

Mineral-Insulated Resistance Thermometers for Industry, Laboratories and Research

Mineral-Insulated Metal-Sheathed Resistance Thermometer Detectors (MIMS RTD's) supplement the Mineral-Insulated Metal-Sheathed Thermocouples (MIMS TC's), which are tested and approved over many years. MIMS RTD's can be applied for temperatures from -100 °C up to +550 °C. They combine the advantages of the MIMS RTD's with those of the bendable mineral-insulated metal-sheathed thermocouples.

Important advantages of the MIMS RTD's:

- bendable with small radius
- suitable for high pressure and vacuum
- two-, three- or four-wire circuits are possible
- easy packing and shipment even in the case of long RTD's

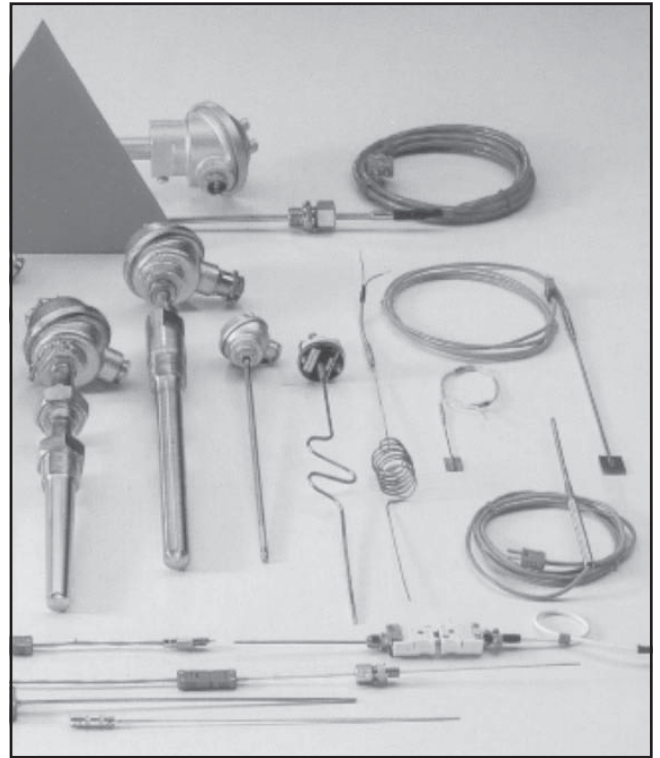
As supply wires mineral-insulated metal-sheathed cables are used. The supply wires are embedded in a MgO compact insulation and surrounded by a metal sheath of stainless steel. The compact insulation fixes the wires completely so that they cannot be damaged neither by vibration nor by strong bending. Short circuits between the wires or between them and the metal sheath are impossible.

The minimum bending radius depends on the outside diameter of the MIMS cable. About 5 to 7 of times the outer diameter is a practicable standard value.

The measuring resistor itself complies with the requirements of the DIN EN 60 751:2009 standard.

If in special cases, for example in the case of great lengths, the inner conductor resistance increases more than usual, the resistance is shown on the identification plate.

The temperature sensitive length of the RTD is typically 35 mm. Different lengths can be supplied upon request.



Special Advantages:

- Highly resistant against vibrations
- Short response times
- Mechanically resistant
- Easily bendable
- 3- and 4-wire circuits from measuring resistor upon request
- Easy packing and shipment even in the case of long RTD's

MIMS Resistance thermometer
Form : WA



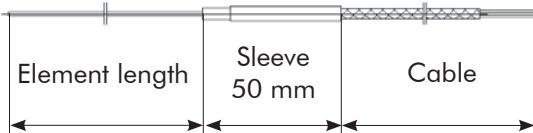
Base version of the MIMS resistance thermometer. For available sheath diameters please turn to „Technical Data“ on page 8. The standard length of the bare connecting wire ends is 20 mm. The metal sheath is hermetically sealed against moisture.

Tmax at the sealed end is 150 °C.

The metal sheath diameter of the standard version is constant. Upon request tapered or reinforced versions can be supplied.

Please specify details in case of order.

Cable firmly connected
Form : WL



Form WL has a firmly connected stranded copper cable. The transition sleeve has a diameter of 6 or 8 mm, depending on the type of cable. The standard length is 50 mm.

Max. temperature at the sleeve: 150 °C, cable type A. The cable type (i.e. conductor cross-section, insulation material, screening) can be chosen from a wide range.

As a standard wire and cable are TEFLON-insulated with a cross-section of 0.38 mm². The bare wire ends are tin-coated.

When ordering please specify the required type.

Cable and jack firmly connected
Form : WLS



Form WLS is an extended version of form WL with an additional connector system.

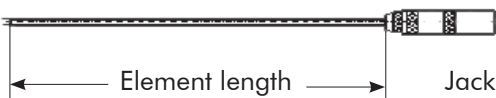
The standard version is fitted with a jack type LEMO -RLK, size 1, with plated brass precision contacts. The outer body is made of matt chromium-plated brass. Max. temperature at the sleeve: 150 °C, cable type A.

On joining, plug and jack are automatically interlocked and thus offer an optimum security of contact.

Other connector systems are available on request as well as the appropriate plugs.

When ordering please specify the required type.

Round jack firmly connected
Form : WS



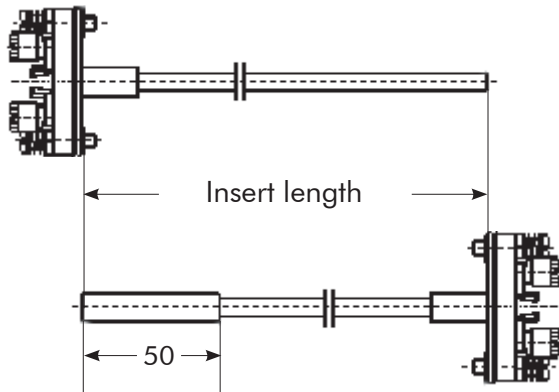
Form WS is an extension of the form WA with an additional connector system. The standard version is fitted with a jack type LEMO - RLK, size 1 (up to 4.8 mm sheath diameter, above that size 2).

Max. temperature at the sleeve: 150 °C.

Other connector systems are available on request as well as the appropriate plugs.

When ordering please specify the required type.

MIMS Measuring insert, with constant diameter or reinforced tip
Form : WMM



Measuring insert with connection socket, terminals and spring-loaded pressuring device. Suitable for mounting in a connection head form B according to DIN 43 729. For mounting in a head form A, an adaptor plate is available upon request.

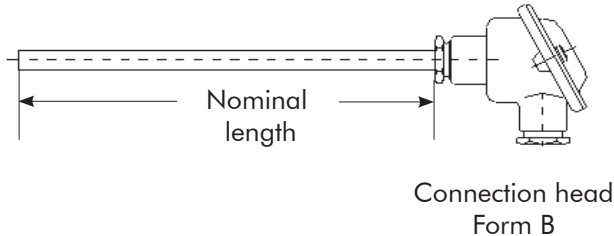
Ordering code see table on page 4
 Connecting diagram see page 5

Standard designs:

- Sheath diameter constant 3.0 mm
- Sheath diameter constant 6.0 mm
- Sheath dia. 5.0 mm, tip 6.0 dia. x 50 mm length
- Sheath dia. 6.0 mm, tip 8.0 dia. x 50 mm length

Please specify details in case of an order. For further details please refer to our Product Information 176.

MIMS Thermometer with connection head form B
Form : WB (B - WMM)



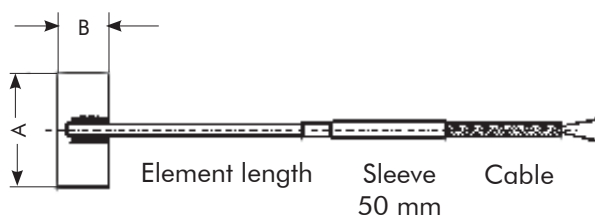
This form consists of a measuring insert with connector socket and cable clip, built into a connecting head form B according to EN 50 446. A special pipe bracket screwing made of stainless steel fixes the measuring insert. The nominal length starts at the bottom edge of the pipe bracket screwing.

Standard designs:

Metal sheath diameters: see form WMM
 Connection head form B according to EN 50 446
 Other heads (see page 5) are available upon request.

When ordering please indicate the form needed.

MIMS Thermometer with weld-on plate
Form : WL - RT



This form is used for temperature measurement at pipe surfaces. The weld-on plate consists of stainless steel for MIMS RTD's and is manufactured in accordance with the sheath diameter. The mounting at the pipe surface may be done by welding, soldering, gluing or clamping.

Max. temp. at the sleeve: 150 °C, cable type A.

All connection forms on pages 2 and 3 can be supplied with weld-on plate. Other designs for special applications are available upon request.

When ordering please specify the required type.

Ordering Code : Form-Diameter-Sensor-Class-Length-Cable length-Cable type

Example:

You want to order a mineral-insulated metal-sheathed resistance thermometer detector with hard-wired cable and jack. The sheath diameter shall be 3.0 mm and the element length 300 mm. A platinum measuring resistor shall be built in with single winding and 100 Ohms nominal resistance at 0 °C. The permitted deviation must be acc. to Class A. The cable type is specified according to the technical data on page 8 as type A with a length of 3 m. The jack is standard type RLK, size 1. The thermometer shall be fitted with a four-wire circuit ex resistor element. The latter must always be specified separately!

Example : WLS - RT - 3.0 - 1 Pt - A - 300 - 3 - A

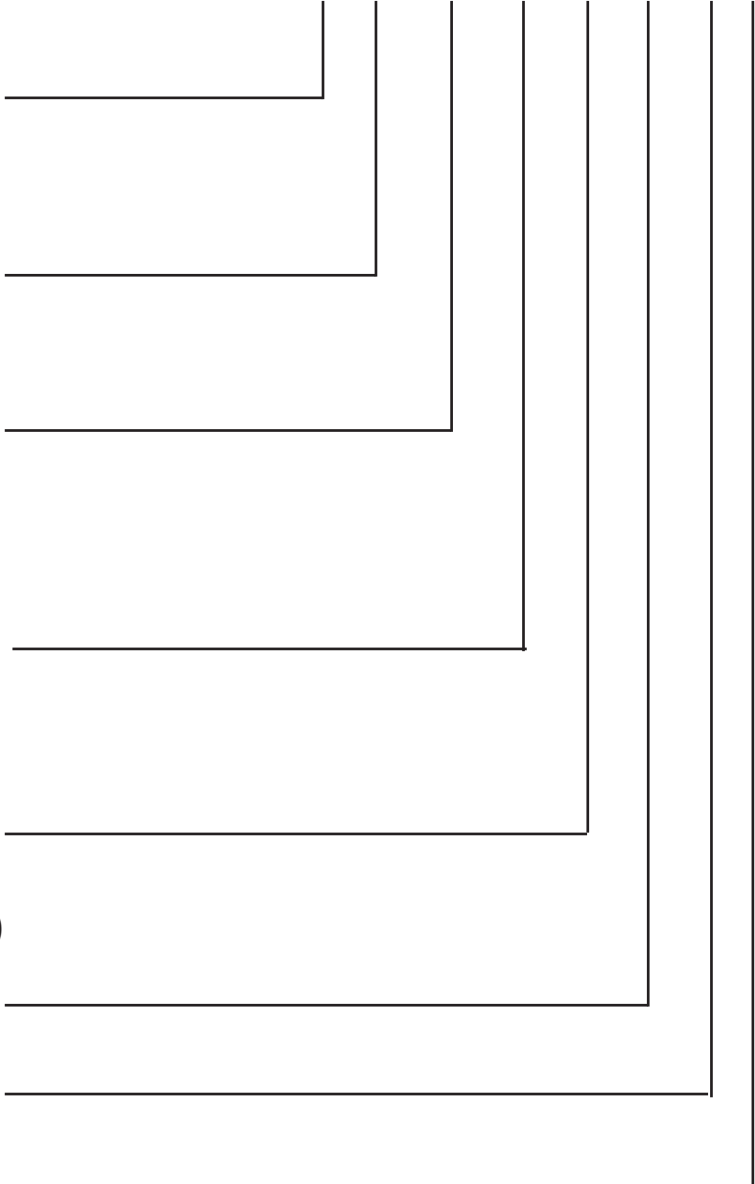
- WA = Base version
- WL = Firmly connected cable
- WLS = Firmly conn. cable and jack
- WS = With round jack
- WMM = MIMS measuring insert
- WB = Connection head form B

- W*-RT = Weld-on plate
- * = Model as per pages 2 and 3

- 1.0/1.2 = Ø 1.0/1.2 mm
- 1.5/1.6 = Ø 1.5/1.6 mm
- 2.0 = Ø 2.0 mm
- 3.0 = Ø 3.0 mm
- 6.0 = Ø 6.0 mm
- 5.0/6.0 = Ø 5.0 to 6.0 mm reinforced
- 6,0/8,0 = Ø 6.0 to 8.0 mm reinforced
- 8,0 = Ø 8.0 mm

- 1 Pt = Single Pt 100/0
- 2 Pt = Duplex Pt 100/0
- 3 Pt = Triplex Pt 100/0

- B = EN 60 751 Class B
- A = EN 60 751 Class A
- 1/3 B = 1/3 Class B (0 .. 200 °C)
- 1/5 B = 1/5 Class B (at 0 °C)
- 1/10 B = 1/10 Class B (upon request)



Element or measuring insert length in mm

Cable length in m

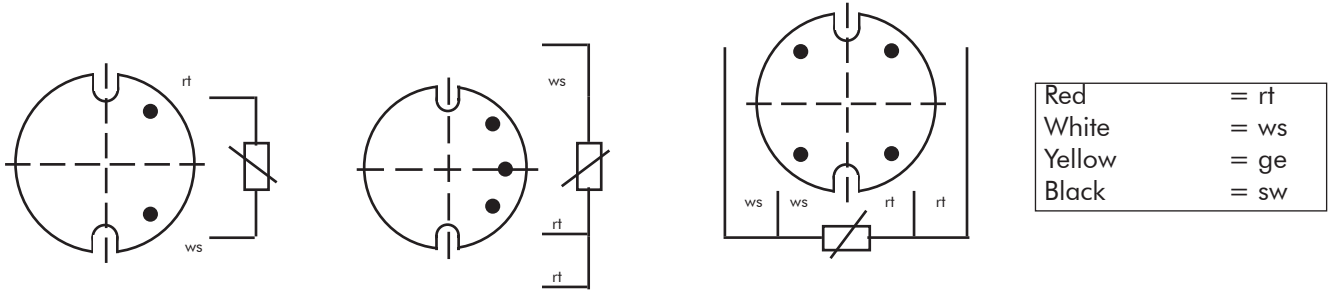
Cable type

- A) TT - 465
- B) SS - 350
- C) PP - 520
- D) TG- 412

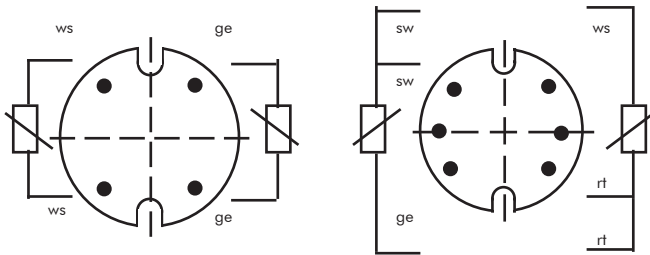
Special cables are available upon request

Note: Please specify particularities separately:
 Circuit (2- , 3- or 4- wire circuit)
 Jack type for forms WS and WLS

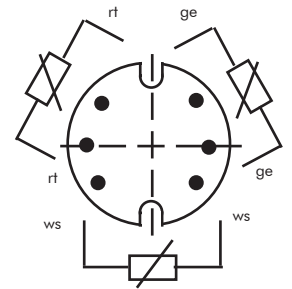
**Socket wiring diagram form WMM resp. WB
 Single Pt 100/0**



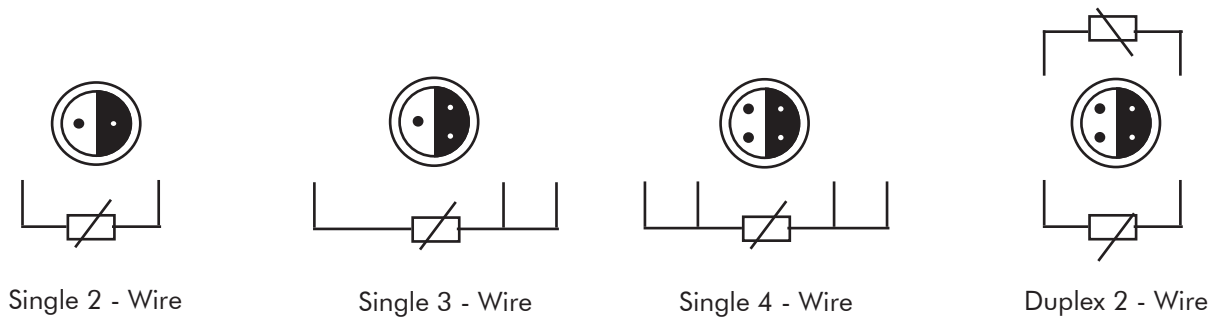
Duplex Pt 100/0



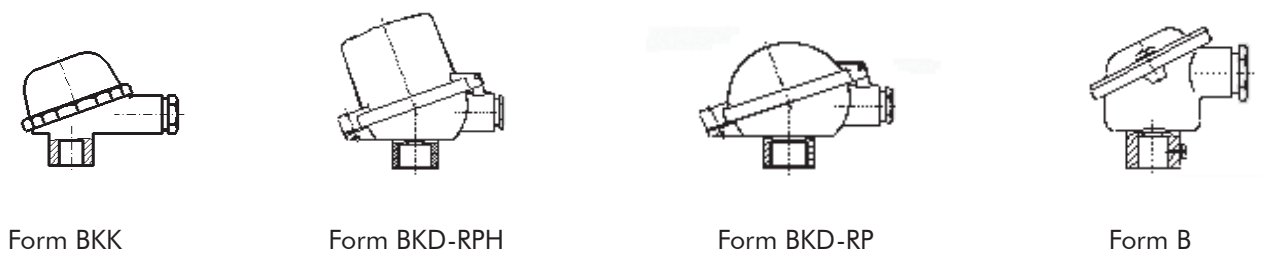
Triplex Pt 100/0



Wiring diagram form WS resp. WLS with round jack



Connection heads for form WB



Temperature resistance relationship according to IEC 60 751

t ₉₀ in °C	0	1	2	3	4	5	6	7	8	9
-200	18.520	18.952	19.384	19.815	20.247	20.677	21.108	21.538	21.967	22.397
-190	22.825	23.254	23.682	24.110	24.538	24.965	25.392	25.819	26.245	26.671
-180	27.096	27.522	27.947	28.371	28.796	29.220	29.643	30.067	30.490	30.913
-170	31.335	31.757	32.179	32.601	33.022	33.443	33.864	34.284	34.704	35.124
-160	35.543	35.963	36.382	36.800	37.219	37.637	38.055	38.472	38.889	39.306
-150	39.723	40.140	40.556	40.972	41.388	41.803	42.218	42.633	43.048	43.462
-140	43.876	44.290	44.704	45.117	45.531	45.944	46.356	46.769	47.181	47.593
-130	48.005	48.416	48.828	49.239	49.649	50.060	50.470	50.881	51.291	51.700
-120	52.110	52.519	52.928	53.337	53.746	54.154	54.562	54.970	55.378	55.786
-110	56.193	56.600	57.007	57.414	57.821	58.227	58.633	59.039	59.445	59.850
-100	60.256	60.661	61.066	61.471	61.876	62.280	62.684	63.088	63.492	63.896
-90	64.300	64.703	65.106	65.509	65.912	66.315	66.717	67.120	67.522	67.924
-80	68.325	68.727	69.129	69.530	69.931	70.332	70.733	71.134	71.534	71.934
-70	72.335	72.735	73.134	73.534	73.934	74.333	74.732	75.131	75.530	75.929
-60	76.328	76.726	77.125	77.523	77.921	78.319	78.717	79.114	79.512	79.909
-50	80.306	80.703	81.100	81.497	81.894	82.290	82.687	83.083	83.479	83.875
-40	84.271	84.666	85.062	85.457	85.853	86.248	86.643	87.038	87.432	87.827
-30	88.222	88.616	89.010	89.404	89.798	90.192	90.586	90.980	91.373	91.767
-20	92.160	92.553	92.946	93.339	93.732	94.124	94.517	94.909	95.302	95.694
-10	96.086	96.478	96.870	97.261	97.653	98.044	98.436	98.827	99.218	99.609
0	100.000	100.391	100.781	101.172	101.562	101.953	102.343	102.733	103.123	103.513
10	103.903	104.292	104.682	105.071	105.460	105.849	106.238	106.627	107.016	107.405
20	107.794	108.182	108.570	108.959	109.347	109.735	110.123	110.510	110.898	111.286
30	111.673	112.060	112.447	112.835	113.221	113.608	113.995	114.382	114.768	115.155
40	115.541	115.927	116.313	116.699	117.085	117.470	117.856	118.241	118.627	119.012
50	119.397	119.782	120.167	120.552	120.936	121.321	121.705	122.090	122.474	122.858
60	123.242	123.626	124.009	124.393	124.777	125.160	125.543	125.926	126.309	126.692
70	127.075	127.458	127.840	128.223	128.605	128.987	129.370	129.752	130.133	130.515
80	130.897	131.278	131.660	132.041	132.422	132.803	133.184	133.565	133.946	134.326
90	134.707	135.087	135.468	135.848	136.228	136.608	136.987	137.367	137.747	138.126
100	138.506	138.885	139.264	139.643	140.022	140.400	140.779	141.158	141.536	141.914
110	142.293	142.671	143.049	143.426	143.804	144.182	144.559	144.937	145.314	145.691
120	146.068	146.445	146.822	147.198	147.575	147.951	148.328	148.704	149.080	149.456
130	149.832	150.208	150.583	150.959	151.334	151.710	152.085	152.460	152.835	153.210
140	153.584	153.959	154.333	154.708	155.082	155.456	155.830	156.204	156.578	156.952
150	157.325	157.699	158.072	158.445	158.818	159.191	159.564	159.937	160.309	160.682
160	161.054	161.427	161.799	162.171	162.543	162.915	163.286	163.658	164.030	164.401
170	164.772	165.143	165.514	165.885	166.256	166.627	166.997	167.368	167.738	168.108
180	168.478	168.848	169.218	169.588	169.958	170.327	170.696	171.066	171.435	171.804
190	172.173	172.542	172.910	173.279	173.648	174.016	174.384	174.752	175.120	175.488
200	175.856	176.224	176.591	176.959	177.326	177.693	178.060	178.427	178.794	179.161
210	179.528	179.894	180.260	180.627	180.993	181.359	181.725	182.091	182.456	182.822
220	183.188	183.553	183.918	184.283	184.648	185.013	185.378	185.743	186.107	186.472
230	186.836	187.200	187.564	187.928	188.292	188.656	189.019	189.383	189.746	190.110
240	190.473	190.836	191.199	191.562	191.924	192.287	192.649	193.012	193.374	193.736
250	194.098	194.460	194.822	195.183	195.545	195.906	196.268	196.629	196.990	197.351
260	197.712	198.073	198.433	198.794	199.154	199.514	199.875	200.235	200.595	200.954
270	201.314	201.674	202.033	202.393	202.752	203.111	203.470	203.829	204.188	204.546
280	204.905	205.263	205.622	205.980	206.338	206.696	207.054	207.411	207.769	208.127
290	208.484	208.841	209.198	209.555	209.912	210.269	210.626	210.982	211.339	211.695
300	212.052	212.408	212.764	213.120	213.475	213.831	214.187	214.542	214.897	215.252
310	215.608	215.962	216.317	216.672	217.027	217.381	217.736	218.090	218.444	218.798
320	219.152	219.506	219.860	220.213	220.567	220.920	221.273	221.626	221.979	222.332
330	222.685	223.038	223.390	223.743	224.095	224.447	224.799	225.151	225.503	225.855
340	226.206	226.558	226.909	227.260	227.612	227.963	228.314	228.664	229.015	229.366
350	229.716	230.066	230.417	230.767	231.117	231.467	231.816	232.166	232.516	232.865
360	233.214	233.564	233.913	234.262	234.610	234.959	235.308	235.656	236.005	236.353
370	236.701	237.049	237.397	237.745	238.093	238.440	238.788	239.135	239.482	239.829
380	240.176	240.523	240.870	241.217	241.563	241.910	242.256	242.602	242.948	243.294
390	243.640	243.986	244.331	244.677	245.022	245.367	245.713	246.058	246.403	246.747
400	247.092	247.437	247.781	248.125	248.470	248.814	249.158	249.502	249.845	250.189
410	250.533	250.876	251.219	251.562	251.906	252.248	252.591	252.934	253.277	253.619
420	253.962	254.304	254.646	254.988	255.330	255.672	256.013	256.355	256.696	257.038
430	257.379	257.720	258.061	258.402	258.743	259.083	259.424	259.764	260.105	260.445
440	260.785	261.125	261.465	261.804	262.144	262.483	262.823	263.162	263.501	263.840
450	264.179	264.518	264.857	265.195	265.534	265.872	266.210	266.548	266.886	267.224
460	267.562	267.900	268.237	268.574	268.912	269.249	269.586	269.923	270.260	270.597
470	270.933	271.270	271.606	271.942	272.278	272.614	272.950	273.286	273.622	273.957
480	274.293	274.628	274.963	275.298	275.633	275.968	276.303	276.638	276.972	277.307
490	277.641	277.975	278.309	278.643	278.977	279.311	279.644	279.978	280.311	280.644
500	280.978	281.311	281.643	281.976	282.309	282.641	282.974	283.306	283.638	283.971
510	284.303	284.634	284.966	285.298	285.629	285.961	286.292	286.623	286.954	287.285
520	287.616	287.947	288.277	288.608	288.938	289.268	289.599	289.929	290.258	290.588
530	290.918	291.247	291.577	291.906	292.235	292.565	292.894	293.222	293.551	293.880
540	294.208	294.537	294.865	295.193	295.521	295.849	296.177	296.505	296.832	297.160
550	297.487	297.814	298.142	298.469	298.795	299.122	299.449	299.777	300.102	300.428
560	300.754	301.080	301.406	301.732	302.058	302.384	302.709	303.035	303.360	303.685
570	304.010	304.335	304.660	304.985	305.309	305.634	305.958	306.282	306.606	306.930
580	307.254	307.578	307.902	308.225	308.549	308.872	309.195	309.518	309.841	310.164
590	310.487	310.810	311.132	311.454	311.777	312.099	312.421	312.743	313.065	313.386

Temperature resistance relationship cont.

t ₉₀ in °C	0	1	2	3	4	5	6	7	8	9
600	313.708	314.029	314.351	314.672	314.993	315.314	315.635	315.956	316.277	316.597
610	316.918	317.238	317.558	317.878	318.198	318.518	318.838	319.157	319.477	319.796
620	320.116	320.435	320.754	321.073	321.391	321.710	322.029	322.347	322.666	322.984
630	323.302	323.620	323.938	324.256	324.573	324.891	325.208	325.526	325.843	326.160
640	326.477	326.794	327.110	327.427	327.744	328.060	328.376	328.692	329.008	329.324
650	329.640	329.956	330.271	330.587	330.902	331.217	331.533	331.848	332.162	332.477
660	332.792	333.106	333.421	333.735	334.049	334.363	334.677	334.991	335.305	335.619
670	335.932	336.246	336.559	336.872	337.185	337.498	337.811	338.123	338.436	338.748
680	339.061	339.373	339.685	339.997	340.309	340.621	340.932	341.244	341.555	341.867
690	342.178	342.489	342.800	343.111	343.422	343.732	344.043	344.353	344.663	344.973
700	345.284	345.593	345.903	346.213	346.522	346.832	347.141	347.451	347.760	348.069
710	348.378	348.686	348.995	349.303	349.612	349.920	350.228	350.536	350.844	351.152
720	351.460	351.768	352.075	352.382	352.690	352.997	353.304	353.611	353.918	354.224
730	354.531	354.837	355.144	355.450	355.756	356.062	356.368	356.674	356.979	357.285
740	357.590	357.896	358.201	358.506	358.811	359.116	359.420	359.725	360.029	360.334
750	360.638	360.942	361.246	361.550	361.854	362.158	362.461	362.765	363.068	363.371
760	363.674	363.977	364.280	364.583	364.886	365.188	365.491	365.793	366.095	366.397
770	366.699	367.001	367.303	367.604	367.906	368.207	368.508	368.810	369.111	369.412
780	369.712	370.013	370.314	370.614	370.914	371.215	371.515	371.815	372.115	372.414
790	372.714	373.013	373.313	373.612	373.911	374.210	374.509	374.808	375.107	375.406
800	375.704	376.002	376.301	376.599	376.897	377.195	377.493	377.790	378.088	378.385
810	378.683	378.980	379.277	379.574	379.871	380.167	380.464	380.761	381.057	381.353
820	381.650	381.946	382.242	382.537	382.833	383.129	383.424	383.720	384.015	384.310
830	384.605	384.900	385.195	385.489	385.784	386.078	386.373	386.667	386.961	387.255
840	387.549	387.843	388.136	388.430	388.723	389.016	389.310	389.603	389.896	390.188
850	390.481									

Permitted deviations for resistance thermometers

The European Standard EN 60 751 defines the relation between temperature in degrees Celsius and the resistance in Ohms for platinum RTD's with a resistance of 100 Ohms at 0 °C. The overall temperature range is from -200 to +850 °C. For technical reasons a range cutout from -100 to +550 °C in the 2008-version of the standard has been selected here and the permitted deviations were newly defined. Especially a clear determination between wire-wound and wafer-form resistors on one hand and thermometers on the other hand was established.

Beside resistance thermometers with 100 Ohms nominal resistance at 0 °C (Pt 100/0) those with 500, 1000, 5000 and 10000 Ohms respectively are available.

Permitted deviations for resistors IEC 60 751:2008

Wire-wound resistors		Wafer-form resistors		Tolerance in °C
Tolerance band	Temperature range in °C	Tolerance band	Temperature range in °C	
W 0.1	-100 to 350	F 0.1	0 to 150	± (0.1+0.0017* t)
W 0.15	-100 to 450	F 0.15	-30 to 300	± (0.15+0.002* t)
W 0.3	-196 to 550	F 0.3	-50 to 500	± (0.3+0.005* t)
W 0.6	-196 to 660	F 0.6	-50 to 600	± (0.6+0.01* t)

|t| = Absolute value of the temperature in °C independent from sign

Permitted deviations for thermometers IEC 60 751:2008

Tolerance band	Temperature range in °C		Tolerance in °C
	Wire-wound resistors	Flat-form resistors	
AA	-50 to 250	0 to 150	± (0.1+0.0017* t)
A	-100 to 450	-30 to 300	± (0.15+0.002* t)
B	-196 to 600	-50 to 500	± (0.3+0.005* t)
C	-196 to 600	-50 to 600	± (0.6+0.01* t)

|t| = Absolute value of the temperature in °C independent from sign

Technical data:

Measuring resistor:

Standard Pt 100 acc. to DIN EN 60 751
Other base resistances and standards are available upon request.

Permitted deviation:

Class A or B acc. to DIN EN 60 751:2008
Reduced permitted deviations (f.e. class AA) are available upon request

Sheath diameter:

Standard: 0.25; 0.5; 1.0; 1.5; 3.0; 6.0; 8.0
Special: 0.35; 1.6; 2.0; 3.2; 4.5; 4.8; 10.0

Insulation resistance:

Typical $\geq 5000 \text{ MOhm} \cdot \text{m}$ at 23 °C
Min. $1000 \text{ MOhm} \cdot \text{m}$ (DIN EN 61 515)

Insulation material:

High-purity magnesiumoxide (MgO)

Sheath material:

INCONEL 600	Mat.-no.: 2.4816
Heat-resistant steel	Mat.-no.: 1.4841
Stainless steel	Mat.-no.: 1.4541

Circuitry:

Standard 2 - wire from measuring resistor

Options:

3- or 4-wire from measuring resistor as single-Pt 100; 3-wire as duplex-Pt 100 in 5.0 resp. 6.0 mm diameter; 4-Wire as duplex-Pt 100 only in 8.0 mm sheath diameter.

Round pin connectors and jacks:

Forms WS resp. WLS are fitted with round jacks type RLK size 1 or 2. Depending on the type of connection the jacks have 2, 3 or 4 poles. The brass precision contacts are gold-plated. The outer body is made of matt chromium-plated brass.
Other connector systems and sizes are available upon request as well as the appropriate plugs.

Cable types:

A) TT - 465 - 4Cu - 0.38 L:

Wires and cable Teflon-insulated; screen braiding: tin-plated Cu; 4x stranded wire with 0.38 mm² cross-section. Suitable for a maximum ambient temperature of 220 °C.

B) SS - 350 - 2Cu - 0.25 L:

Wires and cable silicon-insulated; 2x stranded wire with 0.25 mm² cross-section. Suitable for a max. ambient temperature of 180 °C.

C) PP - 520 - 2Cu - 0.25 L:

Wires and cable PVC-insulated;
2x stranded wire with 0.25 mm² cross-section.
Maximum ambient temperature 85 °C.

D) TG - 412 - 4Cu - 0.25 L:

Wires: Teflon-insulated. Cable: covered with glass fibres, braided with wires of stainless steel, 4x stranded wire with 0.25 mm² cross-section. Suitable for a max. ambient temperature of 240 °C.

Connection heads:

Form WB is fitted with a cast aluminium connection head form B acc. to EN 50 446.

Heads with a bigger volume, e.g. for mounting one or two transmitters inside, are also available (forms BKD-SP, BKD-RP and BKD-RPH respectively form BKK-RPH). Available is also a version made from cast plastics with a screw or hinged cover.

The standard cable gland at the connection heads is M 20 x 1.5. Other cable glands are available upon request.

The protection classification is IP 43. Other classifications, e.g. IP 54 or 65, are available upon request. Connection heads forms A and B of other materials (e.g. stainless steel) are available upon request.

All data given in this data sheet are typical but do not constitute binding and/or guaranteed characteristics. Any data needs to be verified in detail by the customer in relation to any specific application. We reserve the right to change any specification without prior notice in line with our policy of continuous technical improvement.

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