Product Catalogue

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

www.tempsens.com
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 a leading thermal and cable solution provider. The headquarters are based in India, and manufacturing units in Germany and Indonesia.


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

Tempsens is proud of its innovative 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 mission is to lead the Thermal and Cable industry with Passion, Innovation, Intelligence & Reliability.
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
- 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

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 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
- 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
- Auto Clave Testing
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.

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 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 Thermocouples

<table>
<thead>
<tr>
<th>Type of T/C</th>
<th>Material (+ &amp; -)</th>
<th>Temp. Range(°C)</th>
<th>Tolerance Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Standard</td>
</tr>
<tr>
<td>T</td>
<td>Copper &amp; Constantan</td>
<td>-200 to 370°C</td>
<td>±1.0°C or ±0.5°C or ±0.75% ±0.4%</td>
</tr>
<tr>
<td>J</td>
<td>Iron &amp; Constantan</td>
<td>0 to 760°C</td>
<td>±2.2°C or ±1.1°C or ±0.75% ±0.4%</td>
</tr>
<tr>
<td>E</td>
<td>Chromel &amp; Constantan</td>
<td>-200 to 670°C</td>
<td>±1.7°C or ±1.0°C or ±0.5% ±0.4%</td>
</tr>
<tr>
<td>K</td>
<td>Chromel &amp; Alumel</td>
<td>-200 to 1280°C</td>
<td>±2.2°C or ±1.1°C or ±0.75% ±0.4%</td>
</tr>
<tr>
<td>N</td>
<td>Nicrosil &amp; Nisil</td>
<td>-200 to 1260°C</td>
<td>±2.2°C or ±1.1°C or ±0.75% ±0.4%</td>
</tr>
<tr>
<td>S</td>
<td>90% Platinum/ 10% Rhodium &amp; Platinum</td>
<td>0 to 1450°C</td>
<td>±1.5°C or ±0.6°C or ±0.25% ±0.1%</td>
</tr>
<tr>
<td>R</td>
<td>87% Platinum/ 13% Rhodium &amp; Platinum</td>
<td>0 to 1450°C</td>
<td>±1.5°C or ±0.6°C or ±0.25% ±0.1%</td>
</tr>
<tr>
<td>B</td>
<td>70% Platinum/ 30% Rhodium &amp; 94% Platinum/ 6% Rhodium</td>
<td>800 to 1700°C</td>
<td>±0.5% ***</td>
</tr>
<tr>
<td>C</td>
<td>95% Tungsten/5% Rhenium &amp; 74% Tungsten/26% Rhenium</td>
<td>0 to 2320°C</td>
<td>4.5°C or ±1.0% ***</td>
</tr>
</tbody>
</table>

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

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

Tension Table for Type of RTD

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Class A (±)</th>
<th>Class B (±)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-200°C</td>
<td>0.55°C</td>
<td>1.3°C</td>
</tr>
<tr>
<td>-100°C</td>
<td>0.35°C</td>
<td>0.8°C</td>
</tr>
<tr>
<td>0°C</td>
<td>0.15°C</td>
<td>0.3°C</td>
</tr>
<tr>
<td>100°C</td>
<td>0.35°C</td>
<td>0.8°C</td>
</tr>
<tr>
<td>200°C</td>
<td>0.55°C</td>
<td>1.3°C</td>
</tr>
<tr>
<td>300°C</td>
<td>0.75°C</td>
<td>1.8°C</td>
</tr>
<tr>
<td>400°C</td>
<td>0.95°C</td>
<td>2.3°C</td>
</tr>
<tr>
<td>500°C</td>
<td>1.15°C</td>
<td>2.8°C</td>
</tr>
<tr>
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</tr>
<tr>
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<td>-</td>
<td>3.8°C</td>
</tr>
<tr>
<td>800°C</td>
<td>-</td>
<td>4.3°C</td>
</tr>
<tr>
<td>850°C</td>
<td>-</td>
<td>4.6°C</td>
</tr>
</tbody>
</table>

Thermocouple Insert Construction

RTD Insert Construction
**BASICS OF THERMOCOUPLES & RTDs**

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**Metallic Protection Tubes**

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

**Ceramic Protection Tubes**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Material</th>
<th>Max./Operating Temp(°C)</th>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Recrystallised Alumina 99.7% purity (C-799)</td>
<td>1750°C</td>
<td>Good resistance to chemical attack, mechanically strong but avoid severe thermal shock</td>
</tr>
<tr>
<td>2</td>
<td>Ceramic 60% Alumina (C-610)</td>
<td>1500°C</td>
<td>Sintered alumina, used in heating furnaces, regenerators etc.</td>
</tr>
<tr>
<td>3</td>
<td>Nitride Bonded Silicon Carbide</td>
<td>1500°C</td>
<td>Good resistance, mechanically strong, unsuitable for oxidizing atmosphere but resist fluxes.</td>
</tr>
<tr>
<td>4</td>
<td>Silicon Nitride</td>
<td>1350°C</td>
<td>Excellent thermal shock resistance, most suitable for molten aluminium</td>
</tr>
<tr>
<td>5</td>
<td>Recrystallised Silicon Carbide</td>
<td>1500°C</td>
<td>Excellent thermal shock resistance</td>
</tr>
<tr>
<td>6</td>
<td>Tungsten Carbide</td>
<td>350°C</td>
<td>Good mechanical strength and high abrasion resistance</td>
</tr>
</tbody>
</table>
**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, HRS 446, INCONEL-600, 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
### 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

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*Image of thermocouples showing various types and configurations.*
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

Material: SS304, SS316, SS316L, SS321, SS310, HRS446, INCONEL 600/800/601, Hastalloy, Monel, Titanium etc.

Type: Drilled Barstock, Fabricated

Construction: Tapered, Straight, Helical

Process Connection: Screwed, Flanged

Certification: IBR certification on request

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, Nickel Cladding
- Tantalum Tungsten (Ta10W) Alloy
- Graphite
- Silicon Nitride
- Other materials in various sizes available on request

PROTECTION TUBES

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, 24x18 mm 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.
### TEMPERATURE GAUGES

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

### PRESSURE GAUGES

<table>
<thead>
<tr>
<th>Sensing Elements</th>
<th>Bourdon Tube, Sealed Diaphragm, Compact Sealed Diaphragm, Schaffer Diaphragm, Capsule Diaphragm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dial Size</td>
<td>40, 50, 63, 80, 100, 150, 250 mm</td>
</tr>
<tr>
<td>Range</td>
<td>Vacuum, Compound, 0,...1Kg/cm² to 0,...2100Kg/cm²</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±1% FSD</td>
</tr>
<tr>
<td>Over-Range Protection</td>
<td>30% above FSD</td>
</tr>
<tr>
<td>Standard</td>
<td>IS 3624, EN837</td>
</tr>
<tr>
<td>Enclosure Protection</td>
<td>IP-55, IP-65 (Filled)</td>
</tr>
<tr>
<td>Connection</td>
<td>1/8&quot;, 1/4&quot;, 3/8&quot;, ½&quot; BSP/NPT (M/F)</td>
</tr>
<tr>
<td>Mounting</td>
<td>Bottom/Back Direct, Bottom Surface, Back Panel, Back Bracket Mounting</td>
</tr>
</tbody>
</table>

### 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

### Special Pressure Gauges
- Maximum reading pointer Pressure Gauge
- Homogenizer Pressure Gauge
- Mud Pressure Gauge
- Electric Contact Pressure Gauge
- Dampening Liquid Glycerin/Silicon Oil filled
TEMPERATURE INDICATORS/ CONTROLLERS

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

TEMPERATURE TRANSMITTERS

- **Programmable Input**:
  - Thermocouples B, E, J, K, R, S, T, N
  - RTD Pt100
- **User programmable working range**
- **2-wire loop powered 4-20mA output**
- **2, 3 or 4-wire RTD and thermocouples with linear output**

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/0.1°C
- **Power**: Standard 9V battery

**TEMPMET 08 - THERMOCOUPLE & RTD**

- **Thermocouple**: B, C, D, E, J, K, N, R, S, T
- **RTD**: Pt100, Pt50, Pt10, Pt200, Pt500, Pt1000
- **Channels**: RTD - 2 No.
  T/C - 2 No.
- **Resolution**: 0.1°C
- **Accuracy**: RTD - 0.3°C
  T/C - 1°C

**TEMPMET 09 - THERMOCOUPLE & RTD**

- **Thermocouple**: B, C, D, E, J, K, N, R, S, T
- **RTD**: Pt100, Pt50, Pt10, Pt200, Pt500, Pt1000
- **Channels**: RTD - 2 No.
  T/C - 2 No.
- **Resolution**: T/C - 0.01°C,
  RTD - 0.001°C
- **Accuracy**: RTD - 0.05°C
  T/C - 0.3°C
BASICS OF CABLES & WIRES

Conductor
Conductor Insulation
Drain Wire
Screening
Inner Sheath
Armouring
Outer Sheath

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

**Insulation Type**
Temperature range for various insulations are listed below:

<table>
<thead>
<tr>
<th>Insulation Type</th>
<th>Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alumina Fibre</td>
<td>-73°C to 1200°C</td>
</tr>
<tr>
<td>Ceramic Fibre/Silica</td>
<td>-73°C to 800°C</td>
</tr>
<tr>
<td>Fibre Glass</td>
<td>-73°C to 550°C</td>
</tr>
<tr>
<td>Polymide</td>
<td>-267°C to 310°C</td>
</tr>
<tr>
<td>PTFE/PFA</td>
<td>-100°C to 260°C</td>
</tr>
<tr>
<td>PEEK</td>
<td>-60°C to 250°C</td>
</tr>
<tr>
<td>FEP</td>
<td>-80°C to 200°C</td>
</tr>
<tr>
<td>SILICON</td>
<td>-50°C to 180°C</td>
</tr>
<tr>
<td>ETFE</td>
<td>-100°C to 150°C</td>
</tr>
<tr>
<td>PVC</td>
<td>-30°C to 105°C</td>
</tr>
<tr>
<td>XLPE</td>
<td>-40°C to 105°C</td>
</tr>
<tr>
<td>HDPE</td>
<td>-50°C to 80°C</td>
</tr>
<tr>
<td>LDPE</td>
<td>-50°C to 70°C</td>
</tr>
<tr>
<td>PUR</td>
<td>-55°C to 80°C</td>
</tr>
<tr>
<td>XLPO</td>
<td>-40°C to 125°C</td>
</tr>
<tr>
<td>ADVANCE THERMAL POLYMER</td>
<td>68°C to 105°C</td>
</tr>
<tr>
<td>XL-ETFE</td>
<td>-100°C to 200°C</td>
</tr>
</tbody>
</table>

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 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, Polymide, Fibre Glass, PUR, ETFE, HDPE, LDPE, XLPO etc. (as listed in insulation)

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

OUTER SHEATH
PVC, Silicon, Teflon, Polymide, Fibre Glass, PUR, ETFE, HDPE, LDPE, XLPO etc. (as listed in insulation)

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) etc.

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.
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.

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 or Multi pair
**Voltage Grade**: Upto 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, Polyimide, Fiber Glass, Ceramic Fiber etc.
**Screening**: Aluminum Foil type/Mesh Braided type
**Inner/Outer Sheath**: PVC, Teflon, Polyimide, 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

**Technical Specification**

**Construction**: Single Pair / Multi Pair
**Voltage Grade**: Up to 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, Polyimide, Fiber Glass, Ceramic Fiber etc.
**Screening**: Aluminum Foil type/Mesh Braided type
**Inner/Outer Sheath**: PVC, Teflon, Polyimide, 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**

<table>
<thead>
<tr>
<th>Conductor Size mm²</th>
<th>Max. Conductor Resistance at 20°C ohm/Km</th>
<th>Max. Capacitance between Conductor nF/Km</th>
<th>Max. Capacitance between Conductor to Screen nF/Km</th>
<th>Inductance mH/Km</th>
<th>L/R Ratio μH/Ohm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>39.0</td>
<td>250</td>
<td>400</td>
<td>&lt;1</td>
<td>&lt;25</td>
</tr>
<tr>
<td>0.75</td>
<td>26.0</td>
<td>250</td>
<td>400</td>
<td>&lt;1</td>
<td>&lt;25</td>
</tr>
<tr>
<td>1.0</td>
<td>19.5</td>
<td>250</td>
<td>400</td>
<td>&lt;1</td>
<td>&lt;25</td>
</tr>
<tr>
<td>1.5</td>
<td>13.3</td>
<td>250</td>
<td>400</td>
<td>&lt;1</td>
<td>&lt;40</td>
</tr>
<tr>
<td>2.5</td>
<td>7.98</td>
<td>250</td>
<td>400</td>
<td>&lt;1</td>
<td>&lt;40</td>
</tr>
</tbody>
</table>

**COMPENSATING CABLE**

<table>
<thead>
<tr>
<th>CONDUCTOR COMBINATIONS</th>
<th>TOLERANCE CLASS</th>
<th>CABLE TEMP. RANGE °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>±0.5°C</td>
<td>-25°C TO +100°C</td>
</tr>
<tr>
<td>JX</td>
<td>±0.5°C</td>
<td>-25°C TO +100°C</td>
</tr>
<tr>
<td>N</td>
<td>±0.5°C</td>
<td>-25°C TO +100°C</td>
</tr>
<tr>
<td>E</td>
<td>±0.5°C</td>
<td>-25°C TO +100°C</td>
</tr>
<tr>
<td>R</td>
<td>±2.5°C</td>
<td>-25°C TO +100°C</td>
</tr>
<tr>
<td>S</td>
<td>±2.5°C</td>
<td>-25°C TO +100°C</td>
</tr>
<tr>
<td>B</td>
<td>±2.5°C</td>
<td>-25°C TO +100°C</td>
</tr>
<tr>
<td>D</td>
<td>±2.5°C</td>
<td>-25°C TO +100°C</td>
</tr>
<tr>
<td>C</td>
<td>±2.5°C</td>
<td>-25°C TO +100°C</td>
</tr>
</tbody>
</table>
We provide a range of single & multi core heat resistance cable for temperature range upto 800°C. Our Heat Resistance Power Cables are suitable to resist in chemical, fire and flame atmosphere.

**Technical Specification**
- **Construction**: Single / Multi Cores
- **Voltage Grade**: Up to 1.1 KV Grade
- **Conductor**: ABC, NPC, Pure Nickel, NPC 27%
- **Conductor Size**: 1.5, 2.5, 4.0, 6.0, 10.0, 16.0, 25.0, 35.0 Sq mm upto 240 sq. mm
- **Heat Barrier Tape**: Polyimide Tape
- **Conductor Stranding**: Multistrand as per IS 8130:84/IEC60228
- **Core Insulation**: PTFE, FEP, PFA, Silicon, Polyimide, Fiber Glass, Ceramic Fiber etc.
- **Screening**: Aluminum Foil type/Mesh Braided type
- **Inner/Outer Sheath**: PVC, Teflon, Polyimide, 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

**DIGITAL LINEAR HEAT CABLES**

Linear Heat Detection Cable consist of a twisted pair of extremely low resistance tri metallic conductors, coated in advanced temperature sensitive thermal polymers which is chemically engineered to breakdown at particular fixed temperatures allowing the twisted conductors to make contact and initiate an alarm at the control panel. This linear cable can detect a fire anywhere along its entire length.

**OTHER SPECIAL CABLES**
- Automotive Wires & Cables
- Solar Photovoltaic Cables
- Fire Survival Cables
- Electron Beam Irradiator Cable
- 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 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.

<table>
<thead>
<tr>
<th>OD (MM)</th>
<th>TYPE</th>
<th>SHEATH</th>
<th>MGO GRADE</th>
<th>ACCURACY</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>K - Simplex</td>
<td>304 - SS304L</td>
<td>STANDARD</td>
<td>CLASS 1</td>
</tr>
<tr>
<td>0.6</td>
<td>J - Simplex</td>
<td>301 - SS301</td>
<td>STANDARD</td>
<td>CLASS 2</td>
</tr>
<tr>
<td>0.8</td>
<td>E - Simplex</td>
<td>304 - SS304L</td>
<td>STANDARD</td>
<td>High Purity (&gt; 99.4% Pure)</td>
</tr>
<tr>
<td>1.0</td>
<td>N - Simplex</td>
<td>310 - SS310</td>
<td>STANDARD</td>
<td>Class 1</td>
</tr>
<tr>
<td>1.2</td>
<td>T - Simplex</td>
<td>316 - SS316L</td>
<td>STANDARD</td>
<td>Class 2</td>
</tr>
<tr>
<td>1.5</td>
<td>S - Simplex</td>
<td>321 - SS321</td>
<td>STANDARD</td>
<td>As per IEC 584-2</td>
</tr>
<tr>
<td>2.0</td>
<td>R - Simplex</td>
<td>600 - INC600</td>
<td>STANDARD</td>
<td>or ANSI MC 96.1</td>
</tr>
</tbody>
</table>

**MINERAL INSULATED RTD CABLES**

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

<table>
<thead>
<tr>
<th>OD (MM)</th>
<th>NO. OF CONDUCTOR</th>
<th>CONDUCTOR MATERIAL</th>
<th>SHEATH</th>
<th>MGO GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>3</td>
<td>Ni - Nickel</td>
<td>304 - SS304L</td>
<td>STANDARD (&gt; 96% PURE)</td>
</tr>
<tr>
<td>0.6</td>
<td>4</td>
<td>Cu - Copper</td>
<td>316 - SS316L</td>
<td>HIGH PURITY (&gt; 99.4% PURE)</td>
</tr>
<tr>
<td>0.8</td>
<td>6</td>
<td>NiCu - Constantan</td>
<td>321 - SS321</td>
<td></td>
</tr>
<tr>
<td>0.9</td>
<td>8</td>
<td></td>
<td>600 - INC600</td>
<td></td>
</tr>
</tbody>
</table>

**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).

**LINEAR HEAT DETECTOR CABLE**

- Semiconductor insulation
- Double Metallic Sheathed
- Negative Temperature Gradient
- Male - Female Edison Connectors

**Application**: To detect fire in Ship Engine area and provide alarm to take necessary action
TUBULAR HEATERS

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

Finned Tubular Heaters
(Safe & Hazardous Area)

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
(Safe & Hazardous Area)

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

**METALLIC HEATING ELEMENTS**

- **Temperature Range**: Upto 1100°C
- **Strip Element**: NiCr 80:20, FeCrA1 alloy equivalent to Kanthal APM, AF, A1
- **Application Areas**: Ammonia Cracker, Furnace Elements etc.

**ACCESSORIES**

- **Radiant Tube Material**: HU, Alloy-600 etc.
- **Hanger Material**: SS310, Incoloy 800, N40 etc.

**BOBBIN IMMERSION HEATERS**

Marathon 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.
PROCESS HEATERS

SILICON CARBIDE HEATERS

- 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

QUARTZ IMMERSION HEATER

- Temperature Range: Upto 120°C

CUSTOMIZED HEATING ELEMENTS

- High Temperature IR Heater
- Flexible Kapton Heater
- Barrel Heater
- Thermo Cutter
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

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.

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

AIR HEATERS

Marathon Tempsens 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

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.

FLEXIBLE HEATERS - SILICON & POLYMIDE

- Temperature Range up to 250°C
- High Di-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

- 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
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”

\[ M = \int M_A d_A = \frac{2\pi k T^4}{15c^2h} = \sigma T^4 \]

- **Field 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.

\[
\text{Installed Spot size} = \text{Installed working distance} \times (S + A) - A
\]

\[
\text{Installed Spot size} = \text{Installed working distance} \times (S - A) + A
\]

- **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**

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

### BASICS OF PYROMETERS

- **Field 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.

- **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.
**PYROMETERS**

<table>
<thead>
<tr>
<th>Instruments</th>
<th>AST IR CAST 2C</th>
<th>AST AL30</th>
<th>AST AL45</th>
<th>AST AL514</th>
<th>AST AL390</th>
<th>AST A250 FO/PL</th>
</tr>
</thead>
</table>

**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 adjustable
- 0.1....1 adjustable

**Spectrum Range**
- 0.7....1.15 μm
- 0.1....1 adjustable

**Distance to Spot Size Ratio**
- DV=166:1(V=Vertical)
- DH=33:1(H=Horizontal)
- 50 : 1
- 100 : 1
- 40 : 1
- 80 : 1
- 100:1(OH,l)
- 200:1(OH,l)
- 200:1(OH,II l)
- 100:1(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).

**FIBER OPTICS**

<table>
<thead>
<tr>
<th>Instruments</th>
<th>AST A450 FO/PL</th>
<th>AST A250C FO/PL</th>
<th>AST A450C FO/PL</th>
<th>ASTE250 PL</th>
<th>AST E450 PL</th>
<th>AST E450C PL</th>
</tr>
</thead>
</table>

**Features**
- Digital 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 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
- 0.7 .......1.15μm adjustable
- 0.1....1 adjustable
- 0.1....1 adjustable
- 0.1....1 adjustable

**Spectrum Range**
- 0.7....1.15 μm
- 1μm
- 1.5 μm / 1.6 μm
- 0.7 .......1.15μm
- 1μm

**Distance to Spot Size Ratio**
- 100:1(OH,l)
- 200:1(OH,II l)
- 200:1(OH II V)
- 100:1(OH,l)
- 200:1(OH,II l)
- 200:1(OH,II V)
- 100:1(OH,II)
- 200:1(OH,II l)
- 200:1(OH,II V)
- 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
- ±0.3% of the measured value +1°C
- ±0.5% of the measured value +1°C
- ±0.5% 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 or 0-20mA/0-10V User Selectable

**Digital Output**
- USB 2.0/B, Bluetooth, RS-232 or RS-485 (User Selectable).
- USB 2.0/B, Bluetooth, RS-232 or RS-485 User Selectable

* in different temperature ranges
### PYROMETERS

#### E - SERIES

<table>
<thead>
<tr>
<th>Instruments</th>
<th>AST EL50/EL50H</th>
<th>AST T3-250</th>
<th>AST T3-450</th>
<th>AST T3-390</th>
<th>AST T3-514</th>
<th>AST T3-814</th>
<th>ML - Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features</td>
<td>Digital IR pyrometer with extended sensor head, analog o/p, digital interface, relay o/p, USB 2.0, inbuilt LCD &amp; keypad for parameterization</td>
<td>Digital IR pyrometer in two wire technology with analog output, laser targeting light, TTL output &amp; USB interface for parameter setting, emissivity adjust at device</td>
<td>Digital IR pyrometer in two wire technology with analog output, Laser targeting light, TTL output &amp; USB interface for parameter setting, for measurement through flame, emissivity adjust at device</td>
<td>Digital IR pyrometer in two wire technology with analog output, Laser targeting light, TTL output &amp; USB interface for parameter setting, for temperature measurement, emissivity adjust at device</td>
<td>Digital IR pyrometer in two wire technology with analog output, Laser targeting light, TTL output &amp; USB interface for parameter setting, for low temperature application, emissivity adjust at device</td>
<td>Miniature Digital online IR pyrometer for low temp. applications</td>
<td></td>
</tr>
<tr>
<td>Temperature Range*</td>
<td>0°C….800°C</td>
<td>300°C….1800°C</td>
<td>600°C….2100°C</td>
<td>300°C….1400°C</td>
<td>300°C….2500°C</td>
<td>0°C….1000°C</td>
<td>0°C….1000°C</td>
</tr>
<tr>
<td>Emissivity</td>
<td>0.1….1.2 adjustable</td>
<td>0.1….1.0 adjustable</td>
<td>0.1….1.0 adjustable</td>
<td>0.1….1.2 adjustable</td>
<td>0.1….1.2 adjustable</td>
<td>0.1….1.2 adjustable</td>
<td>0.1….1.2 adjustable</td>
</tr>
<tr>
<td>Spectrum Range</td>
<td>8….14 µm</td>
<td>1.6 µm</td>
<td>1 µm</td>
<td>3.9 µm</td>
<td>5.14 µm</td>
<td>8….14 µm</td>
<td>8….14 µm</td>
</tr>
<tr>
<td>Distance to Spot</td>
<td>5:1</td>
<td>100:1</td>
<td>200:1</td>
<td>50:1</td>
<td>50:1</td>
<td>50:1</td>
<td>2:1</td>
</tr>
<tr>
<td>Size Ratio</td>
<td>200:1</td>
<td>200:1</td>
<td>200:1</td>
<td>50:1</td>
<td>50:1</td>
<td>50:1</td>
<td>2:1</td>
</tr>
<tr>
<td>Response Time</td>
<td>100 sec.</td>
<td>10 sec.</td>
<td>10 sec.</td>
<td>60 sec.</td>
<td>60 sec.</td>
<td>60 sec.</td>
<td>60 sec.</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±1.0% of the measured value or +3°C</td>
<td>±0.3% of measured value or +1°C</td>
<td>±0.1% of measured value or +1°C</td>
<td>±0.5% of measured value or +1°C</td>
<td>±2% of measured value or ±3°C</td>
<td>±2% of measured value or ±3°C</td>
<td>±2% of measured value or ±3°C</td>
</tr>
<tr>
<td>Analog Output</td>
<td>0-120°C / 0-180°C</td>
<td>0-120°C / 0-180°C</td>
<td>0-120°C / 0-180°C</td>
<td>0-120°C / 0-180°C</td>
<td>0-120°C / 0-180°C</td>
<td>0-120°C / 0-180°C</td>
<td>0-120°C / 0-180°C</td>
</tr>
<tr>
<td>Digital Output</td>
<td>USB 2.0</td>
<td>TTL Output</td>
<td>TTL Output</td>
<td>TTL Output</td>
<td>TTL Output</td>
<td>TTL Output</td>
<td>TTL Output</td>
</tr>
</tbody>
</table>

*EL50H - sensor head 180°C

#### A+ SERIES

<table>
<thead>
<tr>
<th>Instruments</th>
<th>AST A250+</th>
<th>AST A450+</th>
<th>AST A450C+</th>
<th>A4</th>
<th>AST 450G2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features</td>
<td>Focusable digital IR Pyrometer with analog o/p, digital interface, laser targeting, through the lens view finder, video module, parameterising keys, LCD display &amp; bluetooth</td>
<td>Two color focusable Pyrometer with analog o/p, digital interface, laser targeting, through the lens view finder, video module, parameterising keys &amp; LCD display &amp; bluetooth</td>
<td>Digital IR pyrometer with Digital &amp; analog o/p for aluminum &amp; non-ferrous applications (measures through smoke, dust, water vapor etc.)</td>
<td>2 wire pyrometer for glass industry with fast digital &amp; analog interface with heavy duty optic cable usable in high ambient temp. without cooling</td>
<td></td>
</tr>
<tr>
<td>Temperature Range*</td>
<td>210°C….3000°C</td>
<td>600°C….2500°C</td>
<td>600°C….2500°C</td>
<td>170°C….1500°C</td>
<td>600°C….1800°C</td>
</tr>
<tr>
<td>Emissivity</td>
<td>0.1….1 adjustable</td>
<td>0.1….1 adjustable</td>
<td>0.1….1 adjustable</td>
<td>0.1….1.0 adjustable</td>
<td>0.05….1 adjustable</td>
</tr>
<tr>
<td>Spectrum Range</td>
<td>1.6µm</td>
<td>1.0µm</td>
<td>0.7 ….1.15µm</td>
<td>Multiple spectral range</td>
<td>1µm</td>
</tr>
<tr>
<td>Distance to Spot</td>
<td>Focal length: 75:1</td>
<td>Focal length: 150:1</td>
<td>Focal length: 300:1</td>
<td>10 mm from 1 mtr distance</td>
<td>100:1</td>
</tr>
<tr>
<td>Size Ratio</td>
<td>150:1</td>
<td>300:1</td>
<td>300:1</td>
<td>250mm adjustable upto 10 sec.</td>
<td></td>
</tr>
<tr>
<td>Response Time</td>
<td>2ms. adjustable upto 10 sec.</td>
<td>2ms. adjustable upto 10 sec.</td>
<td>20ms adjustable upto 10 sec.</td>
<td>0.5 Sec.</td>
<td>250ms adjustable upto 10 sec.</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.3% of the measured value +1°C</td>
<td>±0.3% of the measured value +1°C</td>
<td>±0.5% of the measured value +1°C</td>
<td>±1% of measurable value</td>
<td>±0.3% of measured value or ±3°C which is greater</td>
</tr>
<tr>
<td>Analog Output</td>
<td>0-20mA</td>
<td>0-20mA</td>
<td>0-20mA</td>
<td>4….20mA or 0 20mA</td>
<td>4….20mA</td>
</tr>
<tr>
<td>Digital Output</td>
<td>USB 2.0/Bluetooth, RS-485 (User Selectable)</td>
<td>RS-232, RS-422, USB/Bluetooth</td>
<td>USB 2.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Sensing Head 0-120°C / 0-180°C

*Specifications are subject to change without prior notice.*
### PYROMETERS

<table>
<thead>
<tr>
<th>GLASS INDUSTRY</th>
<th>PORTABLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruments</td>
<td>PGM+</td>
</tr>
</tbody>
</table>

**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, USB. Bright Back light, LCD Graphics

**Temperature Range**
- 250.....600°C
- -60.....500°C
- -60.....760°C
- -60.....1500°C
- 200.....2400°C
- 210.....2500°C
- 600.....3000°C
- 200.....2400°C
- 210.....2500°C
- 600.....3000°C
- 200.....2400°C
- 210.....2500°C
- 600.....3000°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
- 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
- 100:1
- 200:1
- 400:1

**Response Time**
- 2msec adjustable upto 10 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

**Digital Output**
- USB 2.0
- -
- USB 2.0

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### THERMAL IMAGERS

**TE-700 (HIGH RESOLUTION, HIGH TEMPERATURE ULTRA COMPACT INFRARED CAMERA)**

AST-TE700 is a thermal Imaging System, with high spatial and thermal resolution, that provides monitoring of temperature profile of the target object round the clock visually in a display system for demanding real time imaging applications in various industries. Whether in quality control, process monitoring or process automation - the infrared camera TE-700 measures temperatures without contact exactly and reliably. This model is specifically designed for continuous operation in fixed-mount applications. The device is durable, robust and suitable for industrial continuous operation.

**Technical Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>TE-700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Range</td>
<td>700°C…..1800°C</td>
</tr>
<tr>
<td>Spectral Range</td>
<td>0.85 - 1.1μm</td>
</tr>
<tr>
<td>Detector</td>
<td>High Dynamic CMOS</td>
</tr>
<tr>
<td>Optional Resolution/Frame Rate</td>
<td>768 x 576 Pixels@ 25Hz</td>
</tr>
<tr>
<td>Thermal Sensitivity (NETD)</td>
<td>&lt;1K(700°C[1292°F]), &lt;2K(1000°C [1832°F])</td>
</tr>
<tr>
<td>Analog Output</td>
<td>4 Channel Analog Current Output</td>
</tr>
<tr>
<td>Digital Input</td>
<td>4 Active-high, Buffered Inputs</td>
</tr>
<tr>
<td>Digital Output</td>
<td>4 Open Source, Mosfet Outputs</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Ethernet/USB</td>
</tr>
<tr>
<td>Protocol</td>
<td>GIGE for ethernet, Proprietary for USB</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>0°C - 60°C</td>
</tr>
</tbody>
</table>

**Features**
- Wide measurement range 700-1800°C (upto 25Hz frame rate)
- High dynamic CMOS detector with upto 768 x 576 pixels resolution
- Thermal as well as Monochrome Video Display
- Fast thermal data acquisition in real time via Gigabit Ethernet/USB
- Configurable storage and replay temperature video
- Digital and analog input/output modules
- Software controlled parameter settings
- Multiple client PC configuration
- Small aluminum compact housing
- Standard InfraView Software Package
- Integration in customized system solution, including software adjustments
- Accessories : Water Cooling Jacket
LTE-384 (HIGH RESOLUTION, LONG WAVELENGTH ULTRA COMPACT INFRARED CAMERA)

LTE-384 is affordable thermal camera in the market, with 50Hz frame rate, multi functions and wide temperature measurement range. It provides ultimate inspection tools and unprecedented easy-to-use designs to fit your needs. Application areas include:
- Online Monitoring System
- UAV & Aircraft & Robot Application
- Automation Security

**Technical Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>LTE-384</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detector Type</td>
<td>Uncooled FPA detector</td>
</tr>
<tr>
<td>IR Resolution</td>
<td>384x288</td>
</tr>
<tr>
<td>Pixel Pitch</td>
<td>17μm</td>
</tr>
<tr>
<td>Spectral Range</td>
<td>7.5 - 14μm</td>
</tr>
<tr>
<td>NETD</td>
<td>&lt;0.05°C @30°C</td>
</tr>
<tr>
<td>Frequency</td>
<td>50Hz/60Hz</td>
</tr>
<tr>
<td>Operation Temp. Range</td>
<td>-30°C ~ +60°C</td>
</tr>
</tbody>
</table>

**Features**
- 384 x 288 17μm uncooled FPA detector
- NETD ≤ 40mk
- Multiple motorized Ge. lens, supporting auto focusing
- Auto tracking of hot spots and showing the temperature values
- Thermal images, temperature and temperature data flows are saved
- 100M network transmission temperature data
- Compact structure with weight of 420g
- IP54 encapsulation, 3 year warranty
- Professional software for free

LTE-80 (Low Resolution, Long Wavelength Most Economic Thermal Camera)

Infrared pyrometers can be used when we know the exact critical point of temperature measurement. Pyrometers help in temperature measurement at a certain point. But thermal imagers are required in applications where temperature of a certain area needs to measured. High resolution, like 640x480 pixels /384x288 pixels is not always needed in industrial applications. Sometimes we just need to identify faults. So AST LTE-80 ,80x64 pixels, is the most economic solution.

**Fit for Purpose**

Very high resolution is not always needed as we just need to identify faults. However the resolution offered by our thermal camera is good which is equivalent to using hundreds of pyrometer for monitoring larger areas.

**Technical Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>LTE-80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical Resolution</td>
<td>80 x 64 pixels</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>5 V</td>
</tr>
<tr>
<td>Ambient temp. range</td>
<td>0 to 70°C</td>
</tr>
<tr>
<td>Object temperature range</td>
<td>-20 to &gt;1000°C</td>
</tr>
<tr>
<td>Frame rate (full frame)</td>
<td>9 to 20 Hz</td>
</tr>
<tr>
<td>NETD (best optics)</td>
<td>150 mk@1Hz</td>
</tr>
<tr>
<td>Communication</td>
<td>Ethernet</td>
</tr>
</tbody>
</table>

**Features**
- More accuracy and security in every measurement
- High sensitivity of the system
- Temperature display
- Contrast adjustment
- Several lenses for different FOV
- Real time temperature measurement values
**FURNACE MONITORING CAMERA**

<table>
<thead>
<tr>
<th>Model</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>TFV-750/TFV-1100</td>
<td>Straight View Visual Camera</td>
</tr>
<tr>
<td>TE-750/TE-1100</td>
<td>Straight View Thermal Camera</td>
</tr>
<tr>
<td>TFV-750/OV &amp; TFV-1100/OV</td>
<td>Elbow View Visual Camera</td>
</tr>
<tr>
<td>TE-750/OV &amp; TE-1100/OV</td>
<td>Elbow View Thermal Camera</td>
</tr>
</tbody>
</table>

**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%)

**PINHOLE LENS**

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

**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

**THERMAL CAMERA (Thermal View)**

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

**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
**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**

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

**DRY BLOCK/FURNACES**

<table>
<thead>
<tr>
<th>Calibration</th>
<th>Temperature Range</th>
<th>Stability</th>
<th>Calibration Volume (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CALsys -196/-80</td>
<td>-196 to -80°C</td>
<td>0.1°C</td>
<td>Dia 24 x 300 (L) (2holes of 6.5, 2holes of 9.5)</td>
</tr>
<tr>
<td>CALsys -15/110 (Peltier Dry Block)</td>
<td>-15 to 110°C</td>
<td>0.1°C</td>
<td>Dia 24 x 120 (L), (3 holes of 6.0) 115 (D)</td>
</tr>
<tr>
<td>CALsys 650</td>
<td>50 to 650°C</td>
<td>0.1°C</td>
<td>Dia 32 x 150 (L), 4 holes of 6.5 x 120 (D)</td>
</tr>
<tr>
<td>CALsys FB (Fluidised Bath)</td>
<td>50 to 650°C</td>
<td>1.0°C</td>
<td>Dia 150 x 385 (D)</td>
</tr>
<tr>
<td>CALsys 1200</td>
<td>250 to 1200°C</td>
<td>0.5°C</td>
<td>Dia 37 x 215 (L), (2x6 &amp; 2x8 holes) of 150 (D)</td>
</tr>
<tr>
<td>CALsys 1200L</td>
<td>300 to 1200°C</td>
<td>0.5°C</td>
<td>Dia 37 x 240 (L), (2x6 &amp; 2x8 holes) of 160 (D)</td>
</tr>
<tr>
<td>CALsys 12003Z (3-Zone Furnace)</td>
<td>300 to 1200°C</td>
<td>0.4°C</td>
<td>Dia 37 x 240 (L), (2x6 &amp; 2x8 holes) of 150 (D)</td>
</tr>
<tr>
<td>CALsys 1500L</td>
<td>500 to 1500°C</td>
<td>1.0°C</td>
<td>Dia 37 x 245 (L), (2x6 &amp; 2x8 holes) of 140 (D)</td>
</tr>
<tr>
<td>CALsys 1700L</td>
<td>500 to 1700°C</td>
<td>2.0°C</td>
<td>Dia 37 x 240 (L), (2x6 &amp; 2x8 holes) of 225 (D)</td>
</tr>
</tbody>
</table>

**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-C799)

**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

<table>
<thead>
<tr>
<th>Type</th>
<th>Channel*</th>
<th>Ref. Temp.</th>
<th>Type of Junction</th>
</tr>
</thead>
<tbody>
<tr>
<td>CALref 0</td>
<td>20</td>
<td>0°C</td>
<td>J,K,T,E,N,R,S,B</td>
</tr>
<tr>
<td>CALref 60</td>
<td>24</td>
<td>60°C</td>
<td>J,K,T,E,N,R,S,B</td>
</tr>
</tbody>
</table>

*As per requirement

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.

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

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

METERS

- High resolution & high accuracy read outs.
- CALSYS C-4004 (HIGH ACCURACY DIGITAL THERMOMETER)
  - High Stability of Temperature measurement (0.98°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)

MASTER PYROMETERS WITH SPECIAL CALIBRATION

- AST AL30 : 0 to 1000°C
- AST A250 : 250 to 2500°C
### MF STANDARD FURNACES (MAX. 1200°C)

<table>
<thead>
<tr>
<th>Model</th>
<th>Liters</th>
<th>Inside Dimensions (mm)</th>
<th>kW</th>
<th>Heating Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>MF 312</td>
<td>5</td>
<td>175 X 300 X 95</td>
<td>2.8</td>
<td>Kanthal A1</td>
</tr>
<tr>
<td>MF 412</td>
<td>7.9</td>
<td>175 X 300 X 150</td>
<td>3.2</td>
<td>Kanthal A1</td>
</tr>
<tr>
<td>MF 512</td>
<td>18.5</td>
<td>200 X 400 X 230</td>
<td>8.0</td>
<td>Kanthal A1</td>
</tr>
<tr>
<td>MF 112</td>
<td>1.5</td>
<td>100 X 150 X 100</td>
<td>2.0</td>
<td>Kanthal A1</td>
</tr>
</tbody>
</table>

*Custom size on request

### OTHER SPECIAL FURNACES
- Microwave Furnace.
- Induction Heating Furnace.
- Hybrid-dual Mode Furnace (microwave & resistance heating).
- Special vacuum & gas atmosphere furnace.

### BOTTOM LOADING FURNACES

### TUBULAR FURNACES

<table>
<thead>
<tr>
<th>Model</th>
<th>Maximum Temperature (°C)</th>
<th>Internal Dimensions (W x D x H) (mm)</th>
<th>Heating Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLF - 1200</td>
<td>1200</td>
<td>120X120X120</td>
<td>Kanthal A1</td>
</tr>
<tr>
<td>BLF - 1500</td>
<td>1500</td>
<td>120X120X120</td>
<td>Silicon Carbide</td>
</tr>
<tr>
<td>BLF - 1800</td>
<td>1800</td>
<td>120X120X120</td>
<td>MoSi₂</td>
</tr>
</tbody>
</table>

*Custom size on request

<table>
<thead>
<tr>
<th>Model</th>
<th>Maximum Temperature (°C)</th>
<th>Ceramic Tube ID X Hot zone length (mm)</th>
<th>Heating Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>TF - 1200</td>
<td>1200</td>
<td>50 X 200 &amp; 80 X 250</td>
<td>Kanthal A1</td>
</tr>
<tr>
<td>TF - 1400</td>
<td>1400</td>
<td></td>
<td>Silicon Carbide</td>
</tr>
<tr>
<td>TF - 1600</td>
<td>1600</td>
<td></td>
<td>MoSi₂</td>
</tr>
<tr>
<td>TF - 1800</td>
<td>1800</td>
<td></td>
<td>MoSi₂</td>
</tr>
</tbody>
</table>

*Option available with inert gas atmosphere and vacuum.
*Custom tube size on request.
*Also available in 3 Zone design
FURNACES

BOX FURNACE (HT-1200)

- Max. Temperature: 1200°C
- Working Temperature: 1150°C
- Muffle: Ceramic Fiber Board
- Heating Element: MoSi2

Note: Customised Sizes Available

CHAMBER FURNACE (HT-1600)

- Max. Temperature: 1600°C
- Working Temperature: 1550°C
- Muffle: Ceramic Fiber Board
- Heating Element: MoSi2

Note: Customised Sizes Available

KILN OR BOGIE FURNACE (HT-K-1200)

- Max. Temperature: 1200°C
- Working Temperature: 1200°C
- Insulation: High insulating refractory bricks
- Heating Element: Kanthal APM / Silicon Carbide

Note: Customised Sizes Available

ELECTRICAL CONVEYER MESH BELT FURNACE (MB-C-1100)

- Max. Temperature: 1100°C
- Working Temperature: 1100°C
- Heating 2 Zone: 400mm(W) x 150mm(H) x 3000mm(L)
- Conveyor Mesh Belt: Chain Link with SS roller with electric drive including speed control

Note: Customised Sizes Available
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.

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

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

The lab offer both at Lab & On-Site Calibration of Furnace/Bath from -80°C to 1600°C and Black Body Calibration from 50°C to 1700°C. Furnace/Chamber Calibration (TUS) with multiple sensors from -80°C to 1200°C is also in the scope of the lab.

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.

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

Sample Thermography Report