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THERMOCOUPLES | TEMPERATURE SENSORS OEM, CUSTOMISED DESIGN, SPECIAL PROJECTS, CRITICAL APPLICATIONS & MADE-TO-ORDER MANUFACTURER







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#### **History & Background**

With 30 years of experience and under our trademark brand Maltec-H, we are proud to be the only manufacturer to have been accredited with the prestigious UL certificate in Malaysia, along with other certifications such as ISO 9001, CE, UKAS, and Standards. Our trademark brand Maltec-T is the only thermocouple that is CE certified in Malaysia. We are an industry leader in temperature sensor manufacturing for thermocouples, PT100 sensors, and all other types of customized temperature sensors. Lastly, through our brand Maltec-F we manufacture and fabricate float switches for level sensing.

Customers prefer us because we are able to customise, design, and manufacture. Further, our calibration lab allows us to develop the most accurate and reliable temperature sensors in the market for temperature related applications. Refineries, plants, industrial manufacturing, machine makers, equipment fabricators, and HVAC companies engage us for OEM manufacturing because of our cost competitiveness, our cutting edge technology, and our fast production capabilities.

We are able to make drawings through AutoCAD and so on to demonstrate to machine makers and end users alike the specifications, information, and designs of our products before it gets delivered. This is because we believe in providing only the best solutions that customers actually desire, because at Dpstar we believe that product quality is critical and we must deliver customer satisfaction that is unparalleled.







(MALTEC-T)









## Dpstar Capabilities & Competencies

**30+ Years Experience** 

ISO 9001 Certified, UKAS, CE, UL

**Custom Solutions** 

**Satisfaction Guaranteed** 

**Fastest Lead Times** 

**Competitive Prices** 





#### **Exceptional Quality**

Dpstar guarantees our products quality to be one of the best in the industry. We strive to offer the highest quality products in the market and to work with customers to ensure complete satisfaction. Our mission is to consistently satisfy our customers' needs through high quality products and coupled with an excellent service. Our Research and Development department has expanded our range of possibilities by developing innovative solutions and our heater & thermocouple products.

#### **Services & Test Facilities**

- Welding robot
- Manufacturing record book
- Quality inspection plan
- Visual inspection
- Dimensional check
- WPS and PQR for welded Thermowells
- Batch certificate
- Certificate of origin
- Certificate of conformance
- Functional performance test
- Loop resistant test

- Insulation resistance test
- Dye penetration test
- Pressure test
- Calibration test
- From -200 °C up to 1.500 °C (RvA/ILAC)
- Calibration test for each instrument, mV, mA, Ohms and V (RvA/ILAC)
- Vacuum test
- · Helium leak test
- PMI test



#### **Quality & Warranty Guarantee**

Customer satisfaction is our first priority. Dpstar understands the value of service and the needs of customers. Dpstar has a dedicated team to provide quotes within an hour, manufacture custom made designs in a day and delivery uncompromised quality goods to industries such as distributors of temperature sensors, heating products, food processing industries, plastic injection molding, and any other small or large organization requiring exceptional service. Proud to say that, our heaters and thermocouples have traveled quite a distance from our humble beginning – Malaysia. Whether you are from Middle East, Europe, Singapore, Thailand, Indonesia, Philippines or further, we are able to deliver your order to your doorstep.

Dpstar offers manufacturer's warranty on all our products. We are the only ONE in Asia that confidently provides a 1 Year Warranty. Our Mission is to consistently satisfy our customers' needs through high quality products and coupled with an excellent service.

# Customer satisfaction has always been our first priority











# Capabilities

#### **Dpstar Capabilities**



At Dpstar, we are able to assist you in achieving your business target. We simplify your operations by developing state-of-the-art automation solutions, custom-made according to your specific

requirements. Setup in early 90's, Dpstar has played a major role as a renowned provider of Factory, Building and Process Automation Solutions for a wide range of applications and industries. We have proven and enviable track record of timely high-technological precision in supplying electronics and electrical engineering equipment for numerous projects around Malaysia. Dpstar is a responsive organization with an emphasis on dynamic innovation. From its catalogue of standard products to products that we custom made according to customer's specification, Dpstar pledged quality and excellent in all our products and services, and provide designs that are able to negate any process complications.

Through continuous investment in research and development, our engineering team is able to develop a pattern of constant innovation, in-line with our commitment towards achieving the finest. More than 150 employees currently work in Dpstar, in one production centre and ten sales offices through out Peninsular Malaysia. Our strength lies in our abilities and dare to innovate ahead of our time. From presale to implementation and beyond, Dpstar is committed in providing excellent services and solutions. Our automation solutions are constantly being improved, simplified and getting more powerful by the day. As a result, efficiency constantly increases and this spells benefits for organizations, system and factories everywhere.

#### **Design Expertise**

Dpstar design teams support our partners from conceptual design and feasibility study throughout the life cycle of the equipment. Contact our team today to discuss your specific needs.





#### **Engineering & Manufacturing**



In being a leader in providing total solutions for industrial, building and process automation, Dpstar Group also have its own production centre, Dpstar Manufacturing Sdn. Bhd. Maltec-H and Maltec-T are our house brands for heaters and thermocouples that our factory manufacture to suit exacting automation needs. In preparation for a forecasted increase in the automation market, we have increased our intensive product development investment to ensure constant ground breaking initiatives. Our future activities will be fueled by our commitment to "Cutting Edge Technology" as we move into the future, we will proceed in line with the advances in resources and technologies.

#### **In House Capabilities**

- Testing
- X-Ray
- Insulation resistance
- High voltage dielectric
- Harmonic test
- Waveform test
- Load test (power controls)
- Functional

#### **Complete Supply**

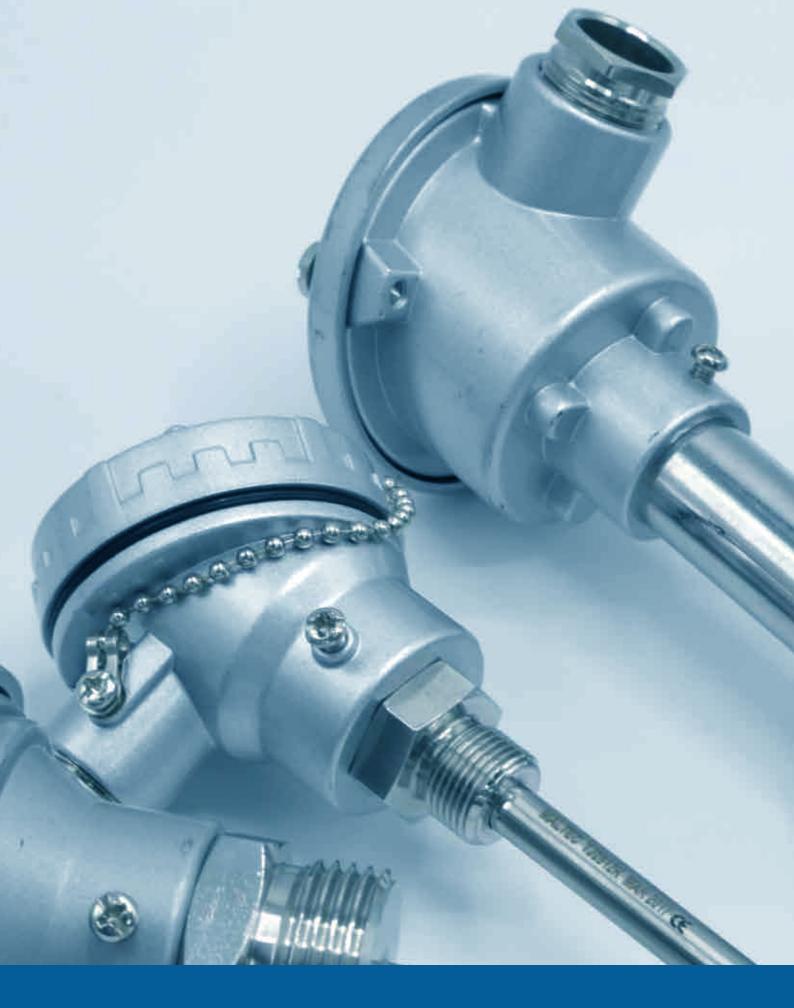
- In house manufacturing
- Technical design support
- · Dedicated project teams
- After sales support services
- On site commissioning and start up assistance

#### **Industries Served**

- Agriculture
- Automotive
- Chemicals/Petrochemicals
- Electronic & Semiconductor
- Food & Beverage
- Furnaces and Incinerators
- Glass Manufacturing
- HVAC
- Ovens and Kilns
- Packaging & Printing
- Petrochemical, Oil and Gas
- Pharmaceuticals
- Plastics & Rubber Industry
- Power Generation
- Pulp/Paper/Wood
- Textiles
- Waste & Wastewater





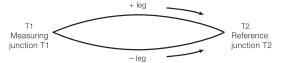


# Production

#### **1. Operating Principles**

A thermocouple consists of two wires, each made of a different metal, welded together at one end to form a circuit as shown in Fig.16. When a temperature different is produced between T1 and T2 by heating one end or by other means, a thermoelectromotive force specific to the metals used is produced in the circuit. This pair of wires is called a thermocouple and this effect, named after its discoverer, is know as the Zeebeck effect. The effect is used to measure temperature. Three laws have been established concerning thermocouple characteristics. The first is the law of homogeneous. The second is the law of intermediate metals that no thermoelectromotive force is produced even when a different metal is inserted in the circuit as long as the temperature of its junctions

is the same. The third is the law of successive or intermediate temperature that when the circuit has an intermediate junction, its thermoelectromotive force is added if the material used is the same.



Principles of Thermocouple Construction (Fig.16)

#### 2. Thermocouple Type and Their Features (JIS-C 1602-1981) (Table 10)

Material symbol	Main materials		Operating temp. range (°C)		Features
Material Symbol	+ leg	- leg	In normal application	In overheated application	reatures
В	Pt 70, Rh 30	Pt 94, Rh 6	1500	1700	Operates at the highest temperature of all JIS types.
R	Pt 87, Rh 13	Pt 100	1400	1600	The most widely used platinum type.
S	Pt 90, Rh 10	Pt 100	1400	1600	Widely used in Europe and U.S.A. All platinum type themocouples are vulnerable to reducing atmosphere.
К	Ni, Cr	Ni, A	650~1000	850~1200	Extensively used because of wide operating temperature range, but vulnerable to reducing atmosphere.
E	Ni, Cr	Ni, Cu	450~700	500~800	Produces highest thermoelectromotive force of all JIS types.
J	Fe	Ni, Cu	400~600	500~750	Resistant to reducing atmosphere, but + leg has a tendency to oxidize.
Т	Cu	Ni, Cu	200~300	250~350	Resistant to reducing atmosphere. Retains good characteristics down to relatively low temperature (300°C).

#### 3. Non JIS Thermocouples (Table 11)

Material symbol         Main materials         Operating temp. range (°C)           + leg         - leg         In normal application         In overheated application	Main materials		Operating temp. range (°C)		Features
	reatures				
PR 13	Pt 87.3, Rh12.7	Pt 100	1400	1600	Dropped from JIS in 1981, Same characteristics as R type.
PR 20-40	Pt 60, Rh 40	Pt 80, Rh 20	1700	1900	Operates at the highest temperature of all platinum types.
WRe 0-26	W	W 74, Re 26	2000	2200	Very vulnerable to oxidizing atmosphere. Used in vaccum or inert gas.
WRe 5-26	W 95, Re 5	W 74, Re 26	2100	2300	+ leg contains 5% Re to increase strength.
AF	Ni, Cr	Au, Fe	+100	~-269	Gold, iron - chromel thermocouple. Used in cryogenic application.
N	Ni, Cr	Ni, Si	650~1100	700~1200	Developed to replace the K thermocouple. Stable.
Ni-Mo	Ni	Ni 82, Mo 18	1000	1200	Used in high temperature up to 1200°C. Not for use in oxidizing aimosphere.
PN	Pt, Pd, Au	Pd, Au	1200	1300	Similar thermoelectromotive force to the K thermocouple. Used at relatively high temperature.

#### 4. Temperature Tolerance of Thermocouples (Table 12)

Material symbol	Former symbol	Measuring temp. range	Class	Tolerance *
В	-	600°C up to 1700°C	Class 0.5	$\pm$ 4°C or $\pm$ 0.5% of measuring temp.
R		0°C up to 1600°C	Class 0.25	$\pm$ 1.5°C or $\pm$ 0.25% of measuring temp.
		0°C up to 1000°C	Class 0.4	± 1.5°C or ± 0.4% of measuring temp.
К	CA	0°C up to 1200°C	Class 0.75	$\pm$ 2.5°C or $\pm$ 0.75% of measuring temp.
		-200°C up to 0°C	Class 1.5	± 2.5°C or ± 1.5% of measuring temp.
	CRC	0°C up to 800°C	Class 0.4	$\pm$ 1.5°C or $\pm$ 0.4% of measuring temp.
E		0°C up to 800°C	Class 0.75	$\pm$ 2.5°C or $\pm$ 0.75% of measuring temp.
		-200°C up to 0°C	Class 1.5	± 2.5°C or ± 1.5% of measuring temp.
	IC -	0°C up to 750°C	Class 0.4	± 1.5°C or ± 0.4% of measuring temp.
J		0°C up to 750°C	Class 0.75	± 2.5°C or ± 0.75% of measuring temp.
	сс	0°C up to 350°C	Class 0.4	$\pm$ 0.5°C or $\pm$ 0.45% of measuring temp.
Т		0°C up to 350°C	Class 0.75	$\pm$ 1°C or $\pm$ 0.75% of measuring temp.
		-200°C up to 0°C	Class1.5	$\pm$ 1°C or $\pm$ 1.5% of measuring temp.

\* Tolerance is the maximum allowable difference between the temperature converted from the thermoelectromotive force according to the reference thermoelectromotive force table and the actual temperature of the measuring junction, it is the large of the two values.



#### MALTEC-T

#### **Base Metal Thermocouples with Thermowells / Protection Tubes**

#### (MALTEC-T)



Base metal thermowell assemblies are manufactured from drilled bar stock and have threaded NPT process connections or flanges for direct immersion into high pressure or corrosive applications. Base Metal Thermocouple types are composed of common, inexpensive metals such as nickel, iron and copper. The thermocouple element can be constructed of ceramic insulated thermocouple wires or mineral insulated cable for increased durability.

Туре	J, K, T, E, N		
Element size (MI)	3.0, 3.2, 4.8, 6.0, 6.4, 8.0 mm, Other sizes on request		
Element size (Non-MI)	1.6, 2.0, 3.0, 3.2, 4.8, 6.0, 8.0, 9.5, 10 mm, Other sizes on request		
Sheath Material	SS304, SS316, SS310, Inconel		
Thermowell Material	HRS 446, INCONEL-600/601/800, Nickel, Hastalloy Titanium, Tantalum Sleeve, Ceramic 610 & C -799, Silicon Carbide, Monel etc		
Configuration	Simplex/ Duplex/Multipoint		

#### **MI Thermocouple**



Mineral insulated thermocouples consist of an outer metal sheath which protects the thermocouple elements from damage and contamination, this sheath is malleable so mineral insulated thermocouples can be easily bent and formed into a variety of shapes to suit your application. The inner thermocouple elements are insulated with magnesium oxide powder, tightly packed so no air is trapped inside, this provides great thermal conductivity. This construction provides an incredibly durable temperature sensor that can be adapted to a wide variety of applications.

Туре	J, K, T, E, N, R, S
Element size (MI)	0.25, 0.5, 1.0, 1.5, 3.0, 4.5, 6.0, 8.0 mm Other sizes on request
Sheath Material	SS321, SS316, SS310, HRS 446, Inconel 600, Nimonic, Pyrosil, Platinum etc.
Configuration	Simplex/Duplex/Multipoint
Configuration	<ul> <li>Miniature Thermocouples with minimum 0.25 mm Dia</li> <li>Swaged Tip Thermocouples</li> <li>Tube Temperature Skin Type Thermocouples</li> <li>Special Sensors as per ASTM-E235 for critical application</li> <li>High Wall Thickness</li> </ul>



#### **Noble Metal Thermocouple**





Noble Metal Thermocouples are manufactured with precious or noble metals like Platinum and Rhodium. Noble metal thermocouples can be used in oxidizing or inert applications and must be used with a ceramic protection tube surrounding the thermocouple element. Noble Metal thermocouples are designed for high temperature applications, where it is essential that the thermocouple withstands the damaging effects of oxidation and corrosion.

Туре	R, S, B
Element Diameter	0.30, 0.35, 0.4, 0.45, 0.5 mm, Other sizes on request
Sheath Material	Recrystallized Alumina Ceramic(C-799), 610, Inconel, Silicon Carbide, Platinum etc
Configuration	Simplex/Duplex/Multipoint
Configuration	<ul> <li>Hot Blast &amp; Stove Dome Thermocouples</li> <li>Tri Level Thermocouples</li> <li>Crown Thermocouples</li> </ul>

#### **Refractory Thermocouples**



Refractory Thermocouples are designed for use in oxidizing, neutral and reducing environments. Refractory Metal Thermocouples are manufactured with wire that is made from the exotic metals tungsten and Rhenium. These metals are expensive, difficult to manufacture and wires made with these metals are very brittle. Applications in all type of furnaces can be measured with these types of sensors. All standard refractory metal and noble metal thermocouple alloys are available in High-Temperature Thermocouples are defined as sensors used at temperatures of 2300°C and beyond.

Туре	G, C, D
Element Diameter	1.6, 3.2, 6.4, 8.0 mm
Sheath Material	Tantalum, Molybdenum, Inconel 600, Ceramic etc
Configuration	SS316 or INCONEL
Configuration	Magnesium Oxide, Aluminium Oxide, Beryllium Oxide, Hafnium Oxide



#### **Thermocouples 1000 Series**



#### MT 1003



Thermocouple, complete with small aluminium enclosure (IP65 rating), 304, 316, Inconel stainless steel sheath, constructed using mineral insulated cable, ungrounded junction.

Calibration	Diameter	Part No. Ø length
К	3mm	MT 1003 - K - 030 -
К	6mm	MT 1003 - K - 060 -
К	8mm	MT 1003 - K - 080 -
J/T/E	5mm	MT 1003 - J - 050 -
J/T/E	6mm	MT 1003 - J - 060 -
J/T/E	8mm	MT 1003 - J - 080 -

Insert part number when ordering diameter and length, eg. 6mm diameter 250mm long = MT 1003 - K - 0.0000 - 0.000 - 0.000 - 0

#### MT 1004



Thermocouple, complete with large aluminium enclosure (IP65 rating), 304, 316, Inconel stainless steel sheath, constructed using mineral insulated cable, ungrounded junction.

Calibration	Diameter	Part No. Ø length
K	6mm	MT 1004 - K - 060 -
K	8mm	MT 1004 - K - 080 -
K	12mm	MT 1004 - K - 120 -
J/T/E	6mm	MT 1004 - J - 060 -
J/T/E	8mm	MT 1004 - J - 080 -
J/T/E	12mm	MT 1004 - J - 120 -

Insert part number when ordering diameter and length, eg. 6mm diameter 250mm long = MT 1004 - K - 060 - 0250

#### MT 1003a



As for Model 101 complete with 1/2" BSP small enclose 316 stainless steel fixed nipple, sanitary weld.

Calibration	Diameter	Part No. Ø length
K/J/T/E	3mm	MT 1003a - 030 -
K/J/T/E	6mm	MT 1003a - 060 -
K/J/T/E	8mm	MT 1003a - 080 -

Insert part number when ordering diameter and length, eg. 3mm diameter 250mm long = MT 1003a - 030 - 0250



#### **Thermocouples 1000 Series**



#### MT 1004a



As for Model 102 complete with 1/2" BSP large enclose 316 stainless steel fixed nipple, sanitary weld.

Calibration	Diameter	Part No. Ø length
K/J/T/E	6mm	MT 1004a - 060 -
K/J/T/E	8mm	MT 1004a - 080 -
K/J/T/E	12mm	MT 1004a - 120 -

Insert part number when ordering diameter and length, eg. 6mm diameter 250mm long = MT 1004a - 060 - 0250

#### **Thermocouples 2000 Series**



Thermocouple, complete with 2 metres PVC lead. Fiber glass, screen braided, fiber, teflon, silicone, 304, 316, Inconel stainless steel sheath, constructed using mineral insulated cable, undergrounded junction.

Calibration	Diameter	Part No. Ø length
K	1mm	MT 2002 - K - 010 -
K	1.5mm	MT 2002 - K - 015 -
K	3mm	MT 2002 - K - 030 -
J/T/E	3mm	MT 2002 - J - 030 -
J/T/E	4.5mm	MT 2002 - J - 045 -
J/T/E	6mm	MT 2002 - J - 060 -

Insert part number when ordering diameter and length, eg. 6mm diameter 250mm long = MT 2002 - K - 060 - 0250

#### MT 2002a



Thermocouple, complete with standard plug and tube adaptor, 304, 316, Inconel stainless steel sheath, constructed using mineral insulated cable, ungrounded junction.

Calibration	Diameter	Part No. Ø length
K	3mm	MT 2002a - K - 030 -
К	4.5mm	MT 2002a - K - 045 -
К	6mm	MT 2002a - K - 060 -
J/T/E	3mm	MT 2002a - J - 030 -
J/T/E	4.5mm	MT 2002a - J - 045 -
J/T/E	6mm	MT 2002a - J - 060 -

Insert part number when ordering diameter and length, eg. 3mm diameter 250mm long = MT 2002a - K - 030 - 0250



#### **Thermocouples 400 Series**





Thermocouple, complete with ceramic terminal block, constructed using ceramic insulators over 8/3.2 AWG thermocouple grade wire.

Calibration	Part No. length
К	MT 401 - K -

MT 402



Thermocouple, complete with aluminium encloser, stainless steel support tube, enclosed within ceramic sheath.

Calibration	Part No.
К	MT 402 - K -
R	MT 402 - R -
S	MT 402 - S -

#### **Thermocouples MT-BYN Series**



Bayonet cap type. Thermocouple complete with spring clamp and bayonet cap, constructed using thermocouple grade wires screen braided over fiber 4.8/6mm and/or screen braided over fiber glass (Round) diameter tip section, grounded junction.

Calibration	Part No.
К	MT - BYN - K - 1000
J/T/E	MT - BYN - J - 1000



#### **Thermocouples MT-BYN Series**



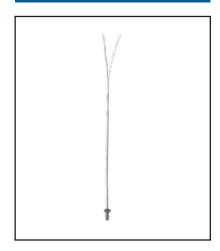
#### **Adaptors**



Part No.	
BF4	
BF5	
BF6	
BF9	

Single pin 1/8" BSP thread to suit Model MT-BYN

#### MT-TCE 50



Bolt type 1/4 BSW thread. Thermocouple complete with swivel retaining bolt, constructed using thermocouple grade screen braided over fiber, grounded junction.

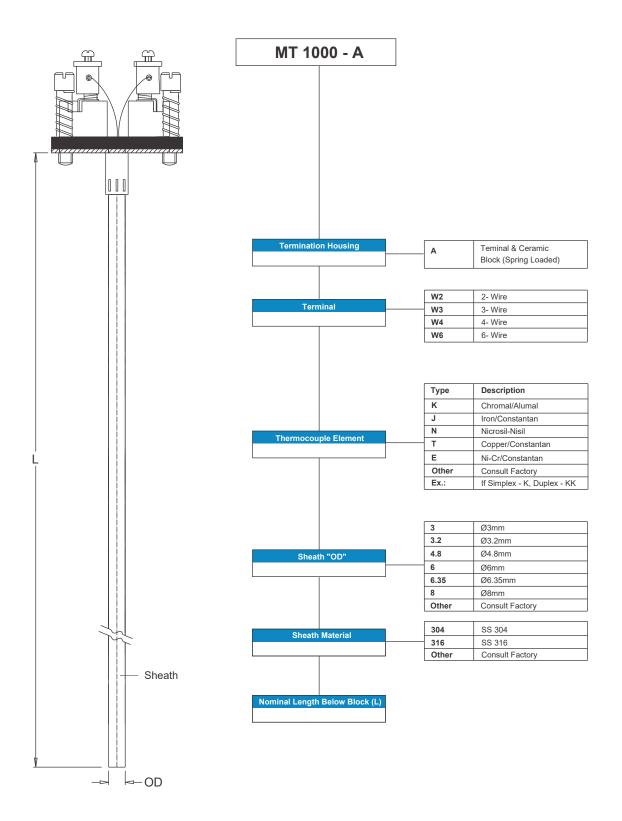
Calibration	length	Part No.
К	2M	MT-TCE 50K

\*optional bolt M6/M8, ungrounded





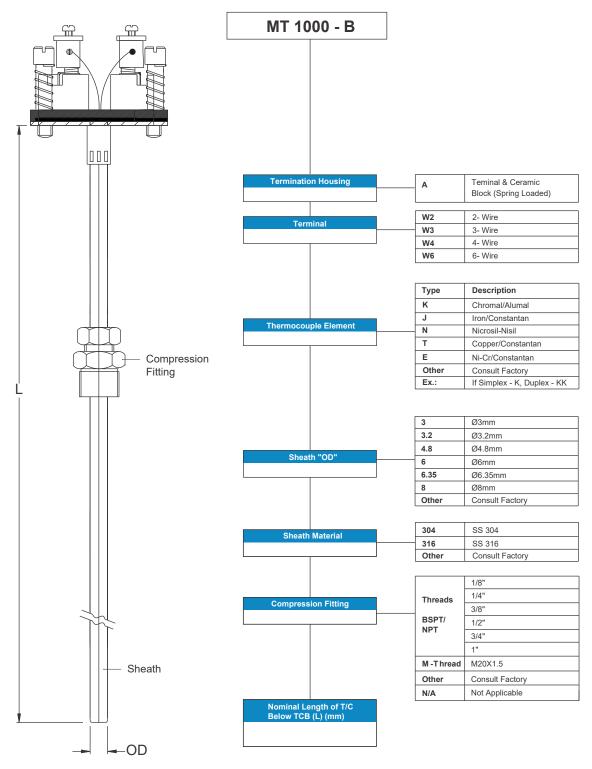
## **THERMOCOUPLE INSERT**





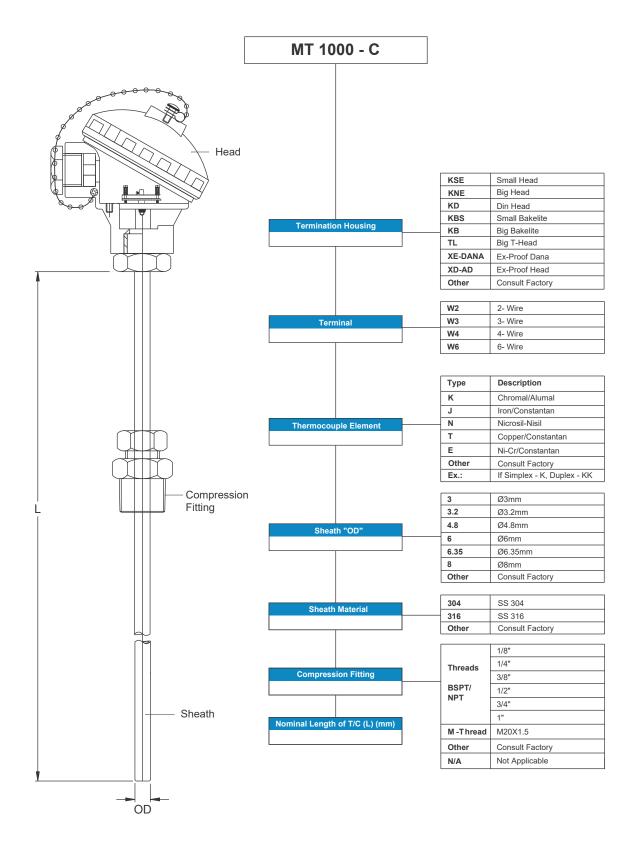


### THERMOCOUPLE INSERT WITH COMPRESSION FITTING





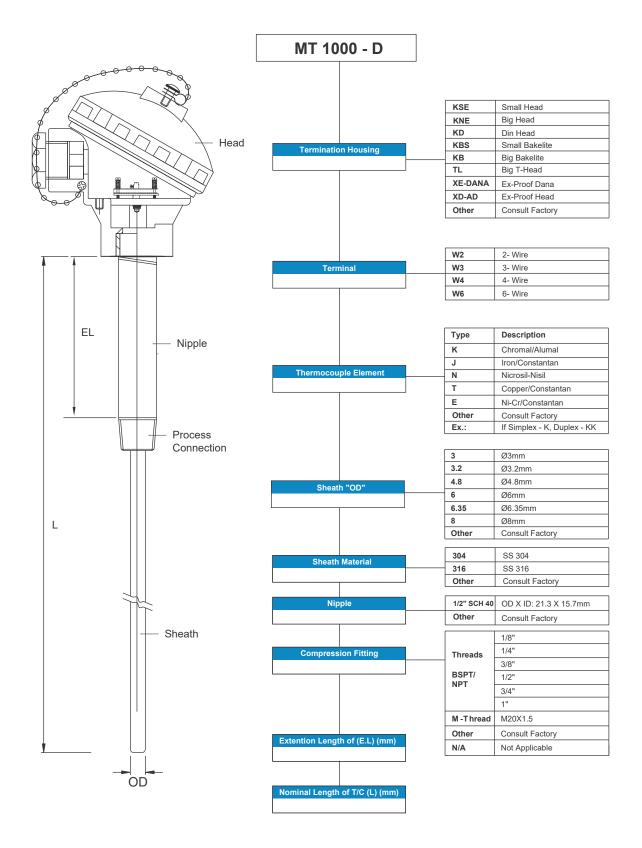
## THERMOCOUPLE WITH COMPRESSION FITTING



🌏 Dpstar Group



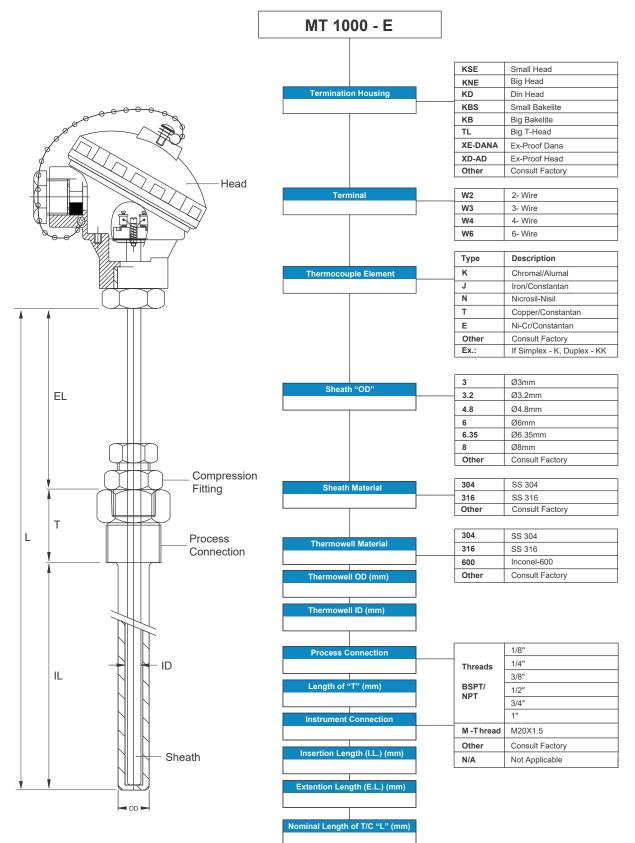
## THERMOCOUPLE WITH NIPPLE







### THERMOCOUPLE WITH THERMOWELL COMPRESSION FITTING







# THERMOCOUPLE WITH NIPPLE & STRAIGHT THERMOWELL

		MT 1000 - F		
			Ker	Small Llaad
			KSE KNE	Small Head Big Head
		Termination Housing	KD	Din Head
			KBS	Small Bakelite
	000000		KB	Big Bakelite
			TL	Big T-Head
			XE-DANA	Ex-Proof Dana
			XD-AD	Ex-Proof Head
	Head		Other	Consult Factory
			W2	2- Wire
		Terminal	W3	3- Wire
			W4	4- Wire
			W6	6- Wire
			Туре	Description
		Thermocouple Element	К	Chromal/Alumal
			J	Iron/Constantan
•			N	Nicrosil-Nisil
			T	Copper/Constantan
			E	Ni-Cr/Constantan
			Other Ex.:	Consult Factory
			EX	If Simplex - K, Duplex - KK
	EL Nipple		3	Ø3mm
	EL Nipple	Sheath "OD"	3.2	Ø3.2mm
		Sheath "OD"	4.8	Ø4.8mm
			6	Ø6mm
			6.35	Ø6.35mm
			8	Ø8mm
	<u> </u>		Other	Consult Factory
	Instrument Connection	Sheath Material		
			304	SS 304
			316	SS 316
			Other	Consult Factory
		Thermowell Material	304	SS 304
	Ť I I I I I I		316	SS 316
		Thermowell OD (mm)	600	Inconel-600
L	Connection RF Flange		Other	Consult Factory
		ID (mm)	1/2" SCH 40	OD X ID: 21.3 X 15.7mm
			Other	Consult Factory
			L	, ,
		Nipple	Flange Rating	Flange Size
				1/4"
		Length of "T" (mm)	JIS 5 K	1/2"
			JIS 10 K	3/4"
		Process Connection	ANOL (10 1	1"
	NIIIN		ANSI 150 #	1 1/4"
	NIIII		ANOI 300 #	1 1/2"
		Flange Material		1 3/4"
				2"
		Instrument Connection	Other	Consult Factory
				1/8"
				1/4"
Ţ	OD	Insertion Length (I.L.) (mm)	Threads	3/8"
Y	1		BSPT/	1/2"
		Extention Length (E.L.) (mm)	NPT	3/4"
			-	1"
		Nominal Length of T/C "L" (mm)	M-Thread	M20X1.5
			Other	Consult Factory
			NIA	Net Applicable

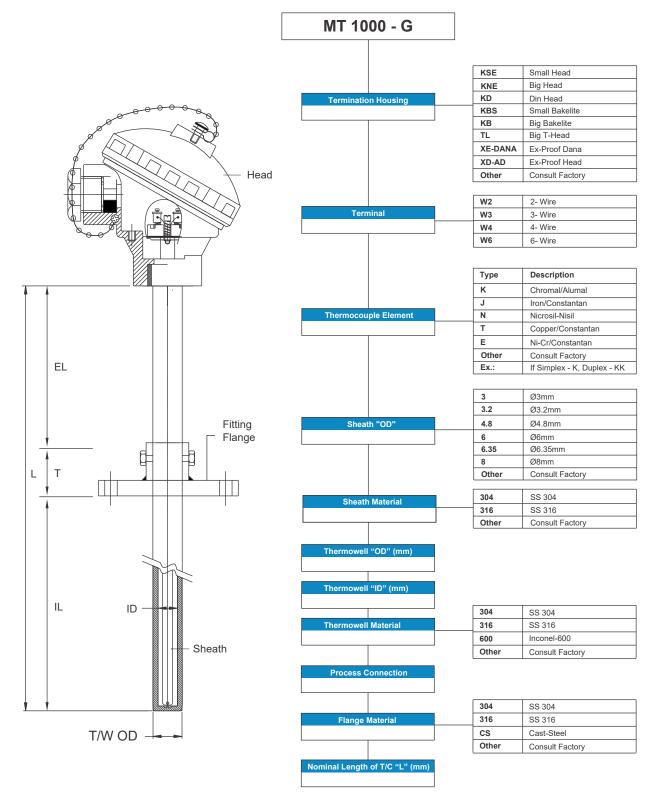
N/A

Not Applicable





### THERMOCOUPLE WITH ADJUSTABLE FLANGE THERMOWELL







# THERMOCOUPLE WITH NIPPLE & FLANGE THERMOWELL

		MT 1000 - H		
			KOF	0
			KSE	Small Head
			KNE	Big Head
		Termination Housing	KD KBS	Din Head Small Bakelite
000	00000		KBS	Big Bakelite
000-	Far		TL	Big T-Head
$\not$	Head		XE-DANA	Ex-Proof Dana
ø KJT	$\times$ $$		XD-AD	Ex-Proof Head
9			Other	Consult Factory
			W2	2- Wire
		Terminal	- W2 W3	3- Wire
			W4	4- Wire
			W6	6- Wire
Soo Car				
¥.			Туре	Description
			к	Chromal/Alumal
		The sum as a sum le Element	J	Iron/Constantan
† †		Thermocouple Element	N	Nicrosil-Nisil
			т	Copper/Constantan
			E	Ni-Cr/Constantan
			Other	Consult Factory
EL	Nipple		Ex.:	If Simplex - K, Duplex - KK
		Sheath "OD"	3	Ø3mm
			3.2	Ø3.2mm
			4.8	Ø4.8mm
			6	Ø6mm
			6.35	Ø6.35mm
			8	Ø8mm
	Instrument		Other	Consult Factory
	Connection	Sheath Material	304	SS 304
T				
			316	SS 316
	Process		Other	Consult Factory
<u>,</u>	Connection	Thermowell Material	304	SS 304
Ī			316	SS 316
			600	Inconel-600
		Thermowell OD1 (mm)	Other	Consult Factory
		Thermowell OD2 (mm)		
		Thermowell ID (mm)		
IL	Sheath	Thermowell ID (mm)		
				1/0"
		Length of "T" (mm)		1/8"
	r III II I		Threads	1/4"
		Process Connection	BSPT/	3/8"
↓			NPT	1/2"
	Y II I II I			3/4"
		Instrument Connection		1" NOOX4 5
			M -Thread	M20X1.5
		Insertion Length (I.L.) (mm)	Other N/A	Consult Factory Not Applicable
			1974	
		Extention Length (E.L.) (mm)		
		Nominal Length of T/C "L" (mm)		





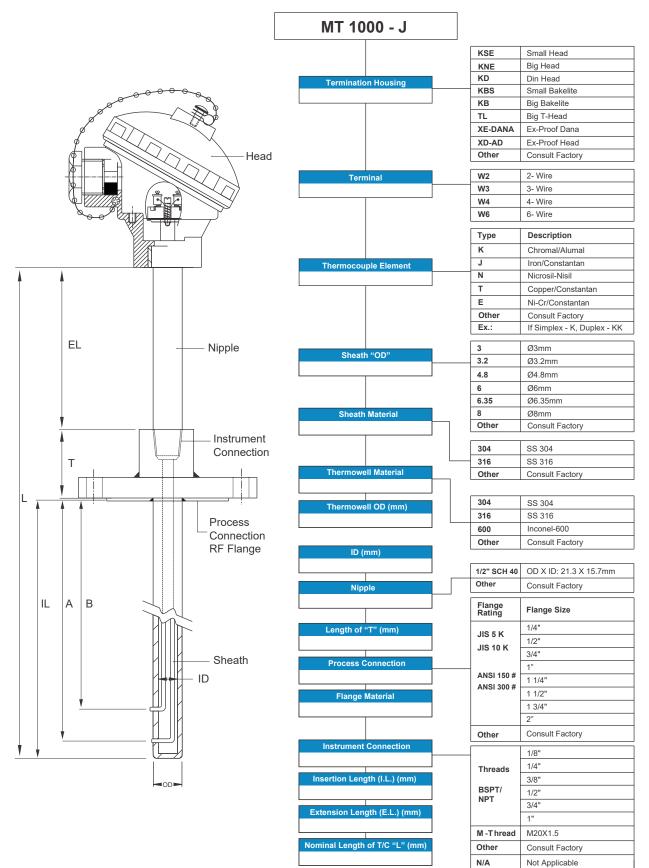
## THERMOCOUPLE WITH FLANGE THERMOWELL & COMPRESSION FITTING

		MT 1000 - I		
	<u>`</u>		KSE	Small Head
00000	- og		KNE	Big Head
			KD	Din Head
ø k	LKQ	Termination Housing	KBS	Small Bakelite
	$\searrow$		KB	Big Bakelite
			TL	Big T-Head
	∠ · Head		XE-DANA	Ex-Proof Dana
	$\langle \gamma \rangle \setminus$			
			XD-AD	Ex-Proof Head
			Other	Consult Factory
	$\sim$	Terminal	W2	2- Wire
			W3	3- Wire
			W4	4- Wire
			W6	6- Wire
			Туре	Description
	-		к	Chromal/Alumal
			J	Iron/Constantan
		Thermocouple Element	N	Nicrosil-Nisil
			т	Copper/Constantan
EL			E	Ni-Cr/Constantan
			Other	Consult Factory
			Ex.:	If Simplex - K, Duplex - KK
			3	Ø3mm
	Fitting	Sheath "OD"	3.2	Ø3.2mm
	Compression		4.8	Ø4.8mm
	J		6	Ø6mm
	Instrument		6.35	Ø6.35mm
	Connection		8	Ø8mm
			Other	Consult Factory
		Sheath Material	304	SS 304
			316	SS 316
▲ '			Other	Consult Factory
	Process	Thermowell Material		
			304	SS 304
	Connection	Thermowell OD (mm)	316	SS 316
	RF Flange		600	Inconel-600
			Other	Consult Factory
		ID (mm)		
		Length of "T" (mm)	Flange Rating	Flange Size
			JIS 5 K	1/4"
			JIS 10 K	1/2"
IL		Process Connection		3/4"
			ANSI 150 #	1"
		Elence Meteriel	ANSI 150 #	1 1/4"
		Flange Material	And 000 #	1 1/2"
	- 			1 3/4"
			1	2"
		Instrument Connection		
		Instrument Connection	Other	Consult Factory
	—— Sheath		Other	
	—— Sheath	Instrument Connection Fitting Compression		1/8"
	—— Sheath		Other	1/8" 1/4"
	—— Sheath		Threads	1/8" 1/4" 3/8"
	—— Sheath	Fitting Compression	Threads BSPT/	1/8" 1/4" 3/8" 1/2"
	—— Sheath	Fitting Compression	Threads	1/8" 1/4" 3/8" 1/2" 3/4"
	—— Sheath	Fitting Compression	Threads BSPT/ NPT	1/8" 1/4" 3/8" 1/2" 3/4" 1"
	—— Sheath	Fitting Compression Insertion Length (I.L.) (mm) Extention Length (E.L.) (mm)	Threads BSPT/	1/8" 1/4" 3/8" 1/2" 3/4"
	—— Sheath	Fitting Compression	Threads BSPT/ NPT	1/8" 1/4" 3/8" 1/2" 3/4" 1"





### **TWO POINT THERMOCOUPLE**





#### Thermocouples

#### **Platinium Curve Rigid Averaging Sensors**

#### DESCRIPTION

Continuous-resistance element **Platinum Curve Rigid Averaging Sensors** provide accurate sensing of duct temperatures when a small, inaccessible area must be covered. They average temperatures over their entire length and terminate in a weather-resistant housing. They are available in 12", 18", 24", and 36" (30.5, 45.7, 61, and 91.4 cm) lengths. The sensor uses an element that closely matches platinum resistance/temperature characteristics over the specified range. It is available in  $100\Omega$  and  $1000\Omega$  385 curve and  $1000\Omega$  375 curve. The sensors have a brass case that is rigid for easy singlepoint mounting.

#### FEATURES

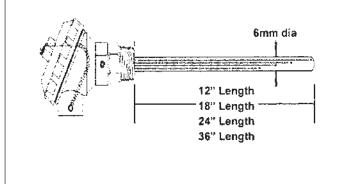
- Continuous averaging
- Rigid sensor
- 12", 18", 24", 36" (30.5, 45.7, 61, and 91.4 cm) lengths
- $100\Omega$  and  $1000\Omega$  385 curve
- 1000Ω 375 curve
- Weather-resistant box

AP	PL	ICA	T	ÖN

- Small ducts without access
- Mixed air chambers
- Hot/Cold deck discharge
- Face/Bypass discharge
- Unit vents

SPECIFICATIONS			
Sensors	1000Ω ±0.25% @ 32°F (0°C); 100Ω ±0.25% @ 32°F (0°C) TCR 375 or 385	Element Length	4 RTD Element 12" (30 cm) or 18" (45 cm); 24" (61 cm) or 36" (91 cm)
Temp range	-50° to 275°F (-45° to 135°C)	Casing	Cast Iron
Approx sensitivity		Diameter	6mm
100Ω	0.21Ω/°F @ 32°F (0°C)	Warranty	1 year
1000Ω	2.1Ω/°F @ 32°F (0°C)	Connection	1/2" BSP

#### **MOUNTING / DIMENSIONS**



#### ORDERING INFORMATION

MODEL	DESCRIPTION			
MAS-100	100Ω With 4 TO 20mA Transmitter		S-100 100Ω With 4 TO 20mA Transmitter	
MAS-1000	1000Ω Wi	ith 4 TO 20mA Transmitter		
	INSERTIC	ON LENGTH		
	12	12" length		
	18*	18" length		
	24* 24" length			
	36 36* tength			







										No.	3467001	14-1/2
					検査	₹成	績書			140.	_ 3407001	14 1/2
顧客名							TIFICATE				_04/06/	2016
CUSTOMER 最終顧客名			· · · ·		殿		D_JISC 1	602-1995	<u> </u>			
END USER 御注文番号					殿	ELEMEN1 階級		R			工株式: DENKO CO.	
ORDER NO. 製品名称	,		<u>XP0-1603-</u> 熱電対			<u>CLASS</u> 線径		2				
PRODUCT N 型名	AME		THERMOCOU			室内温」			承	認者 PROVED BY	K.U,	<u>utr</u>
<u>MODEL</u> 作業票 NO JOB NO.			<u>)COUPLE WI</u> 46700		<u>R</u>	<u>ROOM TE</u> 室内湿り ROOM HU			Ϋ́C		y miye	
100 101						显度特			<u>,,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,</u>		<u> </u>	
	/			00 °C	温度 4	00 °C				00 °C		00 %
		規 格	TEMPERATUR 基準値 mV	E 許容差℃	TEMPERATUR 基準値 mV	1	TEMPERATUR 基準値 mV	E 許容差℃	TEMPERATUR 基準値 mV	€ 許容差℃	TEMPERATUR 基準値 mV	E 許容差で
		STANDARD	DESIRED	TOLERANCE		TOLERANCE	DESIRED	TOLERANCE	DESIRED	TOLERANCE	DESIRED VALUE	TOLERANC
製造番 SERIAI			1.469	± 1.5	3. 408	± 1.5	5. 583	± 1.5	7.950	± 2.0	10.506	± 2.5
		TAG NO.	測定值 mV ACTUAL VALUE	誤差℃ ERROR	測定值 mV ACTUAL VALUE	誤差℃ ERROR	測定値 mV ACTUAL VALUE	誤差℃ ERROR	測定值 mV ACTUAL VALUE	誤差 ℃ ERROR	測定値 mV ACTUAL VALUE	誤差 で ERROR
1			1. 466	-0.3	3. 404	-0.4	5. 579	-0.3	7.948	-0.2	10.506	0.0
2												
3					 		ļ			 		
4 5					· · · · · · · · · · · · · · · · · · ·							· · · · · · · · ·
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20			夏目 ITEM			129 =	F REMARK		L	L	l <u></u>	l
外 観 APPEARANCE		"			良 GOOD		B REMARK 日はロット」 e abore fi	成績によ igures av	<u>3</u> re taken i	form Lat	testing	results
オ子EARCANCE す法検査 DIMENSION CHECK			クランジ、ね I, FLANGE, SCR		良 600D	I	vpeR0.5	0. TC	64032	,		
絶縁抵抗	端子· TERMI	-保護管、 INAL-PROTEC	<del>πινε τοβε</del>		良 GOOD							

QC-101

MALTEC-T





									No,	3467001	14-2/2
				検ィ	<b>昏成</b>	績書			NO.	3401001	14-2/2
					FION CEF	RTIFICATE				04/00/	0010
顧客名 CUSTOMER				殿		RD_JISC 1	<u>602–1995</u>			_04/06/	
最終顧客名 <u>END_USER</u> 御注文番号				酸	種類 <u>ELEMENT</u> 階級	ŗ	R			工株式: DENKO CO.	
個但又留写 ORDER NO. 製品名称		XP0-1603 然暄女	- <u>192</u>		CLASS 線径	<u>.</u>	2		INTROL	DENKO CO.	, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
PRODUCT NAME 型名		THERMOCOL	IPLES		<u>WIRE D</u> 室内温				:認者 PROVED BY	K. U.	uta
MODEL 作業票 NO.		RMOCOUPLE W			室内湿				资者	4 mill	alasa
<u>JOB NO.</u>		346700	) 1 _1		<u>ROOM HU</u> 温度特		43	<u>% IN</u>	SPECTED B	<u>, j . nag</u>	
				TEMPERAT	FURE CHARA	CTERISTICS				E	
	/ 規 杉	温度 1 TEMPERATU		温度 1 4 TEMPERATUR	400°C	温度 1 6 TEMPERATUR	300℃ E	温度 TEMPERATUR	е °С	温度 TEMPERATUR	۲ E
	STANDA	基準値 mV	許容差℃ TOLERANCE	基準値 mV DESIRED VALUE	許容差℃ TOLERANCE	基準値 mV DESIRED VALUE	許容差℃ TOLERANCE	基準値 mV DESIRED VALUE	許容差℃ TOLERANCE	基準値 mV DESIRED VALUE	許容差℃ TOLERANCE
製造番号 SERIAL NO		13. 228	± 3.0	16. 040	± 3.5	18.849	± 4.0		±		<u>±</u>
	TAG N	測定値 mV ACTUAL VALUE	誤差℃ ERROR	測定値 mV ACTUAL VALUE	訳差℃ ERROR	測定値 mV ACTUAL VALUE	訳差℃ ERROR	測定値 mV ACTUAL VALUE	誤差℃ ERROR	測定値 mV ACTUAL VALUE	誤差 ℃ ERROR
1		13. 229	+0.1	16. 039	-0.1	18.846	-0.2				
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外 観 APPEARANCE		<u>хн</u> хниц		良 GOOD		- abore f	成績によ igures a	ろ rc taken	form Lot	testing	results.
寸法検査 DIMENSION B CHECK	MENSION DIAMETER, LENGTH, FLANGE, SCREW				I	ot N ype R 0.5	o. TC	64032	2		
絶縁抵抗的 INSULATION T RESISTANCE F	端子ー保護管 ERMINAL-PRO <del>XC500V</del> 10	TECTIVE TUBE		良 G00D							

QC-101

#### **Explosion Proof Thermocouple**







Dpstar Explosion Proof Thermocouple is designed to measure temperatures in explosive gaseous or liquid environments. Dpstar offers a wide range of standard or customised ATEX or IECEx certified temperature-sensors, single and multipoint for Gas zone 0, 1 and 2 with Exi, Exe and Exd, and Dust for zone 20, 21 and 22 approval. These sensors can be fitted with an integral certified head-mounted temperature transmitter or display unit with 4-20mA, HART or Profibus communication.

#### **Features**

- Temperature sensor range from -200°C to 1600°C depending on the sheath material.
- Thermowell connection by a nipple union nipple with 1/2"NPT connection.
- Aluminium connection head with swing cover.
- Cable entry M20x1.5mm.
- Replaceable 6mm insert with 20mm spring action.
- Calibration K, T, J, E, N, R, S or B, single or duplex.
- Can be delivered with head-mounted transmitter.
- Insertion length as required.

#### **Applications**

- Heavy duty applications
- Oil & Gas processing industry
- Gas tanker ships
- Chemical plants
- Offshore oil platforms
- Harsh environments

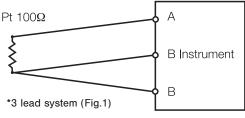


#### **1. Operating Principles**

Electric resistance of a metal changes at a fixed rate according to temperature changes. The resistance bulb uses this property to measure temperature. Theoretically, any metal may be used, but because of characteristics such as constant resistance change with temperature, interchangeability, and high temperature coefficient, there are few metals suitable for application. Only Platinum (Pt) is currently

adopted by Japanese Industrial Standard (JIS), although nickel, copper and other metals are also used by other standards. The principle of measurement is shown in Fig.1. A constant current (1mA to 5mA) is flowed through a fixed resistance element (typically Pt100  $\Omega$ ) and the change in resistance with

temperature is measured. The common practice is to adopt a P three-wire system to prevent lead resistance.



#### 2. Allowable Error of Resistance Bulb (Table 1)

	JLS C1604-1989							Former JIS C1604-1981					
	Allowat	ole error	Operating			Operating				Allowable error			
Norminal	Class A	Class B	ass B temperature		Measuring		temperature		Class 0.15	Class 0.2	Class 0.5	Norminal	
resistance	Temperature va <b>l</b> ue °C	Temperature value °C		range		range		Ū	Temperature value °C	Temperature value °C	Temperature value °C	resistance	
	± 0.55	± 1.3			-200				± 0.45	± 0.55	± 1.3		
	<u>+</u> 0.35	<u>+</u> 0.8			-100			1	<u>+</u> 0.30	± 0.35	<u>+</u> 0.8		
	± 0.15	± 0.3			0			- L	± 0.15	± 0.15	± 0.3		
	<u>+</u> 0.35	<u>+</u> 0.8			100				± 0.30	± 0.35	<u>+</u> 0.8		
100 -	± 0.55	± 1.3	M		200		M		± 0.45	± 0.55	± 1.3	100 Ω	
100 Ω	± 0.75	± 1.8			300	H			± 0.60	± 0.75	± 1.8	(50 Ω)	
	± 0.85	± 2.05 ± 2.3		H	350				± 0.68	± 0.85	± 2.05		
	± 0.95 ± 1.15	± 2.3			400 500				-	± 0.95 ± 1.15	± 2.3 ± 2.8		
	± 1.15 ± 1.35	± 2.0 ± 3.3			600				-	± 1.10	- 2.0		
	± 1.35 ± 1.45	± 3.5 ± 3.6			650				-	-	-		
		Resistance			000				Desistance	Resistance			
	Resistance value Ω	Resistance value Ω							Resistance value Ω	Resistance value <b>Ω</b>	Resistance value Ω		
	<u>+</u> 0.24	± 0.56			-200				<u>+</u> 0.19	<u>+</u> 0.24	± 0.56		
	<u>+</u> 0.14	<u>+</u> 0.32			-100				<u>+</u> 0.12	<u>+</u> 0.14	<u>+</u> 0.32		
	± 0.06	± 0.12	L		0			L	± 0.06	± 0.06	± 0.12	100 Ω	
	<u>+</u> 0.13	<u>+</u> 0.30			100				<u>+</u> 0.12	<u>+</u> 0.13	<u>+</u> 0.31	Resistance	
	± 0.20	± 0.48	M		200		M		± 0.16	± 0.20	± 0.48	for 50 Ω	
100 Ω	<u>+</u> 0.27	± 0.64			300	H			± 0.21	± 0.27	± 0.64	elements	
	± 0.29	<u>+</u> 0.71		H	350				± 0.24	± 0.30	± 0.73	are ha <b>l</b> f	
	± 0.33	± 0.79			400				-	± 0.33	± 0.80	these	
	<u>+</u> 0.38	± 0.93			500				-	± 0.39	± 0.95	value	
	<u>+</u> 0.43	± 0.06			600				-	-	-		
	± 0.46	± 0.13			650				-	-	-		

Note:

① L = Low temperature, M = Medium temperature, H = High temperature ② Specified currents 5 mA and 10 mA do not apply to Class A

#### **Calculation Formula of Allowable Error of Medium temperature (Table 2)**

Former JIS C1604	-1981	Former JIS C1604-1981				
Allowable error	Class	Class	Allowed error			
-	-	Class 0.15	<u>+</u> (0.15 + 0.015 t)℃			
<u>+</u> (0.15 + 0.002 t)°C	Class A	Class 0.2	<u>+</u> (0.15 + 0.002 t)°C			
<u>+</u> (0.3 + 0.005 t)°C	Class B	Class 0.5	± (0.3 + 0.005 t)°C			

where t is the absolute value of the measured temperature (°C)

#### 3. Insulation Resistance and Withstand Voltage (JLS C1604-1989)(Table 3)

Operating temperature range	Test temperature	Insulation resistance	Withstand voltage, 1 minute
	- 183°C	5M Ω / 500V	DC 500 V
Low temperature	Normal temperature	10M Ω / 500V	" 500 V
	100°C	5M Ω / 500V	" 500 V
Medium temperature	Normal temperature	10M Ω / 500V	" 500 V
Medium temperature	350°C	5M Ω / 500V	" 250 V
High temperature	Normal temperature	10M Ω / 500V	" 500 V
nightemperature	650°C	1M Ω / 250V	" 250 V

Note:

Insulation resistance and withstand voltage are measured between the terminal and protecting tube with the temperature measuring section at the test temperature in Table 3.
 In withstand voltage testing of resistance bulbs with protecting tube ODs smaller than 4 8mm the test voltage must be reduced to 1/2 of the value in Table 3



(MALTEC-T)

#### 4. Resistance Bulb Elements



CR Series (Ceramic Encapsulated Platinum Element) (Table 4)

CR Series ( Ceramic Encapsulated Platinum Element) (Table 4) √ : Available											
Appearance	Model No.	OD(¢)	Length (mm)	No elem 1	. of ients 2	Resistance	Rated current	Class	Lead length (mm)	Operating temp. range	
	<b>※</b> CR-1010	1.0 ± 0.1	10±2	$\checkmark$	I		1 mA max.		10±3	-200°C to	
	<b>※</b> CR-1210	1.2 ± 0.1	10±2	$\checkmark$	-		2 mA max.	JIS DIN IEC CLASS A CLASSB			
	<b>※</b> CR-1215	1.2 ± 0.1	15±2	$\checkmark$	Ι	- Pt 100 Ω	2 mA max.				
	<b>※</b> CR-1615	1.6 ± 0.1	15±2	V	Ι		5 mA max.				
	CR-1620	1.6 ± 0.1	20±0.1	$\checkmark$	$\checkmark$						
	CR-2010	2.0 ± 0.1	10±2	$\checkmark$	I					+500°C	
	<b>※</b> CR-2015	2.0 ± 0.1	15±2	$\checkmark$	$\checkmark$						
	CR-2020	2.0 ± 0.1	20 ± 2	$\checkmark$	$\checkmark$						
	CR-2830	2.8 <sup>+ 0.3</sup> - 0.1	30 ± 2	V	V						
	<b>※</b> CR-2020	2.0 ± 0.1	20 ± 2	$\checkmark$	-	500 Ω	1 mA max.				

We also produce former JLS standard models to order

☆ Semi-standard product

#### CRZ Series (Thin Film Platinum Elements)

0.2X0.3 Lead Wire Palladium Length ±0.5 12 <sup>±3</sup>											
Model	Dimension of element (mm) Width x Length x Height		nber of ment Resistance D Value		Measurement Current	Dimension of Lead Wire (mm) Width x Length x Height	Class	Recommendable Operating Temperature Range			
CRZ-1632-100	1.6x3.2x1.0	0	-	Pt 100 Ω	not exceeding 1mA	0.25x0.15x12	1/3B	1/3B -20 ~ +250°C			
CRZ-2005-100	2.0x5.0x1.0	0	-	Pt 100 Ω	not exceeding 1mA	eeding 0.25x0.15x12		A -20 ~ +400°C			
CRZ-2005-1000	2.0x5.0x1.0	0	-	Pt 500 Ω Pt 1000 Ω	not exceeding 1mA	0.25x0.15x12	В 2В	B, 2B -40 ∼ +500°C			



## 5. CRF Series (Ceramic Elements with Heat Sensitive Fins) (Table 6)



CRF series elements have heat sensing fins so shaped as tp fit 6, 8 or 10mm diameter protecting tubes.

Appearance	Model No.	OD(ф)	Length (mm)	No elem	. of nents 2	Resistance	Rated current	Class	Lead length (mm)	Operating temp. range
	CRF-6	6 to 9	32 ± 1.5	V	√		1 mA	CLASS A CLASs B		-200°C
	CRF-10	10 to 12	42 ± 1.5	V	$\checkmark$	Pt100 Ω	) Ω 2 mA 5 mA	JIS DIN IEC	30 <u>+</u> 3	to +500°C

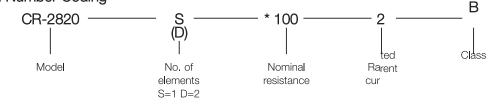
We also produce former JIS standard models to order

## 6. CRF Series (Glass Insulated Platinum Elements)(Table 7)

Appearance	Model No.	OD(¢)	Length (mm)	No elem 1	. of ients 2	Resistance	Rated current	Class	Lead length (mm)	Operating temp. range	
	<b>※</b> GR-0705	0.7 ± 0.1	5 ± 1	V	-						
	GR-0708	0.7 ± 0.1	8 ± 1	V	-			JIS DIN IEC CLASS A	10 ± 3	-200°C to	
	<b>※</b> GCR-1005	1.0 ± 0.1	5 ± 1	V	-		1 mA max.				
	GR-1010	1.0 ± 0.1	10 ± 1	V	I		DIN				
	<b>※</b> GR-1205	1.2 ± 0.15	5 ± 1	$\checkmark$	I	Pt 100 Ω					
	GR-1210	1.2 ± 0.15	10 ± 2	$\checkmark$	Ι			+350	+350°C		
	GR-1610	1.6 ± 0.15	10 ± 1	$\checkmark$	Ι						
	GR-2010	2.0 ± 0.2	10 ± 1	V	-	5 mA max					
	GR-2015	2.0 ± 0.2	15 ± 1.5	V	1						
	GR-3030	3.0 ± 0.2	30 ± 1	$\checkmark$	_	Pt 1000 Ω	1 mA max.				

We also produce former JIS standard models to order

#### Model Number Coding



. When ordering former JIS standards  $\,$  please specif  $\,$  JPT100 instead of 100  $\,$ 

☆ Semi-standard product



### **RTDs With Thermowells/ Protection Tubes**





Resistance temperature detectors are designed for corrosive, high pressure, fast flowing medium with Thermowell. Resistance temperature detectors are temperature sensors that have elements which change their electrical resistance with change in temperature. RTDs with thermowell are suitable for high pressure and flow medium where there is a need for frequent change of sensor.

Туре	Pt 100, 200, 500, 1000 etc
Element Diameter	Wire wound ceramic encapsulated, wire wound glass encapsulated, Thin film ceramic encapsulated
Sheath Material	2, 3, 4 Wire
Configuration	SS304, SS321, SS316, SS310, Inconel 600/800, HRS 446, Hastalloy
Configuration	Simplex/Duplex/Others

### **Mineral Insulated RTDs**



Mineral-insulated RTDs provide excellent performance, even when exposed to high levels of shock and vibration in tough industrial environments. Mineral Insulated Resistance Thermometers are made with Platinum-measuring resistors Pt100 $\Omega$  to DIN IEC 751. The measuring resistor will be connected to the inner conductors, is also embedded and is surrounded by the metal sheath to form a hermetically sealed assembly.

Туре	Pt 100, 200, 500, 1000 cu-50, 53 etc
Connection	2, 3, 4 wire
Element Diameter	1.5, 3.0, 4.5, 6.0, 8.0 mm
Configuration	Simplex/Duplex/Others



### **RTD Sensors 1000 Series**



### MT 1001



RTD 3 wire type, complete with small aluminium enclosed head (IP65 rating). Constructed using 316 stainless steel sheath, maximum operating temperature 400°C

Calibration	Diameter	Part No. Ø length
RTD Pt100	3mm	MT 1001 - 030 -
RTD Pt100	6mm	MT 1001 - 060 -
RTD Pt100	8mm	MT 1001 - 080 -

Insert part number when ordering diameter and length, eg. 3mm diameter 250mm long = MT 1001-030-0250



As for model 1001 complete with 1/2" BSP 316 stainless steel fixed nipple, sanitery weld.

Calibration	Diameter	Part No. Ø length
RTD Pt100	3mm	MT 1001a - 030 -
RTD Pt100	6mm	MT 1001a - 060 -
RTD Pt100	8mm	MT 1001a - 080 -

Insert part number when ordering diameter and length, eg. 3mm diameter 250mm long = MT 1001a - 030 - 0250

### MT 1002



RTD 3 wire type, complete with large aluminium enclosed head (IP65 rating). Constructed using 316 stainless steel sheath, maximum operating temperature 400°C.

Calibration	Diameter	Part No. Ø length
RTD Pt100	3mm	MT 1002 - 030 -
RTD Pt100	6mm	MT 1002 - 080 -
RTD Pt100	8mm	MT 1002 - 080 -

Insert part number when ordering diameter and length, eg. 3mm diameter 250mm long = MT 1002 - 030 - 0250



### **RTD Sensors 1000 Series**



## MT 1002a



As for model 1002 complete with 1/2" BSP 316 stainless steel fixed nipple, sanitery weld.

Calibration	Diameter	Part No. Ø length
RTD Pt100	3mm	MT 1002a - 030 -
RTD Pt100	6mm	MT 1002a - 060 -
RTD Pt100	8mm	MT 1002a - 080 -

Insert part number when ordering diameter and length, eg. 6mm diameter 250mm long = MT 1002a - 060 - 0250Remarks : Duplex version add x2

### **RTD Sensors 2000 Series**



RTD 3 wire type, complete with screenfiber, silicon, PVC wire, constructed using 316 stainless steel sheath.

Calibration	Diameter	Part No. Ø length
RTD Pt100	2mm	MT 2001 - 020 -
RTD Pt100	3mm	MT 2001 - 030 -
RTD Pt100	4mm	MT 2001 - 040 -
RTD Pt100	6mm	MT 2001 - 060 -

Insert part number when ordering diameter and length, eg. 2mm diameter 250mm long = MT 2001 - 020 - 0250Remarks : Duplex version add **x**2

#### **RTD Sensors 3000 Series**

MT 3001

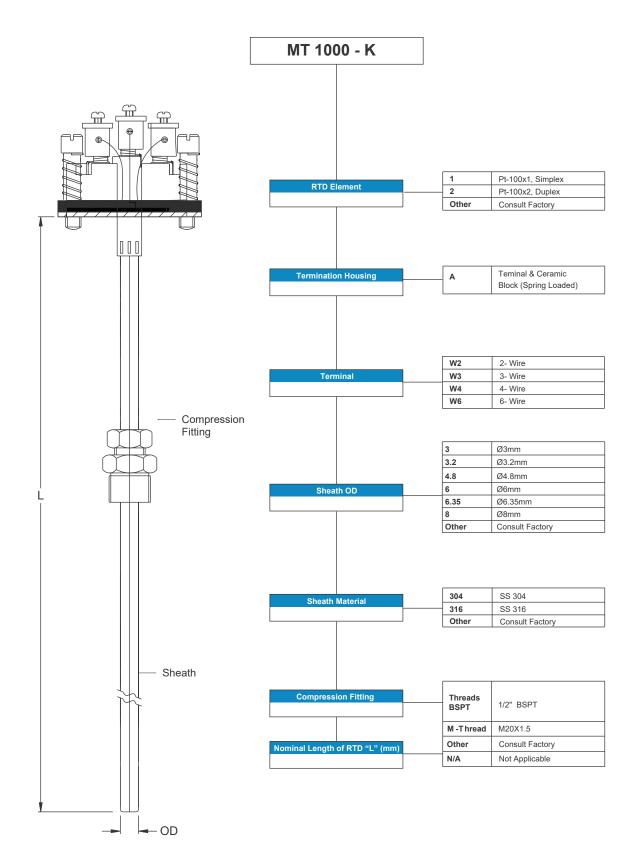
RTD 3 wire type industrial wall mounted.



Dpstar Group

Calibration	Box Size	Part No.
RTD Pt100	71mm x 71mm x 30mm	MT 3001

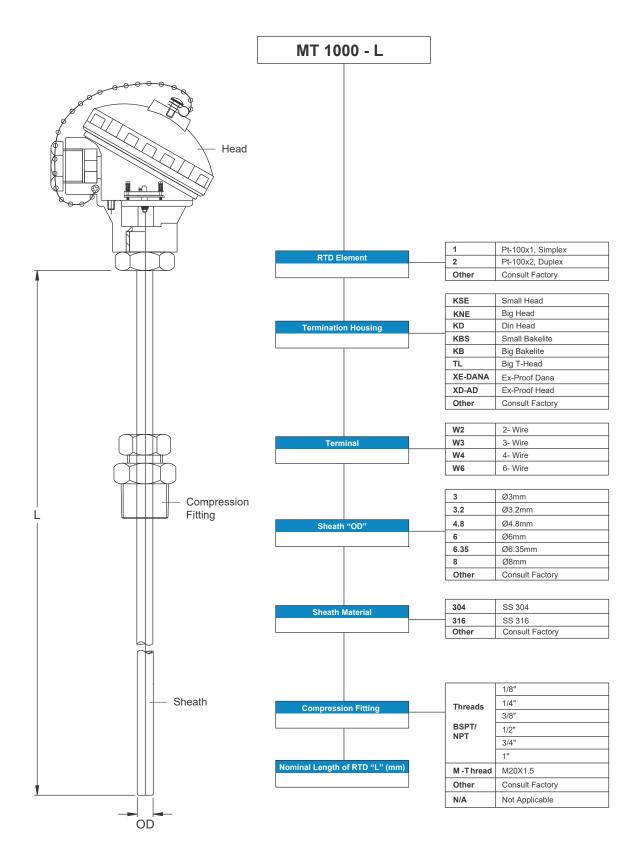
# **RTD INSERT WITH COMPRESSION FITTING**





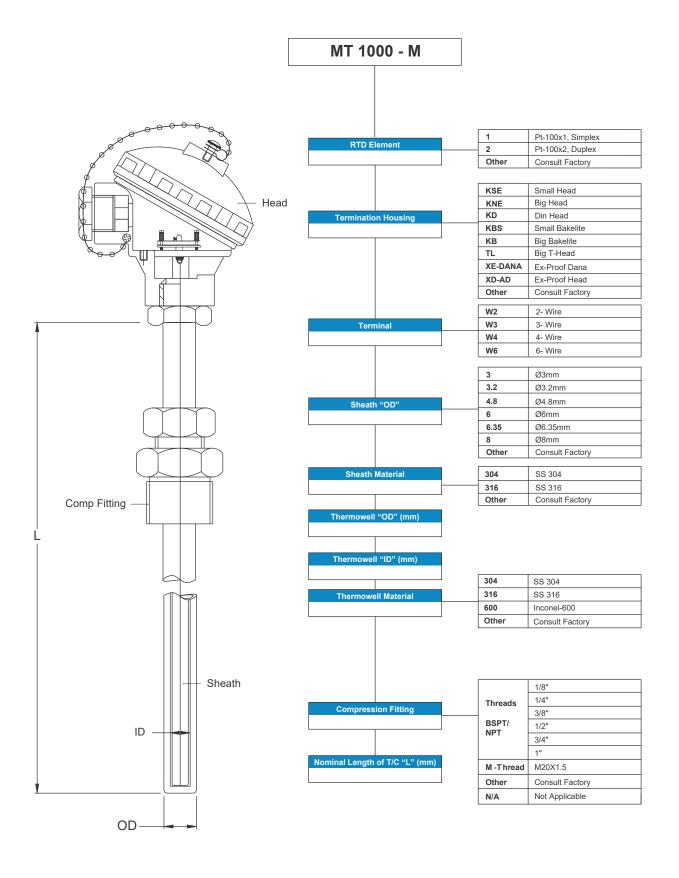


# **RTD WITH COMPRESSION FITTING**





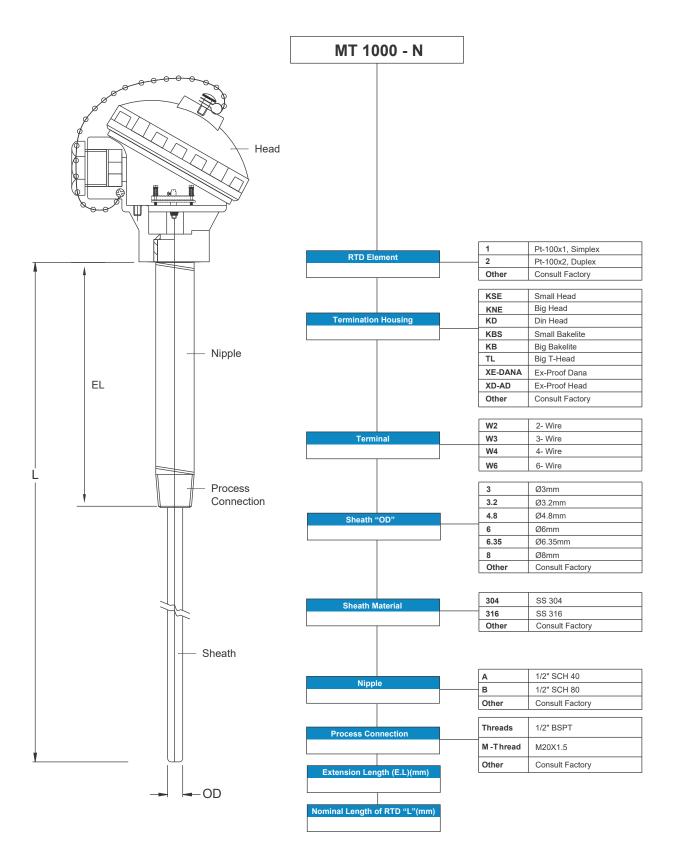
# **RTD WITH THERMOWELL & COMPRESSION FITTING**







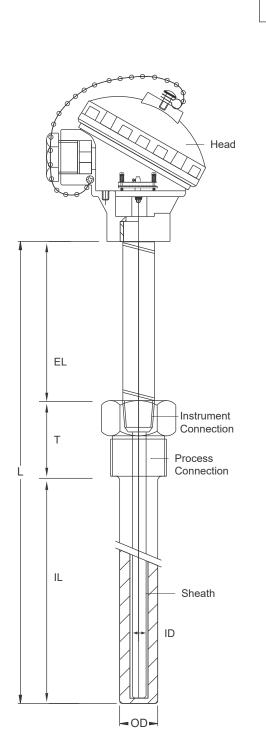
## **RTD WITH NIPPLE**

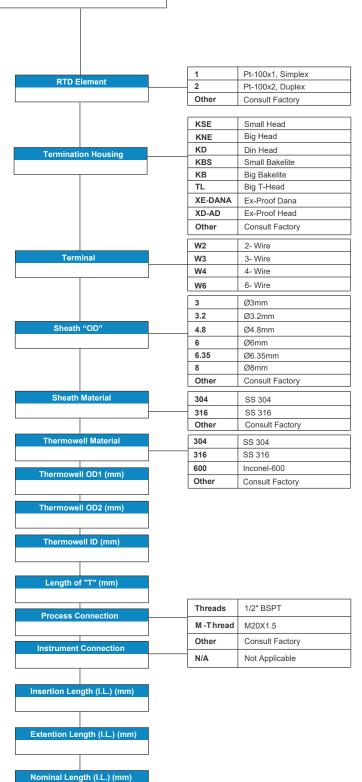




# **RTD WITH NIPPLE & STRAIGHT THERMOWELL**

MT 1000 - O

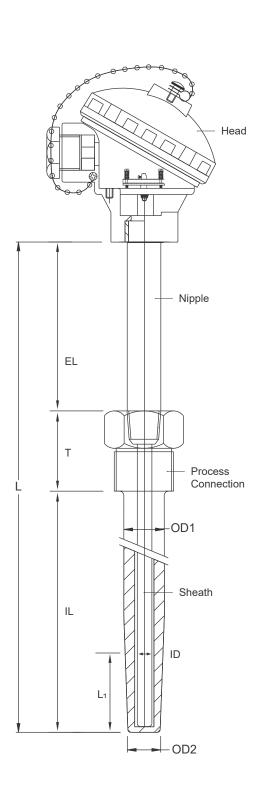


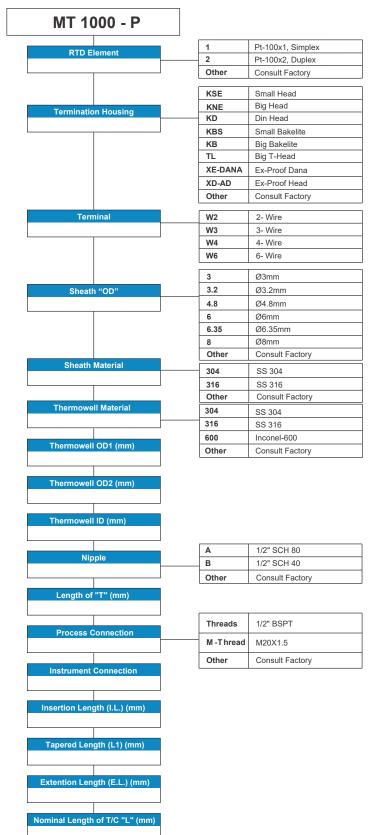






# **RTD WITH NIPPLE & TAPPER THERMOWELL**

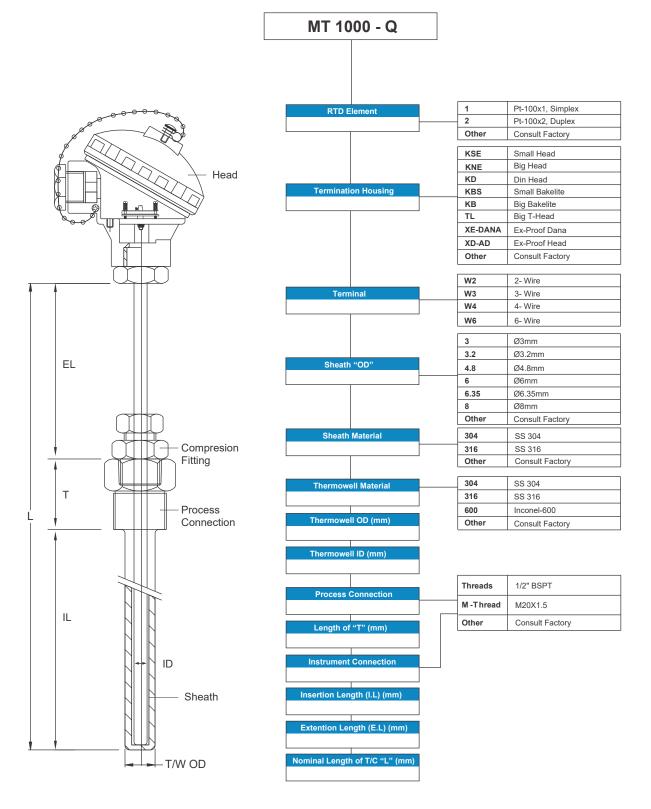






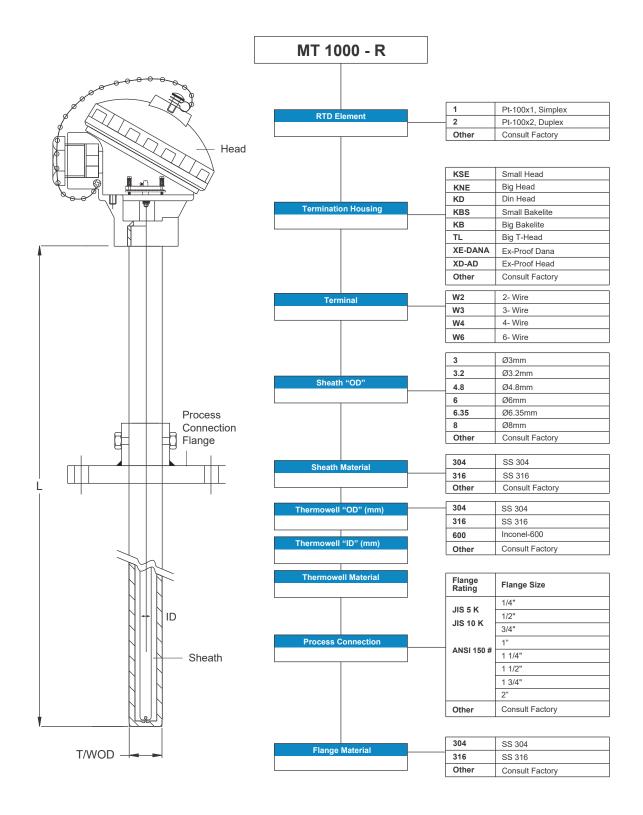


## RTD WITH STRAIGHT THERMOWELL & COMPRESSION FITTING



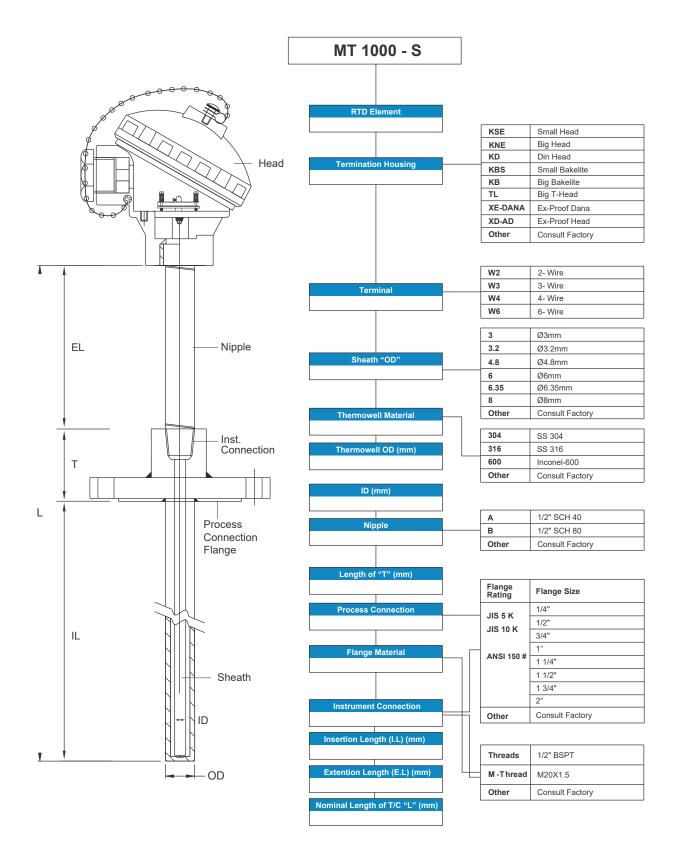


# **RTD WITH ADJUSTABLE FLANGE THERMOWELL**





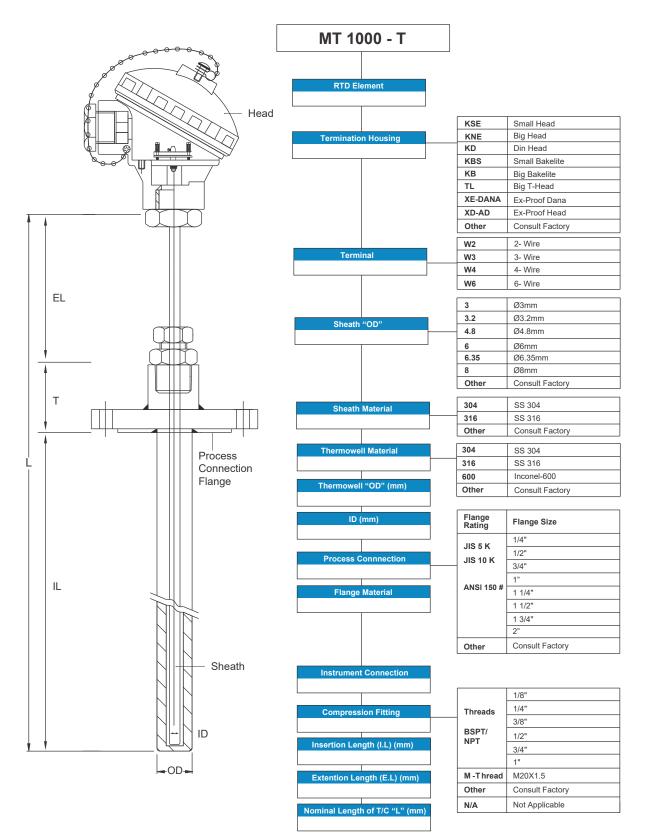
# **RTD WITH FLANGE STRAIGHT THERMOWELL**







## **RTD WITH NIPPLE & FLANGE STRAIGHT THERMOWELL**





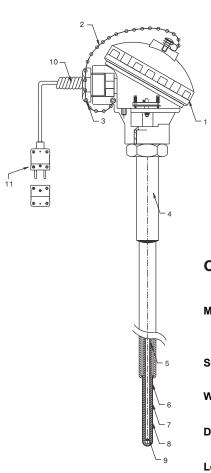
## **Thermocouple For Glass Industry**



#### **Simplex Fore Hearth and Distributor**

In Distributor & in Fore-Hearths rear and middle zone most of the glass companies use this simplex small thimble thermocouple. This is the substitute of fibre optic pyrometer. With Pyrometer customer can get only glass surface temperature but using this thermocouple, customer can get immersion temperatures. It is commonly used in all container glass industries. When conditioning zone trilevels & rear /Middle zone simplex Thermocouple are manufactured with same batch element, Customer can get relative temperatures.

Measuring range	100 to 1600°C
Sensor type	R / S / B. At 3 levels at B-Bottom, M-Middle, T-Top
Protection sheathing	Recrystallised alumina KER-710 (C-799) tube with hole at one end. Special hardened platinum / PT alloy thimble
Application	Fore hearth and distributor glass immersion



No	Description
1	SS/ Aluminium connection head IP-67
2	SS chain
3	1/2" NPT (M) Cable gland
4	Holding Tube : Inconel 600 / SS310
5	Recrystallized alumina tube : OD x ID to be specified
6	Inner Tube suitable to outer tube
7	2 bore recrystallized alumina insulating tube
8	Hardened PT/PT alloy thimble : OD x thk. Suitable to inner dimension
9	PT-RHPT thermocouples element - R / S / B type
10	Ceramic fibre insulated compensating cable 3 / 6 meters long with overall ceramic fiber sleeve
11	Quick release compensated connectors - R / S / B

#### **Ordering Cable**

Model : MT/GL 1 _ /	I —
Sensor Type :	
Wire Size (mm) :	
Diameter of Platinum / PT alloy Thimble :	
Length (mm) L1 / L2 / L3 :	
Optional :	

4-20mA : Transmitter 4-20 mA

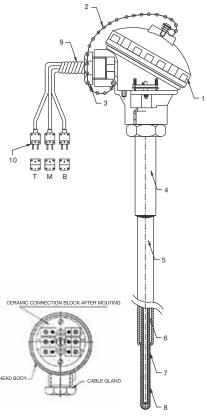




#### **Trilevel Fore Hearth/Distributor**

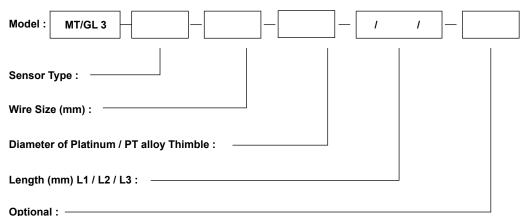
In Distributor & Fore-Hearths temperature measurement & control is most important, the glass fore-hearth control system includes a temperature sensing system and control system. The temperature sensing system includes an arrangement of pre-positioned temperature sensors. Simplex thimble thermocouples & tri-level / triplex thermocouples consist of an assembly of a bottom, middle and top thermocouples for sensing the vertical temperature profile of the molten glass at a fixed location. The output signals from these temperature sensors are received by controllers of the system which then provide control signals & regulate the operation of the heat input devices and the cooling input devices. Thermocouple output & controller's calibration must be accurate, reliable and repeatable. The Tri-Level Thermocouples designed to achieve thermal homogeneity of the glass exiting from the fore-hearth for forming, as the homogeneity will help to get the proper distribution of Gob in moulds.

Measuring range	100 to 1600°C
Sensor type	R / S / B. At 3 levels at B-Bottom, M-Middle, T-Top
Protection sheathing	Recrystallised alumina KER-710 (C-799) tube with hole at one end. Special hardened platinum / PT alloy thimble
Application	Fore hearth and distributor glass immersion



No	Description	
1	SS/ Aluminium connection head IP-67	
2	SS chain	
3	1/2" NPT (M) Cable gland	
4	Holding Tube : Inconel 600 / SS310	
5	Recrystallized alumina tube : OD x ID to be specified	
6	6 Inner Tube suitable to outer tube	
7	7 6 bore recrystallized alumina insulating tube	
8	Hardened PT/PT alloy thimble : OD x thk. Suitable to outer dimension	
9	Ceramic fibre insulated compensating cable 3 / 6 meters long with overall ceramic fiber sleeve	
10	Quick release compensated connectors - R / S / B	
11	a, b, c are distances from tip to bottom, middle & top sensor elements depending on the design	

#### **Ordering Cable**



4-20mA : Transmitter 4-20 mA

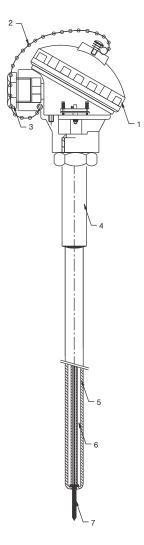




#### **Glass Level Probe For Level Control**

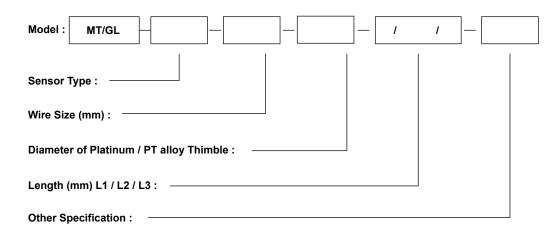
Glass level probe for glass level control is made with Pt alloy probe. Inside and outside protection is with recrystallized alumina tubes. With this, customer can replace old fashioned water cooled level probes. These probes are available in different type of hangers as per customers requirement. Service life is very good. All lengths & dia are available as per site needs.

Measuring range	Glass Contact
Sensor type	PT. or PT RH alloy electrode
Protection sheathing	Recrystallised alumina KER-710 (C-799) tube with hole at one end. With PT alloy tip for glass level sensing
Application	Fore hearth and distributor



No	Description
1	SS/ Aluminium connection head IP-67
2	SS chain
3	1/2" NPT (M) Cable gland
4	Holding Tube : Inconel 600 / SS310
5	Recrystallized alumina outer tube hole at close end : OD x 1D to be specified
6	Inner Tube suitable to outer tube
7	Pt alloy electrode

#### **Ordering Cable**





### **HVAC Temperature Sensor**



### MT-701-A/B



#### **Temperature Sensor Flange Mount**

Incorporate a hermitically sealed 304 SS probe, crimped on to a steel flange providing a rugged assembly for duct temperature sensing. Two mounting holes are provided for #8 screws and the flange mating surface is fully gasketted to seal off the probe and screw holes. MT-701-A is available with 3 in/76mm wire leads and the MT-701-B has 6 ft/1.8 meter plenum rated cable. MT-701-A/B is an ideal product for a rugged, reliable, quick and easy installation in air handlers, fan coil units, ducts, furnaces, freezers, ovens or any other through the wall temperature sensing application. Maximum temp 200°C.

## MT-701-C/D



#### **Temperature Sensor Bulkhead Mount**

Fast response 304 SS probe with a brass bulkhead fitting and a compression sleeve forms a strong assembly for duct temperature sensing if adjustable insertion depth is desired. The bulkhead fitting is installed in the duct, compression sleeve loosened, probe inserted to the desired length and the sleeve is tightened. Sensor is available with 3 in/75mm leads or 6 ft/1.8 meter plenum rated cable. MT-701-C/D sensors provide a low cost, rugged, quick and easy installation in air handlers, fan coil units, ducts, plenum, furnaces, freezers, oven or any other through the wall temperature sensing, maximum temp 200°C.

### **Ordering Information: MT-701**

Installation	Sensor*	Probe Length
A Flange mount 3 in/75mm wire leads	1 100 ohm Platinum RTD	A 4 inches/100mm
B Flange mount 6 ft/1.8m plenum cable	2 1,000 ohm Platinum RTD	B 6 inches/150mm
C Bulkhead mount 3 in/75mm wire leads	3 1,000 ohm NTC thermistor	C 8 inches/200mm
D Bulkhead mount 6 ft/1.8m plenum cable	4 5,000 ohm NTC thermistor	D 12 inches/300mm
	5 10,000 ohm NTC thermistor	

Example : MT-701-B-3-A Flange mount with 6 ft cable, 1,000 ohm thermistor and 4 inch probe length.





### MT-702-A



#### **Temperature Sensor Polycarb Enclosure**

Polycarbonate enclosure designed to withstand temperature extreme, mechanical shock and vibration. 304 SS probe crimp attached to the enclosure flange for a low profile mating surface, external mounting bracket to conform to irregular surfaces, single screw cover attachment, are some of the features which improve reliability and lower installation cost. MT-702-A temperature sensors provide a cost effective and reliable solution for air handlers, fan ocil units, ducts, plenums, furnaces or any other application which does not require conduit wiring, Maximum temp 200°C.

## MT-702-B



#### **Temperature Sensor Aluminum Enclosure**

Aluminum enclosure designed for all industrial and commercial duct temperature sensing applications. Hermitically sealed, fast response 304 SS probe crimped attached to the enclosure flange to provide a low profile mating surface, external mounting bracket to conform to uneven surfaces, some of the features which improve reliability and lower installation cost, Maximum temp 200°C.

#### **Ordering Information: MT-702**

Installation	Sensor*	Probe Length
A Polycarb Plastic Enclosure IP-54	1 100 ohm Platinum RTD	A 4 inches/100mm
B Galvanized Steel Eclosure NEMA-1/ IP-30	2 1,000 ohm Platinum RTD	B 6 inches/150mm
	3 1,000 ohm NTC thermistor	C 8 inches/200mm
	4 5,000 ohm NTC thermistor	D 12 inches/300mm
	5 10,000 ohm NTC thermistor	

Example : MT-702-A-2-D Polycarb plastic enclosure with 1000 ohm Platinum RTD and 12 inch probe length.





### MT-703-A



#### **Immersion Temperature Sensor Thermowell Adapter Mount**

Incorporate a hermitically sealed 304 SS probe and a brass adapter with a compression sleeve providing a rugged assembly for immersion temperature sensing if field adjustable insertion depth is desired. The brass adapter is screwed in to the thermowell, compression sleeve is loosened, probe inserted to desired length and the sleeve is tightened. Sensor has 6ft/1.8m plenum rated cable for remote termination. MT-704-A sensors provide a cost effective and reliable solution for hot/ chilled water condenser water or low pressure steam applications which require adjustable insertion length, Maximum temp 200°C.

## MT-703-B



## Immersion Temperature Sensor Polycarb Enclosure

Polycarbonate enclosure designed to withstand temperature extreme, mechanical shock and vibration. 304 SS probe crimp attached to the enclosure for a low profile mating surface. Patented locking thermowell adapter, single screw cover attachment, are some of the features which improve reliability and lower installation costs. MT-703-B sensors provide a cost effective and reliable solution for hot/ chilled water, Maximum temp 200°C.

#### **Ordering Information: MT-703**

Installation	Sensor*	Probe Length	Adapter
<ul><li>A Immersion style with adapter</li><li>B Polycarb Plastic Enclosure IP-54</li></ul>	<ol> <li>100 ohm Platinum RTD</li> <li>1,000 ohm Platinum RTD</li> </ol>	A 4 inches/100mm B 6 inches/150mm	1 1/8" NPT 2 1/4" NPT
C Aluminum Enclosure NEMA-1/ IP-30	3 1,000 ohm NTC thermistor	C 8 inches/200mm	3 1/2" NPT
	<ul><li>4 5,000 ohm NTC thermistor</li><li>5 10,000 ohm NTC thermistor</li></ul>		

Example: MT-703-A-3-A-3: Immersion style with 1/2" adapter, 1,000 ohm Thermistor and 4 inch probe.





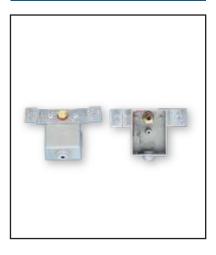
## MT-704-A



#### Surface Temperature Sensor Strap On Probe Enclosure

Incorporates a 2" 304 SS probe with a 6ft/1.8m plenum rated cable for pipe surface temperature sensing, Nylon ties are provided to secure the probe to the pipe. MT-704-A provides a cost effective and reliable solution for surface contact temperature measurement of conditioned water pipes, low pressure steam or refrigerant line, Maximum temp 200°C.

### MT-704-B



#### Surface Temperature Sensor Polycarb Enclosure

Polycarbonate enclosure designed to withstand temperature extreme, mechanical shock and vibration. Fast response brass contact sensor attached to the enclosure for a low profile mating surface, mounting bracket for pipe clamp installation, single screw cover attachment, are some of the features which improve reliability and lower installation costs, Maximum temp 200°C.

## MT-704-C



Standard Aluminum enclosure designed for all industrial and commercial surface temperature sensing applications. Fast response brass contact sensor attached to the enclosure for a low profile mating surface, Maximum temp 200°C.

Surface Temperature Sensor Aluminum Enclose





## **Ordering Information: MT-704**

Installation	Sensor*
A Surface Mount Strap-on	1 100 ohm Platinum RTD
B Polycarb Plastic Enclosure IP-54	2 1,000 ohm Platinum RTD
C Aluminum Enclosure NEMA-1/ IP-30	3 1,000 ohm NTC thermistor
	4 5,000 ohm NTC thermistor
	5 10,000 ohm NTC thermistor

Example: MT-704-C-1: NEMA-1 Enclosure with 100 ohm Platinum RTD surface mount sensor.

## MT-705



### **Duct Averaging Temperature Sensor**

Two probe construction options-3/8" (9.53mm) bendable thin wall copper probe. MT-705-A incorporates rugged copper sensor strain reliefs. Available with plastic Aluminum to cover all applications, Maximum temp 200°C.

## **Ordering Information: MT-705**

Installation	Sensor*	Probe Length	Adapter
<ul><li>A Polycarb plastic PVC Box Enclosure</li><li>B Aluminum Enclosure NEMA-1/IP-30</li><li>C Thermocouple Head</li></ul>	<ol> <li>100 ohm Platinum RTD</li> <li>1,000 ohm Platinum RTD</li> <li>1,000 ohm NTC thermistor</li> <li>5,000 ohm NTC thermistor</li> <li>10,000 ohm NTC thermistor</li> </ol>	A 6 feet/1.8m B 12 feet/3.6m C 24 feet/7m	1 Bendable 3/8" Copper



## **Wireless Temperature Transmitter**



#### MTW1



#### **Wireless Temperature Transmitter**

The Universal Wireless Temperature Transmitter MTW1 is specifically designed to meet the most rigorous requirements of operation in the industrial process environments. Due to its reduced dimensions, it may be installed in the DIN Form B Sensor connection head, in place of the traditional terminal blocks or current loop temperature transmitter. In its high RF power mode, it can communicate over a long distance range (up to 4 km line of sight). It accepts the most commonly used temperature sensors.

Dimensions	45ø x 23 mm
Weight	50g (approx.)
Material	Nylon 66
Protection Index	IP40

#### **Features**

#### Universal Sensor Input

Resistance Thermometers, Thermocouples and DC Voltage Sources

#### • Up To 4km Or 2km Distance (Los)

Transmission Up to 4km Distance (LOS) 868 MHZ Transmission Up to 2km Distance (LOS) 2,4 GHZ

#### • Real Time Transmission

Process and Ambient Temperature, RF Signal Strength and Battery Status

- Ultra Low Power Mode Long Battery Life
- Wide Supply Voltage Range 5 TO 24 V DC
- Compact Design
   DIN Form B Connection Head Mounting





#### TECHNICAL SPECIFICATIONS

INPUT RESISTANCE THERMOMETER (RTD)	
Measured variable	Temperature
Sensor type	PT100, PT500, PT1000
Units	°C or °F
Connection	1 Resistance thermometer (RTD) in 2-wire, 3-wire or 4-wire system
Sensor current	<0.05 mA (50µA)
Response time	<500 ms
Open-circuit monitoring	Always active (cannot be disabled)
Short-circuit monitoring	Always active (cannot be disabled)
Measuring range	See "Digital measuring accuracy thermometer" table

INPUT THERMOCOUPLES (TC)	
Measured variable	Temperature
Sensor type	E, J, K, N ,R ,S, T
Units	°C or °F
Connection	1 Thermocouple
Sensor current	<0.05 mA (50µA)
Response time	<500 ms
Open-circuit monitoring	Always active (cannot be disabled)
Short-circuit monitoring	Not available
Cold junction compensation (CJC)	Integrated resistance thermometer
Measuring range	See "Digital measuring accuracy thermocouples" table

RADIO SPECIFICATIONS	868 MHZ	2,4 GHZ
Range <sup>1</sup>	Up to 4km LoS, 27 dBm (500mW)	Up to 2km LoS, 10 dBm (10mW)
Frequency band	868 to 870 MHz <sup>2</sup>	2,4 to 2,5 GHz <sup>2</sup>
Number of channels	16	
Reception sensivity	-97 to -109 dBm <sup>2</sup>	-91 to -108 dBm <sup>2</sup>
Transmit power	0 to 27 dBm <sup>2</sup>	-10 to 18 dBm <sup>2</sup>
Communication period	Adjustable from 1 second to 24h	

OUTPUT (RF TRANSMISSION)	
Output signals	
Sensor value (Temperature / mV)	Temperature °C (°F) / mV
Internal Temperature	Temperature ºC (ºF)
RSSI	Absolute value
Power supply voltage	Voltage V
Configurable parameters	Sensor type, Communication period



## Wireless Temperature Transmitter



OPERATING ENVIRONMENT	868 MHZ	2,4 GHZ
Ambient temperature range	-40 to 80 °C (-40 to 176 °F)	-20 to 80 °C (-4 to 176 °F)
Storage temperature range	-40 to 80 °C (-40 to 176 °F)	-20 to 80 °C (-4 to 176 °F)
Relative humidity	$\leq$ 95 %, without condensation	

POWER SUPPLY	
Voltage Range	5 to 24 V DC
Measurement accuracy	± 100mV
Power consumption (sleep)	< 0,2 mA
Battery Life	For a 9V battery, with 1200 mAh with a transmission interval of 2 minutes, the battery life is higher than 2 years

CASING	
Material	Nylon 66
Weight	Approx. 50g
Dimensions	See "Dimensional drawings"
Cross section	2.5 mm
Protection type	IP40

FACTORY DEFAULT SETTINGS	
Sensor	Thermocouple K
Measuring range	0100°C (32212°F)
Transmission interval	300s
Wireless transmitter ID	0
Wireless network ID	0

CERTIFICATIONS AND APPROVALS	
EN 61326	Electrical equipment for measurement, control and laboratory use. EMC requirements.
IEC 61000-4-2	Electrostatic discharge immunity test
IEC 61000-4-3	Radiated, radio-frequency, electromagnetic field immunity test
IEC 61000-4-4	Electrical fast transient/burst/immunity test
IEC061000-4-5	Surge immunity test
EN 300 228	Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission sys- tems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modu- lation techniques; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive
EN 300 440	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices; Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive

#### MEASURING ACCURACY

MEASURING ACCURACY	
Reference conditions	
Auxiliary power	9V DC $\pm$ 1%
Ambient temperature	23℃ (73,4°F)
Warm-up time	>5min
Error due to internal cold junction	<0.5°C (0.9°F)



### **Wireless Temperature Transmitter**



Influence of ambient temperature	
with resistance thermometers	0.06°C (0.11°F)/10°C (18°F)
with thermocouples	0.6°C(1.1°F)/10°C(18°F)

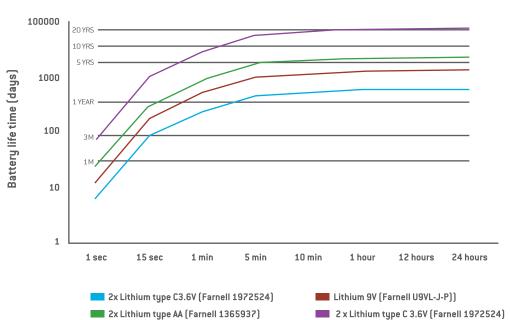
ACCURACY RESISTANCE THERMOMETER (RTD)		
Sensor	Range °C (°F)	Digital accuracy °C (°F)
PT100	-200 to 850 (-328 to 1562)	0,1 (0,18)
PT500	-200 to 850 (-328 to 1562)	0,2 (0,36)
PT1000	-200 to 350 (-328 to 662)	0,2 (0,36)

ACCURACY THERMOCOUPLES (TC)		
Sensor	Range °C (°F)	Digital accuracy °C (°F)
E	-200 to 1000 (-328 to 1832)	1 (1,8)
J	-210 to 1200 (-346 to 2192)	1 (1,8)
К	-230 to 1370 (-382 to 2498)	1 (1,8)
Ν	-200 to 1300 (-328 to 2372)	1 (1,8)
R	-50 to 1760 (-58 to 3200)	2 (3,6)
S	-50 to 1760 (-58 to 3200)	2 (3,6)
Т	-200 to 400 (-328 to 752)	1 (1,8)

DIGITAL MEASUREMENT ACCURACY MV		
Sensor	Range (mV)	Accuracy
mV	- 8 to 100 mV	<40 µV

#### **TECHNICAL DRAWINGS AND INFORMATION**

BATTERY LIFE TIME

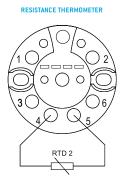


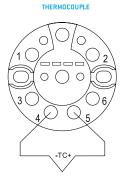
#### BATTERY LIFE TIME X REFRESH TIME

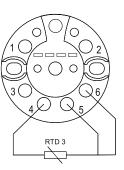




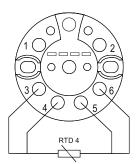
#### ELECTRICAL CONNECTIONS

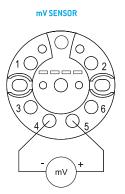




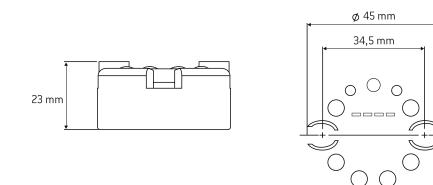


POWER SUPPLY (Uaux)
+ Uaux - mA
30 $6$ $40$ $5$

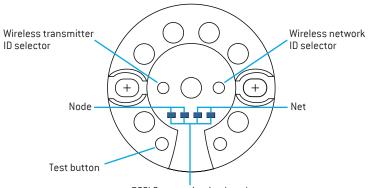




DIMENSIONAL DRAWINGS



#### LED INDICATION IN CONNECTION AND CONFIGURATION

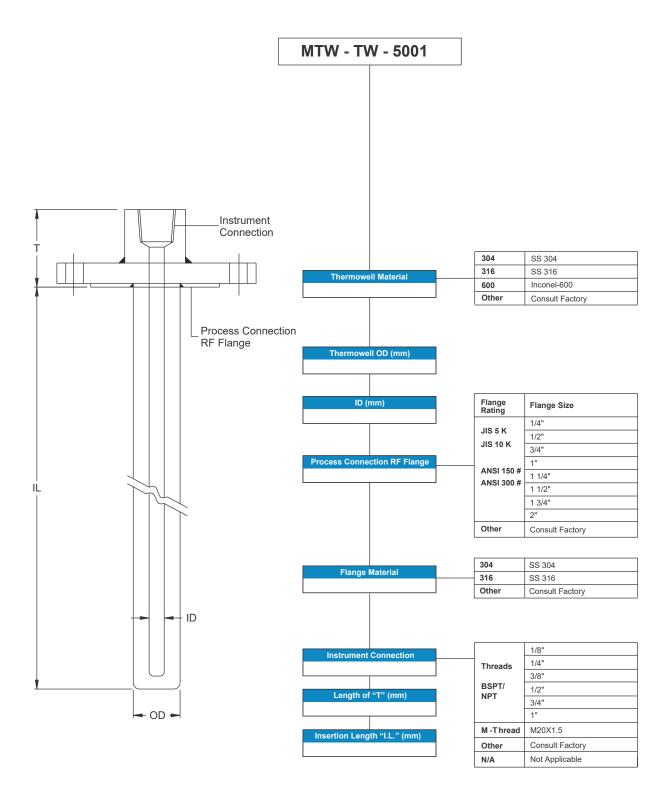


RSSI Communication Level





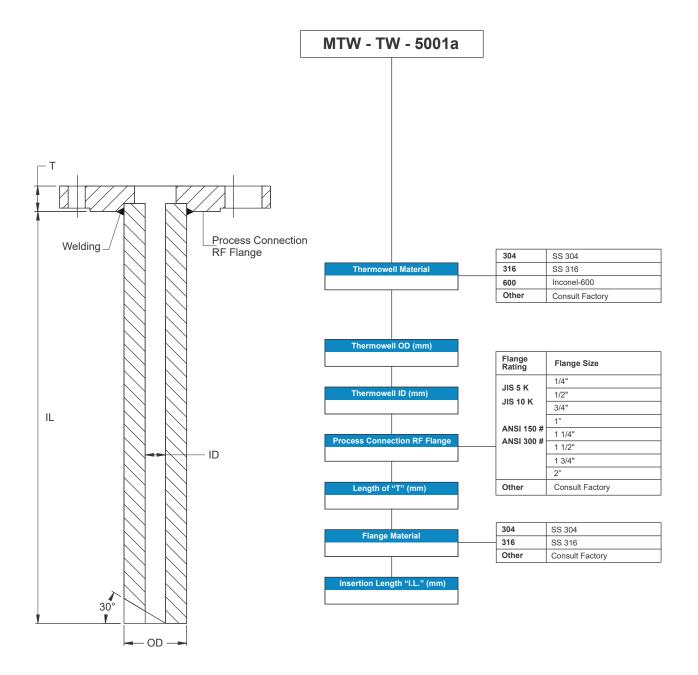
## STRAIGHT THERMOWELL WITH FLANGE







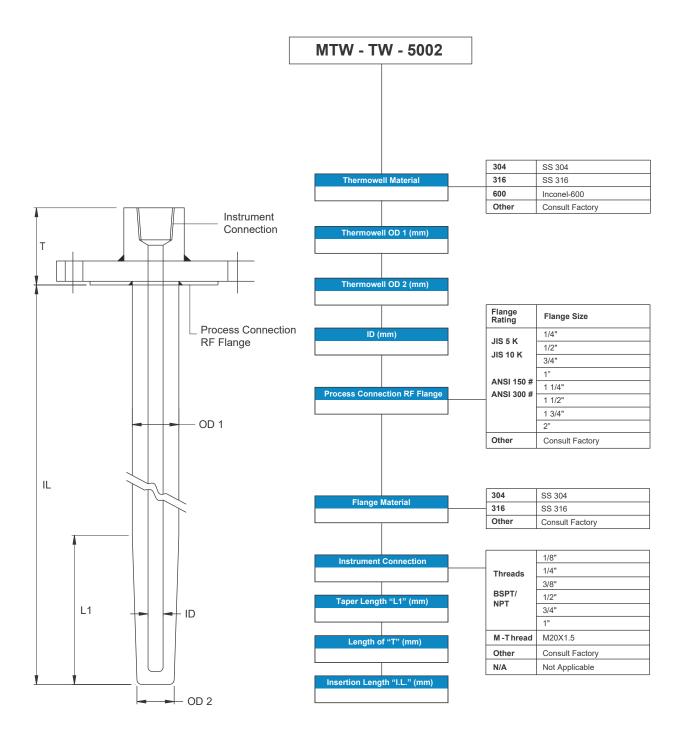
## **HEAVY DUTY THICK WALL THERMOWELL**







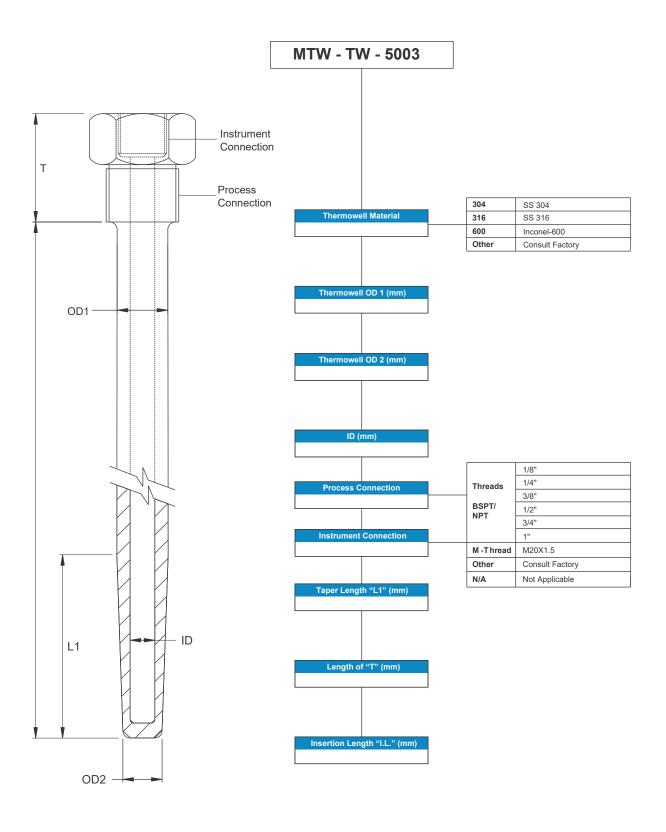
## TAPER THERMOWELL WITH FLANGE







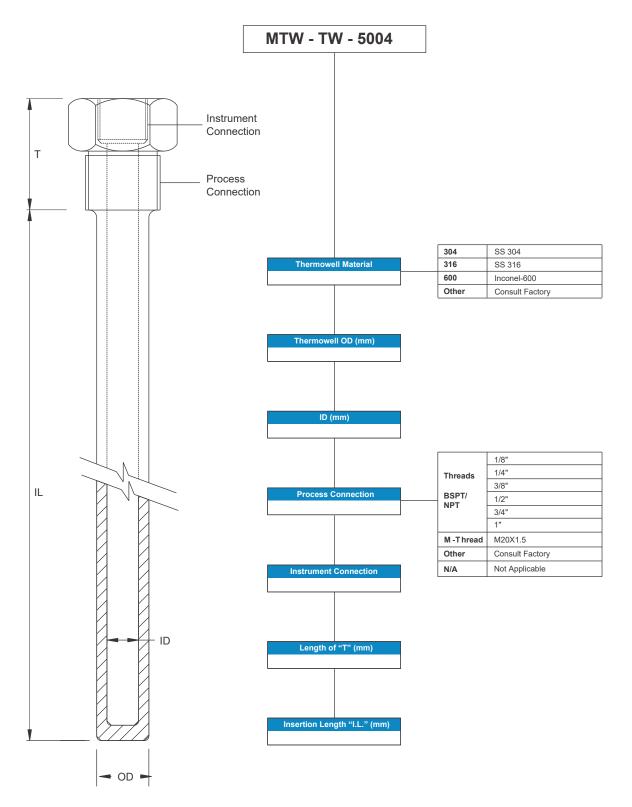
# TAPER THERMOWELL WITH FLANGE







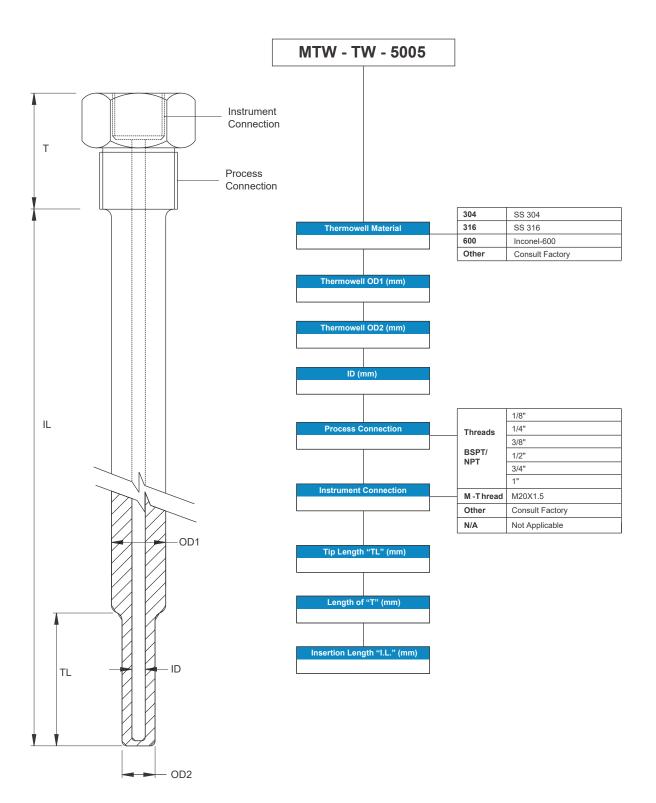
# STRAIGHT THERMOWELL (SCREWED TYPE)







## **STEPPED THERMOWELL**

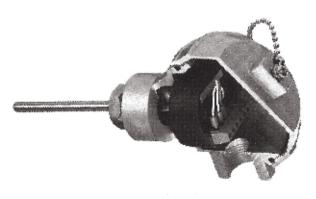




## **Temperature Transmitters**



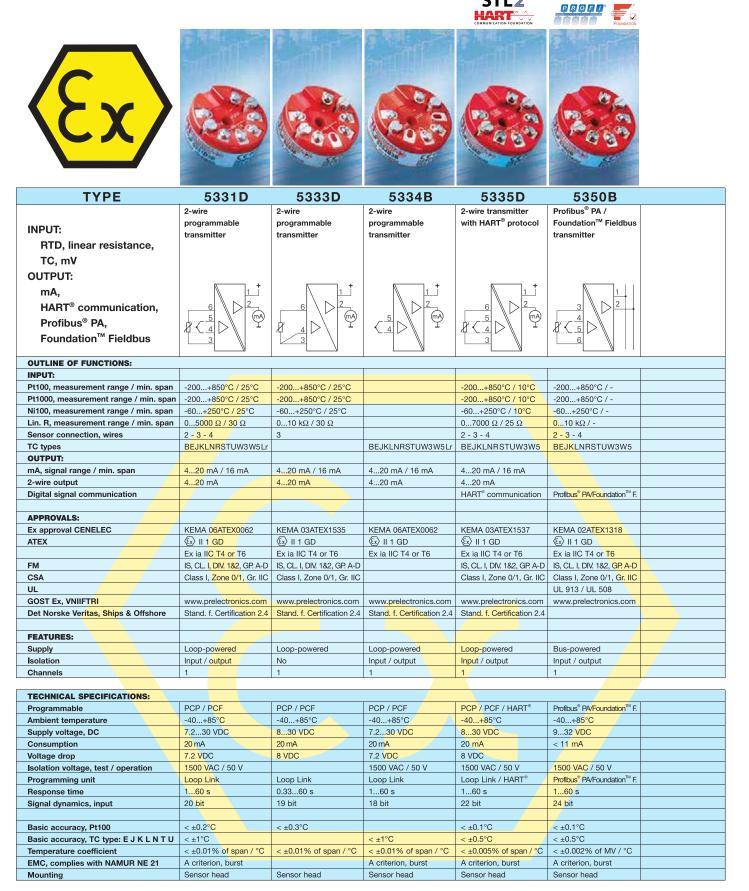






ТҮРЕ	5331A	5333A	5334A	5335A	5350A	
	2-wire	2-wire	2-wire	2-wire transmitter	Profibus <sup>®</sup> PA /	
INDUT	programmable	programmable	programmable	with HART <sup>®</sup> protocol	Foundation <sup>™</sup> Fieldbus	
INPUT:	transmitter	transmitter	transmitter		transmitter	
RTD, linear resistance,						
TC, mV						
OUTPUT:						
mA,	1	1	1	1	1	
HART <sup>®</sup> communication,	6	$6 \setminus \mathbb{P}^2$		6	3	
Profibus <sup>®</sup> PA,	5 MA			mA	4	
,						
Foundation <sup>™</sup> Fieldbus	3	3		3	6	
OUTLINE OF FUNCTIONS:					I	
Number of hardware versions	1	1	1	1	1	
INPUT:						
Pt100, measurement range / min. span	-200+850°C / 25°C	-200+850°C / 25°C		-200+850°C / 10°C	-200+850°C / -	
Pt1000, measurement range / min. span	-200+850°C / 25°C	-200+850°C / 25°C		-200+850°C / 10°C	-200+850°C / -	
Ni100, measurement range / min. span	-60+250°C / 25°C	-60+250°C / 25°C		-60+250°C / 10°C	-60+250°C / -	
Lin. R, measurement range / min. span	05000 Ω / 30 Ω	010 kΩ / 30 Ω		07000 Ω / 25 Ω	010 kΩ / -	
Sensor connection, wires	2 - 3 - 4	3		2 - 3 - 4	2 - 3 - 4	
TC types	BEJKLNRSTUW3W5Lr		BEJKLNRSTUW3W5Lr	BEJKLNRSTUW3W5	BEJKLNRSTUW3W5	
CJC connector 1 / 2 channels						
Max. offset	50% of selec. max. value					
OUTPUT:						
mA, signal range / min. span	420 mA / 16 mA					
2-wire output	420 mA	420 mA	420 mA	420 mA		
Digital signal communication				HART <sup>®</sup> communication	Profibus <sup>®</sup> PA/Foundation <sup>™</sup> F.	
APPROVALS:						
Ex approval CENELEC	KEMA 10ATEX0002 X	KEMA 10ATEX0003 X	KEMA 10ATEX0002 X	KEMA 03ATEX1508 X	KEMA 03ATEX1011 X	
ATEX	€ II 3 GD	⟨€x⟩    3 GD	(Ex)    3 GD	🖾 II 3 GD	(Ex)    3 GD	
	Ex nA [nL] IIC T4T6	Ex nA [nL] IIC T4T6				
UL					UL 1604, UL 508	
Det Norske Veritas, Ships & Offshore	Stand. f. Certification 2.4					
FEATURES:						
Supply	Loop-powered	Loop-powered	Loop-powered	Loop-powered	Bus-powered	
Isolation	Input / output	No	Input / output	Input / output	Input / output	
Channels	1	1	1	1	1	









SIL<sub>2</sub>

## Accessories Terminal Blocks





Part No.	Description
SB 2P	Small 2-pole High aluminium ceramic (extra white colour)
SB 3P	Small 3-pole High aluminium ceramic (extra white colour)
LB 2P	Large 2-pole High aluminium ceramic (extra white colour)
LB 3P	Large 3-pole High aluminium ceramic (extra white colour)
LB 4P	Large 4-pole High aluminium ceramic (extra white colour)
LB 6P	Large 6-pole High aluminium ceramic (extra white colour)

## **Compression Fittings**



Part No.	Material	Tube Size	Process Connection
CFB 30 B 125	Brass	3mm (1/8")	1/8" BSP
CFB 30 B 250	Brass	3mm (1/8")	1/4" BSP
CFB 45 B 125	Brass	4.5mm (3/16")	1/8" BSP
CFB 45 B 250	Brass	4.5mm (3/16")	1/4" BSP
CFB 60 B 125	Brass	6mm (1/4")	1/8" BSP
CFB 60 B 250	Brass	6mm (1/4")	1/4" BSP
CFB 60 B 375	Brass	6mm (1/4")	3/8" BSP
CFB 60 B 500	Brass	6mm (1/4")	1/2" BSP
CFB 95 B 500	Brass	9.5mm (3/8")	1/2" BSP
CFB 30 B 250	S/S 316	3mm (1/8")	1/4" BSP
CFB 45 B 250	S/S 316	4.5mm (3/16")	1/4" BSP
CFB 60 B 250	S/S 316	6mm (1/4")	1/4" BSP
CFB 60 B 375	S/S 316	6mm (1/4")	3/8" BSP
CFB 60 B 500	S/S 316	6mm (1/4")	1/2" BSP



# **Terminal Heads**





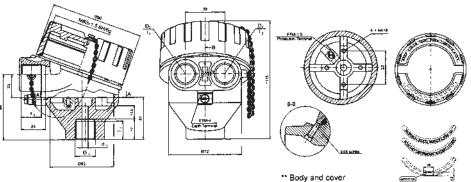
Part No.	Size	Material	Sensor Connection	Cable Entry
KSC 500	Small	Aluminium	1/2" BSP	M16 x 1.5
KNC 500	Big	Aluminium	1/2" BSP	M20 x 1.5
KNC 750	Big	Aluminium	3/4" BSP	M20 x 1.5
KB 250	Small	Bakelite	1/4" BSP	M16 x 1.5
KB 500	Small	Bakelite	1/2" BSP	M16 x 1.5
KD 500	Big	Din Aluminium	1/2" BSP	M20 x 1.5
LS 500	Big	S/S 316	1/2" BSP	M20 x 1.5

# EEx d (flameproof) Connection Head

# Type XD-AD



Material of body and cover : aluminium pressure die-casting, max.0.5% Mg Ambient temperature:  $T_{amb} = -40$  to  $100^{\circ}$ C - silicone rubber Coating: yellow chromating and chemically resistant paint (outside only) Maximum space for transmitter: Ø52 x 30



\* sign "mod" means modified thread ac.to OIT-17/03



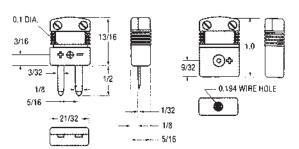
# **Miniature Connectors**

To Order (Specify Model Number)

Alloy¹ Code	Compensa Used in C	ating A <b>ll</b> oy Connector	Shell Color	Glass-Fille Model Ni	-	
Oute	+		COIOI	w/ Window	w/o Window	
К	CHROMEGA®	ALOMEGA®	Yellow	SMPW-K-(*)	SMPW-K-(*)	
Т	Copper	Constantan	Blue	SMPW-T-(*)	SMPW-T-(*)	
J	Iron	Constantan	Black	SMPW-J-(*)	SMPW-J-(*)	
E	CHROMEGA®	Alloy #11	Purple	SMPW-E-(*)	SMPW-E-(*)	
R	Copper	Alloy #11	Green	SMPW-R-(*)	SMPW-R-(*)	
S	Copper	Alloy #226	Green	SMPW-S-(*)	SMPW-S-(*)	
G	Alloy #200	Alloy#426	Red/Green	SMPW-G-(*)	SMPW-G-(*)	
С	Alloy #405	Alloy#225	Red	SMPW-C-(*)	SMPW-C-(*)	
D	Alloy #203	Alloy#203	Red/White	SMPW-D-(*)	SMPW-D-(*)	
U	Copper	Copper	White	SMPW-U-(*)	SMPW-U-(*)	
N	OMEGA-P®	OMEGA-N®	Orange	SMPW-N-(*)	SMPW-N-(*)	

SMPW & SMP

MALTEC-T

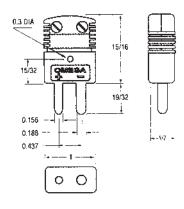


# **Standard Connectors**

To Order (Specify Model Number)

Alloy¹ Code		ating Al <b>l</b> oy Connector	Shell	Glass-Filled Nylon Model Number
	+		Color	w/ Window w/o Window
К	CHROMEGA®	ALOMEGA®	Yellow	OSTW-K-(*)
Т	Copper	Constantan	Blue	OSTW-T-(*)
J	Iron	Constantan	Black	OSTW-J-(*)
E	CHROMEGA®	Constantan	Purple	OSTW-E-(*)
R/S	Copper Alloy #11		Green	OSTW-R/S-(*)
U	Copper Copper		White	OSTW-U-(*)
Ν	OMEGA-P®	OMEGA-N®	Orange	OSTW-N-(*)

OSTW

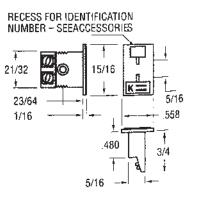


# **Miniature Panel Jacks**

To Order (Specify Model Number)

Alloy¹ Code	Type of Thermocouple Used	Compensa Used in C	Model Number		
	with Connector	+	-		(Female)
К	CHROMEGA® ALOMEGA®	CHROMEGA®	ALOMEGA <sup>®</sup>	Yellow	MPJ-K-F
Т	Copper-Constantan	Copper	Constantan	Blue	MPJ-T-F
J	Iron-Constantan	Iron	Constantan	Black	MPJ-J-F
E	CHROMEGA®-Constantan	CHROMEGA®	Constantan	Purple	MPJ-E-F
R/S	Pt-Pt/13%Rh	Copper	Alloy #11	Green	MPJ-R/S-F
G	W-W/26%Re	Alloy #200	Alloy #226	Red	MPJ-G-F
С	W/5%Re-W/26%Re	Alloy #405	Alloy#426	Red	MPJ-C-F
D	W/3%Re-W/25%Re	Alloy #203	Alloy#225	Red	MPJ-D-F
U	Uncompensated	Copper	Copper	White	MPJ-U-F
Ν	OMEGALLOY®	OMEGA-P®	OMEGA-N®	Orange	MPJ-N-F



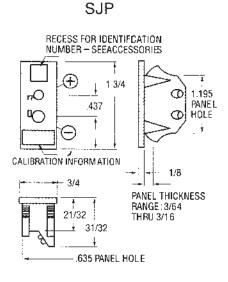




# **Standard Panel Jacks**

To Order (Specify Model Number)

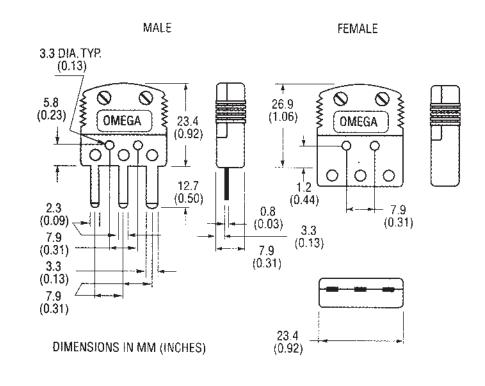
Alloy¹ Code	Type of Thermocouple Used with Connector	Compensa Used in C +	<b>U</b>	Shell Color	Model Number (Female)
К	CHROMEGA®-ALOMEGA®	CHROMEGA®	ALOMEGA®	Yellow	SPJ-K-F
Т	Copper-Constantan	Copper	Constantan	Blue	SPJ-T-F
J	Iron-Constantan	Iron	Constantan	Black	SPJ-J-F
E	CHROMEGA®-Constantan	CHROMEGA®	Constantan	Purple	SPJ-E-F
R/S	Pt-Pt/13%Rh	Copper	Alloy #11	Green	SPJ-R/S-F
G	W-W/26%Re	Alloy #200	Alloy #226	Red	SPJ-G-F
С	W/5%Re-W/26%Re	Alloy #405	Alloy#426	Red	SPJ-C-F
D	W/3%Re-W/25%Re	Alloy #203	Alloy#225	Red	SPJ-D-F
U	Uncompensated	Copper	Copper	White	SPJ-U-F
N	OMEGALLOY®	OMEGA-P®	OMEGA-N®	Orange	SPJ-N-F



# **Standard Panel Jacks**

To Order (Specify Model Number)

Alloy¹ Code	Type of Thermocouple Used		mpensating All sed in Connect		Shell Color	Model Number
Coue	with Connector	+	- G		Color	(Female)
К	CHROMEGA®-ALOMEGA®	CHROMEGA®	ALOMEGA®	Copper	Yellow	MTP-K-(*)
Т	Copper-Constantan	Copper	Constantan	Copper	Blue	MTP-T-(*)
J	Iron-Constantan	Iron	Constantan	Copper	Black	MTP-J-(*)
E	CHROMEGA®-Constantan	CHROMEGA®	Constantan	Copper	Purple	MTP-E-(*)
U	Uncompensated	Copper	Copper	Copper	White	MTP-U-(*)
Ν	OMEGALLOY®	OMEGA-P®	OMEGA-N®	Copper	Orange	MTP-N-(*)







# **Insulations Tubes**

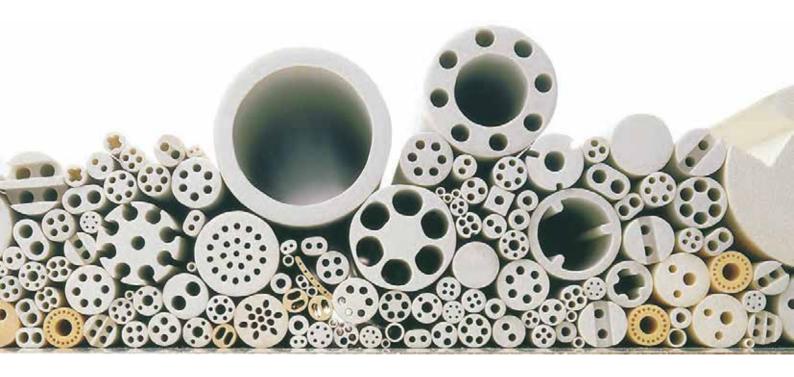


Sillimantin 60 NG-Tubes medium fine structure Al <sub>2</sub> O <sub>3</sub> content approx. 73-75%	Sillimantin 65-Rollers fine structure Al <sub>2</sub> O <sub>3</sub> content 78-80% Especially for roller hearth kilns.	Sillimantin 60-Tubes Type 530 (DIN VDE 0335) medium fine structure Al <sub>2</sub> O <sub>3</sub> contant approx. 73-75%	Sillimantin KS-Tubes medium fine structure Al <sub>2</sub> O <sub>3</sub> content approx. 70%	Silicon Carbide-Tubes fine and coarse structure SiC content 75%–90% claybonded	Halsic-R-Tubes recrystallized SiC SiC content 99%
$\begin{array}{c} \text{Outer/Inner } \varnothing \\ \text{mm} \\ 20 \times 15 \\ 22 \times 17 \\ 24 \times 19 \\ 26 \times 18 \\ 28 \times 22 \\ 30 \times 23 \\ 35 \times 27 \\ 40 \times 32 \\ 50 \times 40 \\ 60 \times 50 \\ 70 \times 60 \\ 80 \times 75 \\ 100 \times 85 \\ 110 \times 95 \\ 120 \times 100 \\ 130 \times 110 \\ 140 \times 120 \\ 160 \times 140 \\ 200 \times 175 \\ 250 \times 230 \\ 330 \times 310 \end{array}$	Outer/inner_∅ mm 25.0 × 15.0 26.9 × 17.0 27.0 × 17.0 30.0 × 20,0 31.0 × 21.0 33.7 × 23.0 33.7 × 23.7 34.0 × 22.5 35.0 × 28.0 36.0 × 24.0 36.0 × 25.0 40.0 × 30.0 42.0 × 32.0 42.4 × 32.4 55.0 × 45.0	Outer/inner Ø mm 20 × 15 22 × 17 24 × 19 26 × 18 28 × 22 30 × 23 35 × 27 40 × 32 50 × 40 60 × 50 70 × 60 80 × 70 90 × 75 100 × 85 110 × 95 120 × 100 130 × 110 140 × 120 160 × 140 200 × 175 250 × 230 330 × 310	Outer/inner Ø mm 15 × 7 20 × 12 20 × 15 25 × 15 25 × 15 30 × 20 35 × 25 40 × 30 45 × 35 50 × 40 55 × 45 60 × 48	Outer/inner $\emptyset$ mm 17 × 12 20 × 15 22 × 17 24 × 19 26 × 20 28 × 22 30 × 23 31 × 25 33 × 28 35 × 27 40 × 32 45 × 35 50 × 40 55 × 45 60 × 50 65 × 55 70 × 60 75 × 65 80 × 70 85 × 75 90 × 75	Outer/inner Ø mm 20 × 10 22 × 12 25 × 15 30 × 20 32 × 22 34 × 24 35 × 25 40 × 30 45 × 35 50 × 38
max, length 3200 mm depending on diameter	max. length 3400 mm depending on diameter	max. length 3500 mm depending on diameter	max. length 2000 mm depending on diameter	max. length 2000 mm depending on diameter	max. length 3000 mm depending on diameter

# **Porous materials**

Insulators and short insulating tubes for thermocouple elements are made in our materials ALSINT 99,7 TYPE 799 and PYTHAGORAS TYPE 610.

The tolerances adhered to are according to DIN 40 680. Closer tolerances on enquiry.







# **Impervious materials**

Alsint 99,7-Tub Type 799 (DIN VE Al <sub>2</sub> O <sub>3</sub> content 99	DE 0335)		Pythagoras-Tul Type 610 (DIN VI Al <sub>2</sub> O <sub>3</sub> content ap Alkali content 39	DE 0335) oprox. 60%		Pythagoras 1800 Z-Tubes Al <sub>2</sub> O <sub>3</sub> content approx. 76% Alkali content 0.3%	Haisic-I-Tubes reaction bonded Si-infiltrated SiC SiC content approx. 90% free Si approx. 10%
$\begin{array}{c} mm \\ 0.8 \times \ 0.3 \\ 1.3 \times \ 0.7 \\ 1.6 \times \ 1.0 \\ 1.8 \times \ 1.2 \\ 2.0 \times \ 1.0 \\ 2.7 \times \ 1.7 \\ 3.0 \times \ 2.0 \\ 4.0 \times \ 2.0 \\ 5.0 \times \ 3.0 \\ 6.0 \times \ 4.0 \\ 8.0 \times \ 5.0 \\ 9.0 \times \ 6.0 \\ 9.6 \times \ 6.0 \\ 9.6 \times \ 6.0 \\ 9.6 \times \ 6.0 \\ 12.7 \times \ 8.9 \\ 14.0 \times \ 10.0 \\ 15.0 \times \ 10.0 \\ 17.0 \times \ 12.0 \\ 17.5 \times \ 11.1 \\ 20.0 \times \ 15.0 \\ 24.0 \times \ 18.0 \end{array}$	Duter/inner         Ø           mm         26 × 20           28 × 22         30 × 23           35 × 27         38 × 30           42 × 34         46 × 38           50 × 40         55 × 45           60 × 50         65 × 56           70 × 60         72 × 62           75 × 65         80 × 70           85 × 75         90 × 80           95 × 85         100 × 85           105 × 90         110 × 95           115 × 100         100	mm 120 × 100 120 × 105 130 × 110 140 × 125 150 × 130 155 × 135 160 × 140 175 × 155 180 × 160 185 × 165 190 × 170 200 × 175 220 × 200 240 × 220 240 × 220 240 × 220 240 × 250 300 × 280 320 × 300 420 × 380 450 × 430	$\begin{array}{c} mm \\ 0.8 \times \ 0.3 \\ 1.3 \times \ 0.7 \\ 1.6 \times \ 1.0 \\ 1.8 \times \ 1.2 \\ 2.0 \times \ 1.0 \\ 2.7 \times \ 1.7 \\ 3.0 \times \ 2.0 \\ 4.0 \times \ 2.0 \\ 5.0 \times \ 3.0 \\ 6.0 \times \ 4.0 \\ 8.0 \times \ 5.0 \\ 9.0 \times \ 6.0 \\ 9.6 \times \ 6.0 \\ 9.6 \times \ 6.0 \\ 12.0 \times \ 8.0 \\ 12.7 \times \ 8.9 \\ 14.0 \times \ 10.0 \\ 15.0 \times \ 11.0 \\ 15.0 \times \ 11.0 \\ 17.0 \times \ 12.0 \\ 17.0 \times \ 13.0 \\ 17.5 \times \ 11.1 \end{array}$	Outer/inner $\emptyset$ mm 20 × 15 22 × 17 24 × 18 24 × 19 26 × 20 28 × 22 30 × 23 31 × 25 35 × 27 38 × 30 40 × 32 45 × 38 48 × 30 40 × 32 45 × 38 48 × 40 50 × 40 52 × 42 55 × 46 58 × 50 60 × 50 65 × 55 70 × 60 75 × 65	$\begin{array}{c} mm \\ 80 \times 70 \\ 85 \times 75 \\ 90 \times 75 \\ 90 \times 80 \\ 95 \times 85 \\ 105 \times 90 \\ 110 \times 95 \\ 115 \times 100 \\ 120 \times 100 \\ 120 \times 100 \\ 120 \times 100 \\ 140 \times 120 \\ 140 \times 120 \\ 140 \times 120 \\ 160 \times 140 \\ 170 \times 150 \\ 180 \times 160 \\ 190 \times 170 \\ 200 \times 180 \\ 240 \times 220 \\ 300 \times 280 \end{array}$	$\begin{array}{c} \text{Outer/inner } \varnothing \\ mm \\ 48 \times 40 \\ 53 \times 43 \\ 60 \times 52 \\ 63 \times 53 \\ 70 \times 60 \\ 73 \times 63 \\ 75 \times 65 \\ 80 \times 70 \\ 82 \times 72 \\ 85 \times 74 \\ 86 \times 76 \\ 87 \times 77 \\ 88 \times 78 \\ 93 \times 83 \\ 95 \times 85 \\ 100 \times 90 \\ 105 \times 90 \\ 115 \times 105 \\ 120 \times 110 \end{array}$	Outer/inner Ø mm 20 × 13 22 × 15 25 × 18 27 × 20 30 × 20 40 × 30 42 × 32 45 × 35
	length 3500 m nding on diame			x. length 3500 n ending on diam		max. length 2000 mm depending on diameter	max. length 3000 mm depending on diameter

Dimensions not shown above can be made to order. The dimensions shown are a selection from our range. The maximum outer diameter which can be manufactured is 450 mm. We supply the following types of tubes: open both ends closed one end open both ends with flange closed one end with flange





# **Ninomiya Thermocouple Wire**



The extension and compensating cables for thermocouples correspond with JIS C 1610-1995.

The JIS standards corresponds to the following international standards. IEC 584-3 Thermocouples Parts 3: Extension and compensating cables. Tolerances and identification system. Quality insulation and sheaths are adopted in our extension and compensating cables for a wide range of uses, cables which are manufactured based on the NINOMIYA Standards.

MALTEC-T

Please refer to our catalogs.

# 1. Varieties, Symbols, and Composing Materials of Conductors (Cores)

	Classification JISC 1610-1995							5				ASTM (Old standard : ANSi MC96.1)							
Type of		omposing		Tolerance Colour coding							Temperature	Tok	erance	(	Colour Cod	ing			
hermocouple	CO	res	Symbol	Class 1	Class 2	Compensating iuncation	C	ore covering		Outer	sheath	Symbol	range	Class		Core c	ovoring	Outer	
combined for service	+side core	-side core	Cyrnisor	μV	μV	temperature	+side				Cyrribor		Special	Standard		Jvenng	sheath		
					μ.	μν	(°C)	Section 1	Section 2	-side	Section 1	Section 2		°C	°C	°C	+side	-side	
В	Cu	Cu	BC	not sp	ecified	0 ~+100	Gray	Red	White	Gray	Red	BX	0 ~+100	-	<u>+</u> 3.7	Gray	Red	Gray	
в	Cu	Cu,Ni alloy	RCA	-	<u>+</u> 30	0 ~+100	Orange	Red	White	Orange	Black	RX	0 ~+200	-	<u>+</u> 5.0	Black	Red	Green	
n –	Cu	Cu,Ni alloy	RCB	-	<u>+</u> 30	0 ~+200	Orange	Red	White	Orange	Black	- 1	-	-	-	-	-	-	
0	Cu	Cu,Ni alloy	SCA	-	<u>+</u> 30	0 ~+100	Orange	Red	White	Orange	Black	SIX	0 ~+200	-	<u>+</u> 5.0	Black	Red	Green	
S	Cu	Cu,Ni alloy	SCB	-	<u>+</u> 60	0 ~+200	Orange	Red	White	Orange	Black	-	-	-	-	-	-	-	
N	Ni,Si alloy	Ni,Si alloy	NX	<u>+</u> 60	<u>+</u> 100	-25 ~+200	Pink	Red	White	Pink	- 1	NX	0 ~+200	-	<u>+</u> 2.2	Orange	Red	Orange	
IN	Cu,Ni alloy	Cu,Si alloy	NC	-	<u>+</u> 100	0 ~+150	Pink	Red	White	Pink	- 1	- 1	-	-	-	-	-	-	
	Ni, Cr alloy	Ni alloy	KX	<u>+</u> 60	<u>+</u> 100	-25 ~+200	Green	Red	White	Green	Blue	КХ	0 ~+200	-	<u>+</u> 2.2	Yellow	Red	Yellow	
к	Ni, Cr alloy	Ni alloy	KCA	-	<u>+</u> 150	0 ~+150	Green	Red	White	Green	Blue	- 1	-	-	-	-	-	-	
ĸ	Fe	Cu,Ni alloy	KCB	-	<u>+</u> 150	0 ~+150	Green	Red	White	Green	Blue	-	-	-		-	-	-	
	Cu	Cu,Ni alloy	KCC	-	± 100	0 ~+100	Green	Red	White	Green	Blue	- 1	-	-	-	-	-	-	
E	Ni, Cr alloy	Cu,Ni alloy	EX	<u>+</u> 120	<u>+</u> 200	-25 ~+200	Violet	Red	White	Violet	Purple	EX	0 ~+200	-	<u>±</u> 1.7	Purple	Red	Purple	
J	Fe	Cu,Ni alloy	JX	<u>+</u> 85	± 140	-25 ~+200	Black	Red	White	Black	Yellow	JX	0 ~+200	± 1.1	<u>+</u> 2.2	White	Red	Black	
Т	Cu	Cu,Ni alloy	TX	+ 30	± 60	-25 ~+200	Brown	Red	White	Brown	Brown	TX	-25 ~+100	± 0.5	± 1.0	Blue	Red	Blue	

Note : Though "purple" and "violet" are differentiale in the above specifications, coloring of our products are all purple.

# 2. Insulation Materials and Operating-temperature Range

ltem	Symbol	Description	Operating temperature range	Item	Symbol	Description	Heat-resistance enduring temperature (°C
		General service : P.V.C system (1) Not applicable to RCB and SCB			V	90°C heat-resistant PVC	-20 to + 90
	G	(2) The operating temperature range of BC, RCA, SCA, NC,	-20 to + 90		V1	105°C heat-resistant flame-retardant PVC	-20 to + 105
		KCA, KCB and KCC shall be 0°C to +90°C.			V2	Flame-retardant low-chlorinated PVC	-20 to + 105
Service category	н	Heat-resistant service: Glass system (1) Not applicable to be BC, RCA, SCA, KCC and TX.	0 to + 150		V3	Flexible PVC	-20 to + 90
		Super-heat resistant service : Tetrafluoroethylene system			V4	Elastomer vinyl	-20 to + 90
	S	<ol> <li>Not applicable to compensating type core.</li> <li>The operating temperature range of TX shall be -25~ +100oC.</li> </ol>	-25 to + 200		E	Polyethylene	-20 to + 75
	SR	Silicone-rubber	0 to + 180		E1	Crosslinked Polyethylene	-20 to + 120
-	SRGB	Silicone-rubber+Glass-varn braid, Finished with heat-resistant coating		Service	E2	Flame-retardant Polyethylene	-20 to + 90
			-55 to + 200	category	N	Chloroprene rubber	-20 to + 80
	6F	Fluorocarbon-resin (FEP)	-0 to + 200	(NINOMIYA Standards)	G	Duxplex glass-yarn rolled single braid	0 to + 200
	6FGB	Fluorocarbon-resin (FEP)+Glass-yarn braid. Finished eith heat-resisita	-250 to + 200	,	В	Single glass-yarn braid	0 to + 200
	6FSR	Fluorocarbon-resin (FEP)+Silicone-rubber	-0 to + 180		К	Silicone-rubber	-55 to + 180
	SRNR	Silicone-rubber+Chloroprene rubber	-20 to + 80		K1	High-strength silicone-rubber	-55 to + 180
Service category	SRGB	Silicone-rubber+Glass-yam braid. Finished with heat-resistant coating	0 to + 180		K2	Flame-retardant silicone-rubber	-55 to + 180
(NINOMIÝA Standards)	CERAC	Ceramic fiber braid	0 to + 1000		F	FEP	-250 to + 20
otanaa aoj	CF	Ceramic fiber braid. Fiber-Convergent agent free	0 to + 1000		F1	PTFE	-250 to + 260
	SLGB	Silicone-glass-yam braid. Finished with polyimide coating	0 to + 600		F2	PFA	-250 to + 260
	GBSR	Glass-yam braid+Silicone-rubber	0 to + 180		F3	ETFE	-100 to + 150
	GB6F	Glass-vam braid+Fluorocarbon-resin (FEP)	0 to + 200		F	Flat type	-
	PE	Polyethlene	-20 to + 75		R	Round type with filler	-
	ETFE	Fluorocarbon-resin (ETFE)	-100 to + 150	Shapes	Т	Round type without filler	-
	TIS	Inner shield of cooper tape (Round type : JIS Symbol S1)	-		P	Flat type with protective braid (without sheath)	-
	IS	Inner shield of tin-plated annealed copper wire braid (Flat type : JIS Symbol S2)	-		FF	Eyeglass-shaped flat type by batch extrusion	· ·
Shields and	AIS	Inner shield aluminum-foil laminated plastic tape (Round type ; JIS Symbol S2)	-		r	Bonded flat type of single pair or more	-
protective Braids	OS	Outer sheld tin-plated annealed copper wire braid					
braids			-				
	SOS	Outer shield of stainless-wire braid	-				
	FIS	Inner shield of iron-braid shield	-				



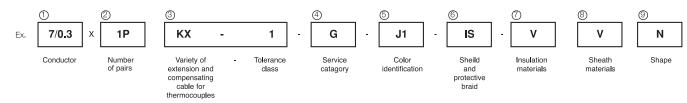


# 3. NINOMIYA Parts Numbers



### How to make a NINOMIYA Parts Number

③and④of a NINOMIYA Parts Number are not yet fixed for the products contained in the catalog. Please determine your NINOMIYA Parts Number as per the Article 4. How to order. The Parts Number can be produced as follows:



# 4. How to Order

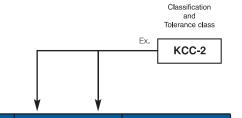
### How to order standardized products

### Please let us be informed on the following:

- \* Name of a product
- \* Symbol of a product : Each standardized product is numbered. A product-code number is determined by completing  $\Box$  .
  - To fill in ], select a symbol among the ones shown in the below table. A type, tolerance class, and color identification of an extension and compensating cable for thermocouples should be selected.

\* Quantity

### How to fill using the symbols



ltem	Sym	npol	Class of t	tolerance	
	JIS	ASTM	JIS	ASTM	
	BC	BX-ASt	Not specified	Standard	
	RCA-2	RX-ASt	Class 2	Standard	
	RCB-2	-	Class 2	-	
	SCA-2	SX-ASt	Class 2	Standard	
	SCB-2	-	Class 2	-	
	NX-1	-	Class 1	-	
	NX-2	NX-ASt	Class 2	Standard	
Classification	NC-2	-	Class 2	-	
and	KX-1	KX-ASt	Class 1	Standard	
	KX-2	-	Class 2	-	
Class of	KCA-2	-	Class 2	-	
tolerance	KCB-2	-	Class 2	-	
	KCC-2	-	Class 2	-	
	EX-1	-	Class 1	-	
	EX-2	EX-ASt	Class 2	Standard	
	JX-1	JX-ASp	Class 1	Special	
	JX-2	JX-ASt	Class 2	Standard	
	TX-1	TX-ASp	Class 1	Special	
	TX-2	TX-ASt	Class 2	Standard	

Servic catago		Color coding	
G	-	J2	
	ltem	Symbol	Remarks
		J1	Color code in the JIS Section 1
	Color coding	J2	Color code in the JIS Section 2 (former JIS)
		AS	Color code in the ASTM (former ANSI MC96.1)

### How to order customized products

The extension and compensating cables contained in the catalog are just part of our line of business. We have been also producing extension cables with various kinds of construction and material other than the listed products. We can manufacture extension and compensating cables for thermocouples with the same basic construction as contained in the catalog, cables which have different type of insulation and sheath materials.

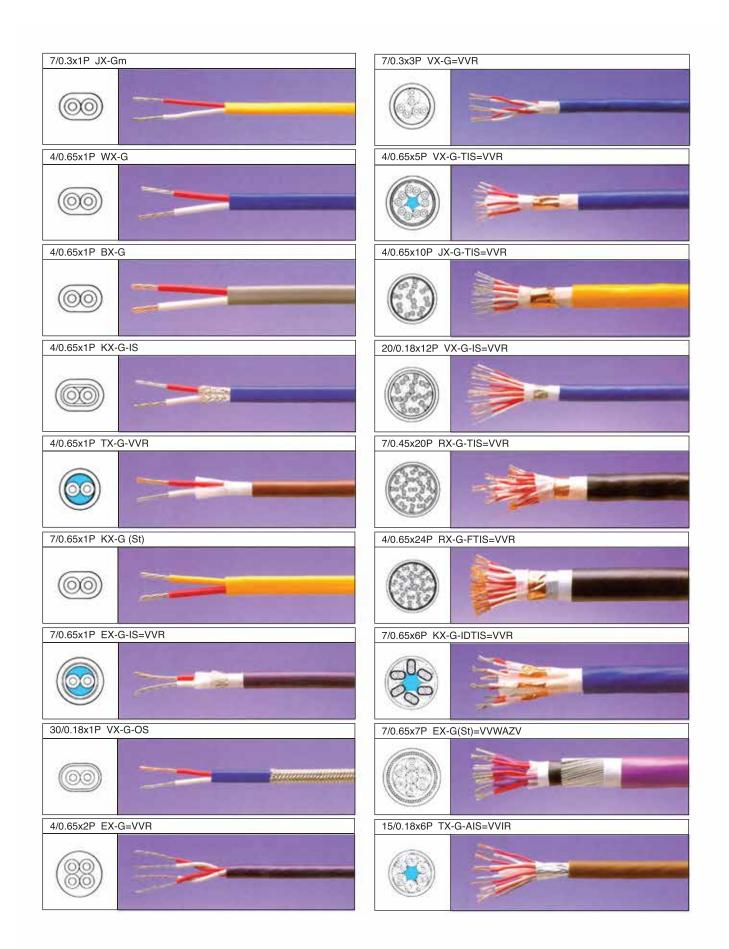
In addition, depending on applications, we can manufacture multi-pair types of extension and compensating cables with flat / round shape and composite cable made up of different types of cable.

Since we are ready to comply with your requests, please contact our salespeople.



# Ninomiya Thermocouple Wire

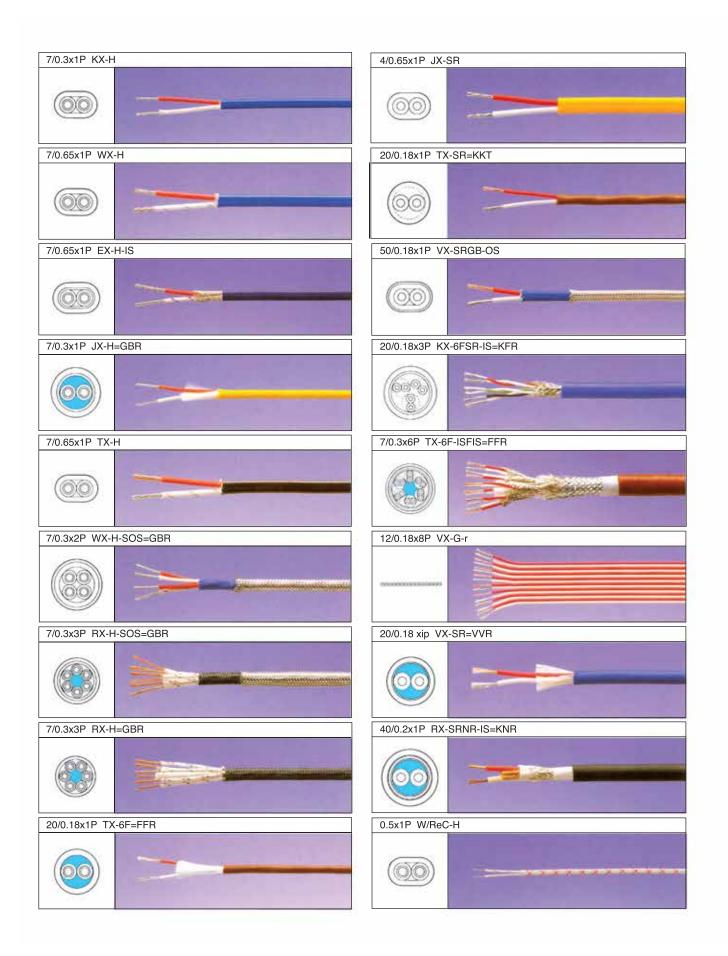






# Ninomiya Thermocouple Wire







# INTERNATIONAL THERMOCOUPLE WIRE COLOUR CODE

ANSI Code	7	¥	*	F	ш	z	œ	S	5	Û	ع§	(M5) (M5)	* <b>Q</b> (M3)
Comments Environment- Bare Wire	Reducing, Vacuum, Inert, Limited Use in Oxidizing at High Temperatures Not Recommended for Low Temperatures	Clean Oxidizing and Inert. Limited Use in Vacuum or Reducing. Becomes unstable from 1050°C	Alternative to KX type extension wire for low temperatures; Not recommended for general use	Mild Oxidizing, Reducing Vacuum or Inert. Good where Moisture is Present Low Temperature and Cryogenic Applications	Oxidizing or Inert. Limited use in Vacuum Highest EMF Change per Degree	Clean, Oxidizing, Inert, Reducing, Vacuum. More Stable up to 1300 <sup>e</sup> C	Oxidizing or Inert. Do Nor Insert in Metal Tubes. Beware of Contamination. High Temperature	Oxidizing or Inert. Do Nor Insert in Metal Tubes. Beware of Contamination. High Temperature	Extension grade connecting wire for R & S thermocouples; also known as RX and SX extension wire	Oxidizing or Inert. Do Not Insert in Metal Tubes. Beware of Contamination. High Temperature. Common Use in Glass Industry	Vacuum, Inert, Hydrogen. Beware of Embrittlement. Not Practical Below 399°C Not for Oxidizing Atmosphere	Vacuum, Inert, Hydrogen. Beware of Embrittlement. Not Practical Below 399 <sup>o</sup> C Not for Oxidizing Atmosphere	Vacuum, Inert, Hydrogen. Beware of Embrittlement. Not Practical Below 399 <sup>e</sup> C Not for Oxidizing Atmosphere
FRENCH to NFE-18001	Ś	Ż	Ś	Ś	Ś		Ś	Ś	Ś	NO STANDARD USE COPPER WIRE			
JAPANESE to JIS C1610-1981	Ś	Ś	Ś	Ś	Ś	NO STANDARD USE AMERICAN COLOUR CODES	Ś	Ś	Ś	١	VDARD ERICAN CODES	VDARD ERICAN CODES	VDARD ERICAN CODES
DUTCH CERMAN to Din 43710	Ŵ	٢		٢	Ś		Ś	Ś	Ś	ال	NO STANDARD USE AMERICAN COLOUR CODES	NO STANDARD USE AMERICAN COLOUR CODES	NO STANDARD USE AMERICAN COLOUR CODES
CZECH BRITISH to BS 1843	Ś	Ś	ţ,	ĊĊ	Ś	÷ b	Ċ	Ċ	Ċ,	NO STANDARD USE COPPER WIRE			
Coding Extension Grade	ţ,	Ż	NONE ESTABLISHED	÷\$	Ś	Ċ	١	١	١	ال	ال	Ś	٩
Colour Coding Thermocouple Exte Grade	Ś	٢	NONE ESTABLISHED	فلل	فلل	<b>1</b>	NONE ESTABLISHED	NONE ESTABLISHED	NONE ESTABLISHED	NONE ESTABLISHED	NONE ESTABLISHED	NONE ESTABLISHED	NONE ESTABLISHED
International IEC 584-3 Intrinsically safe	Ś	Ċ	Ċ	Ś	Ċ	Ċ	Ś	Ś	Ś				
International IEC 584-3	Ċ	Ċ	Ċ	Ċ	Ċ	Ċ	Ċ	Ċ	Ċ				
of Error r is Greater) sw wire Special	1.1ºC or 0.4%	1.1ºC or 0.4%		0.5°C or 0.4%	1.0⁰C or 0.4%	1.1ºC or 0.4%	0.6ºC or 0.1%	0.6ºC or 0.1%		NOT ESTABLISHED	NOT ESTABLISHED	NOT ESTABLISHED	NOT ESTABLISHED
Limits of (Whichever is For new Standard	2.2°C or 0.75%	2.2%C or 0.75% Above 0°C 2.2%C or 2.0% Below 0%C		1.0°C or 0.75% Above 0°C 1.0°C or 1.5% Below 0°C	1.7ºC or 0.5% Above 0ºC 1.7ºC or 1.0% Below 0ºC	2.2°C or 0.75% Above 0°C 2.2°C or 2.0% Below 0°C	1.5%C or 0.25%	1.5⁰C or 0.25%		0.5% over 800≗C	4.5% to 425% 1.0% to 2320°C	4.5°C to 425% 1.0% to 2320°C	4.5°C to 425% 1.0% to 2320°C
EMF (mV) Over Max. Temperature Range	-8.095 to 43.559	-6.458 to 49.995		-6.258 to 20.872	-9.835 to 76.373	4 345 to 47 513	-0.226 to 21.101	-0.236 to 18.693		0 to 13.820	0 to 38.564	0 to 37.066	0 to 39.506
Maximum Temperature Range	-210 to 760°C Thermocouple Grade 0 to 200°C Extension Grade	-270 to 1150°C Thermocouple Grade 0 to 200°C Extension Grade	0 to 80%C Extension Grade	-270 to 400⁰C Thermocouple Grade -60 to 100⁰C Extension Grade	-270 to 1000°C Thermocouple Grade 0 to 200°C Extension Grade	-270 to 1300°C Thermocouple Grade 0 to 200°C Extension Grade	-50 to 1768⁰C Thermocouple Grade 0 to 150⁰C Extension Grade	-50 to 1768⁰C Thermocouple Grade 0 to 150⁰C Extension Grade	0 to 50⁰C Extension Grade	0 to 1820°C Thermocouple Grade 0 to 100°C Extension Grade	0 to 2320°C Thermocouple Grade 0 to 260°C Extension Grade	0 to 2320°C Thermocouple Grade 0 to 870°C Extension Grade	0 to 2320℃ Thermocouple Grade 0 to 260℃ Extension Grade
nbination - Lead	CONSTANTAN - COPPER-NICKEL Cu-Ni	NICKEL- ALUMINUM Ni-AI (magnetic)	CONSTANTAN COPPER-NICKEL Cu-Ni	CONSTANTAN COPPER-NICKEL Cu-Ni	CONSTANTAN COPPER-NICKEL Cu-Ni	NISIL Ni-Si-Mg	PLATINUM Pt	PLATINUM Pt	COPPER LOW NICKEL Cu-Ni	PLATINUM- 6% RHODIUM Pt-6% Rh	TUNGSTEN 26% RHENIUM W-26% Re	TUNGSTEN 26% RHENIUM W-26% Re	TUNGSTEN- 25% RHENIUM W-25% Re
Alloy Combination + Lead - Le	IRON Fe (magnetic)	NICKEL- CHROMIUM NI-Cr	COPPER Cu	COPPER Cu	NICKEL- CHROMIUM NI-Cr	NICROSIL Ni-Cr-Si	PLATINUM- 13% RHODIUM Pt-13% Rh	PLATINUM- 10% RHODIUM Pt-10% Rh	COPPER Cu	PLATINUM- 30% RHODIUM Pt-30% Rh	TUNGSTEN W	TUNGSTEN- 5% RHENIUM W-5% Re	TUNGSTEN- 3% RHENIUM W-3% Re
ANSI Code	7	¥	*	F	Ш	Z	œ	S	* N	B	ع گ	(SW5) (W5)	* <b>(</b> EM)

MALTEC-T



# **Float Switches**

MALTEC-T

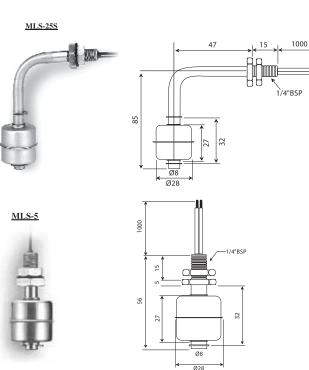
The stem of this liquid float switches contains a hermitically sealed reed switch. The float contains a permanent magnet. As the float rises or falls with the level of the liquid, the reed switch is activated by the magnet. The operation of the switch, normally open or normally closed, is easily changed by removing a retainer and inverting the float.

## **Features**

- Compact design
- Low Cost
- High Reliability and Long switch life.

# **Application**

- Marine Industry
- Power station equipment
- Automatic vending machine
- Food Industry
- Waste-water/pure water processing
- Small collection tanks



# **Specification**

Part Number	MLS-5 / MLS-25S		
Material: Steam Float Retainer	316SS		
Operating Temperature	-20 ~ 120°C		
Pressure Rating	10 bar		
Switch Rating	50VA / 240VAC		
Maximum Carry Current	2.5A		
Liquid Specific Gravity Min.	0.7		
Lead Wire	PVC Wire, 1 Meter		
Pull-in Value (PI)	20~60 AT		
Drop-out Value (PI)	6min AT		
Contact resistance (CR)	100 mΩ		
Breakdown voltage	600 min (PI≥35)VDC		
breakdown voltage	500 min (PI 20 to 35)VDC		
Insulation resistance	$10^{10}min\Omega$		
Electrostatic capacitance	0.5max pF		
	50W		
Contact rating	70VA		
Maximum switching voltage	300VAC		
	350VDC		
Maximum switching current	DC0.7/AC0.5A		



### **MALTEC-F Series Multi-level Float Switches**



### MT-F - Standard Type • MT-FH - Heavy Duty Type

### **Common Specifications**

- Aluminium terminal head
- All wetted parts 316SS
- Multiple floats
- Operating temperature -55°C -+150°C
- High current ratings

### **MT-F** (Standard)

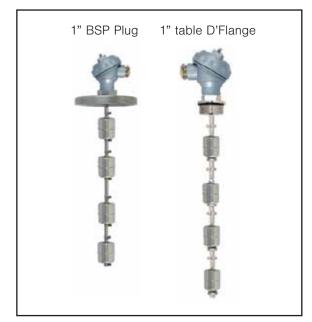
- 1" table 'D' flange or 1" BSP plug
- Switching voltage: 250 VAC/200 VDC
- Switching current: 1 AMP AC/DC
- Switching power: 30W AC/DC
- Minimum voltage breakdown: 430 VDC

### **MT-FH (Heavy Guty)**

- 2" table 'D' flange or 2" BSP plug
- Switching voltage: 250 VAC/200 VDC
- Switching current: 2 AMPS AC/DC
- Switching power: 50W AC/DC
- Minimum voltage breakdown: 500 VDC

### **Common options**

• 316SS or plastic terminal head



### **MT-F Series**

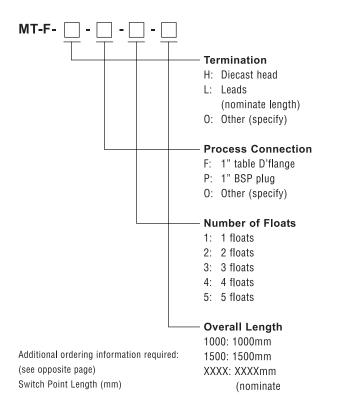


# MT-FH Series

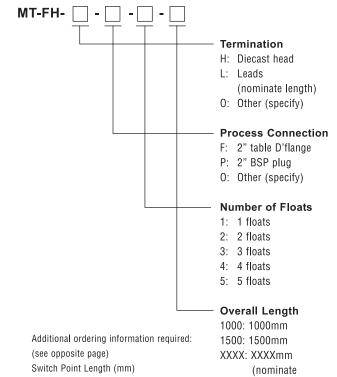




### **MT-F Series Ordering Information**



### **MT-FH Series Ordering Information**



### **MT-F Series Ordering Specifications**

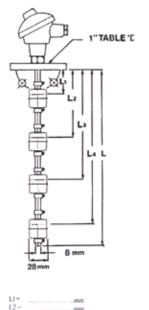
1. Switch Point Length

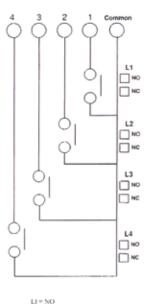
2. Switch Operation (N.O or N.C) Other circuit configuration available on request

### **MT-FH Series Ordering Specifications**

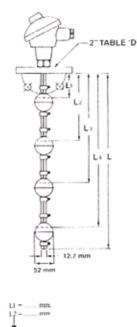
1. Switch Point Length

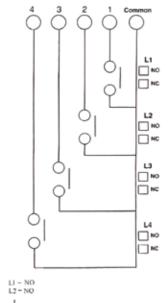
2. Switch Operation (N.O or N.C) Other circuit configuration available on request





L4 = NC







# **Temperature Instruments**



# Handheld Thermometer

# CENTER 307 & 308

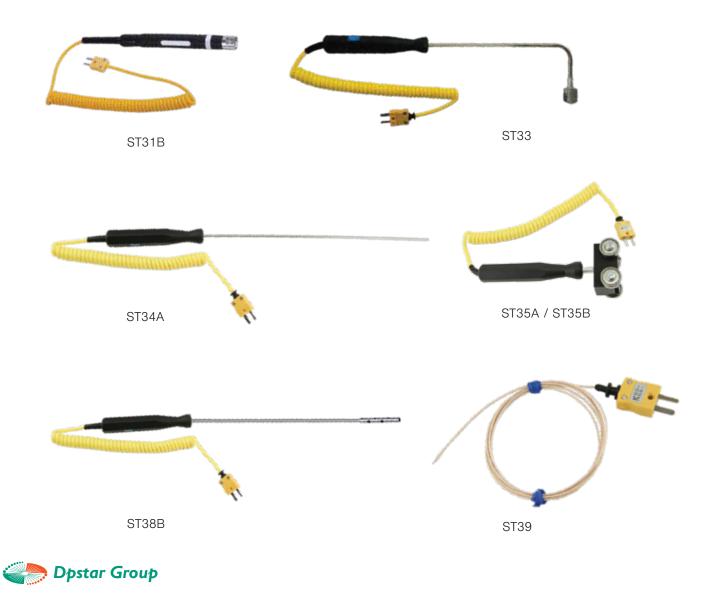


Handheld temperature instruments and plug-in probes to suit.

Model	Description	Calibration	Range
CENTER 307	Single input thermocouple	К	-200° ~ 1370°C
CENTER 308	Dual input thermocouple	K	-200° ~ 1370°C

# **Plug-In Probes**

Model	Description	Max. Temp.	Response Time
ST39	Air probe : plug wire soldered beaded tip	150°C	-
ST31B	Surface probe	400°C	3 sec
ST33	L-Shape surface probe	400°C	3 sec
ST34A	Immersion probe	600°C	3 sec
ST38B	Air probe : enclosed	600°C	3 sec
ST35A	Metal roller probe	400°C	3 sec
ST35B	Teflon roller probe	400°C	3 sec







Customised Temperature Sensor



Thermocouples in Low-Pressure Die Casting

Temperature Sensor For Steam Pipelines In A Chemical Plant

Temperature Sensor For Production Process



PT100 Sensor To Measure The Oil Temperature



Temperature Monitoring In A Continuous Casting Plant



Vibration-resistant Rtd Sensor With Thermowell For Power Plant







Temperature Sensor For Pipe Systems



Temperature Sensor For Brewing Water Tank



Trane Chiller Suction Temperature Sensor Replacing



Chiller Energy Measurement



Oil and gas industry (Refinery)







Multi-level Temperature Sensors For Oil Refinery Industry



Thermocouples For Cement Manufacturing Process



Temperature Sensor Solutions For The Chemical Industry



Temperature Sensor For Rotary Kiln In Cement Plant





Temperature Sensor for Harsh Industry





# **Our Certifications**

# (MALTEC-T)





### Standard Malaysia

### UKAS



### UL Certificate



### **UL** Certificate

### **CE Certificate**

### **CE** Certificate

**CE** Certificate





### **CE** Certificate

CE Certificate

CE Certificate



# <sup>Our</sup> Clients





# **Frequently Asked Questions**

- Q. How many feet of T/C wire can I run?
- A. For a specific instrument, check its specifications to see if there are any limits to the input impedance. However as a rule of thumb, limit the resistance to 100 Ohms resistance maximum, and this depends on the gauge of the wire; the larger the diameter, the less resistance/foot, the longer the run can be. However, if the environment is electrically noisy, then a transmitter may be required which transmits a 4-20 mA signal that can be run longer distances and is more resistant to noise.
- Q. Should I use a grounded or ungrounded probe?
- A. It depends on the instrumentation. If there is any chance that there may be a reference to ground (common in controllers with nonisolated inputs), then an ungrounded probe is required. If the instrument is a handheld meter, then a grounded probe can almost always be used.
- Q. What size relay do I need to control my heaters?
- A. This must be calculated from known parameters. Take the total wattage of heaters and divide this value in watts by the voltage rating of the heaters in volts. The answer will be in amperes, and solid state and mechanical relays are rated by "current rating" in amperes.
- Q. Can I send my 4-20 mA control output to a chart recorder to monitor a process input?
- A. No. A control output is designed to control a valve or some equivalent control device. If you need to send an analog signal to a recording device, then choose a controller that has a "retransmission or recorder output" option.
- Q. Can I split my one T/C signal to two separate instruments?
- A. No. The T/C signal is a very low-level millivolt signal, and should only be connected to one device. Splitting to two devices may result in bad readings or loss of signal. The solution is to use a "dual" T/C probe, or convert one T/C output to a 4-20 mA signal by using a transmitter or signal conditioner; then the new signal can be sent to more than one instrument.
- Q. What are the accuracies and temperature ranges of the various thermocouples?

- A. They are summarized in the tables on the first few pages of Section H. It is important to know that both accuracy and range depend on such things as the thermocouple alloys, the temperature being measured, the construction of the sensor, the material of the sheath, the media being measured, the state of the media (liquid, solid, or gas) and the diameter of either the thermocouple wire (if it is exposed) or the sheath diameter (if the thermocouple wire is not exposed but is sheathed).
- Q. Why can't I use ANY multimeter for measuring temperature with thermocouples? What errors will result if I don't use a thermocouple temperature meter?
- Α. The magnitude of the thermoelectric voltage depends on the closed (sensing) end as well as the open (measuring) end of the particular thermocouple alloy leads. Temperature sensing instruments that use thermocouples take into account the temperature of the measuring end to determine the temperature at the sensing end. Most millivoltmeters do not have this capability, nor do they have the ability to do non-linear scaling to convert a millivoltage measurement to a temperature value. It is possible to use lookup tables to correct a particular millivoltage reading and calculate the temperature being sensed. However, the correction value needs to be continuously recalculated, as it is generally not constant over time. Small changes in temperature at the measuring instrument and the sensing end will change the correction value.
- Q. How can I choose between thermocouples, resistance temperature detectors (RTD's), thermistors and infrared devices when measuring temperature?
- A. You have to consider the characteristics and costs of the various sensors as well as the available instrumentation. In addition: THERMOCOUPLES generally can measure temperatures over wide temperatures over wide temperature ranges, inexpensively, and are very rugged, but they are not as accurate or stable as RTD's and thermistors. RTD's are stable and have a fairly wide temperature range, but are not as rugged and inexpensive as thermocouples. Since they require the use of

electric current to make measurements, RTD's are subject to inaccuracies from self-heating. THERMISTORS tend to be more accurate than RTD's or thermocouples, but they have a much more limited temperature range. They are also subject to self-heating. INFRARED SENSORS can be used to measure temperatures higher than any of the other devices and do so without direct contact with the surfaces being measured. However, they are generally not as accurate and are sensitive to surface radiation efficiency (or more precisely, surface emissivity). Using fiber optic cables, they can measure surfaces that are not within a direct line of sight.

**MALTEC-T** 

- Q. What are the two most often overlooked considerations in selecting an infrared temperature measuring device?
- A. The surface being measured must fill the field of view, and the surface emissivity must be taken into account.
- Q. What are the best ways of overcoming electrical noise problems?
- A. 1) Use low noise, shielded leads, connectors and probes. 2) Use instruments and connectors that suppress EMI and RF radiation.
   3) Consider using analog signal transmitters, especially current transmitters. 4) Evaluate the possibility of using digitized signals.
- Q. If a part is moving, can I still measure temperature?
- Yes. Use infrared devices or direct contacting sensors plus a slip ring assembly.
- Q. Can a two-color infrared system be used to measure low emissivity surfaces?
- A. Only if at high temperature, say, above 700°C (1300°F).
- Q. What error will result if the spot size of the infrared pyrometer is larger than the target size?
- A. It would be indeterminate. The value would be a weighted average that wouldn't necessarily be repeatable.
- Q. What readout should be used with the OS36, OS37 and OS38 units?
- A. Using the DP5000, BS6000, or the HH-200 would be best.








Dpstar Group






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ou Need



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