Head-mounted Two-wire Signal Conditioners
27-UNIT

2-WIRE UNIVERSAL TEMPERATURE TRANSMITTER
(HART communication)

Functions & Features
- Universal input: DC mV, T/C, RTD and resistance
- High accuracy
- HART communication
- Intrinsically safe 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.)
- CE marking (conforms to ATEX and EMC)

MODEL: 27HU–[1][2]

ORDERING INFORMATION
- Code number: 27HU-[1][2]
  Specify a code from below for each [1] and [2].
  (e.g. 27HU-2/L)
  Use Ordering Information Sheet (No. ESU-7651). 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.

[1] SAFETY APPROVAL
  0: None
  1: FM intrinsically safe
  2: CENELEC intrinsic safety (ATEX)

[2] OPTIONS
Temperature Drift
Blank: Standard (temp. coefficient 0.015%/°C)
/L: Ultra-low temperature drift
  (temp. coefficient 0.002%/°C typ., 0.005%/°C max.)

RELATED PRODUCTS
- 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.

GENERAL SPECIFICATIONS
Construction: Sensor head-mounting
Connection: M3 screw terminals (torque 0.5 N·m)
Screw terminal: Nickel-plated brass
Housing material: Flame-resistant resin (black)
Isolation: Input to output
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
  - 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.

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)

M-SYSTEM CO., LTD.
http://www.m-system.co.jp/
**Input resistance:** $\geq 1 \text{ M}\Omega$

**Burnout sensing:** 33 $\mu$A

- **External CJC sensor type:** Pt 100
- **RTD (2-wire, 3-wire or 4-wire)**
- **Input resistance:** $\geq 1 \text{ M}\Omega$
- **Excitation:** 0.2 mA
- **Allowable leadwire resistance:** Max. 10 $\Omega$ per wire
- **Resistance (2-wire, 3-wire or 4-wire)**
- **Input resistance:** $\geq 1 \text{ M}\Omega$
- **Excitation:** 0.2 mA
- **Allowable leadwire resistance:** Max. 10 $\Omega$ per wire

**OUTPUT SPECIFICATIONS**

**Output range:** 4 – 20 mA DC

**Operational range:** 3.75 – 23 mA

**Load resistance vs. supply voltage:**

\[
\text{Load Resistance (}\Omega\text{)} = \frac{(\text{Supply Voltage (V)} - 8 (\text{V}))}{0.023 (\text{A})} \quad \text{(including leadwire resistance)}
\]

- **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)

**INSTALLATION**

**Supply voltage**

- 8 – 35 V DC (non-approved)
- 8 – 28 V 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:** Head-mounting (DIN type B head)

**Weight:** 50 g (1.76 oz)

**PERFORMANCE**

**Accuracy:** See Table 1.

**Cold junction compensation accuracy:** $\pm0.5^\circ\text{C (}\pm0.9^\circ\text{F)}$ with internal CJC sensor

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

**Supply voltage effect:** $\pm0.005$ % of span/V

**Insulation resistance:** $\geq 100 \text{ M}\Omega$ with 500 V DC

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

**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.

**STANDARDS & APPROVALS**

**EU conformity:**

- ATEX Directive
  
  Ex ia EN 60079-11

- EMC Directive
  
  EN 61326-1

- RoHS Directive
  
  EN 50581

**Safety approval:**

- FM: Intrinsically safe
  
  Class I, Division 1, Groups A, B, C and D
  
  Class I, Zone 0, AEx ia IIC (US)
  
  Class I, Zone 0, Ex ia IIC (Canada)
  
  T4, T5 and T6
  
  (Class 3610, ANSI/ISA 60079-11,
  
  CAN/CSA-C22.2 No. 157,
  
  CAN/CSA-C22.2 No. 60079-11)

- CENELEC: Intrinsic safety (ATEX)
  
  I I 1G, Ex ia IIC; T4, T5 and T6
  
  (EN 60079-11)

**SAFETY PARAMETERS**

**Operating temperature**

For CENELEC (ATEX) / FM:

- T4: -40 to +80°C
- T5: -40 to +60°C
- T6: -40 to +45°C

**Ex-data:**

- Output circuit
  
  $U_i (V_{\text{max}})$: 30 V DC
  
  $I_i (I_{\text{max}})$: 96 mA DC
  
  $P_i (P_{\text{max}})$: 720 mW
  
  $C_i$: 1 nF
  
  $L_i$: 0 mH
  
  $P_i$: 0 mH

- Sensor circuit
  
  $U_o (V_{\text{oc}})$: 30 V DC
  
  $I_o (I_{\text{sc}})$: 24 mA DC
  
  $P_o$: 180 mW
  
  $C_o (C_a)$: 50 nF
  
  $L_o (L_a)$: 40 mH

Consult M-System.
## INPUT TYPE, RANGE & ACCURACY

<table>
<thead>
<tr>
<th>INPUT TYPE</th>
<th>MINIMUM SPAN</th>
<th>MAXIMUM SPAN</th>
<th>ACCURACY</th>
<th>TEMPERATURE DRIFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC mV</td>
<td>4 mV</td>
<td>-100 to +800 mV</td>
<td>±0.1 μV</td>
<td>±1.5 μV/°C</td>
</tr>
<tr>
<td>Resistance</td>
<td>25 Ω</td>
<td>0 to 4 kΩ</td>
<td>±0.1 Ω</td>
<td>±15 mΩ/°C</td>
</tr>
</tbody>
</table>

### Thermocouple

<table>
<thead>
<tr>
<th>Type</th>
<th>MINIMUM SPAN</th>
<th>MAXIMUM SPAN</th>
<th>ACCURACY</th>
<th>TEMPERATURE DRIFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>K (CA)</td>
<td>50</td>
<td>-180 to +1372</td>
<td>±0.5</td>
<td>90</td>
</tr>
<tr>
<td>E (CRC)</td>
<td>50</td>
<td>-100 to +1000</td>
<td>±0.5</td>
<td>90</td>
</tr>
<tr>
<td>J (IC)</td>
<td>50</td>
<td>-100 to +1200</td>
<td>±0.5</td>
<td>90</td>
</tr>
</tbody>
</table>

### RTD

<table>
<thead>
<tr>
<th>Type</th>
<th>MINIMUM SPAN</th>
<th>MAXIMUM SPAN</th>
<th>ACCURACY</th>
<th>TEMPERATURE DRIFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt 100 (JIS '97, IEC)</td>
<td>10</td>
<td>-200 to +850</td>
<td>±0.1</td>
<td>18</td>
</tr>
<tr>
<td>Pt 200</td>
<td>10</td>
<td>-200 to +850</td>
<td>±0.1</td>
<td>18</td>
</tr>
<tr>
<td>Pt 500</td>
<td>10</td>
<td>-200 to +850</td>
<td>±0.1</td>
<td>18</td>
</tr>
</tbody>
</table>

### DIMENSIONS unit: mm (inch)

![Diagram of dimensions](image)

*1. DC mV: Or ±0.05 % of absolute range (greater of 0 % and 100 % range values), whichever is greater.

*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

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

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.
MOUNTING REQUIREMENTS  
unit: mm (inch)

The screws are to be provided by the customer.

SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

*1. Input Connection Examples

*2. Limited to 250 – 1100 Ω 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.
Specifications are subject to change without notice.