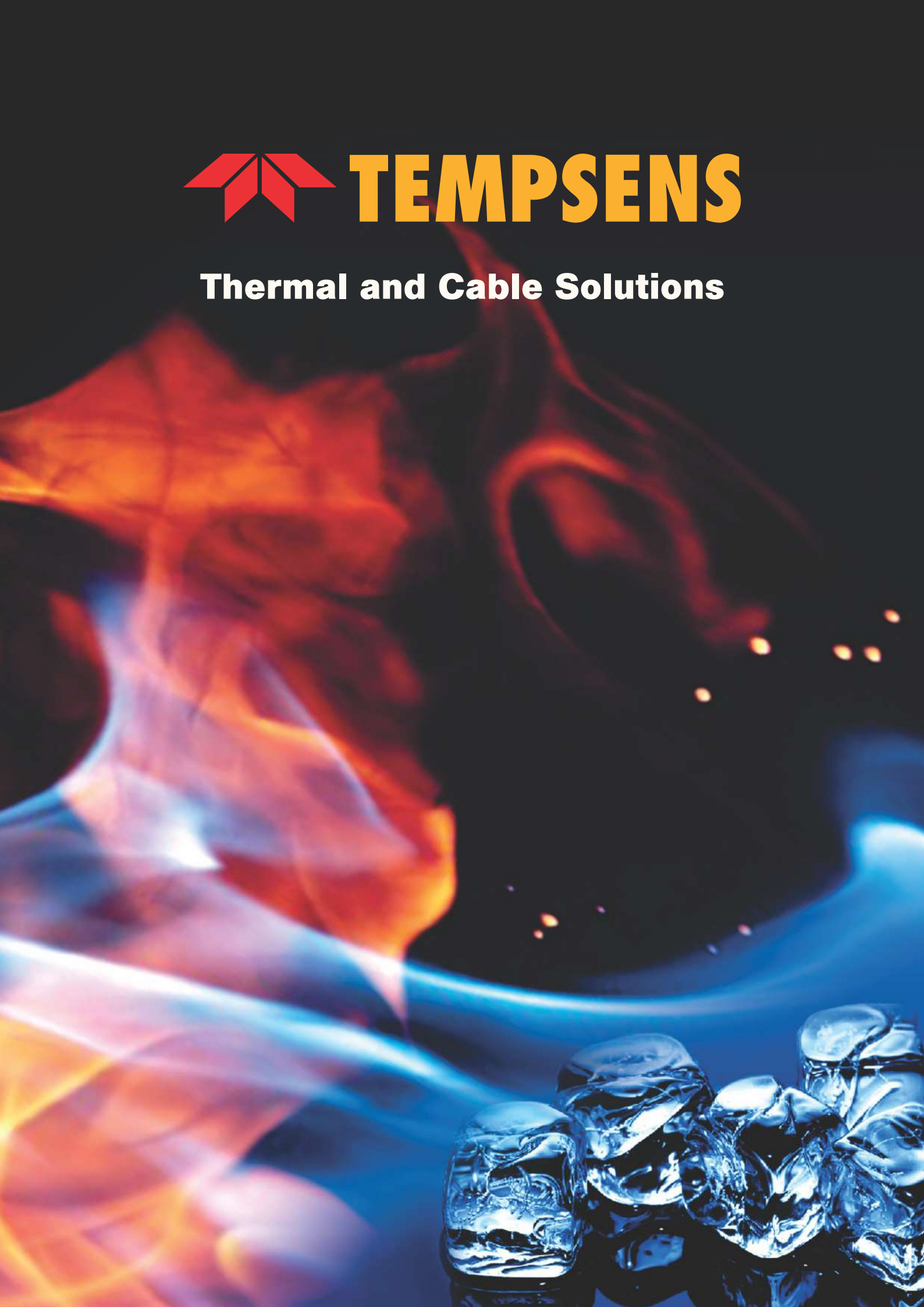
TEMPSENS

Thermal and Cable Solutions



About The Company

Tempsens Instruments (I) Pvt. Ltd. is a part of the diversified manufacturing group of companies of PYROTECH Group, which was established in 1976 by four tech-savvy technocrats. TEMPSENS has carved its niche in bringing technology and engineering together in the field of temperature measurement applications. We offer thermal engineering and cable solutions in industrial markets around the world.

Besides the headquarter and manufacturing facilities in India, Tempsens has broadened its horizon with manufacturing facilities in Germany and Indonesia besides sales offices in UAE and USA.

After the initial beginning with Thermocouples and RTDs, Tempsens has continuously focused on the manufacturing and supply of high quality thermal engineering products, accessories and services; built to specific customer needs. The company is involved in manufacturing of Thermocouple Nickel Alloys, Thermocouples, RTDs, Thermowells, Cables & Wires, Non-Contact Pyrometers, Heaters, Furnaces and Calibration equipments etc. with covered area of 2,70,000 sq. ft. Tempsens is an ISO 9001:2015, ISO 14001:2015, OHSAS 18001 certified company with NABL Accredited Laboratories.

Tempsens has earned the customer reputation worldwide of being a Preferred Vendor for its innovative solutions, quick delivery, high technical standards and outstanding quality.

Our mission is to lead the Thermal and Cable industry with Passion, Innovation, Intelligence & Reliability.

Tempsens Instruments U# I

Tempsens Instruments U# II

Marathon & AST Plant

Tempsens Instruments U# II Cable Plant

Tempsens Instruments GmbH - Germany

Pt. Tempsens Asia Jaya- Indonesia

About The Company

600
EMPLOYEES

OVER
6500
CUSTOMERS

40+
YEARS
EXPERIENCE

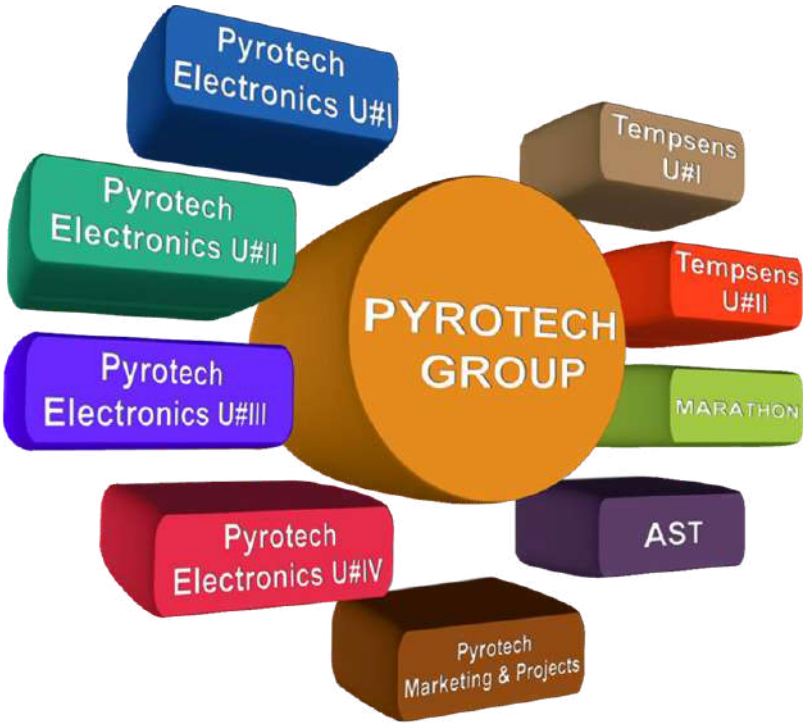
SALES IN OVER
75
COUNTRIES
AROUND THE GLOBE

5
GLOBAL LOCATIONS

5
PATENTS
APPLIED

~25%
YOY GROWTH

PYROTECH GROUP



Since 1976, Pyrotech Group is leader in Automation & Control Equipments with highly diversified products range manufactured in different divisions- Panels, Enclosures, LVS, LIR/LIE, LED Lightening, Electronic products, Temperature Sensors and Modular furniture.

Facilities







WELDING AND BRAZING

- Laser Welding Machines
- Programmable Micro Plasma Welding Machines
- TIG Welding Machines with Pulse Modulation And Rotary Positioner
- Induction Brazing Machines
- Resistance Welding Machines
- Brazing Sets (Oxy-Acetative)
- Deep Penetration Welding Machines
- Capacitive Discharge

CABLE PLANT MACHINERY

- FEP/PFA Extrusion Lines
- PVC/XLPE Extrusion Lines
- Silicon Extrusion Line
- Armoring Lines
- Laying Lines
- Copper Drawing Plant
- Conductor Stranding Machines
- Braiding Machines - High Speed and Regular
- Vertical Lapping Machines & Stranding Machines
- Tape Wrapping Machines
- PTFE Extrusion and Tape Roll Down Plant
- Buncher Machines
- Spark Tester & Diameter Testers

NICKEL ALLOY PLANT

- Vacuum Induction Furnace
- Pit Annealing Furnace
- Buel Block Drawing
- Nickel alloy multi die drawing machine
- Bright Annealing Machine

MACHINING

- CNC Turning Centers
- Turn Mill Centers
- VMC Machines
- Deep Hole Drilling Machines upto 1500mm Drilling Capacity
- Milling Centers
- Manual Lathe Machines

HEATER PLANT

- Swaging Machines
- Laser Marking Machines
- Laser Cutting Machine
- Bright Annealing Machine
- Engraving Machines
- Coil Making Machines
- High Frequency Annealing Machines
- MgO Filling Towers
- Rolling Machine & Skinning Machines
- Vacuum Presses
- CNC Breading Machines

MI CABLE PLANT

- Draw Bench 50 meters
- Annealing Furnaces
- MI Polishing Machines
- MgO Plant
- Polishing Machine

TESTING AND CALIBRATION

- NABL Accredited Calibration Lab -196°C to 1600°C for Contact and upto 2900°C for Non Contact Sensors
- NABL Accredited Testing Centre for cables & wires.
- Computerized Calibration System
- Fixed Point Cells-TPW, Ga, Sn, Zn, & Al and AC Bridge for Primary Standards
- Digital Radiography Setup for Junction Integrity
- PMI Setup for Chemical Analysis of Alloys
- Pressure Test Setup
- Helium & Nitrogen Leak Detector
- Profile Projector
- Dye Penetration Test Setup for Weld Joints
- Microscopic Junction Check
- Auto Clave Testing
- Response Time Test, least count 1 msec.
- Ultrasonic Thickness Test
- Giga Ohm Insulation Resistance Testers
- Mechanical checks - lengths, gauges, concentricity checks
- Conductor Resistance Test
- Test for thickness of Insulation and Sheath
- Physical test for Insulation and Outer Sheath
- High Voltage Test Sets
- Flammability Test & Tensile Testers

INDEX

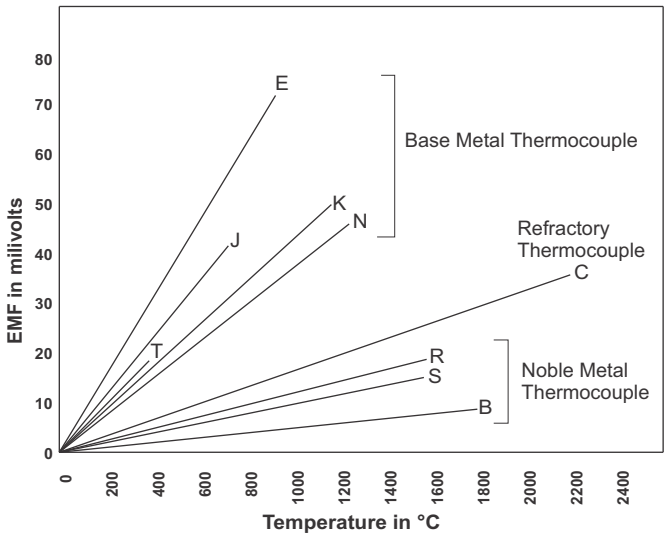
Contact Temperature Sensors

Thermal and Cable Solutions

Basics of Thermocouples & RTDs

Thermocouples

Thermocouples are pairs of dissimilar metal wire joint at one end, which generate a net thermoelectric voltage between the open pair according to temperature difference between the ends.



Tolerance Table for Type of Thermocouples

Type of T/C	Material (+ & -)	Temp. Range(°C)	Tolerance Grade	
			Standard	Special
T	Copper & Constantan	-200 to 370°C	±1.0°C or ±0.75%	±0.5°C or ±0.4%
J	Iron & Constantan	0 to 760°C	±2.2°C or ±0.75%	±1.1°C or ±0.4%
E	Chromel & Constantan	-200 to 870°C	±1.7°C or ±0.5%	±1.0°C or ±0.4%
K	Chromel & Alumel	-200 to 1260°C	±2.2°C or ±0.75%	±1.1°C or ±0.4%
N	Nicrosil & Nisil	-200 to 1260°C	±2.2°C or ±0.75%	±1.1°C or ±0.4%
S	90% Platinum+10% Rhodium & Platinum	0 to 1450°C	±0.5°C or ±0.25%	±0.6°C or ±0.1%
R	87% Platinum+13% Rhodium & Platinum	0 to 1450°C	±0.5°C or ±0.25%	±0.6°C or ±0.1%
B	70% Platinum + 30% Rhodium & 94% Platinum + 6% Rhodium	800 to 1700°C	±0.5%	---
C	95% Tungsten+5% Rhenium & 74% Tungsten+26% Rhenium	0 to 2320°C	4.5°C or ±1.0%	---

Thermocouple Insert Construction

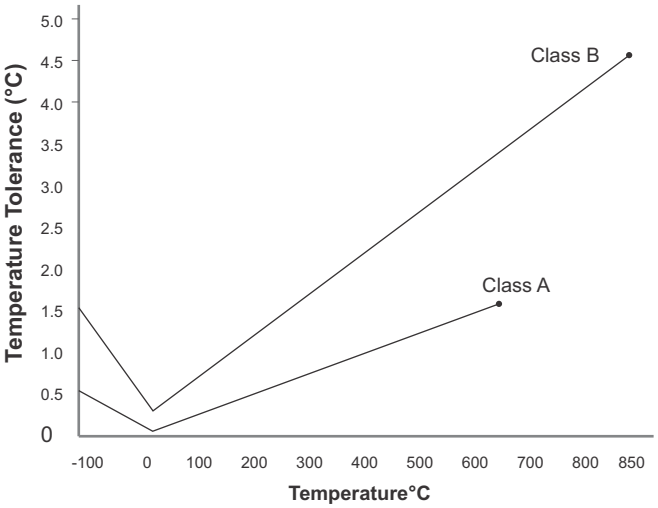
RTD

Resistance thermometer use metals that alter their electric resistance when heated.

Platinum is the most commonly used material for industrial RTD. However Copper and Nickel are also used for some applications.

The resistance at 0°C is called R_0 and it is an important parameter to be defined. The most commonly used RTD element is of platinum with resistance of 100 Ω at 0 °C. Thus named as Pt 100.

Platinum RTD are suitable for temperature range -200 to 850°C. Normally, Industrial RTD's are used at temperature range upto 400°C.

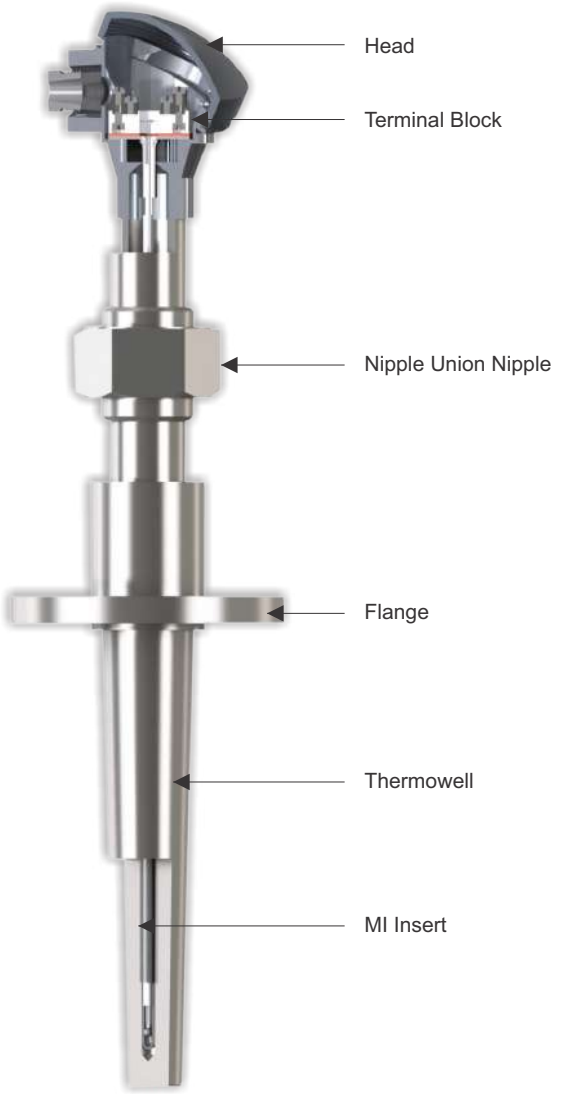


Tolerance Table for Type of RTD(as per IEC 751) Pt100

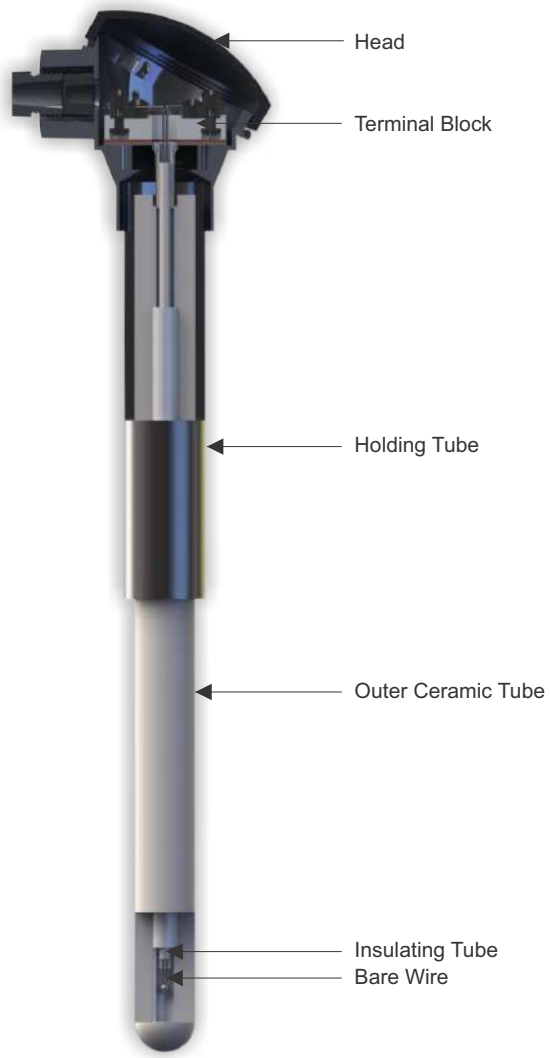
Temperature	Class A (±)	Class B (±)
-200°C	0.55°C	1.3°C
-100°C	0.35°C	0.8°C
0°C	0.15°C	0.3°C
100°C	0.35°C	0.8°C
200°C	0.55°C	1.3°C
300°C	0.75°C	1.8°C
400°C	0.95°C	2.3°C
500°C	1.15°C	2.8°C
600°C	1.35°C	3.3°C
700°C	-	3.8°C
800°C	-	4.3°C
850°C	-	4.6°C

RTD Insert Construction

Basics of Thermocouples & RTDs



MI Construction



Non MI Construction

Metallic Protection Tubes

Sr. No.	Material	Max./Operating Temp(°C)	Feature
1	304 S.S.	980°C	Common against heat and corrosion.
2	321 S.S.	980°C	Higher corrosion resistance.
3	316 S.S.	980°C	Excellent resistance to corrosives, heat, acids and alkalis.
5	310 S.S.	1,000°C	Good high temperature strength with resistance to oxidation.
6	446 S.S.	1,050°C	Excellent resistance to oxidizing and reducing flames containing sulphur.
7	Inconel 800	1000°C	Excellent to high temperature oxidizing atmosphere and thermal shock.
8	Inconel 600	1,050°C	Excellent resistance at high temperature, Avoid sulphurous atmospheres
9	Platinum	1,650°C	Well suited for use at extremely high temperature specially for molten glass
10	Titanium	Oxi. 250, Red. 1000°C	Superior corrosion resistance in cryogenic temperature.
11	Tantalum	Oxi. 300, Red. 2200°C	Suitable for inert & vacuum applications
12	Molybde-num	Oxi. 400, Red. 2000°C	Suitable for inert, vacuum & reducing applications

Ceramic Protection Tubes

Sr. No.	Material	Max./Operating Temp(°C)	Feature
1	Recrystallised Alumina 99.7% purity (C-799)	1750°C	Good resistance to chemical attack, mechanically strong but avoid severe thermal shock
2	Ceramic 60% Alumina (C-610)	1500°C	Sintered alumina, used in heating furnaces, regenerators etc.
3	Nitride Bonded Silicon Carbide	1500°C	Good resistance, mechanically strong, unsuitable for oxidizing atmosphere but resist fluxes.
4	Silicon Nitride	1350°C	Excellent thermal shock resistance, most suitable for molten aluminium
5	Recrystalised Silicon Carbide	1500°C	Excellent thermal shock resistance
6	Tungsten Carbide	350°C	Good mechanical strength and high abrasion resistance

Thermocouples

Base Metal Thermocouples With Thermowells / Protection Tubes

Base Metal Thermocouple types are composed of common, inexpensive metals such as nickel, iron and copper. The thermocouple types E, J, K, N and T are of this group and are the most commonly used type of thermocouple.

Type	J, K, T, E, N
Element Size (MI)	3.0, 4.5, 6.0, 8.0 mm, Other sizes on request
(Non-MI)	1.2, 1.6, 2.0, 2.5, 3.2 mm, Other sizes on request
Protection Sheath Material	SS304, SS321, SS316, SS310
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

Thermocouples

MI Thermocouples

Mineral Insulated Thermocouples, commonly referred as MgO (Magnesium Oxide) thermocouples, are used in many process and laboratory applications. They are available in all thermocouple element types and a wide variety of sheath diameters and materials. They are rugged in nature and bendable, and their fairly high temperature ratings make MI thermocouples a popular choice for a multitude of temperature measuring applications.

Type	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	• Miniature Thermocouples with minimum 0.25 mm Dia • Swaged Tip Thermocouples • Tube Temperature Skin Type Thermocouples • Special Sensors as per ASTM-E235 for critical application • High Wall Thickness

Thermocouples

Noble Metal Thermocouples

Noble Metal Thermocouples are manufactured with precious or noble metals like Platinum and Rhodium. Noble Metal Thermocouple must be used with ceramic protection tube surrounding the thermocouple element. These are normally used for high temperature applications.

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

Thermocouples

Refractory Thermocouples

Refractory Metal Thermocouples are manufactured from exotic metals Tungsten and Rhenium. These metals are expensive, difficult to manufacture and are brittle. These are used for high temperature, reducing or vacuum atmosphere conditions.

Type	G, C, D (operating temperature upto 2300°C)
Sheath Material	Tantalum, Molybdenum, Inconel 600, Ceramic etc
Sheath Diameter	1.6, 3.2, 6.4, 8.0 mm
Standard Transition Sleeve	SS316 or INCONEL
Insulation Material	Magnesium Oxide, Aluminium Oxide, Beryllium Oxide, Hafnium Oxide

Resistance Temperature Detectors

RTDs With Thermowells/ Protection Tubes

RTDs for corrosive, high pressure, fast flowing medium with Thermowell.

Type	Pt 100, 200, 500, 1000 etc.
Element size (MI)	Wire wound ceramic encapsulated, Wire wound glass encapsulated, Thin film ceramic encapsulated
Connection	2, 3, 4 Wire
Protection Sheath Material	SS304, SS321, SS316, SS310, Inconel 600/800, HRS 446, Hastalloy, Monel
Configuration	Simplex/ Duplex/ Others

Resistance Temperature Detectors

Mineral Insulated RTDs

Mineral Insulated Resistance Thermometers are made with Platinum-measuring resistors Pt100Ω 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.

Type	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

Special RTDs

- Slide shoe bearing RTDs
- Vibration proof RTDs for Bearing & DG sets
- Motor & Transformer winding temperature RTDs
- Handheld & Probe in various designs
- RTDs with IBR approved Thermowells
- Strap on RTDs for nuclear application
- High Temperature RTDs upto 1/10 DIN
- Semi Standard PRTs with NABL Certificate calibrated at Fixed points suitable up to 661°C
- Autoclave Thermocouple & RTD for Validation.

Thermowells And Protection Tubes

Thermowells

Thermowell is a tube, closed at one end, which protects the probe and allows its removal without breaking the liquid seal. Many materials and styles are available to match application requirements. Thermowells drilled from solid bar stock provide the highest pressure ratings, and welded models are also available.

Material	SS304, SS316, SS316L, SS321,SS310, HRS446, INCONEL 600/800/601 Hastalloy, Monel, Titanium etc
Type	Drilled Barstock, Fabricated
Construction	Tapered, Straight, Helical
Process Connection	Screwed, Flanged
Certification	IBR certification on request, Radiography, PMI, Pressure test etc. Calculation as per PTC 19.3 can be provided

Thermowells And Protection Tubes

Special Thermowells /Protection Tubes

•	Metal Thermowells with Tungsten Carbide/ Ceramic/ PTFE/ PVDF/ PFA/ Starlite/ Zirconium coatings
•	Solid Sintered Tungsten Carbide
•	Silicon Carbide(Recrystallised & Nitride Bonded)
•	Platinum Thimble
•	Tantalum, Titanium, Nickle Cladding
•	Tantalum Tungsten (Ta10W) Alloy
•	Graphite
•	Silicon Nitride
•	Other materials in various sizes available on request

Protection Tubes

Material	Recrystallised Alumina 99.7%
Type	KER 710(C-799) Open Ended, Close Ended
Length	350, 530, 600, 650, 740, 900, 1030, 1200, 1430 mm etc.
OD x ID	6x4, 8x5, 10x6, 12x8, 15x10, 20x15, 24x18mm etc. High wall thickness tubes available
Insulating Tubes	2/4/6 Holes etc.
OD	1.5, 2.8, 3.5, 5.5, 8.5 etc.

Gauges

Temperature Gauges

Sensing Elements	Bi-Metal, Liquid Filled, Gas Filled
Dial Size	63, 80, 100, 150, 250 mm
Stem Dia	6, 8, 10, 12 mm
Range	Min. -40°C, Max. 650°C
Accuracy	Class 1 as per EN13190
Standard	EN13190/IS13211
Enclosure Protection	IP-55, IP-65 (Filled)
Connection	1/8", 1/4", 3/8", ½" BSP/NPT (M/F)
Mounting	Center Back, Bottom Direct, Every Angle Mounting
Over-Range Protection	30% above FSD

Pressure Gauges

Sensing Elements	Bourdon Tube, Sealed Diaphragm, Compact Sealed Diaphragm, Schaffer Diaphragm, Capsule Diaphragm
Dial Size	40, 50, 63, 80, 100, 150, 250 mm
Range	Vacuum, Compound, 0...1Kg/cm^2 to 0...2100Kg/cm^2
Accuracy	±1% FSD
Over-Range Protection	30% above FSD
Standard	IS 3624, EN837
Enclosure Protection	IP-55, IP-65 (Filled)
Connection	1/8", 1/4", 3/8", ½" BSP/NPT (M/F)
Mounting	Bottom/Back Direct , Bottom Surface, Back Panel, Back Bracket Mounting

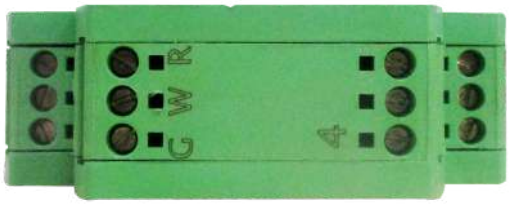
Accessories

Temperature Indicators / Controllers

Input	mA, mV, J, K, E, T, N, Pt100
Output	Relay, 4 - 20mA, (Retransmission)
Power Supply	24VDC, 30mA or 230VAC
Range	-999 to 9999

Temperature Transmitters

Head Mounted Type



Din Rail Type

Input type	RTD, TC, Ohm, mV
Output Signal	Analog 4 ~ 20mA, 2 wire / 4 wire
Communication	HART-protocol / USB
Power Supply	7.5 to 45 VDC

Connectors

- Plug and jack compensated for thermocouples.
  J, K, N, R, S, B, T, E, C Types
- Standard, Miniature, Panel mounted, Simplex, Duplex
  Material : Glass Filled Nylon and Ceramic
  Colour Coding : Various Standards
- Lemo Connectors

Accessories

Hand Held Temperature Indicators

TEMPMET 05 - K TYPE THERMOCOUPLE

Thermocouple	K
Dimensions	162 X 76 X 38.5 mm
Measurement Range	-50 to 1300 °C
Accuracy	± 2°C (-50 to 0°C), ±0.5% of reading + 1°C(0 to 1000°C), ±0.8% of reading + 1°C(1000 to 1300°C)
Unit	°C, F, K
Resolution	1 °C/0.1°C
Power	Standard 9V battery

TEMPMET 08 - THERMOCOUPLE & RTD

Thermocouple	B, C, D, E, J, K, N, R, S, T
RTD	Pt100, Pt50, Pt10, Pt200, Pt500, Pt1000
Channels*	RTD - 1 No., T/C - 1 No.
Resolution	RTD - 0.01°C, T/C - 0.1°C
Accuracy	RTD - 0.3°C

*2 Channel available on request

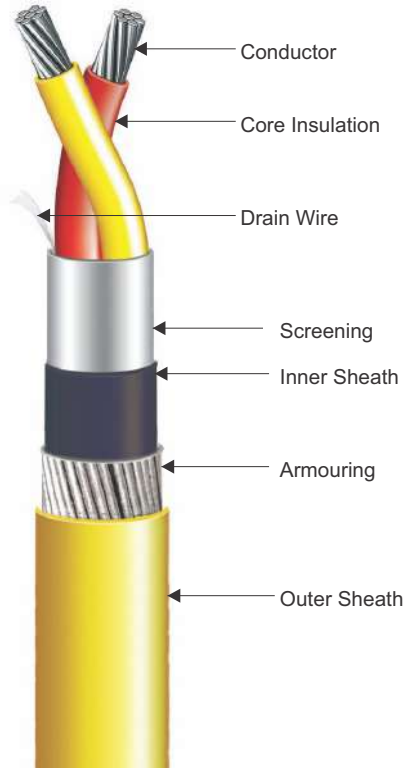
TEMPMET 09 - THERMOCOUPLE & RTD

Thermocouple	B, C, D, E, J, K, N, R, S, T
RTD	Pt100, Pt50, Pt10, Pt200, Pt500, Pt1000
Channels	RTD - 1 No., T/C - 1 No.
Resolution	T/C - 0.01°C, RTD - 0.001°C
Accuracy	RTD - 0.05°C, T/C - 0.3°C

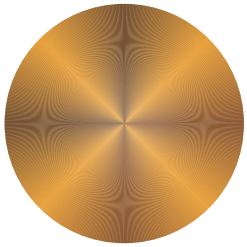
Cables & Wires

Thermal and Cable Solutions

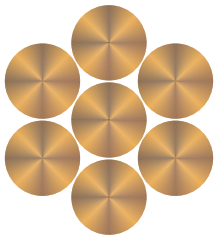
Cables



CONDUCTOR



Solid



Stranded

The center component of any cable is the conductor, which carries the signal or power through that cable. For signal & power transmission copper is the most commonly used conductor.

Copper Conductors

Annealed Bare Copper (ABC), Tinned Plated Copper (TPC), Nickel Plated Copper (NPC), Silver Plated Copper (SPC), NPC 27%

Thermocouple Conductors

Thermocouple grade conductor (TC)

Extension grade conductor (EX)

Compensating grade conductor (C)

Other Conductors

Pure Nickel Conductor (Ni),

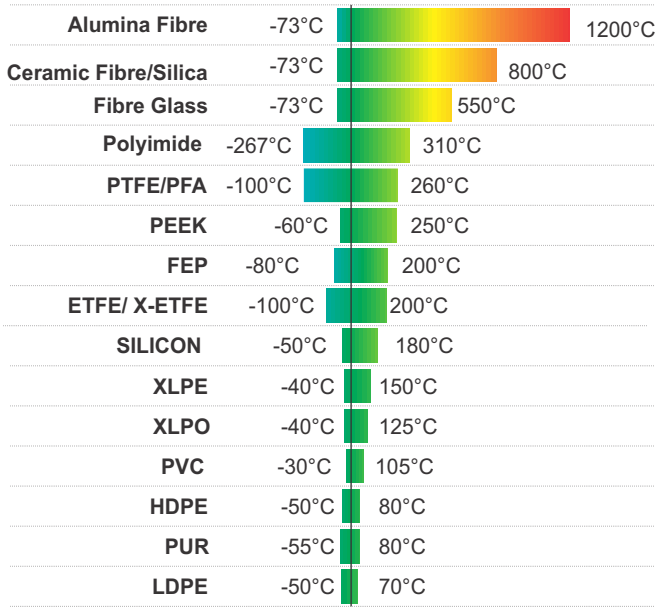
Silver Plated High Strength Copper Alloy etc.

INSULATION

Insulation refers to the layer of plastic, polymer or high temperature compound that is applied directly over the conductor. Tempsens provide variety of insulations along with wide temperature range from -267°C to 1200°C.

Insulation Type

Temperature range for various insulations are listed below :



SCREENING

Screening is applied for electromagnetic protection. Generally, two types of Screening are available :

- Aluminum Foil Type : - Screening is done by helically wound aluminum foil along with copper drain wire with 100 % coverage.
- Mesh Braided Type :- Screening is done by Copper wire (Bare Copper, Tinned Copper, Nickel Plated Copper, Silver Plated Copper). It is in mesh braided form with 70 % to 95% coverage area.

INNER SHEATH

PVC, Silicon, Teflon, Polyimide, PUR, HDPE, etc. (as listed in insulation type)

MECHANICAL PROTECTION

- G.I. Armouring (Round wire / Flat strip as per IS 3975:99)
- SS Braiding as per JSS 51038, BS 50288-7

OUTER SHEATH

PVC, Silicon, Teflon, Polyimide, Fibre Glass, PUR, ETFE, XLPO etc. (as listed in insulation type)

IS694 : 2010
CML No. - 8400077612

IS1554-1:1988
CML No. - 8400106609

IS7098-1:1988
CML No. - 8400128712

RoHS

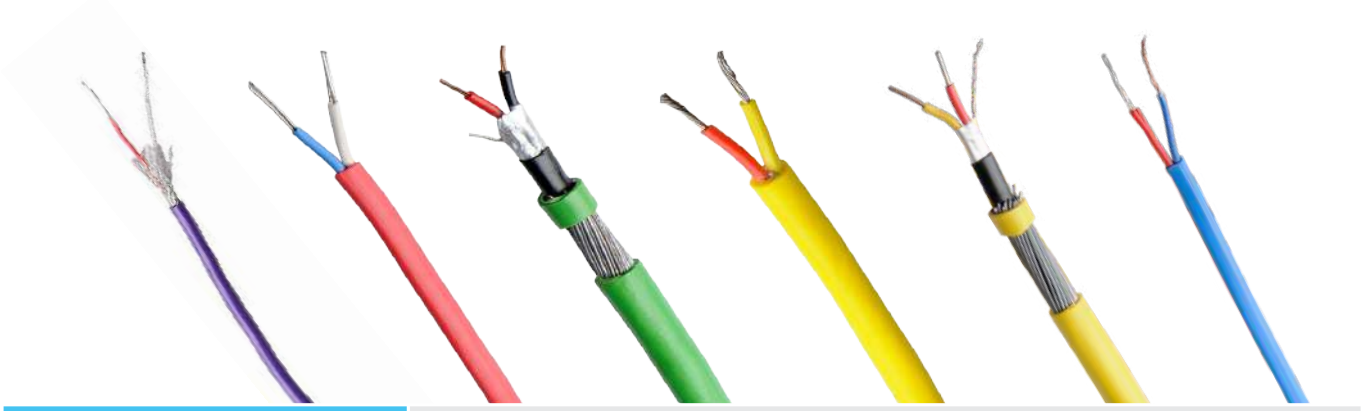
REACH COMPLIANT

NABL T-4096

Cables

Thermocouple Cables

Thermocouple Cables are used to measure the temperature directly. Thermocouple Extension or Compensating wires are only used to extend a thermocouple signal from a sensor to instrument for readings.



Construction	Single or Multi pair
Voltage Grade	Up to 1.1 KV
Conductor	TC, EX, C (as per below table)
Type of Conductor	K, T, J, E, N, R, S, B, D, C
Conductor Size	AWG 12 to AWG 32
Conductor Stranding	Solid or Multi strand
Core Insulation	PVC, XLPE, LSZH, PE, PTFE, FEP, PFA, PEEK, Silicon, ETFE, Polyimide, Fiber Glass, Ceramic Fiber
Screening	Aluminum Foil type/Mesh Braided type
Inner/Outer Sheath	PVC, LSZH, PTFE, FEP, PFA, ETFE, Silicon, Polyimide, Fiber Glass, Ceramic Fiber
Armouring	G.I. Armouring/ SS Braiding (For High Temperature Insulations)
Color Code	As per below table
Standards	ANSI MC 96.1, IEC 584.3, IS 8784

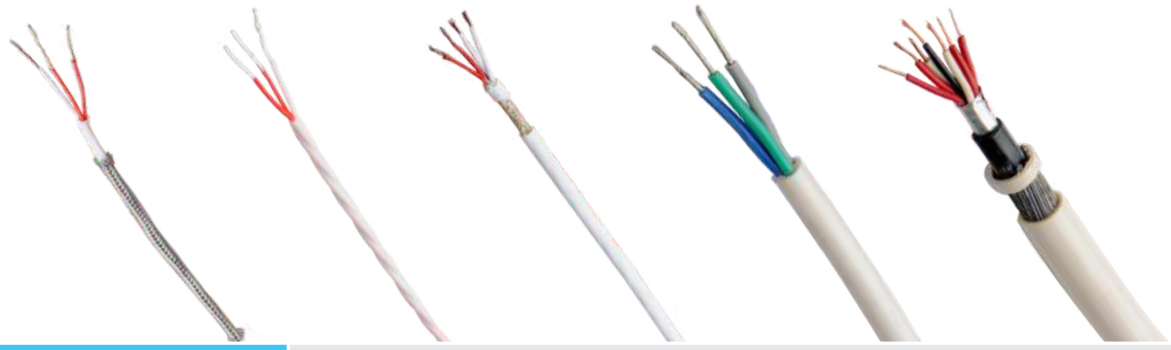
Colour Code & Accuracy of Thermocouple, Extension& Compensating Cables

T/CTYPE	CONDUCTOR		CONDUCTOR COMBINATIONS		COLOR CODE		TOLERANCE CLASS AS PER IEC 584.3		CABLE TEMP. RANGE°C
	EXTENSION CABLE	COMPENSATING CABLE	+LEG	-LEG	IEC 5843:1989	ANSI/MC96.1	CLASS 1	CLASS 2	
K			CHROMEL	ALUMEL			±1.5°C or 0.4% of T	±2.5°C or 0.75% of T	0°C TO +1100°C
	KX		CHROMEL	ALUMEL			±1.5°C	±2.5°C	-25°C TO +200°C
		KCA	IRON	CONSTANTAN			-	±2.5°C	0°C TO +150°C
		KCB	COPPER	CONSTANTAN			-	±2.5°C	0°C TO +100°C
T			COPPER	CONSTANTAN			±0.5°C or 0.4% of T	±1.0°C or 0.75% of T	-185°C TO +300°C
	TX		COPPER	CONSTANTAN			±0.5°C	±1.0°C	-25°C TO +100°C
J			IRON	CONSTANTAN			±1.5°C or 0.4% of T	±2.5°C or 0.75% of T	+20°C TO +700°C
	JX		IRON	CONSTANTAN			±1.5°C	±2.5°C	-25°C TO +200°C
N			NICROSIL	NISIL			±1.5°C or 0.4% of T	±2.5°C or 0.75% of T	0°C TO +1100°C
	NX		NICROSIL	NISIL			±1.5°C	±2.5°C	-25°C TO +200°C
E			CHROMEL	CONSTANTAN			±1.5°C or 0.4% of T	±2.5°C or 0.75% of T	0°C TO +800°C
	EX		CHROMEL	CONSTANTAN			±1.5°C	±2.5°C	-25°C TO +200°C
R		RCA	COPPER	COPPER LOW VALUE NICKEL			-	±2.5°C	0°C TO +100°C
S		SCA	COPPER	COPPER LOW VALUE NICKEL			-	±2.5°C	0°C TO +100°C
B		BC	COPPER	COPPER			-		0°C TO +100°C
D		DC	ALLOY 203*	ALLOY 225*			-	±4.5°C	0°C TO +100°C
C		CC	ALLOY 405*	ALLOY 426*			-	±4.4°C	0°C TO +100°C

Cables

RTD Triad Cables

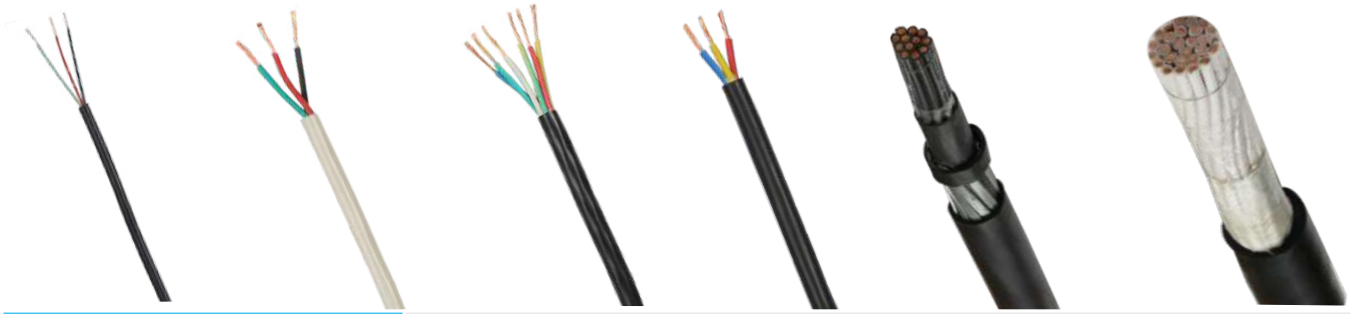
RTD triad cables are used to carry the RTD signals to the control room or field mounted instruments.



Construction	Single / Multi Triads
Voltage Grade	Up to 1.1 KV
Conductor	Electrolytic Grade Bare Copper/ Tinned Copper/ SPC/ NPC
Conductor Size	0.50, 0.75, 1.0, 1.5 Sq. mm up to 48 triad
Conductor Stranding	Solid or Multi Strand
Core Insulation	PTFE, FEP, Silicon, PFA, PVC, PE, XLPE, LSZH Polymer etc.
Screening Method	Individual and Overall/Overall Shield
Screening	Aluminum Foil type/Mesh Braided type
Inner/Outer Sheath	PTFE, FEP, Silicon, PFA, PVC, LSZH Polymer etc.
Armoring	G.I. Armouring/ SS Braiding (For High Temperature Insulations)
Standards	As per BS 5308 Part 1 and Part 2, IS 1554, EN 50288-7, IS 7098, DIN 43760, JSS 51038

LT Control & Power Cables

Control & Power cable up to 1.1 KV voltage grade with variety of insulations.

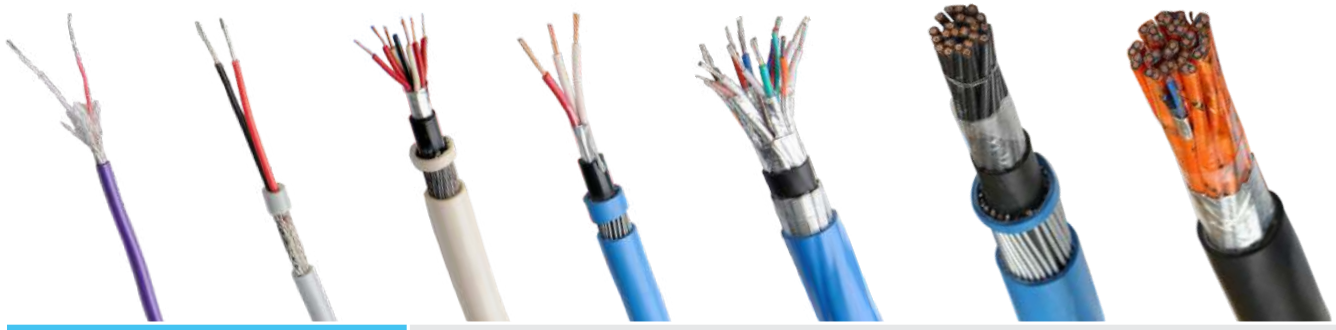


Construction	Single / Multi Core
Voltage Grade	Up to 1.1 KV
Conductor	Electrolytic Grade Bare Copper/ Tinned Copper
Conductor Size	0.50, 0.75, 1.0, 1.5, 2.5, 4.0, 6.0, 10.0, 16.0, 25.0, 35.0 upto 300 Sq. mm
Conductor Stranding	Solid or Multi Strand
Core Insulation	PVC, HR PVC, PE, XLPE, LSZH Polymer, FR PVC, FRLS PVC, XLPO etc.
Screening	Aluminum Foil type/Mesh Braided type
Inner/Outer Sheath	PVC, HR PVC, PE, LSZH Polymer, FR PVC, FRLS PVC, PUR, XLPO etc.
Armoring	G.I. Round Wire / Flat Strip Armouring(As per IS 3975 : 99)
Standards	As per IS 694, IS 1554, IS 7098, IEC 60227, IEC 60502-1, IEC 60332

Cables

Instrumentation Signal Cables

Instrumentation Signal Cables minimize noise and signal interference, delivering clean signals in harsh environments and general manufacturing operations. These cables are designed for use in communication and instrumentation.



Construction	Single / Multi, Pair / Triads
Voltage Grade	Up to 1.1 KV
Conductor	Electrolytic Grade Bare Copper/ Tinned Copper
Conductor Size	0.50, 0.75, 1.0, 1.5, 2.5 Sq. mm upto 48 pairs
Conductor Stranding	Solid or Multi strand
Core Insulation	PVC, HR PVC, PE, XLPE, LSZH Polymer, FR, FRLS PVC, XLPO etc.
Screening Method	Individual and Overall(F type)/Overall Shield (G type)
Screening	Aluminum Foil with Drain Wire/Mesh Braided
Inner/ Outer Sheath	PVC, HR PVC, PE, LSZH Polymer, FR PVC, FRLS PVC, PUR, XLPO etc.
Armoring	G.I. Round Wire / Flat Strip Armouring
Standards	As per BS 5308 Part 1 and Part 2, IS 1554, EN 50288-7, IS 7098

Fire Survival Cables

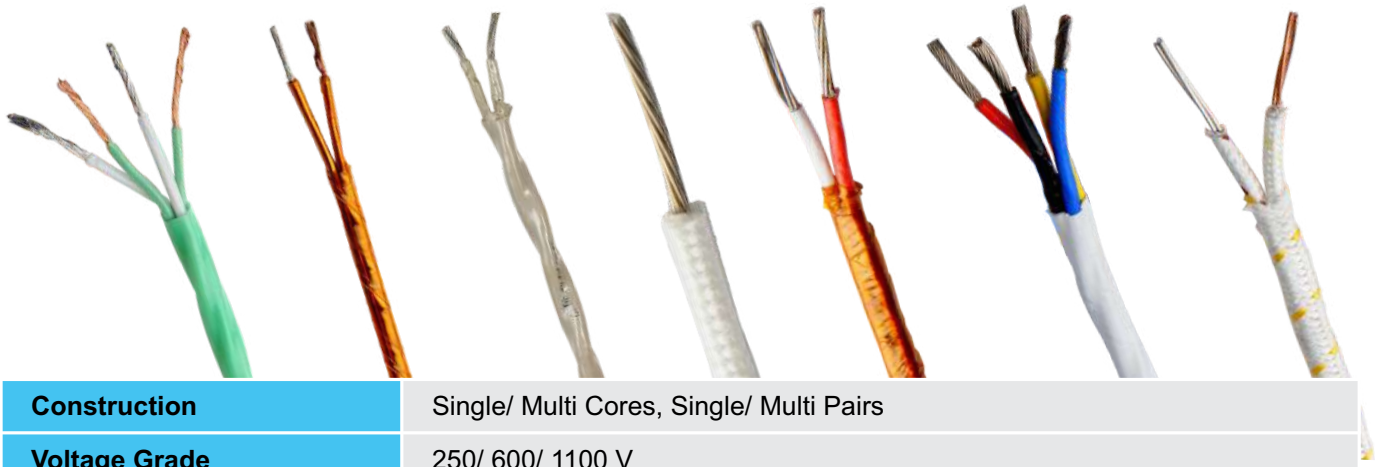
Fire Survival Cables are used in the installations where vital circuits are required to continue operation under fire conditions. In all disaster, fire smoke head & toxic fumes are the main obstacles to safe evacuation of a building area.A major contribution towards overcoming these hazards is the use of fire survival cables & halogen free cables.

Conductor	Electrolytic Grade Bare Copper/Tinned Copper
Fire Resist Heat Barrier	Glass Mica Heat Barrier Tape
Insulation	XLPE/ SILICON
Screening	Al-myler/Metal braided
Inner/Outer Sheath	Halogen Free Low Smoke Polymeric compound
Armouring	G.I. Round Wire / G.I. Flat Strip
Standard	IEC 60331, IEC 60332, IEC 60754, BS 6387, EN 50290-2-27, BS 7655, BS 7629-1, IS 7098, IS 9968

Cables

High Temperature Cables

High Temperature Cables are used in areas where both working temperature and ambient temperature are too high. A variety of high temperature insulations such as alumina yarn, ceramic yarn, fibre glass, fluoroplastic polymers and elastomer to perform in continuos temperature up to 1200°C.



Construction	Single/ Multi Cores, Single/ Multi Pairs
Voltage Grade	250/ 600/ 1100 V
Conductor Type	Annealed Bare Copper, Tinned Copper, Silver Plated Copper, Nickel Plated Copper, Pure Nickel, NPC 27%, High Strength Copper Alloy
Conductor Size	From 0.22 Sq. mm to 240 Sq. mm
Heat Barrier Tape (Optional)	Glass Mica Tape, Polymide Tape
Core Insulation	FEP, PTFE, PEEK, PFA, Silicon, PEEK, ETFE/ X-ETFE, Polyimide, Fibre Glass, Ceramic Fibre, Alumina Fibre
Screening Method	Individual and/or Overall
Screening	Aluminum Foil with Drain Wire/ Mesh Braided
Inner/ Outer Sheath	FEP, PTFE, PEEK, PFA, Silicon, PEEK, ETFE/ X-ETFE, Polyimide, Fibre Glass, Ceramic Fibre, Alumina Fibre
Armourning	Stainless Steel Wire Braiding
Generally Confirm to	JSS 51034, JSS 51038, JSS 51037, ASTM B298, ASTM B355, MIL 81381, MIL-DTL-27500H, MIL 16878, IS 9968, VDE 207 Part 6

DC Solar Photovoltaic Cables

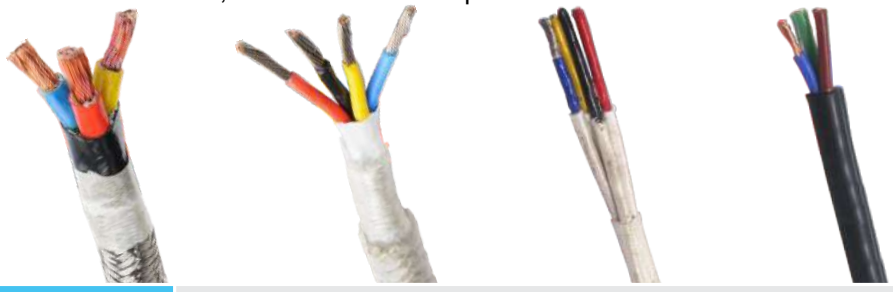
DC Solar Cable are single core copper cables each for +ve and -ve, They are insulated with cross linkable Low Smoke Zero Halogen compound and sheathed with Low Smoke Zero Halogen compound (Conforming to BS EN 50618:2014 Standard)

- Lasts up to 30 years even under tough external conditions.
- Annealed Tinned Copper Conductor (Class 5 as per IEC-60228).
- Resists extreme temperatures (-40°C to 120°C maximum at the core) and ozone resistant.
- Full protection against ultraviolet rays.
- Low smoke emission & low toxicity / corrosivity during fire.
- Flame retardant, fire retardant.
- Fast & Easy installation with color identification.
- In accordance with new environmental regulations.
- Suitable to common connector types.

Cables

Heat Resistance Cables

A range of single & multi core Heat Resistance Cable for temperature range upto 800°C. Our Heat Resistance Power Cables are suitable to resist in chemical, fire and flame atmosphere.



Construction	Single / Multi Cores
Voltage Grade	Up to 1.1 KV Grade
Conductor	ABC, NPC, NPC 27%
Conductor Size	1.5, 2.5, 4.0, 6.0, 10.0, 16.0, 25.0, 35.0 Sq mm upto 240 sq. mm
Heat Barrier Tape	Polyimide Tape
Conductor Stranding	Multistrand as per IS 8130:84/IEC60228
Core Insulation	PTFE, FEP, PFA, Silicon, Fibre Glass, Ceramic Fibre etc.
Isolator	Polyimide, Sintered PTFE Foil
Fire Barrier Tape	Glass Mica Tape
Screening	Mesh Braided(Overall)
Inner/Outer Sheath	Teflon, Fibre Glass, Ceramic Fibre etc.
Outer Braiding	Asbestos
Armouring	SS Braiding
Standards	As per IS 8130:84, JSS 51038, JSS 51037

Sleeves

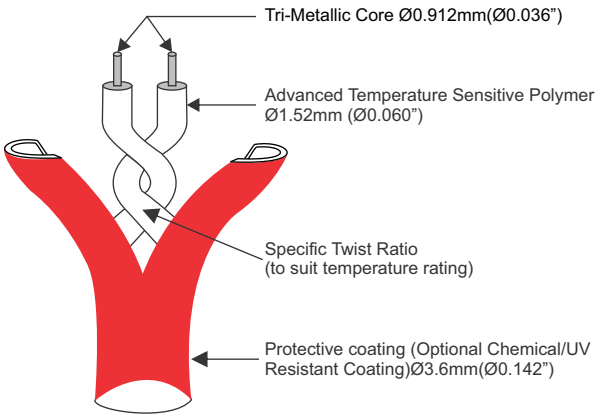
Variety of sleeves suitable for wide temperature range with various insulation such as PTFE, FEP, Silicon, Fiber Glass, Stainless Steel wire, Polyamide & PVC.

Inner Diameter	0.50 mm to 30 mm
Voltage Grade	Up to 4 KV
Color	As per Customer requirement

Other Special Cables

- Radiation Resistance Cable
- Automotive Wires & Cable
- Electron Beam Irradiated Cable
- RS-485 Cable
- Lance Cable
- Load Cell Cables
- Composite Cables
- Co-axial Cable
- Cat 5 & Cat 6 Cable

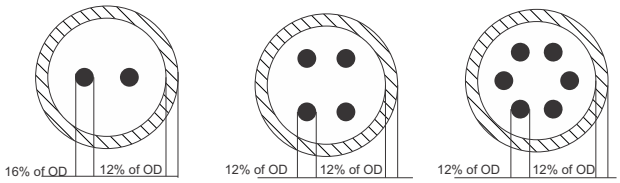
Digital Linear Heat Sensing Cables



Cables

Mineral Insulated Cables

Mineral insulated cables are designed for high-temperature applications and particularly strict requirements with regard to mechanical, chemical and electrical stability.



Mineral Insulated Thermocouple Cables

Mineral Insulated Thermocouple Cables Have Inner Conductors of Thermocouple Base Material As Per Standard ASTM E 585/585m and ASTM E 839.

OD (MM)	TYPE	SHEATH	MGO GRADE	ACCURACY
1.5 2.0 2.2 3.0 4.5 5.0 6.0 8.0 9.5 10.0 12.7	K - Simplex KK - Duplex J - Simplex JJ - Duplex E - Simplex EE - Duplex N - Simplex NN - Duplex T - Simplex TT - Duplex R - Simplex RR - Duplex S - Simplex SS - Duplex	304 – SS304L 310 - Ss310 316 - SS316L 321 - Ss321 600 - INCONEL 600 **Note:-** Diagonal Element Supplied Unless Specified	STANDARD (⩾ 96% PURE) HIGH PURITY (⩾ 99.4% PURE)	CLASS 1 CLASS 2 As per IEC 584-2 or ANSI MC 96.1

Mineral Insulated RTD Cables

Mineral insulated cables for RTDs have inner conductors of copper, copper-nickel alloys, nickel etc.

OD (MM)	NO. OF CONDUCTOR	CONDUCTOR MATERIAL	SHEATH	MGO GRADE
1.5 2.0 2.2 3.0 4.5 5.0 4.8 6.0 8.0 9.5	3 4 6 8	Ni - Nickel Cu - Copper NiCu - Constantan	304 - SS304L 316 - SS316L 321 - Ss321 600 - INC 600	STANDARD (⩾96% PURE) HIGH PURITY (⩾ 99.4% PURE)

Other Special Type of MI Cables

Mineral Insulated Heating Cables

Mineral Insulated Heating Cables are constructed with a solid resistor element embedded in highly compacted mineral insulation. MI cables are built to handle high temperature, high wattage applications.

Mineral Insulated Copper Cables (MI Power Cables)

Mineral Insulated Copper cable is used as an electric cable for critical areas of plant and follows standard of IEC/EN 60702 Part 1. It has two voltage grade 500V & 750V

Coaxial Cables/Triaxial Cables

Triaxial cable is a type of electrical cable similar to coaxial cable, but with the addition of an extra layer of insulation and a second conducting sheath. It provides greater bandwidth and rejection of interference than coaxial cable.

SPND's

Self-Powered Neutron Detectors are in-core flux monitors in nuclear power reactors.The typical SPND is a coaxial cable consisting of an inner electrode (the emitter), surrounded by insulation and an outer electrode (the collector).

Linear Heat Detector Cables

Linear heat detector cable is used to detect high temperature in critical equipments like engines etc.

They use a semiconductor as insulation, the resistance drops characteristic in high temperature condition.

Industrial Heaters

Thermal and Cable Solutions

Industrial Heaters

Component Heaters

Marathon offers Cartridge Heater, Strip Heater, Band Heater, Silicon Rubber Heater, Coil Heater and Customize Heating Solutions etc.

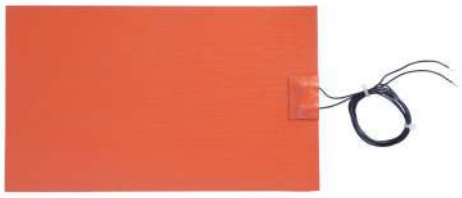
Cartridge Heaters

Temperature Range	Up to 600°C
Material	SS304, SS316, Incoloy 600

Mica Band Heaters

Nickel/Chromium resistance wire evenly wound for uniform heat distribution and reliable accuracy. Highest grade mica provides excellent electrical insulation at high temperatures and is resistant to moisture.

Silicon Rubber Heaters



Temperature Range	Up to 250°C
Applications	Good for heating drums, De-icing, Vending machines etc.

Ceramic Band Heaters

Ceramic band heaters are medium-to-high temperature heaters that have 550°C as the maximum working temperature. Ceramic band heaters are available with different terminal styles, are fully flexible, and can accommodate holes and cut-outs.

Bolt Heaters

Hot Bolt Heaters are used to preheat large, hollow holding bolts or studs where a high concentration of heat is critical for bolt expansion in a short period of time.

Heating Element	80:20 NiCr Alloy resistance wire
Construction	Alloy sheath swaged tubular construction

Coil Heaters

The basic construction of these heaters consist of compacted MgO, high temperature resistance wire and Chrome Nickel Steel tube. These heaters can be constructed with or without built in thermocouples.

Underwriters Laboratories

Marathon Tempsens

Industrial Heaters

Process Heaters

Process Heating Systems consisting Heater Bundle, Vessel, Control Mechanism, Circulating Heater, Immersion Heaters, Air Heaters, Bundle Rod Heaters etc

Temperature Range	Upto 700°C
Pressure Range	Up to 500 bar
Heating Element	NiCr 80:20 with Mgo insulation
Material	SS/ Alloys/ CS
Application Areas	Oil and Gas, Refinery, Petrochemicals, Power, Marine, R&D and Nuclear, Chemical, Industrial Heating Applications
Certifications	ATEX, CCOE, IECEX, PED, CE etc.

Underwriters Laboratories

Marathon TempSens

Industrial Heaters

Furnace Heaters

Bundle Rod Heaters

Temperature Range	Up to 1100°C
Heating Element	NiCr 80:20, FeCrAl alloy

Silicon Carbide

Temperature Range	Up to 1600°C
Heating Element	SiC (Silicon Carbide)

Edge Wound Heaters

Temperature Range	Up to 1100°C
Heating Element	NiCr 80:20, FeCrAl alloy

Metallic Heating Elements

Temperature Range	Up to 1100°C
Metallic Heating Element	Molybdenum, NiCr 80:20, FeCrAl alloy

Bobbin Heaters

Temperature Range	Up to 800°C
Heating Element	NiCr 80:20

Accessories

Hangers

Radiant Tubes

Radiant Tube Material	Cast Alloy-HU, HK, SS316
Hanger Material	N80, Incoloy 600

Underwriters Laboratories

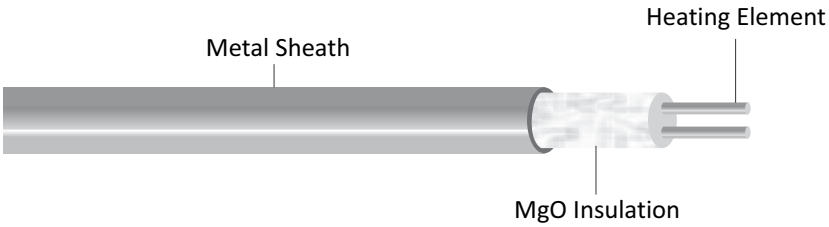
Marathon Tempsens

Industrial Heaters

Surface Heating Solutions

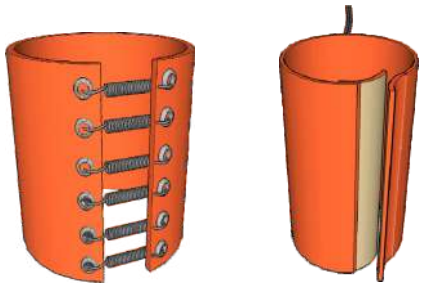
Marathon provide Surface Heating Solutions, Open Electric Heat Tracing MI Cable, Panel Type Hopper Heater, Silicon Rubber Heater which are used to maintain or raise the temperature of Pipes, Vessels and Hopper etc.

Mineral Insulated Heating Cables



Temperature Range	Up to 500°C
Sheath Material	SS304, SS316, SS321, Alloy 600
Applications	Suitable for heating tanks, valves, pipes, pumps, tools and industrial process heating systems

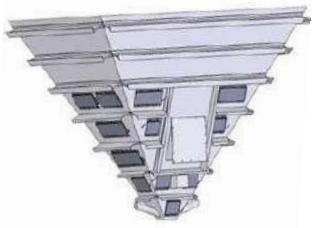
Silicon Rubber Heaters



Temperature Range	Up to 200°C
Applications	Surface of drum or heating barrel, Surface of pipe heating

Hopper Heating Modules

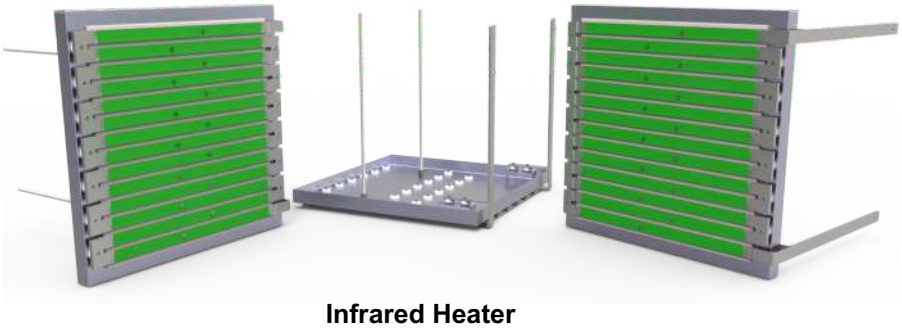
Marathon Hopper Heating Jackets are ideally suited to raise or maintain elevated temperatures of the contents in reaction vessels, storage tanks, tankers and process equipments in industries.



Temperature Range	Up to 200°C
Applications	Hopper heating, Vessels, Storage Tanks etc

Industrial Heaters

Customized Heating Elements



Infrared Heater

Barrel Heater

Thermo Cutter

Integrated Control Panel System

Marathon offer control panels that integrates temperature controllers, customer input and power control system into a complete package. This precise power control allows process temperature to be controlled to ±1°C. We can offer customized panel sizes for unique applications.

CE IEC CSA VDE Ex UL Underwriters Laboratories

Non-Contact Temperature Sensors

Thermal and Cable Solutions

Pyrometers

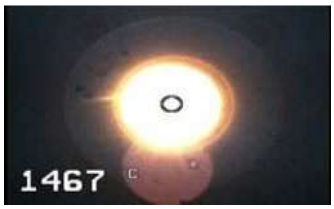
A pyrometer is a non-contacting device that intercepts and measures thermal radiation. This device can be used to determine the temperature of an object's surface without contact to the surface.

A+ Series

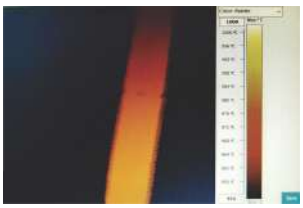
Focusable Pyrometers with Analog output, Digital interface, Laser targeting / Through the lens view finder / Video module sighting, Keypad for Parameterizing, Integrated OLED Display.

Special Pyrometer with thermal imager (A+450C TI)

OLED Display



Video Module



Thermal Image
(A+ 450C TI)

Model	A+ 250	A+ 450	A+ 450C	A+ 450C TI
Temperature Range	210°C…3000°C	600°C...2500°C	600°C...2500°C	
Emissivity	0.1...1 adjustable			
Spectral Range	1.6 µm	1.0 µm	0.7...1.15µm	
Distance to Spot Size Ratio	Focusable 75:1, 150:1, 300:1	Focusable 300:1	Focusable 150:1, 300:1	
Response Time	2msec. adjustable upto 10 sec.		20msec. adjustable upto 10 sec.	
Accuracy	±0.3% of the measured value +1°C		±0.5% of the measured value +1°C	
Analog Output	0-20mA, 4-20 mA (user selectable)			
Digital Output	RS-485			

A+ Series With Fiber Optics(A+FOPL)

Digital IR Fiber Optic Pyrometers with Mono Fiber Optic Cable (Single & Two Color Options Available).

Model	A+250 FOPL	A+450 FOPL	A+450C FOPL
Temperature Range	250...2500°C	600...2500°C	800...3200°C
Emissivity	0.1...1.0 adjustable		0.75 to 1.25 slope adjustable
Spectral Range	1.6µm	1.0µm	0.7...1.15µm
Distance to Spot Size Ratio	100:1, 200:1		
Response Time	2msec adjustable upto 10 sec		20msec adjustable upto 10 sec
Accuracy	±0.3% of measured value in °C+1°C		±0.5% of measured value in °C+1°C
Analog Output	0-20mA, 4-20mA (user selectable)		
Digital Output	RS-485		

Pyrometers

A Series

Standard Industrial Pyrometers with single & two color models, Analog output, Digital interface, Bluetooth/USB communication, Laser targeting or Through the lens view finder

Model	A250	A450	A250C	A450C	A150
Temperature Range	210°C...3000°C	600°C...2500°C	350°C...1350°C	600°C...2500°C	75°C...700°C
Emissivity	0.1...1 adjustable				
Spectral Range	1.6µm	1µm	1.5 µm/1.6 µm	0.7...1.15 µm	2…2.6 µm
Distance to Spot Size Ratio	50:1 ,100:1, 200:1	200:1	100:1, 200:1		40:1, 50:1
Response Time	2msec. adjustable upto 10 sec.		100msec. adjustable upto 10 sec.	20msec. adjustable upto 10 sec.	2msec. adjustable upto 10 sec.
Accuracy	±0.3% of measured value +1°C		±0.5% of measured value +1°C		above 400°C:0.5% of measured value in °C+1°C
Analog Output	4 - 20mA / 0-20mA / 0-10V (optional)				
Digital Output	USB 2.0 / Bluetooth, RS-232 or RS-485 (user selectable)				

*Specification are subject to change without prior notice.

A Series with Fiber Optics

Fiber Optic Pyrometers (optical head withstands ambient upto 250°C) with Single & Two Color Models, Mono Fiber Optic Cable, Laser Targeting, Digital Interface, Analog Output & Bluetooth / USB communication.

Model	A250 FOPL	A450 FOPL	A250C FOPL	A450C FOPL
Temperature Range	250°C...1800°C	600°C...2500°C	350°C...1350°C	800°C...3200°C
Emissivity	0.1...1 adjustable		0.75...1.25 slope adjustable	
Spectral Range	1.6 µm	1µm	1.5 µm / 1.6 µm	0.7 .....1.15µm
Distance to Spot Size Ratio	100:1(OH I), 200:1(OH II), 200:1(OH II V)	100:1(OH I), 200:1(OH II) 200:1(OH II V)	100:1(OH I), 200:1(OH II)	100:1(OH I), 200:1(OH II)
Response Time	2msec. Adjustable upto 10 sec.		100msec. adjustable upto 10 sec.	20msec. adjustable upto 10 sec.
Accuracy	±0.3% of the measured value +1°C		±0.5% of the measured value +1°C	
Analog Output	4...20mA or (0-20mA/0-10V) user selectable		0-20mA, 4-20mA, 0-10V(user selectable)	4...20mA, 0-20mA, 0-10V(user selectable)
Digital Output	USB 2.0/Bluetooth, RS-232 or RS-485 optional			

Pyrometers

A Series with Thermopile (AL)

Pyrometers with Analog output, Digital interface, USB, Laser targeting light for temperature measurement.

Model	AL30	AL45	AL514	AL390
Application	Non-Metallic Surfaces, Painted, Coated or Anodized Metals	Flames and Combustion Gases that include Co2	Glass Surface	Through Flame
Temperature Range	0°C...1000°C	400°C...1500°C	300°C...2500°C	300°C...1400°C
Emissivity	0.1…1.2 adjustable	0.1…1 adjustable	0.1…1.2 adjustable	0.1...1.2 adjustable
Spectral Range	8…14 µm	4.43 µm	5.14 µm	3.9 µm
Distance to Spot Size Ratio	50 : 1, 100 : 1	40:1	50 : 1	
Response Time	60msec. adjustable upto 10 sec.			
Accuracy	T < 200°C : ±1.5%, T ⩾ 200°C : ±1.0%	T < 500°C : ±1.5% of measured value, T ⩾ 500°C : ±1.0% of measured value		
Analog Output	4...20mA / 0-20mA / 0-10V (user selectable)			
Digital Output	USB 2.0, RS-232 or RS-485 (user selectable).			

IR CAST 2C

Special two color Pyrometer for Foundries

Model	AST IR CAST 2C	IR CAST 2C+
Temperature Range	700°C...1700°C	
Emissivity	0.1...1 adjustable	
Spectral Range	0.7...1.15 µm	
Distance to Spot Size Ratio	DV=166:1 (V=Vertical), DH=33:1 (H=Horizontal)	DV=250:1 (V=Vertical), DH=50:1 (H=Horizontal)
Response Time	20msec. adjustable upto 10 sec.	
Accuracy	±0.5% of measured value +1°C	
Analog Output	4...20mA or (0-20mA/0-10V) user selectable	
Digital Output	USB 2.0, RS-232 or RS-485 (user selectable)	

Pyrometers

E Series

Economic Series Pyrometers with extended sensor head, Analog output, Digital interface, Relay output, USB Output, Inbuilt LCD, Laser Targeting & Keypad for parameterization.

Model	AST E250 PL	AST E450 PL	AST E450C PL	AST EL50/EL50H
Temperature Range	250°C...1800°C	600°C...1900°C	800°C...2500°C	0°C…800°C
Emissivity	0.1...1 adjustable			0.1...1.2 adjustable
Spectral Range	1.6 µm	1µm	0.7...1.15 µm	8...14 µm
Distance to Spot Size Ratio	20 : 1, 40 : 1, 80 : 1	80:1	80:1	2 : 1, 15 : 1
Response Time	2msec. adjustable upto 10 sec.		20 msec. adjustable upto 10 sec.	20 msec. adjustable upto 10 sec.
Accuracy	±0.3% of the measured value +1°C		±0.5% of the measured value +1°C	±1.0% of the measured value or 3°C
Analog Output	4...20mA / 0-20mA / 0-10V (user selectable)			4...20mA / 0-20mA / 0-10V T/C type K or J(optional)
Digital Output	USB 2.0, RS-232/RS-485 user selectable			USB 2.0, RS-232/ RS-485 (optional)

*EL50H - sensor head 180°C

T3 Series

Pyrometers in 2 wire technology with Analog output, TTL output, USB interface and External Emissivity setting.

Model	T3-250	T3-450	T3-390	AST T3-514	AST T3-814
Temperature Range	250°C…2500°C	600°C…2500°C	300°C…1400°C	300°C…2500°C	0°C…1000°C
Emissivity	0.1...1.0 adjustable		0.1...1.2 adjustable		
Spectral Range	1.6 µm	1 µm	3.9 µm	5.14 µm	8…14 µm
Distance to Spot Size Ratio	50:1, 100:1, 200:1	200:1	50 : 1		50 : 1, 100 : 1
Response Time	10msec. adjustable upto 10 sec.		60msec...10sec adjustable		
Accuracy	0.3% of measured value or +1°C		T<500°C, ±1.5% of measured value, T ≥ 500°C, ±1%		±2% of measured, value or ± 3°C, whichever is greater
Analog Output	2 wire, 4-20 mA				
Digital Output	TTL output				

Pyrometers

Portable Pyrometers

Portable Pyrometers with LCD display, Laser pointer/ Through the lens sighting, battery

Model	TCT 500	TI 750	TI 1500	TI 2400	AST P250	AST P450	AST P450C
Temperature Range	-60°C… 500°C	-60°C… 760°C	-60°C… 1500°C	200°C… 2400°C	210°C… 2500°C	600°C… 3000°C	600°C... 2500°C
Emissivity	0.95	0.1...1.0 adjustable			0.1...1.2 Adjustable		
Spectral Range	8...14µm			1.1...3.7µm	1.6µm	1.0µm	0.7...1.15µm
Distance to Spot Size Ratio	12 : 1	12 : 1	50 : 1	100 : 1	100:1, 200:1, 400:1	400:1	200:1, 400:1
Response Time	1 sec.				5 msec in Numerical Mode, 10 msec in Graphical Mode, 10 msec (when data storage is ON)		25 msec in Numerical Mode,30 msec in Graphical Mode
Accuracy	+/-2% of reading or 2°C whichever is greater				± 0.3% of the measured value + 1°C		± 0.5% of measured value + 1°C
Analog Output	20mA						
Digital Output	USB 2.0						

Special Pyrometer

		ALUMINIUM INDUSTRY	GLASS INDUSTRY	
Model	ML - Series	A5	AST 450G2	PGM+
Temperature Range	0°C…1000°C	300°C...2000°C	600°C…1800°C	250°C...600°C
Emissivity	0.1...1.2 adjustable	0.1...1.0	0.05...1 adjustable	0.1…1 adjustable
Spectral Range	8…14 µm	1.3...1.6µm	1.1...3.7µm	1.6µm
Distance to Spot Size Ratio	2 : 1, 15 : 1	100:1, 200:1	100 : 1	-
Response Time	60 msec adjustable upto 10 sec	Adjustable from 0.15 to 17 sec	250msec. adjustable upto 10 sec.	2msec adjustable upto 10 Sec
Accuracy	± 2% of measured value or ± 3°C whichever is greater	±1%	±0.3% of measured value or 3°C which is greater	±0.3% of measured value or 3°C which is greater
Analog Output	2 wire 4 - 20mA, 0 - 10V/0 - 5V J & K type T/c	4-20mA, 0-20mA, 0-10V, K Type T/C	4...20mA	-
Digital Output	TTL Output	RS-232, RS-422, RSX-485, USB, Bluetooth	USB 2.0	USB 2.0

Furnace Monitoring Cameras

Application

Steel, Cement, Power, Glass Industries

Model	Specification
TFV-750/TFV-1100	Straight View Visual Camera
TE-750/TE-1100	Straight View Thermal Camera
TFV-750/OV & TFV-1100/OV	Elbow View Visual Camera
TE-750/OV & TE-1100/OV	Elbow View Thermal Camera

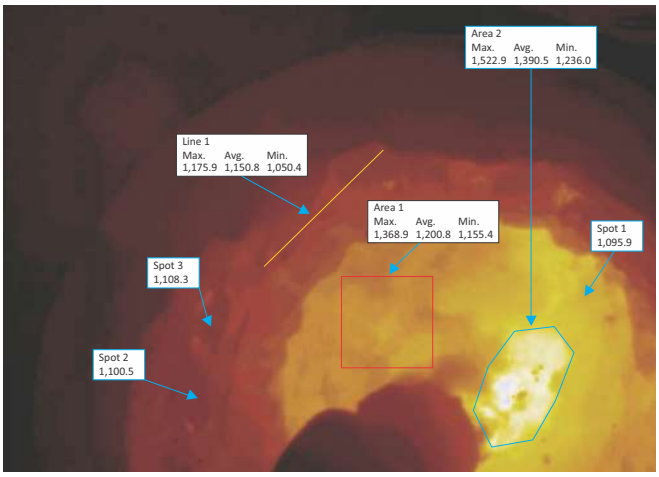
CCD Camera (Normal View)

Image sensor	1/3" Super HD CCD
TV Line	Black and White 650 lines
Illumination	0.005Lux@F2.0
Image	Manual adjustable
Video output	Composite 1 [Vp-p]@75(Ω)
Power	DC12V (±10%)

Thermal Camera (Thermal View)

Image Sensor	HD CMOS Sensor
Temperature Range	700° C to 1800° C
Accuracy	±0.3% of measure value + 1°C
Resolution	768 x 576 pixels
Frame rate	25 Hz
Spectral Range	0.85 to 1.1µm
Connectivity	Ethernet/USB

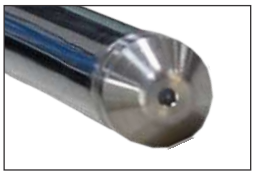
Normal View



Thermal View

Pinhole Lens

Lens length	820 mm & 1100 mm
Lens type	Straight or Elbow (45° or 60°)
Field of view	67°(H)x 56°(V) x 81°(D)
Focus	Manual Adjustable
Length	820 mm



Straight View

Oblique Angle View

Features

- Water cooled lens tube, Vortex cooled camera chamber
- Auto retraction and shutter
- Pneumatic cylinder
- Air Purged
- Control panel with pneumatic system
- Software Infraview for Thermal camera
- Input/Output module

Infraview Software (for Thermal Camera)

- Configurable ROI's : point, line, free shape
- Histogram and isotherm visualization
- Hot and cold spot detection
- Color pallet scaling
- Trend charts
- Alarm output
- Video and Image export
- Server client configuration

Thermal Imagers

ASTI /Tempsens develops Thermal imaging Camera for radiometric and security surveillance application.

TE-700

LTE-384

LTE-160

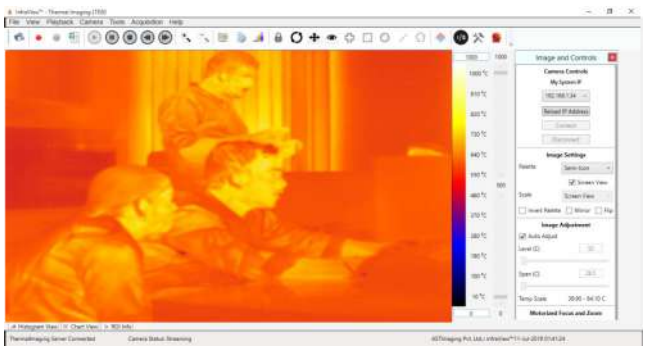
LTE-80

Model	TE-700	LTE-384	LTE-160	LTE-80
Description	High Resolution, High Temperature Infrared Camera	High Resolution, Long Wavelength Infrared Camera	Medium Resolution, Long Wavelength Infrared Camera	Medium Resolution, Long Wavelength Infrared Camera
Temperature Range	700°C - 1800°C	-20°C - 120°C, 0°C - 500°C (Switchable)	0°C – 500°C higher range upto 1000°C/optional	0°C – 500°C higher range upto 1000°C/optional
FOV	32° x 24°, 51° x 39°, 83° x 67°	18.5° x 14.0°	30.4° x 23.1°(Other FOV's also possible)	
Spectral Range	0.85 - 1.1µm	8 - 14µm	8 - 14µm	8 - 14µm
Detector	High Dynamic CMOS	Uncooled FPA detector	Uncooled FPA detector	Uncooled FPA detector
Optical IR Resolution / Frame Rate	640 x 480 @ 25Hz	384x288 @ 25Hz	160x120 @ 30Hz	80x64 @ 9Hz
Ambient Temperature	0°C - 60°C	-10°C ~ +60°C	-10°C ~ +60°C	-10°C ~ +60°C

Software Infraview

Thermal image processing software INFRAVIEW is customizable with Client- Server Architecture for catering to multiple clients at the same time. The modular windows software INFRAVIEW can be configured / customized to cater to application / solution requirements. AST INFRAVIEW Software allows you to control the camera; record, view, manipulate and store the captured video / image as well as measured temperature data. This software allows simple and fast parameterization of the temperature data for optimizing process control

- Configurable ROI's : point, line, free shape
- Histogram and isotherm visualization
- Hot and cold spot detection
- Color palette scaling
- Trend charts
- Alarm output
- Video and Image export



Calibration Equipments

Thermal and Cable Solutions

Calibration Equipments

Liquid Baths

Provide superior thermal environment for probe immersion as no air gap exist between the probe and the medium. The stirring results in very even heat distribution throughout the medium. Liquid Nitrogen is used for -196 to -80°C, Methanol for -80 to 0°C, Water from 0 to 80°C and Silicon Oil for up to 250°C.

CALsys -80/50

CALsys -35/200

CALsys 300SP

CALsys 250

Models	CALsys -196/-80	CALsys -80/50	CALsys -40/50	CALsys -35/200	CALsys 250
Temperature Range	-196 to -80°C	-80 to 50°C	-40 to 50°C	-35 to 200°C	50 to 250°C
Stability	±0.1°C	±0.05°C	±0.05°C	±0.06°C	±0.05°C
Calibration Volume(mm)	Dia 24 x 300(D)	100(L) x 130(W) x 200(D)	90(L) x 90(W) x 150(D)	105(L) x 105(W) x 150(D)	Dia 90 x 140 (D)
Medium	Liquid Nitrogen	Methanol	Methanol	Silicon Oil	Silicon Oil

Calibration Equipments

Dry Blocks and Furnaces

Provides the most convenient, portable facilities for checking & calibrating industrial probes and they are usually reasonable rapid heating and cooling device. The unit consists of a special designed heating block which has located internal holes for the probes.

CALsys -30/110

CALsys 650

CALsys 1700

Models	CALsys -30/110 (Peltier Dry Block)	CALsys 650	CALsys 1200	CALsys 1200L	CALsys 12003Z (3- Zone Furnace)	CALsys 1500L	CALsys 1700L
Temperature Range	-30 to 110°C	50 to 650°C	250 to 1200°C	300 to 1200°C	300 to 1200°C	500 to 1500°C	500 to 1700°C
Stability	±0.07°C	±0.07°C	±0.3°C	±0.35°C	±0.35°C	±1.0°C	±1.5°C
Insert Construction (mm) Dia x Length	Dia 24 x 120(L), (3x6.0)holes 115 (D)	Dia 32 x 150(L), (4x6.5) holes 120 (D)	Dia 37 x 215(L), (2x6 & 2x8 holes) of 160 (D)	Dia 37 x 240(L), (2x6 & 2x8 holes) of 160 (D)	Dia 37 x 240(L), (2x6 & 2x8 holes) of 160 (D)	Dia 37 x 245(L), (2X6 & 2X8 holes) of 140 (D)	Dia 37 x 240 (L) (2x6 & 2x8 holes) of 225 (D)

Calibration Equipments

Black Body Source

Black Bodies are reference sources used for testing infrared systems. They are required in industry for calibration of pyrometers, infrared line scanners or cameras. In laboratory, they are part of benches for characterization of complex optronic systems. Tempsens offers a wide range of black bodies to cover all customer's need.

CALsys 110BB

CALsys 1200BB

FastCAL 3000

Models	CALsys 110BB	CALsys 500BB	CALsys 1200BB	CALsys 1500BB	CALsys 1700BB	Fast Cal 3000
Temperature Range	10 to 110°C	50 to 500°C	300 to 1200°C	500 to 1500°C	500 to 1700°C	600 to 3000°C
Stability	±0.1°C	±1.0°C	±0.5°C	±1.0°C	±2.0°C	±1.0°C
Emissivity	0.95	0.95	0.99	0.99	0.97	0.99
Calibration Area (mm)	Dia - 80mm	Dia - 100 mm	40 mm x 85 mm (Depth)	40 mm x 85 mm (Depth)	29 mm, 235 mm depth	25mm Dia & Depth 127 mm Graphite Cavity

Master Pyrometers With Special Calibration

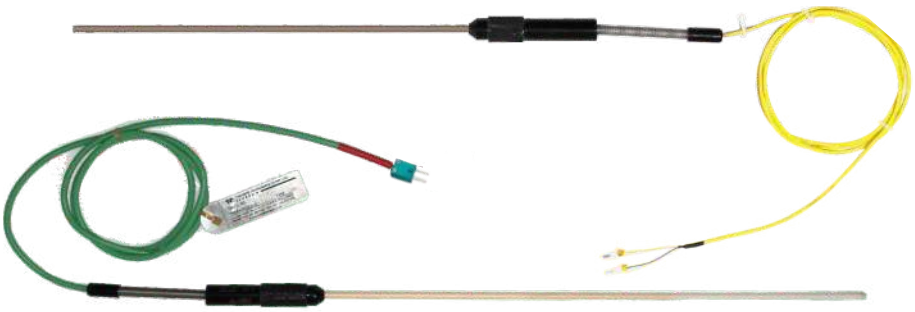
AST AL30	0 to 1000°C
AST A250	250 to 2500°C

Master Pyrometer A250

Calibration Equipments

Master Sensors

Accurate Master Temperature Sensors in various configuration are available with Calibration certificate from our NABL Accredited Lab.



SSPRT	**Type**	PT100/PT25
	Temperature Range	0 to 661°C
RTD	**Type**	PT 100
	Accuracy	1/10, 1/5, 1/3, 1/2 DIN, Class A
	Sheath Material	SS316, Inconel, Quartz
THERMOCOUPLE	**Type**	K/N/R/S
	Accuracy	Special, Class 1, with option cold junction compensation
	Sheath Material	Inconel/ Ceramic (KER710-C 799)

Automatic Calibration System (Auto Cal)

- ✓ Software for automated temperature calibration process.
- ✓ In-Built High Resolution 6 ½ digit digital readout.
- ✓ 12 Channel 4 wire RTD and 12 Channel of Thermocouple input.
- ✓ Includes Easy to use Connectors.
- ✓ Facilities for Temperature Calculation & Error Calculation.
- ✓ internal CJC compensation.
- ✓ Facility for data saving.

Calibration Equipments

Reference Junction Units

Reference Junction eliminates old fashioned ice bath and are used in industries and laboratories.

Type	CALref 0, CALref 60
Channel	20, 24
Ref. Temp	0, 60 °C
Type of Junction	J,K,T,E,N,R,S,B

CALSYS C-4004 (High Accuracy Digital Thermometer)

- High Stability of Temperature measurement (.098° C)
- High Accuracy of RTD Measurement (0.01° C)
- High Accuracy of Thermocouple Measurement (0.1° C)
- High Resolution
- 2 Measuring inputs
- 10 Thermocouple (B, C, D, E, J, K, N, R, S, T)
- 6 RTD's (PT-10, PT-50, PT-100, PT-200, PT-500, PT-1000)

Meters

TEMPMET 08 - THERMOCOUPLE & RTD

Inputs	B, C, D, E, J, K, N, R, S, T
	Pt100, Pt50, Pt10, Pt200, Pt500, Pt1000
Resolution	RTD - 0.01°C, T/C - 0.1°C
Accuracy	RTD - 0.3°C

TEMPMET 09 - THERMOCOUPLE & RTD

Inputs	B, C, D, E, J, K, N, R, S, T
	Pt100, Pt50, Pt10, Pt200, Pt500, Pt1000
Resolution	T/C - 0.01°C, RTD - 0.001°C
Accuracy	RTD - 0.05°C, T/C - 0.3°C

Furnaces

Thermal and Cable Solutions

Furnaces

Laboratory Furnaces

Laboratory Furnaces are a must for specific testing applications such as ashing, preheating , curing, annealing etc. We have models available in front entry, bottom entry, tubular furnace etc.

HTF - 1600

MF 312

TF - 1800 3Z

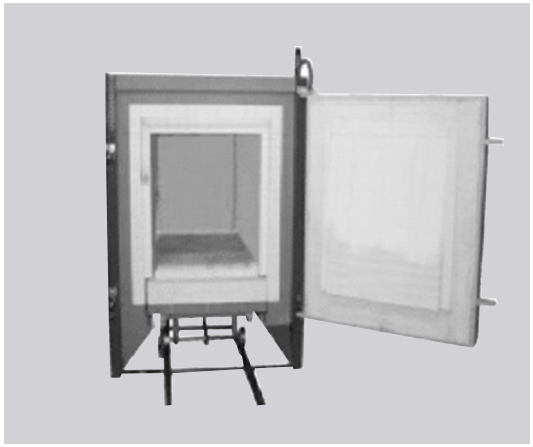
BLF 1800

Maximum Temperature	500 °C - 1800°C
Heating Elements	Kanthal A1, Silicon Carbide, $MoSi_2$
Controlling Sensors	N, R, B, S
Power Rating	2 - 8 KW
Volume(Ltrs.)	1.5 - 18.5

Furnaces

Industrial Furnaces

Industrial Furnaces find applications in processes such as casting, calcination, tempering etc. We offer wide range of industrial furnaces such as Chamber / Box Furnace, Bogie Hearth Furnace, Bottom Loading Furnace, Annealing Furnace, Pit Type Electric Furnace and Electric Conveyer Mesh-Belt Furnace

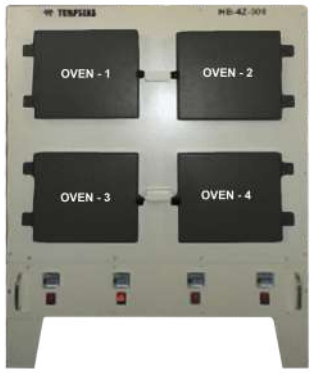


Maximum Temperature	1100 °C - 1800°C
Heating Elements	Kanthal APM, Nichrome, Silicon Carbide, $MoSi_2$
Controlling Sensors	K, N, R, B
Power Control	Power control through thyristor or SSR unit.
Temperature Controller	Microprocessor Based PID Temperature Controller

Furnaces

Laboratory / Industrial Ovens

Laboratory and Industrial Ovens Series offers a range of precision electric ovens. They are designed for low temperature thermal treatment such as drying, heating and thermal testing in an air-flow assisted environment.



Temperature Range	Upto 500ºC
Capacity	4 Liter to 14000 Liters

Microwave Furnace

Microwave Furnaces represent a system that combines free radiating heating elements with a microwaves field. Key advantages include greater energy efficiency, faster sample heating, more uniform heating and improved material properties.

Temperature Range	1200ºC (Max)
Heating System	Microwave by Magnetron

Other Special Furnaces

- Hybrid-dual Mode Furnace (microwave & resistance heating).
- Special vacuum & gas atmosphere furnace.

Services

Calibration Services

Tempsens Calibration Center is an independent unit of Tempsens instruments (I) Pvt. Ltd, having laboratories at Udaipur, Vadodara & Bangalore. It is accredited for wide range of temperature calibration services.

C-0321 Udaipur Lab | **C-1155** Vadodara Lab | **C-1226** Bangalore Lab

Tempsens is the only private sector Laboratory in the country with accredited Fixed Point Temperature calibration Facilities. The lab has highly stable calibration furnaces, measuring instruments and accurate master sensors traceable to National and International Standards.

The calibration center functions as per ISO 17025 / NABL standards. Calibration of contact type sensors can be made in temperature range of -196°C to 1600°C and Calibration of non contact type sensors can be made in temperature range 0°C to 2900°C. Further the laboratory is accredited for onsite temperature calibration.

The lab offer both at Lab & On-Site Calibration of Furnace/Bath from -80°C to 1600°C and Black Body Calibration from 50°C to 1700°C.

Furnace/Chamber Calibration (TUS) with multiple sensors from -80°C to 1200°C is also in the scope of the lab.

IN HOUSE CALIBRATION FACILITY

Quality Measured/ Instruments	Temperature Range	Calibration & Measurement Capability
Contact Type RTD, Thermocouples Thermometers	-196°C -80 to -38°C -38°C to 0°C >0°C to 140°C >140°C to 250°C >250°C to 650°C >650°C to 1200°C >1200°C to 1600°C	0.05°C 0.03°C 0.03°C 0.04°C 0.04°C 0.12°C 1.30°C 2.60°C
Non Contact Type Pyrometer	0°C to 250°C >250°C to 500°C >500°C to 1500°C >1500°C to 1700°C >1700°C to 2900°C	1.5°C 2.4°C 2.5°C 3.2°C 4.0°C

ON SITE CALIBRATION FACILITY

Quality Measured/ Instruments	Temperature Range	Calibration & Measurement Capability
Contact type RTD. Thermocouples Thermometers	-25°C to 0°C >0°C to 140°C >140°C to 250°C >250°C to 650°C >650°C to 1200°C	0.07°C 0.04°C 0.09°C 0.12°C 1.30°C
Non Contact Type Pyrometer	0°C to 250°C >250°C to 500°C >500°C to 1200°C	1.50°C 2.40°C 2.5°C
Multipoint Position Calibration of Chamber, Oven, Furnaces (Thermal Mapping(TUS))	-80°C to 200°C >200°C to 1200°C	2.8°C 4.1°C

PRIMARY TEMPERATURE CALIBRATION FACILITIES

Quality Measured/ Instruments	Temperature Range	Calibration & Measurement Capability
Calibration of SPRT/PRTS/ thermocouple etc.	Triple Point of Water (0.01°C) Melting Point of Gallium (29.7646°C) Freezing Point of Tin (231.928°C) Freezing Point of Zinc (419.527°C) Freezing Point of Aluminum (660.323°C)	0.0038°C 0.0065°C 0.0065°C 0.0071°C 0.0075°C
Calibration of Thermocouple at Secondary Fixed Point	Melting Point of Gold(1064.18 °C)	0.72°C
	Melting Point of Palladium(1554.8 °C)	0.83°C

Pyrotech
Group Company
www.pyrotechindia.com

TEMPSENS

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