

The Series 642 programmable HART® field temperature transmitter is a 2-wire transmitter with analog output. It includes input for RTDs and resistance 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 as a bar graph with limit value violation indicator.

PROGRAMMABLE FIELD TEMPERATURE TRANSMITTER

Programmable temperature transmitter for resistance thermometers (RTD), thermocouples, resistance inputs and voltage inputs, adjustable via HART® 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



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 43 710		

Voltage (mV)

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

Hart® is a registered trademark of Hart Communication Foundation



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	0.2 $^\circ\text{C}$ [0.36 $^\circ\text{F}$]	0.02%
Pt500	0.6 $^\circ\text{C}$ [1.08 $^\circ\text{F}$]	0.02%
Cu50, Pt50, Pt1000, Ni1000	0.4 $^\circ\text{C}$ [0.72 $^\circ\text{F}$]	0.02%
Cu10, Pt200	2 $^\circ\text{C}$ [3.6 $^\circ\text{F}$]	0.02%

Thermocouple (TC)

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

Resistance (Ω)

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

Voltage (mV)

TYPE	MEASUREMENT ACCURACY - DIGITAL	MEASUREMENT ACCURACY - D/A ^[1]	MEASUREMENT RANGE
Voltage	$\pm 20 \mu\text{V}$	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 Light.

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 IEC	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 RTD 	3-wire Ω RTD 	4-wire Ω RTD

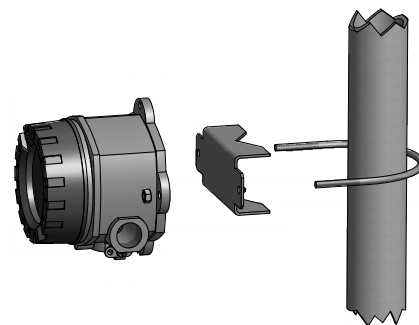
Optional Mounting Bracket

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

