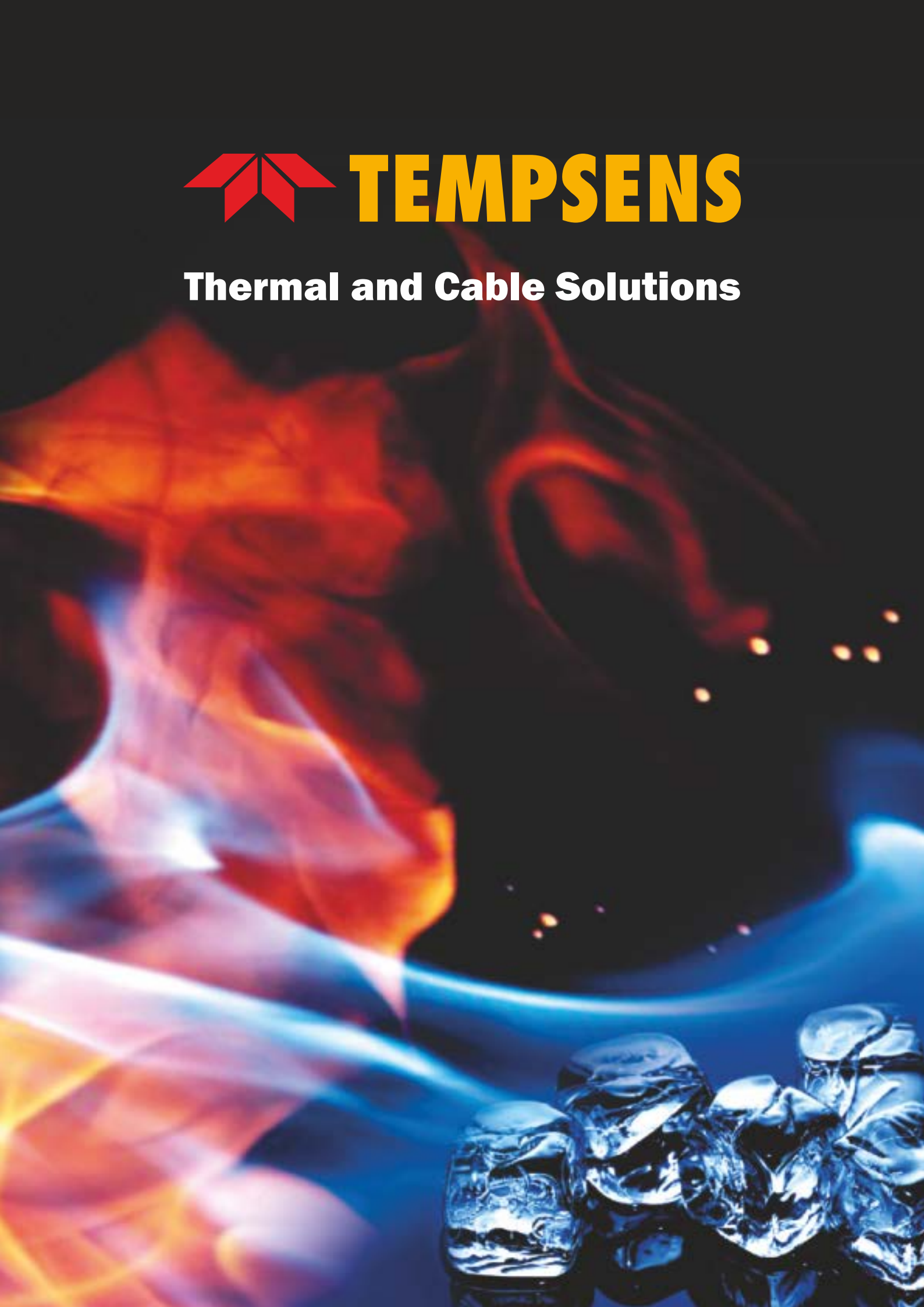
TEMPSENS

Thermal and Cable Solutions



About The Company

Tempsens is a part 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 Thermal and cable solutions.

After the initial beginning with Thermocouples and RTDs, Tempsens has increased its product basket to Wires, Cables, Non-Contact Pyrometers, Thermal Imagers, Heaters, Furnaces and Calibration equipment etc. Tempsens has been adding innovative products in its domain area.

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

With covered area of 4,00,000 sq. ft. in head office India and plants in Germany, Indonesia and Middle East, we today are the largest and most innovative company in our domain.

Tempsens is an ISO 9001:2015, ISO 14001:2015, ISO 45001: 2018, ATEX, IECEX certified company with five NABL Accredited Laboratories.

Tempsens has earned the customer reputation worldwide of being a preferred vendor for its custom built and innovative solutions; quick delivery, high technical standards and outstanding quality.

Tempsens Instruments U# I

Tempsens Instruments U# II

Tempsens Instruments U# II Cable Plant

Tempsens Instruments U# IV Cable Plant

Marathon & AST Plant

Tempsens GmbH - Germany

Pt. Tempsens Asia Jaya- Indonesia

About The Company

800
EMPLOYEES

OVER
6500
CUSTOMERS

40+
YEARS
EXPERIENCE

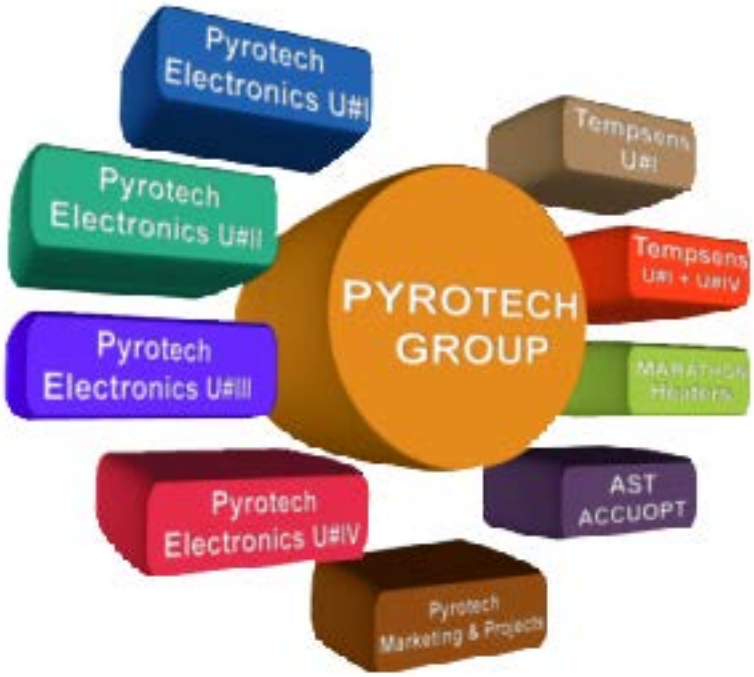
SALES IN OVER
75
COUNTRIES
AROUND THE GLOBE

4
GLOBAL LOCATIONS

4
PATENTS

~30%
YOY GROWTH

About 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
- Robotic Welding Machines
- Micro Plasma Welding Machines
- TIG Welding Machines with Pulse Hot TIG 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 with Online Annealing Machines
- 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, Tin, Silver Plating Lines

NICKEL ALLOY PLANT

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

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

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

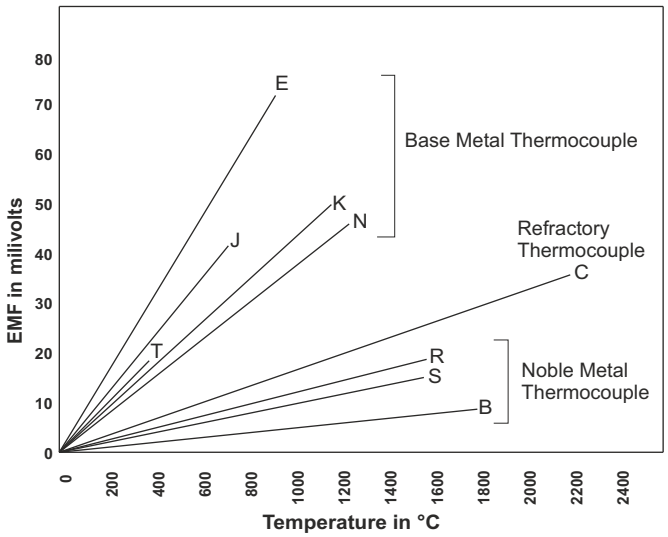
Contact Temperature Sensors

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

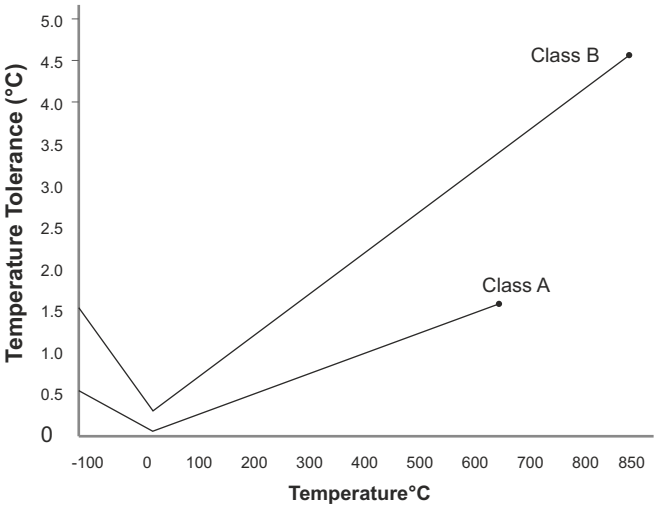
RTD

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.

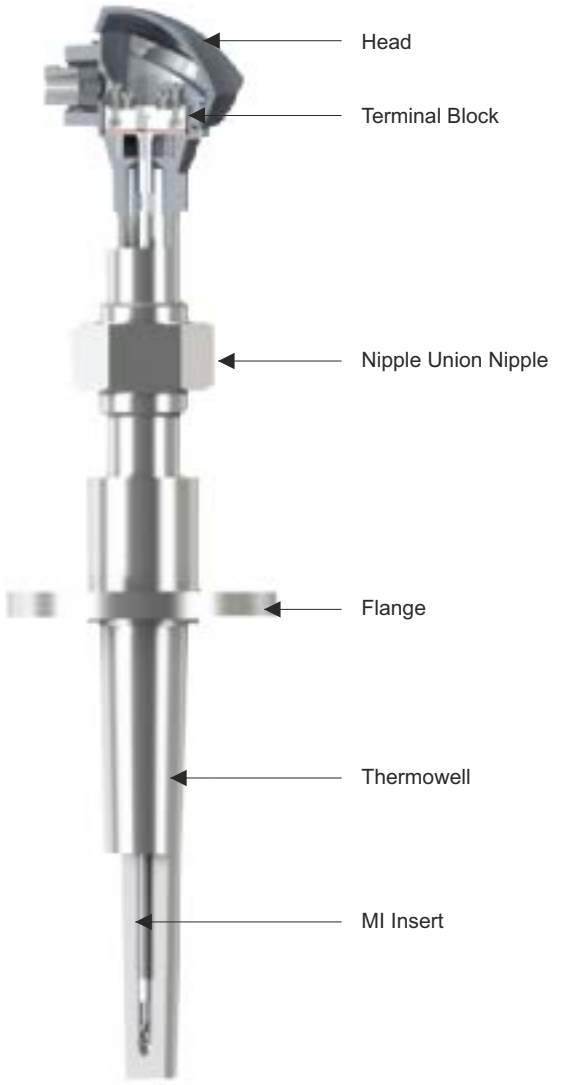


Tolerance Table for Type of RTD(as per IEC 751) Pt100

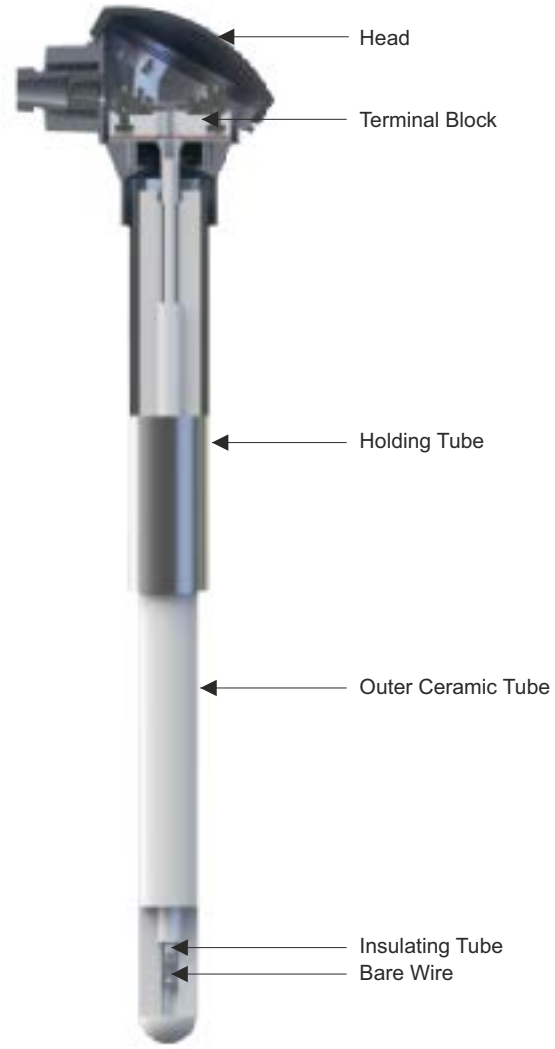
Temperature	Class A (±)	Class B (±)
-200°C	0.55°C	1.3°C
-100°C	0.35°C	0.8°C
0°C	0.15°C	0.3°C
100°C	0.35°C	0.8°C
200°C	0.55°C	1.3°C
300°C	0.75°C	1.8°C
400°C	0.95°C	2.3°C
500°C	1.15°C	2.8°C
600°C	1.35°C	3.3°C
700°C	-	3.8°C
800°C	-	4.3°C
850°C	-	4.6°C

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 size on request
(Non-MI)	1.2, 1.6, 2.0, 2.5, 3.2 mm, Other size 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 size on request
Sheath Material	SS321, SS316, SS310, HRS 446, Inconel 600, Nimonic, Pyrosil, Platinum etc.
Configuration	Simplex/Duplex/Multipoint
Configuration	• Miniature Thermocouple 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, 04, 0.40, 0.45, 0.5 mm, Other size on request
Protection Sheath Material	Recrystallized Alumina Ceramic(C-799), 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	Pt100, 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	Pt100, 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/Multipoint

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.

Special Thermowells with machined or welded helical strakes are available. Wake frequency calculation as per PTC 19.3 can be provided on request.

Material	SS304, SS316, SS316L, SS321, SS310, HRS446, INCONEL600/800/601 Hastalloy, Monel, Titanium etc.
Type	Drilled Barstock, Fabricated
Construction	Tapered, Straight, Helical
Process Connection	Screwed, Flanged
Certification	IBR certification as 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	6 x 4, 8 x 5, 10 x 6, 12 x 8, 15 x 10, 20 x 15, 24 x 18 mm etc.
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
Dia Size	63, 100, 150 mm
Stem Dia	6, 8, 10, 12 mm
Range	Min. -40°C, Max. 600°C
Accuracy	Class 1 as per EN13190
Standard	EN13190/IS13211
Enclosure Protection	IP-65(Filled), IP-68
Connection	1/8", 1/4", 3/8", 1/2" BSP/NPT (M/F)
Mounting	Center Back, Bottom Direct, Every Angle Mounting
Over Range Protection	30% above FSD

Pressure Gauges

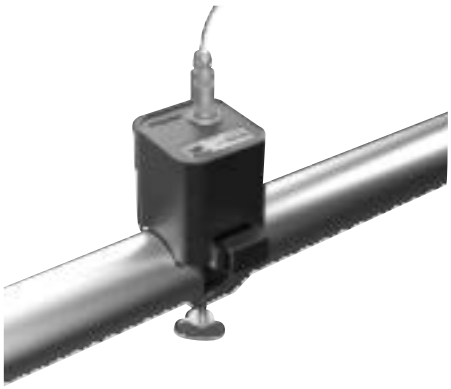
Sensing Elements	Bourdon Tube, Sealed Diaphragm, Compact Sealed Diaphragm, Schaffer Diaphragm, Capsule Diaphragm, Low Pressure Diaphragm, Differential Pressure Gauge, Meghnelic Gauge.
Dia Size	40, 50, 63, 80, 100, 150, 250 mm
Range	Vacuum, Compound, 0...1Kg/cm^2 to 0....2100Kg/cm^2
Accuracy	±1% FSD
Over-Range Protection	30% above FSD
Standard	IS3624, EN837
Enclosure Protection	IP-65(Filled), IP-68
Connection	1/8", 1/4", 3/8", 1/2" BSP/NPT (M/F)
Mounting	Botttom/Back Direct, Bottom Surface, Back Panel, Back Bracket Mounting

Accessories

Non Invasive Clamp Sensors

Conventional invasive type sensors such as RTDs and thermocouples with Thermowells were used to measure process media temperature inside a pipe. Surface temperature sensors were also used to approximate the inside temperature. At Tempsens, we have developed India's first noninvasive sensors for measuring the temperature of process media flowing inside the pipe. This sensor eliminate all of the major problems faced by conventional thermowell sensing technology and surface temperature sensors.

Temperature Range	0°C - 100°C
Ambient Temperature	0°C - 40°C
Accuracy for metal	±3°C
Response time	7 sec.
Standard pipe size 1,	1, 2 inch
Components	head, Clamp and electronic box
Analog Output	Analog Output 0 - 20mA, 4 - 20mA, 0 - 10V
Digital Output	USB 2.0 RS-232/RS-485 interface card (Optional) *At a time only one digital output possible



Temperature Transmitters

Head Mounted Type

Din Rail Type

Wireless Transmitter & Receiver

Input Type	RTD, TC, Ohm, mV
Output Signal	Analog 4 ~ 20mA, 2 wire/4wire
Accuracy	Pt100 ±0.2% full scale, Thermocouple ±0.3% max. of full scale
Communication	HART Protocol / USB
Power Supply	12 to 25 V DC

Input Type	RTD, TC, Ohm, mV
Accuracy	0.1% of full scale
Resolution	0.1°C
Battery Life	1 Year
Radio Frequency	868 MHZ

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 / TEMPMET 09 THERMOCOUPLE & RTD

Thermocouple	B, C, D, E, J, K, N, R, S, T
RTD	Pt100, Pt,50, Pt10, Pt200, Pt500, Pt1000
Channels*	RTD-1 No., T/C-1 No.
Resolution	0.01°C (for Tempmet 08) 0.001°C 9for Tempmet 09)
Accuracy	RTD-0.3°C

*2 Channel available on request

Temperature Indicators / Controllers

Wall Mounted

Panel Mounted

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

Fiber Optic Temperature Sensors

Fiber optic temperature sensing is a technology where optical fiber as a passive sensor is used in various sensing applications as it have advantages such as electromagnetic immunity, multi-point measurement, chemically inertness, reliability, small size and light weight.

Our precise and accurate fiber optics sensors quickly detects and respond to surface hot-spot conditions while triggering alarms and relays to protect important assets. It is suitable for hot-spot monitoring and condition monitoring application in commercial transportation, hydro and nuclear power plant station, oil and gas pipelines and harsh environments having high electromagnetic interference.

FluoroSenz

Fiber Optic Monitoring System for real-time temperature or hotspot detection in Transformers and High Voltage Switchgears. Provides precise and accurate single-point measurements in harsh environments having EMI, RFI and high voltages.

Temperature Measurement Range	-40°C to 260°C
Temperature Accuracy	±1°C
Temperature Resolution	0.1°C
Number of Channels	Upto 16
Communication Interface	USB 2.0, RS-485, Ethernet (RJ-45)
Power Supply	100-230 V AC, 50-60 Hz

BraggSenz

Highly Accurate Multi-point Bragg Wavelength Shift Detection system suitable for Temperature, Strain, and Vibration sensing in wide-range of Industrial, Commercial, and R&D applications using Fiber Bragg Grating Technology.

Temperature Measurement Range	-20°C - 650°C
Temperature Accuracy	±1°C
Temperature Resolution	0.1°C
Number of Channels	Upto 8
Number of Sensing Point	Upto 20
Communication Interface	USB 2.0, RS-485, Ethernet (RJ-45)
Power Supply	100-230 V AC, 50-60 Hz

DTSenz

Distributed Temperature Sensing System ideal for linear heat detection and fire detection in tunnels, conveyor belts, and power transmission lines. It outputs a continuous temperature profile along the whole length of optical fiber cable.

Temperature Measurement Range	-40°C - 200°C (Sensor cable dependent)
Temperature Accuracy	±1°C
Temperature Resolution	0.1°C
Number of Channels	Upto 16
Communication Interface	USB 2.0, RS-485, Ethernet (RJ-45)
Power Supply	100-230 V AC, 50-60 Hz
Length of Fiber	Upto 10 km

Thermal Profiling System

From heat treatment process in industries proper temperature monitoring of the product is essential for better product quality. Adequate temperature monitoring of the product also helps in process optimization and energy savings. A Thermal Profiling System consists of a data logger i.e., Smartrack 10, which stores data, and a thermal barrier box, which protects data logger electronics from high-temperature environment.

SmarTrack10

Data logger Smartrack 10 is constructed using a solid block of aluminium and is perfect for monitoring your day to day temperature requirements.

No. of Channel	10
Thermocouple Type	K Type
Accuracy	±1.0°C(for sampling interval ≥ 1sec.)
Resolution	0.1°C
Memory Size	50000 readings per channel with Date & Time
Sample Interval	100 msec to 1 hour
Communications	USB
Max. Operating Temperature	70°C (Rechargeable) 100°C (Non-Rechargeable)
Weight	500 gm
Parameterising via Software	Type selection, No of channel selection, sampling interval, sate & time setting
LED Indications	Charging, Low Battery, Communication, Start, Stop etc.
Future Scope	Wireless Telemetry (Wi-Fi / Bluetooth)

Thermal Barrier Box

Thermal barriers provide essential protection for the data logger electronics against high and low temperatures in the furnaces. Thermal barriers are typically constructed of a high-temperature steel enclosure, a layer of microporous insulation, and a sealed phase change heatsink (PCM/Water) that surround the data logger which maintains its temperature within permissible limits. We have a wide range of thermal barrier boxes that provide the best thermal protection range up to 1200°C for more than 12 hours, depending on the temperature range, duration and application.

Applications

1. Reflow Oven / Soldering process monitoring.
2. Paint and powder coating industries.
3. Low Temperature Tempering.
4. Heat Treatment processes.
5. Slab/Billet reheat process.
6. Vacuum annealing heat treatment

(a) Magnetic Clamp Sensor

(b) Mini-Mag Sensor

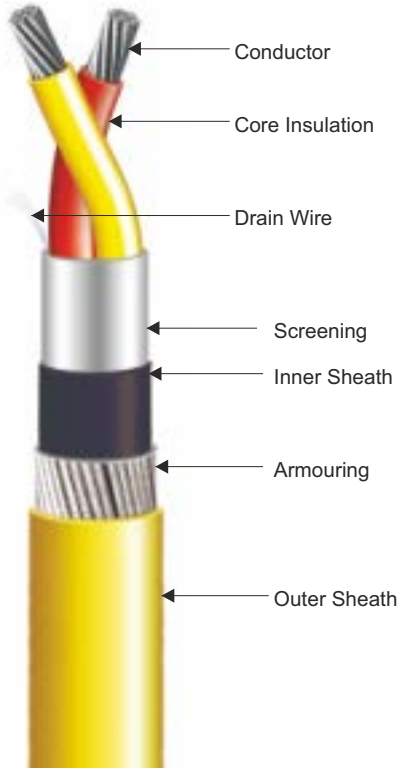
(c) Sheet Clamp Sensor

(d) Surface Magnetic Probe

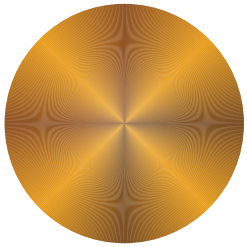
Cables & Wires

Thermal and Cable Solutions

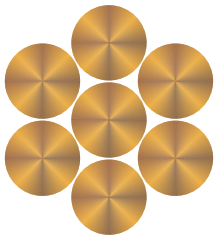
Cables



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),

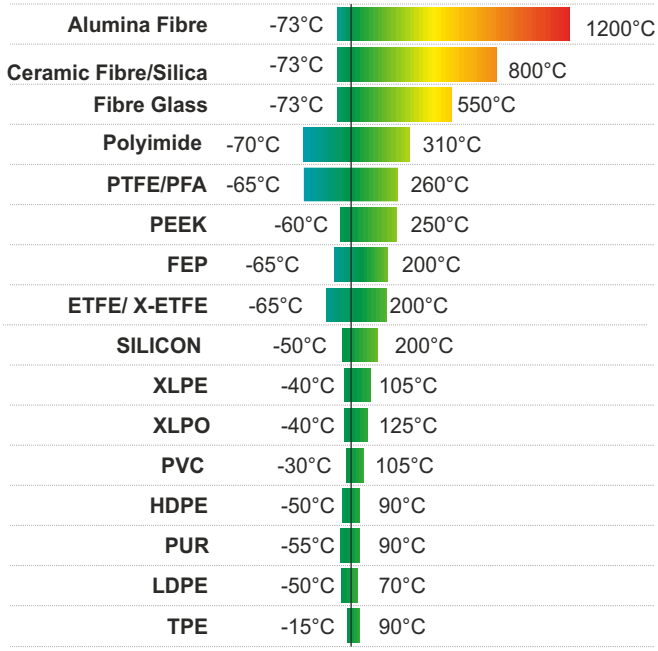
Silver Plated High Strength Copper Alloy etc.

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 -73°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, IEC 60502-1
- G.I. Wire Braiding as per BS 502887

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

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 34
Conductor Stranding	Solid or Multi Strand
Core Insulation	PVC, XLPE, LSZH, PE, PTFE, FEP, PFA, PEEK, Silicon, ETFE, Polyiomide, Fiber Glass, Ceramic Fiber, Alumina Yarn
Screening	Aluminum Foil Type / Mesh Braided Type
Inner/Outer Sheath	PVC, LSZH, PTFE, FEP, PFA, ETFE, Silicon, Polyimide, Fiber Glass, Ceramic Fiber, PUR, Alumina Yarn
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

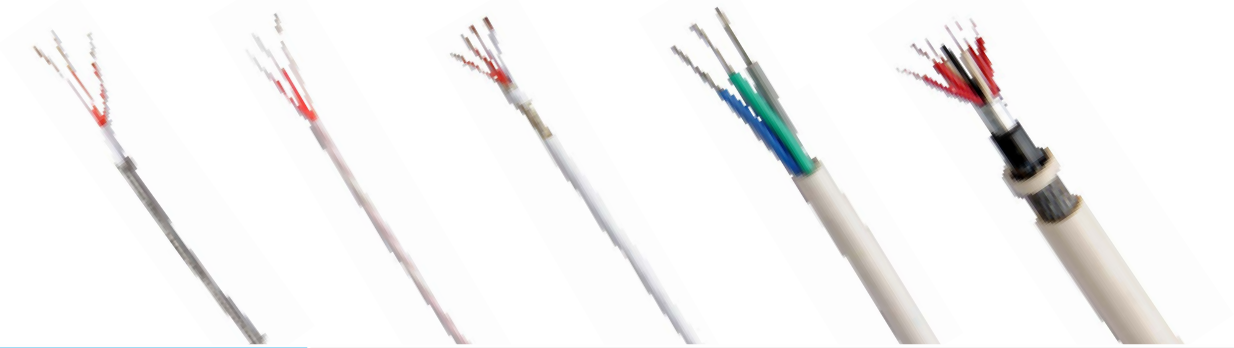
Colour Code & Accuracy of Thermocouple, Extension& Compensating Cables

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

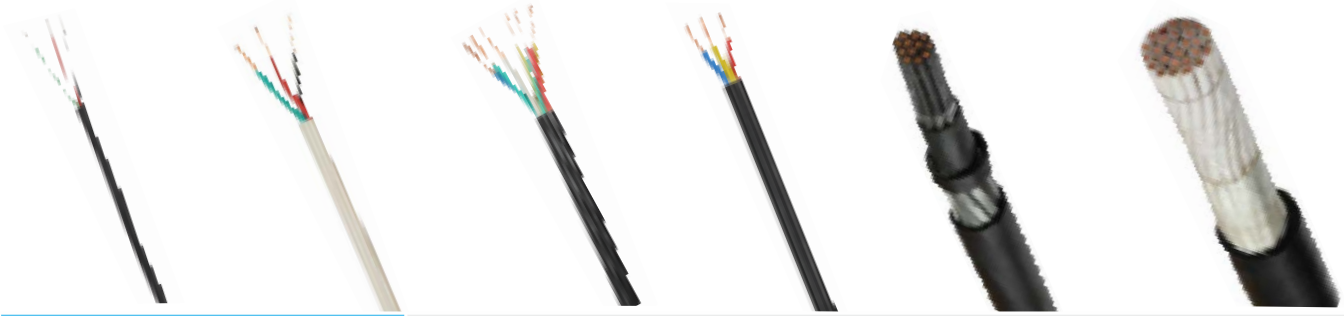
RTD triad cables are used to carry the RTD signals to the control room or field mounted instruments.



Construction	Single or 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, PUR, LSZH Polymer etc.
Armouring	G.I. Armouring/SS Braiding/G.I. Braiding (For High Temperature insulations)
Standards	As per BS 5303 Part 1 and Part 2, IS 1554, EN 50288-7, Is7098, DIN 43760, JSS 51038

LT Control & Power Cables

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



Construction	Single or 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 300Sq. 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 (for Control Cable)
Inner/Outer Sheath	PVC, HR PVC, PE, LSZH Polymer, FR PVC, FRLS PVC, PUR, XLPO etc.
Armouring	G.I Round Wire/Flat Strip Armouring (As per IS3975:99), G.I. Braiding
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 up to 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.
Armouring	G.I. Round Wire/Flat Strip Armouring, G.I. Wire Braiding
Standards	As per BS 5303 Part 1 and Part 2, IS 1554, EN 50288-7, IS 7098

Fire Survival Cables

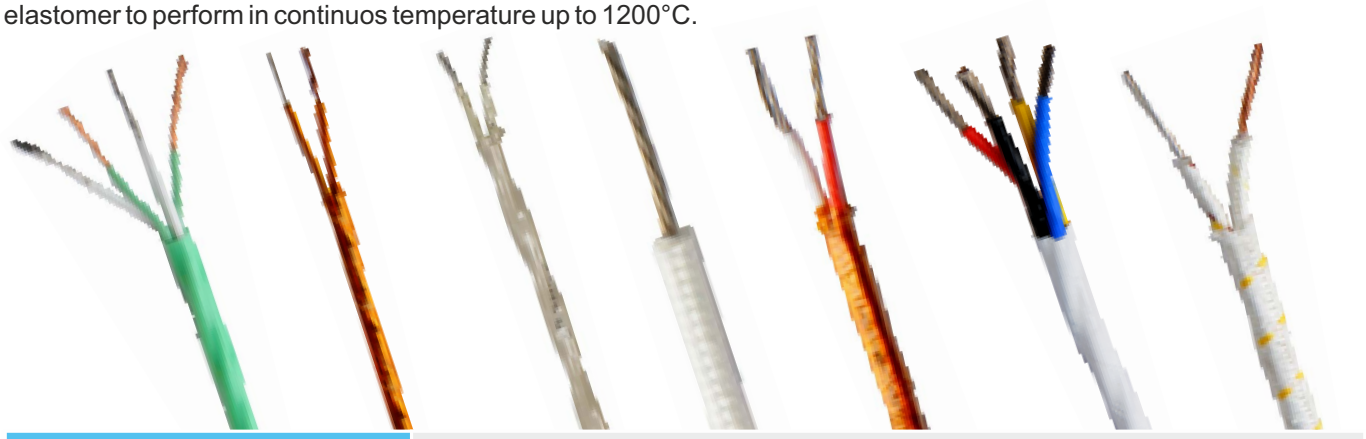
Fire Survival Cables are used in the installations where vital circuits are required to continue operation under fire conditions. In all disaster, fire smoke head & toxic fumes are the main obstacles to safe evacuation of a building area.A major contribution towards overcoming these hazards is the use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

Construction	Electrolytic Grade Bare Copper/Tinned Copper
Fire Resist Heat Barrier	Glass Mica heat barrier Tape
Insulation	XLPE/SILICON
Screening	Al-myler/Metal Braided
Inner/Output Sheath	Halogen Free Low Smoke Polymeric Compound / FRLS PVC
Armouring	G.I. Round Wire/ G.I. Flat Strip/ G.I. Wire Braiding
Standard	IEC 60331, IEC 60332, IEC 60754, BS 6387, EN 50290-2-27, BS 7655, BS 7679-1, 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
Temperature Range	Up to 1100°C (for Thermocouple Cables) Max. 600°C (for Resistance Power & Control Cables) Max. 400°C (for Instrumentation Cables)
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, Polyimide Tape
Core Insulation	FEP, PTFE, PEEK, PFA, Silicon, PEEK, ETFE/X-ETFE, Polyimide, Fiber Glass, Ceramic, Fiber, Alumina Fiber
Screening Method	Individual and Overall
Screening	Aluminum Foil with Drain Wire/ Mesh Braided
Inner/Outer Sheath	FEP, PTFE, PEEK, PFA, Silicon, PEEK, ETFE/X-ETFE, Polyimide, Fiber Glass, Ceramic Fiber, Alumina Fiber
Armouring	Stainless Steel Wire Braided
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

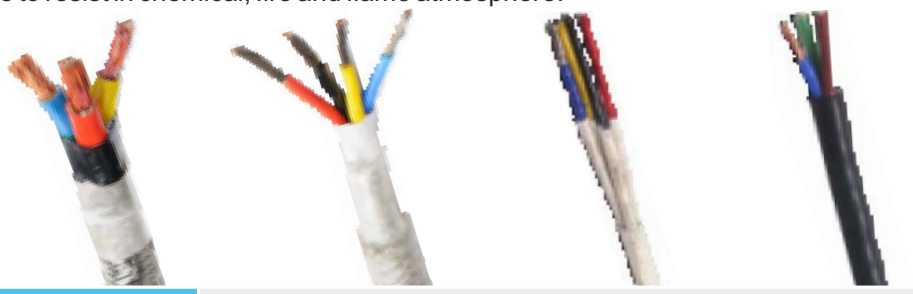
DC Solar Cable are single core copper cables each for +ve and -ve, They are insulated with cross linkable Low Smoke Zero Halogen compound and sheathed with Low Smoke Zero Halogen compound (Conforming to BS EN 50618:2014 Standard)

- 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 600°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 up to 240 Sq. mm
Heat Barrier Tape	Polyimide Tape
Conductor Stranding	Multistrand as per IS 8130:84/ IEC 60228
Core Insulation	PTFE, FEP, PFA, Silicon, Fiber Glass, Ceramic Fiber etc.
Isolator	Polyimide, Sintered PTET Foil
Fire Barrier Type	Glass Mica Tape
Screening	Mesh Braided (Overall)
Inner/Outer Sheath	Teflon, Fiber Glass, Ceramic Fiber etc.
Outer Braiding	Asbestos
Armouring	SS Braiding
Standards	As per IS 8130:84, JSS 51038, JSS 51037
Max. Temperature Range	550°C continuos, 600°C short time

Sleeves

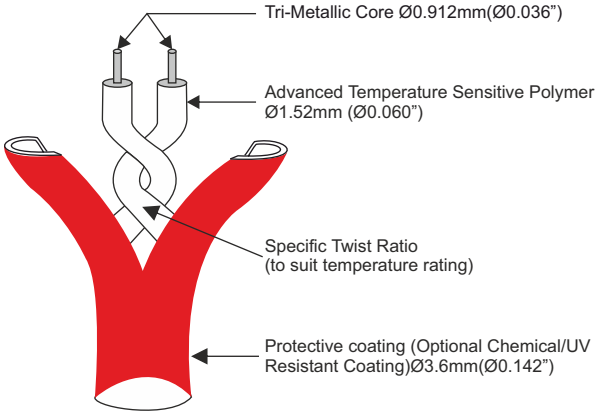
Variety of sleeves suitable for wide temperature range with various insulation such as PTFE, FEP, Silicon, Fiber Glass, Stainless Steel wire, Polyamide & PVC.

inner Diameter	0.50 mm to 30 mm
Voltage Grade	Up to 4KV
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

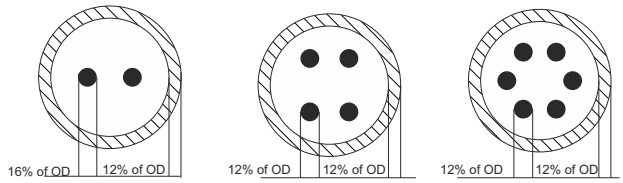
Digital Linear Heat Sensing Cables



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 RRK-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 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

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

Air Heaters

Sheath Material	SS304
Sheath Outer Diameter	63.5 mm, 101.6 mm
Wattage	Available ranging from 2kW to 30 kW
Watt Density	Up to 77 W/inch2
Glass wool Insulation	Up to 1200°C
Wattage tolerance	+5%, -10%
Resistance tolerance	-5%, +10%

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

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.

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.

Coil Heaters

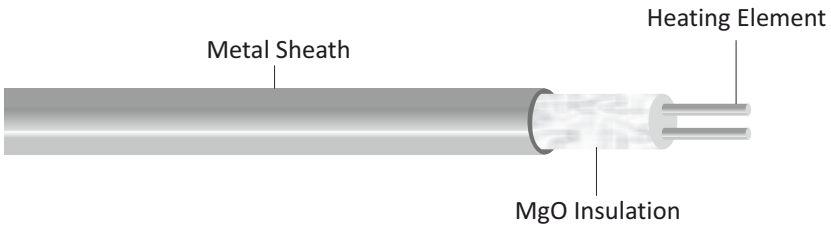
The basic construction of these heaters consist of compacted MgO, high temperature resistance wire and Chrome Nickel Steel tube. These heaters can be constructed with or without built in thermocouples.

CE IEC cULus Ex Underwriters Laboratories

Component Heaters

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

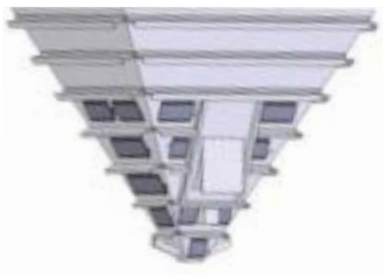
Silicon Rubber Heaters



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

Hopper Heating Modules

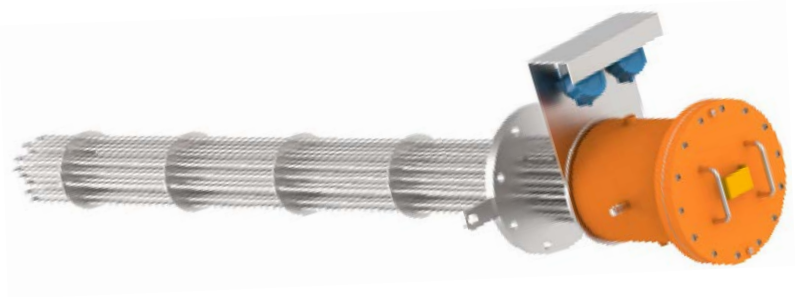
Marathon Hopper Heating Jackets are ideally suited to raise or maintain elevated temperatures of the contents in reaction vessels, storage tanks, tankers and process equipments in industries.

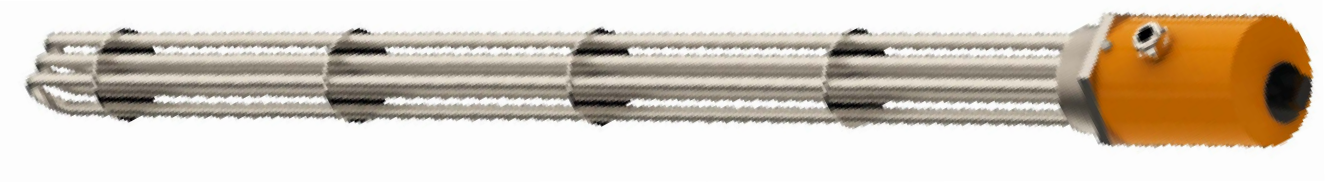



Temperature Range	Up to 200°C
Applications	hopper heating, Vessels, Storage Tanks etc.

Process Heaters

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





Temperature Range	Up to 750°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, IECEX, UL, BLS, PESO etc.

Process Heaters

Skid Heaters

Each heater skid is custom made design to suite respective process specifications. A Typical Heater Skid consist of

- Electric Heater bundle
- Pressure Vessel or housing for the Heater Bundle
- Control Panel for the Heater operation control
- Temperature sensors such as RTD's, thermocouples, temperature transmitters, etc.
- Pressure Safety Valve
- Valves for flow control
- Power & Instrument wiring
- Skid base for easy installation at site.

Additional Scope such as extended piping, scrubber installation, Instrumentation for flow, pressure & level monitoring etc. can be provided on specific requirement.

We perform “customized” executions by designing each skid in accordance with the needs of the end user, either composed of thermal oil heater, or only by re-circulation units or secondary groups. The main targets of these skids are asphalt sector and petrochemicals; the automotive industry or wood sector, for heating presses, etc.

Features

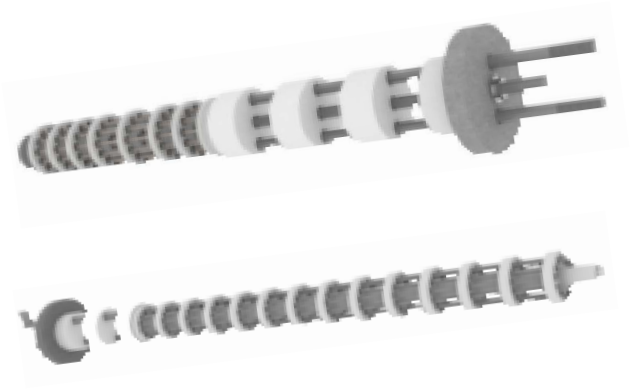
- Single point piping connections for flow and return.
- Optional stainless-steel terminal box and control panel.
- Single point terminations for field power and instrumentation cabling.

Furnace Heaters

High Temperature Bundle Rod Heaters and Metallic Heating Elements are used for different furnace applications including Annealing Furnaces, Galvanizing Furnaces etc.

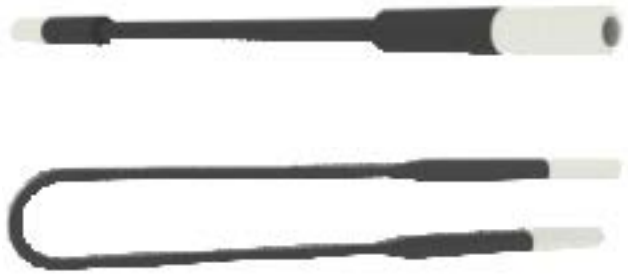
Bundle Rod Heaters

Temperature Range	Upto 1100°C
Heating Element	NiCr 80:20, Ferritic Alloys (FeCrAl) (Powder Metallurgical Heating Element
Radiant Tube Material	HU, Alloy-600 etc. (Customized Diameters and Length)
Application Areas	Annealing Furnace, Spherodizing Furnace, Other Heat Treatment Furnaces



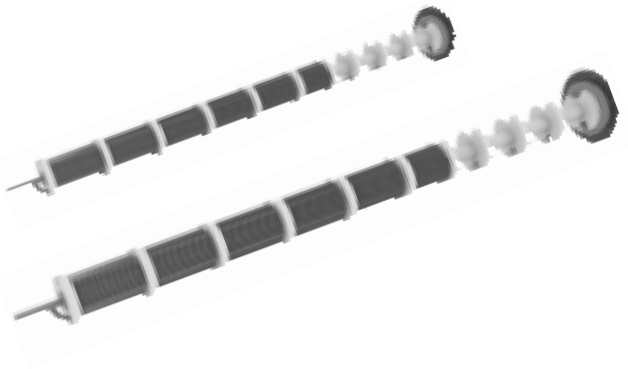
Silicon Carbide Heating Elements

Temperature Range	Upto 1600°C
Heating Element	Ceramic material with relatively high electrical conductivity
Application Areas	Aluminium Holding & Melting Furnace, Industrial Ovens, Glass feeder & Float Glass Line, Laboratory Furnaces



Edge Wound Heaters

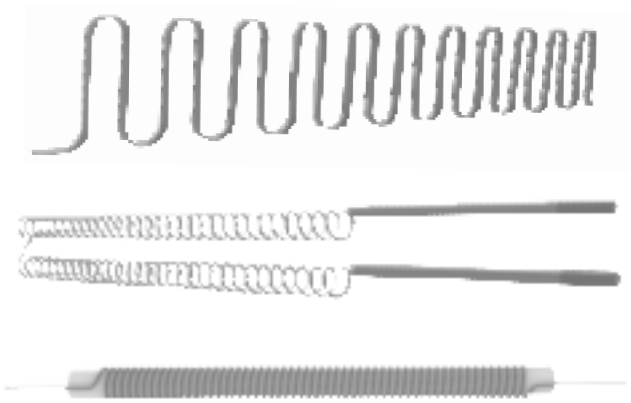
Temperature Range	Upto 1100°C
Heating Element	NiCr 80:20
Radiant Tube Material	HU, Alloy-600 etc. (Customized Diameters and Length)
Application Areas	Annealing Furnace, Spherodizing Furnace, Other Heat Treatment Furnaces



Furnace Heaters

Metallic Heating Elements

Temperature Range	Upto 1100°C
Strip Element	NiCr 80:20, Ferritic Alloys (FeCrAl) (Powder Metallurgical Heating Element
Application Areas	Ammonia Cracker, Furnace Elements etc.



Ceramic Bobbin Heaters

Temperature Range	Upto 800°C
Heating Element	NiCr 80:20
Application Areas	Ammonia Cracker, Furnace Elements etc.

Accessories

Radiant Tube Material
HU, HK-40, Alloy-600/800, SS310

Hanger Material
NiCr 80:20

Radiant Tubes

Hangers

Floor Heating Cables & Mats

Radiant floor heating is the most energy-efficient way of delivering heat. It is a low-temperature technology that may be regulated individually in each area because it warms the people and item directly rather than heating air.

Floor Heating Cables

Floor Heating Mats

Specifications

Shielding Coverage	100% Coverage
Bending Radius	5 times of cable thickness
Jacketing	Heat Resistant and Flame Retardant Jacketing
Flexibility of Cable	Excellent Flexibility for easy installation
Long Cold Lead	3.5 meter cold tail (Can be customized as per requirement)
Comfort	Higher degrees of comfort can be achieved by using heating cables with close and consistent spacing, as well as thermostat to determine temperature needs.
Range	Standard heat loads are available in 100 watt to 3300 watt. As part of the offered product range, several sizes for various types / sizes of flooring are also available.
Custom-Built	In addition to this broad range, cables can be customized to meet specific length requirements, as well as heat loads and voltage needs.

Advantages of Marathon Heating Cables & Mats

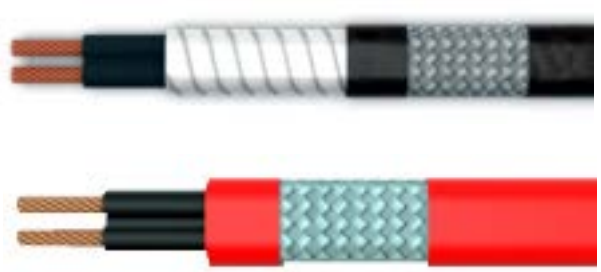
- Easy installation and can be installed in any area in the house and any type of flooring.
- Can be an excellent option for low-energy homes.
- Works quietly from beneath the tiles/plywood.
- Underfloor heating distributes heat where it is needed, resulting in maximum heat efficiency and only very little heat loss.
- Easy to control required temperature in all weather by digital temperature controller with thermostat.
- For optimal protection, Marathon floor heating cables & mats are insulated using XPLE/ETFE/FEP/PTFE on both the conductors and PVC (HR-FR) on the outer jacket.
- To facilitate 'tape-down' installation, the mats are also available into the preassembled fiber glass mesh.
- Marathon floor heating cables & mats are completely grounded and comes with a 3.5 meter long cold lead wire for power connection.

Heat Tracing Solutions

Constant Wattage Heat Tracing Cables

Parallel circuit Heating cables are constant watt arrangement designed to put out a certain amount of wattage per linear foot of cable. These are generally constructed of two #12AWG polymer insulated parallel bus wires with a nickel alloy heating element wire wrapped alternatively along the insulated bus wires. These connections are made at the 'NODE' point where the nickel-alloy heating element is either welded or connected by rivets. The entire element assembly is then dielectrically insulated with an additional polymer jacket. The power output per unit length is constant, regardless of the overall length of the heating unit.

Output wattage at 10°C	20, 30, 40, 50, 60 W/M
Braiding covering area	Over 85%
Surface Temperature	200°C
Max. exposure	230°C
Cut to Length	Yes
Min Bending radius	25 mm
Voltage	230 V / Customise
Insulation	Dark Brown



Self Regulating Heating Cables

Marathon Heaters self regulating heating cable provide the most versatility in heat trace design and applications. Constructed of a Semi-conductive heater matrix extruded between parallel bus wires, a self regulating cable adjusts its output to independently respond to ambient temperatures all along its length. As temperatures increase, the heater's resistance increase which lower the output wattage. Conversely, as the temperature decrease, the resistance decreases and the cable produces more heat.

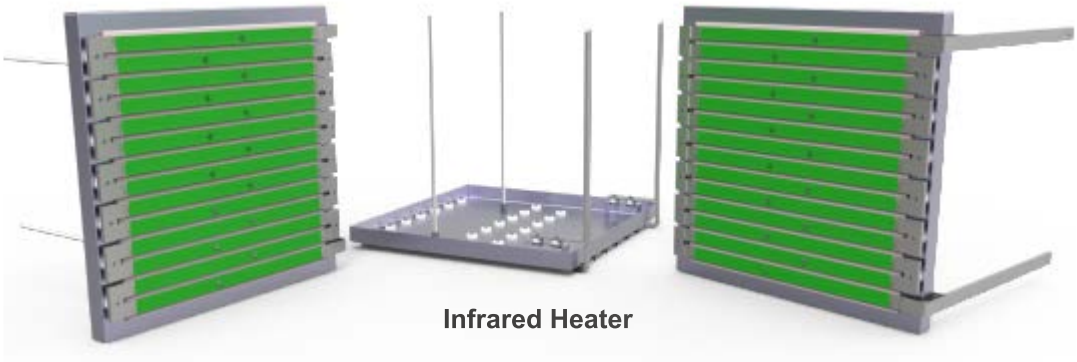
LTSRH (Low Temperature Self Regulating Heating Cables)

Output wattage at 10°C	10, 15, 25, 30, 35 W/M
Braiding covering area	Over 85%
Max. maintain temp @10°C	65°C
Max. exposure temp.	105°C
Min.installation temp.	-40°C
Bending radius	5 times*cable thickness
Voltage	208-277 V
Insulation color	Black
Regular size to insulation	10*4mm (Width*Thickness)

MTSRH (Medium Temperature Self Regulating Heating Cables)

Output wattage at 10°C	40, 45, 50, 60 W/M
Braiding covering area	Over 85%
Max. maintain temp @10°C	105°C
Max. exposure temp.	135°C
Min.installation temp.	-40°C
Bending radius	10 times*cable thickness
Voltage	208-277 V
Insulation color	Grey
Regular size to insulation	11.8*3.4mm-polyolefin insulation 11.6*3.2 Fluoropolymer insulation (Width*Thickness)

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.

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.

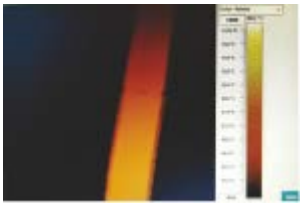
A+ Series

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	A250+	A250C+	A450+	A450C+
Temperature Range	210°C - 3000°C	475°C - 1475°C	600°C - 2500°C	600°C - 2500°C
Emissivity	0.1….1.0 adjustable	0.75....1.25 slope adjustable	0.1….1.0 adjustable	0.75....1.25 slope adjustable
Spectral Range	1.6 µm	1.5µm/1.6 µm	1.0 µm	0.7….1.15 µm
Distance to Spot Size Ratio	75:1, 150:1, 300:1	150:1	300:1	150:1, 300:1
Response Time	2 msec adjustable upto 10 sec	100 msec adjustable upto 10 sec	2 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	±0.3% of the measured value +1°C	±0.5% of the measured value +1°C
Analog Output	0-20mA, 4-20mA (User selectable)			
Digital Output	RS-485	RS-485	RS-485	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	A250+ FO PL	A250C+ FO PL	A450+ FO PL	A450C+ FO PL
Temperature Range	250°C - 2500°C	350°C - 1350°C	600°C - 2500°C	800°C - 2500°C
Emissivity	0.1….1.0 adjustable	0.75....1.25 slope adjustable	0.1….1.0 adjustable	0.75....1.25 slope adjustable
Spectral Range	1.6 µm	1.5µm/1.6 µm	1.0 µm	0.7….1.15 µm
Distance to Spot Size Ratio	100:1, 200:1, 400:1	100:1, 200:1	100:1, 200:1, 400:1	100:1, 200:1, 400:1
Response Time	2 msec adjustable upto 10 sec	100 msec adjustable upto 10 sec	2 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	±0.3% of the measured value +1°C	±0.5% of the measured value +1°C
Analog Output	0-20mA, 4-20mA (User selectable)			
Digital Output	RS-485	RS-485	RS-485	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	A150	A250	A250C	A450	A450C
Temperature Range	75°C - 700°C	210°C - 3000°C	350°C - 1350°C	600°C - 2500°C	600°C - 2500°C
Emissivity	0.1....1.0 adjustable	0.1....1.0 adjustable	0.75....1.25 slope adjustable	0.1....1.0 adjustable	0.75....1.25 slope adjustable
Spectral Range	2 to 2.6 µm	1.6 µm	1.5µm/1.6µm	1.0 µm	0.7.....1.15 µm
Distance to Spot Size Ratio	40 : 1	50 : 1, 100 : 1, 200 : 1, 200 : 1	100:1, 200:1	200 : 1	100 : 1, 200 : 1
Response Time	2 msec. adjustable upto 10 sec.		100 msec adjustable upto 10 sec	2 msec. adjustable upto 10 sec	10 msec.
Accuracy	Upto 400°C : 3°C T> 400°C : 0.5% of measured value in °C +1°C	±0.3% of the measured value +1°C	±0.5% of the measured value + 1°C	±0.3% of the measured value +1°C	±0.5% of the measured value +1°C
Analog Output	0-20mA, 4-20mA, 0-10V (User selectable)				
Digital Output	Bluetooth/USB 2.0, RS-232 / 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 FO PL	A250C FO PL	A450 FO PL	A450C FO PL
Temperature Range	250°C - 2500°C	350°C - 1350°C	600°C - 2500°C	800°C - 3200°C
Emissivity	0.1.....1.0 adjustable	0.75....1.25 slope adjustable	0.1.....1.0 adjustable	0.75....1.25 slope adjustable
Spectral Range	1.6µm	1.5µm/1.6µm	1.0 µm	0.7.....1.15µm
Distance to Spot Size Ratio	100:1, 200:1	100:1, 200:1	100:1, 200:1	100:1, 200:1
Response Time	2 msec. adjustable upto 10 sec	100 msec. adjustable upto 10 sec	2 msec adjustable upto 10 sec	20 msec. adjustable upto 10 sec
Accuracy	±0.3% of the measured value +1°C	±0.5% of measured value +1°C	±0.3% of the measured value +1°C	±0.5% of measured value +1°C
Analog Output	0-20mA, 4-20mA, 0-10V (User selectable)			
Digital Output	Bluetooth/USB 2.0, RS-232 / RS - 485 (User Selectable)			

Pyrometers

A Series with Thermopile (AL)

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

Model	AL30	AL390	AL514	AL45
Temperature Range	0°C - 1000°C	300°C - 1400°C	300°C - 2500°C	400°C - 1500°C
Emissivity	0.1...1.2 adjustable	0.1 … 1.2 adjustable	0.1 … 1.2 adjustable	0.1….1.2 adjustable
Spectral Range	8.....14µm	3.9 µm	5.14 µm	4.43 µm
Distance to Spot Size Ratio	50 : 1, 100 : 1	50 : 1	50 : 1	40 : 1
Response Time	60 msec. adjustable upto 10 sec			
Accuracy	T< 200°C; ±1.5% of measured value or 3°C T⩾200°C ; ±1.0% of measured value or 4°C	T< 500°C ; ±1.5% of measured value T⩾500°C ; ±1.0% of measured value	T< 500°C ; ±1.5% of measured value T⩾500°C ; ±1.0% of measured value	T < 500°C ,± 1.5% of measured value T⩾ 500°C, ± 1% of measured value
Analog Output	0-20mA, 4-20mA, 0-10V (User selectable)			
Digital Output	USB 2.0, RS-232 / RS - 485 (User Selectable)			

Pyrometer for Glass Industry

Model	AST 450G2	PGM+
Temperature Range	600°C ... 1800°C	200°C....600°C
Emissivity	0.05....1 adjustable	0.1...1.0 adjustable
Spectral Range	1.0 µm	1.6µm
Distance to Spot Size Ratio	100 : 1	-
Response Time	250msec. adjustable upto 10 sec.	2 msec. adjustable upto 10 sec.
Accuracy	±0.3% of measured value or ±3°C whichever is greater	±0.3% of measured value ±1°C
Analog Output	4 - 20 mA	-
Digital Output	USB	USB 2.0

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	E150	E250	E450	E450C	EL50/EL50H
Temperature Range	100°C….600°C	250°C - 1800°C	600°C - 1900°C	800°C - 2500°C	-20°C - 800°C
Emissivity	0.1….1.0 adjustable	0.1....1.0 adjustable	0.1....1.0 adjustable	0.75....1.25 slope adjustable	0.1...1.2 adjustable
Spectral Range	2.3.....2.6 µm	1.6µm	1µm	0.7.....1.15µm	8.....14µm
Distance to Spot Size Ratio	20 : 1, 40 : 1	20 : 1, 40 : 1, 80 : 1	80 : 1	80 : 1	2:1, 15:1
Response Time	2 msec adjustable upto 10 sec	2 msec. adjustable upto 10 sec.	2 msec. adjustable upto 10 sec.	20 msec. adjustable upto10 sec.	20/60 msec. adjustable upto 10 sec.
Accuracy	±0.5% of the measured value ±2°C	±0.3% of the measured value +1°C	±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	0-20mA, 4-20mA, 0-10V(User Selectable)				
Digital Output	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	T3-814	T3-250	T3-390	T3-514	T3-450
Temperature Range	0°C - 1000°C	250°C - 2500°C	300°C - 1400°C	300°C - 2500°C	600°C - 2500°C
Emissivity	0.1….1.0 adjustable at device				
Spectral Range	8 µm...14 µm	1.6 µm	3.9µm	5.14 µm	1.0 µm
Distance to Spot Size Ratio	50:1, 100:1	50:1, 100:1, 200:1	50:1	50:1	200:1
Response Time	60 msec. adjustable upto 10sec	10 msec adjustable upto 10 sec	60 msec. adjustable upto 10sec	60 msec. adjustable upto 10sec	10 msec adjustable upto 10 sec
Accuracy	T < 200°C; ± 1.5% of measured value or 3°C, whichever is greater T ⩾ 200°C; ± 1% of measured value or 4°C is greater	± 0.3% of the measured value + 1°C	T < 500°C; ± 1.5% of measured value T ⩾ 500°C; ± 1% of measured value	T < 500°C; ± 1.5% of measured value, T ⩾ 500°C, ± 1% of measured value	± 0.3% of the measured value + 1°C
Analog Output	2 wire....4-20mA(Isolated)				
Digital Output	TTL Output				

Pyrometers

Portable Pyrometers

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



Model	TCT 500	TI 1500	TI 1800	AST P250	AST P450	AST P450C	AST P390
Temperature Range	-60°C - 500°C	0°C - 1500°C	250°C - 2400°C	210°C - 2500°C	600°C - 3000°C	600°C - 2500°C	400°C - 1400°C
Emissivity	0.95	0.1 to 1.2	0.1 to 1.2	0.1 to 1.2 adjustable			0.1 to 1.0
Spectral range	8....14µm	8....14µm	1.1....1.6µm	1.6µm	1.0µm	0.7....1.15µm	3.9µm
Distance to spot size ratio	12:1	50:1	100:1	100:1, 200:1, 400:1	400:1	200:1 400:1	200:1
Response time	1 sec.	100msec.	10msec.	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	25 msec in Numerical Mode, 30 msec in Graphical Mode
Accuracy	±2% of the reading or 2°C whichever is greater	±0.1% of the measured value 2°C whichever is greater	±0.3% of the measured value 1°C whichever is greater	±0.3% of the measured value 1°C	±0.3% of the measured value 1°C	±0.5% of the measured value 1°C	200 ±1.0% of the measured value 1°C :1
Analog output	20mA						
Digital output	USB 2.0						

Special Pyrometer



Model	SWIFT SERIES 250/350/450	ALUMINIUM PYROMETERS A5	AST IR CAST 2C	AST IR CAST 2C+
Temperature Range	250°C....3000°C	300°C....2000°C	700°C....1700°C	
Emissivity	0.1 ...1.0	0.1...1.0	0.75....1.25 slope adjustable	
Spectral Range	1.6µm	1.3...1.6µm	0.7....1.15µm	
Distance to Spot Size Ratio	150:1, 300:1, 300:1	100:1, 200:1	DV=166:1(V=Vertical) DH=33:1(H=Horizontal)	DV=250:1(V=Vertical) DH=50:1(H=Horizontal)
Response Time	10 µmsec. adjustable upto 10 sec.	Adjustable from 0.15 to 17 sec.	20msec. adjustable upto 10 sec.	
Accuracy	±0.5% of the measured value	±1%	±0.5% of measured value +1°C	
Analog Output	0-20mA, 4-20mA (User selectable)	4-20mA, 0-20mA, 0-10V, K Type T/C	4....20mA or (0-20mA/0-10V) user selectable	
Digital Output	Ethernet	RS-232, RS-422, RSX-485, USB,	USB 2.0, RS-232 or RS-485 (user selectable)	

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

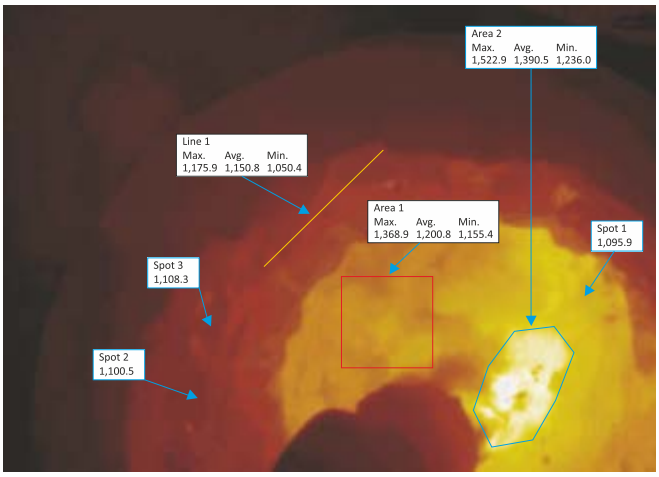
CCD Camera (Normal View)

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 tp 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 & 1100mm
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

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

Accuopt/Tempsens develops Thermal Imaging Camera for radiometric and security surveillance application.

ThermCAM 80

ThermCAM 160

ThermCAM 384

ThermCAM 640

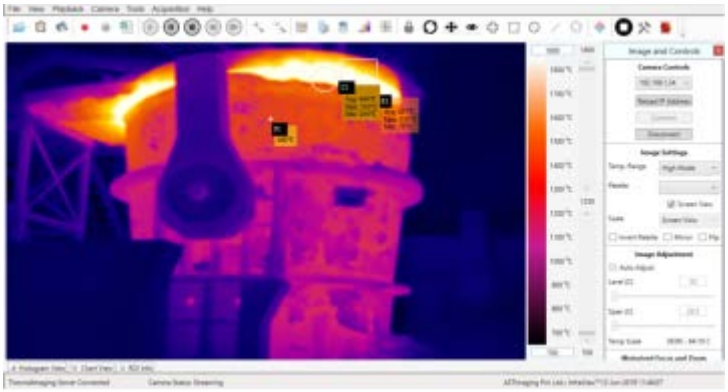
ThermCAM HT

Model	ThermCAM 80	ThermCAM 160	ThermCAM 384	ThermCAM 640	ThermCAM HT
Description	Low Resolution Long Wavelength Infrared Camera for Fault detection	Medium Resolution, Long Wavelength Infrared Camera	High Resolution, Long Wavelength Infrared Camera	High Resolution, Long Wavelength Infrared Camera	High Resolution, Camera for high temperature measurement
Temperature Range	-20°C to 120°C 100°C to 1000°C (Switchable via InfraView Software)	-20°C to 120°C 100°C to 1000°C (Switchable via InfraView Software)	-20°C to 120°C 100°C to 1000°C (Switchable via InfraView Software)	-20°C to 120°C 100°C to 1000°C (Switchable via InfraView Software)	700°C to 1800°C
FOV	28° x 28°	31° x 23°	28.19° x 21.33° (Other FOVs also available)°	23° x 17.3° (Other FOVs also available)°	20.6° x 15.5° (Other FOVs also available)°
Spectral Range	8 - 14µm	8 - 14µm	8 - 14µm	8 - 14µm	0.85 - 1.1µm
Detector	Uncooled FPA detector	Uncooled FPA detector	Uncooled FPA detector	Uncooled FPA detector	High Dynamic CMOS Detector
Optical IR Resolution / Frame Rate	80 x 80 pixels @25Hz	160 x 120 pixels @30Hz	384 x 288 pixels @30Hz	640 x 480 pixels @15Hz	640 x 480 pixels @25Hz
Ambient Temperature	0°C to 50°C	0°C to 50°C	0°C to 50°C	0°C to 50°C	0°C to 50°C

Thermal Imagers

Software InfraView

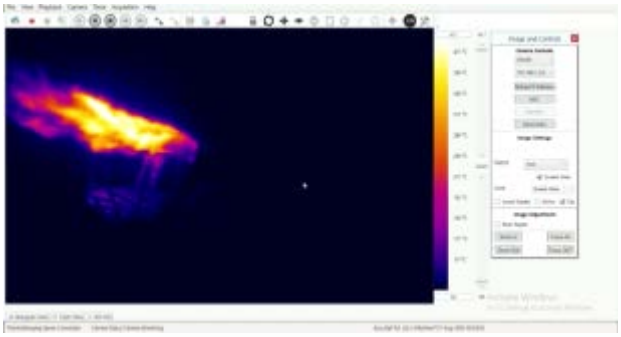
Accuopt's InfraView™ software is under the standard scope of supply with Thermal Imaging Cameras. It is a windows based thermal image processing software. It provides high-speed, real-time data acquisition, which enables viewing, analyzing, and storage of thermal data captured by AccuOpt's thermal imaging infrared cameras.



- Real time display of thermal images.
- Include 9 different colour palates.
- Multiple type of ROI including point, Line and area with min./max./avg. temperature display.
- Includes analysis tools like histogram and temperature trend chart for multiple ROI's.
- Alarm generation for entire or ROI based on min./max./avg. temperature.

Solutions

FlareStack Monitoring System



Flare View

- FlareVIEW, an automated system for continuous monitoring of Pilot Flame presence & flame temperature as well.
- Configurable storage and temperature video recording.
- Provide continuous thermal output in all-weather conditions.
- High shock and vibration tolerance for maintenance-free operation.
- Analog outputs corresponding to flame temperature and Digital relay output for flame status.

Substation Hotspot Monitoring System

SparkView

- SparkView is an Automated Hot-Spot Monitoring system for substations/switchyards componets like CT (current transformer), PT (power transformer), CB (circuit Breakers) Surge or Lightning and many more.
- Early detection of faults ensuring preventive maintenance.
- Reduces human activity in the critical areas.
- 24/7 inspection leading towards reliable operation.
- 360° view for maximum coverage using Pan-Tilt System.
- Dashboard and analytics features for future evaluation.

Thermal Imagers

Hand Held Thermal Imagers

Model	ThermEye 256	ThermEye 256M	ThermEye 384	ThermEye 640
Resolution	256 x 192	251 x 192	384 x 288	640 x 512
Detector	Uncooled Microbolometer	Uncooled Microbolometer	Uncooled Microbolometer	Uncooled Microbolometer
Temperature Range	-20°C ... 550°C	-20°C ... 550°C (Optional upto 1200°C	-20°C ... 650°C (Optional upto 2000°C)	-20°C ... 650°C (Optional upto 2000°C)
FOV	56° x 42.2°	24° x 18° (Optional 46°, 12°, 7°)	24° x 18° (Optional 48°, 12°, 6°)	24° x 18° (Optional 48°, 12°, 6°)
NETD	50mK	50mK	35mK	35mK
Focus	Fixed	Manual, Automatic, Electric	Manual, Automatic, Electric	Manual, Automatic, Electric
Spectral Range	7.5µm....14µm	7.5µm....14µm	7.5µm....14µm	7.5µm....14µm
Emissivity	0.01 to 1.0	0.01 to 1.0	0.1 to 1.0	0.1 to 1.0

Defense Solutions

Scorpion 640

Scorpion 640 is high thermal weapon scope suitable for a wide range of weapons and also can be used as a helmet mount or handheld unit.

This thermal imaging scope works on shutter less technology with sharpest image output using 12 microns high resolution thermal imaging sensor.

Owl 360

Owl 360 is a panoramic thermal imaging camera for wide area surveillance. It has close packed, lightweight and waterproof design which can be positioned on light tower or on top of a building for 360° view.

This thermal imaging system has a main application area in airport surveillance, 24/7 perimeter security, censorious infrastructure supervision.

Python 384

Python 384 is a multi-sensor system designed for perimeter security using high performance radar, self-developed thermal camera and HD low light camera.

When object are detected by radar or thermal / visual camera, the data is further transmitted to the control room.

Calibration Equipments

Thermal and Cable Solutions

Calibration Equipments for Contact Type Sensors

Portable Dry Block Calibrator

Provides the most convenient, portable facilities for contact type temperature sensor checking and calibrating. they have usually very fast response (Rapid Heating and Cooling). basically dry-block calibrators have a removable metal inserted for measurement.

Model	CALsys -190/-80	CALsys -100/40	CALsys -30/110	CALsys 650	CALsys 1200
Temperature Range	-190°C to -80°C	-100°C to 40°C	-30°C to 110°C	50°C to 650°C	250°C to 1200°C
Stability	±0.1°C	±0.04°C	±0.07°C	±0.05°C	±0.3°C
Uniformity	±0.2°C	±0.05°C	±0.08°C	±0.1°C	±0.4°C
Insert Construction	Dia 25x330(L) (2x6 & 2x8 holes) of 300(D)	Dia 37x160(L) (4x6 holes) of 150(D)	(1x8 & 2x6 holes) of 120(D)	Dia 32x150(L) 4 holes of 6.5 x 120(D)	Dia 37x180(L) (2x6 & 2x8 holes) of 160(D)
Dimensions (WxHxD) mm	270 x 380 x 270	510 x 245 x 350	380 x 170 x 188	325 x 185 x 265	405 x 205 x 285
Weight	15 Kg	16 Kg	12 Kg	10 Kg	12 Kg

Laboratory Furnace

Model	CALsys 1200L	CALsys 1500L	CALsys 1700L
Temperature Range	300°C to 1200°C	500°C to 1500°C	-30°C to 110°C
Stability	±0.35°C	±1.0°C	±0.07°C
Uniformity	±0.4°C	±1.2°C	±0.08°C
Insert Construction	Dia 37x240(L) (2x6 & 2x8 holes) of 160(D)mm	Dia 37x245(L) (2x6 & 2x8 holes) of 140(D)mm	Dia 37x245(L) (2x6 & 2x8 holes) of 220(D)mm
Dimensions (WxHxD) mm	590 x 450 x 530	590 x 450 x 530	640 x 500 x 550
Weight	55 Kg	55 Kg	130 Kg

Calibration Equipments for Contact Type Sensors

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. Methanol is used for -80°C to 50°C, Water from 5°C to 70°C and Silicon Oil for up to 250°C.




Model	CALsys -80/50*	CALsys -40/50*	CALsys -35/200*	CALsys 250
Temperature Range	-80°C to 50°C	-40°C to 50°C	-35°C to 200°C	50°C to 250°C
Stability	±0.07°C	±0.07°C	±0.04°C	±0.04°C
Uniformity	±0.09°C	±0.09°C	±0.07°C	±0.06°C
Calibration Volume (L x W x D)	90 x 90 x 200	105 x 105 x 150	105 x 105 x 150	90 x 140
Medium	Methanol	Methanol	Methanol/Silicon Oil	Silicon Oil
Dimensions (WxHxD) mm	630 x 1200 x 500	702 x 140 x 603	702 x 410 x 605	330 x 250 x 350
Weight (Kg)	135	65	65	12

Reference Master Sensor

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

Model	Type S	Type K	SSPRT	TPRT110
Temperature Range	0 to 1500°C	0 to 1200°C	-200°C to 670°C	-80°C to 400°C
Element Type	S(Pt10%Rh/Pt)	NI-CR-SI/N	PT 100	PT 100
No. of Element	Simplex	Simplex	Simplex	Simplex
Sheath Material	Alumina (99.7% pure Al203)	Inconel 600	Inconel 600	SS-316
Sheath Length	450 mm	450 mm	450 mm	450 mm
Extension Cable	1.5 mtr. Long Teflon insulated cable with male/female miniature connector	1.5 mtr. Long Teflon insulated cable with male/female miniature connector	1.5 mtr. Long Teflon insulated silver plated copper cable with flying leads	1.5 mtr. Long Teflon insulated silver plated copper cable with flying leads
Sheath Diameter	6 mm	6 mm	6 mm	6 mm
Calibration	At 5 points ar Tempsens NABL Accredited Lab	At 5 points ar Tempsens NABL Accredited Lab	5 Fixed Point Calibration	At 5 points at Tempsens NABL Accredited Lab
Accuracy	Special Class (0.6°C or 0.1% of temperature whichever is greater)	Special Class (1.1°C or 0.4% of temperature whichever is greater)	Drift ±30°C at 0°C after 100 Hrs at 670°C	0.03 at 0°C

Calibration Equipments

Automatic Temperature Calibrator

Autocal -80/50

Autocal -100/40

Autocal 650

Autocal 1200

- Easy–to-read color 5 Inch LCD Display with perfect overview of actual Temp calibrator status.
- Intuitive, Fast and User-Friendly navigation.
- 4 Channel Calibration (4 No's Easy to use Universal input connector suitable for thermocouple and Rtd).
- Internal CJC Compensation.
- Ethernet (LAN) Communication with CALsys 650 AUTOCAL Model for PC/Laptop Interface.
- USB Connector for Data saving (Optional)
- Temperature Range from -196°C to 1700°C

Manual Mode:

Auto Mode:

Calfast

Quick And Easy To Carry Temperature Calibrator For On-site Calibration

Model	Calfast 120	Calfast 350	Calfast BB
Temperature Range	-10°C to 125°C	50°C to 350°C	50°C to 400°C
Stability	±0.05°C	±0.05°C	±0.1°C
Uniformity	±0.1°C	±0.2°C	±0.2°C
Heating Time	10 Minutes	15 Minutes	15 Minutes
Weight (Kg)	2	1.5	1.5
Dimensions (WxHxD) mm	110 x 120 x 170	80 x 120 x 170	120 x 200 x 180

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

Input	B, C, D, E, J, K, N, R, S, T Pt100, Pt50, Pt10, Pt200, Pt500, Pt1000
Resolution	RTD - 0.01°C, T/C - 0.01°C
Ref. Temp.	RTD - 0.3°C

TEMPMET 09 - Thermocouple & RTD

Input	B, C, D, E, J, K, N, R, S, T Pt100, Pt50, Pt10, Pt200, Pt500, Pt1000
Resolution	RTD - 0.001°C, T/C - 0.001°C
Ref. Temp.	RTD - 0.05°C, T/C - 0.3°C

Calibration Equipments for Non-Contact Type Sensors

Extended Area Black Body Temperature Calibrator

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.

Model	LBBCH SP.	LBBCH	LBBH	LBBCH DUAL
Temperature Range	(-)40°C to 100°C	0°C to 110°C	50°C to 500°C	-20°C to 500°C
Stability	±0.1°C	±0.01°C	±0.1°C	±0.01°C at 50°C
Uniformity	±0.2°C at 50°C	±0.1 ar 50°C	±2 ar 400°C	±0.1 at 50°C
Emissivity	0.98 ±0.02	0.98 (±0.02)	0.98 (±0.02)	0.99 (±0.01)
Emissivity Area	Upto 300 x 300 mm^2	Upto 300 x 300 mm^2	Upto 300 x 300 mm^2	Upto 50 x 50 mm^2

High Temperature Black Body Calibrator

Model	CALsys 1200BB	CALsys 1500BB	CALsys 1700BB	Fast Cal 3000
Temperature Range	300°C to 1200°C	500°C to 1500°C	500°C to 1700°C	600°C to 3000°C
Stability	±0.5°C	±0.05°C	±1.5°C	±1.0°C
Emissivity	0.99	0.99	0.97	0.99
Calibration Area (mm)	Dia 40 x 85 (D)	Dia 40 x 85 (D)	Dia 29 x 235 (D)	Dia 25 x 127 (D) Graphite Cavity

Master Pyrometers With Special Calibration

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

Master Pyrometer A250

Furnaces

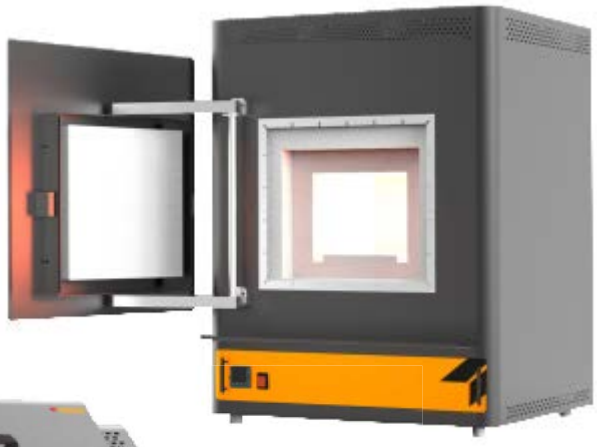
Thermal and Cable Solutions

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, Split tube furnace etc.

MF 312



HTF - 1600

STF 1200

TF - 1800

BLF 1800

Maximum Temperature	300°C to 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	300°C to 1800°C
Heating Elements	Kanthal APM, Nichrome, Silicon Carbide, MoS_{i2}
Controlling Sensors	K, N, R, B
Power Rating	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 5000°C
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	1700°C (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 & Indonesia. It is accredited as per ISO17025 : 2017 for wide range of temperature calibration services.

CC-2840 Udaipur Lab | **CL-105** Vadodara Lab | Bangalore Lab | **LK-345-IDN** Indonesia Lab

IN HOUSE CALIBRATION FACILITY

Quality Measured/ Instruments	Temperature Range	Calibration & Measurement Capability
Contact Type RTD, Thermocouples Thermometers	-196°C -80°C -180 To -80°C >10°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 0.05°C 0.04°C 0.10°C 1.30°C 2.60°C
Non Contact Type Pyrometer	0°C to 250°C >250°C to 500°C -30 to -15°C -15 to 250°C >500°C to 1700°C >1700°C to 3000°C	1.5°C 2.44°C 2.40°C 1.6°C 3.74°C 7.08°C

ON SITE CALIBRATION FACILITY

Quality Measured/ Instruments	Temperature Range	Calibration & Measurement Capability
Contact type RTD. Thermocouples Thermometers	-100°C to -25°C -25°C to 0°C >0°C to 250°C >250°C to 650°C >650°C to 1200°C	0.07°C 0.07°C 0.04°C 0.08°C 1.30°C
Non Contact Type Pyrometer	-15°C to 250°C >250°C to 500°C >500°C to 1200°C 1200°C to 1700°C	1.60°C 2.44°C 3.50°C 3.74°C
Multipoint Position Calibration of Chamber, Oven, Furnaces (Thermal Mapping(TUS))	-80°C to 200°C >200°C to 1200°C	0.50°C 3.8°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

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 : 2017 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 3000°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.

TEMPSENS

Pyrotech
Group Company
www.pyrotechindia.com

TEMPSENS

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