RÖSSEL MESSTECHNIK

Consultation. Solution. Innovation.

HIGH TEMPERATURE THERMOCOUPLES

DESIGNED TO MEASURE TEMPERATURES UP TO 2000°C

We offer specially developed high temperature thermocouples for use in temperatures up to 2000 °C or for highly corrosive and/or reducing atmospheres. High temperature thermocouples are primarily used in the aerospace industry, research laboratories, crystal cultivation and coating systems. Suitable thermowell materials, thermocouple combinations and insulating materials are available for the various areas of application. The following thermocouple types are used for high-temperature applications: Precious metal thermocouple types S, R, B, tungsten-rhenium thermocouple types A, C, D, G and special thermocouple types such as type V, among others.

High-temperature thermowell materials can only be used in oxidizing atmospheres to a very limited extent. This does not apply to thermowell materials made of platinum alloys up to a temperature of 1300°C.

Several thermocouples can be installed in a joint thermowell on request for special applications Measuring points for profile thermocouples can be positioned within a wide range.

SPECIAL ADVANTAGES:

- Customized versions available for many applications
- Suitable for oxidizing, reducing atmospheres and vacuums
- Pressure/vacuum-tight feedthroughs available in many types
- Transition joint thermocouples can be varied within wide limits
- Profile thermocouples available on request

AL VERSION WITH PERMANENTLY CONNECTED CABLE

With this version the connection cable, typically an compensating cable, is permanently connected. The transition sleeve has a diameter of 5, 6 or 10 mm depending on the sheath diameter. The standard length is 50 mm. The cable type (wire cross-section, insulation structure, shielding) can be varied within certain limits.

S VERSION WITH PERMANENTLY CONNECTED COUPLING

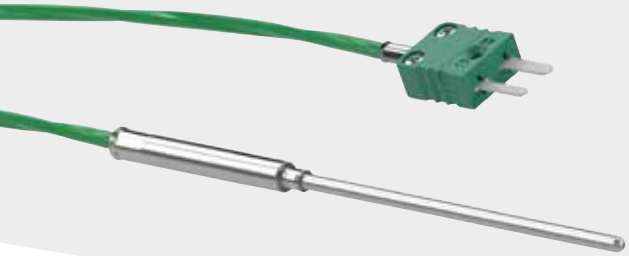
With the S version, the connector system (coupling) is directly connected to the sheathed thermocouple. The positive pole is positioned on the pin. The contacts are made of brass and are gold-plated. The maximum coupling temperature is 150 °C. Other connector systems are available on request.

(Please specify the required connector version when placing an order).

STE VERSION WITH PERMANENTLY CONNECTED THERMOCOUPLE CONNECTOR - mini or standard

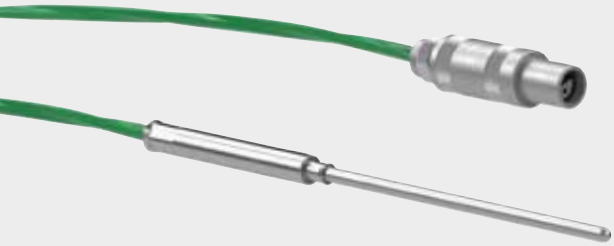
With the STE version, the connector is directly connected to the sheathed thermocouple. The standard version is fitted with a miniature connector (TC-dia. =1.6 mm) or standard connector (TC dia. =3.2 mm). The contacts are made of an equalizing material; the outer housing is made of temperature-resistant plastic. The maximum connector temperature is 150 °C. Other connector systems with a higher glass fiber content (-450°C) and ceramic connector stems are available on request along with the corresponding couplings.

(Please specify the required connector version when placing an order).



ALSTE VERSION with permanently connected cable and thermocouple connector

The ALSTE version is the AL version including a thermocouple connector. This version includes a mini or standard connector depending on customer specifications (see STE version). The connector and sleeve temperature are based on the cable used and limited to a maximum of 150 °C.



ALS VERSION with permanently connected cable and LEMO round coupler

The ALS version is the AL version including a LEMO round coupler. This design includes a round coupler size 0 or 1 depending on customer specifications or the cable diameter. Other versions and sizes, e.g. with LEMO round couplers, are available on request.

ORDER CODE STRUCTURE

Example: ALSTE - 2CO - 6.4 - 720 - 0.1 - H

Versions

AL	With connection cable
ALS	With cable and round coupler
ALSTE	With cable and thermocouple connector
S	With round coupler
STE	With thermocouple connector

Thermo-couples

without number	= 1 thermocouple
2	= 2 thermocouples

Thermocouple types pursuant to DIN EN 60 584

C (AE)	W5%Re - W26%Re
D (AO)	W3%Re - W25%Re
S	Pt10%Rh - Pt
R	Pt13%Rh - Pt
B	Pt6%Rh - Pt30%Rh
A	W5%Re-W20%Re

Code letter for sheath material

AA	Platinum 6% rhodium
AH	Platinum 10% rhodium
N	Tantalum
O	Molybdenum

Other sheath materials available on request
*Other high temperature sheath materials are available on request

Sheath diameter

1.6	dia. 1.6 mm
3.2	dia. 3.2 mm
6.4	dia. 6.4 mm
8.0	dia. 8.0 mm

Thermocouple length in mm

Cable length in m

Insulation material

M	Magnesium oxide (MgO)
A	Aluminum oxide (Al2O3)
H	Hafnium oxide (HfO2)

GUIDELINES FOR THE USE OF HIGH TEMPERATURE THERMOCOUPLES

Sheath material	Type	Thermowire type	Insulation	Permissible atmosphere	Max. operating temperature
Pt 6 % Rh	AA	S, R, B & V	MgO	Oxidizing	1400 °C
Pt 10 % Rh	AH	S, R, B & V	MgO	Oxidizing	1400 °C
Pt 6 % Rh	AA	V, A, AA, C & D	MgO / HfO_2	Oxidizing	1700 °C
Pt 10 % Rh	AH	V, A, AA, C & D	MgO / HfO_2	Oxidizing	1700 °C
Tantalum	N	V, A, AA, C & D	MgO / HfO_2	Inert/vacuum	1700 °C
Tantalum	N	A, AA, C & D	HfO_2	Inert/vacuum	2150 °C
Molybdenum (Mo)	O	A, AA, C & D	HfO_2	Reducing/inert/vacuum	2200 °C (2500 °C)
Mo 50 % rhenium	BE	A, AA, C & D	HfO_2	Reducing/inert/vacuum	2300 °C

More information is available on request. Our technical sales team is happy to help with any queries.

THERMOELECTRIC VOLTAGES FOR HIGH TEMPERATURE THERMOCOUPLES

Temp. in°C	Type G (AA)	Type D (AE)	Type C (AO)	Type A (A1)	Type S	Type R	Type B	Type V
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	0.344	1.145	1.381	1.337	645.9	647.4	33.2	0.371
200	1.005	2.603	2.987	2.871	1440.8	1468.6	178.3	0.841
300	1.985	4.289	4.767	4.513	2323.0	2400.6	430.6	1.380
400	3.282	6.129	6.654	6.203	3259.4	3407.7	786.5	1.961
500	4.793	8.098	8.573	7.908	4233.3	4471.3	1241.4	2.562
600	6.487	10.092	10.508	9.606	5238.7	5583.5	1791.9	3.172
700	8.330	12.128	12.450	11.284	6275.2	6742.7	2430.6	3.861
800	10.299	14.183	14.374	12.934	7345.0	7949.8	3153.6	4.448
900	12.318	16.225	16.265	14.550	8449.2	9204.9	3956.9	5.021
1000	14.392	18.242	18.120	16.127	9587.1	10506.0	4834.3	5.576
1100	16.497	20.229	19.943	17.662	10756.5	11849.6	5779.5	6.116
1200	18.647	22.191	21.724	19.150	11950.5	13228.0	6786.4	6.643
1300	20.767	24.081	23.423	20.589	13159.1	14628.7	7848.2	7.159
1400	22.813	25.896	25.032	21.976	14372.6	16040.1	8956.2	7.669
1500	24.841	27.686	26.582	23.311	15581.7	17450.7	10099.1	8.177
1600	26.849	29.450	28.078	24.593	16776.8	18848.9	11263.0	8.687
1700	28.841	31.181	29.528	25.821	17947.3	20221.7	12432.5	9.205
1800	30.813	32.874	30.922	26.997	-	-	13591.3	9.732
1900	32.589	34.359	32.298	28.119	-	-	-	10.272
2000	34.245	35.723	33.632	29.186	-	-	-	10.826
2100	35.851	37.037	34.914	30.194	-	-	-	-
2200	37.435	38.306	36.088	31.142	-	-	-	-
2300	38.896	39.350	36.928	32.028	-	-	-	-
2400	-		-	32.855	-	-	-	-
2500	-	-	-	33.640	-	-	-	-

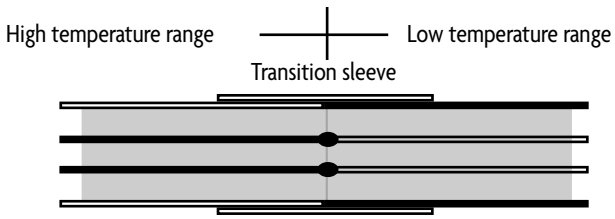
Thermoelectric voltages in mV, reference temperature 0 °C

LIMIT DEVIATIONS

The limit deviations for precious metal thermocouples S, R and B are standardized in DIN EN 60 584-1. Types S and R are available in classes 1 and 2; type B is only available in classes 2 and 3. The limit deviations of types A and C are standardized in DIN EN 60584-1 and can be found in ASTM E988. The limit deviation in the ASTM is 1 % of the measured value in the range 440 °C to 2315 °C.

TRANSITION JOINT THERMOCOUPLE

With long thermocouples, it can be advisable to opt for a transition joint to a different sheath material - e.g. Inconel or stainless steel - for cost reasons. The installation length of the part exposed to the high temperature and the overall length can be provided according to customer specifications.



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