm²

Power supply

7,5÷30V DC for LTT-03B, LTT-03J
 15÷30V DC for LTT-03BU

Operating conditions

temperature -40÷85°C
 humidity ≤95% RH

Ordering code

Przetwornik temperatury

Output 0÷10V: **BU, TU**

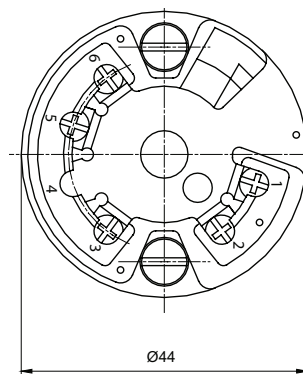
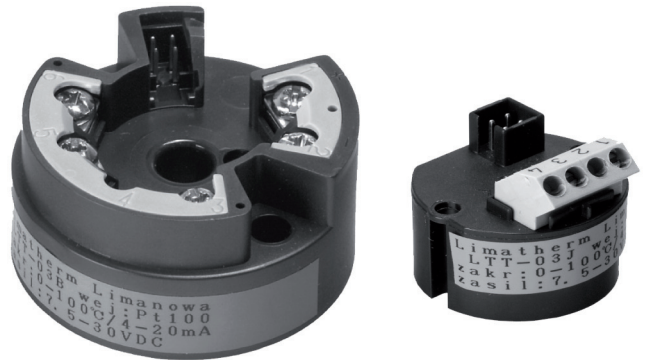
Output 4÷20 mA: **B, J, T**

Temperature range: **(-20÷20)°C** or other

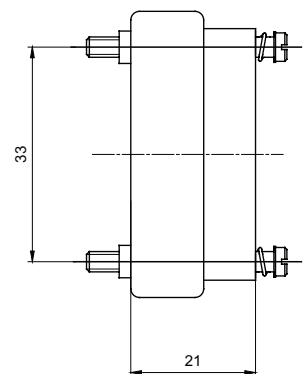
With adapter for 35 mm rail mounting for B and BU: **A**

Ordering example:

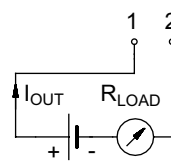
Transmitter LTT-03B-(-20÷20)°C-A



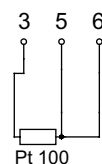
LTT-03B



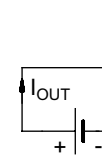
LTT-03J



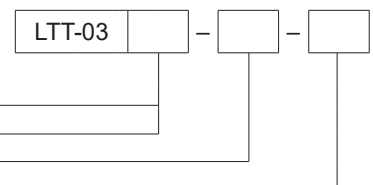
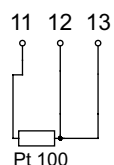
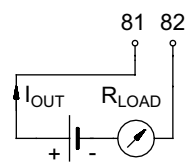
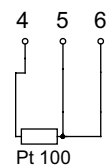
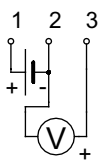
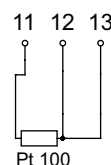
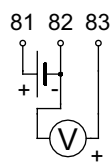
LTT-03TU



LTT-03BU



LTT-03T



Temperature transmitters LTT-01, LTT-01T

Specification

Characteristic

- universal transmitter
- accurate calibration
- mounting in connection head BA: LTT-01
- mounting on a 35 mm rail: LTT-01T
- with HART Communication Protocol: LTT-01-H, LTT-01T-H
- intrinsically safe ATEX II 1G Exi a IIC T6

Input

RTD: Pt100, Pt500, Pt1000
 Ni: Ni100, Ni500, Ni1000
 TC: L, J, U, T, K, E, N, S, R, B, D, C

Output

4÷20 mA i 20÷4 mA

Measuring range

Pt100 -200÷800°C 2-, 3-, 4-wire
 Pt500, Pt1000 -200÷250°C
 Ni -60÷150°C

TC for given thermocouples acc. to operating range

Range span

- min. 10°C for resistance inputs
- min. 50°C for types: L, J, U, T, K, E, N
- min. 500°C for remaining types

Accuracy

- resistance inputs ≤0,1% of range
- TC inputs < 0,2% of range

Zero point adjustment

- in full range

Response time

< 1 s

Galvanic isolation

- galvanically isolated output and input
- test voltage 3, 73 kV

Max. lead wire resistance

11Ω per wire for 3-, 4-wire connection

Lead wire connection

<1,75 mm²

Ordering code

Temperature transmitter

Head mount: **not present**

35 mm rail mount: **T**

Standard: **not present**

HART protocol: **H**

Intrinsically safe: **Ex**

Intrinsically safe with HART protocol: **H-Ex** (only LT-01)

Temperature range: **(0÷100)°C** or other

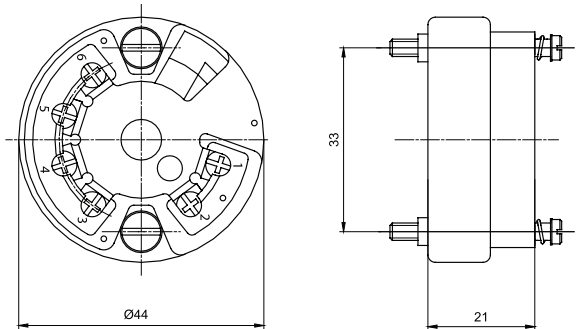
Input type: **Pt100** or other

RTD connection: **3-wire** or other

With adapter for 35 mm rail mounting for LTT-01: **A**

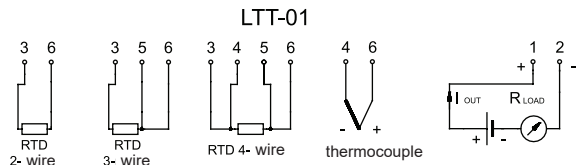
Ordering example:

Transmitter LTT-01-(0÷100)°C-Pt100/3p



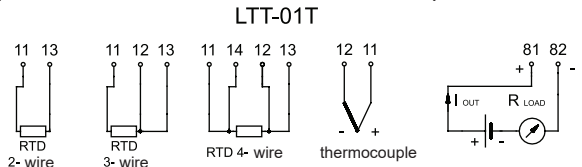
Input connections

Output connections



Input connections

Output connections

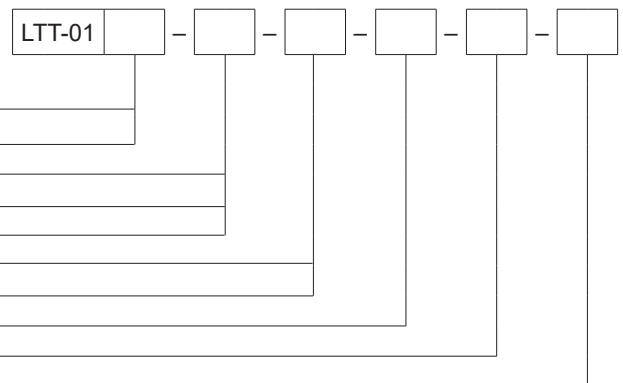


Power supply

8÷35V DC
 8÷30V DC for Ex version

Operating conditions

temperature -40÷85°C
 humidity ≤95% RH



Temperature transmitters **FLEX TOP 2202, 2203**

Specification

Characteristic

- programmable transmitter
- mounting in connection head BA, NA
- excellent temperature stability
- intrinsically safe version ATEX II 1G Ex ia IIC T5 / T6

Input

Pt100: 2, 3, 4- wire (FLEX TOP 2202)
 TC: B, J, K, N, S (FLEX TOP 2203)

Output

4÷20 mA

Measuring range

Pt100: -200÷850°C min. span 25°C
 TC: see the chart

Zero point adjustment

in full range

Accuracy

Pt100: 250°C < 0,25°C
 > 0,1% of range

TC: see the chart

Response time

< 0,7s (FLEX TOP 2202)
 < 1s (FLEX TOP 2203)

Galvanic isolation

not present

Output signal resolution

12 bit

Lead wire connection

< 2,5 mm²

Power supply

8÷35V DC
 8÷28V DC for Ex version

Operating conditions

temperature: -40÷85°C
 humidity: up to 98% RH non-condensing

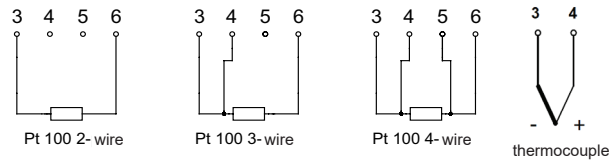
Ordering code

Temperature transmitter

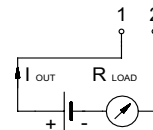
For Pt100: **2202**
 For TC: **2203**
 Standard: **0001**
 Ex version: **0002-Ex**
 Temperature range, input: **(0÷100)°C** or other
 RTD connection: **3-wire** or other
 With adapter for 35 mm rail mounting: **A**



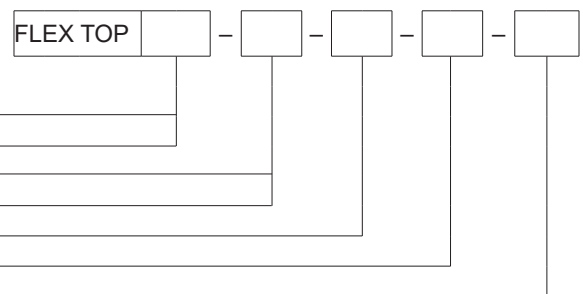
Input connections



Output connections



TC type	Measuring range	Min. temperature range	Accuracy
B (PtRh30-Pt)	100÷1820°C	50°C	> 500°C = 5°C
J (FeCu-Ni)	-100÷1200°C	50°C	3°C
K (NiCr-Ni)	-100÷1370°C	50°C	3°C
N (NiCrSi-NiSi)	-100÷1300°C	50°C	4°C
S (PtRh10-Pt)	-50÷1750°C	100°C	> 50°C = 5°C
Voltage	10÷100 mV	5 mV	0.2 mV



Ordering example: **Transmitter FLEX TOP 2202-(0÷300)°C-4p**

Temperature transmitters **FLEX TOP 2211, 2221, 2231**

Specification

Characteristic

- universal transmitter
- head mounted
- configurable range
- standard Flex Top 2211-0001
- communication with HART protocol, HCF, Rev5 Flex Top 2221-0001
- communication with Profibus protocol PA ver 3,0 DPVI Flex Top 2231-0001
- intrinsically safe Flex Top 2211-0002 Ex Flex Top 2221-0002 Ex
- ATEX II 1G Ex ia IIC T5 / T6

Input

RTD: Pt25...1000 2-, 3-, 4-wire
 TC: B, E, J, K, L, N, R, S, T, U, C, D
 resistance: 0±2200Ω or 0±390Ω
 voltage: -10÷70 mV or -0,1÷1,1V

Output

4÷20 mA, 20÷4 mA for Flex Top 2211 and 2221
 11 mA ± mA signal acc. to IEC 1158-2 for Flex Top 2231

Measuring range

- 200÷850°C for RTD min. 10°C
- acc. to operating range for TC min. 50/100°C
- acc. to operating range for resistance input min. 5/25Ω
- acc. to operating range for voltage input 2/20 mV

Zero point adjustment

in full range

Accuracy

Pt100 0,1°C, TC 1±2°C

Response time

Pt100 – 1,0 sek; TC – 1,6 sek

Galvanic isolation

3,75 kV AC Flex Top 2211; Flex Top 2221
 2,0 kV AC Flex Top 2231

Max. lead wire resistance

- 10Ω per wire

Lead wire connection

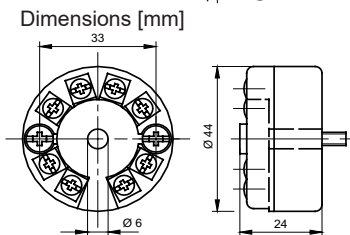
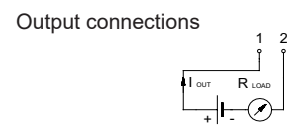
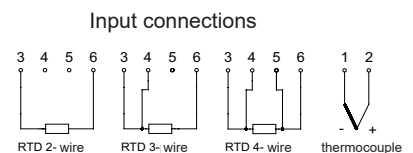
< 2,5 mm²

Ordering code

Temperature transmitter

- Standard: **2211 – 0001**
- Standard Ex: **2221 – 0001 Ex; 0002 Ex**
- With HART: **2221 – 0001; 0002 Ex**
- With HART Ex: **2221-0001 Ex**
- With Profibus: **2231-0001**
- With Profibus Ex: **2231-0002Ex**
- Temperature range, input: **(0÷100)°C** or other
- Input type: **K** or other
- RTD connection: **4-wire** or other
- With adapter for 35 mm rail mounting: **A**

Ordering example: **Transmitter FLEX TOP 2211-(0÷100)°C-K**

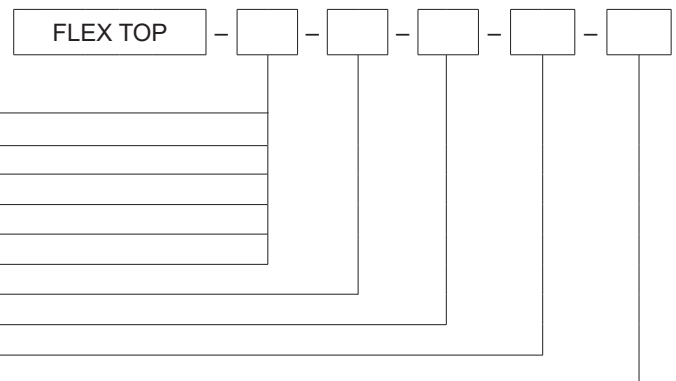


Power supply

6,5±35V DC – 2211, 6,5±30V DC – 2211 Ex,
 8±35V DC – 2221 8±30V DC – 2221 Ex,
 9±32V DC – 2231, 9±17V DC – 2231 Ex

Operating conditions

temperature: -40÷85°C
 humidity: up to 98% RH non-condensing



Temperature transmitters **ROSEMOUNT 248H, 248R**

Specification

Characteristic

- universal transmitter
- accurate calibration
- mounting in connection head BA: 248H
- mounting on a 35 mm rail: 248R
- with HART protocol
- intrinsically safe version ATEX II 1G Ex ia IIC T5/T6

Input

RTD Pt100, Pt500, Pt1000
 Ni Ni120
 TC L, J, U, T, K, E, S, R, B

Output

4÷20 mA

Measuring range

Pt100..1000: -200÷850°C 2-, 3-, 4-wire
 Ni120: -70÷150°C
 TC: -10÷100 mV

Min. span

for TC: 2,5 mV

Accuracy

≤0,1% of range

Zero point adjustment

in full range

Time response

< 1 s

Galvanic isolation

500V AC

Max. lead wire resistance

< 11Ω per wire for 3-, 4-wire connection

Lead wire connection

<1,75 mm²

Power supply

18÷42V DC

Operating conditions

temperature: -40÷85°C
 humidity: up to 95% RH non-condensing

Ordering code

Temperature transmitter

Head mounted: **H** _____

35mm rail mounted: **R** _____

Intrinsically safe version: **Ex** _____

Input/ Pt connection*: **N** or **Pt500/3** or other _____

Temperature range: **(0÷400)°C** _____

Producer's calibration certificate: not present: **no designation**; 3 point: **C4**; 5 point: **Q4** _____

* Standard transmitter is configured for Pt100 with 3-wire connection and range (0÷100)°C

Ordering example: **Rosemount Transmitter 248HA-I1-K-(0÷500)°C**



Connection schemes

