TEWA ELECTRONICS GROUP
HIGH PRECISION NTC THERMISTORS AND TEMPERATURE SENSORS

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THE COMPANY PROFILE

EXPERIENCE

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

HIGH QUALITY PRODUCTS

Tewa Electronics Group 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 COMPANY PROFILE

THE HIGHEST QUALITY EQUIPMENT

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

ENVIRONMENT FRIENDLY

All Tewa Electronics Group products will be Restriction of Hazardous Substances Directive (RoHS) compliant by the end of 2005. We have already started to modify our process to offer you, our customer, products meeting all quality and environmental standards.

INNOVATION AND TECHNOLOGY IMPROVEMENT

Tewa Electronics Group research and development is focused on enhancing the products. The combined knowledge of the wide range of specialists and engineers results in constant product development and new material applications.
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PRODUCT CATALOGUE

TT1 DISC THERMISTORS
TT2 GLASS THERMISTORS
TT-DO GLASS THERMISTORS
TT3 CHIP THERMISTORS
TT4 CUSTOM TEMPERATURE SENSORS
TT0 WATERPROOF SENSORS
TT5 MICRO CHIP PROBES
TT7 LEAD FRAME THERMISTORS
TT8 SMD NTC THERMISTORS
TT-PT PLATINUM TEMPERATURE SENSORS
TT-TCO THERMOCOUPLES

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The TT1 series NTC Disc Thermistors are available in a wide range of sizes and resistance characteristics as a bare disc and in a 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:**
- Available in custom probe assemblies.
- Proven Stability and Reliability.
- Designed for temperature measurement, control, and compensation.
- Voltage insulation provided by epoxy resin.
- Available with tinned copper bare wire and stranded copper leads with very flexible silicon insulation.
- Different kinds of resins for mechanical and electrical protection.

**Specification:**
- Resistance values: 2.2 Ω to 47 kΩ.
- Resistance tolerance: ±5%, ±10%, ±20%.
- B values (25/85): from 2668K to 4535K.
- Minimum operating temperature: -40°C.
- Maximum operating temperature: 125°C.
- Silver Laver Electrode.
- DC (Dissipation Constant): from 5mW/°C to 12mW/°C typical in still air at 25°C.

**Applications:**
- Ambient temperature sensing, control, and compensation.
- Liquid or gas temperature control and monitoring.
- Assembly into probes.
- Automotive (Air Conditioning, Temperature Monitoring, Heated Seat, Oil temperature Control other).
- Fire detecting systems.
- Chemical Industry.
GLASS ENCAPSULATED NTC THERMISTOR

TT-2 SERIES

The TT2 series NTC "pearl" thermistors are glass encapsulated sensing devices with standard electrical characteristics similar to the TT-1 series disc thermistors. Custom electrical characteristics can be produced in this configuration also. The glass encapsulation provides excellent stability and durability in an established product style. TT2 series thermistors are available with dumet wire with or without polyimide tubes for insulation.

Features:

- Well-established glass encapsulation method.
- Proven Stability and Reliability.
- Designed for temperature measurement control and compensation.
- Available with dumet wire with or without polyimide tubes insulation.
- Glass encapsulation provides extra moisture protection and interchangeability.
- Available in custom probe assemblies

Specification:

- Resistance values: from 1kΩ to 68kΩ.
- Resistance tolerance: ±10%, ±20%, custom values
- B values (25/85): from 2668K to 4535K.
- Minimum operating temperature: -25°C.
- Maximum operating temperature: 200°C.
- DC (Dissipation Constant): from 0.24mW/°C to 1.5mW/°C typical in still air at 25°C.

Applications:

- HVAC Products.
- White Goods.
- Industrial, Instrumentation.
- Chemical Industry.
The TT-DO series NTC thermistors are DO-35, 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.

**Features:**

- Low Cost.
- Excellent moisture protection.
- Excellent stability and reliability.
- Dumet leads are suitable for soldering or welding.
- Excellent stability and reliability.
- Bulk or Tape packaging available

**Specification:**

- Industry standard resistance values from 300Ω up to 1.3MΩ
- Resistance tolerance at selected temperature point from ±1% to ±5%.
- B values tolerance : ±1%, ±2%
- Typical Response Time : <16s in still air.
- Typical Dissipation Constant : 2.1 mW/°C.

**Applications:**

- Ambient temperature sensing, control and compensation.
- Liquid or gas temperature control and monitoring.
- Home appliances sensors.
- General instrumentation.
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.

**Features:**

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

**Specification:**

- Resistance values: 0.1 kΩ to 1 000 kΩ
  - Curve matched
  - Resistance tolerance from ±0.05°C to ±1°C
- B value tolerance: ± 0.3% to ±3%.
- Response Time in well stirred oil bath: 1 - 1.3 second.
- Response Time in still air: ~10 seconds.
- Minimum operating temperature: -40°C.
- Maximum operating temperature: 110°C to 150°C (depending on the product type).
- Typical Dissipation Constant: 0.75mW/°C in still air at 25°C.
- Reduced bead size if required.
- ROHS COMPLIANT

**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.
TEWA ELECTRONICS GROUP
HIGH PRECISION NTC THERMISTORS AND TEMPERATURE SENSORS

NTC CHIP THERMISTOR

STANDARD PART NUMBERS
TT3- KC -

LEADS 76mm:
G – NON INSULATED
Z – INSULATED

RESISTANCE AT 25°C IN KOHMS

CURVE CODE NUMBER

RESISTANCE TOLERANCE CODE:
A : ± 0.1°C FROM 0°C TO 70°C
B : ± 0.2°C FROM 0°C TO 70°C
C : ± 0.5°C FROM 0°C TO 70°C
D : ± 1.0°C FROM 0°C TO 70°C

Available Curves and Resistance values

We offer a wide range of various Resistance vs Temperature characteristics.
In addition to our standards we can easily develop custom curve shapes required by our customers.

<table>
<thead>
<tr>
<th>Tewa Curve</th>
<th>Beta Constant (25/85)</th>
<th>Beta Constant (0/50)</th>
<th>Resistance range at 25°C (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>3187K</td>
<td>3108K</td>
<td>0.5k do 1k</td>
</tr>
<tr>
<td>C2</td>
<td>3348K</td>
<td>3263K</td>
<td>0.5k do 2k</td>
</tr>
<tr>
<td>C3</td>
<td>3976K</td>
<td>3892K</td>
<td>0.47k do 30k</td>
</tr>
<tr>
<td>C4</td>
<td>3694K</td>
<td>3575K</td>
<td>10k do 15k</td>
</tr>
<tr>
<td>C5</td>
<td>3942K</td>
<td>3811K</td>
<td>10k do 30k</td>
</tr>
<tr>
<td>C6</td>
<td>4261K</td>
<td>4143K</td>
<td>30k do 100k</td>
</tr>
<tr>
<td>C7</td>
<td>3499K</td>
<td>3422K</td>
<td>0.3k do 3k</td>
</tr>
<tr>
<td>C8</td>
<td>3435K</td>
<td>3320K</td>
<td>10k</td>
</tr>
</tbody>
</table>

Please contact our sales department to obtain more detailed information about available RT characteristics.
Tewa Electronics Group 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 +800°C. TT4 Series Group contains temperature sensors build using NTC/PTC thermistors, PTRTDs and other sensing elements.

General features:
- Proven Stability and Reliability.
- Low cost.
- 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, 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, Boilers
- HVAC and Refrigeration.
- Fire Detectors.
- Pools and Spas.
- Others...
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HIGH PRECISION NTC THERMISTORS AND TEMPERATURE SENSORS

TYPICAL APPLICATIONS

TT-4 SERIES

- HVAC:
  BOILER PROBES, SPECIAL HOUSING, CUSTOM DESIGNS.

- CHEMICAL INDUSTRY:
  GLASS THERMISTOR PROBES, CUSTOM HOUSING AND CURVES.

- AUTOMOTIVE:
  DISCRETE THERMISTOR & ASSEMBLIES, INDUSTRY STANDARD CURVES.

- SPACE AND MILITARY:
  SUPPLIER TO SOVIET-ERA PROGRAMS.

- BIOMEDICAL:
  STANDARD CURVES, SERIES 400 COMPATIBLE, CATHETER PROBES, MINIATURE THERMISTORS.

- INSTRUMENTATION:
  STANDARD CURVES, CUSTOM ELECTRICAL AND PHYSICAL DESIGNS, MINIATURE SENSORS.

- AVIATION:
  DISCRETE THERMISTORS, CUSTOM DESIGNS.

- COMMUNICATION:
  CHIP THERMISTORS, CUSTOM DESIGNS, MINIATURE SENSORS.

- OTHERS APPLICATIONS:
  VERSATILE PROBES DESIGNS.
WATERPROOF TEMPERATURE SENSOR

TT-O SERIES

TTO 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 TTO overmoulded probes are a perfect solution for applications where the best waterproof and moisture protection is required.

The probe is available in a wide range of standardized sizes and tolerances with a single, double or triple reinforced insulation. NTC, PTC and PtRTD versions are available.

Features:

- Excellent insulation
- Flexible size and tolerances
- Degree of waterproof protection IP68
- Wide range of R/T curves available
- Tight resistance and beta value tolerance
- High temperature NTC probe available (up to 150°C)

Specification:

- Cable length: from 100mm to 100m (others available).
- Insulation resistance: 100MΩ at 1000VDC.
- Flexible size and tolerances
- Excellent resistance to UV (black insulation)
- NTC and PTC Thermistors, PtRTD versions are available
- Wide range of R/T Characteristics
- Tight resistance tolerance ±0.2°C, 1% to 5%
- Cable: 0.3 mm² stranded copper, VDE approved

Applications:

- Refrigeration
- Air conditioning
- Underfloor heating
- Climate control systems
- Industrial Process control
- Others
The TT5 series NTC thermistors are very small size sensing devices that provide very 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 TT5 a perfect solution for applications where improved moisture protection is required.

**Features:**

- Curve or point 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.

**Specification:**

- **Wide range of resistance values and R/T characteristics available**
- Resistance tolerance: from ±0.2 °C to ±1°C
- Response Time in well stirred oil bath: **400** milliseconds
- Dissipation Constant: 0.5 mW/°C in still air at 25°C

**Applications:**

- Ambient temperature sensing, control and compensation,
- Liquid or gas temperature control and monitoring
- **Medical Probes YSI400 series compatible**
- Small probes assemblies
- Computer and Communications Industry
LEAD FRAME NTC THERMISTORS

TT-7 SERIES

The TT7 series NTC thermistors are small size epoxy coated sensing devices. Industry standard characteristics and tolerances makes them ideal choice for low cost high volume applications. TT7 series thermistors are available in various leads lengths in bulk or tape and reel packaging for automatic assembly.

Features:

- Low Cost.
- Good Long Term Stability.
- Excellent endurance against thermal shock.
- Industry Standard Beta Values and Resistance Values.
- Resistance tolerance at selected temperature point: from ±1% to ±5%.
- Tape and Reel Packaging Available.
- ROHS COMPLIANT

Applications:

- Temperature Control and Compensation.
- Instrumentation.
- Others.
The TT8 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(0806) size configurations in **bulk or tape and reel packaging for automatic assembly**. Industry standard and customized characteristics are available on request.

- **Polymer surface coating.**
- **Low Cost.**
- **Wide range of R/T Characteristics and Resistance Values.**
- **From 1% to 5% Resistance and Beta Tolerance.**
- **ROHS Compliant.**

**Applications :**

- **PC Related Equipment.**
- **Audio Video Equipment**
- **Mobile Electronics Equipment.**
- **Others.**

**Dimensions (D x W x T x C) mm**

- 1005(0402) - 1.00 x 0.50 x 0.50 x 0.25
- 1608(0603) - 1.60 x 0.80 x 0.80 x 0.40
- 2012(0805) - 2.00 x 1.25 x 0.80 x 0.50
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 Electronics Group 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 400°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

**Specification:**

- Linear characteristics
  \[ \alpha = \frac{R_{100} - R_0}{100 \times R_0} = 0.00385^\circ C^{-1} \]
- Standard resistance values at 0°C: 100Ω, 500Ω or 1000Ω
- Available in following tolerance classes:

<table>
<thead>
<tr>
<th>Class</th>
<th>Tolerance °C</th>
<th>Tolerance of resistance at 0°C (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/3 B</td>
<td>± (0.1 + 0.0017t)</td>
<td>± 0.04</td>
</tr>
<tr>
<td>A</td>
<td>± (0.15 + 0.002t)</td>
<td>± 0.06</td>
</tr>
<tr>
<td>B</td>
<td>± (0.3 + 0.005t)</td>
<td>± 0.12</td>
</tr>
<tr>
<td>2B</td>
<td>± (0.6 + 0.01t)</td>
<td>± 0.25</td>
</tr>
</tbody>
</table>

*where t is the actual temperature, in degrees °C of the platinum element

**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 Electronics Group
- Others
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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 application. 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

Specification:

- Insulation resistance 100M Ω at 100Vdc.
- Sheath material: type K Inconel 600 type J AISI 304
- Several tolerance classes according to IEC 584

Applications:

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

Thermocouple type „K“ (max 1150°C)

<table>
<thead>
<tr>
<th>d</th>
<th>L</th>
<th>L1</th>
<th>lC</th>
<th>lC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø 2</td>
<td>250</td>
<td>1500</td>
<td>3000</td>
<td>5000</td>
</tr>
<tr>
<td>Ø 3</td>
<td>250</td>
<td>500</td>
<td>750</td>
<td>1000</td>
</tr>
<tr>
<td>Ø 4.5</td>
<td>500</td>
<td>1500</td>
<td>3000</td>
<td>5000</td>
</tr>
<tr>
<td>Ø 6</td>
<td>250</td>
<td>1500</td>
<td>3000</td>
<td>5000</td>
</tr>
<tr>
<td>Ø 8</td>
<td>500</td>
<td>1500</td>
<td>3000</td>
<td>5000</td>
</tr>
</tbody>
</table>

Thermocouple type „J“ (max 600°C)

<table>
<thead>
<tr>
<th>d</th>
<th>L</th>
<th>L1</th>
<th>lC</th>
<th>lC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø 2</td>
<td>150</td>
<td>200</td>
<td>250</td>
<td>500</td>
</tr>
<tr>
<td>Ø 3</td>
<td>150</td>
<td>200</td>
<td>250</td>
<td>500</td>
</tr>
<tr>
<td>Ø 4.5</td>
<td>500</td>
<td>1500</td>
<td>3000</td>
<td>5000</td>
</tr>
<tr>
<td>Ø 6</td>
<td>250</td>
<td>500</td>
<td>750</td>
<td>1000</td>
</tr>
</tbody>
</table>

Miniature Thermocouple type „J“ and „K“

<table>
<thead>
<tr>
<th>d</th>
<th>L</th>
<th>L1</th>
<th>lC</th>
<th>lC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø 0.25*</td>
<td>500</td>
<td>1500</td>
<td>2000</td>
<td>3000</td>
</tr>
<tr>
<td>Ø 0.5</td>
<td>500</td>
<td>1500</td>
<td>2000</td>
<td>3000</td>
</tr>
<tr>
<td>Ø 1</td>
<td>250</td>
<td>500</td>
<td>750</td>
<td>1000</td>
</tr>
<tr>
<td>Ø 1.5</td>
<td>500</td>
<td>1500</td>
<td>3000</td>
<td>5000</td>
</tr>
</tbody>
</table>

*Only type „K“
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LOCATION AND CONTACT INFORMATION

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