



Thermal Solutions Worldwide

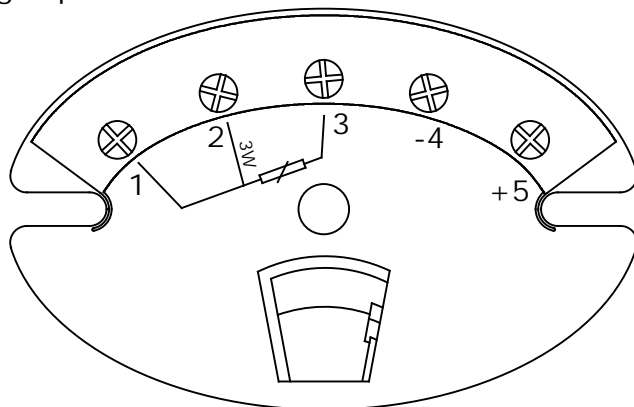
SECTION K

Instruments

| | |
|---|------------|
| Programmable RTD Temperature Transmitters—Series 440 | K-1 |
| Programmable temperature Transmitters—Series 441 | K-4 |
| Digital Thermometer DE-305 | K-9 |
| Surface Probes ATT36 & ATT37 Series | K-9 |

PROGRAMMABLE RTD TEMPERATURE TRANSMITTERS - SERIES 440

The Series 440 programmable RTD temperature transmitter is a two-wire transmitter with an analog output. It has measurement input for Pt100 resistance thermometers (RTD) in 2 or 3 wire connection. Setting up for the transmitter is done using the 440-CABLE. These small units can be mounted in Acrolab heads so they can be used for surface mounting by using a 35mm DIN rail mounting clip.

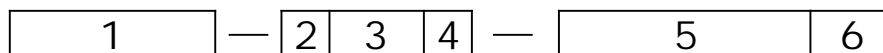


Application Areas

- PC programmable temperature transmitter for converting Pt100 input signal into a scaleable (4 to 20) mA analog output signal
- Platinum Resistance thermometer (RTD)
- Online configuration using PC with SETUP connector

Features and Benefits

- Universally PC programmable for Pt100 signals
- 2 wire technology, (4 to 20) mA analog output
- High accuracy in total ambient temperature range
- Fault signal on sensor break or short circuit
- RFI/EMI Protected, CE marked
- UL Recognized Component
- General Purpose and non-incendive for use in hazardous locations
- Online configuration during measurement using SETUP connector



| 1. Series | |
|-----------|--|
| CODE | |
| 440 | |

| 4. Burnout | |
|------------|---------------------------------|
| CODE | DESCRIPTION |
| U | Upscale Burnout ≥ 21.0 mA |
| D | Downscale Burnout ≤ 3.6 mA |

| Available Accessories | |
|-----------------------|--|
| CODE | DESCRIPTION |
| 440-CABLE | Communication Cable and Software (RS232) |
| 440-CABLE-USB | Communication Cable and Software (USB) |
| 440-DIN35 | 35 mm DIN rail mounting clip |

| 2. Input | |
|----------|--------------|
| CODE | DESCRIPTION |
| 2 | RTD (2-wire) |
| 3 | RTD (3-wire) |

| 5. Temperature Range | |
|-----------------------------|--|
| RANGE | |
| (lower limit - upper limit) | |

| 3. RTD Style | |
|--------------|-----------------------------------|
| CODE | DESCRIPTION |
| 85 | 100 ohm platinum (a=0.00385 °C-1) |

| 6. Temperature Scale | |
|----------------------|-------------|
| CODE | DESCRIPTION |
| C | Celcius |
| F | Fahrenheit |

PROGRAMMABLE RTD TEMPERATURE TRANSMITTERS - SERIES 440

Resistance Thermometer Input (RTD)

| TYPE | MEASUREMENT RANGE | MINIMUM RANGE |
|--|--|---------------|
| Pt100 ($\alpha = 0.00385^{\circ} \text{C}^{-1}$) | -200 to 650° C (-328 to 1202° F) | 10° C (18° F) |
| Connection Type | 2 or 3 wire cable resistance compensation possible in the 2 wire system (0 to 20) Ω | |
| Sensor cable resistance | maximum 11 Ω per cable | |
| Sensor current | $\leq 0.6 \text{ mA}$ | |

Output (Analog)

| | |
|----------------------------|---|
| Output Signal | (4 to 20) mA or (20 to 4) mA |
| Transmission as | Temperature linear |
| Maximum Load | ($V_{\text{power supply}} - 10 \text{ V}$) / 0.023 A (current output) |
| Digital filters 1st degree | (0 to 8) s |
| Induced current required | $\leq 3.5 \text{ mA}$ |
| Current limit | $\leq 23 \text{ mA}$ |
| Switch on delay | 4 s (during power $I_2 = 3.8 \text{ mA}$) |
| Electronic response time | 1 s |

Failure Mode

| | |
|---------------------------------|---|
| Undershooting measurement range | Decrease to 3.8 mA |
| Exceeding measurement range | Increase to 20.5 mA |
| Sensor breakage/short circuit | $\leq 3.6 \text{ mA}$ or $\geq 21.0 \text{ mA}$ |

Electronic Connection

| | |
|------------------|---|
| Power Supply | $U_b = (10 \text{ to } 30) \text{ V dc}$, polarity protected |
| Allowable ripple | $U_{ss} \leq 5 \text{ V}$ at $U_b \geq 13 \text{ V}$, $f_{\text{max}} = 1 \text{ kHz}$ |

Resistance Thermometer Accuracy (RTD)

| TYPE | MEASUREMENT ACCURACY |
|----------------------|--|
| Pt100 | 0.2° C or 0.08% ⁽¹⁾ |
| Reference conditions | Calibration temperature: 23 ± 5° C (73 ± 9° F) |

General Accuracy

| | |
|---------------------------|---|
| Influence of power supply | $\pm 0.01\% \text{ V}$ deviation from 24 V ⁽²⁾ |
| Load influence | $\pm 0.02\% / 100 \Omega$ ⁽²⁾ |
| Temperature drift | $T = (15 \text{ ppm}/^{\circ} \text{C} \times (\text{range end value} + 200) + 50 \text{ ppm}/^{\circ} \text{C} \times \text{measurement range}) \times \Delta\theta$ $\Delta\theta$ = deviation of the ambient temperature according to the reference condition |
| Long term stability | $\leq 0.1^{\circ} \text{ C}/\text{year}$ ⁽³⁾ or $\leq 0.05\%/\text{year}$ ⁽¹⁾⁽³⁾ |

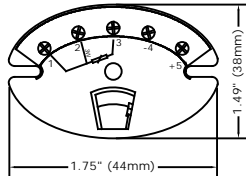
(3) Under reference conditions

PROGRAMMABLE RTD TEMPERATURE TRANSMITTERS - SERIES 440

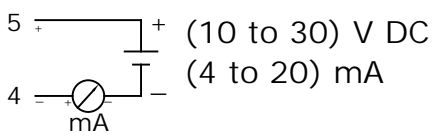
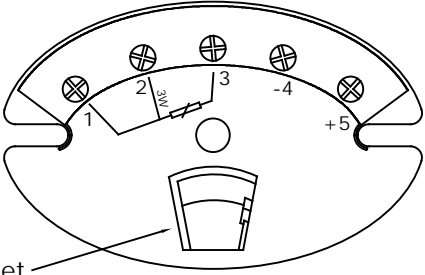
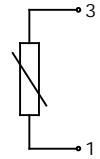
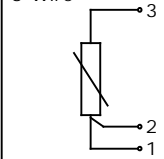
Environmental Conditions

| | |
|---------------------|--|
| Ambient temperature | -40 to 85° C (-40 to 185° F) |
| Storage temperature | -40 to 100° C (-40 to 212° F) |
| Climatic class | EN 60 654-1, Class C |
| Condensation | Permitted |
| Shock resistance | 4 g / (2 to 150) Hz according to IEC 60 068-2-6 |
| EMC immunity | Interference immunity and interference according to EN 61 326-1 (IEC 1326) |




Mechanical Construction

| | |
|------------|--|
| Dimensions |  |
| Weight | Approximately 44 g |
| Materials | Housing: Polycarbonate Potting: Polyurethane |
| Terminals | 15 AWG (maximum) |

Terminal Connections

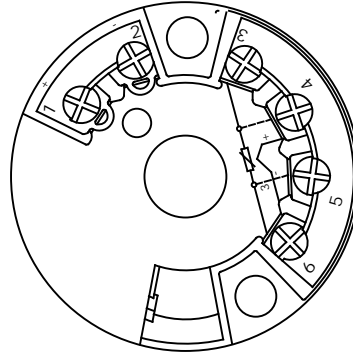
| | |
|--|--|
| <p>Power supply and current output</p>  |  |
| <p>2-Wire</p>  | |
| <p>3-Wire</p>  | |

Approvals

| | |
|---|--|
|    | <p>Unit complies with the legal requirements set forth by the EU regulations</p> <p>UL Recognized Component</p> <p>General Purpose and non-incendive for use in hazardous locations Class 1, Division 2 Groups A, B, C and D</p> |
|---|--|

PROGRAMMABLE TEMPERATURE TRANSMITTERS - SERIES 441

The Series 441 programmable RTD temperature transmitter is a two-wire transmitter with an analog output. It has measurement input for resistance thermometers (RTD) in 2, 3 or 4 wire connection, thermocouples, resistance and voltage. Setting up for the transmitter is done using the 440-CABLE. These small units can be mounted in Acrolab heads so they can be used for surface mounting by using a 35mm DIN rail mounting clip.

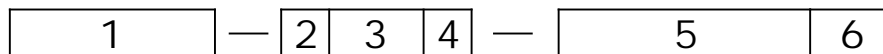


Application Areas

- PC programmable temperature transmitter for converting various input signals into a scaleable (4 to 20) mA analog output signal
- Input
 - Resistance thermometer (RTD)
 - Thermocouple (TC)
 - Resistance (Ω)
 - Voltage (mV)
- Online configuration using PC with SETUP connector

Features and Benefits

- Universally PC programmable for various signals
- Galvanic isolation
- 2 wire technology, (4 to 20) mA analog output
- High accuracy in total ambient temperature range
- Fault signal on sensor break or short circuit
- RFI/EMI Protected, **CE** marked
- **UL** Recognized Component
- **FM** Intrinsicly safe and non-incendive for hazardous locations
- Online configuration during measurement using SETUP connector
- Online simulation



| |
|-----------|
| 1. Series |
| CODE |
| 441 |

| 2. Input | |
|----------|-------------------|
| CODE | DESCRIPTION |
| 1 | Thermocouple (TC) |
| 2 | RTD (2-wire) |
| 3 | RTD (3-wire) |
| 4 | RTD (4-wire) |

| 4. Burnout | |
|------------|---------------------------------|
| CODE | DESCRIPTION |
| U | Upscale Burnout ≥ 21.0 mA |
| D | Downscale Burnout ≤ 3.6 mA |

| 5. Temperature Range | |
|-----------------------------|--|
| RANGE | |
| (lower limit - upper limit) | |

| 3. Calibration | |
|----------------|--|
| CODE | DESCRIPTION |
| J | Type J thermocouple |
| K | Type K thermocouple |
| T | Type T thermocouple |
| N | Type N thermocouple |
| E | Type E thermocouple |
| R | Type R thermocouple |
| S | Type S thermocouple |
| B | Type B thermocouple |
| 85 | 100 ohm platinum ($\alpha=0.00385$ °C-1) |
| 55 | 500 ohm platinum ($\alpha=0.00385$ °C-1) |
| 95 | 1000 ohm platinum ($\alpha=0.00385$ °C-1) |
| MV | Millivolts |
| W | Resistance |

| 6. Temperature Scale | |
|----------------------|-------------|
| CODE | DESCRIPTION |
| C | Celcius |
| F | Fahrenheit |

| Available Accessories | |
|-----------------------|--|
| CODE | DESCRIPTION |
| 440-CABLE | Communication Cable and Software (RS232) |
| 440-CABLE-USB | Communication Cable and Software (USB) |
| 440-DIN35 | 35 mm DIN rail mounting clip |

PROGRAMMABLE TEMPERATURE TRANSMITTERS - SERIES 441

Input

Resistance Thermometer (RTD)

| TYPE | MEASUREMENT RANGE | MINIMUM RANGE |
|---|--|---------------|
| Pt100 ($\alpha = 0.00385\text{ }^{\circ}\text{C}^{-1}$) | -200 to 850° C (-328 to 1562° F) | 10° C (18° F) |
| Pt500 | -200 to 250° C (-328 to 482° F) | 10° C (18° F) |
| Pt1000 | -200 to 250° C (-328 to 482° F) | 10° C (18° F) |
| Ni100 ($\alpha = 0.00618\text{ }^{\circ}\text{C}^{-1}$) | -60 to 180° C (-76 to 356° F) | 10° C (18° F) |
| Ni500 | -60 to 150° C (-76 to 302° F) | 10° C (18° F) |
| Ni1000 | -60 to 150° C (-76 to 302° F) | 10° C (18° F) |
| Connection Type | 2, 3 or 4 wire connection cable resistance compensation possible in the 2 wire system (0 to 20) Ω | |
| Sensor Cable Resistance | maximum 11 Ω per cable | |
| Sensor Current | ≤ 0.6 mA | |

Resistance (Ω)

| TYPE | MEASUREMENT RANGE | MINIMUM RANGE |
|------------|---------------------|---------------|
| Resistance | 10 to 400 Ω | 10 Ω |
| | 10 to 2000 Ω | 100 Ω |

Thermocouple (TC)

| TYPE | MEASUREMENT RANGE | MINIMUM RANGE |
|----------------------------|-----------------------------------|-----------------|
| B | 0 to 1820° C (32 to 3308° F) | 500° C (900° F) |
| C | 0 to 2320° C (32 to 4208° F) | 500° C (900° F) |
| D ⁽³⁾ | 0 to 2495° C (32 to 4523° F) | 500° C (900° F) |
| E | -200 to 915° C (-328 to 1679° F) | 50° C (90° F) |
| J | -200 to 1200° C (-328 to 2192° F) | 50° C (90° F) |
| K | -200 to 1372° C (-328 to 2501° F) | 50° C (90° F) |
| L ⁽²⁾ | -200 to 900° C (-328 to 1652° F) | 50° C (90° F) |
| N | -270 to 1300° C (-454 to 2372° F) | 50° C (90° F) |
| R | 0 to 1768° C (32 to 3214° F) | 500° C (900° F) |
| S | 0 to 1768° C (32 to 3214° F) | 500° C (900° F) |
| T | -200 to 400° C (-328 to 752° F) | 50° C (90° F) |
| U ⁽²⁾ | -200 to 600° C (-328 to 1112° F) | 50° C (90° F) |
| MoRe5-MoRe4 ⁽¹⁾ | 0 to 2000° C (32 to 3632° F) | 500° C (900° F) |

Voltage (mV)

| TYPE | MEASUREMENT RANGE | MINIMUM RANGE |
|----------------|-------------------|---------------|
| Millivolt (mV) | -10 to 100 mV | 5 mV |

(1) no reference

(2) according to DIN 43710

(3) according to ASTM E988

PROGRAMMABLE TEMPERATURE TRANSMITTERS - SERIES 441

Output

Output (Analog)

| | |
|---------------------------|--|
| Output signal | 4 to 20 mA or 20 to 4 mA |
| Transmission as | Temperature linear, resistance linear, voltage linear |
| Maximum load | $(V_{\text{power supply}} - 8 \text{ V}) / 0.025 \text{ A}$ (current output) |
| Digital filter 1st degree | 0 to 8 s |
| Induced current required | $\leq 3.5 \text{ mA}$ |
| Current limit | $\leq 25 \text{ mA}$ |
| Switch on delay | 4 s (during power up $I_a = 3.8 \text{ mA}$) |
| Electronic response time | 1 s |

Failure Mode

| | |
|--|---|
| Undershooting measurement range | 4 to 20 mA or 20 to 4 mA |
| Exceeding measurement range | Temperature linear, resistance linear, voltage linear |
| Sensor breakage/short circuit ⁽¹⁾ | $\leq 3.5 \text{ mA}$ or $\geq 21.0 \text{ mA}$ |

Failure Mode

| | |
|-----------------------------|---|
| Power Supply | $U_b = (8 \text{ to } 30) \text{ V dc}$, polarity protected |
| Galvanic Isolation (in/out) | $\hat{U} = 3.75 \text{ kV ac}$ |
| Allowable ripple | $U_{ss} \leq 5 \text{ V}$ at $U_b \geq 13 \text{ V}$, $f_{\text{max}} = 1 \text{ kHz}$ |

Accuracy

Output (Analog)

| | |
|----------------------|--|
| Reference conditions | Calibration temperature: $23 \pm 5^\circ \text{ C}$ ($73 \pm 9^\circ \text{ F}$) |
|----------------------|--|

Resistance Thermometer (RTD)

| TYPE | MEASUREMENT ACCURACY |
|----------------|--|
| Pt100, Ni100 | 0.2° C or 0.08% ⁽¹⁾ |
| Pt500, Ni500 | 0.5° C or 0.20% ⁽¹⁾ |
| Pt1000, Ni1000 | 0.3° C or 0.12% ⁽¹⁾ |

Resistance (Ω)

| TYPE | MEASUREMENT RANGE | MINIMUM RANGE |
|------------|---|---------------------|
| Resistance | 0.1Ω or 0.08% ⁽²⁾ | 10 to 400Ω |
| | 1.5Ω or 0.12% ⁽²⁾ | 10 to 2000Ω |

(1) not for thermocouple

(2) % is related to the adjusted measurement range (the value to be applied is the greater)

PROGRAMMABLE TEMPERATURE TRANSMITTERS - SERIES 441

Accuracy (continued)

Thermocouple (TC)

| TYPE | MEASUREMENT ACCURACY |
|------------------------------------|--|
| E, J, K, L, T, U | 0.5° C or 0.08% ⁽¹⁾ |
| C, D, N | 1.0° C or 0.08% ⁽¹⁾ |
| B, MoRe5-MoRe41, R, S | 2.0° C or 0.08% ⁽¹⁾ |
| Influence of the internal junction | Pt100 $\pm 0.30 + 0.005 t $ ° C t = value of temperature without regard to sign ° C |

Voltage (mV)

| TYPE | MEASUREMENT RANGE | MINIMUM RANGE |
|----------------|--|---------------|
| Millivolt (mV) | $\pm 20 \mu\text{V}$ or 0.08% ⁽¹⁾ | -10 to 100 mV |

General

| | |
|---------------------------|---|
| Influence of power supply | $\pm 0.01\%/V$ deviation from 24 V ⁽²⁾ |
| Load influence | $\pm 0.02\%/100 \Omega$ ⁽²⁾ |
| Temperature drift | Resistive thermometer (RTD): $T_d = \pm(15 \text{ ppm}/^\circ\text{C} \times \text{range end value} + 50 \text{ ppm}/^\circ\text{C} \times \text{measurement range}) \Delta\theta$ |
| | Resistive thermometer Pt100: $T_d = \pm(15 \text{ ppm}/^\circ\text{C} \times (\text{range end value} + 200) + 50 \text{ ppm}/^\circ\text{C} \times \text{measurement range}) \Delta\theta$ |
| | Thermocouple (TC) $T_d = \pm(50 \text{ ppm}/^\circ\text{C} \times \text{range end value} + 50 \text{ ppm}/^\circ\text{C} \times \text{measurement range}) \Delta\theta$ |
| Load influence | $\Delta\theta$ = Deviation of the ambient temperature according to the reference condition |
| Long Term Stability | $\leq 0.1^\circ\text{C}/\text{year}$ ⁽³⁾ or $\leq 0.05\%/ \text{year}$ ⁽¹⁾⁽³⁾ |

Installation Conditions

Environmental Conditions

| | |
|-----------------------|--|
| Ambient temperature | -40 to 85° C (-40 to 185° F) |
| Storage temperature | -40 to 100° C (-40 to 212° F) |
| Climatic class | EN 60 654-1, Class C |
| Moisture condensation | Allowable |
| Vibration resistance | 4 g / (2 to 150) Hz according to IEC 60 068-2-6 |
| EMC immunity | Interference immunity and interference according to EN 61 326-1 (IEC 1326) |

(1) % is related to the adjusted measurement range (the value to be applied is the greater)

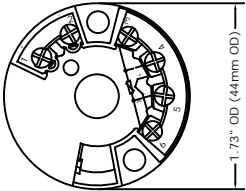
(2) All data is related to a measurement end value of 20 mA

(3) Under reference conditions

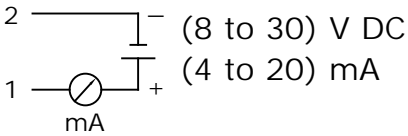
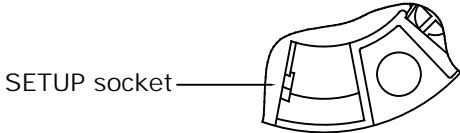
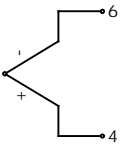
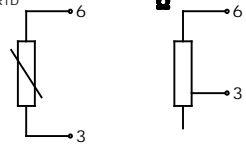
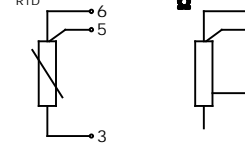
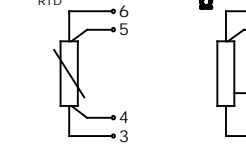
PROGRAMMABLE TEMPERATURE TRANSMITTERS - SERIES 441

Mechanical Construction

Mechanical Construction

| | |
|------------|--|
| Dimensions |  |
| Weight | Approximately 40 g |
| Materials | Housing: Polycarbonate Potting: Polyurethane |
| Terminals | 15 AWG (maximum) |

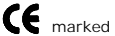


Terminal Connections

| | | | |
|--|---|--|---|
| <p>Power supply and current output</p>  |  | | |
| <p>Thermocouple</p>  | <p>2-Wire RTD</p>  | <p>3-Wire RTD</p>  | <p>4-Wire RTD</p>  |

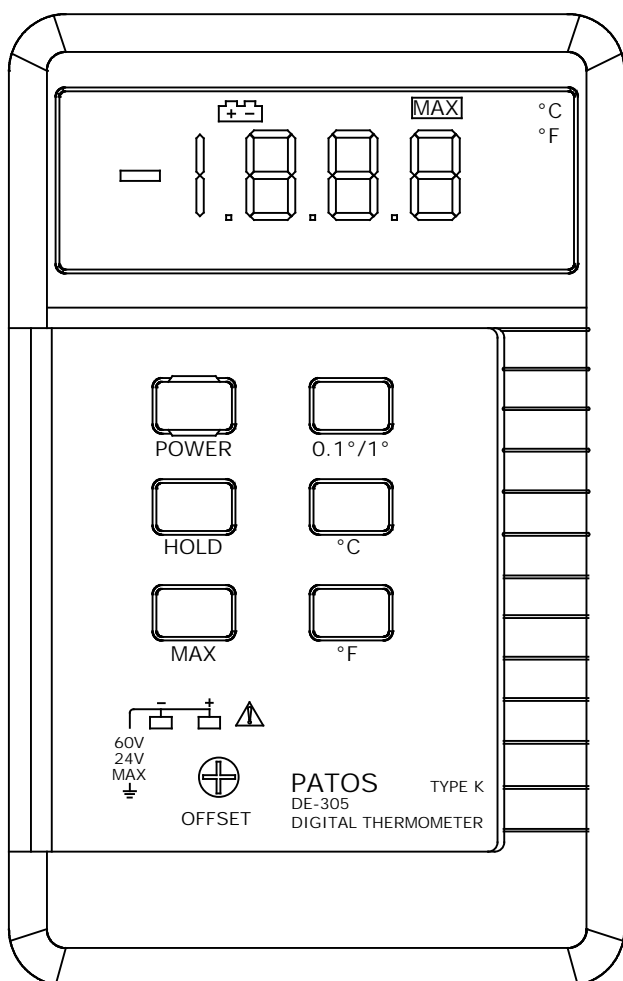
Remote Operations

| | |
|--------------------------|--|
| Configuration set | Configuration kit 440-CABLE |
| Configuration | Using PC program TransComm |
| Interface | PC interface connection cable TTL -/- RS 232 with plug |
| Configuration parameters | Sensor type and connection type, engineering units ($^{\circ}\text{C}/^{\circ}\text{F}$), measurement range, internal/external cold junction compensation, cable resistance compensation on 2 wire connection, fault conditioning, output signal 4 to 20 mA or 20 to 4 mA, digital filter (damping), offset, measurement point identification (8 characters), output simulation. |

Approvals

| | |
|---|---|
|    | <p>Unit complies with the legal requirements set forth by the EU regulations</p> <p>UL Recognized Component</p> <p>Intrinsically safe and non-incendive for use in hazardous locations Class 1, Division 2 Groups A, B, C and D</p> |
|---|---|

DIGITAL THERMOMETER DE-305



DE-305 Digital Thermometer

- Large size LCD indication
- Low Battery Indication
- K-Type Thermocouple (option)
- Handheld Lightweight Design
- Reading Hold Function
- Maximum Record
- °C or °F Annunciators Display
- 1°C or 0.1°C (1°F or 0.1°F)
- °C °F switchable on front panel
- Single Thermocouple Input
- User-Selectable Resolution
- Front Panel Offset Adjustment

Specifications

Technical

Temperature scale: °C or °F User-Selectable.
Resolution: 1°C or 1°F (or 0.1°C or 0.1°F)
User-Selectable
Inputs: One K-type Thermocouple
Measurement Range: 50 ~ 1300°C, (-59 ~ 2000°F)
Meter Operating Range: For Using at 0°C ~ 50°C
Environment(32 ~ 122°F)
Accuracy: (18~28°C ambient)
±(0.3%rdg + 1°C) -50 ~ 1000°C
±(0.5%rdg + 1°C) 1000 ~ 1300°C
±(0.3%rdg + 2°C) -58 ~ 2000°C
The accuracy specification does not include type D thermocouple probe accuracy.
Temperature Coefficient: 0.1 times the applicable accuracy specification per °C from 0°C to 18°C to 50°C
Error Offset: Errors contributed by one particular thermocouple may be practically eliminated, over a limited measurement range, using a recessed front panel OFFSET adjust on the meter and an accurate standard when making the adjustment. Although making the adjustment may increase errors for using different thermocouples
Maximum Input: 60V dc or 24V rms ac between the input pins or any input and ground.

General

Display: 3 1/2 digit liquid crystal display (LCD) with maximum reading of 1999.
Sampling Rate: 2.5 times per second
Battery: One 9V battery (6F 22)
Dimensions (mm): 148(H)x71(W)x36(D)
Weight: 208g (including battery)
Power Current: Approx. DC 2.8mA (typical)

Enclosure

1. Manual 2. Battery 9V 3. Rubber Holster

Accessories for Customer Option

1. NR-31B 2. NR-33 3. NR-34
4. NR-39 5. NR-34-INCO

Surface Probes - Type K

ATT-36 - Straight Probe

ATT-37 - 90 Degree Probe