M.M.SYSTEM CO., LTD.

Space-saving Two-wire Signal Conditioners B3-UNIT 2-WIRE UNIVERSAL TEMPERATURE TRANSMITTER MODEL **B3HU** (HART communication, intrinsically safe) **MODEL & SUFFIX CODE SELECTION** 18 (.71) B3HU-D MODEL -106 (4.17)SAFETY APPROVAL **0** : None 1 : FM intrinsically safe 2 : CENELEC intrinsically safe (ATEX) 110 5 (4.35)mm (inch) **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

ORDERING INFORMATION

Specify code number (e.g. B3HU-0).

Use Ordering Information Sheet (No. ESU-7502). Factory standard 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, NT4.0, 2000 and XP Pro)

RELATED PRODUCTS

- RS-232C interface Bell202 modem (model: COP-H)*
- USB interface Bell202 modem (model: COP-HU)*
- Hand-held communicator**
- AMS (version 6.0 or higher)
- Simatic PDM (version 6.0 or higher)
- *Usable in 'non-hazardous' area only.

**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 parameters:

• User's temperature table can be used

· Input sensor type

Self diagnostics

- · Number of wires (RTD & resistance)
- · Input range
- \cdot Sensor calibration
- \cdot Output calibration
- · Linearization data
- \cdot HART communication mode
- (burst mode selectable)
- \cdot 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 protocol

 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: $1M\Omega \min$ Burnout sensing: $130nA \pm 10\%$

■ RTD (2-wire, 3-wire or 4-wire) Input resistance: 1MΩ minimum Excitation: 0.2mA ±10% Allowable leadwire resistance: Max. 20Ω per wire

■ POTENTIOMETER

Excitation: $0.2\text{mA} \pm 10\%$ **Allowable leadwire resistance**: Max. 20 Ω 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: Supply Voltage (V) – 12 (V)

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

STANDARDS & APPROVALS

CE conformity: ATEX Directive (94/9/EC) Ex ia EN 50020 EMC Directive (2004/108/EC) EMI EN 61000-6-4 EMS EN 61000-6-2

Safety approval FM: Intrinsically safe

Class I, Div. 1, Groups A, B, C and D Class I, Zone 0, AEx ia IIC T4 and T5 (Class 3610) CENELEC: Intrinsically safe (ATEX) (a) II 1G, Ex ia IIC; T4 and T5 (EN 50020 : 2002)

SAFETY PARAMETERS

Operating temperature for CENELEC (ATEX)/ FM:

	T4 -40 to T5 -40 to	+80°C +55°C		
Ex-data:	Ui (Vmax)	30V DC	Uo (Voc)	$6.4 \mathrm{V}\mathrm{DC}$
	Ii (Imax)	96mA DC	Io (Isc)	30mA DC
	Pi (Pmax)	0.72W	Po	48mW
	Ci	1 nF	$Co\left(Ca ight)$	20 µF
	Li	$0 \mathrm{mH}$	Lo (La)	$10 \mathrm{mH}$

INPUT TYPE, RANGE & ACCURACY

■ INPUT TYPE, RANGE & ACCURACY										
INPUT TYPE	MIN. SPAN	MAXIMUM RANGE	ACCURACY	ACCURACY						
DC mV & V	4mV	-50 to +1000mV	aV ±0.1% or ±10µV, whichever is greater (F.S. input ≤50mV)							
			±0.1% or ±40µV, whichever is greater (F.S. input ≤200mV)							
			r is great	is greater (F.S. input ≤500mV)						
		$\pm 0.1\%$ or $\pm 80\mu$ V, whichever is greater (F.S. input >500mV)								
Potentiometer	80Ω	0 to 4000Ω	±0.1%							
Resistance	10Ω	0 to 4000Ω	$\pm 0.1\%$ or $\pm 0.1\Omega$, 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		
Ν	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		°C			°F					
	MIN. SPAN	MAXIMUI	M RANGE	$\mathop{\rm ACCURACY}_{*2}$	MIN. SPAN	MAXIMU	M RANGE	ACCURACY		
Pt 100 (JIS '97, IEC)	20	-200 to +850		±0.15	36	-328 to +1562		±0.27		
Pt 200	20	-200 to +850		±0.15	36	-328 to +1562		±0.27		
Pt 300	20	-200 to +850		±0.15	36	-328 to +1562		±0.27		
Pt 400	20	-200 to +850		±0.15	36	-328 to +1562		±0.27		
Pt 500	20	-200 to +850		±0.15	36	-328 to +1562		±0.27		
Pt 1000	20	-200 to +850		±0.15	36	-328 to +1562		±0.27		
Pt 50 (JIS '81)	20	-200 to +649		±0.15	36	-328 to +1200		±0.27		
JPt 100 (JIS '89)	20	-200 to +510		±0.15	36	-328 to +950		±0.27		
Ni 100	20	-80 to +260		±0.15	36	-112 to +500		±0.27		
Ni 120	20	-80 t	-80 to +260		36	-112 to	+500	±0.27		
Ni 508.4	20	-50 t	-50 to +200		36	-58 to	+392	±0.27		
Ni-Fe 604	20	-200 to +200		±0.15	36	-328 to	+392	±0.27		
Cu 10 @25°C	20	-50 to +250		±0.50	36	-58 to	o +482	±0.90		

*1. [Accuracy + Cold Junction Compensation Error] or $\pm 0.1\%$ of span, whichever is greater. *2. Or $\pm 0.1\%$ of span, whichever is greater.

(For 2- or 3-wire RTD, the value is valid by the sensor calibration after the wiring is done.)

EXPLANATIONS 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 - 200 mV

Absolute value accuracy (Table 1): 40µV $40\mu V$ / $200000\mu V \times 100$ = 0.02 % < 0.1% ➡ Overall accuracy = ±0.1% of span

2) 0 - 4mV

Absolute value accuracy (Table 1): 10µV

 $10 \mu V \,/\, 4000 \mu V \times 100$ = 0.25 % > 0.1%

• Overall accuracy = $\pm 0.25\%$ 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 $0.75^{\circ}C / 1000^{\circ}C \times 100 = 0.075 \% < 0.1\%$ Overall accuracy 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 $0.75^{\circ}C/(150-50)^{\circ}C \times 100 = 0.75 \% > 0.1\%$ ➡ Overall accuracy including CJC error = ±0.75% of span

• RTD

- 1) Pt 100, -200 800°C Absolute value accuracy (Table 1): 0.15°C
 - $0.15^{\circ}C / (800 -200)^{\circ}C \times 100 = 0.015 \% < 0.1\%$ \blacksquare Overall accuracy = $\pm 0.1\%$ of span
- 2) Pt 100, 0 100°C Absolute value accuracy (Table 1): 0.15°C $0.15^{\circ}{\rm C} \: / \: 100^{\circ}{\rm C} \times 100 = 0.15 \: \% > 0.1\%$ ➡ Overall accuracy = ±0.15% of span

SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM



EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm (inch)



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

M.M.SYSTEM CO., LTD.