Mineral insulated thermocouples

type

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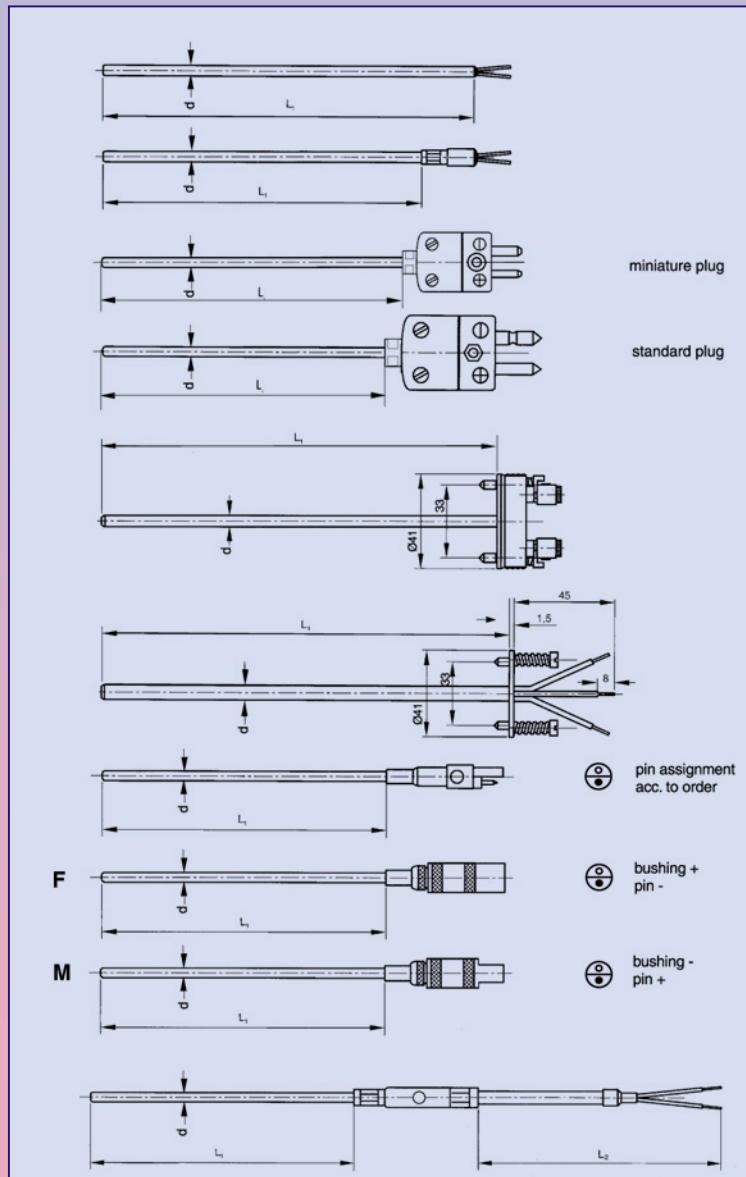

type

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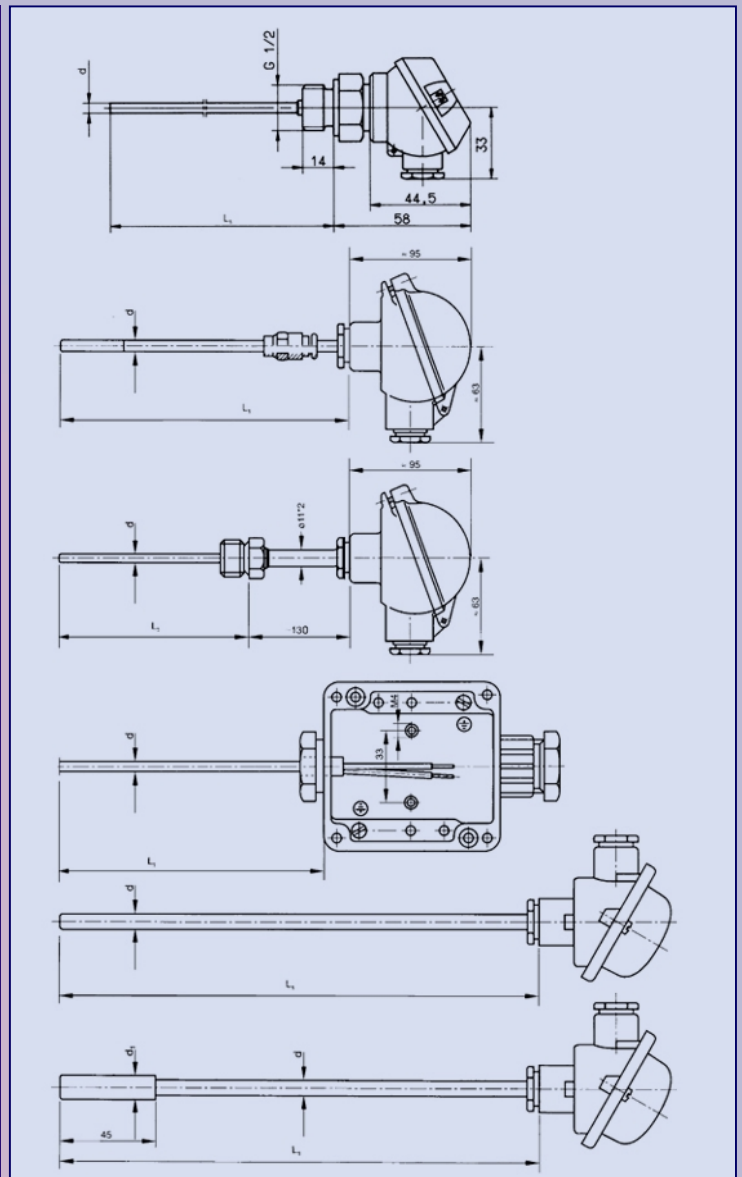

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Mineral insulated thermocouples

Thermocouple

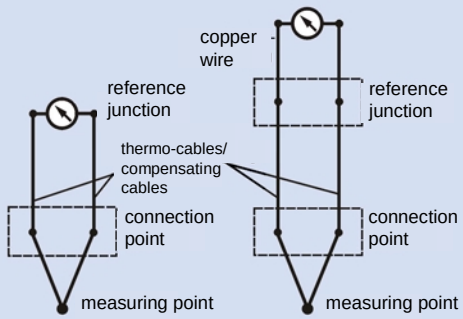
Structure and operation:

Two wires made from different metals or metal alloys are welded at one end (hot end). The welded joint is called the measuring point and the free ends of the thermocouple are designated as the reference junction. By changing the temperature of the measuring point (compared to the reference junction) a voltage called thermo-voltage at the reference junction (cold end) arises. The free ends are connected to the measuring instrument by insulated wires. The thermo-voltage depends on the material of the thermowires and on the temperature difference between the measuring point and the reference junction. The temperature at the reference junction has to be kept constant during the measurement. If this cannot be guaranteed, the reference junction has to be located in a zone of constant temperature and must be connected to the measuring point by a thermo-cable or a compensating cable. Thus, the thermo-couple is "extended" up to the reference point. To determine the temperature of the measuring point, the reference temperature has to be known. Note that the thermo-cable is made of a thermo-material, such as NiCr-Ni, while the compensating cable may consist of a substitute material. The compensating cable delivers the same thermo-voltage as the thermocouple up to +200°C. Note that for any thermocouple only compensating cables and thermo-cables of the appropriate materials should be used. The basic values of the thermo-voltage are defined in so-called basic sequences which are listed in the standards DIN 43 710 and IEC 584-1. The maximum permissible variations (tolerances) for thermocouples according to IEC 584-1 are specified in standard IEC 584-2. These standards also define specific requirements in regard to the material composition, purity and processing. The requirements on cables connecting the thermocouple with a display are specified in the standard VDE 0250 which concerns insulated cables for power systems. The standards valid for the compensating cables are DIN 43 713 and 43 714.

elements and their descriptions acc. to norm

element	type	norm
NiCr-Ni	K	IEC 584-1
Fe-CuNi	L	DIN 43710
Fe-CuNi	J	IEC 584-1
Cu-CuNi	U	DIN 43710
Cu-CuNi	T	IEC 584-1
NiCr-CuNi	E	IEC 584-1
PtRh-Pt	S	IEC 584-1
90% Pt, 10% Rh - 100% Pt		
PtRh-Pt	R	IEC 584-1

fig. 1 **fig. 2**



Mineral insulated thermocouples

Thermocouple:
L (Fe-CuNi) DIN 43 710
J (Fe-CuNi) DIN IEC 584
K (NiCr-Ni) DIN IEC 584
S (Pt-Rh10) DIN IEC 584

Sheath wire diameter d:	**Built-in length L_1(mm):** or acc. to order
0,5 mm	
1,0 mm	
1,5 mm	
2,0 mm	
3,0 mm	100
4,5 mm	100
6,0 mm	100, 200, 300, 500
special design	

Sheath material:
1.4541
1.4571
1.4841
2.4816 (Inconel 600)

Number of thermocouples:
1 thermocouple
2 thermocouples separated welding bead
2 thermocouples common welding bead

Measuring point version:
sheath insulated
sheath welded

Connection wire length L_2(mm):
acc. to order

Connection head:
acc. to order

Thread:
G ½" A, or acc. to order

Range of working temperatures and tolerances for
- mineral insulated thermocouple type L acc. to DIN 43 710
- mineral insulated thermocouple type J, K and S acc. to DIN IEC 584

type	max. permissible continuous operating temperature in air (in°C)	permissible tolerance ΔT for class 2 (in K)	temperature range
L	+600	±3,0	+100°C … +400°C
J	+750	±2,5	-40°C … +700°C
K	+1200		-40°C … +1200°C
S	+1400	±1,5	… +1300°C

Working temperatures for protective tube materials

material		max. continuous operating temperature in air (in °C)
name	no.	
X 6 Cr Ni Ti 18-10	1.4541	+800
X 6 Cr Ni Mo Ti 17-12-2	1.4571	+800
X 15 Cr Ni Si 25-20	1.4841	+1200
Inconel 600	2.4816	+1100

other versions by inquiry