

The Series 642 programmable HART® field temperature transmitter is a 2-wire unit with analog output. It includes input for RTDs; resistance inputs in 2-wire, 3-wire, and 4-wire connections; thermocouples and voltage signals. The transmitter can be supplied with or without a digital display, in either a general-purpose aluminum housing, or explosion-proof aluminum housing. The Series 642 can be programmed with a PC or a HART® protocol handheld terminal. When supplied with a digital display, the LC screen shows the current measured value and a bar graph with limit value violation indicator.

PROGRAMMABLE FIELD TEMPERATURE TRANSMITTER

Programmable temperature transmitter for resistance thermometers (RTDs), thermocouples, resistance inputs and voltage inputs:
adjustable via HART® protocol.



HART COMMUNICATION PROTOCOL

Application Areas

- Temperature field transmitter with HART® protocol for converting various input signals to an analog, scaleable (4 to 20) mA output signal
- Input:
 - Resistance thermometer (RTD)
 - Thermocouples (TC)
 - Resistance input (Ohm)
 - Voltage input (mV)
- HART® protocol for operating the device on site using a handheld communicator or remotely via the PC

Features and Benefits

- Universally programmable with HART® protocol for various input signals
- Illuminated display, rotatable
- Operation, visualization and maintenance with PC; e.g. using TransComm Light operating software
- 2-wire technology, analog output (4 to 20) mA
- Undervoltage detection
- Highly accurate in entire operating temperature range
- Approvals:
 - FM and CSA (IS, NI, XP and DIP)
- Galvanic isolation
- Output simulation
- Min./max. process values recorded
- Customized measuring range setup or expanded SETUP; see questionnaire

HART® is a registered trademark of HART Communication Foundation



CE marked

ORDER CODES

Example Order Number:

1-0 1-1 1-2 1-3 1-4 1-5 1-6
642A - **D** - **3 85 U** - **S(0-200)** **C**

1-0 Transmitter Type

CODE	DESCRIPTION
642A	(4 to 20) mA HART® Field Transmitter with general-purpose aluminum housing
642C	(4 to 20) mA HART® Field Transmitter with explosion-proof aluminum housing FM/CSA / XP Class I / Div 1 / Groups A,B,C,D / DIP Class II / Div 1 / Groups E,F,G / Class III / NI Class I / Div 2 / Groups A,B,C,D
642F	(4 to 20) mA HART® Field Transmitter with general-purpose aluminum housing FM/CSA IS Class I / Div 1 / Groups A,B,C,D / NI Class I / Div 2 / Groups A,B,C,D

1-1 Options

CODE	DESCRIPTION
T	Solid cover
D	Glass cover with digital display

1-2 Input Type

CODE	DESCRIPTION
00	Unconfigured ^[1]
1	Thermocouple (TC) or millivolt
2	RTD (2-wire) or resistance
3	RTD (3-wire) or resistance
4	RTD (4-wire) or resistance

[1] Default setting for unconfigured transmitter is 3-wire Pt100 (0 - 100) °C

Accessories

CODE	DESCRIPTION
10321	Pipe mounting bracket for use on pipes with a diameter between 1.5" to 3.3"

1-6 Unit of Measure

CODE	DESCRIPTION
C	Celsius
F	Fahrenheit
K	Kelvin

1-5 Range

CODE	DESCRIPTION
S	(lower limit – upper limit)

1-4 Failure Mode

CODE	DESCRIPTION
U	Upscale Burnout ≥ 23 mA
D	Downscale Burnout ≤ 3 mA

1-3 Sensor Type

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
Other types available. Consult factory.	

HART® is a registered trademark of HART Communication Foundation

INPUT

Resistance Thermometer (RTD)

TYPE	STANDARDS	MEASUREMENT RANGE	MINIMUM RANGE
Pt100 ($\alpha = 0.00385\text{ }^{\circ}\text{C}^{-1}$) Pt200 Pt500 Pt1000	ASTM E1137 IEC 60 751	(-200 to 850) °C [-328 to 1562] °F (-200 to 850) °C [-328 to 1562] °F (-200 to 250) °C [-328 to 482] °F (-200 to 250) °C [-328 to 482] °F	10 °C [18 °F] 10 °C [18 °F] 10 °C [18 °F] 10 °C [18 °F]
Pt100 ($\alpha = 0.003916$)	JIS C1604	(-200 to 649) °C [-328 to 1200] °F	10 °C [18 °F]
Pt100 ($\alpha = 0.003923$)	SAMA	(-100 to 700) °C [-148 to 1292] °F	10 °C [18 °F]
Ni100 ($\alpha = 0.006180$) Ni1000 ($\alpha = 0.006180$)	DIN 43 760	(-60 to 250) °C [-76 to 482] °F (-60 to 150) °C [-76 to 302] °F	10 °C [18 °F] 10 °C [18 °F]
Ni120 ($\alpha = 0.006720$) Cu10 ($\alpha = 0.004274$)	Edison Curve	(-70 to 270) °C [-94 to 518] °F (-100 to 260) °C [-148 to 500] °F	10 °C [18 °F] 10 °C [18 °F]
Pt50 ($\alpha = 0.003911$) Pt100 ($\alpha = 0.003911$) Cu50 ($\alpha = 0.004278$) Cu100 ($\alpha = 0.004278$)	GOST	(-200 to 1100) °C [-328 to 2012] °F (-200 to 850) °C [-328 to 1562] °F (-200 to 200) °C [-328 to 392] °F (-200 to 200) °C [-328 to 392] °F	10 °C [18 °F] 10 °C [18 °F] 10 °C [18 °F] 10 °C [18 °F]
Polynomial RTD Pt100 (Callendar - van Dusen)		(-200 to 850) °C [-328 to 1562] °F (-200 to 850) °C [-328 to 1562] °F	10 °C [18 °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		3-wire and 4-wire connection, sensor wire resistance to maximum 50 Ω per wire	
Sensor current		≤ 0.3 mA	

Resistance (Ω)

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

Thermocouples (TC) (ASTM E230)

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) [1]	(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]
Cold junction	internal (Pt100) or external (0 to 80) °C [32 to 176] °F	
Cold junction accuracy	± 1 °C	
Max. sensor resistance	10 k Ω	
[1] no reference [2] according to DIN 43710		

Voltage (mV)

TYPE	MEASUREMENT RANGE	MINIMUM RANGE
Millivolt (mV)	(-20 to 100) mV	5 mV

HART® is a registered trademark of HART Communication Foundation



© 2006 Pyromation, Inc.

OUTPUT

Output (Analog)

Output signal	Analog (4 to 20) mA or (20 to 4) mA
Transmission as	Temperature linear, resistance linear, voltage linear
Maximum load	$(V_{\text{power supply}} - 11V) / 0.022 \text{ A}$ (current output)
Digital filter 1st degree	(0 to 60) s
Induced current required	$\leq 3.5 \text{ mA}$
Current limit	$\leq 23 \text{ mA}$
Switch on delay	4 s (during switch-on operation $I_a = 4 \text{ mA}$)
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 $\geq 21.0 \text{ mA}$ (configurable 21.6 mA to 23 mA)

Electrical Connection

Power supply	$U_b = 11$ to 40 V (8 to 40 without display), reverse polarity protected
Cable entry	Three 1/2" NPT openings
Allowable ripple	$U_{ss} \leq 3 \text{ V}$ at $U_b \geq 13.5 \text{ V}$, $f_{\text{max}} = 1 \text{ kHz}$

ACCURACY

Reference conditions	Calibration temperature $(23 \pm 5) \text{ }^\circ\text{C}$ [73.4 ± 9] $^\circ\text{F}$
----------------------	---

Resistance Thermometer (RTD)

TYPE	MEASUREMENT ACCURACY - DIGITAL	MEASUREMENT ACCURACY - D/A ^[1]
Cu100, Pt100, Ni100, Ni120	$\pm 0.2 \text{ }^\circ\text{C}$ [0.36 $^\circ\text{F}$]	$\pm 0.02\%$
Pt500	$\pm 0.6 \text{ }^\circ\text{C}$ [1.08 $^\circ\text{F}$]	$\pm 0.02\%$
Cu50, Pt50, Pt1000, Ni1000	$\pm 0.4 \text{ }^\circ\text{C}$ [0.72 $^\circ\text{F}$]	$\pm 0.02\%$
Cu10, Pt200	$\pm 2 \text{ }^\circ\text{C}$ [3.6 $^\circ\text{F}$]	$\pm 0.02\%$

Thermocouple (TC)

TYPE	MEASUREMENT ACCURACY - DIGITAL	MEASUREMENT ACCURACY - D/A ^[1]
K, J, T, E, L, U	Typical $\pm 0.5 \text{ }^\circ\text{C}$ [0.9 $^\circ\text{F}$]	$\pm 0.02\%$
N, C, D	Typical $\pm 1 \text{ }^\circ\text{C}$ [0.18 $^\circ\text{F}$]	$\pm 0.02\%$
S, B, R	Typical $\pm 2 \text{ }^\circ\text{C}$ [3.6 $^\circ\text{F}$]	$\pm 0.02\%$

Resistance (Ω)

TYPE	MEASUREMENT ACCURACY - DIGITAL	MEASUREMENT ACCURACY - D/A ^[1]	MEASUREMENT RANGE
Resistance	$\pm 0.08 \text{ } \Omega$	$\pm 0.02\%$	(10 to 400) Ω
	$\pm 1.6 \text{ } \Omega$	$\pm 0.02\%$	(10 to 2000) Ω

Voltage (mV)

TYPE	MEASUREMENT ACCURACY - DIGITAL	MEASUREMENT ACCURACY - D/A ^[1]	MEASUREMENT RANGE
Voltage	$\pm 20 \text{ } \mu\text{V}$	$\pm 0.02\%$	(20 to 100) mV

[1] % relates to the set span. Accuracy = digital + D/A accuracy

HART® is a registered trademark of HART Communication Foundation



© 2006 Pyromation, Inc.

ACCURACY (continued)

Physical input range of the sensors

TYPE	MEASUREMENT ACCURACY ^[1]
(10 to 400) Ω	Cu10, Cu50, Cu100, polynomial RTD, Pt50, Pt100, Ni100, Ni120
(10 to 2000) Ω	Pt200, Pt500, Pt1000, Ni1000
(-20 to 100) mV	Thermocouple type: C, D, E, J, K, L, N
(-5 to 30) mV	Thermocouple type: B, R, S, T, U

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

General

Repeatability	0.03% of the physical input range (15 Bit) Resolution A/D conversion: 18 Bit
Load influence	≤ ± 0.005%/V deviation from 24 V, related to the full-scale value
Long term stability	≤ 0.1 °C [0.18 °F] / year or ≤ 0.05%/year Date under reference conditions. % relates to the set span. The larger value applies.

Temperature Drift

Total temperature drift = input temperature drift + output temperature drift	Effect on the accuracy when ambient temperature changes by 1 °C [1.8 °F]	
	Input (10 to 400) Ω	0.002% of measured value
	Input (10 to 2000) Ω	0.002% of measured value
	Input (-20 to 100) mV	typ. 0.002% of measured value (maximum value = 1.5 x typical)
	Input (5 to 30) mV	typ. 0.002% of measured value (maximum value = 1.5 x typical)
	Output (4 to 20) mA	typ. 0.002% of measured value (maximum value = 1.5 x typical)

INSTALLATION CONDITIONS

Ambient Conditions

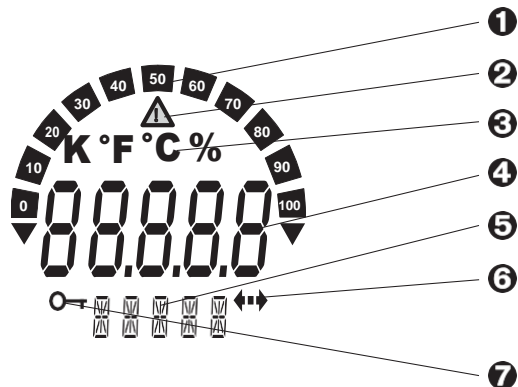
Ambient temperature	Without display: (-40 to 85) °C [-40 to 185] °F With display: (-40 to 70) °C [-40 to 158] °F NOTE: The display can react slowly for temperature < -20 °C [< -4 °F]
Storage temperature	Without display: (-40 to 100) °C [-40 to 212] °F With display: (-40 to 85) °C [-40 to 185] °F
Allowable Altitude	6500 ft. above sea level
Climatic class	As per EN 60 654-1, Class C
Moisture condensation	Allowable
Shock and vibration protection	3 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) (0.08 to 2) GHz 10 V/m; (1.4 to 2) GHz 30 V/m to EN 61 000-4-3
Protection	IP67, NEMA 4X, Class 1, Division 1, Group A, B, C; Class II Division I, Groups E, F, G and Class III, Division I (when specified)

HART® is a registered trademark of HART Communication Foundation



INTERFACE

Display Elements



LC display of the field transmitter
(illuminated, can be rotated in 90° increments)

- Item 1: Bar graph display in 10% increments with indicators for overranging / underranging
- Item 2: 'Caution' display
- Item 3: Unit display K, °F, or °C or %
- Item 4: Measured value display (digit height 20.5 mm / 0.81 ")
- Item 5: Status and information display
- Item 6: 'Communication' display
- Item 7: 'Programming disabled' display

Operating Elements

No operating elements are present directly on the display. The device parameters of the field transmitter are configured using the handheld communicator or a PC with HART® Modem and operating software TransComm

Remote Operation

Interface	HART® communication via transmitter power supply
Configurable device parameters	Sensor type and connection type, engineering units (°C/°F), measurement ranges, internal/external cold junction compensation of wire resistance with 2-wire connection, failure mode, output signal (4 to 20) mA (20 to 4) mA, digital filter (damping), offset, TAG+descriptor (8+16 characters), output simulation, customized linearization, recording of min./max process value, analog output: Option: customized linearization

STANDARDS

Approvals

CE marked	Unit complies with the legal requirements set forth by the EU regulations.
FM APPROVED and SP	Intrinsically safe and non-incendive or explosion proof for hazardous locations Class I, Division 1 and 2, Groups A, B, C and D
Other standards and guidelines	IEC 60 529: Degrees of protection through housing (IP code) IEC 61 010: Protection measures for electrical equipment for measurement, control, regulation and laboratory procedures IEC1326: Electromagnetic compatibility (EMC requirements)

HART® is a registered trademark of HART Communication Foundation

MECHANICAL CONSTRUCTION

Dimensions		DIMENSIONS IN INCHES [mm]		
	Display rotatable in 90° increments			
Weight	approximately 1.6 kg [3.53 lb]			
Materials	Housing: die-cast aluminum with powder coating			
Terminals	Cables / wires up to max. 2.5 mm ² (AWG 13)			

Terminal Connections

		HART® Communication on (4 to 20) mA	
Sensor TC 	2-wire Ω 	3-wire Ω 	4-wire Ω

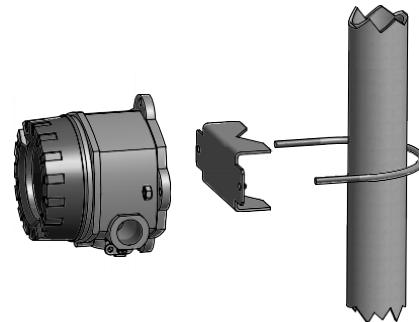
Optional Mounting Bracket

Part Number: 10321

Designed for use on pipes with a diameter between 1.5" to 3.3".

The additional mounting plate must be used for pipes with a diameter of 1.5" to 2.2". No plate is required for pipes with a diameter of 2.2" to 3.3".

Assembly includes bracket, screws, and mounting plate.



HART® is a registered trademark of HART Communication Foundation