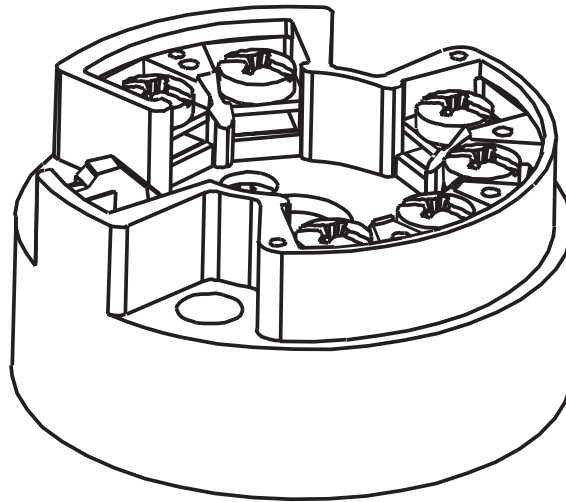


The Series 441 programmable temperature transmitter is a two-wire transmitter with an analog output. It has measurement input for resistance thermometers (RTD) in 2, 3 or 4 wire connection, thermocouples, resistance and voltage. Setting up of the transmitter is done using the 440-CABLE. These small units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

### TEMPERATURE HEAD TRANSMITTER

Universal head transmitter for resistance thermometers (RTD), thermocouples, resistance and voltage transmitters, settable using a PC, for installation in a sensor head (Form B)



### Application Areas

- PC programmable temperature head transmitter for converting various input signals into an scalable (4 to 20) mA analog output signal
- Input:
  - Resistance thermometer (RTD)
  - Thermocouple (TC)
  - Resistance ( $\Omega$ )
  - 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** US UL Recognized Component
- **FM** Intrinsicly safe and non-incendive for hazardous locations
- **FM** Intrinsicly safe and non-incendive for hazardous locations
- Online configuration during measurement using SETUP connector
- Output simulation

### ORDER CODES

**Unconfigured Order Number:** 441-00

**Configured Order Number:** **4 4 1** - **1 J U** - **S (50-300) F**

**1**

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

**2**

| 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 ( $\alpha = 0.00385\text{ }^{\circ}\text{C}^{-1}$ )  |
| 55   | 500 ohm platinum ( $\alpha = 0.00385\text{ }^{\circ}\text{C}^{-1}$ )  |
| 95   | 1000 ohm platinum ( $\alpha = 0.00385\text{ }^{\circ}\text{C}^{-1}$ ) |
| MV   | Millivolts  |
| W    | Resistance  |

1 2 3  
**1 J U**

4 5  
**S (50-300) F**

**3**

| CODE | DESCRIPTION                            |
|------|--|
| U    | Upscale Burnout $\geq 21.0\text{ mA}$  |
| D    | Downscale Burnout $\leq 3.5\text{ mA}$ |

**4**

| RANGE                          |
|--------------------------------|
| S ( lower limit – upper limit) |

**5**

| CODE | DESCRIPTION |
|------|-------------|
| C    | Celsius     |
| F    | Fahrenheit  |

#### Accessories

| CODE          | DESCRIPTION                              |
|---------------|--|
| 440-CABLE     | Communication Cable and Software (RS232) |
| 440-CABLE-USB | Communication Cable and Software (USB)   |
| 441-DIN35     | 35 mm DIN rail mounting clip             |

### 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) $\Omega$ |               |
| Sensor Cable Resistance                                   | maximum 11 $\Omega$ per cable  |               |
| Sensor current  | $\leq 0.6 \text{ mA}$  |               |

#### Resistance ( $\Omega$ )

| TYPE                    | MEASUREMENT RANGE                             | MINIMUM RANGE               |
|-------------------------|---|-----------------------------|
| Resistance ( $\Omega$ ) | (10 to 400) $\Omega$<br>(10 to 2000) $\Omega$ | 10 $\Omega$<br>100 $\Omega$ |

#### Thermocouples (TC)

| TYPE                   | MEASUREMENT RANGE  | MINIMUM RANGE   |
|------------------------|--|-----------------|
| B (PtRh30-PtRh6)       | (0 to 1820) °C [32 to 3308] °F                           | 500 °C [900 °F] |
| C (W5Re-W26Re)         | (0 to 2320) °C [32 to 4208] °F                           | 500 °C [900 °F] |
| D (W3Re-W25Re) [3]     | (0 to 2495) °C [32 to 4523] °F                           | 500 °C [900 °F] |
| E (NiCr-CuNi)          | (-200 to 915) °C [-328 to 1679] °F                       | 50 °C [90 °F]   |
| J (Fe-CuNi)            | (-200 to 1200) °C [-328 to 2192] °F                      | 50 °C [90 °F]   |
| K (NiCr-Ni)            | (-200 to 1372) °C [-328 to 2501] °F                      | 50 °C [90 °F]   |
| L (Fe-CuNi) [2]        | (-200 to 900) °C [-328 to 1652] °F                       | 50 °C [90 °F]   |
| N (NiCrSi-NiSi)        | (-270 to 1300) °C [-454 to 2372] °F                      | 50 °C [90 °F]   |
| R (PtRh13-Pt)          | (0 to 1768) °C [32 to 3214] °F                           | 500 °C [900 °F] |
| S (PtRh10-Pt)          | (0 to 1768) °C [32 to 3214] °F                           | 500 °C [900 °F] |
| T (Cu-CuNi)            | (-200 to 400) °C [-328 to 752] °F                        | 50 °C [90 °F]   |
| U (Cu-CuNi) [2]        | (-200 to 600) °C [-328 to 1112] °F                       | 50 °C [90 °F]   |
| MoRe5-MoRe41 [1]       | (0 to 2000) °C [32 to 3632] °F                           | 500 °C [900 °F] |
| Cold junction          | internal (Pt100) or external (0 to 80) °C [32 to 176] °F |                 |
| Cold junction accuracy | $\pm 1 \text{ } ^\circ\text{C}$                          |                 |

#### 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

### 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              | Decrease to 3.8 mA                              |
| Exceeding measurement range                  | Increase to 20.5 mA                             |
| Sensor breakage/short circuit <sup>[1]</sup> | $\leq 3.5 \text{ mA}$ or $\geq 21.0 \text{ mA}$ |

#### Electrical Connection

|                             |   |
|-----------------------------|---|
| 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

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

#### Resistance Thermometer (RTD)

| TYPE           | MEASUREMENT ACCURACY                                    |
|----------------|---|
| Pt100, Ni100   | $0.2 \text{ }^\circ\text{C}$ or $0.08\%$ <sup>[2]</sup> |
| Pt500, Ni500   | $0.5 \text{ }^\circ\text{C}$ or $0.20\%$ <sup>[2]</sup> |
| Pt1000, Ni1000 | $0.3 \text{ }^\circ\text{C}$ or $0.12\%$ <sup>[2]</sup> |

#### Resistance ( $\Omega$ )

| TYPE       | MEASUREMENT ACCURACY                                 | MEASUREMENT RANGE     |
|------------|--|-----------------------|
| Resistance | $\pm 0.1 \text{ } \Omega$ or $0.08\%$ <sup>[2]</sup> | (10 to 400) $\Omega$  |
|            | $\pm 1.5 \text{ } \Omega$ or $0.12\%$ <sup>[2]</sup> | (10 to 2000) $\Omega$ |

[1] Not for thermocouple

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

### ACCURACY (continued)

#### Thermocouple (TC)

| TYPE   | MEASUREMENT ACCURACY  |
|--|---|
| K, J, T, E, L, U                             | 0.5 °C or 0.08% <sup>[1]</sup>  |
| N, C, D                                      | 1.0 °C or 0.08% <sup>[1]</sup>  |
| S, B, R MoRe5-MoRe41                         | 2.0 °C or 0.08% <sup>[1]</sup>  |
| Influence of the internal reference junction | Pt100 ± (0.30 + 0.005  t ) °C<br> t  = value of temperature without regard to sign °C |

#### Voltage (mV)

| TYPE           | MEASUREMENT ACCURACY            | MEASUREMENT RANGE |
|----------------|---------------------------------|-------------------|
| Millivolt (mV) | ± 20 µV or 0.08% <sup>[1]</sup> | (-10 to 100) mV   |

#### General

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

### INSTALLATION CONDITIONS

#### Ambient Conditions

|                       |   |
|-----------------------|---|
| Ambient temperature   | (-40 to 85) °C [-40 to 185] °F  |
| Storage temperature   | (-40 to 100) °C [-40 to 212] °F   |
| Climatic class        | To EN 60 654-1, Class C   |
| Moisture condensation | Allowable   |
| Vibration protection  | 4 g / (2 to 150) Hz according to IEC 60 068-2-6                               |
| EMC immunity          | Interference immunity and interference emission as per 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

### MECHANICAL CONSTRUCTION

|            |  |
|------------|--|
| Dimensions | <p>Dimensions in inches (mm)</p> <p>Top View Dimensions:<br/> <math>\varnothing 0.197</math> [5]<br/> <math>\varnothing 0.28</math> [7]<br/> <math>\varnothing 1.3</math> [33]<br/> <math>\varnothing 1.73</math> [44]</p> <p>Side View Dimension:<br/> <math>0.89</math> [23]</p> |
| Weight     | approximately 40 g   |
| Materials  | Housing: Polycarbonate • Potting: Polyurethane   |
| Terminals  | 15 AWG (maximum)   |

### Terminal Connections

|  |                     |  |  |  |
|--|---------------------|--|--|--|
| <p>Power supply and current output</p> <p>2 ———   — (8 to 30) V dc<br/>         1 ———   + (4 to 20) mA<br/>         mA</p> | <p>SETUP socket</p> |  |  |  |
| <p>Sensor Connection</p>   | <p>TC</p>           | <p>2-Wire</p> <p>RTD <math>\Omega</math></p> | <p>3-Wire</p> <p>RTD <math>\Omega</math></p> | <p>4-Wire</p> <p>RTD <math>\Omega</math></p> |

### Remote Operation

|                         |   |
|-------------------------|---|
| Configuration set       | Configuration kit 440-CABLE   |
| Configuration           | Using PC program TransComm  |
| Interface               | PC interface connection cable TTL -/- RS 232 with plug  |
| Configurable 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

|                                       |  |
|---------------------------------------|--|
| CE marked<br>UL US<br><br>FM APPROVED | <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 hazardous locations Class I, Division 1 and 2, Groups A, B, C and D</p> <p>Intrinsically safe and non-incendive for hazardous locations Class I, Division 1 and 2, Groups A, B, C and D</p> |
|---------------------------------------|--|