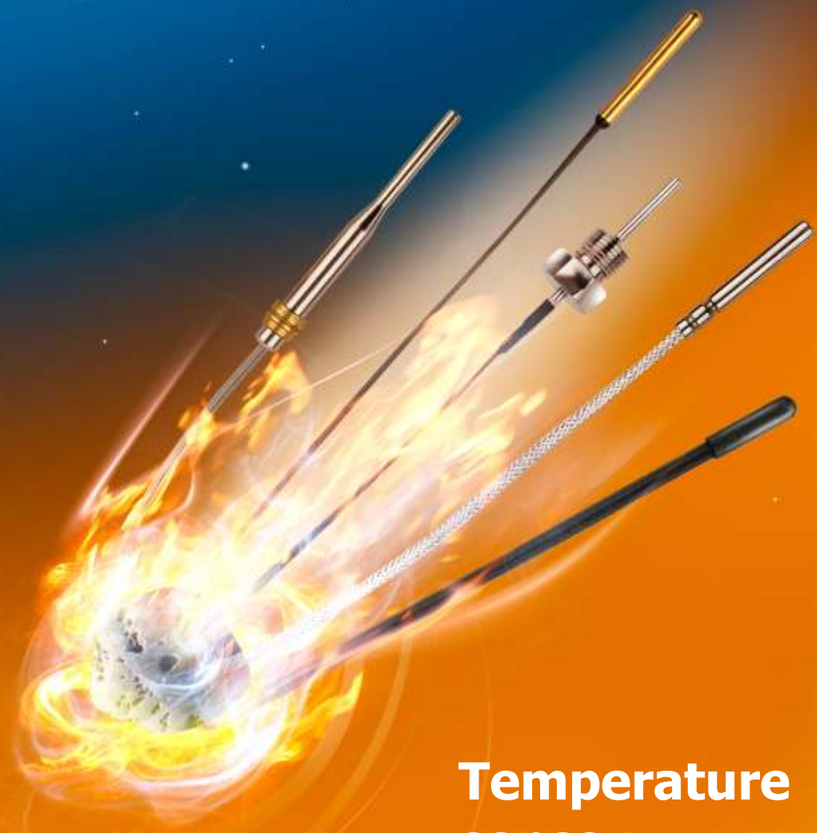

# Temperature sensor technologies


TEWA TEMPERATURE SENSORS

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Tewa Temperature Sensors is a leading NTC Thermistor and Temperature Probe manufacturer located in Lublin, Poland serving the European market.

Tewa Temperature Sensors has grown from the established Polish company "TEWA" which has more than 40 years of experience in serving customer needs and supplying Temperature Sensing Solutions to a broad spectrum of user markets.

**www.tewa-sensors.com**

TEWA

## TEMPERATURE SENSORS

NTC/PTC THERMISTOR SENSORS, PTRTD SENSORS, THERMOCOUPLES

# TEMPERATURE SENSORS

Our expanding organization has operated in the electronics market for almost half a century, constantly enhancing and improving our thermistor manufacturing processes.

To meet the requirements of this competitive market, Tewa Temperature Sensors has adopted a policy of continual quality improvement of both product and service.

Dynamic and flexible sales and engineering teams are focused on providing superior customer service.

We will continue to dedicate the efforts of all of our employees to total customer satisfaction by striving to:

- manufacture thermistors and temperature probes to the highes quality standards;
- be the most responsive and flexible thermistor supplier in Europe;
- offer outstanding customer service;
- supply customized and standard products at fair prices.

## EXPERIENCE

Tewa Temperature Sensors is a leading NTC Thermistor and Temperature Probe manufacturer located in Lublln, Poland serving the European market. Tewa Temperature Sensors has grown from the established Polish company "UNITRA CEMI" which has more than 40 years of experience in serving customer needs and supplying Temperature sensing solutions to a broad spectrum of user markets.

## HIGH QUALITY PRODUCTS

Tewa Temperature Sensors manufacture a wide range of high quality, precision temperature sensors, mainly based upon NTC thermistor chips designed and manufactured in-house in Lublin, by an ISO 9001:2000 approved factory.

## ENGINEERING SUPPORT

Our Design and Manufacturing Engineering resource is focused to provide you, our customer with a complete sensing solution rather than just a range of standard catalogue products. Our Engineers will be pleased to work with you, the customer to develop a temperature sensing solution to meet your specific application requirements.
We can contribute more than 40 years of thermistor design and manufacturing expertise to the partnership.

## THE HIGHEST QUALITY EQUIPMENT

Tewa Temperature Sensors use the most flexible and the highest quality production and test equipment. An in-house semiconductor ceramics manufacturing line gives us an opportunity to control the NTC thermistor and Temperature Probe manufacturing process from the chip design stage.

## INNOVATION AND TECHNOLOGY IMPROVEMENT

Tewa Temperature Sensors research and development is focused on improving the products. The combined knowledge of the wide range of specialists and engineers results in constant product improvement and new material applications.

## ENVIRONMENT FRIENDLY

Tewa products will be Restriction of Hazardous Substances Directive (RoHS). We are enhancing our process to offer you, our customer, products meeting the relevant quality and environmental standards.

## NTC THERMISTOR CERAMICS

**FROM THERMISTOR CERAMICS TO COMPLETE SENSOR ASSEMBLIES**

## DISCREETE THERMSTORS

**In-house developed and controlled, wet process of manufacturing thermistor ceramics**

**Wide range of customised R/T curves**

**Ability to design R/T curves meeting customer's requirements**

**Flexibility in adjusting resistance values depending on application requirement**

**High stability and reliability of ceramics**

## TEMPERATURE PROBES

**Designing temperature sensors meeting individual customer's requirements**

**Engineering support in application design**

**Building temperature sensors based on:**

- **NTC/PTC Thermistors**
- **PT100, PT500, PT1000, Thermocouples**
- **Other temperature sensing elements**

## NTC Disc Thermistor

# TT-1 SERIES

The TT-1 series NTC Disc Thermistors are available in wide range of sizes and resistance characteristics as a bare discs and in leaded configuration. Available with tinned copper bare wire and stranded copper leads with very flexible silicon insulation.
Different kinds of resins for mechanical and electrical protection.

FEATURES:

Proven Stability and Reliability
Designed for temperature measurement, control and compensation
Available in custom probe assemblies
Voltage insulation provided by epoxy resin

APPLICATIONS:

Ambient temperatur sensing, control and compensation
Liquid or gas temperature contol and monitoring
Assembly into probes
Automotive (air conditioning, temperature monitoring, heated seat, oil temperature control, others)
Fire detecting systems
Chemical industry

| | |
|---|---|
| Resistance values | 3Ohm ÷ 5MOhm |
| Resistance tolerance | ± 5%, ± 10%, ± 20% |
| B values | 2700K ÷ 5050K |
| Minimum operating temperature | -55°C |
| Maximum operating temperature | 125°C |
| Wires/cables: | with / without insulation |
| Dimensions | diameter 6.5mm ÷ 35mm |
| Packing | Bulk / Tape |

## Glass Encapsulated NTC Thermistor

# TT-2 SERIES

The TT-2 series NTC thermistors are glass encapsulated sensing devices with standard electrical characteristics. Custom electrical characteristics can be produced in this configuration also. The glass encapsulation provides excellent stability and durability in an established product style. TT-2 series thermistors are available with dumet wire with or without polyimide tubes for insulation.

FEATURES:

Glass encapsulation provides extra moisture protection and interchangeability,
Proven Stability and Reliability.
Designed for temperature measurement, control and compensation
Available with dummet wire with or without polyimide tubes insulation
Available in custom probe assemblies

APPLICATIONS:

HVAC Products
White Goods
Industral, Instrumentation
Chemical Industry
Medical

| | |
|---|---|
| Resistance values | 1KOhm ÷ 1.4MOhm |
| Resistance tolerance | ± 1% ± 2% ,± 3% ± 5% ± 10%, ± 20% |
| B values | 2700K ÷ 4535K |
| Minimum operating temperature | -50°C |
| Maximum operating temperature | 500°C |
| Wires/cables: | bare dumet wire or with polyimide insulation |
| Dimensions | diameter 0.75mm ÷ 3.0mm |
| Packing | Bulk |

## PTC thermistor sensors

# TT-PTC SERIES

The TT-PTC thermistor sensors offered by Tewa Temperature Sensors are standard PTC devices that resistance rises suddenly at certain critical, defined temperature. This point is described as ROT (Rated Operating Temperature) and it can vary depending on customer's request. Resistance values are standard, according to DIN 44081 and DIN 44082.

FEATURES:

Custom size and wire configuration
Standard resistance values
Customized ROT
Single, double, triple or more PTC sensors available in one harness

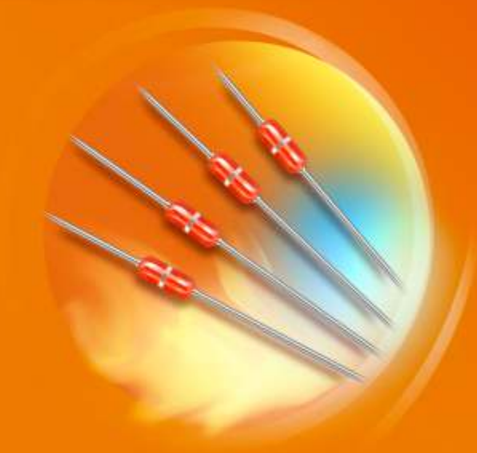
APPLICATIONS:

Motor protection
Overtemperature protection
Overcurrent protection
Thermostats
Switching

| | |
|---|---|
| Resistance values | according to DIN 44081 & 44082 |
| Resistance tolerance | ± 5K |
| B values | - |
| Minimum operating temperature | -190°C |
| Maximum operating temperature | 260°C |
| Wires/cables: | with / without insulation |
| Dimensions | diameter ≥ 2.5mm |
| Packing | Bulk |

## Diode Type Glass NTC Thermistor

# TT-DO SERIES



The TT-DO series NTC thermistors are DO-35, cost effective glass encapsulated NTC thermistors, ideally suited for applications between -40°C and 250°C.
The glass package provides excellent stability and durability.
Units are available in industry standard characteristics and tolerance versions also in tape packaging for auto assembling.

FEATURES:

Low cost
Excellent moisture protection
Dumet leads are suitable for soldering or welding
Excellent stability and reliability
Bulk or tape packaging available

APPLICATIONS:

Ambient temperature sensing, control and compensation
Liquid or gas temperature control and monitoring
Home appliances sensors
Air Conditioning
Instrumentation

| | |
|---|---|
| Resistance values | 300Ohm ÷ 1.3MOhm |
| Resistance tolerance | ± 1% ± 2% ,± 3% ± 5%, ± 10% |
| B values | 2800K ÷ 4400K |
| Minimum operating temperature | -40°C |
| Maximum operating temperature | 250°C |
| Wires/cables: | Nickel or tin plated copper wire |
| Dimensions | glass body diameter 2.0mm |
| Packing | Bulk / Tape |

Epoxy Coated Interchangeable Thermistors

# TT-3 SERIES

The TT-3 series NTC thermistors are small size epoxy coated sensing devices. Wide range of RT characteristics, tolerances and wire configurations makes them ideal choice for temperature sensing, control and compensation.
Very tight resistance tolerance up to +/-0.05°C makes them one of the highest precision NTC thermistor available on the market.

FEATURES:

Curve matched characteristics,
Custom size and wire configuration,
Fast Response Time,
Tight resistance and Beta Value tolerance,
Excellent stability and reliability.

APPLICATIONS:

Ambient temperature sensing, control and compensation,
Liquid or gas temperature control and monitoring, Assembly into probes,
Automotive (Air Conditioning, Cabin Climate Control/Management,
External Temperature Monitoring, Heated Seats, Heated Steering
Wheels, other), Industrial applications, Computer and Communications Industry
HVAC, White Goods, Military.

| | |
|---|---|
| Resistance values | 100Ohm ÷ 1MOhm |
| Resistance tolerance | ± 0.05°C, ± 0.1°C, ± 0.2°C |
| B values | 3348K ÷ 4261K |
| Minimum operating temperature | -40°C |
| Maximum operating temperature | 150°C |
| Wires/cables: | AWG28 ÷ AWG36 with / without Teflon insulation |
| Dimensions | diameter 1.2mm ÷ 5mm |
| Packing | Bulk |

Epoxy Coated NTC Chip Thermistor

# TT-S SERIES

The TT-S series NTC thermistors are similar to TT-3 series. Dimensions, wire configurations and RT specification can be similar in both types. The main difference is resistance tolerance which for TTS series is point matched with standard precision of +/- 1% at 25C.
It assures better cost effectiveness comparing to more precise but more expensive, interchangeable TT3 series thermistors.

FEATURES:

Cost effective comparing with interchangeable TT3 thermistors
Point matched characteristics,
Custom size and wire configuration,
Fast Response Time,
Excellent stability and reliability.

APPLICATIONS:

Ambient temperature sensing, control and compensation,
Liquid or gas temperature control and monitoring, Assembly into probes,
Automotive (Air Conditioning, Cabin Climate Control/Management,
External Temperature Monitoring, Heated Seats, Heated Steering Wheels, other),
Industrial applications, Computer and Communications Industry,
HVAC, White Goods, Military.

| | |
|---|---|
| Resistance values | 100Ohm ÷ 1MOhm |
| Resistance tolerance | ± 0.5%, ± 1% ± 2% ,± 3% ± 5% |
| B values | 3500K ÷ 4570K |
| Minimum operating temperature | -40°C |
| Maximum operating temperature | 150°C |
| Wires/cables: | AWG26 ÷ AWG36 with / without Teflon insulation |
| Dimensions | diameter 1.2mm ÷ 5mm |
| Packing | Bulk / Tape |



NTC Microchip Thermistor

# TT-5 SERIES

The TT-5 series NTC thermistors are very small size sensing devices that provide vely quick response time.
Wide range of tolerances and wire configurations make them an ideal choice for temperature sensing, control and compensation.
Epoxy filled polyimide tube makes TT-5 a perfect solution for applications where precise dimensional control of sensor's tip is required.

FEATURES:

Point or Curve matched characteristics,
Custom size tube and wire configuration,
Improved moisture protection
Tight resistance and Beta Value tolerance,
Excellent stability and reliability,
Fast Response Time,
Small size

APPLICATIONS:

Ambient temperature sensing, control and compensation,
Liquid or gas temperature control and monitoring
Medical Probes YSI400 Series compatibile
Small probes assemblies, Computer and Communications Industry

| | |
|---|---|
| Resistance values | 1KOhm ÷ 100KOhm |
| Resistance tolerance | ± 0.05°C, ± 0.1°C, ± 0.2°C |
| B values | 3348K ÷ 4261K |
| Minimum operating temperature | -40°C |
| Maximum operating temperature | 125°C |
| Wires/cables: | AWG32 ÷ AWG40 with / without Teflon insulation |
| Dimensions | diameter 0.55mm ÷ 1.2mm |
| Packing | Bulk |

Thin-Film NTC Thermistor

# TT-6 SERIES

TT6 series thin film thermistors are frequently used for applications where limited space is concern. With typical thickness of 0.55mm they are ideal choice for precise temperature measurement between flat surfaces where quick response time is critical.
TT6 series thermistors are available with wide range of RT characteristics and typical measurement tolerance less than +/-0.3°C.

FEATURES:

Quick response time
Small thickness
Low cost
Very good long term stability
Point Matched Characteristics down to ± 0.5%
Wide range of Resistance and Beta Values
Operating temperature range: from -40°C to 120°C

APPLICATIONS:

PC/Laptop
Office automation equipment
Heat-sinks temperature measurement
Others...

| | |
|---|---|
| Resistance values | 0.3KOhm ÷ 3MOhm |
| Resistance tolerance | ± 0.5%, ± 1% ± 2% ,± 3% ± 5% |
| B values | 2900K ÷ 5100K |
| Minimum operating temperature | -30°C |
| Maximum operating temperature | 120°C |
| Wires/cables: | Phosphorus copper frame |
| Dimensions | length 0.55mm, length 25, 50, 75mm |
| Packing | Bulk |

## Lead Frame NTC Thermistor

# TT-7 SERIES

The TT-7 series products are epoxy coated NTC chip thermistors. Industry standard characteristics and tolerances makes them ideal choice for low cost high volume applications.
TT-7 series thermistors are available in various leads lengths in bulk or tape and reel packaging for automatic assembly.

FEATURES:

Low Cost
High Long Term Stability
Point Matched Characteristics
Very good endurance against thermal shock
Industry Standard Resistance and Beta Values
Operating temperature range: from -40°C to 125°C
Tape and Reel/BOX Packaging Available

APPLICATIONS:

Temperature Control and Compensation
Instrumentation
Automotive, HVACR sensors
OTHERS...

| | |
|---|---|
| Resistance values | 1KOhm ÷ 500KOhm |
| Resistance tolerance | ± 1% ± 2% ,± 3% ± 5% |
| B values | 3325K ÷ 4750K |
| Minimum operating temperature | -40°C |
| Maximum operating temperature | 125°C |
| Wires/cables: | non insulated Sn plated Cu wire |
| Dimensions | diameter 3mm ÷ 5mm |
| Packing | Bulk / Tape |

## SMD NTC Thermistor

# TT-8 SERIES

The TT-8 SMD NTC thermistor is a small temperature sensor used for surface and ambient temperature measurements on circuit board. It`s available in 1005(0402), 1608(0603) and 2012(0805) size configurations in bulk or tape and reel packaging for automatic assembly.
Industry standard and customized characteristics are available.

FEATURES:

Small size, low capacitance at 40 Mhz corresponding to the high B value
Good orotection against electrostatic discharge
Low cost
High accuracy and high environmental resistance
ROHS Compliant
Wide range of beta constant and resistance values

APPLICATIONS:

Mobile communication related equipment (TCXO, RF dircuit, LCD panel, Battery pack) Computer related equipment, Video camcorder, car audio related equipment, Optical communication related equipment

| | |
|---|---|
| Resistance values | 22Ohm ÷ 680KOhm |
| Resistance tolerance | ± 0,5% ± 1% ± 2% ± 3% ± 5% |
| B values | 2800K ÷ 4750K |
| Minimum operating temperature | -55°C |
| Maximum operating temperature | 125°C |
| Wires/cables: | - |
| Dimensions | size 0402, 0603, 0805 |
| Packing | Tape |



## Waterproof Temperature Sensor

# TT-O SERIES

TT-O series sensors are IP68 waterproof temperature probes encapsulated with thermoplastic elastomer materials in overmoulding technology. Excellent performance in extreme freeze-thaw conditions resulting from a wide choice of insulation material.
The TT-O overmoulded probes are a perfect solution for applications where the best waterproof and moisture protection is required.

FEATURES:

Excellent insulation against moisture
Degree of waterproof protection IP68
Flexible size and tolerances (smallest tip diameter 4.5mm)
Excellent resistance to UV (black insulation)
ROHS compliant and Halogen Free
Wide range of R/T characteristics
Marking possible on request
NTC and PTC thermistors, PtRTD versions are available
Cable remains flexible at minimum design temperature
Rigid cable version also available

APPLICATIONS:

Refrigeration applications (evaporator), Air Conditioning, Underfloor heating, Climat control systems, Industral Process control

| | |
|---|---|
| Resistance values | NTC, PTC, PtRTD, KTY version |
| Resistance tolerance | ± 0.5% ÷ 5% |
| B values | 3325K ÷ 4750K |
| Minimum operating temperature | -50°C |
| Maximum operating temperature | 105°C |
| Wires/cables: | TPE single (flat) & double (round) insulated |
| Dimensions | diameter 5mm, 6.5mm |
| Packing | Bulk |

## Custom Temperature Sensors

# TT-4 SERIES

Tewa Temperature Sensors offers wide range of standard and customized temperature sensors designed according to individual customer's requirements covering applications in temperature range between -80°C and +600°C.
TT-4 Series Group contains temperature sensors build using NTC/PTC thermistors, PTRTDs and other sensing elements mounted into wide range of metal/plastic housings.

FEATURES:

Proven Stability and Reliability,
Cost effective solutions
Variety of metal and plastic housings and tubings designed for specific applications
Potted with different kinds of resin for good sensor protection
Available with special kinds of cables
(2-core cables or stranded with PVC, Silicone, Teflon or Kynar insulation, cables with screen & other), connectors and other attachments
Provides good protection from the environment conditions
Proven high voltage strength and dynamic strength
Wide range of Resistance/Temperature, characteristics
Designed for temperature measurement, control and compensation

APPLICATIONS:

Automotive
(Air Conditioning, Cabin Climate Control/Management, External Temperature Monitoring, Heated Seats, Heated Steering Wheels, other), Consumer Products, Instrumentation
Industrial Ovens, Electric Showers, HVAC and Refrigeration, Fire Detectors, Pools and Spas, Others...

| | |
|---|---|
| Resistance values | NTC, PTC, PtRTD, KTY version, DS1820, LM335 |
| Resistance tolerance | 2700K ÷ 5100K |
| B values | -100°C |
| Minimum operating temperature | 600°C |
| Maximum operating temperature | |
| Wires/cables: | PVC, Silicon, Teflon, Fiberglass insulation, Other |
| Dimensions | Bulk |
| Packing | |

## Platinum Temperature Sensors

# TT-PT SERIES

Thin film Platinum Resistance Temperature Detectors from TT-PT group are very commonly used components in industrial applications thanks to very high precision and long term stability. Tewa Temperature Sensors offers three standard types of PT RTDs: PT100, PT500 and PT1000, that can be provided in standard tolerance classes.

FEATURES:

Operating Temperature Range between -40°C and 500°C
High quality materials used for production assure very good long term stability and reliability also at high temperature
Good High Voltage withstanding provided by ceramics that is used for surface coating
Very good resistance against shock and vibrations

APPLICATIONS:

Liquid or gas temperature control and monitoring
Industrial applications
As a sensing element used in wide range of standard and custom temperature sensors manufactured by Tewa Temperature Sensors
Others

| | |
|---|---|
| Resistance values | 100Ohm, 500Ohm, 1000Ohm |
| Resistance tolerance | class A, B, 1/3B |
| B values | Temperature coefficient 3850ppm/k |
| Minimum operating temperature | -70°C |
| Maximum operating temperature | 500°C |
| Wires/cables: | NiPt, AgPd5, Pt |
| Dimensions | Typical 2.1x2.3x0.9mm |
| Packing | Bulk |

## Thermocouple

# TT-TCO SERIES

Products from TT-TCO series group are thermocouple sensors which are commonly used for temperature measurement in wide range of industrial applications. The main advantages of Tewa Temperature Sensors thermocouples are: wide range of sizes, resistance to harsh environment, high reliability and measurement precision.

FEATURES:

Excellent stability at high temperature applications provided by high quality materials
Fast response time
Good bending ability of probe's metal tip
Very good mechanical and chemical resistance even for small diameter probes

APPLICATIONS:

Liquid or gas temperature control and monitoring
Wide range of Industrial applications
Others

| | |
|---|---|
| Thermocouple types | K, J, others |
| Tolerance | tolerances according to IEC 584 |
| B values | - |
| Minimum operating temperature | -200°C |
| Maximum operating temperature | 1150°C |
| Wires/cables: | Inconel 600, s.s.304, s.s.316, silicone, teflon |
| Dimensions | diameter 0.25mm ÷ 8mm |
| Packing | Bulk |



**Automotive:**
Discrete thermistor & assemblies. Industry standard curves, connectors, housings.

**Chemical industry:**
Glass thermistor probes. Custom housing and curves.

**HVAC:**
Boiler probes. Special Housing. Custom desings. Overmolded IP68 Sensors.

**Biomedical:**
YSI 400 Standard curves. Custom electrical and physical designs. Miniature sensors.

**Space and Military:**
Supplier to Soviet-Era programs.

**Instrumentation:**
Standard curves. Custom electrical and physical designs. Miniature sensors.

**Communication:**
Chip thermistors. Custom designs. Miniature sensors.

**Aviation:**
Discrete thermistors. Custom designs.

**Other applications:**
Versatile probes designs.

**temperature sensing solutions for:**

BOILERS

REFRIGERATION

AIR CONDITIONING & VENTILATION

BIOMEDICAL

INSTRUMENTATION

CUSTOM DESIGNS