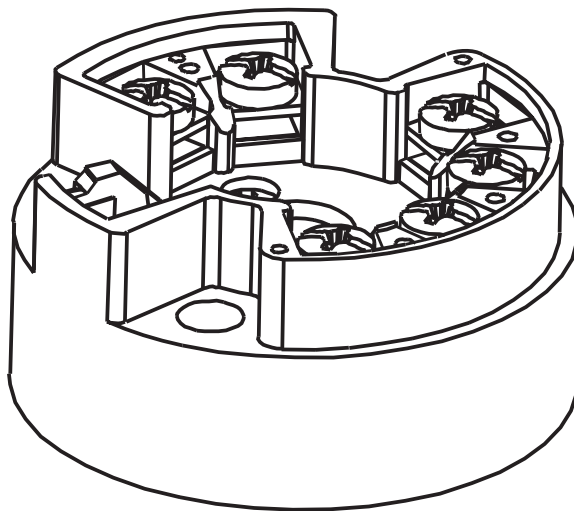


The Series 442 programmable HART® temperature transmitter is a two-wire transmitter with an analog output. It has measurement input for resistance thermometers (RTD) in 2, 3 or 4 wire connection, thermocouples, resistance and voltage. Setting up of the transmitter is done using the 442-MODEM or HART® hand-operating module (275 or 375). 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

Intrinsically safe universal head transmitter for resistance thermometers (RTD), thermocouples, resistance and voltage transmitters, settable using HART® protocol, for installation in a sensor head (Form B).



Application Areas

- Temperature head transmitter with HART® protocol for converting various input signals into an scalable (4 to 20) mA analog output signal
- Input:
 - Resistance thermometer (RTD)
 - Thermocouple (TC)
 - Resistance (Ω)
 - Voltage (mV)
- HART® protocol for front end unit or panel unit operation using the hand-operating module (275 or 375) or PC.

Features and Benefits

- Universal settings with HART® protocol 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
- **CS** Intrinsically safe and non-incendive for hazardous locations
- **FM** Intrinsically safe and non-incendive for hazardous locations
- Output simulation

ORDER CODES

Unconfigured Order Number: 442-00

Configured Order Number: **4 4 2** - **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

3

CODE	DESCRIPTION
U	Upscale Burnout $\geq 21.0 \text{ mA}$
D	Downscale Burnout $\leq 3.6 \text{ mA}$

4

RANGE
S (lower limit – upper limit)

5

CODE	DESCRIPTION
C	Celsius
F	Fahrenheit

Accessories

CODE	DESCRIPTION
442-MODEM	HART® Communication Modem and Software (RS232)
442-MODEM-USB	HART® Communication Modem 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 250) °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 30) Ω	
Sensor Cable Resistance	maximum 11 Ω per cable	
Sensor current	≤ 0.2 mA	

Resistance (Ω)

TYPE	MEASUREMENT RANGE	MINIMUM RANGE
Resistance (Ω)	(10 to 400) Ω (10 to 2000) Ω	10 Ω 100 Ω

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)	(-270 to 1000) °C [-454 to 1832] °F	50 °C [90 °F]
J (Fe-CuNi)	(-210 to 1200) °C [-346 to 2192] °F	50 °C [90 °F]
K (NiCr-Ni)	(-270 to 1372) °C [-454 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)	(-50 to 1768) °C [-58 to 3214] °F	500 °C [900 °F]
S (PtRh10-Pt)	(-50 to 1768) °C [-58 to 3214] °F	500 °C [900 °F]
T (Cu-CuNi)	(-270 to 400) °C [-454 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	± 1 °C	

Voltage (mV)

TYPE	MEASUREMENT RANGE	MINIMUM RANGE
Millivolt (mV)	(-10 to 75) 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	$(V_{\text{power supply}} - 10V) / 0.022 \text{ A current output}$
Digital filter 1st degree	(0 to 60) 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 ^[1]	$\leq 3.6 \text{ mA}$ or $\geq 21.0 \text{ mA}$

Electrical Connection

Power supply	$U_b = (11.5 \text{ to } 30) \text{ V dc}$, polarity protected
Galvanic isolation (In/out)	$\hat{U} = 2 \text{ kV ac}$
Allowable ripple	$U_{ss} \leq 3 \text{ V}$ 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 ± 9] $^\circ\text{F}$
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Resistance Thermometer (RTD)

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

Resistance (Ω)

TYPE	MEASUREMENT ACCURACY	MEASUREMENT RANGE
Resistance	$\pm 0.1 \text{ } \Omega$ or $0.08\% \text{ }^{[2]}$	(10 to 400) Ω
	$\pm 1.5 \text{ } \Omega$ or $0.12\% \text{ }^{[2]}$	(10 to 2000) Ω

[1] Not for thermocouple

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

ACCURACY (CONT)

Thermocouple (TC)

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

Voltage (mV)

TYPE	MEASUREMENT ACCURACY	MEASUREMENT RANGE
Millivolt (mV)	± 20 µV or 0.08% ^[1]	(-10 to 100) mV

General

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

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>
Weight	approximately 40 g
Materials	Housing: Polycarbonate • Potting: Polyurethane
Terminals	15 AWG (maximum)

Terminal Connections

<p>Power supply and current output</p>	<p>HART® Communication on (4 to 20) mA</p>			
<p>Sensor Connection</p>	<p>TC</p>	<p>2-Wire</p> <p>RTD Ω</p>	<p>3-Wire</p> <p>RTD Ω</p>	<p>4-Wire</p> <p>RTD Ω</p>

Remote Operation

Configuration set	Configuration kit 442-MODEM
Configuration	Using PC program TransComm
Interface	PC interface connection cable TTL -/- RS 232 with plug
Configurable parameters	Sensor type and connection type, engineering units (°C/°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 cRU us SIL 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>
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