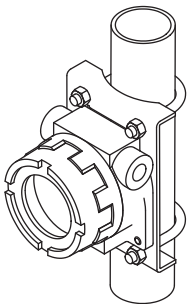


**Field-mounted Two-wire Signal Conditioners  
B6-UNIT**

**2-WIRE UNIVERSAL TEMPERATURE TRANSMITTER**  
(HART communication, intrinsically safe/explosion-proof)

**Functions & Features**

- Universal input: mV, V, T/C, RTD, resistance and potentiometer
- High accuracy
- HART communication
- Intrinsically safe and explosion-proof approval
- Optional stainless steel enclosure
- 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
- Input-output isolated



**MODEL: B6U-B-[1][2][3][4][5]**

**ORDERING INFORMATION**

Specify code number: B6U-B-[1][2][3][4][5]

Specify a code from below for each [1] through [5].  
(e.g. B6U-B-4121).

Use Ordering Information Sheet (No. ESU-7451). 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 or 4.

**[1] SAFETY APPROVAL**

- 0: None
  - 1: FM intrinsically safe
  - 2: IECEx/ATEX intrinsic safety
  - 3: FM explosion-proof
  - 4: IECEx/ATEX flameproof
  - 5: FM nonincendive
  - 7: TIIS intrinsic safety (CE not available)
  - 8: TIIS flameproof (CE not available)
- Confirm selectable combinations of approval and wiring

conduit types in the table.

**[2] LCD DISPLAY**

- 0: Without
- 1: With

**[3] WIRING CONDUIT**

- 0: G 1/2
- 1: 1/2 NPT
- 2: M20 × 1.5
- 3: PG 13.5

Confirm selectable combinations of approval and wiring conduit types in the table.

**[4] MOUNTING BRACKET**

- 0: Without
- 1: With

**[5] OPTIONS**

**Enclosure Materials**

- Blank:** Diecast aluminium enclosure
- /S:** Stainless steel enclosure  
(TIIS flameproof approval not selectable)

**SELECTABLE WIRING CONDUITS SPECIFIC TO EACH APPROVAL**  
'N' marked combinations are not selectable.

WIRING CONDUIT \ APPROVAL	0	1	2	3	4	5	7	8
0	Y	N	Y	N	N	N	Y	Y
1	Y	Y	Y	Y	Y	Y	Y	N
2	Y	Y	Y	N	Y	Y	Y	N
3	Y	N	Y	N	N	N	Y	N

**RELATED PRODUCTS**

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

**PACKAGE INCLUDES...**

- PC configurator software CD (model: B6UCON)  
(OS: Windows 98SE, NT4.0, 2000 and XP Pro)



## GENERAL SPECIFICATIONS

**Degree of protection:** NEMA 4X, IP66/IP67  
**Wiring conduit:** See 'Ordering information.'  
**Cable gland:** Two provided for TIS flameproof type  
**Model No.:** BX-E-SXY  
**Cable entries:** Elastomeric sealing rings  
**Wiring conduit size:** G 1/2  
**Material:** Chrome-plated brass (entry)  
 CR (sealing ring)  
**Applicable wire size:** 8 - 12 dia.  
**Electrical connection:** M3.5 screw terminals (torque 0.8 N·m)  
**Materials**  
**Transmitter housing:** Flame-resistant resin (black)  
**Screw terminals:** Nickel-plated brass  
**Enclosure:** Diecast aluminium standard; stainless steel casting optional (equivalent to type 316); silver color, epoxy resin coated  
**Mounting bracket assembly:** Stainless steel 304  
**Applicable pipe:** 1 1/2" min.; 2" max.  
**Isolation:** Input to output to outdoor enclosure  
**Burnout (T/C & RTD):** Upscale, downscale or no burnout selectable (standard: upscale); Also detects wire breakdown and overrange input exceeding the electrical design limit for DC input.  
**Cold Junction Compensation (thermocouple input):** CJC sensor incorporated  
**User-configurable items:**

- Input sensor type
- Number of wires (RTD & resistance)
- Input range
- Inverted output
- Burnout
- Damping time (via HART only, standard: 0)
- Sensor calibration (via HART only)
- Output calibration
- Special linearization data (via HART only)
- HART communication mode

## HART COMMUNICATION

**Protocol:** HART communication protocol  
**HART address range:** 0 - 15 (factory set to 0)  
**Transmission speed:** 1200 bps  
**Digital current:** Approx. 1 mA<sub>p-p</sub> when communicating  
**Character format:** 1 Start Bit, 8 Data Bits, 1 Odd Parity Bit, 1 Stop Bit  
**Distance:** 1.5 km (0.9 miles)  
**HART communication mode:** Master-Slave Mode and Burst Mode (factory set to Master-Slave)  
**HART network mode:** Point-to-Point Mode and Multi-drop Mode; automatically set to Multi-drop Mode when the address is set to other than 0.

## LCD DISPLAY (option)

**Features:**

- Indicates and sets input signal, engineering unit and transmitter status.
- Removable while the module is powered.

**Display size:** 36 × 20 mm (1.41" × 0.79")  
**Characters**  
**Color:** Black  
**Format:** 2 rows of 5 alphanumeric characters;  
 Top: 7.4 mm high  
 Bottom: 6.5 mm high  
 6 status characters, 1.9 mm high  
**Display range:** -99999 to 99999  
**Decimal point:** In top row  
**Read rate:** 150 msec.  
**Back light:** None

## INPUT SPECIFICATIONS

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:** ≥ 1 MΩ

■ **Thermocouple**  
**Input resistance:** ≥ 1 MΩ  
**Burnout sensing:** 130 nA ±10 %

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

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

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

## OUTPUT SPECIFICATIONS

**Output range:** 4 - 20 mA DC  
**Operational range:** 3.8 - 21.6 mA  
**Load resistance vs. supply voltage:**  
 Load Resistance (Ω) = (Supply Voltage (V) - 12 (V)) ÷ 0.024 (A) (including leadwire resistance)



## INSTALLATION

### Supply voltage

- 12 - 42 V DC (non-approved)
- 12 - 28 V DC (approved)

**Operating temperature:** -40 to +85°C (-40 to 185°F)

Electronics

(See Safety Parameters for use in a hazardous location.)

-30 to +80°C (-22 to 185°F) Display (full visibility)

**Weight:** Approx. 1.3 kg (2.9 lb), aluminium

Approx. 4.0 kg (8.8 lb), stainless steel

Approx. 2.0 kg (4.4 lb), TIS flameproof

## PERFORMANCE

**Accuracy:** See Table 1 and 'Explanations of Terms.'

**Cold junction compensation error:** ±0.5°C or ±0.9°F

**Temp. coefficient:** ±0.015 %/°C (±0.008 %/°F) of max. span at -5 to +55°C [23 to 131°F]

**Start-up time:** Approx. 8 sec.

**Response time:** ≤ 2 sec. (0 - 90 %) with damping time set to 0 and when not communicating via HART.

**Supply voltage effect:** ±0.003 % × [Output Span] / 1 V

**Insulation resistance:** ≥ 100 MΩ with 500 V DC

**Dielectric strength:** 1500 V AC @1 minute

(input to output to outdoor enclosure)

## EXPLANATIONS OF TERMS

### ■ ACCURACY

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

$$\text{Accuracy} = \text{A/D Conversion Error} + \text{D/A Conversion Error}$$

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): 40 μV

$$40 \mu\text{V} \div 200000 \mu\text{V} \times 100 = 0.02 \% < 0.1 \%$$

⇒ Overall accuracy = ±0.1% of span

2) 0 - 4 mV

Absolute value accuracy (Table 1): 10 μV

$$10 \mu\text{V} \div 4000 \mu\text{V} \times 100 = 0.25 \% > 0.1\%$$

⇒ Overall accuracy = ±0.25 % of span

#### • Thermocouple

1) K thermocouple, 0 - 1000°C

Absolute value accuracy (Table 1): 0.25°C

$$0.1\% \times 1000^\circ\text{C} = 1^\circ\text{C} > 0.25^\circ\text{C}$$

CJC error (0.5°C) added: 1 + 0.5 = 1.5°C

$$1.5^\circ\text{C} \div 1000^\circ\text{C} \times 100 = 0.15 \%$$

⇒ Overall accuracy including CJC error = ±0.15 % of span

2) K thermocouple, 50 - 150°C

Absolute value accuracy (Table 1): 0.25°C

$$0.1\% \times (150 - 50)^\circ\text{C} = 0.1^\circ\text{C} < 0.25^\circ\text{C}$$

CJC error (0.5°C) added: 0.25 + 0.5 = 0.75°C

$$0.75^\circ\text{C} \div (150 - 50)^\circ\text{C} \times 100 = 0.75 \%$$

⇒ Overall accuracy including CJC error = ±0.75 % of span

#### • RTD

1) Pt 100, -200 - 800°C

Absolute value accuracy (Table 1): 0.15°C

$$0.15^\circ\text{C} \div (800 - -200)^\circ\text{C} \times 100 = 0.015 \% < 0.1 \%$$

⇒ Overall accuracy = ±0.1 % of span

2) Pt 100, 0 - 100°C

Absolute value accuracy (Table 1): 0.15°C

$$0.15^\circ\text{C} \div 100^\circ\text{C} \times 100 = 0.15 \% > 0.1 \%$$

⇒ Overall accuracy = ±0.15 % of span

## STANDARDS & APPROVALS

### CE conformity:

ATEX Directive (94/9/EC)

Ex ia EN 60079-11: 2007 (for ATEX intrinsic safety)

Cat. 1G EN 60079-26: 2007 (for ATEX intrinsic safety)

Ex d EN 60079-1: 2007 (for ATEX flameproof)

EMC Directive (2004/108/EC)

EMI EN 61000-6-4: 2007/A1: 2011

EMS EN 61000-6-2: 2005

### Safety approval:

FM: Intrinsically safe

Class I, Division 1, Groups A, B, C and D

Class II, Division 1, Groups E, F and G

Class III, Division 1

Class I, Zone 0, AEx ia IIC

T4, T5 and T6

(Class 3600: 1998)

(Class 3610: 2010)

(ANSI/ISA 60079-0: 2009)

(ANSI/ISA 60079-11: 2009)

FM: Explosion-proof and Dust-ignition proof

Class I, Division 1, Groups B, C and D

Class II, Division 1, Groups E, F and G

Class III, Division 1

T6

(Class 3600: 2011)

(Class 3615: 2006)



## FM: Nonincendive

Class I, Division 2, Groups A, B, C, and D

Class II, Division 2, Groups F and G

Class III, Division 1

Class I, Zone 2, Group IIC

T4, T5 and T6

(Class 3600: 1998)

(Class 3611: 1999)

## IECEX intrinsic safety

EX ia IIC T4, T5 and T6 Ga

(IEC 60079-0: 2007)

(IEC 60079-11: 2006)

(IEC 60079-26: 2006)

## IECEX flameproof

EX d IIC; T4, T5 and T6 Gb

(IEC 60079-0: 2011)

(IEC 60079-1: 2007)

## TIIS: Intrinsic safety

Ex ia IIC T5 X

## TIIS: Flameproof

Ex d IIC T5

## CENELEC: Intrinsic safety (ATEX)

⊕ II 1G, Ex ia IIC, T4, T5, Ga

(EN 60079-0: 2009)

(EN 60079-11: 2007)

(EN 60079-26: 2007)

## CENELEC: Flameproof (ATEX)

⊕ II 2G, Ex d IIC, T4, T5 and T6, Gb

(EN 60079-0: 2012)

(EN 60079-1: 2007)

## SAFETY PARAMETERS

### Operating temperature

#### For IECEX, ATEX and FM:

T4: -40 to +80°C

T5: -40 to +65°C

T6: -40 to +50°C (-40 to +80°C for FM explosion-proof)

#### For TIIS:

T5: -20 to +60°C

### Ex-data:

#### • Output circuit

Ui (Vmax): 30 V

Ii (Imax): 96 mA

Pi (Pmax): 720 mW

Ci: 0 μF (TIIS Intrinsic Safety: 'Negligible value')

Li: 0 mH (TIIS Intrinsic Safety: 'Negligible value')

#### • Sensor circuit

Uo (Voc): 6.4 V (TIIS Intrinsic Safety: 6.0 V)

Io (Isc): 30 mA

Po: 48 mW

Co (Ca): 20 μF

Lo (La): 10 mH



**INPUT TYPE, RANGE & ACCURACY**

■ INPUT TYPE, RANGE & ACCURACY

Table 1

INPUT TYPE	MIN. SPAN	MAXIMUM RANGE	ACCURACY					
DC mV & V	4 mV	-50 to 1000 mV	±0.1 % or ±10µV, whichever is greater (F.S. input 50 mV) ±0.1 % or ±40µV, whichever is greater (F.S. input 200 mV) ±0.1 % or ±60µV, whichever is greater (F.S. input 500 mV) ±0.1 % or ±80µV, whichever is greater (F.S. input >500 mV)					
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	°C			°F				
	MIN. SPAN	MAXIMUM RANGE		ACCURACY *2	MIN. SPAN	MAXIMUM RANGE		ACCURACY *2
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 Ω (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 to +260		±0.15	36	-112 to +500		±0.27
Ni 508.4 Ω	20	-50 to +200		±0.15	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 +482		±0.90

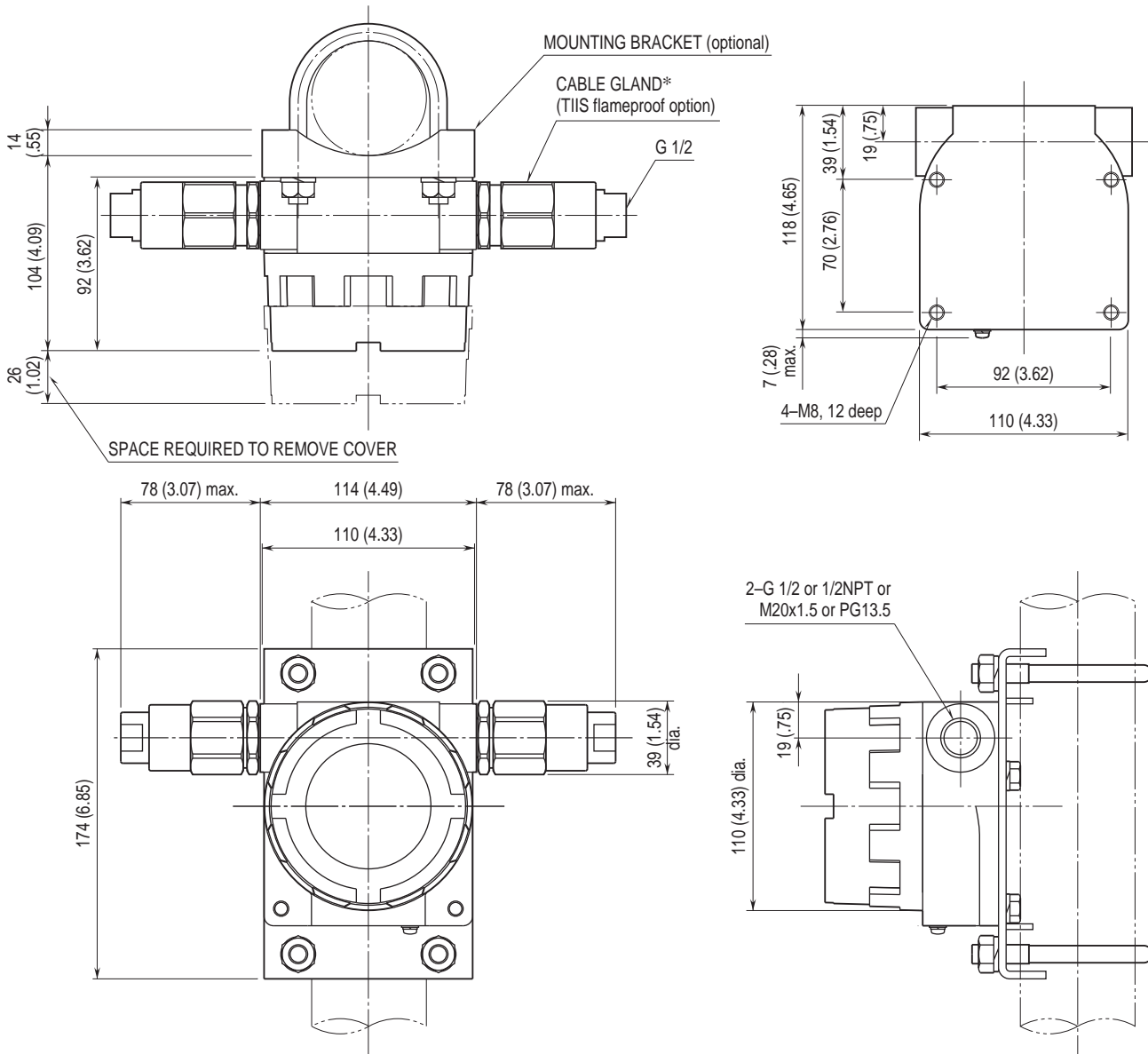
\*1. [Accuracy or ±0.1 % of span, whichever is greater] + Cold Junction Compensation Error

\*2. Or ±0.1% of span, whichever is greater.

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



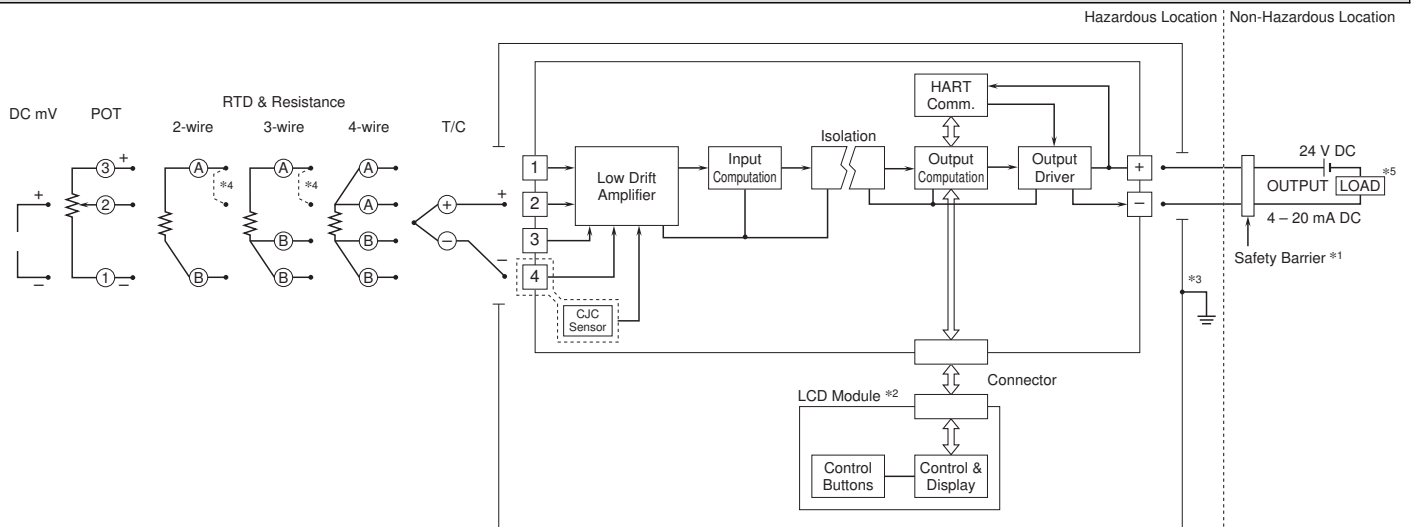
**DIMENSIONS unit: mm (inch)**



\*Two sets of cable gland are attached with TIIS flameproof option.



## SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM



- \*1. 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.
- \*2. Optional
- \*3. Be sure to earth the unit's enclosure to meet the intrinsically safe or explosion-proof (flameproof) requirements.
- \*4. Close across the terminals 1 & 2 for a resistance or RTD input.
- \*5. Limited to 250 – 1100 for HART communication.



Specifications are subject to change without notice.