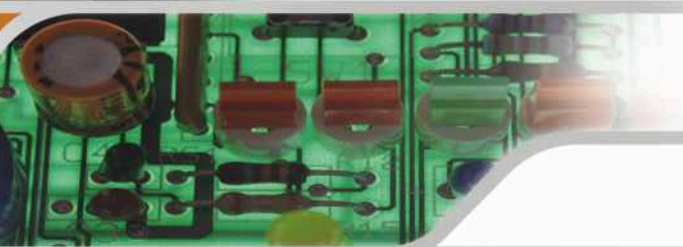


EXATHERMOMETRICS

EXACTING TEMPERATURE SENSING



LIFE SCIENCES ● HVAC ● AUTOMOTIVE ● ELECTRO-DOMESTICS ● INDUSTRIAL



GLOBAL LEADERS IN TEMPERATURE SENSING

Exa Thermometrics leads the way in the manufacture of high quality thermistors for advanced temperature sensing. Starting from ultra high purity transition metal-oxides, further refined into nano particle levels, Exa Thermometrics has pioneered the development of a vast range of material systems, meeting all global RT curve requirements. This State-of-the-art polycrystalline semiconductor fab facility manufactures NTC thermistor chips, discs and ring/polos, a variety of glass encapsulated chips, lead frame coated devices, microchip based catheter thermistor probes and OEM customer specific temperature probes.

Our ISO 9001:2015, IATF 16949:2016 and ISO 14001:2015 certified manufacturing plants with Class 100K clean room facilities are based in Bangalore, India. Innovative application engineering capabilities with prototyping facilities results in highly reliable temperature sensors developed in partnership with our customers.

Exa Thermometrics provides NTC Thermistor based sensing solutions for HVAC, automotive, electro-domestics, life-sciences, health and leisure, aerospace and newly emerging applications in the fields of biotechnology, defence, and medical diagnostics.

Our commitment to exacting temperature sensing is driven by a global need for energy efficiency, transportation safety, emission controls, accurate medical diagnostics, reliability of appliances in an increasingly smarter, ever evolving and greener world.



Exact sensing solutions driving energy efficiency, safety, healthcare and emerging technology for

A WORLD OF APPLICATIONS



MEDICAL DIAGNOSTICS

- Oral temperature
- Esophageal catheter
- Thermolulution heart catheter
- Urinary catheter
- Rectal temperature
- Skin temperature



HEALTH AND LEISURE

- Pools and Spas
- Hot Tubs
- Sauna baths
- Steam rooms
- Power showers



AUTOMOTIVE & LOGISTICS

- Coolant temperature
- Engine management
- Climate control
- Anti-lock braking systems
- HID lamps
- Air bag controls
- Fuel filter sensors
- CRDi sensors
- Motor circuit protection



ELECTRO- DOMESTICS

- Frost free fridges
- Washing machines
- Dishwashers
- Ovens
- Microwave ovens
- Dryers



INDUSTRIAL

- Battery temperature
- Power packs
- Ambient temperature
- Heatsink temperature
- Charge circuit control
- Temperature compensation



MEDICAL EQUIPMENTS

- Baby Incubators
- Dialysis
- Thermolulution Systems
- Bed-side Monitors
- Ventilators



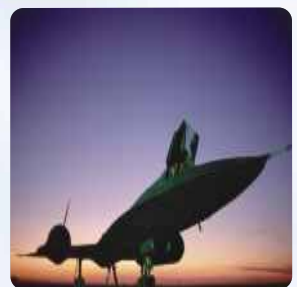
HVAC

- Home heaters
- Evaporator temperature
- Heat pumps
- Condensation systems
- Boilers and chillers
- Ducts and vents
- Electronic thermostats



BIOTECH

- Near cryogenic monitoring
- Vaccine logistics monitoring
- Validation systems
- Forensic analysis
- Cryogenic preservation



DEFENCE AND AVIONICS

- Windscreen de-icing
- Temperature compensation
- Smart systems
- Thermostats



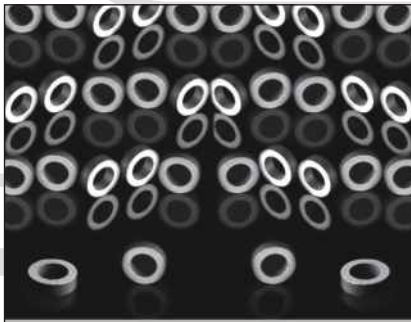
NTC THERMISTOR DEVICES

NTC Disc Thermistor



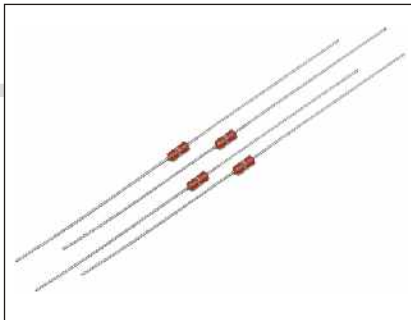
| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|--|---|
| Automotive Engine Temperature Coolant Temp. Monitoring Engine Management Systems Washing Machine Sensors | High Stability High Power Applications Rugged Construction | Operating Temperature -55 to +155°C Dissipation Constant 2 mW/°K to 8 mW/°K Diameter 2mm to 10mm typical | Custom R-t characteristics Broad Range of R-t curves Lead wires |

NTC Ring Thermistors



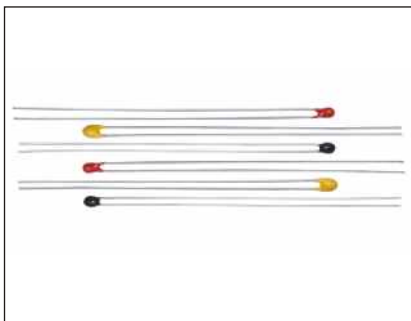
| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|---|---|
| Automotive Engine Temperature Coolant Temp. Monitoring Engine Management Systems Composite Sensors | High Power Applications Rugged Construction High Stability | Operating Temperature -55 to +155°C Diameter 4mm to 7mm typical Dissipation Constant 4 mW/°K to 8 mW/°K | Custom R-t characteristics Broad Range of R-t curves |

Axial Glass Encapsulated NTC Thermistors



| Engineering Applications | Key Features | Specification Summary | Options |
|--|---|--|--|
| Engine Management Systems Battery Packs Washing Machine Sensors Pressure Cookers Fuel Level Sensor | DO-35 Diode Glass Packaging DUMET header lead wires Hermetically sealed High-Temp. Applications High Voltage Insulation | -40°C to t-Max 250°C Diameter 1.8mm, Length 3.8mm Typical Dissipation Constant 3 mW/°K | Tape-on-Reel for Auto-Insertion Broad Range of R-t curves Gold Electroding upto +/- 0.5% tolerance |

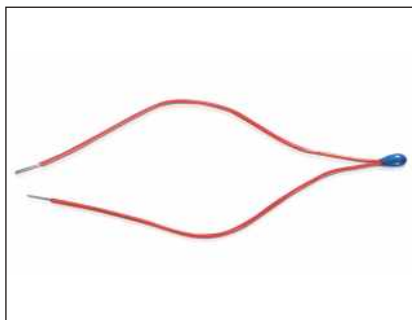
Epoxy coated NTC Chip Thermistors



| Engineering Applications | Key Features | Specification Summary | Options |
|--|---|---|--|
| Overmolded Automotive Sensors Air-Conditioning Probes Refrigeration Probes Engine Management Systems Medical Sensors Thermometers | Interchangeable up to +/- 0.1°C Accuracy Miniature Head Size Fast Response Time | t-Max 150°C Diameter 1mm to 3mm Typical Steel/Alloy 52/Alloy 42/Nickel/Copper Lead Wires | Long Lead Length for Overmoulding Applications Broad Range of R-t Curves High Temperature Resins |

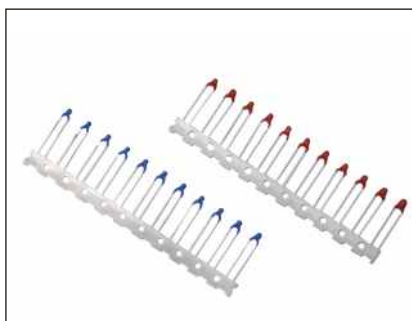
NTC THERMISTOR DEVICES

Epoxy Coated NTC Chip Thermistors with Insulated Lead Wires



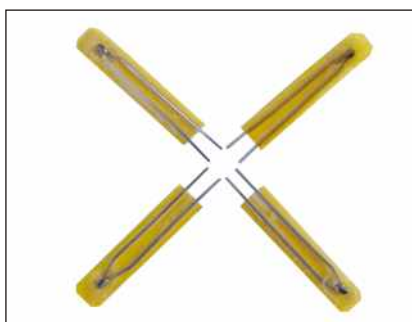
| Engineering Applications | Key Features | Specification Summary | Options |
|--|--|---|--|
| Heater Control Systems Engine Management Systems Battery Packs Uninterrupted Power Systems Heatsink Temperature Ambient Temperature Circuit Protection | Interchangeable to +/- 0.1°C Accuracy Miniature Head Size Fast Response Time | PTFE/PVC/KYNAR Insulation t-Max 150°C Diameter 1mm to 3mm Typical Nickel/Copper lead wires | Matched pair Broad Range of R-t curves High Temperature Resins |

Lead Frame NTC Thermistors



| Engineering Applications | Key Features | Specification Summary | Options |
|--|--------------------------------------|---|--|
| Designed for Automated Assembly Engine Management Systems Ambient Temperature Monitoring Temperature Compensation | Optimum for overmolding applications | Operating Temperature -55 to +155°C Diameter 2mm to 5mm typical Dissipation Constant 2 mW/°K to 5 mW/°K | X or Y lead form Lead length Broad Range of R-t curves |

Ultra-Thin NTC Thermistors Sensors in Flexible Tape/PCB



| Engineering Applications | Key Features | Specification Summary | Options |
|--|--|--|--|
| Multi-layer Gaskets Heat Pumps Cell-Phone Battery Sensor Laptop Battery Sensor Boiler Temperature Sensors Automotive Seat Heaters | Kapston Tape Protected Nickel Bifilar Lead Wires Gold Electroded | Operating Temperature -55 to +155°C 250 Micron sensor thickness 150 Micron NTC Microchip | Variety of Adhesive Tapes Adhesive Foam Base PTFE connector harness Broad Range of R-t curves |

Chip in Glass NTC Thermistors



| Engineering Applications | Key Features | Specification Summary | Options |
|--|---|---|--|
| IT Peripherals Optical Scanners Engine Management Systems Electronic Thermostats Medical Sensors Medical Catheters High-End HVAC Systems | High Stability Thermistor Fast Response Ultra Miniature Gold Electroded Hermetically sealed | t-Max 250°C Diameter 0.5mm to 3mm Typical DUMET Leaded Wire | Ultra fast response Broad Range of R-t curves |

ELECTRO-DOMESTICS SENSORS

Washing Machine Probes



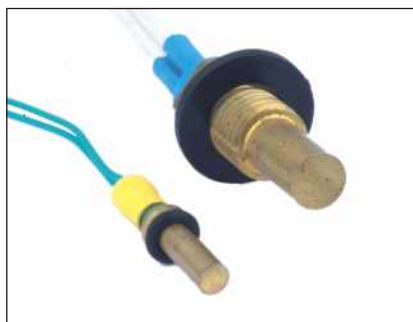
| Engineering Applications | Key Features | Specification Summary | Options |
|--|--|--|--|
| Washer Fill Funnel Temperature Sensor Drum Water Temperature Sensor | Fast Response Time Hermetically Sealed Thermally Conductive Plastic Overmoulded | Choice of NTC Thermistor Choice of Interconnect -20 to 125°C Operating Temperature | Diode Pack NTC Chip in Glass NTC Customised Probe Encapsulation UL Approved |

Fridge Probes



| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|---|---|
| Main Compartment Temperature Sensing Ice maker Sensor Freezer Sensor Frost Free Compartment Sensor | Fixed Response Time Probes Hermetically Sealed Thermally Conductive Plastic Overmoulded Food Grade Plastic Caps Medical Grade Steel Thermowells | Choice of NTC Thermistor Choice of Interconnect -40 to 85°C Operating Temperature | Gold Electroded Thermistor for Ultra High Reliability Customised Probe Encapsulation |

Power Shower Probes



| Engineering Applications | Key Features | Specification Summary | Options |
|--|--|--|--|
| Water Heater Control Shower Fill Funnel Temperature Sensor Drum Water Temperature Sensor | Ultra Fast Response Time Brass Body | Choice of NTC Thermistor Choice of Interconnect -20 to 125°C Operating Temperature | Diode Pack NTC Chip in Glass NTC Customised Probe Encapsulation Gold Electroded Thermistor for Ultra High Reliability |

Microwave Oven Probes



| Engineering Applications | Key Features | Specification Summary | Options |
|--|-----------------------------------|--|--|
| Main Oven Temperature Sensing Convection Heater Control | Ultra Fast Response Brass Body | Choice of NTC Thermistor Choice of Interconnect -20 to 250°C Operating Temperature | Diode Pack NTC Chip in Glass NTC Customised Probe Encapsulation Gold Electroded Thermistor for Ultra High Reliability |

HEATING SENSORS

Pipe Clip Probes



| Engineering Applications | Key Features | Specification Summary | Options |
|--|--|---|---|
| <ul style="list-style-type: none"> Condensing Heating Systems Home Heating Systems Convection Heating Systems Radiator Temperature Sensing | <ul style="list-style-type: none"> Typically 13, 15, 17 and 22mm Diameter Pipe Fit Choice of NTC Thermistor Chip | <ul style="list-style-type: none"> Multi Diameter Pipe Clips Ultra Fast Response Time Overmoulded Housing Corrosion Resistant Shoe Alumina Electrical Insulation | <ul style="list-style-type: none"> Customised Interconnect Customised Clip Design |

Flue Gas Sensor



| Engineering Applications | Key Features | Specification Summary | Options |
|---|---|---|---|
| <ul style="list-style-type: none"> Condensing Heating Systems Gas Return Controls Safety Control Systems | <ul style="list-style-type: none"> Isolated Thermistor Isolated Brass Housing | <ul style="list-style-type: none"> Choice of NTC Thermistor Chip Choice of Interconnect | <ul style="list-style-type: none"> Fire Retardant Cables |

Water Tank Sensor



| Engineering Applications | Key Features | Specification Summary | Options |
|--|---|---|---|
| <ul style="list-style-type: none"> Home Heating Systems Condensing Heating Systems | <ul style="list-style-type: none"> Fast Response Time Holding/Placement Bracket | <ul style="list-style-type: none"> Choice of NTC Thermistor Chip Choice of Interconnect | <ul style="list-style-type: none"> Hermetically Sealed Fire Retardant Cables Customised Interconnect Customised Clip Design |

Boiler Probes



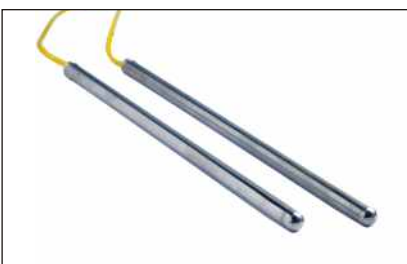
| Engineering Applications | Key Features | Specification Summary | Options |
|--|---|--|---|
| <ul style="list-style-type: none"> Condensing Heating Systems Home Heating Systems Convection Heating Systems Radiator Temperature Sensing | <ul style="list-style-type: none"> Precision Machined SS-316 Housings Precision Machined SS-304 Housings Precision Machined Brass with Arsenic Housings Fast Response Time Fixed Response Time | <ul style="list-style-type: none"> Choice of NTC Thermistor Choice of Interconnect | <ul style="list-style-type: none"> Fire Retardant Cables Customised Interconnect Customised Clip Design Customised Flange |

Heat Pump Probes



| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|---|--|
| <ul style="list-style-type: none"> External Surface Temperature Sensor Safety Circuit Control Ambient Temperature Monitoring | <ul style="list-style-type: none"> Single/Double Sided Adhesive Foam Base Kapston Tape Protected Ultra Fast Response Time Ultra Thin Wafers | <ul style="list-style-type: none"> Choice of NTC Spec Choice of Interconnect -55 to +155°C Operating Temperature | <ul style="list-style-type: none"> Gold Electroded for Ultra High Reliability PTFE connector harness |

PRT 100/500/1000 Probes



| Engineering Applications | Key Features | Specification Summary | Options |
|---|---|---|---|
| <ul style="list-style-type: none"> Food Quality/Preparation Monitoring Laboratory Reference Compressor Sensor Process Control | <ul style="list-style-type: none"> Wide Range of Stainless Steel Housings Sharp Tipped Food Probe | <ul style="list-style-type: none"> Thin Film PRT High CpK Options Choice of Interconnect | <ul style="list-style-type: none"> Fire Retardant Cables Hand Held Digital Read-out |

AIR CONDITIONING AND VENTILATION SENSORS

Evaporator Sensor



| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|---|---|
| De-icing Temperature Sensor Ambient Temperature Sensor | Moisture Resistant Compact Hermetically Sealed Fixed Response Time | -30 to 85°C Operating Temperature Choice of NTC Thermistor Choice of Interconnect | Hermetical Sealing Chip in Glass NTC |

Heat Duct Sensor



| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|---|---|
| Air Inlet Temperature Sensor Duct Temperature Monitoring Fan Temperature Sensor | Moisture Resistant Compact Hermetically Sealed Fixed Response Time | -30 to 85°C Operating Temperature Choice of NTC Thermistor Choice of Interconnect | Hermetical Sealing Chip in Glass NTC |

Ventilation Duct Sensor



| Engineering Applications | Key Features | Specification Summary | Options |
|--|--|---|---|
| Damper Control Fan Temperature Sensor Duct Temperature Monitoring Actuator Control Home Heating Systems Office HVAC Systems | Moisture Resistant Compact Hermetically Sealed Fixed Response Time | -30 to 85°C Operating Temperature Choice of NTC Thermistor Choice of Interconnect | Hermetical Sealing Chip in Glass NTC |

Fan Sensor



| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|---|---|
| Fan Temperature Sensor Office HVAC Systems Window Air Conditioning Fan units | Moisture Resistant Compact Hermetically Sealed Fixed Response Time | Hermetical Sealing Chip in Glass NTC | -30 to 85°C Operating Temperature Choice of NTC Thermistor Choice of Interconnect |

AUTOMOTIVE

Gasoline System Sensors



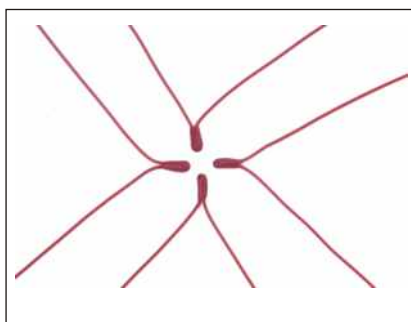
| Engineering Applications | Key Features | Specification Summary | Options |
|---|---|---|-------------------|
| CRDi Fuel Sensing Safety 4th Generation CRDi Systems Petrol Mpi Systems | Brass Overmoulded Construction Fast Response Time Ultra High Stability Ultra High Reliability Corrosion Resistant Composition Precision Machined | Choice of NTC Chip Choice of Interconnect -40 to 85°C Operating Temperature | Chip in Glass NTC |

Fuel Filter Sensors



| Engineering Applications | Key Features | Specification Summary | Options |
|--------------------------------------|---|---|-------------------|
| Diesel Fuel Air Intake Filter Safety | Brass Overmoulded Construction Fast Response Time Ultra High Stability Ultra High Reliability Corrosion Resistant Composition Precision Machined | Choice of NTC Chip Choice of Interconnect -40 to 85°C Operating Temperature | Chip in Glass NTC |

Fuel Level Sensors



| Engineering Applications | Key Features | Specification Summary | Options |
|---|---|---|-------------------|
| Empty Tank Indicator Multi Level Tank Level Indication | Hermetically Sealed Construction Corrosion Resistant Composition Low Dissipation Factor Ultra High Stability | Choice of NTC Chip Choice of Interconnect -40 to 85°C Operating Temperature | Chip in Glass NTC |

Vision System Sensors



| Engineering Applications | Key Features | Specification Summary | Options |
|---|---|---|------------------------------------|
| Wing Mirror Heating System Control Bonnet Mirror Heating System Control Side Mirror Heating System Control Anti-fogging Systems Anti-freeze Systems | Hermetically Sealed Construction Corrosion Resistant Composition Low Dissipation Factor Ultra High Stability Custom Moulded Construction for Mirror Insertion | Choice of NTC Chip Choice of Interconnect -40 to 85°C Operating Temperature | Chip in Glass NTC Cable Shields |

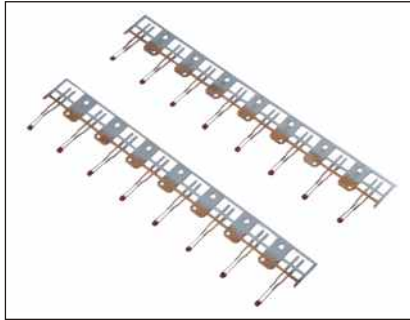
Temperature Switches



| Engineering Applications | Key Features | Specification Summary | Options |
|--|---|---|---------|
| Set Temperature On/Off Control Safety Systems | Hermetically Sealed Construction Corrosion Resistant Composition Low Dissipation Factor Ultra High Stability Fast Response Time | Choice of Interconnect -40 to 85°C Operating Temperature | N/A |

AUTOMOTIVE

Ambient NTC Lead Frames



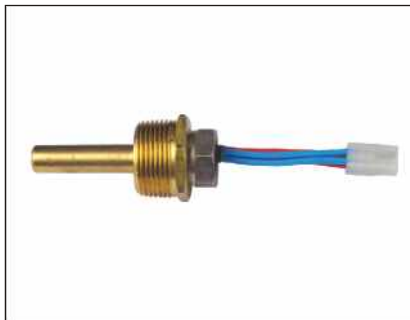
| Engineering Applications | Key Features | Specification Summary | Options |
|---|----------------------|--|---|
| Overmoulded Ambient Temperature Sensors Air Intake Sensor Engine management System Sensor | Plastic Overmoulding | Choice of Thermistor -40 to 125°C Operating Temperature | Spot Welding Resin Potting Press Fit Pins Compliant Pins |

Seat Heater Sensors



| Engineering Applications | Key Features | Specification Summary | Options |
|--|---|---|--|
| Seat Heater Controls Heating Circuit Safety Passenger Presence Sensing | Flat Sensor Construction 150 Micron NTC Microchip Protective Coating Fixed Response Time Hermetically Sealed Construction | Choice of Thermistor Choice of Interconnect -40 to 85°C Operating Temperature | Gold Electroded for Ultra High Reliability |

Coolant Temperature Sensor



| Engineering Applications | Key Features | Specification Summary | Options |
|--|--|--|-------------------|
| Engine Coolant Temperature Monitoring Engine Management System Interface Fan On/Off Controls | Precision Machined Brass Body Plastic Overmould Hermetically Sealed Construction Ultra High Reliability | Choice of Thermistor Choice of Interconnect -40 to 125°C Operating Temperature | Chip in Glass NTC |

Cabin Temperature Sensor



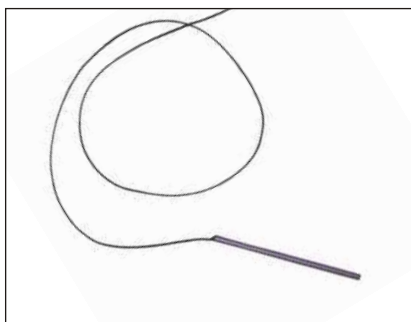
| Engineering Applications | Key Features | Specification Summary | Options |
|--|--|---|-------------------|
| Climate Control Systems Damper Control Smart Air Conditioning Engine Management Systems | Fast Response Time Protective Overmould Epoxy Coated NTC | Choice of Thermistor Choice of Interconnect -40 to 85°C Operating Temperature | Chip in Glass NTC |

Electronic Thermostats



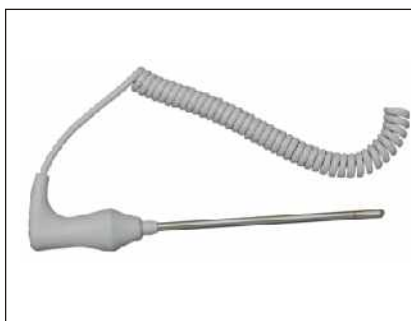
| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|--|-------------------|
| Engineering Applications Evaporator De-icing Climate Control Systems Smart Air Conditioning Engine Management Systems | Preset On/Off/On Temperature Settings 107V DC Load Dump Capable Integral Protective Circuitry Against Engine Noise EMI RFI Protected Predefined Hysteresis | +/- 0.1°C Set point Accuracy 12V and 24V Versions | Chip in Glass NTC |

Injectate/Hypodermic Needle Probes



| Engineering Applications | Key Features | Specification Summary | Options |
|--|---|---|---|
| Thermodilution Catheterisation Cancer Research & Treatment Brain Tumour Treatment Tissue Temperature Measurement Open Heart Surgery | Interchangeable to +/- 0.1°C Accuracy Ultra Miniature Fast Response Gold Electroded High Stability Thermistor | t-Max 120°C Diameter 0.56mm Upwards Typical Injectate - SS Tubing (FED GGN-196) Hypodermic - ASTM SS Tubing | Ultra Fast Response Other Tubing - Copper/Inconel Other Tubing - Monel/Nickel/Titanium Broad Range of R-t curves |

Hospital Oral Temperature Probe



| Engineering Applications | Key Features | Specification Summary | Options |
|--|---|--|---|
| Body Temperature Monitoring Critical Care Thermometry | Interchangeable to +/- 0.1°C Accuracy Ultra Miniature Fast Response Gold Electroded High Stability Thermistor | t-Max 120°C Diameter Up to 3mm Typical SS 304/316 Probe | Ultra Fast Response Welded Probe Tip Disposable Probe Covers Up to 5m Cable with Phono Jack Broad Range of R-t curves |

Esophageal Catheter Thermistor Probe



| Engineering Applications | Key Features | Specification Summary | Options |
|--|---|--|--|
| Core Body Temperature Monitoring Critical Post-Operative care | Food Grade Contact Materials Interchangeable to +/- 0.1°C Accuracy Ultra Miniature Fast Response Gold Electroded High Stability Thermistor | t-Max 120°C Diameter Up to 2mm Typical Monitor Interconnection ABS Probe Cover R37 = 1355 Ohms +/- 0.3% typical | Gamma-Ray/EtO Sterilised and Packaged Broad Range of R-t curves |

Near Cryogenic Probe



| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|---|--|
| Ultra Low Temperature Cooling Compressor Control | Food Grade Contact Materials SS316-L Thermowell Construction PRT-500 Thick Film Device Silicone Cable with Strain Relief Silicone Resins | +/-0.5°C Accuracy Between -100°C to +85°C 3mm Diameter, 5 Inch Probe Thermowell | Bar-coded Calibration Data Special Probe Case |

MEDICAL

Thermodilution Catheter Thermistor Probe



| Engineering Applications | Key Features | Specification Summary | Options |
|---|---|--|--|
| Cardiac Diagnostics Coronary Blood Flow Evaluation | Food Grade Contact Materials Interchangeable to +/- 0.1°C Accuracy Ultra Miniature Fast Response Gold Electroded High Stability Thermistor | t-Max 120°C Diameter 0.5mm Typical R37 = 14004 Ohms +/- 0.5% Typical Polyimide Tubing Isomide Coated Nickel Bifilar Wire | Gamma-Ray/EtO Sterilised and Packaged Broad Range of R-t curves |

Baby Incubator



| Engineering Applications | Key Features | Specification Summary | Options |
|--|--|---|--|
| Skin Temperature Sensing Incubator Fan Control Sensor Incubator Heating Element Control Feedback Damper Control Ambient Temperature Sensor | Medical Grade Adhesive Tape Food Grade Plastics Diode Pack Hermetically Sealed NTCs | +/-0.2°C Accuracy Between 25°C to 50°C Choice of Interconnect Choice of NTC Thermistor | Matched Pairs Available Overmoulded Devices |

Autoclave Probe



| Engineering Applications | Key Features | Specification Summary | Options |
|--|--|--|-------------------|
| Engineering Applications Sterilisation System Controls Autoclave Heating Element | SS316-L Thermowell Construction Precision Machined Steel Body Gold Electroded for Ultra High Reliability | Choice of Interconnect Choice of NTC Thermistor | Chip in Glass NTC |

Thermometer Sensor



| Engineering Applications | Key Features | Specification Summary | Options |
|---|---|---|---|
| Body Temperature Sensing Systems Predictive Thermometry Fever Thermometer | Ultra Miniature Interchangeable to +/- 0.1°C Accuracy High Stability Thermistor Fast Response Time | t-Max 85°C Diameter 2mm Typical R37 = 50k Ohms +/- 0.2% Typical | Gold Electroded for Ultra High Reliability Chip on Alumina Substrate with Heating Resistor for Predictive Applications Isomide Coated Nickel Bifilar Wire |

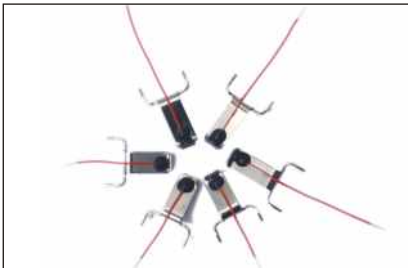
INDUSTRIAL

UPS



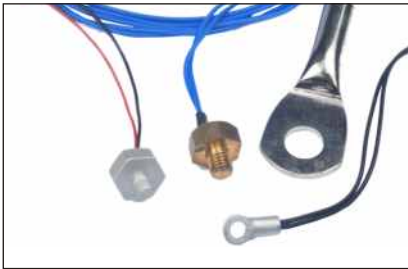
| Engineering Applications | Key Features | Specification Summary | Options |
|---|------------------------------|---|---------|
| IGBT Temperature Control MOSFET Temperature Control Heat Sink Temperature Sensing Fan Temperature Sensing Transformer Temperature Sensing | Eyelet Encased PTFE Wires | R25 = 10k Ohms +/- 3% Typical Choice of Interconnect | N/A |

Power Pack



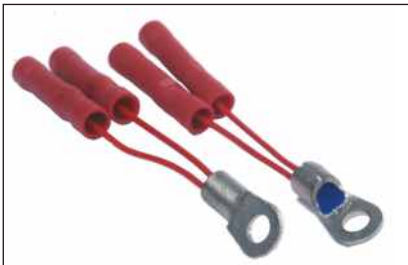
| Engineering Applications | Key Features | Specification Summary | Options |
|--|--------------------------------------|--|--------------------------|
| Charge Current Control Battery Temperature Feedback Heat Sink Temperature Sensing Transformer Temperature Sensing | Miniature Construction PTFE Wires | R25 = 100k Ohms +/- 3% Typical Choice of Interconnect | Fuse Holder Based Device |

Heat Sink Sensors



| Engineering Applications | Key Features | Specification Summary | Options |
|---|---|---|------------------|
| Current Control IGBT Temperature Control MOSFET Temperature Control | Screw in or Screw Down Construction Resin Potted PTFE Wires | R25 = 10k Ohms +/- 3% Typical Choice of Interconnect | M2 to M6 Eyelets |

Power Tool Sensor



| Engineering Applications | Key Features | Specification Summary | Options |
|--|--------------------------------------|--|--------------------------|
| Charge Current Control Battery Temperature Feedback Heat Sink Temperature Sensing Transformer Temperature Sensing | Miniature Construction PTFE Wires | R25 = 100k Ohms +/- 3% Typical Choice of Interconnect | Fuse Holder Based Device |

Battery Temperature Probes



| Engineering Applications | Key Features | Specification Summary | Options |
|--|---|---|------------------|
| Charge Current Control Battery Temperature Feedback | Screw in or Screw Down Construction Resin Potted PTFE Wires | R25 = 10k Ohms +/- 3% Typical Choice of Interconnect | M2 to M6 Eyelets |

Soft Drink Dispenser Sensor



| Engineering Applications | Key Features | Specification Summary | Options |
|--|---|---|-------------------|
| Concentrate Temperature Control Concentrate Presence Sensor | R25 = 10k Ohms +/- 0.5% Typical Choice of Interconnect | Miniature Construction Food Grade Encapsulation Ultra Fast Response Time Interchangeable to +/- 0.2°C Accuracy | Chip in Glass NTC |

HEALTH AND LEISURE

Swimming Pool probes



| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|--|--|
| Heater Controls Boiler Controls Water Temperature Sensor Flow Detection Pool Safety Water Presence Indication Heat Pump Control | Corrosion Resistant Thermowells Fixed Response Time UL Approved Cables Ultraviolet Resistant Cables | Choice of NTC Thermistor Choice of Interconnect +25 to +50°C +/-0.2°C Accuracy | Thermally Conductive Plastic Overmoulded |

Spa probes



| Engineering Applications | Key Features | Specification Summary | Options |
|--|--|--|--|
| Heater Controls Boiler Controls Water Temperature Sensor Flow Detection Spa Safety Water Presence Indication Heat Pump Control | Corrosion Resistant Thermowells Fixed Response Time UL Approved Cables Ultraviolet Resistant Cables | Choice of NTC Thermistor Choice of Interconnect +25 to +50°C +/-0.2°C Accuracy | Thermally Conductive Plastic Overmoulded |

Heat Pump probes



| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|--|--|
| Heater Controls Water Temperature Sensor Flow Detection Water Presence Indication Heat Pump Control | Corrosion Resistant Thermowells Fixed Response Time UL Approved Cables Ultraviolet Resistant Cables | Choice of NTC Thermistor Choice of Interconnect +25 to +50°C +/-0.2°C Accuracy | Thermally Conductive Plastic Overmoulded Single/Double Sided Adhesive Foam Base |

Hot Tub probes



| Engineering Applications | Key Features | Specification Summary | Options |
|--|--|--|--|
| Heater Controls Boiler Controls Water Temperature Sensor Flow Detection Hot Tub Safety Water Presence Indication Heat Pump Control | Corrosion Resistant Thermowells Fixed Response Time UL Approved Cables Ultraviolet Resistant Cables | Choice of NTC Thermistor Choice of Interconnect +25 to +50°C +/-0.2°C Accuracy | Thermally Conductive Plastic Overmoulded |

Sauna Sensors



| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|---|---------|
| Heater Controls Boiler Controls Water Temperature Sensor Sauna Safety Water Presence Indication | Corrosion Resistant Thermowells Fixed Response Time UL Approved Cables Ultraviolet Resistant Cables | Choice of NTC Thermistor Choice of Interconnect +25 to +125°C +/-0.2°C Accuracy | N/A |

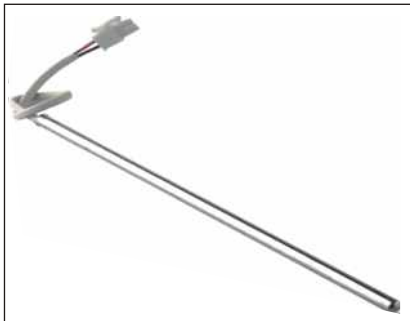
Steam Room Sensors



| Engineering Applications | Key Features | Specification Summary | Options |
|--|--|---|---------|
| Heater Controls Boiler Controls Water Temperature Sensor Steam Room Safety Water Presence Indication | Corrosion Resistant Thermowells Fixed Response Time UL Approved Cables Ultraviolet Resistant Cables | Choice of NTC Thermistor Choice of Interconnect +25 to +125°C +/-0.2°C Accuracy | N/A |

BIOTECHNOLOGY

Cryogenic Sensors



| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|---|--|
| <ul style="list-style-type: none"> Ultra Low Temperature Cooling Compressor Control Cryogenic Chamber Temperature Control | <ul style="list-style-type: none"> Food Grade Contact Materials SS316-L Thermowell Construction PRT-500 Thick Film Device Silicone Cable with Strain Relief Silicone Resins | <ul style="list-style-type: none"> +/-0.5°C Accuracy Between -100°C to +85°C 3mm Diameter, 5 Inch Probe Thermowell Choice of Interconnect | <ul style="list-style-type: none"> Bar-coded Calibration Data Special Probe Case |

Vaccine Logistics Monitoring Biovalidator

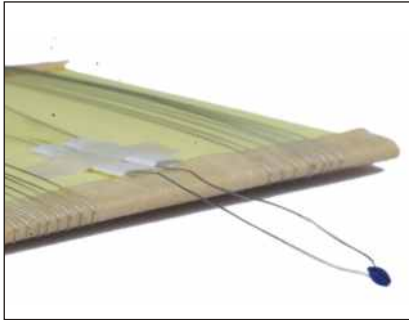


| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|--|---|
| <ul style="list-style-type: none"> Data Acquisition System for Logistics | <ul style="list-style-type: none"> Multi Use within Battery Life Built in Temperature Sensor Optional External Probe LCD Display with Back Light 1 Year Battery Life Tamper Proof USB Interconnect for Data Downloading Data Download Software Water and Moisture Resistant Rugged Design for High Reliability | <ul style="list-style-type: none"> +/-0.5°C Accuracy Between -30°C to +85°C Hand Held IP 66 Case Integral NTC Thermistor | <ul style="list-style-type: none"> N/A |



DEFENCE AND AVIONICS

Aircraft Windscreen Sensor



| Engineering Applications | Key Features | Specification Summary | Options |
|--|--|---|--|
| Windscreen De-icing Heater Controls | Nickel Iron Alloy 180 Leads Epoxy Coated NTC Thermistor | R25 = 10k Ohms +/- 1% typical -40 to +85°C Operating Temperature | Protective Sleeves Choice of Interconnect |

Temperature Compensation Sensor



| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|---|---|
| Electronic Controls Reference Temperature Radar Systems Contrast Advanced Monitoring Advanced Scanner Drum Temperature Control IT Hardware CPUs Missile Guidance Circuitry | High Accuracy Epoxy Coated NTC Thermistor | R25 = 10k Ohms +/- 0.5% typical -40 to +85°C Operating Temperature | Protective Sleeves Choice of Interconnect Chip in Glass NTC |

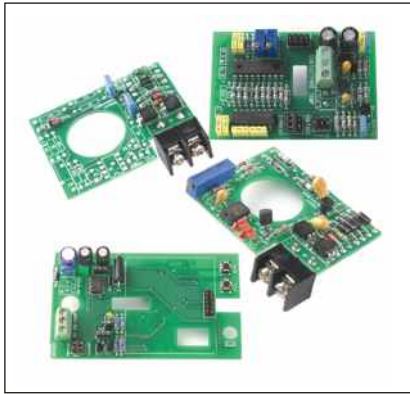
Smart Thermostats



| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|--|-------------------|
| Evaporator De-icing Climate Control Systems Smart Air Conditioning Engine Management Systems | Preset On/Off/On Temperature Settings 107V DC Load Dump Capable Integral Protective Circuitry Against Engine Noise EMI RFI Protected Predefined Hysteresis | +/- 0.1°C Set point Accuracy 12V and 24V Versions | Chip in Glass NTC |

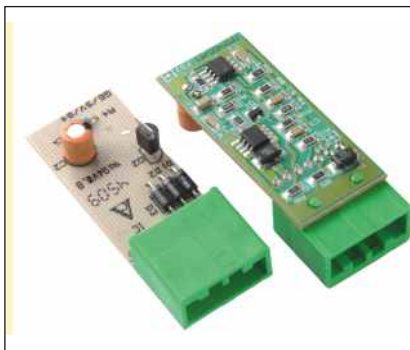


Transmitters



| Engineering Applications | Key Features | Specification Summary | Options |
|--|--|-----------------------|--|
| Engineering Applications Signal Conditioning Built In Linearization Three-Port Isolation Multi Transfer Function Systems | Improves Accuracy to +/- 0.1% of Range Multiple Output Options Microcontroller Based Design Customised Sensor to Output Transfer Function Sensor Isolated from External Circuitry Built In Line Drivers | +/- 0.1% of Range | PRT input NTC Input Thermocouple Input |

Thermostats



| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|--|-------------------|
| Evaporator De-icing Climate Control Systems Smart Air Conditioning Engine Management Systems | Preset On/Off/On Temperature Settings 107V DC Load Dump Capable Integral Protective Circuitry Against Engine Noise EMI RFI Protected Predefined Hysteresis | +/- 0.1°C Set point Accuracy 12V and 24V Versions | Chip in Glass NTC |

Data Acquisition Systems



| Engineering Applications | Key Features | Specification Summary | Options |
|--|---|---|---------|
| Data Acquisition System for Critical Environments Data Acquisition System for ATMs Data Acquisition System for Wireless Telecom Towers | Built in Temperature Sensor LCD Display with Back Light Optional External Probe 1 Year Battery Life Tamper Proof USB Interconnect for Data Downloading Data Download Software Water and Moisture Resistant Rugged Design for High Reliability | +/-0.5°C Accuracy Between -30°C to +85°C Hand Held IP 66 Case Integral NTC Thermistor | N/A |

Fridge Controllers with Fridge Sensors



| Engineering Applications | Key Features | Specification Summary | Options |
|---|--|--|---|
| Multiple Display and Control Compressor On/Off Control Fridge Door Open Alarm | Customised Digital Display High Accuracy Fixed Response Time Integral Sensor End Customer Programmable | +/-0.5°C Accuracy Between -30°C to +85°C | Choice of Interconnect Overmoulded Fridge Sensor Probe |

MATERIAL SYSTEMS

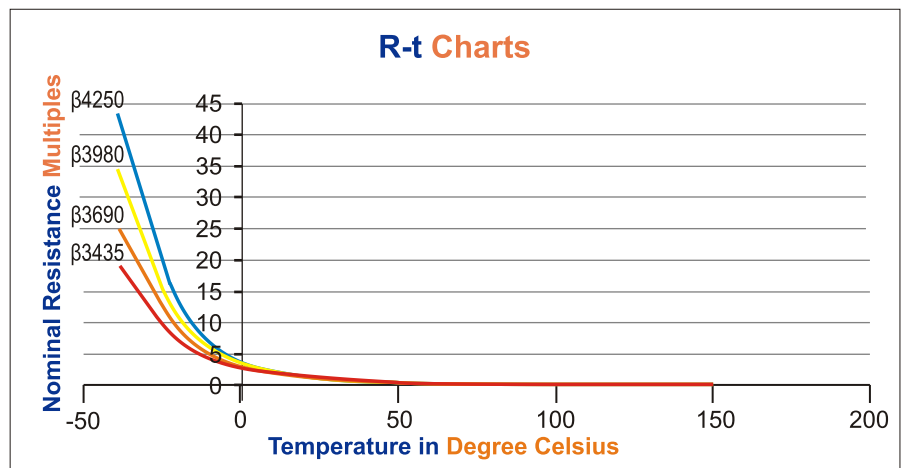
Typical in-house Beta Value (25/85)°C range of 3000 to 5000 K with a tolerance as tight as +/- 0.15%
Examples of our Material Systems with temperature multiples

| Temperature °C / °F | Material System - 2 $\beta(25/85)^{\circ}\text{C} = 3980\text{K}$ Rt / R25 nominal | Material System - 4 $\beta(25/85)^{\circ}\text{C} = 3690\text{K}$ Rt / R25 nominal | Material System - 5 $\beta(25/85)^{\circ}\text{C} = 3970\text{K}$ Rt / R25 nominal | Material System - 6 $\beta(25/85)^{\circ}\text{C} = 3960\text{K}$ Rt / R25 nominal | Material System - 7 $\beta(25/85)^{\circ}\text{C} = 3935\text{K}$ Rt / R25 nominal |
|---------------------|--|--|--|--|--|
| -40 / -40 | 33.36 | 24.25 | 34.23 | 33.00 | 29.96 |
| -20 / -4 | 9.68 | 7.94 | 9.78 | 9.58 | 9.11 |
| 0 / 32 | 3.26 | 2.96 | 3.27 | 3.24 | 3.18 |
| 25 / 77 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 50 / 122 | 0.360 | 0.390 | 0.360 | 0.362 | 0.366 |
| 85 / 185 | 0.107 | 0.126 | 0.108 | 0.108 | 0.110 |
| 100 / 212 | 0.0678 | 0.0821 | 0.0683 | 0.0685 | 0.0694 |
| 120 / 248 | 0.0388 | 0.0486 | 0.0392 | 0.0392 | 0.0395 |
| 150 / 302 | 0.0184 | 0.0241 | 0.0187 | 0.0186 | 0.0186 |

| Temperature °C / °F | Material System - 8 $\beta(25/85)^{\circ}\text{C} = 3435\text{K}$ Rt / R25 nominal | Material System - 9 $\beta(25/85)^{\circ}\text{C} = 3690\text{K}$ Rt / R25 nominal | Material System - 10 $\beta(25/85)^{\circ}\text{C} = 4250\text{K}$ Rt / R25 nominal | Material System - 12 $\beta(25/85)^{\circ}\text{C} = 3540\text{K}$ Rt / R25 nominal | Material System - 13 $\beta(25/85)^{\circ}\text{C} = 4073\text{K}$ Rt / R25 nominal |
|---------------------|--|--|---|---|---|
| -40 / -40 | 18.40 | 27.31 | 41.54 | 22.41 | 36.07 |
| -20 / -4 | 6.72 | 8.03 | 11.18 | 7.48 | 10.21 |
| 0 / 32 | 2.72 | 3.05 | 3.52 | 2.85 | 3.36 |
| 25 / 77 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 50 / 122 | 0.416 | 0.383 | 0.336 | 0.403 | 0.351 |
| 85 / 185 | 0.145 | 0.122 | 0.092 | 0.137 | 0.101 |
| 100 / 212 | 0.0973 | 0.0796 | 0.0562 | 0.0911 | 0.0633 |
| 120 / 248 | 0.0596 | 0.0471 | 0.0308 | 0.0553 | 0.0360 |
| 150 / 302 | 0.0308 | 0.0234 | 0.0138 | 0.0282 | 0.0168 |

Our typical customer tolerance requirements

| Resistance at 25°C/77°F | Material System | Tolerance | Application |
|-------------------------|-----------------|--------------------------|---------------------|
| 30k Ω | 7 | +/- 0.2°C (0°C to 70°C) | Spas |
| 30k Ω | 7 | +/- 0.1°C (25°C to 50°C) | Spas |
| 25k Ω | 12B | +/- 0.1°C (0°C to 30°C) | Medical Diagnostics |
| 20k Ω | 12 | +/- 0.1°C (25°C to 50°C) | Medical Diagnostics |
| 2.2k Ω | 21 | +/- 0.2°C (0°C to 25°C) | Automotive |
| 10k Ω | 2 | +/- 0.2°C | HVAC |



CHIP MANUFACTURING FACILITY

Our semiconductor NTC chip fabrication unit produces silver and gold electroded high precision devices with an integrated material system development lab to meet all global RT curve requirements.

Capabilities:

- Thermistor chips: Au and Ag electroded
- Thermistor discs/polos
- Axial and Radial Glass Encapsulated NTCs
- Ultra miniature thermistors with fast response
- Beta value range: 3000 to 5000 K with tolerances of +/-0.15%
- Ultra high stability Capacity of 50 million NTC chips and 10 million NTC discs/polos



NTC Discs



NTC Ring/Polos



Gold Electroded Chips



Silver Electroded Chips



Wafer Dicing Stations



High Speed Particle Attritor

Chip Bonding in Class 100K Clean Room



RELIABILITY

TEST CENTRE

Exa Thermometrics has a dedicated world-class reliability test facility to validate the performance of all its temperature sensors, from thermistor elements to fully assembled products. The tests comply with IEC / ISO and custom standards. Tests commence on semiconductor chips, child parts, complete sensors, and electronic modules. The reliability test laboratory has amongst others the following facilities:

Capabilities:

- Damp / Dry Heat Test for up to 99% Relative Humidity levels
- Response Time measurement
- Rapid Temperature Cycle Test
- Climatic Sequence Test
- Tensile Strength Test
- Thermal Shock Test
- Endurance Test
- EMI/RF
- Salt Spray Test

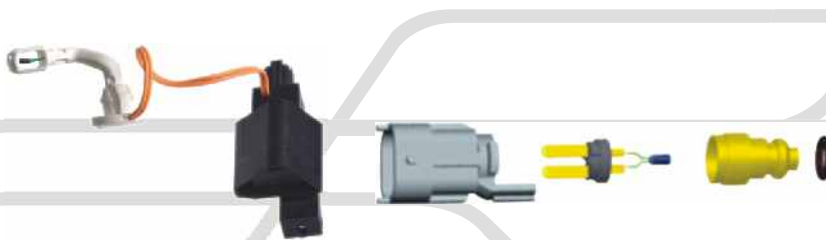


SENSOR MANUFACTURING &

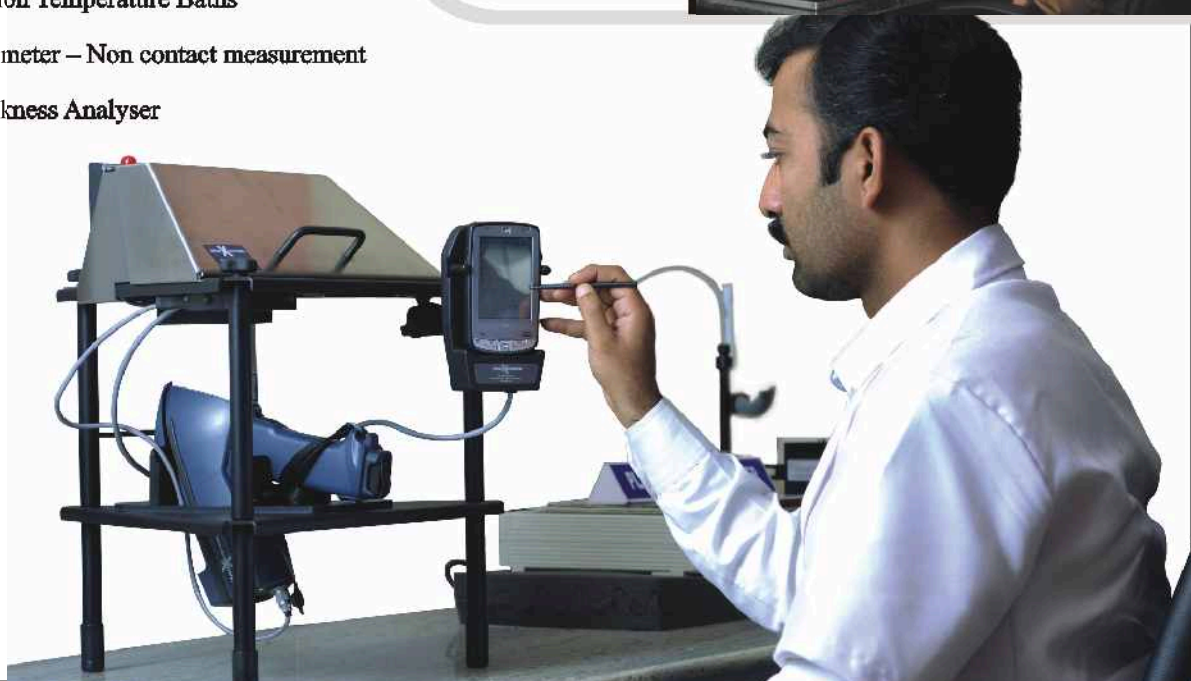
QUALITY ASSURANCE LABORATORY

Exathermometrics India has fully fledged manufacturing and quality assurance laboratories for high-reliability, customized thermistors, temperature sensors, and electronic sensor modules with the following capabilities:

- Lead Frame development
- 2D/3D Cadcam modeling
- Precision tooling support with Pro-Engineer
- Cad-based electronic Circuit design
- Electronic prototyping
- Embedded firmware development
- PPAP, DFMEA & PFMEA
- Special purpose machine design and development



- X-Ray Florescence Spectrometry for RoHS and Alloy Grade Compliance
- Ultrasonic Flaw Detector – Subsurface cracks and porosity
- Fluorescent Penetration Tester – for micro surface cracks
- 3D Digital Microscopy – for x,y,z axis analysis of components
- Ultra Precision **Temperature Baths**
- Laser **Micrometer – Non contact measurement**
- Plating Thickness **Analyser**



MANUFACTURING CAPABILITIES

Located in Electronics City, South Bangalore with 100,000 Sft of facilities, ExaThermometrics India has an installed capacity of 50 million temperature sensors per annum.

Our manufacturing includes fully integrated capabilities including a semiconductor NTC chip fab unit; automatic wire forming, chip insertion and soldering; reflow soldering, wire bonding and welding; plastic overmoulding; vacuum potting; precision trimming and calibration; additionally we have our own SMD electronic assembly lines for temperature sensing modules. These capabilities enable ExaThermometrics to provide temperature sensing solutions across a wide value add spectrum, from devices to services, for OEM customers worldwide.



EXATHERMOMETRICS

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