Product Catalogue

- Thermocouples & RTDs
- Non-Contact Pyrometers
- Instrumentation & Control Cables
- Mineral Insulated Cables
- Heaters
- Furnaces
- Temperature Calibration Equipments
- Temperature & Pressure Gauges
- Calibration Services

TEMPSENS

www.tempsens.com

ABOUT THE COMPANY

TEMPSENS Instruments (I) Pvt. Ltd is a part of Pyrotech group which was established by four technocrats in 1976 at Udaipur, with its first product as Thermocouples and RTDs.

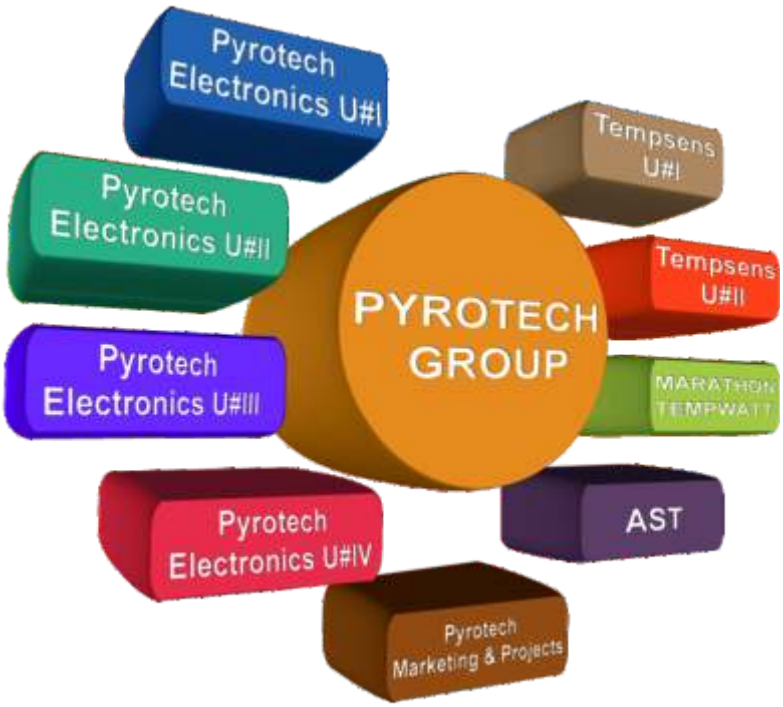
Today Tempsens is one of the world's largest solution provider for thermal engineering products - ie. Temperature Sensors, Infrared Pyrometers, Heaters and Cables. The headquarters are based in India, and manufacturing units in Germany and Indonesia.

Tempsens is an ISO 9001:2008, ISO 14001, OHSAS 18001 certified company with NABL Accredited Laboratories.

The company is involved into manufacturing of Thermocouples, RTDs, Thermowells, Cables, Non contact Pyrometers, Heaters and Calibration Equipments etc. with covered area of 2,70,000 Sq. Ft.

Tempsens is proud of its technical solution, quick delivery, high technical standards and outstanding quality which have been appreciated and valued by its customers worldwide.

Tempsens exports to more than 70 countries.



Tempsens success is driven by its people and their unrelenting focus on delivering results the right way - by operating responsibly, executing with excellence, applying innovative technologies and capturing new opportunities for profitable growth.

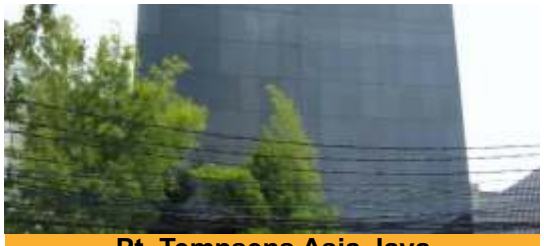
Tempsens Instruments U# I

Tempsens Instruments U# II

AST Plant - First Floor
Marathon Plant - Ground Floor

Tempsens Instruments U# II
Cable Plant

Tempsens Instruments GmbH
- Germany



Pt. Tempsens Asia Jaya
- Indonesia

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

MACHINING

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

HEATER PLANT

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

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
- Rewinding Machines
- Vertical Lapping Machines & Stranding Machines
- Tape Wrapping Machines
- PTFE Extrusion and Tape Roll Down Plant
- Metering Machines
- Buncher Machines
- Spark Tester & Diameter Testers
- Packaging Machines

MI CABLE PLANT

- Draw Bench 50 meters, Horizontal Draw Benches
- Annealing Furnaces
- MI Polishing Machines
- MgO Plant

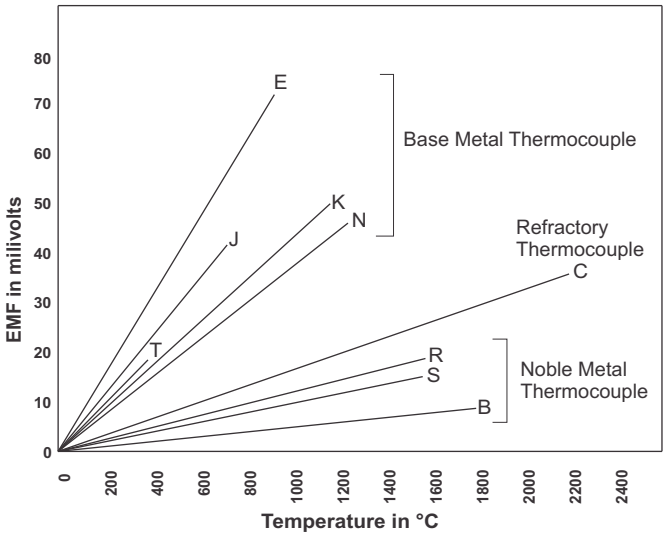
TESTING AND CALIBRATION

- NABL Accredited Calibration Lab -196°C to 1600°C for Contact and upto 2700°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
- 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
- On Line High Voltage Test Sets
- Flammability Test & Tensile Testers

BASICS OF THERMOCOUPLES & RTDs

THERMOCOUPLE

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

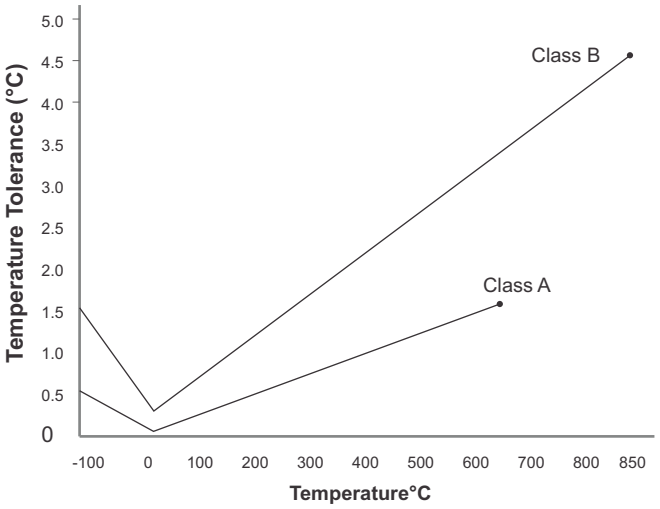
RTD

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.

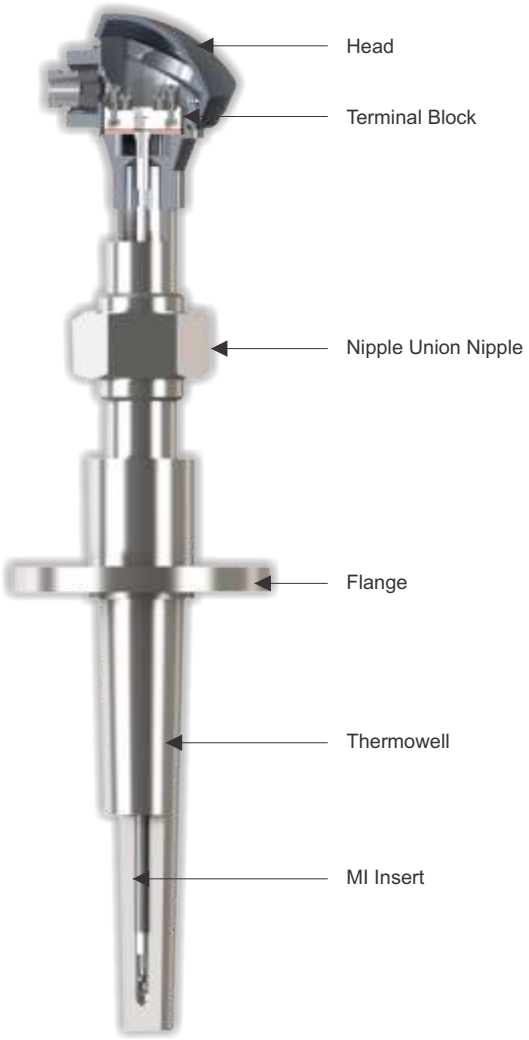


Tolerance Table for Type of RTD(as per IEC 751)

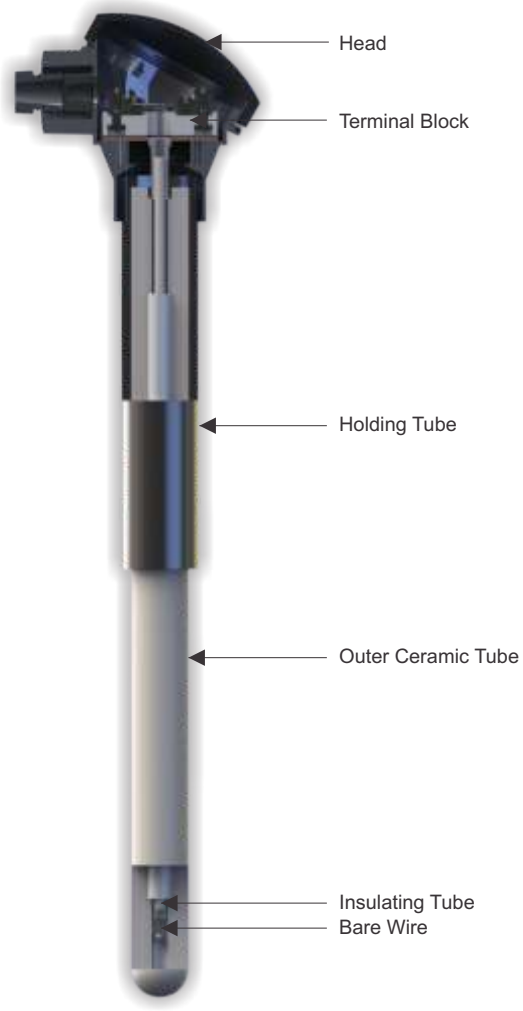
Temperature	Class A (±)	Class B (±)
-200°C	0.55°C	1.3°C
-100°C	0.35°C	0.8°C
0°C	0.15°C	0.3°C
100°C	0.35°C	0.8°C
200°C	0.55°C	1.3°C
300°C	0.75°C	1.8°C
400°C	0.95°C	2.3°C
500°C	1.15°C	2.8°C
600°C	1.35°C	3.3°C
700°C	-	3.8°C
800°C	-	4.3°C
850°C	-	4.6°C

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 THERMOCOUPLE WITH THERMOWELLS / PROTECTION TUBES

Type	:	J, K, T, E, N
Element Size (MI)	:	3, 4.5, 6, 8 mm, Other sizes on request
(Non-MI)	:	1.2, 1.6, 2, 2.5, 3.2 mm, Other sizes on request
Protection Sheath	:	SS304, SS321, SS316, SS310,
Thermowell		HRS 446, INCONEL-600/601/800, Nickel, Hastalloy, Titanium, Tantalum, Ceramic 610 & C -799, Silicon Carbide, Monel etc.
Configuration	:	Simplex/Duplex/Multipoint

MI THERMOCOUPLES

Type	:	J, K, T, E, N, R, S
Element Size (MI)	:	0.25, 0.5, 1, 1.5, 3, 4.5, 6, 8mm, Other sizes on request
Sheath Material	:	SS321, SS316, SS310 HRS 446, INCONEL 600, Nimonic, Platinum, Pyrosil etc.
Configuration	:	Simplex/Duplex/Multipoint
Special	:	• Miniature Thermocouples with minimum 0.25mm Dia • Swaged Tip Thermocouples • Tube Temperature Skin Type Thermocouples • Special Sensors as per ASTM-E235 • High Wall Thickness

THERMOCOUPLES

NOBLE METAL THERMOCOUPLES

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

REFRACTORY THERMOCOUPLES

Type	:	G, C, D (operating temperature upto 2300°C)
Sheath Material	:	Tantalum, Molybdenum, Inconel 600, Ceramic etc.
Sheath Dia	:	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

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
Accuracy	:	Class A, B, ½, 1/3, 1/5, 1/10 DIN
Protection Sheath	:	SS304, SS321, SS316, SS310, Inconel 600/800, HRS 446, Hastalloy, Monel etc.
Configuration	:	Simplex/Duplex/Others

MINERAL INSULATED RTDs

Type	:	Pt 100, 200, 500, 1000 cu-50, 53 etc.
Connection	:	2, 3, 4 wire
Element Dia	:	1.5, 3, 4.5, 6, 8 mm
Configuration	:	Simplex/Duplex/Others

SPECIAL RTDs

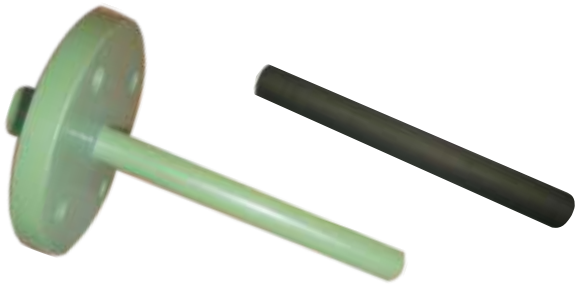
- Slide shoe bearing RTDs
- Vibration proof RTDs for Bearing & DG sets
- Motor & Transformer winding temperature RTDs
- Handheld & Probe in various designs
- RTDs with IBR approved Thermowells
- Strap on RTDs for nuclear application
- High Temperature RTDs upto 1/10 DIN
- Semi Standard PRTs with NABL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

THERMOWELLS AND PROTECTION TUBES

THERMOWELLS

Material	:	SS304, SS316, SS316L, SS321,SS310, HRS446, INCONEL 600/800/601 Hastalloy, Monel, Titanium etc.
Type	:	Drilled Barstock, Fabricated
Construction	:	Tapered, Straight
Process Connection	:	Screwed, Flanged
Certification	:	IBR certification on request

SPECIAL THERMOWELLS /PROTECTION TUBES



- Metal Thermowells with Tungsten Carbide/Ceramic/ PTFE/PVDF/PFA 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

CeramTec
Germany

Ceramics

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.
		Also 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

Special Feature

- Electric Contact Type Thermometer
- Dual Scale
- External Zero Adjustment
- Gas/Liquid filled with capillary max length upto 30 Mtr
- Dampening Liquid Glycerin/Silicon Oil filled

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

Special Pressure Gauges

- Maximum reading pointer Pressure Gauge
- Homogenizer Pressure Gauge
- Mud Pressure Gauge
- Electric Contact Pressure Gauge
- Dampening Liquid Glycerin/Silicon Oil filled

ACCESSORIES

TEMPERATURE INDICATORS/ CONTROLLERS

Size	:	48 x 96 mm
Input signal type	:	mA, mV, full scale/zero adjustable
Output	:	Relay, 4 - 20mA, (retransmission)
Auxiliary Power supply	:	24V, 30mA
Accuracy	:	±0.3% FS
Digital Communication	:	RS 485

TEMPERATURE TRANSMITTERS

- Head Mounted Transmitter with SMART
- Head Mounted Transmitter with HART Protocol
- Din Rail Mounted Transmitter with HART Protocol
- Field Mounted Transmitter

CONNECTORS

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

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
Battery	: Standard 9V battery

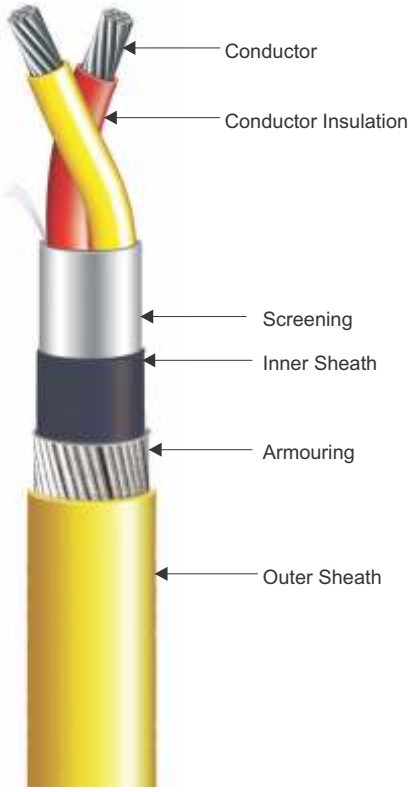
TEMPMET 08 - THERMOCOUPLE & RTD

Thermocouple: K, S, E, T, J, R, B, N	
RTD	: Pt100
Unit	: °C, F, K
Resolution	: 0.1°C

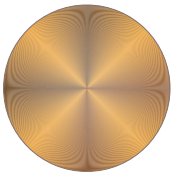
TEMPMET 09 - THERMOCOUPLE & RTD

Thermocouple: K, S, E, T, J, R, B, N	
RTD	: Pt1000, Cu50, Cu10
mV	: -100 to 200mV
mA	: -2 to 24 mV
Resistance	: 0 to 500 Ohms
Unit	: Ohms, mA, mV, °C, F, K
Resolution	: 0.001°C for RTD's 0.01°C for thermocouples

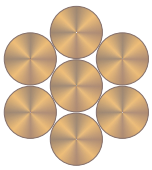
BASICS OF WIRES & CABLES



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.

Type of Conductors

Copper conductors

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

Thermocouple conductors

Thermocouple grade conductors(TC)

Extension grade conductors(EX)

Compensating grade conductors (C)

Other conductors

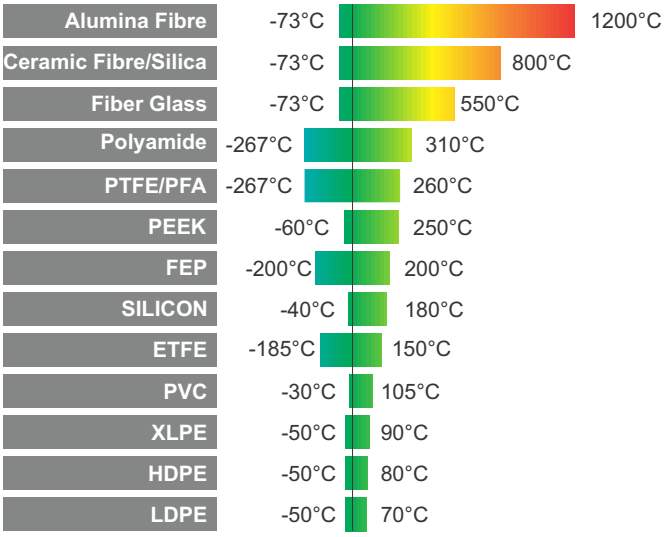
Pure Nickel Conductors (Ni) etc.

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 -260°C to 1200°C.

Insulation Type

Temperature range for various insulations are listed below :



SCREENING

Screening is applied for magnetic and electrical protection. Generally two types of Screening are available :

- Aluminum Foil Type : - Screening is done by helically applied aluminum foil 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, Polyamide, Fibre Glass, Alumina Fibre etc. (as listed in insulation)

MECHANICAL PROTECTION

- G.I. Armouring (Round wire / Flat strip as per IS 3975:99)
- SS Braiding (More Flexible)

OUTER SHEATH

PVC, Silicon, Teflon, Polyamide, Fiber Glass, Alumina Fibre etc. (as listed in insulation).

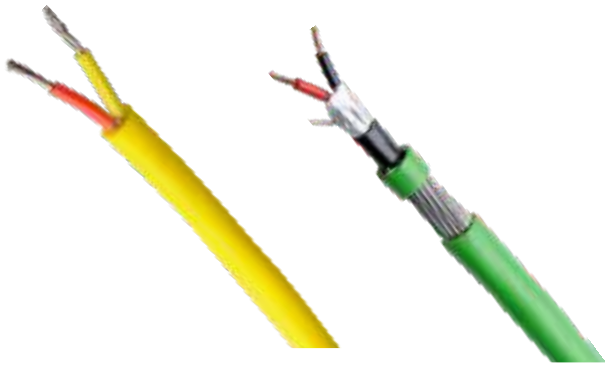
CML No. - 8400077612

RoHS

NABL T-4096

CABLES FOR TEMPERATURE SENSORS & INSTRUMENTATION

THERMOCOUPLE CABLES



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

Technical Specification

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, PTFE, FEP, PFA, Silicon, Polyamide, Fiber Glass, Ceramic Fiber etc.
Screening	:	Aluminum Foil type/Mesh Braided type
Inner/Outer Sheath	:	PVC, Teflon, Polyamide, Fiber Glass, Ceramic Fiber etc.
Armouring	:	G.I. Armouring/SS Braiding
Color Code	:	As per below table
Standards	:	ANSI MC 96.1, IEC 584.3, IS 8784

T/C TYPE	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
		RCB	COPPER	COPPER NICKEL MO			-	±5.0°C	0°C TO +200°C
S		SCA	COPPER	COPPER LOW VALUE NICKEL			-	±2.5°C	0°C TO +100°C
		SCB	COPPER	COPPER NICKEL MO			-	±5.0°C	0°C TO +200°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

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.

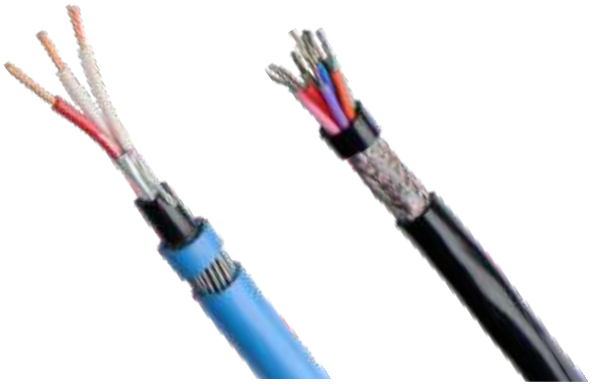
Technical Specification

Construction	:	Single Pair / Multi Pair
Voltage Grade	:	Upto 1.1 KV
Conductor	:	ABC, NPC, TPC, SPC, Ni
Conductor Size	:	0.50, 0.75, 1.0, 1.5, 2.5 Sq.mm or as per requirement
Conductor Stranding	:	Solid or Multi strand
Core Insulation	:	PVC, PTFE, FEP, PFA, Silicon, Polyamide, Fiber Glass, Ceramic Fiber etc.
Screening	:	Aluminum Foil type/Mesh Braided type
Inner/Outer Sheath	:	PVC, Teflon, Polyamide, Fiber Glass, Ceramic Fiber etc.
Armouring	:	G.I. Armouring/SS Braiding
Standards	:	As per BS 5308 Part 1 and Part 2, IS 8130, IEC 60228, JSS 51038

TECHNICAL DATA FOR PVC INSTRUMENTATION CABLE					
Conductror Size mm^2	Max. Conductor Resistance at 20°C ohm/Km	Max. Capacitance between Conductor nf/Km	Max. Capacitance between Conductor to screen nf/Km	Inductance mH/Km	L/R Ratio µH/Ohm
0.5	39.0	250	400	<1	<25
0.75	26.0	250	400	<1	<25
1.0	19.5	250	400	<1	<25
1.5	13.3	250	400	<1	<40
2.5	7.98	250	400	<1	<40

CABLES FOR HIGH TEMPERATURE & OTHERS

LV CONTROL & POWER CABLES



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

Technical Specification

Construction	:	2, 3, 4, 5, 7, 12 or multiple cores
Voltage Grade	:	Up to 1.1 KV
Conductor	:	ABC, TPC, NPC, SPC, Ni
Conductor Size	:	0.50, 0.75, 1.0, 1.5, 2.5 Sq mm or as per customer requirement
Conductor Stranding	:	Solid or Multistrand
Core Insulation	:	PVC, PTFE, FEP, PFA, Silicon, Polyamide, Fiber Glass, Ceramic Fiber etc.
Screening	:	Aluminum Foil type/Mesh Braided type
Inner/Outer Sheath	:	PVC, Teflon, Polyamide, Fiber Glass, Ceramic Fiber etc.
Armouring	:	G.I. Armouring/SS Braiding
Standards	:	As per IS 1554, IEC 60502, IEC 60227, JSS 51038, IS 8130:84

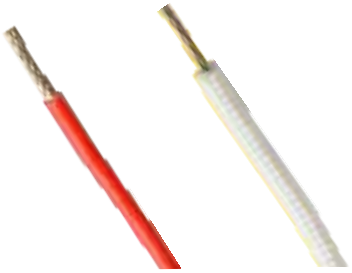
HEAT RESISTANCE CABLES

Tempsens provides Heat resistance cables with maximum 800°C temperature withstanding.

Technical Specification

Construction	:	2, 3, 4, 5, 7, 12 or multiple cores
Voltage Grade	:	Up to 1.1 KV Grade
Conductor	:	ABC, TPC, NPC, SPC, Ni
Conductor Size	:	1.5, 2.5, 4.0, 6.0, 10.0, 16.0, 25.0, 35.0 Sq mm or as per customer specifications
Conductor Stranding	:	Multistrand as per IS 8130:84
Core Insulation	:	PTFE, FEP, PFA, Silicon, Fiber Glass, Ceramic Fiber etc.
Isolator	:	Polymide, Sintered PTFE Foil, Glass Mica Tape
Screening	:	Aluminum Foil type/Mesh Braided type
Fire Barrier Tape	:	Glass Mica Tape
Inner/Outer Sheath	:	Teflon, Fiber Glass, Ceramic Fiber etc.
Armouring	:	SS Braiding
Standard	:	As per IS 8130:84, JSS 51038

PVC LEAD WIRES



Tempsens provide wide range of Lead wire or Hook up wires up from temperature -260 °C to extreme high temperature 1200 °C with insulation PVC, PTFE, FEP, PEEK, Silicon, Glass Fiber, Ceramic Fiber etc.

OTHER SPECIAL CABLES

- Solar Photovoltaic Cables
- RS-485 Cable
- Lance Cable
- Load Cell Cable
- Composite Cable
- Co-axial Cable
- Cat 5 & Cat 6 Cable

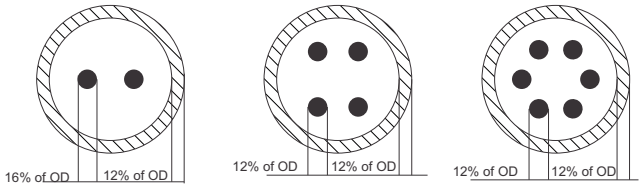
SLEEVES

Tempsens offer 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 10 mm
Voltage Grade	:	Up to 10 KV
Color	:	As per Customer requirement

MINERAL INSULATED METAL SHEATHED 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. metals.

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.

SPNDS

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).

PROCESS HEATERS

TUBULAR HEATERS

Tubular heaters are designed for direct contact heating of water, oils, viscous materials, solvents, process solutions and gases.

FINNED TUBULAR HEATERS

Temperature Range	:	Upto 800°C
Sheath Material	:	SS304, SS316, Incoloy800 etc.
Finns Material	:	GI, SS etc.

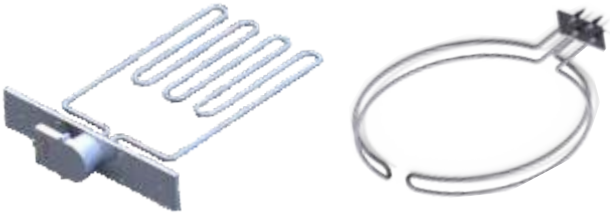
FLANGED IMMERSION HEATERS

Temperature Range	:	Upto 800°C
Sheath Material	:	SS304, SS316, Incoloy 800 etc.
Flange Material	:	MS, SS etc.
Various Wiring options	:	Single Phase, Three Phase

SCREW PLUG IMMERSION HEATERS

Temperature Range	:	Upto 800°C
Sheath Material	:	SS316, SS304, Incoloy800 etc.
Application	:	Heating Air, Water, Gases

ESP HOPPER HEATERS



Temperature Range	:	Upto 300°C
Sheath Material	:	SS321, Incoloy800 etc.
Application	:	ESP Hopper

CIRCULATING HEATERS

Temperature Range	:	Upto 800°C
Sheath Material	:	SS304, SS316, Incoloy800 etc.
Heating Media	:	Air, Water, Other Liquids and Gases

DUCT HEATERS

Temperature Range	:	Upto 800°C
Sheath Material	:	SS304, SS316, Incoloy800 etc.
Heating Media	:	Air, Other Gases

PROCESS 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, Kanthal APM, Kanthal A1, Kanthal AF etc.
Radiant Tube Material	:	Kanthal APM, HU, Alloy-600 etc.

Customized Diameters and Length

Application Areas : Annealing Furnace, Spherodizing Furnace, Other Heat Treatment Furnaces

EDGE WOUND HEATERS

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

METALLIC HEATING ELEMENTS

Temperature Range	:	Upto 1100°C
Strip Element	:	NiCr 80:20, Kanthal APM, Kanthal AF, Kanthal D
Application Areas	:	Ammonia Cracker, Furnace Elements etc.

ACCESSORIES

Radiant Tubes

Radiant Tube Material : Kanthal APM, HU, Alloy-600 etc.

Hangers

Hanger Material : SS310, Incoloy 800, N40 etc.

BOBBIN IMMERSION HEATERS

Marathon Tempwatt make Ceramic Bobbin Heaters are fabricated from high temperature refractory insulators in various diameters and lengths for any voltage or wattage within manufacturing limits. These Bobbin Heaters consist of elements, which are exposed partially in air for better transmission of heat. Also, when it is inserted into a thermowell, it offers a large heated area to the liquid or semi-solid to be heated.

COMPONENT HEATERS

HIGH WATT DENSITY CARTRIDGE HEATERS

Temperature Range	:	Upto 600°C
Material	:	SS304, SS316, Incoloy
Configurations	:	Swaged in Leads, Crimped on Leads, Post Terminals, Right Angle Leads, Teflon Seal, Silicon Rubber Seal, Epoxy Seal, Swaged in Braid, Right Angle Stainless Steel Braid, SS Flexible Conduit, Hex head pipe fittings etc.

Applications

- Hot Runner Nozzles & Bushings
- Tube Extrusion
- Pipe Forming
- Hot runner distribution plates
- Sealing and cutting bars and jaws for packaging machines

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.

Applications

- Small Manifold Heating
- Hot metal forming dies and punches
- Semiconductor manufacturing and wafer processing

MICA BAND & STRIP HEATERS

- High Temperature Oxidation Resistant Metal Sheath
- Highest grade mica provides excellent electrical insulation at high temperatures and is resistant to moisture.
- Clamping band is low thermal expansion stainless steel construction designed to maintain clamping pressure at elevated temperatures.
- Nickel/Chromium resistance wire evenly wound for uniform heat distribution and reliable accuracy.

CERAMIC BAND HEATERS

- Ceramic band heaters are medium-to-high temperature heaters that have 550°C as the maximum working temperature. These durable heaters can have optional in-built ceramic fiber jackets that make them energy efficient. Ceramic band heaters are available with different terminal styles, are fully flexible, and can accommodate holes and cut-outs.

AIR HEATERS

Marathon Tempwatt air heaters feature an open coil of high temperature resistance wire electrically isolated in a stainless steel sheath.

Configurations

- 1/2", 5/8" or 3/4 diameter
- 304 Stainless Steel Sheath
- High temperature leads or 3 pin connector
- Epoxy Seal
- Copper Tee
- 120 Volt and 240 Volt

INDUSTRIAL HEATERS

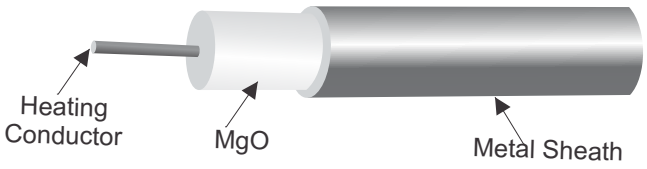
BOLT HEATERS

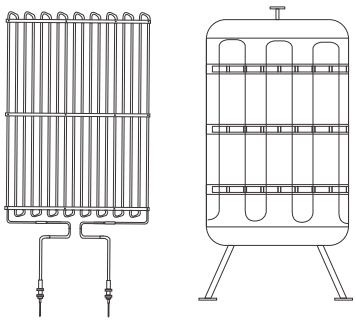
Hot Bolt Heaters are used to preheat large, hollow holding bolts or studs where a high concentration of heat is critical for bolt expansion in a short period of time.

Standard Features

- Alloy sheath swaged tubular construction
- Grade "A" magnesium-oxide filled and swaged
- 80/20 Nickel Chrome alloy resistance wire
- Insulating handle
- Wide range of standard diameters and lengths
- Flexible Bolt heaters are also available

MINERAL INSULATED HEATING CABLES





Typical Application

- Available in different sheath material - SS304,SS316, SS321, INCONEL 600
- Cables are suitable for heating tanks, valves, pipes, pumps, tools and industrial process heating systems
- Available in different customized sizes and termination

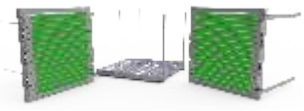
FLEXIBLE HEATERS - SILICON & POLYMIDE

- Temperature ange up to 250°C
- High Die Electric Strength, Flame Retardant, Non Toxic.
- Uniform heating, Adaptability, Long Life
- Good for heating drums, de-icing, vending machines, ATM's, aircrafts, cars, and maintaining a comfortable temperature in medical equipments - such as CAT scanners.

INTEGRATED CONTROL PANEL SYSTEM

We 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.

CUSTOMIZED HEATING ELEMENTS



High Temperature IR Heater

Flexible Kapton Heater

Barrel Heater

Thermo Cutter

BASICS OF PYROMETERS

WHAT IS INFRARED PYROMETER

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.

Theory of the Thermal Emission

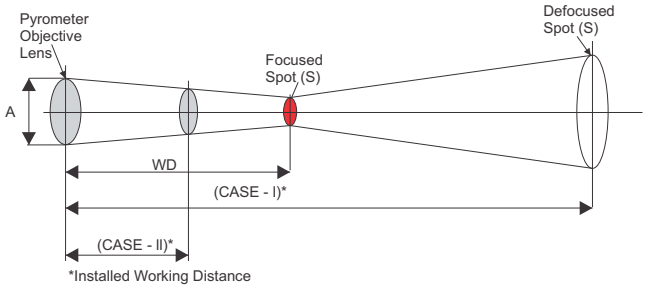
The simplest theory to express the thermal emission is based on the Black Body concept : a Black Body is an object that absorbs all electromagnetic radiation that falls onto it. No radiation passes through it and none is reflected. How much electromagnetic radiation they give off just depends on their temperature.

The total emittance from a black body including all wavelengths is directly proportional to the fourth power of its temperature. This temperature is called “Brightness Temperature, BT”

$$M = \int M_\lambda \, d_\lambda = \frac{2\pi^5 k^4 T^4}{15 c^2 h^3} = \sigma T^4$$

Surface Material	Emissivity Coefficient- ε -
Aluminum Foil	0.04
Black Body Matt	1.00
Black Enamel Paint	0.80
Brass Rolled Plate Natural Surface	0.06
Carbon, not oxidized	0.81
Cast Iron, newly turned	0.44
Cement	0.54
Coal	0.80
Copper heated and covered with thick oxide layer	0.78
Glass smooth	0.92 - 0.94
Iron, Rough Ingot	0.87 - 0.95
Silica	0.79
Silver Polished	0.02 - 0.03
Steel Oxidized	0.79
Steel Polished	0.07
Stainless Steel, weathered	0.85
Wrought Iron	0.94

- **Feld of View (FOV)** : The Field of View (FOV) is expressed in degree solid angle or radians. The FOC allows easy calculation of the minimum target size for each working distance.



Case-I: If installed working distance is greater than manufactured working distance

$$\text{Installed Spot size} = \frac{\text{Installed working distance (Case I)}}{\text{WD}} \times (S + A) - A$$

Case-II: If installed working distance is smaller than manufactured working distance

$$\text{Installed Spot size} = \frac{\text{Installed working distance (Case II)}}{\text{WD}} \times (S - A) + A$$

- **Spectral Responsivity** : The spectral responsivity range should be selected so that the emissivity of the surface is as high as possible in order to maximize the characteristic radiation from the measurement object and minimize the reflected ambient radiation.

- **Selection Chart**

Surface Material	Spectral Range
Metals Shiny	2.6 µm
Metals, Oxidized	1.6 µm & 1 µm
Molten Glass Glass Surface	1 µm 5.14 µm
Through Clean Flame	3.9 µm
Non Metals	8…14 µm
Hot CO2	4.5 µm

A- SERIES

Instruments	AST A250	AST A450	AST A250C	AST A450C	AST A150
					
Features	Digital IR Pyrometer with Analog output, Digital interface, Bluetooth/USB 2.0, Laser targeting or Through the lens view finder		Digital Two color IR Pyrometer with Analog output, Digital interface, USB 2.0, Laser targeting or Through the lens view finder		Digital IR Pyrometer with Analog output, Digital interface, USB 2.0, Laser targeting for temp. measurement of metallic surfaces, graphite or ceramics
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	0.1...1 adjustable	0.1...1.0 adjustable	0.1...1 adjustable	0.1...1 adjustable
Spectrum 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	100 : 1 200 : 1	50 : 1
Response Time	2msec. adjustable upto 10 sec.	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	±0.3% of measured value +1°C	±0.5% of measured value +1°C	±0.5% of measured value +1°C	Upto 400°C : 3°C, above 400°C : 0.5% of measured value in °C+ 1°C
Analog Output	4 - 20mA or (0-20mA/0-10V) optional				4...20mA or (0-20mA/0-10V) optional
Digital Output	USB 2.0 / Bluetooth, RS-232 or RS-485 User Selectable		USB 2.0, RS-232 or RS-485 User Selectable		USB 2.0, RS-232 or RS-485 User Selectable.

*Specification are subject to change without prior notice.

PYROMETERS

		AL- SERIES				FIBER OPTICS
Instruments	**AST IR CAST 2C**	**AST AL30**	**AST AL45**	**AST AL514**	**AST AL390**	**AST A250 FO/PL**
						
Features	Digital two color pyrometer with through the lens sighting, digital interface, analog output & USB 2.0 for metal casting applications	Digital IR pyrometer with analog output, digital Interface, USB output & laser targeting	Digital IR Pyrometer with Analog output, Digital interface, USB 2.0 Laser targeting light for hot Co2 temp. measurement	Digital IR Pyrometer with Analog output, Digital interface, USB 2.0 Laser targeting light for glass surface temp.measurement	Digital IR Pyrometer with Analog output, Digital interface, USB 2.0 Laser targeting light for measurement through flame	Digital IR Pyrometer with mono fiber optic cable, Laser Pilot light, Digital interface, Analog output & Bluetooth/USB 2.0.
Temperature Range*	700°C…1700°C	0°C - 1000°C	400°C…1500°C	300°C…2500°C	300°C…1400°C	250°C - 1800°C
Emissivity	0.1...1 adjustable	0.1….1.2 adjustable	0.1…..1 adjustable	0.1….1.2 adjustable	0.1…..1.2 adjustable	0.1...1 adjustable
Spectrum Range	0.7….1.15 µm	8….14 µm	4.43 µm	5.14 µm	3.9 µm	1.6µm
Distance to Spot Size Ratio	DV=166:1(V=Vertical) DH=33:1(H=Horizontal)	50 : 1 100 : 1	40:1	50 : 1		100:1(OH I) 200:1(OH II) 200:1(OH II V)
Response Time	20msec. adjustable upto 10 sec.	60msec. Adjustable upto 10 sec.				2msec. Adjustable upto 10 sec.
Accuracy	±0.5% of measured value +1°C	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			±0.3% of the 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).					USB 2.0/Bluetooth, RS-232 or RS-485 Optional

* in different temperature ranges

	FIBER OPTICS			E-SERIES		
Instruments	**AST A450 FO/PL**	**AST A250C FO/PL**	**AST A450C FO/PL**	**AST E250 PL**	**AST E450 PL**	**AST E450C PL**
						
Features	Digital IR Pyrometer with mono fiber optic cable, Laser Pilot light, Digital interface, Analog output & Bluetooth/USB 2.0.	Digital Two color IR Pyrometer with mono fiber optic cable, Laser Pilot light, Digital interface, Analog output & USB 2.0.	Digital Two color IR Pyrometer with mono fiber optic cable, Laser Pilot light, Digital interface, Analog output & USB 2.0.	Digital pyrometer with extended sensor head. Analog and digital output, Inbuilt LCD & keypad for parameterization		Digital two colour pyrometer with extended sensor head. Analog and digital output, Inbuilt LCD & keypad for parameterization
Temperature Range*	600°C - 2500°C	350°C - 1350°C	800°C - 3200°C	250°C - 1800°C	600°C - 1900°C	800°C - 2500°C
Emissivity	0.1...1 adjustable	0.75.....1.25 Slope adjustable	0.75.....1.25 Slope adjustable	0.1…..1 adjustable	0.1…..1 adjustable	0.1…..1 adjustable
Spectrum Range	1µm	1.5 µm / 1.6 µm	0.7 .....1.15µm	1.6µm	1µm	0.7…..1.15 µm
Distance to Spot Size Ratio	100:1(OH I) 200:1(OH II) 200:1(OH II V)	100:1 200:1	100:1(OH I) 200:1(OH II)	20 : 1 40 : 1 80 : 1	80 : 1	80 : 1
Response Time	2msec. adjustable upto 10 sec.	100msec. adjustable upto 10 sec.	20msec. adjustable upto 10 sec.	2msec. adjustable upto 10 sec.		20msec. adjustable upto 10 sec.
Accuracy	±0.3% of the measured value +1°C	±0.5% of 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	4...20mA, 0-20mA, 0-10V (User Selectable)	0-20mA, 4-20mA, 0-10V(User Selectable)	4...20mA, 0-20mA, 0-10V (User Selectable)	4...20mA or 0-20mA/0-10V User Selectable		
Digital Output	USB 2.0/Bluetooth, RS-232/RS-485 Optional	USB 2.0, RS-232/RS-485 (User Selectable)	USB 2.0, RS-232/RS-485 (User Selectable)	USB 2.0, RS-232/RS-485 User Selectable		

PYROMETERS

	E - SERIES	T - SERIES					
Instruments	**AST EL50/EL50H**	**AST T2-250**	**AST T2-450**	**AST TL8**	**AST TL514**	**AST TL390**	**ML - Series**
							
Features	Digital IR pyrometer with extended sensor head, analog o/p, digital interface, relay o/p, USB 2.0, inbuilt LCD & keypad for parameterization	Digital IR pyrometer in two wire technique with analog output, TTL output, laser pilot light & USB interface for parameter setting		Digital IR pyrometer with analog output, TTL output & USB interface for parameter setting for low temp. application	Digital IR pyrometer with analog output, TTL output & USB interface for parameter setting for glass surface temp. measurement	Digital IR pyrometer with analog output, TTL output & USB interface for parameter setting for glass surface temp. measurement	Miniature Digital online IR pyrometer for low temp. applications
Temperature Range*	0°C - 800°C	300°C - 1500°C	600°C - 2100°C	0°C…500°C	200°C…1400°C	300°C…1400°C	0°C…1000°C
Emissivity	0.1...1.2 adjustable	0.1..1 adjustable	0.1...1 adjustable	0.1....1.2 adjustable	0.1...1.0 adjustable	0.1....1.2 adjustable	0.1 to 1.2 adjustable
Spectrum Range	8.....14 µm	1.6 µm	1 µm	8….14 µm	5.14 µm	3.9 µm	8 - 14 µm
Distance to Spot Size Ratio	2 : 1 15 : 1	100:1 200:1	100:1 200:1	15 : 1	50 : 1	50 : 1	15:1, 2:1
Response Time	20msec. adjustable upto 10 sec.	50msec. Adjustable upto 10 sec.		100msec...10sec adjustable	100msec...10sec adjustable	100msec...10sec adjustable	60 msec adjustable upto 10 sec
Accuracy	±1.0% of the measured value or 3°C	0.8% of measured value or +2°C		±2% of temp. reading or 3°C	1.5% of Temp. reading	1.5% of Temp. reading	± 2% of measured value or ± 3°C whichever is greater
Analog Output	4...20mA or 0-20mA /0-10V optional, T/C type K or J	4-20 mA, 2 wire		0 - 5V, T/C type J or K, 4 - 20mA	4 - 20mA, 0 - 20mA	4 - 20mA, 0 - 20mA	4 - 20mA, 0 - 10V/0 - 5V, J & K type T/c
Digital Output	USB 2.0, (RS-232/ RS-485 Optional)	TTL Output		TTL Output	TTL Output	TTL Output	TTL Output

*EL50H - sensor head 180°C

	A+ SERIES			ALUMINIUM INDUSTRY	GLASS INDUSTRY
Instruments	**AST A250+**	**AST A450+**	**AST A450C+**	**A4**	**AST 450G2**
					
Features	Focusable digital IR Pyrometer with analog o/p, digital interface, laser targeting, through the lens view finder, video module, parameterising keys, LCD display & bluetooth		Two color focusable Pyrometer with analog o/p, digital interface, laser targeting, through the lens view finder, video module, parameterising keys & LCD display	Digital IR pyrometer with Digital & analog o/p for aluminium & non-ferrous applications (measures through smoke, dust, water vapor etc.)	2 wire pyrometer for glass industry with fast digital & analog interface with heavy duty optic cable usable in high ambient temp. without cooling
Temperature Range*	300°C - 2500°C	600°C - 2500°C	800°C - 3000°C	170°C - 1500°C	600°C - 1800°C
Emissivity	0.1...1 adjustable	0.1...1 adjustable	0.1...1 adjustable	0.1....1.0	0.05....1 adjustable
Spectrum Range	1.6µm	1.0µm	0.7 .....1.15µm	Multiple Spectral Range	1µm
Distance to Spot Size Ratio	Focusable 100:1 200:1 400:1	Focusable 200:1 400:1	Focusable 200:1 400:1	10 mm from 1 mtr distance	100 : 1
Response Time	2msec. adjustable upto 10 sec.	2msec. adjustable upto 10 sec.	20msec. adjustable upto 10 sec.	0.5 Sec.	250msec. adjustable upto 10 sec.
Accuracy	±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% of measurable value	±0.3% of measured value or 3°C which is greater
Analog Output	4...20mA, 0-20mA, 0-10V (User Selectable)			4...20mA or 0 20mA /0-10V optional / K type T/C	4...20mA
Digital Output	USB 2.0/Bluetooth, RS-232/RS-485 (User Selectable)		USB 2.0, RS-232/RS-485 (User Selectable)	RS-232, RS-422, USB/Bluetooth	USB 2.0

*Specification are subject to change without prior notice.

PYROMETERS

	GLASS INDUSTRY	PORTABLES					
Instruments	**PGM**	**TCT 500**	**TI 750**	**TI 1500**	**TI 2400**	**AST P250**	**AST P450**
							
Features	Portable Glass Mould pyrometer, handheld, battery powered for Mould temp. Measurement	Portable pyrometer with large LCD display, Power back light (with ON/OFF control), °C/°F switch mode, Single laser pointer/Dual laser pointer.				Portable IR pyrometer with Data logging, bluetooth, USB, Bright Back light, LCD Graphics	
Temperature Range*	250°C - 600°C	-60°C to 500°C	-60°C to 760°C	-60°C to 1500°C	200°C to 2400°C	350°C to 1800°C	600°C to 1900°C
Emissivity	0.1.....1 adjustable	0.95	0.1.....1.0 adjustable	0.1.....1.0 adjustable	0.1.....1.0 adjustable	0.1.....1.0 adjustable	
Spectrum Range	1.6µm	8.....14µm	8.....14µm	8.....14µm	1.1.....3.7µm	1.6µm	1.0µm
Distance to Spot Size Ratio	-	12 : 1	12 : 1	50 : 1	100 : 1	200:1	
Response Time	2msec adjustable upto 10 Sec	1 sec.	1 sec.	1 sec.	1 sec.	5 msec in Numerical Mode, 10 msec in Graphical Mode, 10 msec (when datastorage is ON)	
Accuracy	±0.3% of measured value or 3°C which is greater	+/-2% of reading or 2°C whichever is greater				± 0.3% of the measured value + 1°C	
Analog Output	-	-				-	
Digital Output	USB 2.0	-				USB 2.0/Bluetooth	

*Specification are subject to change without prior notice.

THERMAL IMAGERS

- IR Resolution : 160*120
- Spectral Range : 7.5~14µm
- Temperature Range : -20°C~+350°C,-20°C~+600°C
- Measurement Accuracy : ±2°C/±2%(reading)
- Emissivity : Adjustable from 0.01 to 1.0
- Storage Type : Built-in flash card,800 images
- USB : USE2.0, radiometric images, measurement data and voice are transferred to PC

FURNACE MONITORING CAMERAS

Cement Kiln & Cooler, Glass furnace, Metal reheat furnace, Power Boiler etc.

- Auto Pneumatic retraction and insert
- Water cooled lens tube assembly.
- Auto shut off gate.
- Wide angle of view.
- Front lens withstand high temperature.
- Manual Focusing, Iris Control.
- Control Cabinet with PLC, Pneumatic control system.
- High Dynamic CCD Camera.

TEMPERATURE CALIBRATION EQUIPMENTS

CALIBRATION

Tempsens manufactures equipments for temperature calibration. The test sensors are calibrated against master sensors in a stable temperature source.

The various temperature source for covering temperature sensor calibration are as under.

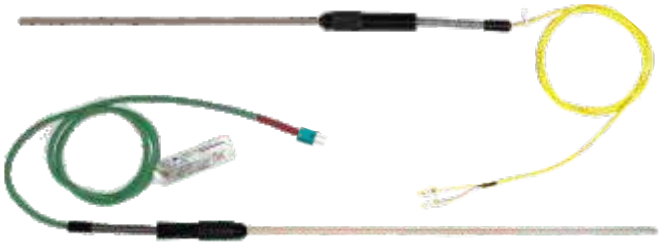
LIQUID BATHS

	Temperature Range	Stability	Calibration Volume (mm)	Medium
CALsys -80/50	-80 to 50°C	0.05°C	100(L) x 130(W) x 200(D)	Methanol
CALsys -40/50	-40 to 50°C	0.05°C	90(L) x 90(W) x 150(D)	Methanol
CALsys -35/50	-35 to 50°C	0.05°C	220(L) x 180(W) x 250(D)	Methanol
CALsys -35/200	-35 to 200°C	0.01°C	157(L) x 142(W) x 127(D)	Silicon Oil
CALsys 120SP	0 to 120°C	0.1°C	Dia 24 x 100(L), 3 x 6 hole	Silicon Oil
CALsys 250	50 to 250°C	0.1°C	Dia 90 x 140 (D)	Silicon Oil
CALsys 300SP (Large Volume)	50 to 250°C	0.1°C	100(L) x 150(W) x 200(D)	Silicon Oil

DRY BLOCK/FURNACES

	Temperature Range	Stability	Calibration Volume (mm)
CALsys -196/-80	-196 to -80°C	0.1°C	Dia 24 x 300 (L) (2holes of 6.5, 2holes of 8.5)
CALsys -15/110 (Peltier Dry Block)	-15 to 110°C	0.1°C	Dia 24 x 120 (L), 115 (D)
CALsys 650	50 to 650°C	0.1°C	Dia 32 x 150 (L), 4 holes of 6.5 x 120 (D)
CALsys FB (Fluidised Bath)	50 to 650°C	1.0°C	Dia 150 x 385 (D)
CALsys 1200	250 to 1200°C	0.5°C	Dia 37 x 215 (L), (2x6 & 2x8 holes) of 160 (D)
CALsys 1200L	300 to 1200°C	0.5°C	Dia 37 x 240 (L), (2x6 & 2x8 holes) of 160 (D)
CALsys 12003Z (3- Zone Furnace)	300 to 1200°C	0.4°C	Dia 37 x 240 (L), (2x6 & 2x8 holes) of 140 (D)
CALsys 1500L	500 to 1500°C	1.0°C	Dia 37 x 245 (L), (2X6 & 2X8 holes) of 160 (D)
CALsys 1700L	500 to 1700°C	2.0°C	Dia 37 x 240 (L) (2x6 & 2x8 holes) of 225 (D)

MASTER SENSORS



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

- **SSPRT** : PT100/PT25, Temperature range 0 to 661°C
- **RTD** : PT100

Accuracy : 1/10, 1/5, 1/3, 1/2 DIN, Class A

Sheath Material : SS316, Inconel, Quartz

- **THERMOCOUPLE** : K/N/R/S

Accuracy : Special, Class 1, with option cold junction compensation

Sheath Material : Inconel/Ceramic (KER710-C 799)

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

TEMPERATURE CALIBRATION EQUIPMENTS

REFERENCE JUNCTION UNITS

- 0°C & 60°C Thermoelectric reference unit
- Eliminates Old Fashioned "Ice Bath"
- Versatile use in industries, Laboratories, Instrument Shop
- NABL Traceable Calibration Available

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

*As per requirement

METERS

	Tempmet 08	Tempmet 09
		
Inputs	Thermocouple, RTD	Thermocouple, RTD, mV, mA
Resolution	0.1°C for RTD & T/C	0.001°C for RTD 0.01°C for T/C 0.001°C for mV, mA
Size(mm)	115 x 70 x 30	115 x 70 x 30

High resolution & high accuracy temperature read outs.

BLACK BODY

Black bodies are reference sources used for testing infrared systems. They are required in industry for calibration of pyrometers, infrared line scanners or cameras.

Tempsens offers black body temperature source with large temperature range, high stability & high emissivity.

	Temp. Range	Stability	Emissivity	Calibration Volume (mm)
CALsys 500BB	50 to 500°C	1.0°C	0.95	Dia - 100 mm
CALsys 1200BB	300 to 1200°C	1.0°C	0.99	37±1mm dia & 140mm depth
CALsys 1500BB	500 to 1500°C	1.0°C	0.99	37±1mm dia & 140mm depth
CALsys 1700BB	500 to 1700°C	2.0°C	0.97	29 mm, 235 mm depth
Fast Cal 1200	300 to 1200°C	1.0°C	0.99	15 (H) x 80 (L), SS Strip
Fast Cal 2600	700 to 2600°C	3.0°C	0.99	15 (H) x 100 (L), Graphite Strip

MASTER PYROMETERS WITH SPECIAL CALIBRATION

- **AST AL30** : 0 to 1000°C
- **AST A250** : 250 to 2500°C

LM STANDARD FURNACES (MAX. 1200°C)

Model	Max. Temp (°C)	Dimension internal HxWxD (mm)	Volume (Liters)	Max Power (kW)	Heating element
LM 112	1200	100x100x150	1.5	2	Kanthal A1
LM 312	1200	90x175x300	5	2.8	Kanthal A1
LM 412	1200	150x175x320	7.5	3.2	Kanthal A1
LM 512	1200	230x200x400	18.5	8	Kanthal A1

VMK(MAX. 1800°C)

Model	Max. Temp (°C)	Dimension internal HxWxD (mm)	Volume (Liters)	Max Power (kW)	Heating element
VMK 1400	1400	150x170x270	6.8	4	Sic
VMK 1600	1600	150x170x270	6.8	4	$MOSi_2$
VMK 1700	1700	110x150x240	4.0	4	$MOSi_2$
VMK 1800	1800	110x150x240	4.0	4	$MOSi_2$

BOTTOM LOADING FURNACES

Model	Maximum Temperature (°C)	Internal Dimension* (HX W X D) (mm)	Heating Element
BLF - 1200	1200	120X120X120	Kanthal A1
BLF - 1500	1500	120X120X120	Silicon Carbide
BLF - 1800	1800	120X120X120	$MoSi_2$

*Custom size on request

TUBULAR FURNACES

Model	Maximum Temperature (°C)	Ceramic Tube * ID X Hot zone length (mm)	Heating Element
TF - 1200	1200	50 X 200 & 80 X 250	Kanthal A1
TF - 1400	1400		Silicon Carbide
TF - 1600	1600		$MoSi_2$
TF - 1800	1800		$MoSi_2$

*Option available with inert gas atmosphere and vacuum.

*Custom tube size on request.

*Also available in 3 Zone design

OTHER SPECIAL FURNACES

Microwave Furnace

Gas Atmosphere Furnace

- Microwave Furnace.
- Induction Heating Furnace.
- 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.

It 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.

C-0321 Udaipur Lab

C-1155 Vadodara Lab

C-1226 Bangalore 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 0.05°C 0.03°C 0.03°C 0.04°C 0.12°C 1.26°C 2.64°C
Non Contact Type Pyrometer	0°C to 100°C >100°C to 500°C >500°C to 1500°C >1500°C to 1700°C >1700°C to 2700°C	1.5°C 2.4°C 2.72°C 3.27°C 5.3°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 1.26°C
Non Contact Type Pyrometer	0°C to 100°C >100°C to 500°C >500°C to 1200°C	1.50°C 2.40°C 2.72°C
Multipoint Position Calibration of Chamber, Oven, Furnaces (Thermal Mapping(TUS))	-80°C to 200°C >200°C to 1200°C	0.87°C 6.30°C

FIXED POINT 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)	0.0035°C 0.0070°C 0.0070°C 0.0075°C 0.0075°C

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 2700°C. Further the laboratory is accredited for onsite temperature calibration.

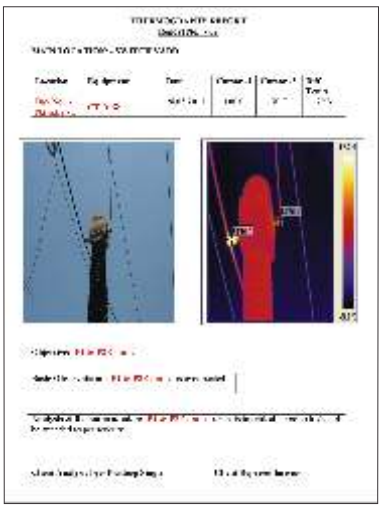
The lab offer both at Lab & On-Site Calibration of Furnace/Bath from -80°C to 1600°C and Black Body Calibration from 50°C to 1700°C.

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

THERMOGRAPHY SERVICES

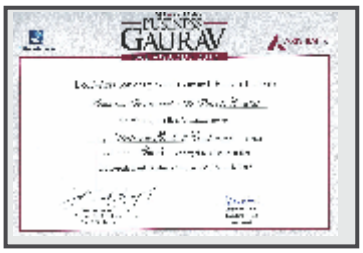
Tempsens provide thermography services for various industries. Thermography enables to monitor the thermal efficiency of critical process systems that rely on heat transfer of retention.

This is one of the most powerful, fast and one of the most cost-effective condition monitoring technique that has wide application in any industry in detecting incipient faults, if left unattended, would not only lead to loss of productivity and quality but also increase operations and maintenance costs.



Sample Thermography Report

CERTIFICATES



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