

FRODE PEDERSEN

Application

- Mineral insulated thermocouples are used for measuring temperature where a flexible, rugged,corrosive resistant, and fast responding sensor is needed.
- Used in solid, fluid and gas medias up to 1100°C (shortly 1250°C)
- Fields of application
 - Power plants - f.inst turbines and steam tubes.
 - Process industry - f.inst petrochemical, combustion, furnaces and heat treatment
 - Engines - exhaust and material

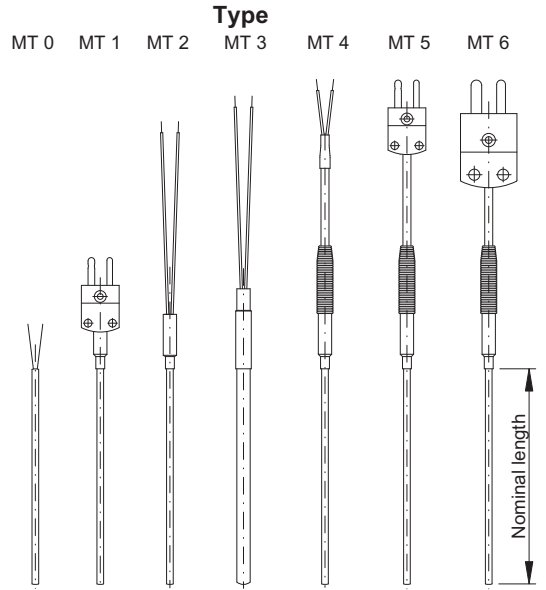
Technical features

- Thermocouple type T, J, K, N, S and R according to IEC 584-1
- Mineral insulated thermocouple consist of one or more thermocouple housed in a thin-walled flexible metal tube, firmly embedded in ceramic powder (MgO - purity >96%)
- Connected to the process by brazing, adjustable compression fittings or other mechanical brackets
- There is a wide range of the material for the sheath. The choice depends on the actual application (temperature and media)

Ordering

The requested sensor is selected from the table below
The colour code means:

- Standard: Built of standard modules (short delivery time)
- Variant: Modified standard modules
- Special: Special versions and material. We are specialist in temperature measurement. Please contact us and we will do our best to solve your specific measuring task



Ordering information

Specification number	Sensor						
Type,electrical connection	Cable length (meter)						
MT 0 20mm bare thermocouple wire.....	0	0	0	0	0	0	00 for type MT 0 and MT 1. For MT2 and MT3 f.inst 0.1
MT 1 mini compensation connector.....	1	0	1	0	1	0	1 meter
MT 2 100 mm flying leads (PVC insulated)...	2	x	x	x	x	x	Special (Min 0.1 meter)
MT 3 100 mm flying leads (PVC insulated)...	3						
MT 4 Compensation cable.....	4						
MT 5 Compensation cable w.mini connector.....	5						
MT 6 Compensation cable w. connector.....	6						
Special:.....	s						
Thermocouple Sheath	Cable type						
Type Diam. Temperature °C Material Temp. °C							
IEC mm Cont. Shortly W. no. Cont.							
T 1.0 400 500 1.4401 800	2	2	0				None or MT0. XP flying lead for MT2/MT3. PVC insulated, 105°C
T 3.0 400 500 1.4541 800	0	1	0				XPP 2x0.22mm². PVC insulated, 105°C
J 1.5 700 800 1.4571 800	0	2	2				XPPF 2x0.22mm². PVC insulated,inner foil screen, 105°C (Not T)
J 3.0 700 800 1.4571 800	0	3	3				XGLGLO 2x0.22mm². Fiberglass +steel braid, 200°C (Not T)
J 6.0 700 800 1.4571 800	0	4	4				XPP 4x0.22mm². PVC isoleret, 105°C (Only J+K)
K 2.0 800 850 1.4571 800	0	5	5				XLSL 2x0.22mm². Silicone insulated, 200°C (Only K)
K 6.0 800 850 1.4571 800	0	6	6				XGLGLO 4x0.22mm². Fiberglass +steel braid, 200°C (Only J+K)
K 1.0 850 950 1.4845 1150	0	7	7				XTGLO 2x0.22mm². Teflon+Fiberglass+steel braid, 200°C (Only K)
K 1.5 850 950 1.4841 1150	0	8	8				Special:
K 3.0 1000 1150 1.4841 1150	0	9	9				Tolerance acc to IEC 584-2
K 6.0 1000 1150 1.4841 1150	1	0	0				0 Class 2, for J, K and N, i.e. ±2.5°C or 0.0075 x t _{actual} (°C) 2)
K 0.5 800 950 2.4816 1100	1	1	1				1 Class 2, for R, S and B, i.e. ±1.5°C or 0.0025 x t _{actual} (°C) 2)
K 6.0 1000 1150 2.4816 1100	1	2	2				2 Class 2, for T, i.e. ±1.0°C or 0.0075 x t _{actual} (°C) 2)
N 2.0 1100 1250 Pyrosil D 1250	1	3	3				3 Class 1, for J, K and N, i.e. ±1.5°C or 0.0040 x t _{actual} (°C) 2)
N 3.0 1100 1250 Pyrosil D 1250	1	4	4				4 Class 1, for T, i.e. ±0.5°C or 0.004 x t _{actual} (°C) 2)
N 6.0 1100 1250 Pyrosil D 1250	1	5	5				s Special
S 3.0 1300 1350 2.4816 1100	1	6	6				Note 2: The highest value apply
R 3.0 1300 1350 2.4816 1100	1	7	7				Hot Junction
K 1.5 800 850 1.4571 800	1	8	8				0 Insulated from outer sheath
K 3.0 800 850 1.4571 800	1	9	9				1 Grounded (thermocouple bonded to outer sheath)
N 3.0 1100 1100 AISI 310 1150	2	0	0				Nominal length (mm)
K 3.0 1000 1150 2.4816 1100	2	1	1				0 0 0 1 5 0 150
Special:.....	s	s	1				0 0 3 0 0 300
							0 0 5 0 0 500
							0 1 0 0 0 1000
							x x x x x Interim lengths (Min. 50, max. 30.000)
							Note 1 Length >800mm is delivered coiled
							Number of thermocouples
							1 1
							2 2 Only for for type J og K and sheath diam. > 3mm

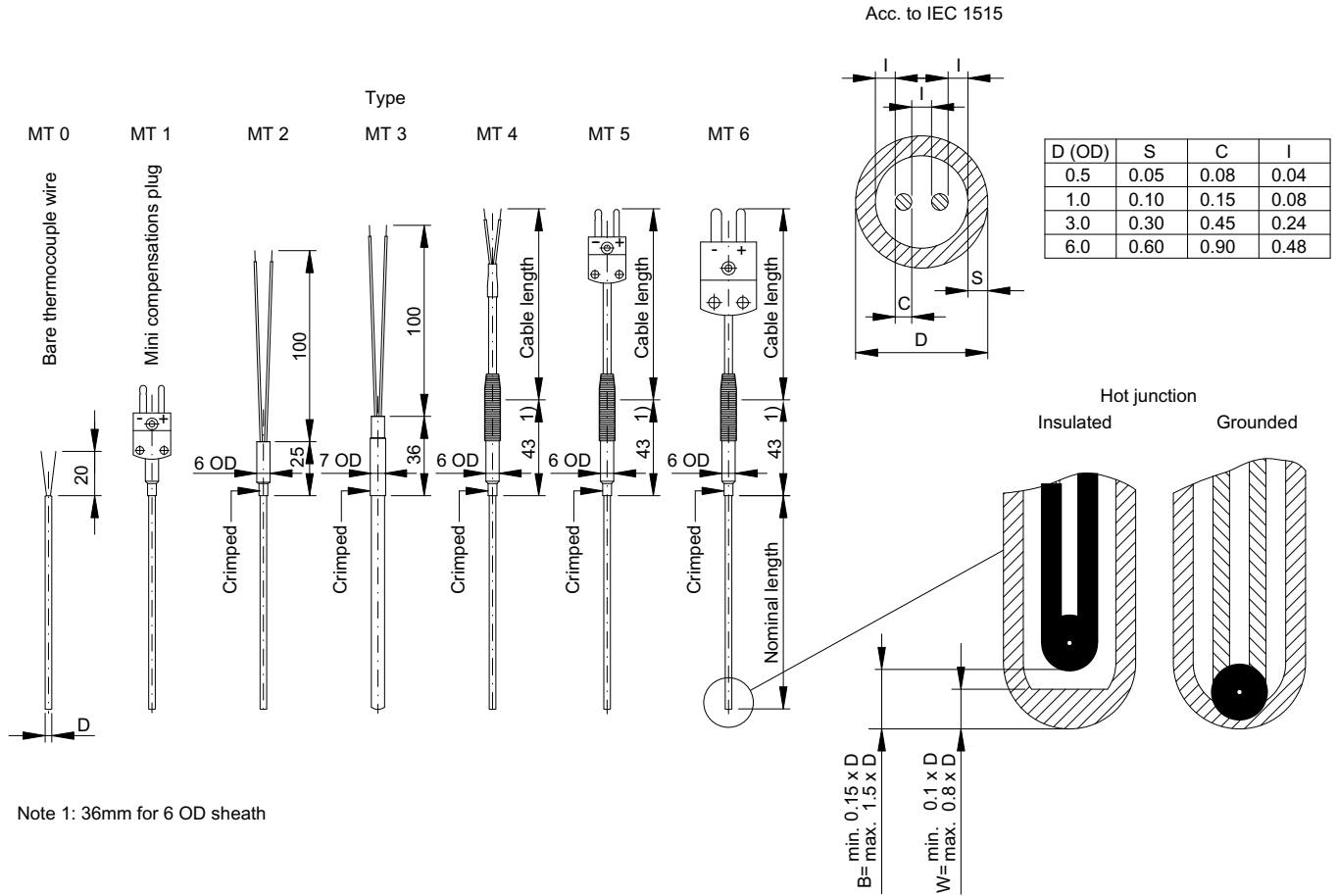
Accessories

Process connection See data sheet 9113
Compensation cable: See data sheet 9150

Customer information

Name:
Tel.:

Dimensions



Properties for MI sheath material

Application	W.no. 1.4571 AISI 316Ti max. 800°C	W.no. 1.4841 AISI 314 max. 1150°C	W.no. 1.4845 AISI 310 max. 1150°C	Nicrobell C max. 1250°C	W.no. 2.4816 Inconel 600 max. 1100°C 2)
Liquids	Recommended	Suitable	Suitable	Suitable	Suitable
Acid	Recommended	Not recommended	Not recommended	Not recommended	Suitable
Sulphur atmospheres	Suitable	Not recommended	Not recommended	Not recommended	Not recommended
Chlorine atmospheres	Suitable	Suitable	Suitable	Suitable	Recommended
Oxidizing atmospheres	Recommended	Recommended 1)	Recommended	Recommended	Recommended
Reducing atmospheres	Not recommended	Not recommended	Not recommended	Suitable	Suitable
Carburizing atmospheres	Not recommended	Suitable	Suitable	Recommended	Recommended

Bending radius
Min. bending radius is
5 x D @ repeatable bendings
2 x D @ stationary bending

Note 1: Not recommended for continuous operation in the range 425°C to 850°C

Note 2: For type S/R thermocouple the maximum recommended operating temperature is 900°C, due to drift caused by contamination from the sheath

Insulation resistance and test voltage

Depending of temperature and length acc. to IEC 1515

Thermo-couple	Length m	Test temperature °C	Insulation resistance minimum	
			M ohm x m	M ohm
			All	≥1
	<1	20 ±15	-	1000
J, K, N, R, S	All lengths	500 ±15	-	5
T	All lengths	300 ±15	-	500

Depending of test voltage, diameter, and number of thermocouple

Diameter mm	Number of thermocouple			
	1		2	
	U Volt	Rmin M ohm x m	U Volt	Rmin M ohm x m
< 1	75 ±25	100		
1 - 1.5	75 ±25	1000		
2 - 6	500 ±50	1000	250 ±50	1000

Note:

The insulation resistance is dependent upon the length of the cable. Therefore, it is listed as a length related resistance in Mohm x m for length > 1 meter and Mohm for length <1 meter

Response time Hot junction insulated

Sheath diameter	Response time in seconds (guidelines) In water @ 0.2m/sec.				Response time in seconds (guidelines) In air @ 2m/sec.			
	t _{0.5}		t _{0.9}		t _{0.5}		t _{0.9}	
	0.5	0.06	0.13	1.8	5.52	0.03	0.10	1.8
1.0	0.15	0.5	3	10	0.06	0.18	3	10
1.5	0.21	0.6	8	25	0.13	0.4	8	25
3.0	1.2	2.9	23	80	0.22	0.75	23	80
6.0	4	9.6	60	200	0.55	2.6	55	185

Hot junction grounded

Note:

The 0.5/0.9 time is the time that it takes the sensor to reach 50%/90% of the final value of a temperature change of a medium. If media and velocity are different from the ones stated, the time can change significantly.