Space-saving Two-wire Signal Conditioners *B3-UNIT*

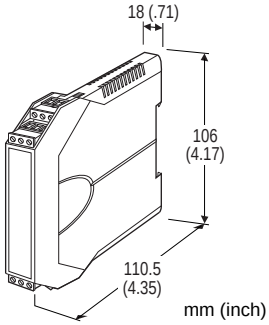
2-WIRE UNIVERSAL TEMPERATURE TRANSMITTER
(HART communication, intrinsically safe)

MODEL **B3HU**

MODEL & SUFFIX CODE SELECTION

B3HU–❑

MODEL
OUTPUT
4 – 20mA DC
SUPPLY VOLTAGE
12 – 42V DC
SAFETY APPROVAL
0 : None
1 : FM intrinsically safe (pending)
2 : CENELEC intrinsically safe (ATEX)



Functions & Features
- Universal input: mV, V, T/C, RTD, resistance and potentiometer
- High accuracy
- HART communication
- Intrinsically safe approval
- CE marking (conforms to ATEX and EMC)
- Programming via hand-held communicator or via PC
- A wide variety of T/C and RTD types
- User's temperature table can be used
- Self diagnostics

ORDERING INFORMATION

Specify code number (e.g. B3HU-0).
Use Ordering Information Sheet (No. ESU-7502). Default setting will be used if not otherwise specified. Specify the country in which the product is to be used with the Safety Approval code 2.

PACKAGE INCLUDES....

- PC configurator software CD (model: B3HUCON)
  (OS: Windows 98SE, 2000, NT4.0 or Windows XP pro)

RELATED PRODUCTS

- Bell202 modem, EIA232C (model: COP-H)
- Bell 202 modem, USB (model: COP-HU)
- Hand-held communicator*
- AMS (version 6.0 or higher)
- Simatic PDM (version 6.0 or higher)

*Consult HART Communication Foundation (HCF) web site: www.hartcomm.org.

GENERAL SPECIFICATIONS

Connection: Removable terminal block
Housing material: Flame-resistant resin (grey)
Isolation: Input to output
User-configurable items:
- Input sensor type
- Number of wires (RTD & resistance)
- Input range
- Sensor calibration
- Output calibration
- Linearization data
- HART communication mode (burst mode selectable)
- HART network mode (point-to-point or multidrop)

Inverted output: User-selectable (default: no inversion)
Burnout (T/C & RTD)**: Upscale, downscale or no burnout selectable (default: upscale)
Linearization: Standard feature
Cold junction compensation (T/C): CJC sensor incorporated
Damping time: 0 to 30 sec. (default: 0)
**Includes overrange inputs out of the electrically selectable range for DC input.

HART COMMUNICATION

Protocol: HART communication protocols
HART address range: 0 – 15 (default: 0)
Transmission speed: 1200 bps
Digital current: Approx. 1mA p-p when communicating
Character format: 1 Start Bit, 8 Data Bits, 1 Odd Parity Bit, 1 Stop Bit
Distance: 1.5 kilometers (0.9 mile)
HART communication mode: Master-Slave Mode and Burst Mode (default: Master-Slave)

INPUT

The input is factory set for use with K thermocouple, 0 to 100°C.
See Table 1 for the available input type, the minimum span and the maximum range.

■DC mV & V
Input resistance: 1MΩ minimum

■THERMOCOUPLE
Input resistance: 1MΩ minimum
Burnout sensing: 130nA ±10%

■RTD (2-wire, 3-wire or 4-wire)
Input resistance: 1MΩ minimum
Excitation: See Table 1.
Allowable leadwire resistance: Max. 20Ω per wire

■POTENTIOMETER
Excitation: 0.2mA ±10%
Allowable leadwire resistance: Max. 20Ω per wire

■RESISTANCE (2-wire, 3-wire or 4-wire)
Excitation: 0.2mA ±10%
Allowable leadwire resistance: Max. 20Ω per wire

OUTPUT

Default output range set to: 4 – 20mA DC
Zero adjustment: 3.8 – 7.2mA (default: 4mA)
Span adjustment: 12.8 – 17.6mA (default: 16mA)
Operational range: 3.8 – 21.6mA
Load resistance vs. supply voltage:

$$\text{Load Resistance } (\Omega) = \frac{\text{Supply Voltage (V)} - 12\text{ (V)}}{0.024\text{ (A)}}$$

(including leadwire resistance)

INSTALLATION

Supply voltage: 12 – 42V DC (non-approved)
12 – 28V DC (approved)
Operating temperature: -40 to +85°C (-40 to +185°F)
(See Safety Parameters for use in a hazardous location.)
Operating humidity: 0 to 95% RH (non-condensing)
Mounting: DIN rail
Dimensions: W18×H106×D110.5 mm (0.71"×4.17"×4.35")
Weight: 80 g (2.8 oz)

PERFORMANCE

Accuracy: See Table 1.
Cold junction compensation error: ±0.5°C (±0.9°F) maximum
Temp. coefficient (of max. range at -5 to +55°C): ±0.015%/°C (±0.008%/°F)
Start-up time: Approx. 8 seconds
Response time: ≤2 seconds (0 – 90%) with damping time set to 0 and when not communicating via HART.
Supply voltage effect: ±0.003% × [Output Span] / 1V
Insulation resistance: ≥100MΩ with 500V DC (input to output)
Dielectric strength: 1500V AC @1 minute (input to output)

STANDARDS & APPROVAL

CE conformity: ATEX Directive (94/9/EC)
EEx ia EN50020
EMC Directive (89/336/EEC)
EMI EN61000-6-4
EMS EN61000-6-2
Safety approval
CENELEC: Intrinsically safe (ATEX)
Ⓔx II 1G, EEx ia IIC; T4 and T5 (EN50020 - 2002)

SAFETY PARAMETERS

Operating temperature for CENELEC (ATEX):
T4 -40 to +80°C
T5 -40 to +55°C

Ex-data:	Ui	30V DC	Uo	6.4V DC
	Ii	96mA DC	Io	30mA DC
	Pi	0.72W	Po	48mW
	Ci	1 nF	Co	20 μF
	Li	0 mH	Lo	10 mH

INPUT TYPE, RANGE & ACCURACY — TABLE 1

INPUT TYPE	MIN. SPAN	MAXIMUM RANGE	ACCURACY
DC mV & V	4mV	-50 to +1000mV	±0.1% or ±10μV, whichever is greater (F.S. input ≤50mV)
			±0.1% or ±40μV, whichever is greater (F.S. input ≤200mV)
			±0.1% or ±60μV, whichever is greater (F.S. input ≤500mV)
			±0.1% or ±80μV, whichever is greater (F.S. input >500mV)
Potentiometer	80Ω	0 to 4000Ω	±0.1%
Resistance	10Ω	0 to 4000Ω	±0.1% or ±0.1Ω, whichever is greater.*2

Thermocouple	°C				°F			
	MIN. SPAN	MAXIMUM RANGE	CONFORMANCE RANGE	ACCURACY *1	MIN. SPAN	MAXIMUM RANGE	CONFORMANCE RANGE	ACCURACY *1
(PR)	20	0 to 1760	0 to 1760	±1.00	36	32 to 3200	32 to 3200	±1.80
K (CA)	20	-270 to +1370	-150 to +1370	±0.25	36	-454 to +2498	-238 to +2498	±0.45
E (CRC)	20	-270 to +1000	-170 to +1000	±0.20	36	-454 to +1832	-274 to +1832	±0.36
J (IC)	20	-210 to +1200	-180 to +1200	±0.25	36	-346 to +2192	-292 to +2192	±0.45
T (CC)	20	-270 to +400	-170 to +400	±0.25	36	-454 to +752	-274 to +752	±0.45
B (RH)	20	100 to 1820	400 to 1760	±0.75	36	212 to 3308	752 to 3200	±1.35
R	20	-50 to +1760	200 to 1760	±0.50	36	-58 to 3200	392 to 3200	±0.90
S	20	-50 to +1760	0 to 1760	±0.50	36	-58 to +3200	32 to 3200	±0.90
C (WRe 5-26)	20	0 to 2315	0 to 2315	±0.25	36	32 to 4199	32 to 4199	±0.45
N	20	-270 to +1300	-130 to +1300	±0.30	36	-454 to +2372	-202 to +2372	±0.54
U	20	-200 to +600	-200 to +600	±0.20	36	-328 to +1112	-328 to +1112	±0.36
L	20	-200 to +900	-200 to +900	±0.25	36	-328 to +1652	-328 to +1652	±0.45
P (Platinel II)	20	0 to 1395	0 to 1395	±0.25	36	32 to 2543	32 to 2543	±0.45

RTD	EXCITA-TION	°C			°F		
		MIN. SPAN	MAXIMUM RANGE	ACCURACY *2	MIN. SPAN	MAXIMUM RANGE	ACCURACY *2
Pt 100 (JIS '97/IEC)	0.2mA	20	-200 to +850	±0.15	36	-328 to +1562	±0.27
Pt 200	0.2mA	20	-200 to +850	±0.15	36	-328 to +1562	±0.27
Pt 300	0.2mA	20	-200 to +850	±0.15	36	-328 to +1562	±0.27
Pt 400	0.2mA	20	-200 to +850	±0.15	36	-328 to +1562	±0.27
Pt 500	0.2mA	20	-200 to +850	±0.15	36	-328 to +1562	±0.27
Pt 1000	0.2mA	20	-200 to +850	±0.15	36	-328 to +1562	±0.27
Pt 50 (JIS '81)	0.2mA	20	-200 to +649	±0.15	36	-328 to +1200	±0.27
JPt 100 (JIS '89)	0.2mA	20	-200 to +510	±0.15	36	-328 to +950	±0.27
Ni 100	0.2mA	20	-80 to +260	±0.15	36	-112 to +500	±0.27
Ni 120	0.2mA	20	-80 to +260	±0.15	36	-112 to +500	±0.27
Ni 508.4	0.2mA	20	-50 to +200	±0.15	36	-58 to +392	±0.27
Ni-Fe 604	0.2mA	20	-200 to +200	±0.15	36	-328 to +392	±0.27
Cu 10 (25°C)	0.2mA	20	-50 to +250	±0.50	36	-58 to +482	±0.90

*1. [Accuracy + Cold Junction Compensation Error] or ±0.1% of span, whichever is greater.

*2. Or ±0.1% of span, whichever is greater.
(For 2- or 3-wire RTD, the value is valid by the sensor calibration after the wiring is done.)

EXPLANATION OF TERMS

■ACCURACY

This transmitter's accuracy is theoretically defined as the addition of A/D and D/A conversion errors:

Accuracy
= A/D Conversion Error + D/A Conversion Error

The A/D conversion error means that measured as HART signal which is A/D converted from the analog input signal.

The D/A conversion error of this transmitter is relatively very small so that it does not really affect the unit's overall performance.

The "Accuracies" given in Table 1 therefore equals the A/D conversion error.

The temperature drift (coefficient) or the cold junction compensation error is not included in the "Accuracy."

■CALCULATION EXAMPLES OF OVERALL ACCURACY IN %

•DC Voltage

1) 0 – 200mV
   Absolute value accuracy (Table 1): 40μV
   40μV / 200000μV × 100 = 0.02 % < 0.1%
   ➠ Overall accucracy = ±0.1% of span
2) 0 – 4mV
   Absolute value accuracy (Table 1): 10μV
   10μV / 4000μV × 100 = 0.25 % > 0.1%
   ➠ Overall accucracy = ±0.25% of span

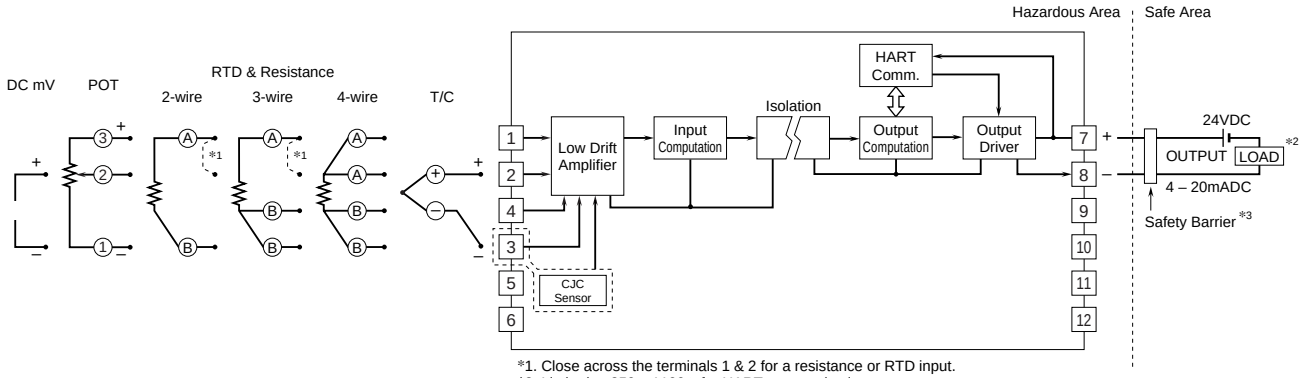
•Thermocouple

1) K thermocouple, 0 – 1000°C
   Absolute value accuracy (Table 1): 0.25°C
   CJC error (0.5°C) added: 0.75°C
   0.75°C / 1000°C × 100 = 0.075 % < 0.1%
   ➠ Overall accucracy including CJC error
   = ±0.1% of span
2) K thermocouple, 50 – 150°C
   Absolute value accuracy (Table 1): 0.25°C
   CJC error (0.5°C) added: 0.75°C
   0.75°C / (150 – 50)°C × 100 = 0.75 % > 0.1%
   ➠ Overall accucracy including CJC error
   = ±0.75% of span

•RTD

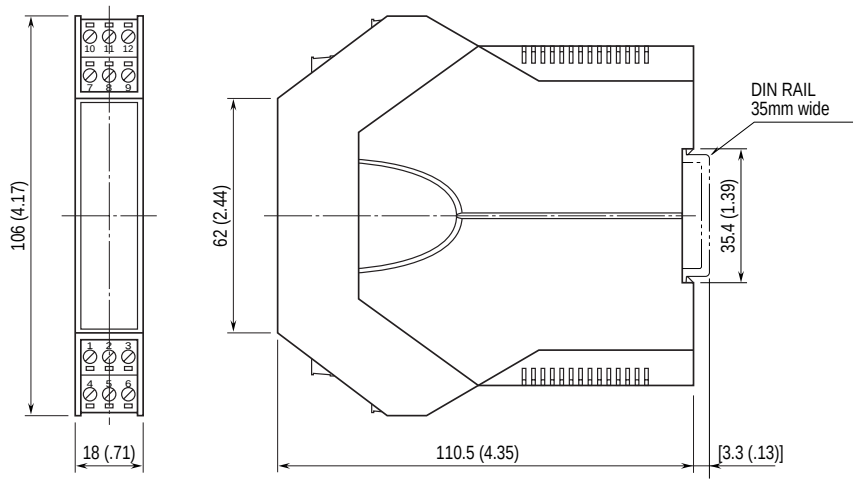
1) Pt 100, -200 – 800°C
   Absolute value accuracy (Table 1): 0.15°C
   0.15°C / (800 – -200)°C × 100 = 0.015 % < 0.1%
   ➠ Overall accucracy = ±0.1% of span
2) Pt 100, 0 – 100°C
   Absolute value accuracy (Table 1): 0.15°C
   0.15°C / 100°C × 100 = 0.15 % > 0.1%
   ➠ Overall accucracy = ±0.15% of span

SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM



*1. Close across the terminals 1 & 2 for a resistance or RTD input.
*2. Limited to 250 – 1100Ω for HART communication.
*3. A safety barrier must be installed for the intrinsic safety.
The safety barrier must meet the Ex-data of this unit and must be approved for the hazardous location.

EXTERNAL DIMENSIONS mm (inch)



•When mounting, no extra space is needed between units.