

**Head-mounted Two-wire Signal Conditioners 27-UNIT**

**2-WIRE UNIVERSAL TEMPERATURE TRANSMITTER** MODEL **27HU-B**  
 (HART communication, outdoor enclosure, explosion-proof)

**MODEL & SUFFIX CODE SELECTION**

MODEL \_\_\_\_\_ 27HU-B-□□□□□□

**SAFETY APPROVAL\*1** \_\_\_\_\_

0 : None  
 3 : FM explosion-proof  
 4 : CENELEC flameproof (ATEX)  
 8 : TIIS flameproof \*2

**TEMPERATURE DRIFT** \_\_\_\_\_

0 : Standard  
 L : Ultra-low temperature drift

**LED INDICATOR** \_\_\_\_\_

0 : Without  
 1 : With

**TERMINAL BLOCK** \_\_\_\_\_

0 : None \*3  
 T : Incorporated \*4

**WIRING CONDUIT\*1** \_\_\_\_\_

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

**MOUNTING BRACKET** \_\_\_\_\_

0 : Without  
 1 : With

**OPTIONS** \_\_\_\_\_

/S : Stainless steel enclosure \*5

\*1 : Confirm selectable combinations of approval and wiring conduit types in the table below.  
 \*2 : CE not available  
 \*3 : For TIIS, selectable only with 'No indicator' option.  
 \*4 : Selectable only with the LED indicator option  
 \*5 : TIIS approval not selectable

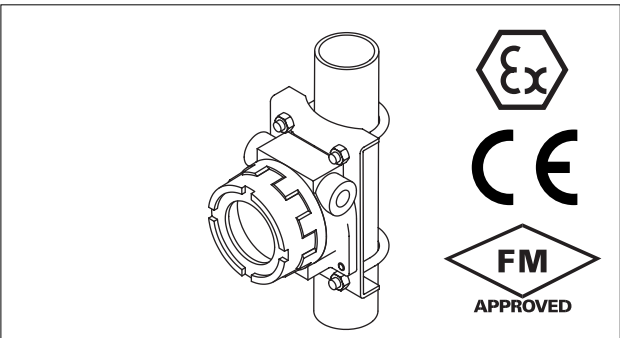
**SELECTABLE WIRING CONDUITS SPECIFIC TO EACH APPROVAL**  
 'N' marked combinations are not selectable.

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

**ORDERING INFORMATION**

Specify code number and suffix codes. Use Ordering Information Sheet (No. ESU-7652). 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 4.

• **Code number** (e.g. 27HU-B-0L1T01/S)



- Functions & Features**
- Universal input: mV, T/C, RTD and resistance
  - 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
  - Ultra-low temp. drift option (20 ppm/°C typ.)
  - Stainless steel enclosure optional

**RELATED PRODUCTS**

- RS-232C interface Bell202 modem (model: COP-H)\*
  - USB interface Bell202 modem (model: COP-HU)\*
  - Hand-held communicator
  - PC configurator software (model: 27HUCFG)  
 Downloadable at M-System's web site:  
<http://www.m-system.co.jp>
  - Cable gland (model: BX-E-SXY)
- \*Usable in 'non-hazardous' area only.

**GENERAL SPECIFICATIONS**

**Environmental protection:** NEMA 4X, IP65  
**Wiring conduit:** See 'Model & Suffix Code.'  
**Transmitter material & connection**  
**Housing:** Flame-resistant resin (black)  
**Electrical connection:** M3 screw terminals  
 (nickel-plated brass; torque 0.5 N·m)  
**Indicator material & connection**  
**Housing:** Flame-resistant resin (black)  
**Electrical connection:** Terminal block  
**Applicable wire size:** AWG26-16 (0.14 – 1.5 mm<sup>2</sup>)  
**Enclosure material:** 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

**User-configurable items:**

- Input sensor type and numbers
- Number of wires (RTD & resistance)
- Input range (inverted range selectable)
- Burnout
- Output limits (Upper / Lower)
- Damping time
- Cold junction compensation (T/C; internal or external sensor selectable)
- Linearization
- Sensor calibration
- Output calibration
- HART communication mode

**Damping time:** 0 to 30 sec. (ex-factory set to: 0)

**LED INDICATOR (option)**

**LED:** 8 mm (.3") 7-segment, red

**Number of display digits:** 4

**Scaling range:** -1999 – 9999

**Offset range:** -1999 – 9999

**Decimal point position:**  $10^{-1}$ ,  $10^{-2}$ ,  $10^{-3}$ , or no decimal point

**Polarity sign:** Minus (–) sign added automatically according to the computation result

**Read rate:** 2.5/s

**Over-range warning:** All segments dark except the top ones that blinks with the input exceeding the display/measurable range; or the bottom ones that blinks with the input below the range.

**Engineering unit display:** Unit label included; LED backlight provided

**HART COMMUNICATION**

**Protocol:** HART communication protocols

**HART address range:** 0 – 15 (ex-factory set to: 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  
(ex-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.

**INPUT**

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

■ **DC mV** (dual input available)

**Input resistance:** 1MΩ minimum

■ **THERMOCOUPLE** (dual input available)

**Input resistance:** 1MΩ minimum

**Burnout sensing:** 33μA

**External CJC sensor type:** Pt 100

■ **RTD & RESISTANCE** (2-wire, 3-wire or 4-wire)

**Input resistance:** 1MΩ minimum

**Excitation:** 0.2mA

**Allowable leadwire resistance:** Max. 10Ω per wire

**OUTPUT**

**Output range:** 4 – 20mA DC

**Operational range:** 3.75 – 23mA

**Burnout:** 3.75 – 3.8mA or 21.5 – 23mA  
(factory set to: 23mA)

**Upper output limit proportional to the input:**  
20 – 21.5mA (factory set to: 21.5mA)

**Lower output limit proportional to the input:**  
3.8 – 4mA (factory set to: 3.8mA)

**Update time:** 440 msec. (660 msec. with dual input)

**Output characteristics for dual input:** Average or Differential selectable

**Load resistance vs. supply voltage:**

$$\text{Load Resistance } (\Omega) = \frac{\text{Supply Voltage (V)} - 8 \text{ (V)**}}{0.023 \text{ (A)}}$$

(including leadwire resistance)

\*\*12 (V) with LED indicator option.

**INSTALLATION**

**Supply voltage**

**Non-approved:** 8 – 35V DC (without LED indicator)  
12 – 39V DC (with LED indicator)

**FM:** 8 – 32V DC (without LED indicator)  
12 – 32V DC (with LED indicator)

**TIIS:** 8 – 28V DC (without LED indicator)  
12 – 32V DC (with LED indicator)

**Operating temperature**

**Non-approved:** : -40 to +85°C (-40 to +185°F)

**CENELEC (ATEX) & FM:** T5, -40 to +80°C (-40 to +176°F)  
T6, -40 to +70°C (-40 to +158°F)

**TIIS:** T6, -20 to +60°C (-4 to +140°F)

**Dimensions:** Refer to the External Dimensions.

**Weight:** Approx. 1.3 kg (2.9 lbs), aluminum

Approx. 4.0 kg (8.8 lbs), stainless steel

Approx. 2.0 kg (4.4 lbs), TIIS flameproof

## PERFORMANCE

**Transmitter accuracy:** See Table 1.

**Display accuracy:**  $\pm 0.01\text{mA}$

**Cold junction compensation accuracy:**  $\leq \pm 0.5^\circ\text{C}$   
with internal CJC sensor

**Temp. coefficient:**

Optional L       $0.002\%/^\circ\text{C}$  typ.  
 $0.005\%/^\circ\text{C}$  max.

w/o Option L     $0.015\%/^\circ\text{C}$

LED indicator     $\pm 0.015\%/^\circ\text{C}$

**Response time:**  $\leq 2$  seconds (0 – 90%) with damping  
time set to 0 and when not communicating via HART.

**Supply voltage effect:**  $\leq \pm 0.005\%$  of span/V

**Insulation resistance:**  $\geq 100\text{M}\Omega$  with 500V DC  
(input to output to outdoor enclosure)

**Dielectric strength:** 1500V AC @1 minute  
(input to output to outdoor enclosure)

## STANDARDS & APPROVAL

**CE conformity:** EMC Directive (89/336/EEC)

EMI EN61000-6-4

EMS EN61000-6-2

**Safety approval**

FM: Explosion-proof and

Dust-ignition proof

Class I, Div. 1, Groups B, C and D

Class II, Div. 1, Groups E, F and G

Class III, Div. 1

T5 and T6

(Class 3615)

CENELEC: Flameproof (ATEX)

Ⓔ II 2G, EEx d IIC; T5 and T6

(EN50018 - 2000)

TIIS: Flameproof

Ex d IIC T6

## INPUT TYPE, RANGE & ACCURACY

TABLE 1

INPUT TYPE	MINIMUM SPAN	MAXIMUM RANGE	ACCURACY *1	TEMPERATURE DRIFT				
				STANDARD DRIFT*2	ULTRA-LOW DRIFT*3			
DC mV	4mV	-100 to +800mV	$\pm 10\mu\text{V}$	$\pm 1.5\mu\text{V}/^\circ\text{C}$	$\pm 0.5\mu\text{V}/^\circ\text{C}$			
Resistance	25 $\Omega$	0 to 4k $\Omega$	$\pm 0.1\Omega$	$\pm 15\text{m}\Omega/^\circ\text{C}$	$\pm 5\text{m}\Omega/^\circ\text{C}$			
Thermocouple	$^\circ\text{C}$			$^\circ\text{F}$			TEMPERATURE DRIFT	
	MINIMUM SPAN	MAXIMUM RANGE	ACCURACY *1	MINIMUM SPAN	MAXIMUM RANGE	ACCURACY *1	STANDARD DRIFT*2	ULTRA-LOW DRIFT*3
K (CA)	50	-180 to +1372	$\pm 0.5$	90	-292 to +2501	$\pm 0.9$	$\pm 0.075^\circ\text{C}/^\circ\text{C}$	$\pm 0.025^\circ\text{C}/^\circ\text{C}$
E (CRC)	50	-100 to +1000	$\pm 0.5$	90	-148 to +1832	$\pm 0.9$	$\pm 0.075^\circ\text{C}/^\circ\text{C}$	$\pm 0.025^\circ\text{C}/^\circ\text{C}$
J (IC)	50	-100 to +1200	$\pm 0.5$	90	-148 to +2192	$\pm 0.9$	$\pm 0.075^\circ\text{C}/^\circ\text{C}$	$\pm 0.025^\circ\text{C}/^\circ\text{C}$
T (CC)	50	-200 to +400	$\pm 0.5$	90	-328 to +752	$\pm 0.9$	$\pm 0.075^\circ\text{C}/^\circ\text{C}$	$\pm 0.025^\circ\text{C}/^\circ\text{C}$
B (RH)	100	400 to 1820	$\pm 1$	180	752 to 3308	$\pm 1.8$	$\pm 0.3^\circ\text{C}/^\circ\text{C}$	$\pm 0.1^\circ\text{C}/^\circ\text{C}$
R	100	-50 to +1760*4	$\pm 1$	180	-58 to +3200*4	$\pm 1.8$	$\pm 0.3^\circ\text{C}/^\circ\text{C}$	$\pm 0.1^\circ\text{C}/^\circ\text{C}$
S	100	-50 to +1760*4	$\pm 1$	180	-58 to +3200*4	$\pm 1.8$	$\pm 0.3^\circ\text{C}/^\circ\text{C}$	$\pm 0.1^\circ\text{C}/^\circ\text{C}$
C (WRe 5-26)	100	0 to 2300	$\pm 1$	180	32 to 4172	$\pm 1.8$	$\pm 0.3^\circ\text{C}/^\circ\text{C}$	$\pm 0.1^\circ\text{C}/^\circ\text{C}$
D (WRe 3-25)	100	0 to 2300	$\pm 1$	180	32 to 4172	$\pm 1.8$	$\pm 0.3^\circ\text{C}/^\circ\text{C}$	$\pm 0.1^\circ\text{C}/^\circ\text{C}$
N	50	-180 to +1300	$\pm 0.5$	90	-180 to +2372	$\pm 0.9$	$\pm 0.075^\circ\text{C}/^\circ\text{C}$	$\pm 0.025^\circ\text{C}/^\circ\text{C}$
U	50	-200 to +600	$\pm 0.5$	90	-328 to +1112	$\pm 0.9$	$\pm 0.075^\circ\text{C}/^\circ\text{C}$	$\pm 0.025^\circ\text{C}/^\circ\text{C}$
L	50	-100 to +900	$\pm 0.5$	90	-148 to +1652	$\pm 0.9$	$\pm 0.075^\circ\text{C}/^\circ\text{C}$	$\pm 0.025^\circ\text{C}/^\circ\text{C}$
RTD	$^\circ\text{C}$			$^\circ\text{F}$			TEMPERATURE DRIFT	
	MINIMUM SPAN	MAXIMUM RANGE	ACCURACY *1	MINIMUM SPAN	MAXIMUM RANGE	ACCURACY *1	STANDARD DRIFT*2	ULTRA-LOW DRIFT*3
Pt 100 (JIS'97, DIN, IEC)	10	-200 to +850	$\pm 0.1$	18	-328 to +1562	$\pm 0.18$	$\pm 0.015^\circ\text{C}/^\circ\text{C}$	$\pm 0.005^\circ\text{C}/^\circ\text{C}$
Pt 200	10	-200 to +850	$\pm 0.1$	18	-328 to +1562	$\pm 0.18$	$\pm 0.015^\circ\text{C}/^\circ\text{C}$	$\pm 0.005^\circ\text{C}/^\circ\text{C}$
Pt 500	10	-200 to +850	$\pm 0.1$	18	-328 to +1562	$\pm 0.18$	$\pm 0.015^\circ\text{C}/^\circ\text{C}$	$\pm 0.005^\circ\text{C}/^\circ\text{C}$
Pt 1000	10	-200 to +850	$\pm 0.1$	18	-328 to +1562	$\pm 0.18$	$\pm 0.015^\circ\text{C}/^\circ\text{C}$	$\pm 0.005^\circ\text{C}/^\circ\text{C}$
JPt 100 (JIS '89)	10	-200 to +510	$\pm 0.1$	18	-328 to +950	$\pm 0.18$	$\pm 0.015^\circ\text{C}/^\circ\text{C}$	$\pm 0.005^\circ\text{C}/^\circ\text{C}$
Ni 100 (DIN43760 '87)	10	-60 to +250	$\pm 0.2$	18	-76 to +482	$\pm 0.36$	$\pm 0.015^\circ\text{C}/^\circ\text{C}$	$\pm 0.005^\circ\text{C}/^\circ\text{C}$

\*1. DC mV: Or  $\pm 0.05\%$  of absolute range (greater of 0% and 100% range values), whichever is greater.  
Or  $\pm 0.2\%$  of absolute negative range for two inputs including negative ranges, whichever is greater.

Resistance: Or  $\pm 0.05\%$  of absolute range (greater of 0% and 100% range values), whichever is greater.

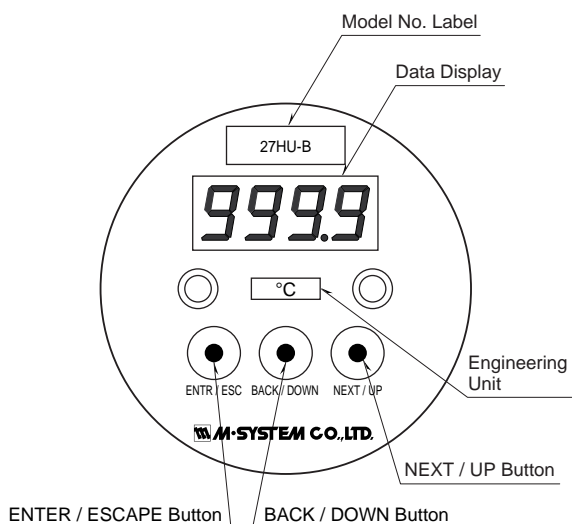
Thermocouple: Or  $\pm 0.05\%$  of span, whichever is greater. Add cold junction compensation error.

RTD: Or  $\pm 0.05\%$  of max. range (greater of 0% and 100% range values converted into  $^\circ\text{C}$ ), whichever is greater.  
(For 2- or 3-wire RTD, the value is valid by the sensor calibration after wiring is complete.)

\*2. Or  $\pm 0.015\%$  of absolute range/ $^\circ\text{C}$  (greater of 0% and 100% range values), whichever is greater.

\*3. Or  $\pm 0.005\%$  of absolute range/ $^\circ\text{C}$  (greater of 0% and 100% range values), whichever is greater.

\*4. Conformance range: 50 to 1760 $^\circ\text{C}$  or 122 to 3200 $^\circ\text{F}$

**INDICATOR TOP VIEW (option)****■ ERROR INDICATION**

The data display blinks when an abnormality is detected. The unit display backlight also blinks.

When the setting error or the security code error occurs, press ESCAPE key once to cancel the error status and proceed to set again.

ERROR TYPE	DATA DISPLAY
Over-scale	
Under-scale	
Setting error	
Security code error	

**ENTER / ESCAPE Button**

**ENTER:** Used to call up the program menu and to apply parameter changes. Press for longer than 2 seconds.

**ESCAPE:** Used to cancel menu selections and to cancel parameter changes. Push for a brief period.

**BACK / DOWN Button:** Used to select a menu item or to decrease parameter values.

**NEXT / UP Button:** Used to select a menu item or to increase parameter values.

**•How to Reset All Parameters to the Factory Setting**

Turn off the power supply to the indicator. In pressing all the three control buttons at once, turn it on. When a message appears on the data display, press ENTER. If you want to cancel the procedure, turn the power supply off.

**■ DISPLAY DIGITS**

The decimal point position may shift according to the required number of digits for the integer section, even when more than one decimal places have been specified.

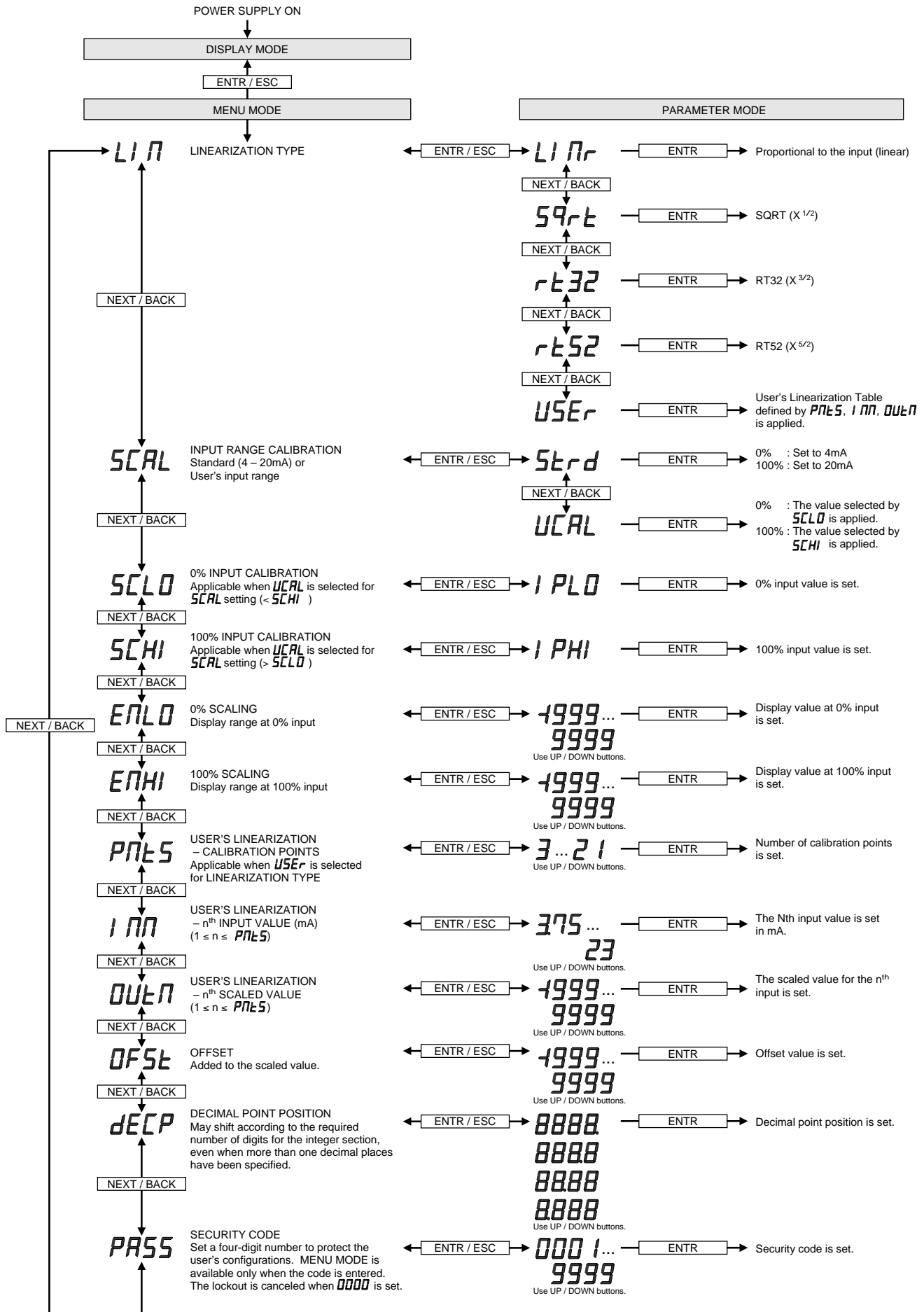
However, when the number of decimal places is set to 3, the '0' in the integer section is not shown in order to secure the number of effective digits, as explained in the table below.

The '0' is displayed when the number of decimal places is set to 2, though the number of effective digits in this case is reduced by 1 digit compared from the 3 decimal places.

Select appropriately for the application. Refer to 'PROGRAMMING PROCEDURE' for how to choose decimal point positions.

DECIMALS	VALUE	DISPLAY
3	-1.000 to -1.999	<del>1.000</del> to <del>1.999</del>
	-0.001 to -0.999	<del>-.001</del> to <del>-.999</del>
2	-1.00 to -1.99	<del>-1.00</del> to <del>-1.99</del>
	-0.01 to -0.99	<del>-0.01</del> to <del>-0.99</del>

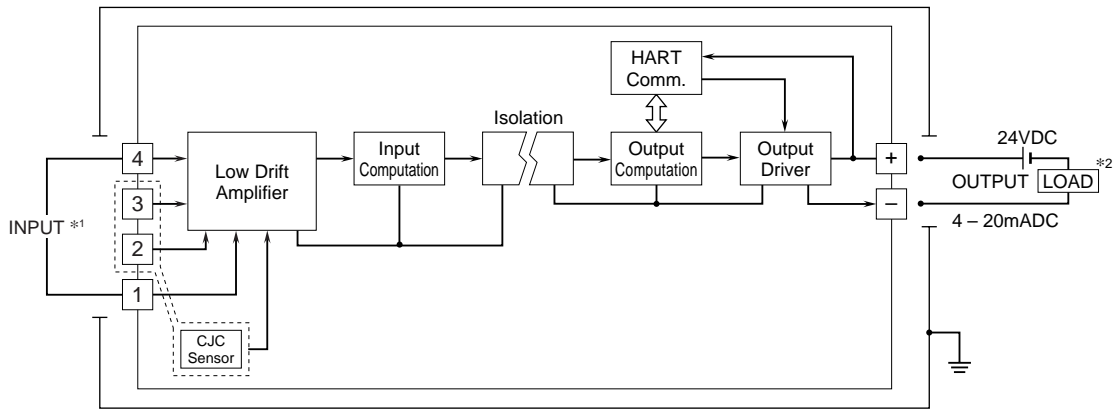
# INDICATOR PROGRAMMING PROCEDURE (option)



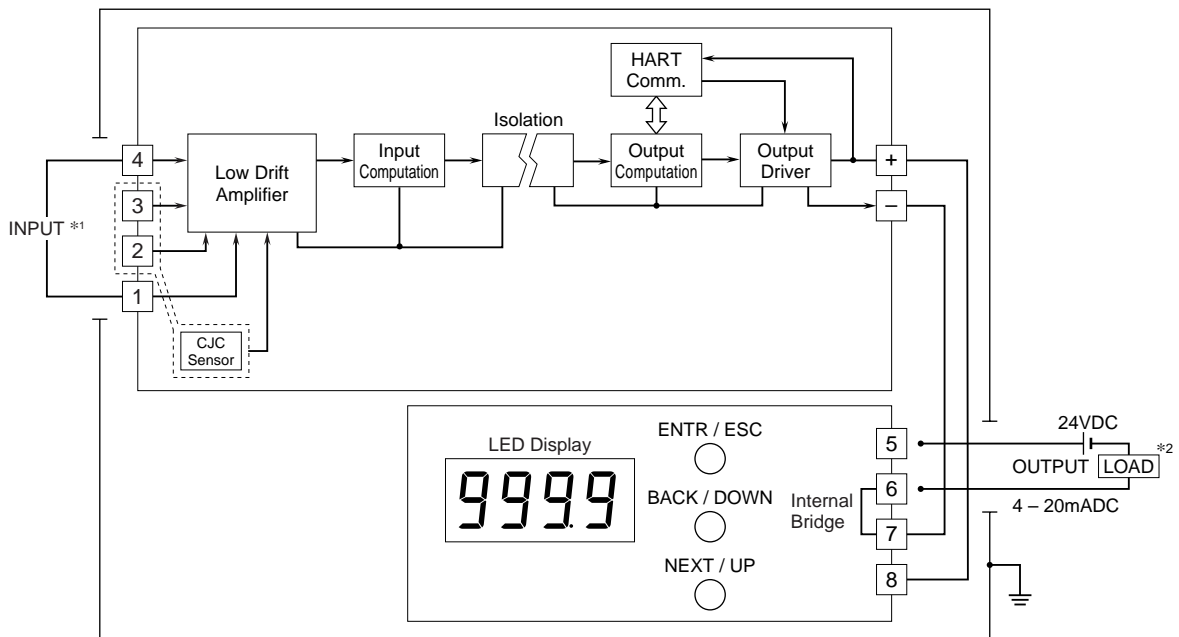
**SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM**

■ WITHOUT TERMINAL BLOCK

• Without LED Indicator

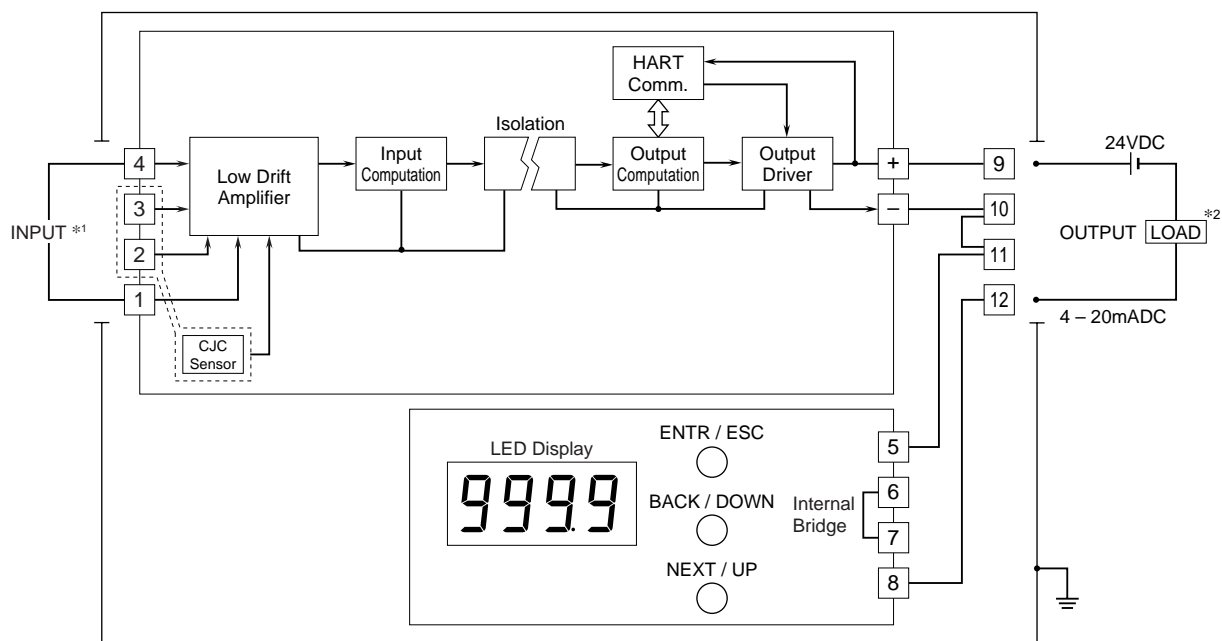


• With LED Indicator



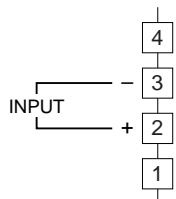
# SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

## WITH TERMINAL BLOCK



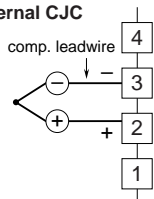
### \*1. Input Connection Examples

#### DC MILLIVOLT

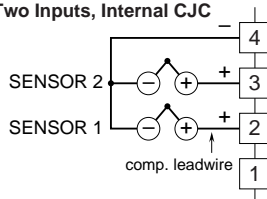


#### THEMOCOUPLE

##### Internal CJC

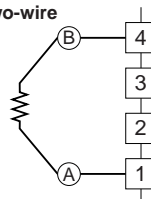


##### Two Inputs, Internal CJC

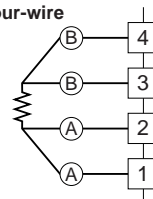


#### RTD & RESISTANCE

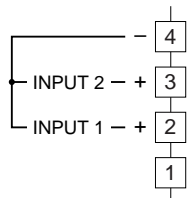
##### Two-wire



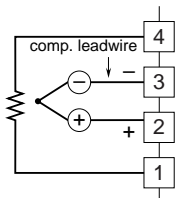
##### Four-wire



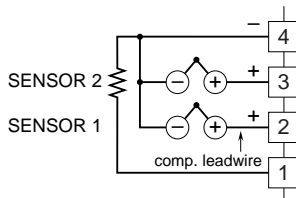
##### Two Inputs



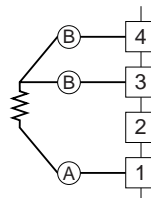
##### External CJC



##### Two Inputs, External CJC

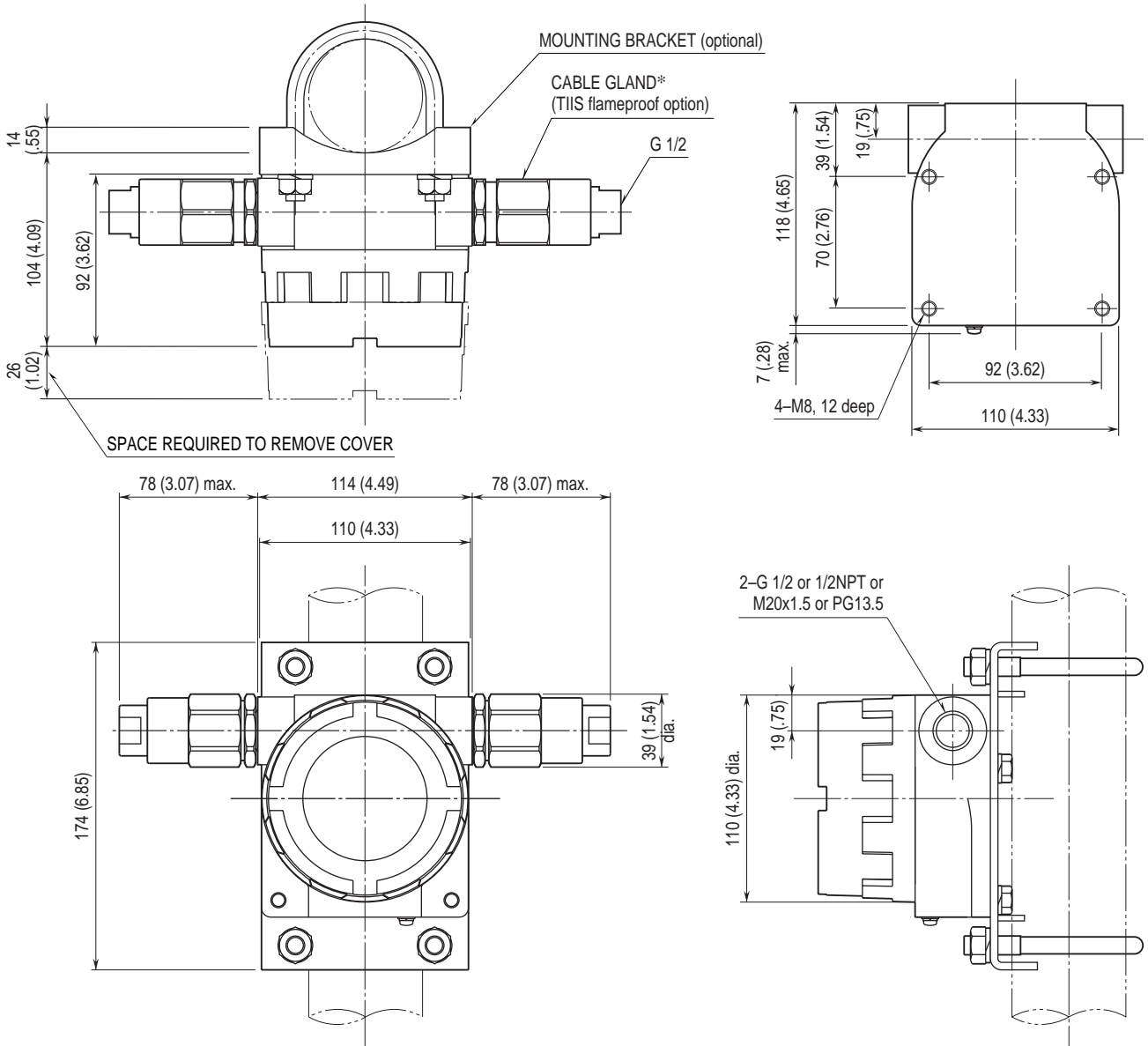


##### Three-wire



\*2. Limited to 250 – 1100Ω for HART communication

**EXTERNAL DIMENSIONS mm (inch)**



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