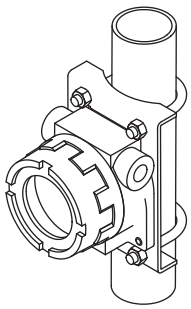
Head-mounted Two-wire Signal Conditioners
27-UNIT

2-WIRE UNIVERSAL TEMPERATURE TRANSMITTER
(HART communication, outdoor enclosure, explosion-proof)

Functions & Features
- Universal input: mV, T/C, RTD and resistance
- High accuracy
- HART communication
- Explosion-proof approval
- Suitable for Functional Safety applications up to SIL2
- 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
- CE marking (conforms to ATEX and EMC)



CE

Ex

FM APPROVED

MODEL: 27HU-B-[1][2][3][4][5][6][7]

ORDERING INFORMATION

• Code number: 27HU-B-[1][2][3][4][5][6][7]
Specify a code from below for each [1] through [7].
(e.g. 27HU-B-0L1T01/S).
Use Ordering Information Sheet (No. ESU-7652). 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 4.

[1] SAFETY APPROVAL

Confirm selectable combinations of approval and wiring conduit types in the table below.
0: None
3: FM explosion-proof
4: CENELEC flameproof (ATEX)
8: TIIS flameproof (CE not available)

[2] TEMPERATURE DRIFT

0: Standard (temp. coefficient 0.015 %/°C)
L: Ultra-low temperature drift
(temp. coefficient 0.002 %/°C typ. 0.005 %/°C max.)

[3] LED INDICATOR

0: Without
1: With (SIL not available)

[4] TERMINAL BLOCK

0: None (Output connection: Terminals on module)
(For TIIS, selectable only with 'No indicator' option.)
T: Incorporated
(Selectable only with the LED indicator option)

[5] WIRING CONDUIT

Confirm selectable combinations of approval and wiring conduit types in the table below.
0: G 1/2
1: 1/2 NPT
2: M20 × 1.5
3: PG 13.5

[6] MOUNTING BRACKET

0: Without
1: With

[7] 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	3	4	8
0	Y	N	N	Y
1	Y	Y	Y	N
2	Y	N	Y	N
3	Y	N	N	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
• PC configurator software (model: 27HUCFG)
Downloadable at M-System's web site.
• Cable gland (model: BX-E-SXY)

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GENERAL SPECIFICATIONS

Degree of protection: NEMA 4X, IP66/IP67
Wiring conduit: See 'Ordering information.'
Materials
Transmitter Housing: Flame-resistant resin (black)
Electrical connection: M3 screw terminals (nickel-plated brass; torque 0.5 N·m)
Indicator Housing: Flame-resistant resin (black)
Electrical connection: Euro terminal
Applicable wire size: AWG26 – 16 (0.14 – 1.5 mm^2)
Built-in terminal: M3 screw terminals (nickel-plated steel; torque 0.5 N·m)
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 (factory set to 0)
· Cold junction compensation (T/C; internal or external sensor selectable)
· Linearization
· Sensor calibration
· Output calibration
· HART communication mode
Refer to the HART setup manual or the PC configurator users manual for the detail.

HART COMMUNICATION

Protocol: HART communication protocol
HART address range: 0 – 15 (factory set to 0)
Transmission speed: 1200 bps
Digital current: Approx. 1 mAp-p 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.

LED INDICATOR (option)

LED: 8 mm (.3") 7-segment, red
Number of display digits: 4
Scaling range: -1999 to 9999
Offset range: -1999 to 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 blink with the input exceeding the display/measurable range; or the bottom ones that blink with the input below the range.
Engineering unit display: Unit label included; LED backlight provided
DC, AC, W, ℃ , °F, V, mV, A, mA, %, kW, mW, kV, kA, psiKvarNl/minkvar, Mvar, var, m, mm, kg, kg/h, kPa, MPa, N·m, Nm^3/h, m^3/h, m^3/sec, m/seckgh/cm^2l/min, %RH, l, l/h, t/h, rpm, ppm, pH, Pa

INPUT SPECIFICATIONS

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: ≥ 1 MΩ
■ Thermocouple (dual input available)
Input resistance: ≥ 1 MΩ
Burnout sensing: 33 μA
External CJC sensor type: Pt 100
■ RTD (2-wire, 3-wire or 4-wire)
Input resistance: ≥ 1 MΩ
Excitation: 0.2 mA
Allowable leadwire resistance: Max. 10 Ω per wire
■ Resistance (2-wire, 3-wire or 4-wire)
Input resistance: ≥ 1 MΩ
Excitation: 0.2 mA
Allowable leadwire resistance: Max. 10 Ω per wire

OUTPUT SPECIFICATIONS

Output range: 4 – 20 mA DC
Operational range: 3.75 – 23 mA
Load resistance vs. supply voltage:
Load Resistance (Ω) = (Supply Voltage (V) – 8 (V)*) ÷ 0.023 (A) (including leadwire resistance)
*12 (V) with LED indicator option.
Burnout: 3.75 – 3.8 mA or 21.5 – 23 mA (factory set to 23 mA)
Upper output limit proportional to the input:
20 – 21.5 mA (factory set to 21.5 mA)
Lower output limit proportional to the input:
3.8 – 4 mA (factory set to 3.8 mA)
Update time: 440 msec. (660 msec. with dual input)

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Output characteristics for dual input:
Average or Differential selectable

INSTALLATION

Supply voltage
Non-approved: 8 – 35 V DC (without LED indicator)
12 – 39 V DC (with LED indicator)
CENELEC (ATEX) & FM: 8 – 32 V DC (without LED indicator)
12 – 32 V DC (with LED indicator)
TIIS: 8 – 28 V DC (without LED indicator)
12 – 32 V 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)
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), TIIS flameproof

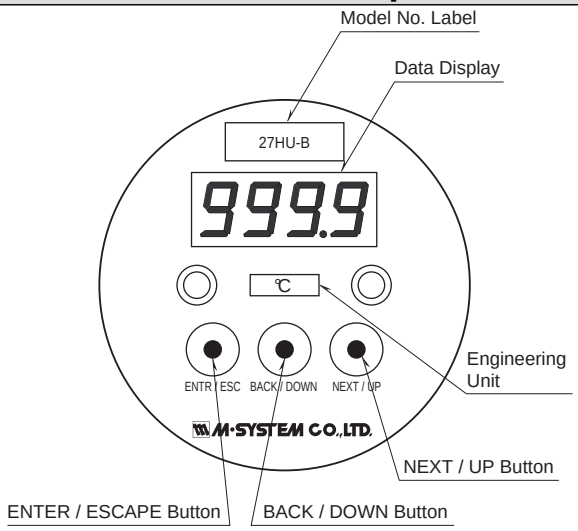
PERFORMANCE

Accuracy: See Table 1.
Display accuracy: ±0.01 mA
Cold junction compensation accuracy: ±0.5°C (±0.9°F) with internal CJC sensor
LED indicator temp. coefficient: ±0.015 %/°C
Response time: ≤ 2 sec. (0 – 90 %) with damping time set to 0 and when not communicating via HART.
Supply voltage effect: ±0.005 % of span/V
Insulation resistance: ≥ 100 MΩ with 500 V DC
Dielectric strength: 1500 V AC @1 minute (input to output to outdoor enclosure)
Safety integrity level according to IEC 61508: Suitable for use in a safety instrumented system up to SIL2 (together with sensor) if appropriate safety instructions are observed. Consult M-System.

STANDARDS & APPROVALS

CE conformity:
ATEX Directive (94/9/EC)
EEx d EN 50018: 2000
EMC Directive (2004/108/EC)
EMI EN 61000-6-4: 2007/A1: 2011
EMS EN 61000-6-2: 2005
Safety approval:
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
T5 and T6
(Class 3615: 2006)
TIIS: Flameproof
Ex d IIC T6
CENELEC: Flameproof (ATEX)
Ⓔx II 2G, EEx d IIC; T5 and T6
(EN50018: 2000)

INDICATOR TOP VIEW (option)



INPUT TYPE, RANGE & ACCURACY

■ **INPUT TYPE, RANGE & ACCURACY** Table 1

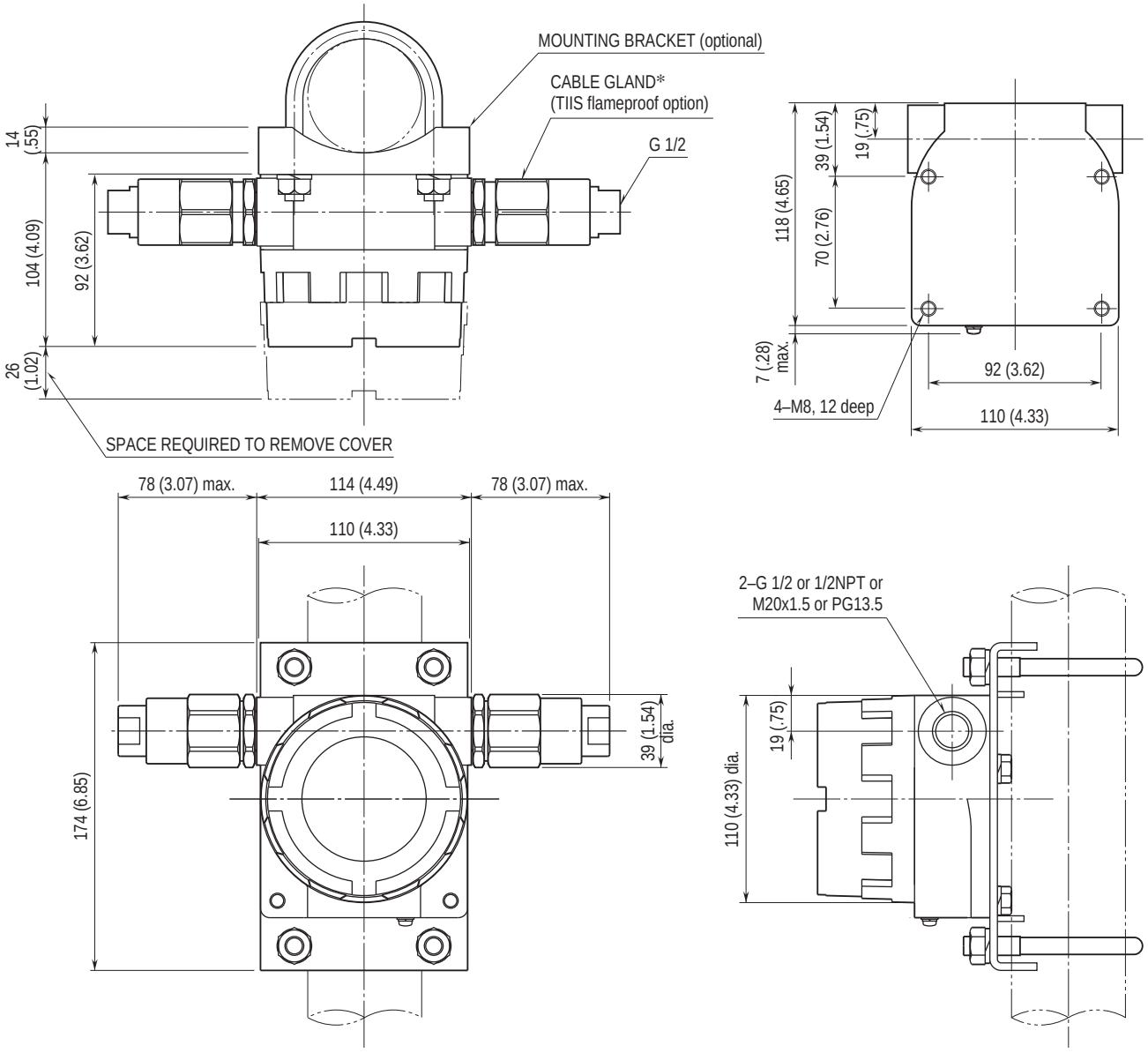
INPUT TYPE	MINIMUM SPAN	MAXIMUM RANGE	ACCRACY *1	TEMPERATURE DRIFT STANDARD DRIFT *2	TEMPERATURE DRIFT ULTRA-LOW DRIFT *3
DC mV	4 mV	-100 to +800 mV	±10 μV	±1.5 μV/°C	±0.5 μV/°C
Resistance	25 Ω	0 to 4 kΩ	±0.1 Ω	±15 mΩ /°C	±5 mΩ /°C

Thermocouple	°C MINIMUM SPAN	°C MAXIMUM RANGE	°C ACCURACY *1	°F MINIMUM SPAN	°F MAXIMUM RANGE	°F ACCURACY *1	TEMPERATURE DRIFT STANDARD DRIFT *2	TEMPERATURE DRIFT ULTRA-LOW DRIFT *3
K (CA)	50	-180 to +1372	±0.5	90	-292 to +2501	±0.9	±0.075°C/°C	±0.025°C/°C
E (CRC)	50	-100 to +1000	±0.5	90	-148 to +1832	±0.9	±0.075°C/°C	±0.025°C/°C
J (IC)	50	-100 to +1200	±0.5	90	-148 to +2192	±0.9	±0.075°C/°C	±0.025°C/°C
T (CC)	50	-200 to +400	±0.5	90	-328 to +752	±0.9	±0.075°C/°C	±0.025°C/°C
B (RH)	100	400 to 1820	±1	180	752 to 3308	±1.8	±0.3°C/°C	±0.1°C/°C
R	100	-50 to +1760*4	±1	180	-58 to +3200*4	±1.8	±0.3°C/°C	±0.1°C/°C
S	100	-50 to +1760*4	±1	180	-58 to +3200*4	±1.8	±0.3°C/°C	±0.1°C/°C
C (WRe 5-26)	100	0 to 2300	±1	180	32 to 4172	±1.8	±0.3°C/°C	±0.1°C/°C
D (WRe 3-25)	100	0 to 2300	±1	180	32 to 4172	±1.8	±0.3°C/°C	±0.1°C/°C
N	50	-180 to +1300	±0.5	90	-292 to +2372	±0.9	±0.075°C/°C	±0.025°C/°C
U	50	-200 to +600	±0.5	90	-328 to +1112	±0.9	±0.075°C/°C	±0.025°C/°C
L	50	-100 to +900	±0.5	90	-148 to +1652	±0.9	±0.075°C/°C	±0.025°C/°C

RTD	°C MINIMUM SPAN	°C MAXIMUM RANGE	°C ACCURACY	°F MINIMUM SPAN	°F MAXIMUM RANGE	°F ACCURACY *1	TEMPERATURE STANDARD DRIFT *2	TEMPERATURE ULTRA-LOW DRIFT *3
Pt 100 (JIS '97, IEC)	10	-200 to +850	±0.1	18	-328 to +1562	±0.18	±0.015°C/°C	±0.005°C/°C
Pt 200	10	-200 to +850	±0.1	18	-328 to +1562	±0.18	±0.015°C/°C	±0.005°C/°C
Pt 500	10	-200 to +850	±0.1	18	-328 to +1562	±0.18	±0.015°C/°C	±0.005°C/°C
Pt 1000	10	-200 to +850	±0.1	18	-328 to +1562	±0.18	±0.015°C/°C	±0.005°C/°C
JPt 100 (JIS '89)	10	-200 to +510	±0.1	18	-328 to +950	±0.18	±0.015°C/°C	±0.005°C/°C
Ni 100 (DIN 43760 '87)	10	-60 to +250	±0.2	18	-76 to +482	±0.36	±0.015°C/°C	±0.005°C/°C

*1. DC mV: Or ±0.05 % of absolute range (greater of 0 % and 100 % range values), whichever is greater.
Or ±0.2 % of absolute negative range for two inputs including negative ranges, whichever is greater.
Resistance: Or ±0.05 % of absolute range (greater of 0 % and 100 % range values), whichever is greater.
Thermocouple: Or ±0.05 % of span, whichever is greater. Add cold junction compensation error.
RTD: Or ±0.05 % of max. range (greater of 0 % and 100 % range values converted into °C), whichever is greater.
(For 2- or 3-wire RTD, the value is valid by the sensor calibration after wiring is complete.)
*2. Or ±0.015 % of absolute range/°C (greater of 0 % and 100 % range values), whichever is greater.
*3. Or ±0.005 % of absolute range/°C (greater of 0 % and 100 % range values), whichever is greater.
*4. Conformance range: 50 to 1760°C or 122 to 3200°F

DIMENSIONS unit: mm (inch)



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

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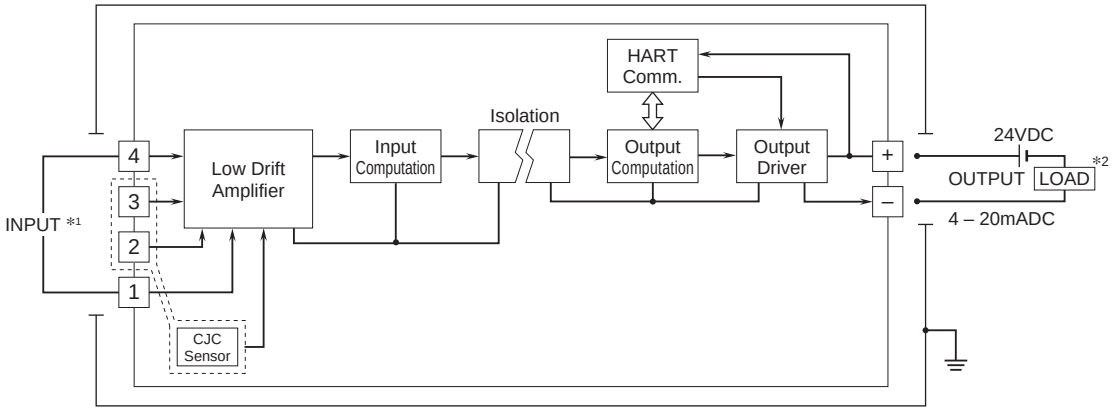
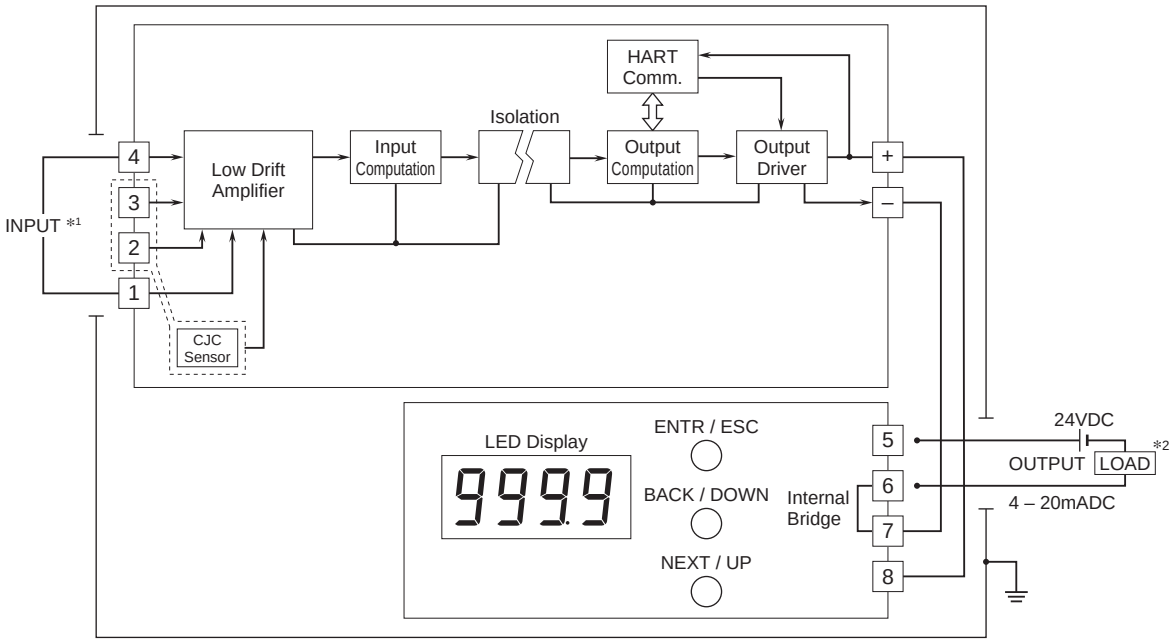
SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

■ **WITHOUT TERMINAL BLOCK (Output connection: Terminals on module)**

• **Without LED Indicator**



• **With LED Indicator**



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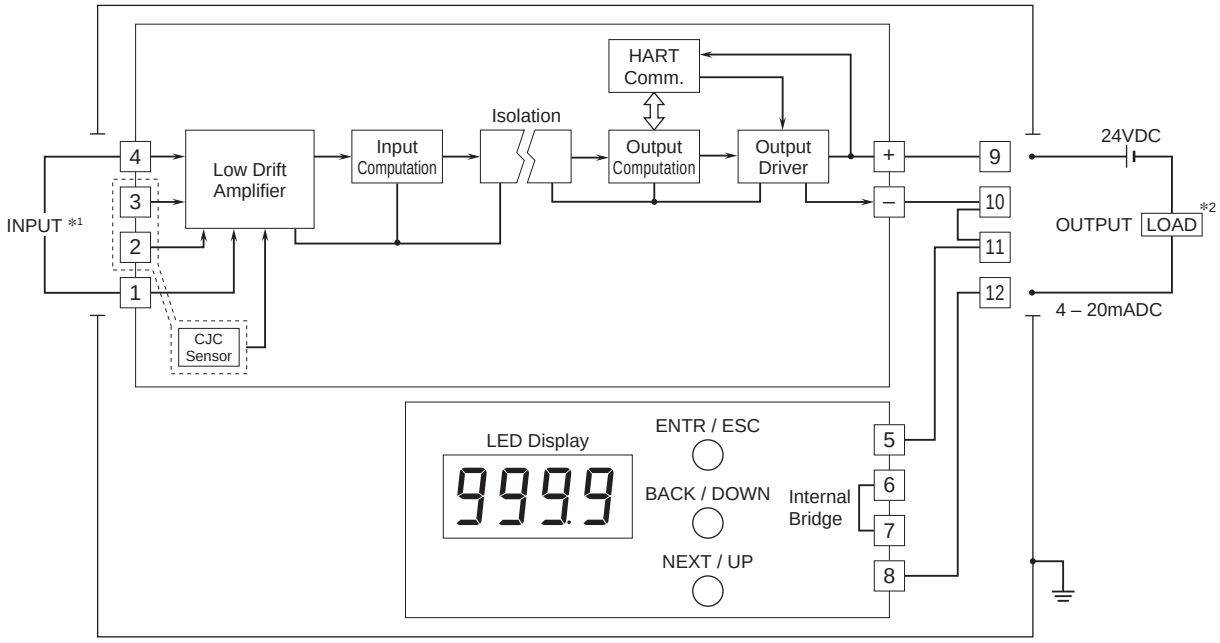
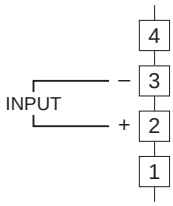
■ WITH TERMINAL BLOCK



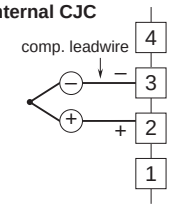
*1. Input Connection Examples

■ DC MILLIVOLT

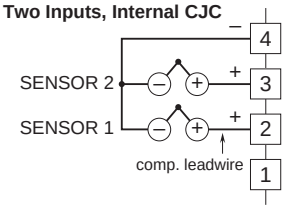


■ THEMOCOUPLE

• Internal CJC

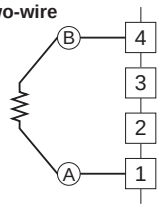


• Two Inputs, Internal CJC

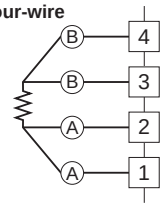


■ RTD & RESISTANCE

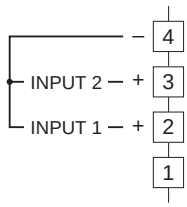
• Two-wire



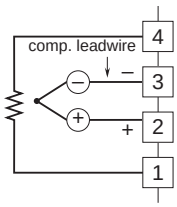
• Four-wire



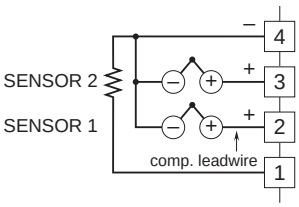
• Two Inputs



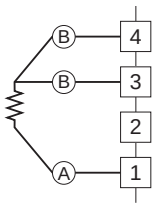
• External CJC



• Two Inputs, External CJC



• Three-wire



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

⚠ Specifications are subject to change without notice.

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