PIDMaxWell

Xiamen Maxwell Automation Limited

# TME110/TME210/TME310 Head mounted
# TTE110/TTE210/TTE310 Rail mounted
# TRE110/TRE210/TRE310 Field mounted

## Temperature transmitter with HART® protocol

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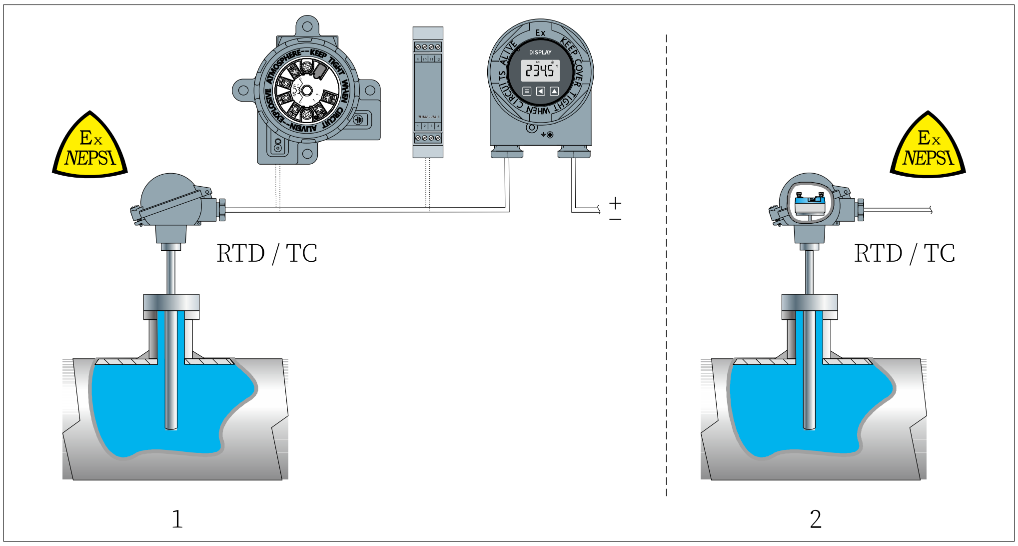
# Function and system design

**Measuring principle**

Linearization processing and electronic conversion of various temperature input signals in industrial measurement.

**Measuring system**

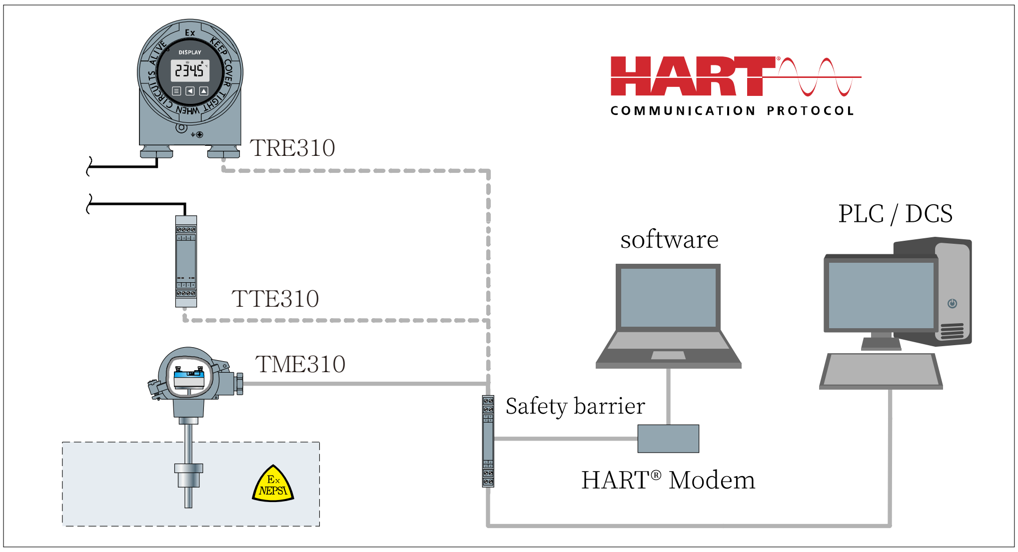



Application examples

1 Split installation: Sensors (RTD or TC) are installed separately from temperature transmitters, with sensor fault alarms.
2 Integrated installation: Sensors (RTD or TC) are assembled together with modular temperature transmitters, equipped with sensor fault alarms.

MOSHU offers a comprehensive range of industrial thermometers with resistance sensors or thermocouples.
When combined with the temperature transmitter, these components form a complete measuring point for a wide range of applications in the industrial sector.

The device not only transfers converted signals from resistance thermometers and thermocouples, it also transfers resistance and voltage signals using HART® communication and as a 4 to 20 mA current signal. It can be installed as an intrinsically safe apparatus in hazardous areas. It is used for instrumentation in the terminal head (flat face) as per DIN EN 50446, as a DIN rail device for installation in the control cabinet on a 35mm mounting rail as per EN 60715 or mounted in a 2-chamber field mount housing with glass window and included plug-on display.




Device architecture for HART® communication

**Standard diagnostic functions**

- Cable open-circuit, short-circuit of sensor wires
- Incorrect wiring
- Internal device errors
- Overrange/underrange detection
- Ambient temperature out-of-range detection

# Input

**Measure variables** Temperature (temperature-linear transmission behavior), resistance and voltage.

**Measuring range**

| Resistance thermometer (RTD) as per standard | Description | α | Measuring range limits | Min. span |
|---|---|---|---|---|
| IEC 60751: 2008 | Pt50<br>Pt100<br>Pt200<br>Pt500<br>Pt1000 | 0.003851 | –200 … +850 °C (–328 … +1562 °F)<br>–200 … +850 °C (–328 … +1562 °F)<br>–200 … +850 °C (–328 … +1562 °F)<br>–200 … +850 °C (–328 … +1562 °F)<br>–200 … +850 °C (–328 … +1562 °F) | 10.5 °C<br>(18.9 °F) |
| Edison curve #7 | Ni50<br>Ni100<br>Ni120<br>Ni1000 | 0.006720 | –80 … +260 °C (–112 … +500 °F)<br>–80 … +260 °C (–112 … +500 °F)<br>–80 … +260 °C (–112 … +500 °F)<br>–80 … +260 °C (–112 … +500 °F) | 5 °C<br>(9 °F) |
| OIML R84: 2003<br>GOST 6651 – 2009 | Cu50<br>Cu100 | 0.004280 | –50 … +150 °C (–58 … +302 °F)<br>–50 … +150 °C (–58 … +302 °F) | 5°C<br>(9 °F) |
| | ▪ Connection type: 2-wire, 3-wire or 4-wire connection, sensor current: ⩽ 0.3 mA<br>▪ With 2-wire circuit, compensation of the wire resistance is possible (0 to 50 Ω )<br>▪ With 3-wire and 4-wire connection, sensor wire resistance up to max. 50 Ω per wire | | | |
| **Resistance transmitter** | Resistance (Ω) | | 0 … 500 Ω<br>0 … 5000 Ω<br>0 … 20000 Ω | 5 Ω<br>50 Ω<br>200 Ω |

| Thermocouples as per standard | Description | Measuring range limits | | Min. span |
|---|---|---|---|---|
| IEC 60584, Part 1<br>ASTM E230–3 | B (PtRh30–PtRh6)<br>E (NiCr–CuNi)<br>J (Fe–CuNi)<br>K (NiCr–Ni)<br>N (NiCrSi–NiSi)<br>R (PtRh13–Pt)<br>S (PtRh10–Pt)<br>T (Cu–CuNi) | 0 … +1820 °C (+32 … +3308 °F)<br>–270 … +1000 °C (–454 … +1832 °F)<br>–210 … +1200 °C (–346 … +2192 °F)<br>–270 … +1372 °C (–454 … +2501 °F)<br>–270 … +1300 °C (–454 … +2372 °F)<br>–50 … +1768 °C (–58 … +3214°F)<br>–50 … +1768 °C (–58 … +3214°F)<br>–270 … +400 °C (–454 … +752 °F) | Recommended temperature range:<br>+500 … +1820 °C (+932 … +3308 °F)<br>–150 … +1000 °C (–238 … +1832 °F)<br>–150 … +1200 °C (–238 … +2192 °F)<br>–150 … +1200 °C (–238 … +2192 °F)<br>–150 … +1300 °C (–238 … +2372 °F)<br>+50 … +1768 °C (+122 … +3214 °F)<br>+50 … +1768 °C (+122 … +3214 °F)<br>–150 … +400 °C (–238 … +752 °F) | 25 °C<br>(45 °F) |
| IEC 60584, Part 1<br>ASTM E230–3<br>ASTM E988–96 | C (W5Re–W26Re) | 0 … +2320 °C (+32 … +4208 °F) | 0 … +2000 °C (+32 … +3632 °F) | 25 °C<br>(45 °F) |
| ASTM E988–96 | D (W3Re–W25Re) | 0 … +2356 °C (+32 … +4272 °F) | 0 … +2000 °C (+32 … +3632 °F) | 25 °C<br>(45 °F) |
| | ▪ Internal reference junction (Pt1000): configurable value –50 … +105 °C (–58 … +221 °F)<br>▪ External reference junction (Pt100): configurable value –200 … +850 °C (–328 … +1562 °F)<br>▪ Maximum sensor wire resistance 10 kΩ | | | |
| **Voltage transmitter (mV)** | Millivolt transmitter (mV) | –100 … 100 mV | | 2 mV |

# Output

**Output signal**

| | |
|---|---|
| Analog output | 4 to 20 mA, 20 to 4 mA (can be inverted) |
| Signal encoding | FSK ±0.5 mA via current signal |
| Data transmission rate | 1200 baud |
| Galvanic isolation | U = 1.5 kV AC for 1 minute (input/output) |

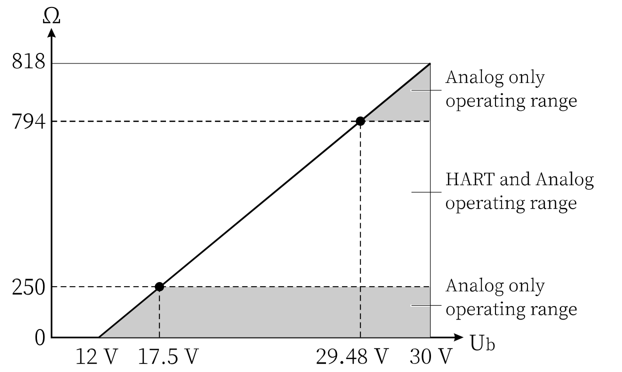
**Fault information**

**Failure information as per NAMUR Ne43:**
Failure information is created if the measuring information is missing or not valid.

| | |
|---|---|
| Underranging | Linear decrease from 4.0 to 3.8 mA |
| Overranging | Linear increase from 20.0 to 20.75 mA |
| Failure e.g. sensor failure; sensor open-circuit or short-circuit 1) | ⩽ 3.6 mA ("low") or ⩾ 21.5 mA ("high"), can be selected<br>The "high" alarm setting can be set between 20.75 mA and 21.6 mA, thus providing the flexibility needed to meet the requirements of various control systems. |

**Load**

$R_{b\,max.} = (U_{b\,max.} - 12\ V) / 0.022\ A$ (current output). Valid for head transmitter
Load in Ohm
$U_b$ = supply voltage in V DC




**Linearization / transmission behavior**

Temperature-linear, resistance-linear, voltage-linear

**Mains filter**

50 Hz

**damping**

1st order digital filter: 0 to 60 s

**Protocol-specific data**

| | |
|---|---|
| HART® version | 7 |
| Device address in the multi-drop mode | Software setting addresses 0 to 63 |
| Device description files (DD) | Information and files are available free of charge at:<br>www.sadi.cn<br>www.fieldcommgroup.org |
| Load (communication resistor) | min. 250 Ω |

**Write protection for device parameters**

- Hardware: Write protection for transmitter using internal jumper
- Hardware: Write protection for head transmitter on optional display using DIP switch
- Software: After configuring the DIP switch on the optional display unit of the head transmitter, it will be temporarily write-protected, and this function will be automatically lifted after the temperature transmitter is restarted.

**Switch-on delay**

- Until the start of HART® communication, approx. 5 s , while switch-on delay = Ia ⩽3.8 mA
- Until the first valid measured value signal is present for HART® communication and at the current output, approx. 15 s, while switch-on delay = Ia ⩽ 3.8 mA , When the ambient temperature is lower than -30°C, the cold start time needs to be increased by about 30 seconds.

1) RTD supports open circuit and short circuit detection; TC only support open circuit detection.

# Power supply

**Supply voltage**

Values for non-hazardous areas, protected against polarity reversal:
- 12 V DC ≤ Vcc ≤ 30 V DC
- I : ≤ 22 mA

Values for hazardous area, see Ex documentation.

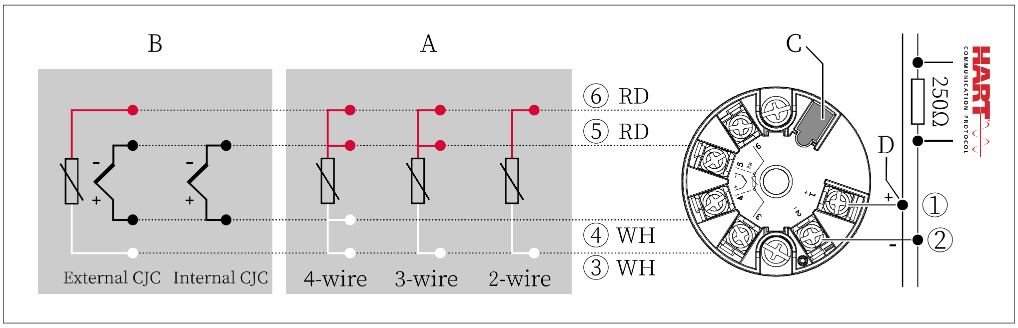
**Current consumption**

- 3.6 ... 21.6 mA
- Minimum current consumption 3.5 mA, Multidrop mode 4 mA
- Current limi: ≤ 22 mA

**Electrical connection**

- The use of shielded sensor cables is generally recommended. For a head transmitter in the 2-chamber field mount housing and for the DIN rail version, a shielded cable must be used for sensor cable lengths of 30 m or more.
- To operate the device via the HART® protocol (terminals 1 and 2 or terminals 9 and 10), a minimum load of 250 Ω is required in the signal circuit.

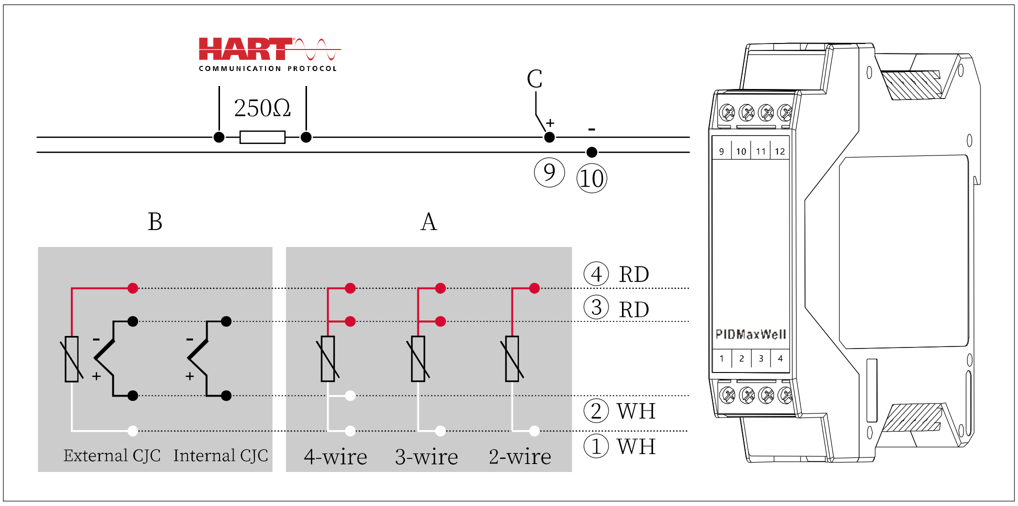
**Head transmitter**




Terminal assignment of the head transmitter

A Sensor input, RTD and Ω, 2-, 3- and 4-wire
B Sensor input, TC and mV, 2-wire (internal CJC) and 4-wire (external CJC)
C Display connection, CMS127 service interface
D Power supply, 4 to 20 mA output, and HART® (Only valid for products with this feature)

**DIN rail device**

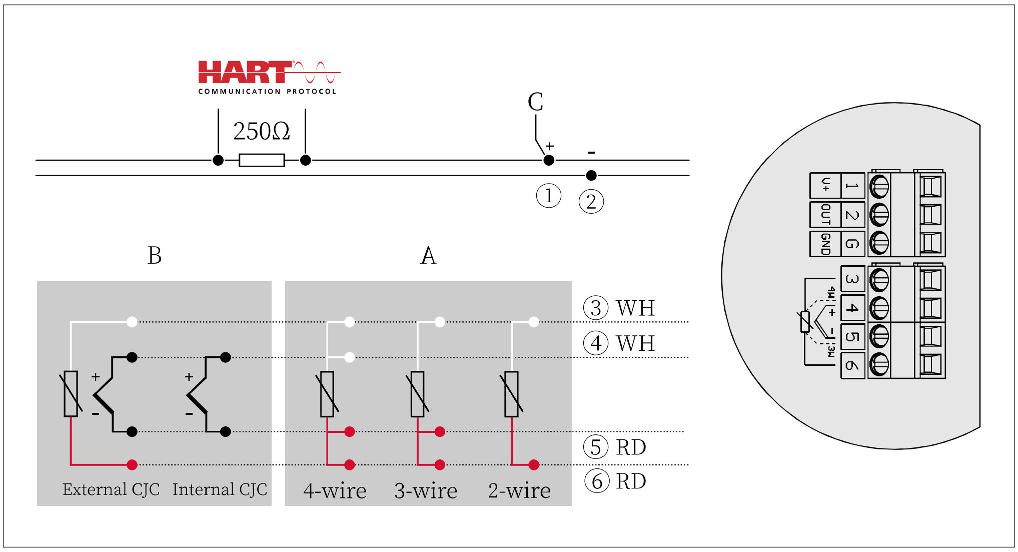



Assignment of terminal connections for DIN rail device

A Sensor input, RTD and Ω, 2-, 3- and 4-wire
B Sensor input, TC and mV, 2-wire (internal CJC) and 4-wire (external CJC)
C Power supply, 4 to 20 mA output, and HART® (Only valid for products with this feature)

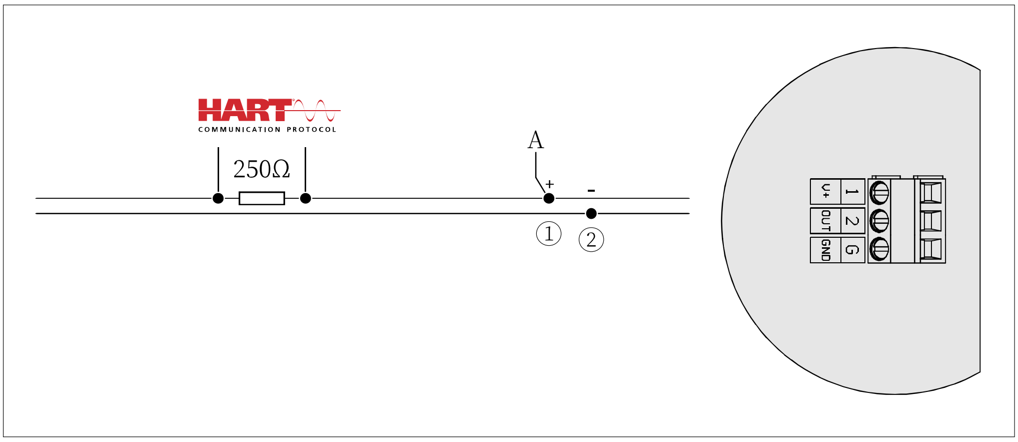
**Field mounted transmitters**

There are two types of housing for field mounter transmitters. Terminal assignment of 1-chamber can refer to the head transmitters; Terminal assignment of 2-chamber refer to the following diagram.




- Terminal assignment of 2-chamber field mount housing, Wiring diagram for split type sensors

A Sensor input, RTD and Ω, 2-, 3- and 4-wire
B Sensor input, TC and mV, 2-wire(internal CJC) and 4-wire(external CJC)
C Power supply、4 to 20 mA output, and HART® (Only valid for products with this feature)




- Terminal assignment of 2-chamber field mount housing, Wiring diagram for integrated sensor

A Power supply、4 to 20 mA output, and HART® (Only valid for products with this feature)

**Terminal**

Choice of screw terminals for sensor and power supply cables:

| Terminal design | Cable design | Type | Cable cross-section | Screwdriver |
|---|---|---|---|---|
| Screw terminals | Rigid or flexible | Head mounted | ⩽ 2 mm² (14 AWG) | Ph1、PH2, Cross |
| | | Rail mounted | ⩽ 2.5 mm² (13 AWG) | 0.6 x 3.5 mm, Flat |
| | | Field mounted (1-chamber housing) | ⩽ 2 mm² (14 AWG) | Ph1、PH2, Cross |
| | | Field mounted (2-chamber housing) | ⩽ 2.5 mm² (13 AWG) | 0.6 x 3.5 mm, Flat |

# Performance characteristics

**Response time**

The measured value update depends on the type of sensor and connection method and moves within the following ranges:

| | |
|---|---|
| Resistance thermometer (RTD) | 0.9 to 1.5 s (depends on the connection method 2/3/4-wire) |
| Thermocouples (TC) | 1.1 s |
| Reference temperature | 1.1 s |

**Update time**

Approx. 100 ms

**Reference operating conditions**

- Calibration temperature: +25 °C ±3 K (77 °F ±5.4 °F)
- Supply voltage: 24 V DC
- 4-wire circuit for resistance adjustment

**Maximum measured error**

In accordance with DIN EN 60770 and the reference conditions specified above. The measured error data correspond to ±2 σ (Gaussian distribution). The data include non-linearities and repeatability.

**Typical**

| Standard | Description | Measuring range | Typical measured error (±) | |
|---|---|---|---|---|
| **Resistance thermometer (RTD) as per standard** | | | Digital value [1] | Value at current output |
| IEC 60751: 2008 | Pt100 | 0 … +200 °C (32 … +392 °F) | 0.08 °C (0.14 °F) | 0.1 °C (0.18 °F) |
| IEC 60751: 2008 | Pt1000 | | 0.08 °C (0.14 °F) | 0.1 °C (0.18 °F) |
| | | | | |
| **Thermocouples (TC) as per standard** | | | Digital value | Value at current output |
| IEC 60584, Part 1<br>ASTM E230–3 | Type K（NiCr–Ni） | 0 … +800 °C (32 … +1472 °F) | 0.31 °C (0.56 °F) | 0.39 °C (0.7 °F) |
| IEC 60584, Part 1<br>ASTM E230–3 | Type S 型（PtRh10–Pt） | | 0.97 °C (1.75 °F) | 1.0 °C (1.8 °F) |

1) Measured value transmitted via HART®

### Measured error for resistance thermometers (RTD) and resistance transmitters

| Standard | Description | Measuring range | Measured error (±) | |
|---|---|---|---|---|
| | | | Digital 1) | D/A 2) |
| | | | Based on measured value 3) | |
| IEC 60751: 2008 | Pt50 | −200 … +850 °C (−328 … +1562 °F) | ME = ± [0.10 °C (0.18 °F) + 0.006 % * (MV − LRV)] | 0.03 % (≙ 4.8 µA) |
| | Pt100 | | ME = ± [0.06 °C (0.11 °F) + 0.006 % * (MV − LRV)] | |
| | Pt200 | | ME = ± [0.12 °C (0.22 °F) + 0.015 % * (MV − LRV)] | |
| | Pt500 | | ME = ± [0.05 °C (0.09 °F) + 0.014 % * (MV − LRV)] | |
| | Pt1000 | | ME = ± [0.03 °C (0.05 °F) + 0.013 % * (MV − LRV)] | |
| Edison curve #7 | Ni50 | −80 … +260 °C (−112 … + 500 °F) | ME = ± [0.05 °C (0.09 °F) − 0.006 % * (MV − LRV)] | |
| | Ni100 | | | |
| | Ni120 | | | |
| | Ni1000 | | ME = ± [0.03 °C (0.05 °F) − 0.013 % * (MV − LRV)] | |
| OIML R84: 2003<br>GOST 6651–2009 | Cu50 | −50 … +150 °C (−58 … +302 °F) | ME = ± [0.10 °C (0.18 °F) + 0.006 % * (MV − LRV)] | |
| | Cu100 | | ME = ± [0.05 °C (0.09 °F) + 0.003 % * (MV − LRV)] | |
| **Resistance transmitter** | Resistance Ω | 0 … 500 Ω | ME = ± 21 mΩ + 0.003 % * MV | 0.03 % (≙ 4.8 µA) |
| | | 0 … 5000 Ω | ME = ± 90 mΩ + 0.011 % * MV | |
| | | 0 … 20000 Ω | ME = ± 400 mΩ + 0.020 % * MV | |

1) Measured value transmitted via HART®.
2) Percentages based on the configured span of the analog output signal.
3) There may be a deviation between the calculation error caused by rounding and the maximum measurement error.

### Measured error for thermocouples (TC) and voltage transmitters

| Standard | Description | Measuring range | Measured error (±) | |
|---|---|---|---|---|
| | | | Digital 1) | D/A 2) |
| | | | Based on measured value 3) | |
| IEC 60584–1<br>ASTM E230–3 | B | +500 … +1820 °C (+932 … +3308 °F) | ME = ± [1.43 °C (2.57 °F) − 0.06 % * (MV − LRV)] | 0.03 % (≙ 4.8 µA) |
| IEC 60584–1<br>ASTM E230–3<br>ASTM E988–96 | C | 0 … +2000 °C (+32 … +3632 °F) | ME = ± [0.55 °C (0.99 °F) + 0.0055 % * (MV − LRV)] | |
| ASTM E988–96 | D | 0 … +2000 °C (+32 … +3632 °F) | ME = ± [0.85 °C (1.53 °F) − 0.008 % * (MV − LRV)] | |
| IEC 60584–1<br>ASTM E230–3 | E | −150 … +1000 °C (−238 … +1832 °F) | ME = ± [0.22 °C (0.40 °F) − 0.006 % * (MV − LRV)] | |
| | J | −150 … +1200 °C (−238 … +2192 °F) | ME = ± [0.27 °C (0.49 °F) − 0.005 % * (MV − LRV)] | |
| | K | −150 … +1200 °C (−238 … +2192 °F) | ME = ± [0.35 °C (0.63 °F) − 0.005 % * (MV − LRV)] | |
| | N | −150 … +1300 °C (−238 … +2372 °F) | ME = ± [0.48 °C (0.86 °F) − 0.014 % * (MV − LRV)] | |
| | R | +50 … +1768 °C (+122 … +3214 °F) | ME = ± [1.12 °C (2.02 °F) − 0.03 % * (MV − LRV)] | |
| | S | | ME = ± [1.15 °C (2.07 °F) − 0.022 % * (MV − LRV)] | |
| | T | −150 … +400 °C (−238 … +752 °F) | ME = ± [0.35 °C (0.63 °F) − 0.04 % * (MV − LRV)] | |
| **Voltage transmitter (mV)** | (mV) | −100 … +100 mV | ME = ± [7.7 µV + 0.0025 % * (MV − LRV)] | 4.8 µA |

1) Measured value transmitted via HART®.
2) Percentages based on the configured span of the analog output signal.
3) There may be a deviation between the calculation error caused by rounding and the maximum measurement error.

MV = Measured Value

LRV = Lower Range Value of relevant sensor

Total measured error of transmitter at current output = √(Measured error digital$^2$ + Measured error D/A$^2$)

**Sample calculation with Pt100, measuring range 0 to +200 °C (+32 to +392 °F), ambient temperature +25 °C (+77 °F), supply voltage 24 V:**

| | |
|---|---|
| Measured error digital = 0.06 °C + 0.006% x (200 °C - (-200 °C)): | 0.08 °C (0.15 °F) |
| Measured error D/A = 0.03 % x 200 °C (360 °F) | 0.06 °C (0.11 °F) |
| | |
| **Measured error digital value (HART):** | 0.08 °C (0.15 °F) |
| **Measured error analog value (current output): √(Measured error digital$^2$ + Measured error D/A$^2$)** | 0.10 °C (0.19 °F) |

**Sample calculation with Pt100, measuring range 0 to +200 °C (+32 to +392 °F), ambient temperature +35 °C (+95 °F), supply voltage 30 V:**

| | |
|---|---|
| Measured error digital = 0.06 °C + 0.006% x (200 °C - (-200 °C)): | 0.08 °C (0.15 °F) |
| Measured error D/A = 0.03 % x 200 °C (360 °F) | 0.06 °C (0.11 °F) |
| Influence of ambient temperature (digital) = (35 - 25) x (0.002% x 200 °C - (-200 °C)), min. 0.005 °C | 0.08 °C (0.14 °F) |
| Influence of ambient temperature (D/A) = (35 - 25) x (0.001% x 200 °C) | 0.02 °C (0.04 °F) |
| Influence of supply voltage (digital) = (30 - 24) x (0.002% x 200 °C - (-200 °C)), min. 0.005 °C | 0.05 °C (0.09 °F) |
| Influence of supply voltage (D/A) = (30 - 24) x (0.001% x 200 °C) | 0.01 °C (0.02 °F) |
| | |
| **Measured error digital value (HART):** √(Measured error digital$^2$ + Influence of ambient temperature (digital)$^2$ + Influence of supply voltage (digital)$^2$ | **0.13 °C (0.23 °F)** |
| **Measured error analog value (current output):** √(Measured error digital$^2$ + Measured error D/A$^2$ + Influence of ambient temperature (digital)$^2$ + Influence of ambient temperature (D/A)$^2$ + Influence of supply voltage (digital)$^2$ + Influence of supply voltage (D/A)$^2$ | **0.14 °C (0.25 °F)** |

The measured error data correspond to ±2 σ (Gaussian distribution).
MV = Measured Value
LRV = Lower Range Value of relevant sensor

| Physical input measuring range of sensors | |
|---|---|
| 0 to 500 Ω | Cu50、Cu100、Pt50、Pt100、Ni50、Ni100、Ni120 |
| 0 to 5000 Ω | Pt200、Pt500、Pt1000、Ni1000 |
| 0 to 20000 Ω | Linear resistance (such as reed level gauge) |
| –100 to 100 mV | Thermocouples type: B、C、D、E、J、K、N、R、S、T |

**Current output adjustment** Correction of 4 or 20 mA current output value (not possible in SIL mode)

**Operating influences** The measured error data correspond to ±2 σ (Gaussian distribution).

**Influence of ambient temperature and supply voltage on operation for resistance thermometers (RTD) and resistance transmitters**

| Description | Standard | Ambient temperature: Influence (±) per 1 °C (1.8 °F) change | | | Supply voltage: Influence (±) per 1 V change | | |
|---|---|---|---|---|---|---|---|
| | | Digital [1] | | D/A [2] | Digital [1] | | D/A [2] |
| | | Maximum | Based on measured value | | Maximum | Based on measured value | |
| Pt50 | | ⩽ 0.03 °C (0.054 °F) | 0.002 % x (MV – LRV), at least 0.01 °C (0.018 °F) | | ⩽ 0.03 °C (0.054 °F) | 0.002 % x (MV – LRV), at least 0.01 °C (0.018 °F) | |
| Pt100 | | ⩽ 0.02 °C (0.036 °F) | 0.002 % x (MV – LRV), at least 0.005 °C (0.009 °F) | | ⩽ 0.02 °C (0.036 °F) | 0.002 % x (MV – LRV), at least 0.005 °C (0.009 °F) | |
| Pt200 | IEC 60751: 2008 | ⩽ 0.026 °C (0.047 °F) | – | | ⩽ 0.026 °C (0.047 °F) | – | |
| Pt500 | | ⩽ 0.014 °C (0.025 °F) | 0.002 % x (MV – LRV), at least 0.009 °C (0.016 °F) | | ⩽ 0.014 °C (0.025 °F) | 0.002 % x (MV – LRV), at least 0.009 °C (0.016 °F) | |
| Pt1000 | | ⩽ 0.01 °C (0.018 °F) | 0.002 % x (MV – LRV), at least 0.004 °C (0.007 °F) | 0.001 % | ⩽ 0.01 °C (0.018 °F) | 0.002 % x (MV – LRV), at least 0.004 °C (0.007 °F) | 0.001 % |
| Ni50 | | | – | | | – | |
| Ni100 | Edison curve #7 | ⩽ 0.005 °C (0.009 °F) | – | | ⩽ 0.005 °C (0.009 °F) | – | |
| Ni120 | | | – | | | – | |
| Ni1000 | | | – | | | – | |
| Cu50 | OIML R84: 2003 GOST 6651–2009 | ⩽ 0.008 °C (0.014 °F) | – | | ⩽ 0.008 °C (0.014 °F) | – | |
| Cu100 | | | 0.002 % x (MV – LRV), at least 0.004 °C (0.007 °F) | | | 0.002 % x (MV – LRV), at least 0.004 °C (0.007 °F) | |
| **Resistance transmitter (Ω)** | | | | | | | |
| 0 … 500 Ω | | 6 mΩ | 0.0015 % x (MV – LRV), at least 1.5 mΩ | 0.001 % | 6 mΩ | 0.0015 % x (MV – LRV), at least 1.5 mΩ | 0.001 % |
| 0 … 5000 Ω | | 60 mΩ | 0.0015 % x (MV – LRV), at least 15 mΩ | | 60 mΩ | 0.0015 % x (MV – LRV), at least 15 mΩ | |

1) Measured value transmitted via HART®
2) Percentages based on the configured span of the analog output signal

MV = Measured Value

LRV = Lower Range Value of relevant sensor

Total measured error of transmitter at current output = $\sqrt{}$(Measured error digital$^2$ + Measured error D/A$^2$)

**Influence of ambient temperature and supply voltage on operation for thermocouples (TC) and voltage transmitters**

| Description | Standard | Ambient temperature: Influence (±) per 1 °C (1.8 °F) change | | | Supply voltage: Influence (±) per 1 V change | | |
|---|---|---|---|---|---|---|---|
| | | Digital 1) | | D/A 2) | Digital 1) | | D/A 2) |
| | | Maximum | Based on measured value | | Maximum | Based on measured value | |
| Type B | IEC 60584–1<br>ASTM E230–3 | ⩽ 0.06 °C<br>(0.11 °F) | – | | ⩽ 0.06 °C<br>(0.11 °F) | – | |
| Type C | IEC 60584–1<br>ASTM E230–3<br>ASTM E988–96 | ⩽ 0.09 °C<br>(0.16 °F) | 0.0045 % x (MV – LRV),<br>at least 0.03 °C (0.054 °F) | | ⩽ 0.09 °C<br>(0.16 °F) | 0.0045 % x (MV – LRV),<br>at least 0.03 °C (0.054 °F) | |
| Type D | ASTM E988–96 | ⩽ 0.08 °C<br>(0.14 °F) | 0.004 % x (MV – LRV),<br>at least 0.035 °C (0.063 °F) | | ⩽ 0.08 °C<br>(0.14 °F) | 0.004 % x (MV – LRV),<br>at least 0.035 °C (0.063 °F) | |
| Type E | | ⩽ 0.03 °C<br>(0.05 °F) | 0.003 % x (MV – LRV),<br>at least 0.016 °C (0.029 °F) | | ⩽ 0.03 °C<br>(0.05 °F) | 0.003 % x (MV – LRV),<br>at least 0.016 °C (0.029 °F) | |
| Type J | | ⩽ 0.02 °C<br>(0.04°F) | 0.0028 % x (MV – LRV),<br>at least 0.02 °C (0.036 °F) | 0.001 % | ⩽ 0.02 °C<br>(0.04 °F) | 0.0028 % x (MV – LRV),<br>at least 0.02 °C (0.036 °F) | 0.001 % |
| Type K | | ⩽ 0.04 °C<br>(0.07°F) | 0.003 % x (MV – LRV),<br>at least 0.013 °C (0.023 °F) | | ⩽ 0.04 °C<br>(0.07°F) | 0.003 % x (MV – LRV),<br>at least 0.013 °C (0.023 °F) | |
| Type N | IEC 60584–1<br>ASTM E230–3 | | 0.0028 % x (MV – LRV),<br>at least 0.02 °C (0.036 °F) | | | 0.0028 % x (MV – LRV),<br>at least 0.02 °C (0.036 °F) | |
| Type R | | ⩽ 0.06 °C<br>(0.11 °F) | 0.0035 % x (MV – LRV),<br>at least 0.047 °C (0.085 °F) | | ⩽ 0.06 °C<br>(0.11 °F) | 0.0035 % x (MV – LRV),<br>at least 0.047 °C (0.085 °F) | |
| Type S | | ⩽ 0.05 °C<br>(0.09 °F) | – | | ⩽ 0.05 °C<br>(0.09 °F) | – | |
| Type T | | ⩽ 0.01 °C<br>(0.02 °F) | – | | ⩽ 0.01 °C<br>(0.02 °F) | – | |
| **Voltage transmitter (mV)** | | | | | | | |
| –100 … 100 mV | | ⩽ 3 µV | | 0.001 % | ⩽ 3 µV | | 0.001 % |

1) Measured value transmitted via HART®
2) Percentages based on the configured span of the analog output signal

MV = Measured Value

LRV = Lower Range Value of relevant sensor

Total measured error of transmitter at current output = √(Measured error digital$^2$ + Measured error D/A$^2$)

### Long-term drift, resistance thermometers (RTD) and resistance transmitters

| Description | Standard | Long-term drift (±) [1] | | |
|---|---|---|---|---|
| | | after 1 year | after 3 years | after 5 years |
| | | Based on measured value | | |
| Pt100 | IEC 60751: 2008 | ⩽ 0.016 % x (MV – LRV), or 0.04 °C (0.07 °F) | ⩽ 0.025 % x (MV – LRV), or 0.05 °C (0.09 °F) | ⩽ 0.028 % x (MV – LRV), or 0.06 °C (0.10 °F) |
| Pt200 | | 0.25 °C (0.44 °F) | 0.41 °C (0.73 °F) | 0.50 °C (0.91 °F) |
| Pt500 | | ⩽ 0.018 % x (MV – LRV), or 0.08 °C (0.14 °F) | ⩽ 0.03 % x (MV – LRV), or 0.14 °C (0.25 °F) | ⩽ 0.036 % x (MV – LRV), or 0.17 °C (0.31 °F) |
| Pt1000 | | ⩽ 0.0185 % x (MV – LRV), or 0.04 °C (0.07 °F) | ⩽ 0.031 % x (MV – LRV), or 0.07 °C (0.12 °F) | ⩽ 0.038 % x (MV – LRV), or 0.08 °C (0.14 °F) |
| Ni100 | Edison curve #7 | 0.04 °C (0.06 °F) | 0.05 °C (0.10 °F) | 0.06 °C (0.11 °F) |
| Ni120 | | | | |
| Cu50 | OIML R84: 2003<br>GOST 6651–2009 | 0.06 °C (0.10 °F) | 0.09 °C (0.16 °F) | 0.11 °C (0.20 °F) |
| Cu100 | | ⩽ 0.015 % x (MV – LRV), or 0.04 °C (0.06 °F) | ⩽ 0.024 % x (MV – LRV), or 0.06 °C (0.10 °F) | ⩽ 0.027 % x (MV – LRV), or 0.06 °C (0.11 °F) |
| **Resistance transmitter (Ω)** | | | | |
| 0 … 500 Ω | | ⩽ 0.0122 % x (MV – LRV), or 12 mΩ | ⩽ 0.02 % x (MV – LRV), or 20 mΩ | ⩽ 0.022 % x (MV – LRV), or 22 mΩ |
| 0 … 5000Ω | | ⩽ 0.015 % x ( MV – LRV), or 144 mΩ | ⩽ 0.024 % x (MV – LRV), or 240 mΩ | ⩽ 0.03 % x (MV – LRV), or 295 mΩ |

1) Whichever is greater

### Long-term drift, thermocouples (TC) and voltage transmitters

| Description | Standard | Long-term drift (±) [1] | | |
|---|---|---|---|---|
| | | after 1 year | after 3 years | after 5 years |
| | | Based on measured value | | |
| B 型 | IEC 60584–1<br>ASTM E230–3 | 1.08 °C (1.94 °F) | 1.63 °C (2.93 °F) | 2.23 °C (4.01 °F) |
| C 型 | IEC 60584–1<br>ASTM E230–3<br>ASTM E988–96 | ⩽ 0.038 % x (MV – LRV), or 0.41 °C (0.74 °F) | ⩽ 0.057 % x (MV – LRV), or 0.62 °C (1.12 °F) | ⩽ 0.078 % x (MV – LRV), or 0.85 °C (1.53 °F) |
| D 型 | ASTM E988–96 | ⩽ 0.035 % x (MV – LRV), or 0.57 °C (1.03 °F) | ⩽ 0.052 % x (MV – LRV), or 0.86 °C (1.55 °F) | ⩽ 0.071 % x (MV – LRV), or 1.17 °C (2.11 °F) |
| E 型 | IEC 60584–1<br>ASTM E230–3 | ⩽ 0.024 % x (MV – LRV), or 0.15 °C (0.27 °F) | ⩽ 0.037 % x (MV – LRV), or 0.23 °C (0.41 °F) | ⩽ 0.05 % x (MV – LRV), or 0.31 °C (0.56 °F) |
| J 型 | | ⩽ 0.025 % x (MV – LRV), or 0.17 °C (0.31 °F) | ⩽ 0.037 % x (MV – LRV), or 0.25 °C (0.45 °F) | ⩽ 0.051 % x (MV – LRV), or 0.34 °C (0.61 °F) |
| K 型 | | ⩽ 0.027 % x (MV – LRV), or 0.23 °C (0.41 °F) | ⩽ 0.041 % x (MV – LRV), or 0.35 °C (0.63 °F) | ⩽ 0.056 % x (MV – LRV), or 0.48 °C (0.86 °F) |
| N 型 | | 0.36 °C (0.65 °F) | 0.55 °C (0.99 °F) | 0.75 °C (1.35 °F) |
| R 型 | | 0.83 °C (1.49 °F) | 1.26 °C (2.27 °F) | 1.72 °C (3.10 °F) |
| S 型 | | 0.84 °C (1.51 °F) | 1.27 °C (2.29 °F) | 1.73 °C (3.11 °F) |
| T 型 | | 0.25 °C (0.45 °F) | 0.37 °C (0.67 °F) | 0.51 °C (0.92 °F) |
| **Voltage transmitter (mV)** | | | | |
| –100 … 100 mV | | ⩽ 0.027 % x (MV – LRV), or 5.5 µV | ⩽ 0.041 % x (MV – LRV), or 8.2 µV | ⩽ 0.056 % x (MV – LRV), or 11.2 µV |

1) Whichever is greater

### Long-term drift analog output

| Long term drift D/A[1] (±) | | |
|---|---|---|
| after 1 year | after 3 years | after 5 years |
| 0.021 % | 0.029 % | 0.031 % |

1) Percentages based on the configured span of the analog output signal.

**Influence of reference junction**

- Pt1000 DIN IEC 60751 Class B (internal cold junction with thermocouples TC)
- Pt100 DIN IEC 60751 Class A (external cold junction with thermocouples TC)

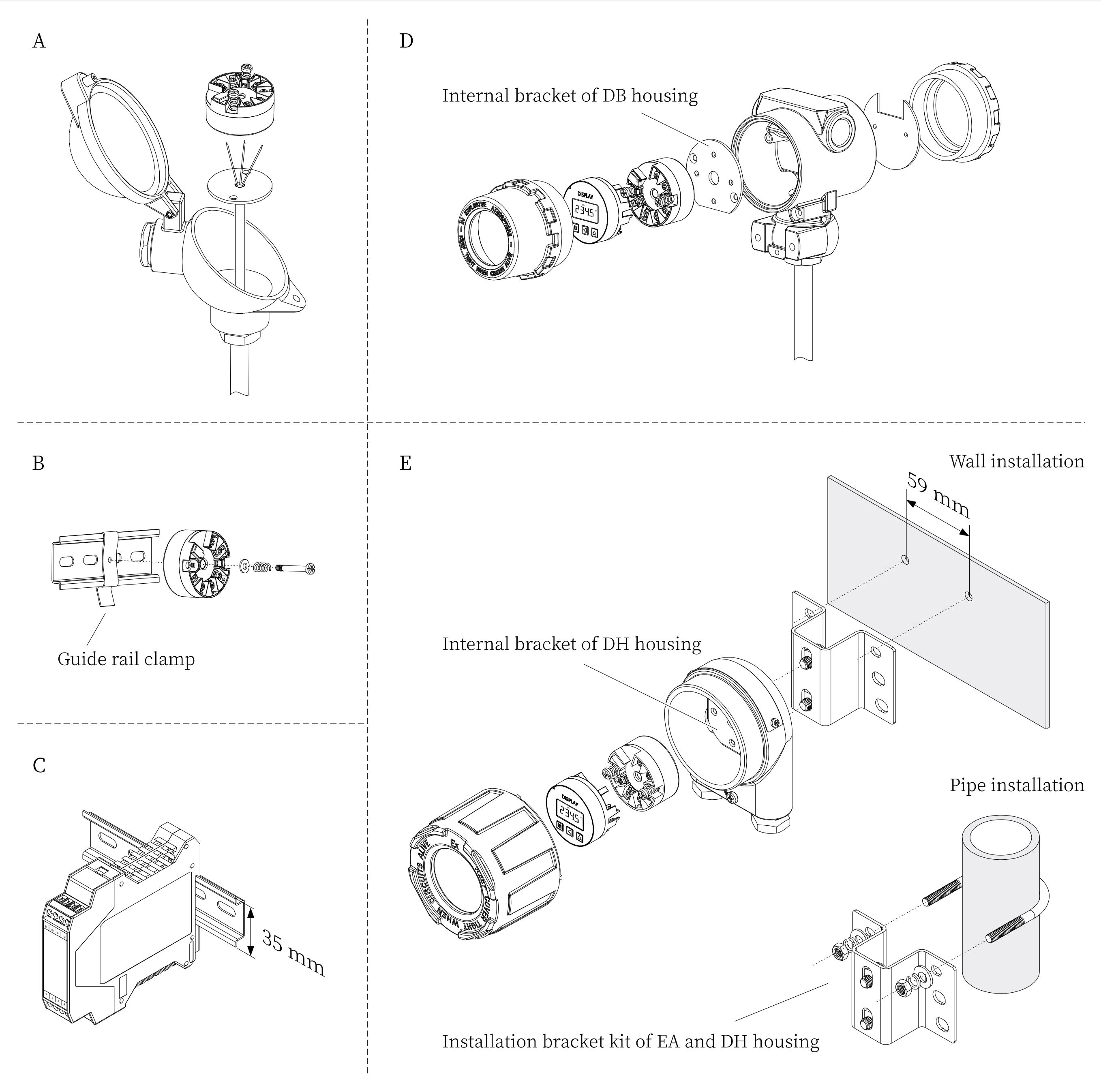
### ANSI and IEC Color Codes for Thermocouples, Wire and Connectors

| ANSI Code | ANSI / ASTM E–230 Color Coding | | Alloy Combination | | Comments Environment Bare Wire | IEC 60584–3 Color Coding | | IEC Code |
|---|---|---|---|---|---|---|---|---|
| connector | Thermocouple Grade | Extension Grade | + Lead | + Lead | | Thermocouple Grade | Intrinsically Safe | connector |
| E | | | NICKEL-CHROMIUM Ni-Cr | COPPER-NICKEL Cu-Ni | Oxidizing or Inert. Limited Use in Vacuum or Reducing. Highest EMF Change Per Degree. | | | E |
| J | | | IRON Fe | COPPER-NICKEL Cu–Ni | Reducing, Vacuum, Inert. Limited Use in Oxidizing at High Temperatures. Not Recommended for Low Temperatures. | | | J |
| K | | | NICKEL-CHROMIUM Ni-Cr | NICKEL Ni | Clean Oxidizing and Inert. Limited Use in Vacuum or Reducing. Wide Temperature Range, Most Popular Calibration. | | | K |
| N | | | NICROSIL Ni-Cr-Si | NISIL Ni-Si | Alternative to Type K. More Stable at High Temperatures. | | | N |
| T | | | COPPER Cu | COPPER-NICKEL Cu–Ni | Mild Oxidizing, Reducing Vacuum or Inert. Good Where Moisture Is Present. Low Temperature & Cryogenic Applications. | | | T |
| R | NONE | | PLATINUM-13% RHODIUM Pt-13 % Rh | PLATINUM Pt | Oxidizing or Inert. Do Not Insert in Metal Tubes. Beware of Contamination. High Temperature. | | | R |
| S | NONE | | PLATINUM-10% RHODIUM Pt-10 % Rh | PLATINUM Pt | Oxidizing or Inert. Do Not Insert in Metal Tubes. Beware of Contamination. High Temperature. | | | S |
| B | NONE | | PLATINUM-30% RHODIUM Pt-30 % Rh | PLATINUM-6% RHODIUM Pt-6 % Rh | Oxidizing or Inert. Do Not Insert in Metal Tubes. Beware of Contamination. High Temperature. Common Use in Glass Industry. | | | B |
| C* (W5) | NONE | | TUNGSTEN-5% RHENIUM W-5 % Re | TUNGSTEN-26% RHENIUM W-26 % Re | Vacuum, Inert, Hydrogen. Beware of Embrittlement. Not Practical Below 399 °C (750 °F) Not for Oxidizing Atmosphere. | NO STANDARD USE ANSI COLOR CODE | | C (W5) |
| D* (W3) | NONE | | TUNGSTEN 3% RHENIUM W-3 % Re | TUNGSTEN 25% RHENIUM W-25 % Re | Vacuum, Inert, Hydrogen. Beware of Embrittlement. Not Practical Below 399 °C (750 °F) – Not for Oxidizing Atmosphere. | NO STANDARD USE ANSI COLOR CODE | | D (W3) |

* Not official symbol or standard designation

# Installation

### Mounting location




• Mounting location options for the transmitter

A Terminal head Form B as per DIN EN 50446, direct installation on insert with cable entry (middle hole 6 mm ), make sure there is sufficient space in the terminal head!
B With DIN rail clip on DIN rail as per IEC 60715 (35 mm)
C DIN rail device for mounting on a TH35 mounting rail as per EN 60715
D 2-chamber field housing, assembled into an integrated temperature transmitter, with display (eg: DB housing)
E 1-chamber field housing, assembled into a split-type temperature transmitter, allowing wall or pipe installation (eg:DH housing)

**Orientation**

- Head transmitter: no restrictions.
- Rail transmitter: ensure that it is correctly aligned (sensor connected at the bottom/power supply at the top).

With DIN rail ransmitter: The measurement deviates from the maximum accuracy when a thermocouple is connected and the internal reference junction is used.

## Environment

| | |
|---|---|
| **Ambient temperature range** | ▪ –40 … +85 °C (–40 … +185 °F)；for hazardous areas see Ex documentation<br>▪ –50 … +85 °C (–58 … +185 °F)；for hazardous areas see Ex documentation, Customization required for use in low-temperature environments [1)]<br>▪ Head transmitter, field mount housing with separate terminal compartment incl. display: –30 … +80 °C (–22 … +176 °F) 。At temperatures < –25 °C (–13 °F) ，the display may react slowly |
| **Storage temperature** | ▪ Head transmitter ：–50 … +100 °C (–58 … +212 °F)<br>▪ Head transmitter, field mount housing with separate terminal compartment incl. display: –40 … +85 °C (–40 … +185 °F)<br>▪ DIN rail temperature transmitter：–40 … +100 °C (–40 … +212 °F) |
| **Altitude** | Up to 4000 m (4374.5 yards) above mean sea level. |
| **Humidity** | ▪ Condensation:<br>  ▪ Head transmitter permitted<br>  ▪ DIN rail transmitter not permitted<br>▪ Max. rel. humidity: 95% as per IEC 60068-2-30 |
| **Climate class** | ▪ Head transmitter: climate class C1 as per IEC 60654-1<br>▪ DIN rail device: climate class B2 as per IEC 60654-1<br>▪ Head transmitter, field mount housing with separate terminal compartment including display: climate Class Dx as per IEC 60654-1 |
| **Degree of protection** | ▪ Head transmitter ：IP 00<br>In installed state,depends on the field housing used.<br>▪ When installing in field housing BS or DA、DH：IP 65 / IP 67<br>▪ Installed in field housing with a dual side：IP 67<br>▪ DIN rail transmitter ：IP 20 |
| **Shock and vibration resistance** | Vibration resistance as per DIN EN 60068-2-27<br>▪ Head transmitter ：2 … 100 Hz, 4 g（increased vibration stress)<br>▪ DIN rail transmitter ：2 … 100 Hz, 0.7 g（general vibration stress)<br>Shock resistance as per KTA 3505 (section 5.8.4 Shock test) |
| **Electromagnetic compatibility (EMC)** | **CE compliance**<br>Electromagnetic compatibility in accordance with all the relevant requirements of the IEC/EN 61326 series and NAMUR Recommendation EMC (NE21). For details, refer to the Declaration of Conformity. All tests were passed both with and without ongoing digital HART®-communication.<br>▪ Maximum measured error <1% of measuring range.<br>▪ Interference immunity as per IEC/EN 61326 series, industrial requirements<br>▪ Interference emission as per IEC/EN 61326 series, Class B equipment |
| **Overvoltage category** | Overvoltage category II |
| **Degree of contamination** | Pollution degree 2 |

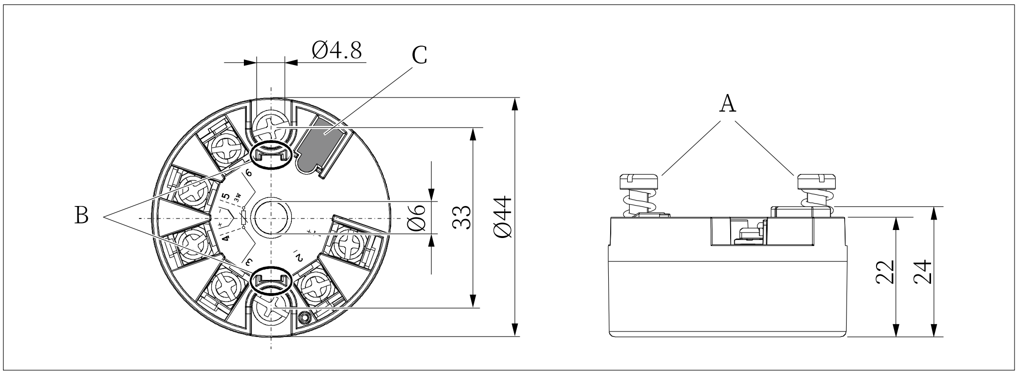
1) If the temperature is below –40 °C (–40 °F)，increased failure rates are likely.

# Mechanical construction

**Design, dimensions**

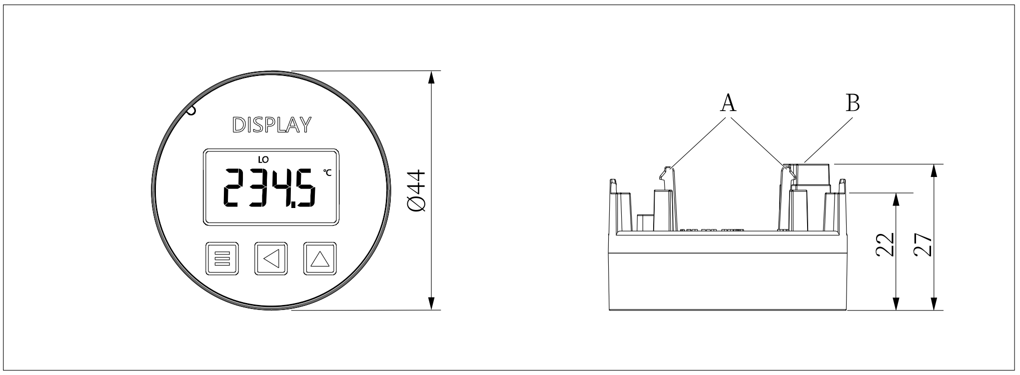
Dimensions in mm

**Head transmitter**



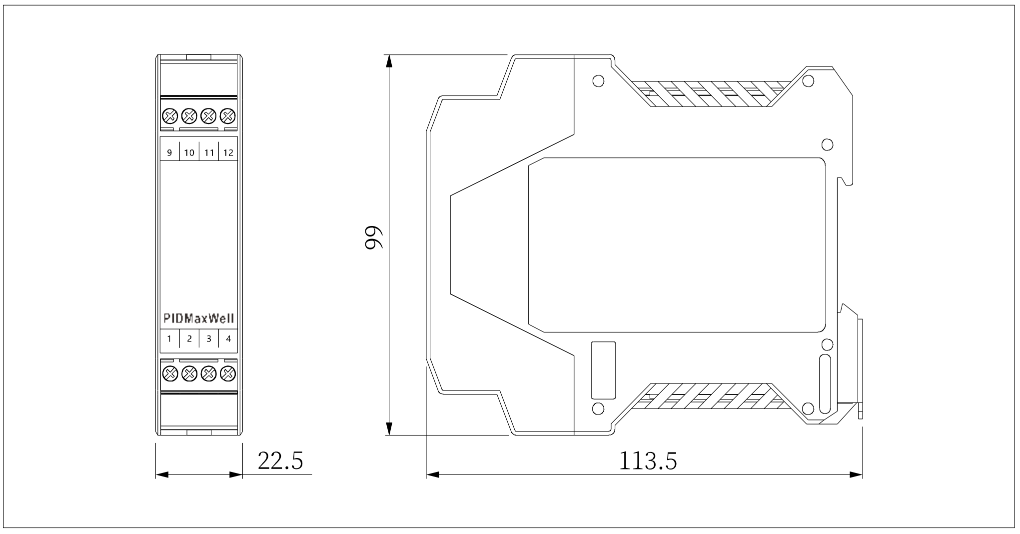

A Spring travel L ⩾ 5 mm (M4 securing screws)
B Mounting elements for attachable measured value display DAE019
C CMS127 service interface for connecting measured value display or configuration tool

**Attachable measured value display**




A Install components to secure the display unit and modular temperature transmitter
B CMS127 service interface for connecting head transmitter

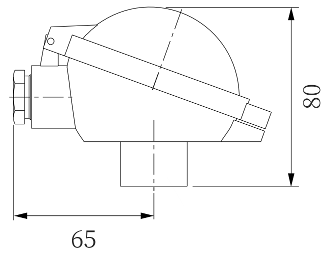
**DIN rail transmitter**

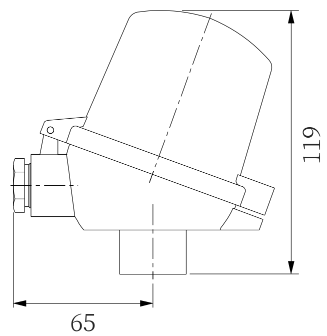


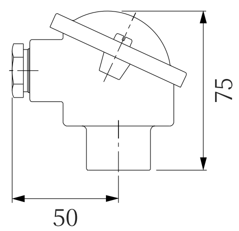
**Field housing**

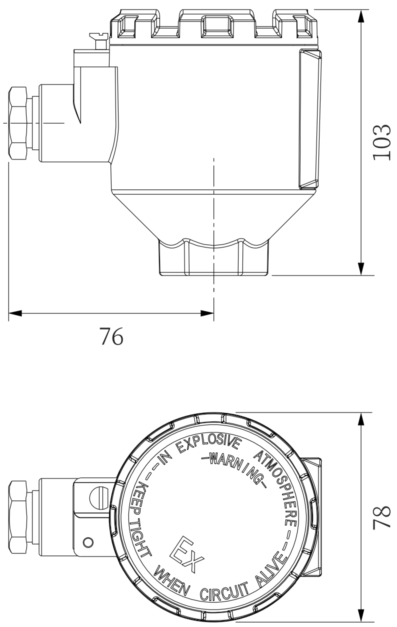
All field housings have an internal geometry in accordance with DIN EN 50446, form B .
Cable glands in the diagrams: M20x1.5

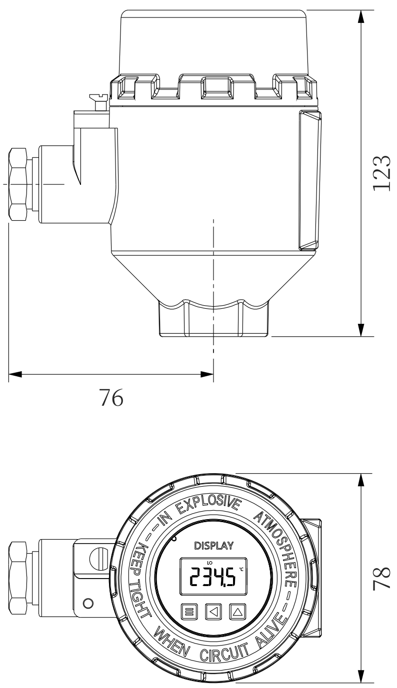
| **Maximum ambient temperatures for cable glands** | |
|---|---|
| **Type** | **Temperature range** |
| Polyamide cable gland ½" NPT, M20x1.5 (non-Ex) | –40 … +100 °C (–40 … +212 °F) |
| Polyamide cable gland M20x1.5 (for dust ignition-proof area) | –20 … +95 °C (–4 … +203 °F) |
| Metal nickel plated cable gland M20x1.5 (for dust ignition-proof area) | –20 … +130 °C (–4 … +266 °F) |
| 304 stainless steel M20x1.5 (for explosion-proof area) | –40 … +85 °C (–40 … +185 °F) |

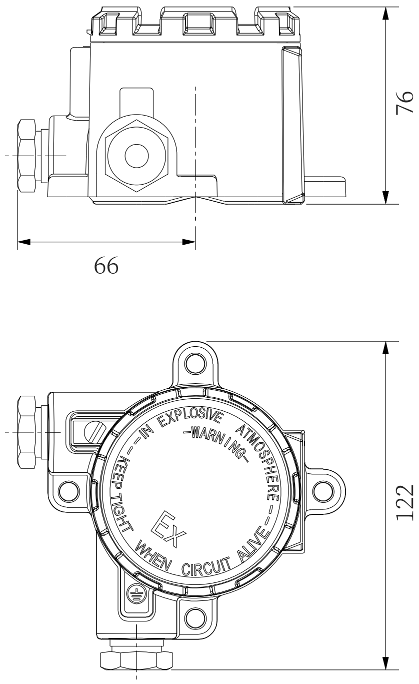
| BS | Specification |
|---|---|
|  | ▪ One cable entry<br>▪ Protection class: IP 65<br>▪ Material: aluminum, polyester powder coated<br>▪ Seals: silicone<br>▪ Cable entry glands: M20x1.5<br>▪ Sensor inlet thread: M20x1.5(F)<br>▪ Head color: off white<br>▪ Cap color: off white<br>▪ Weight: approx. 290 g |

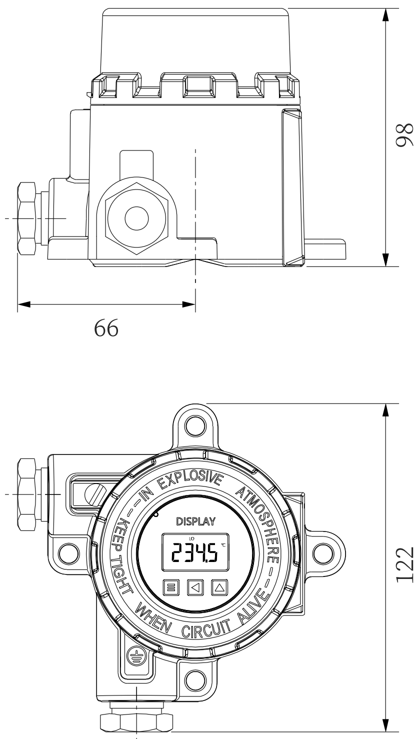
| BH | Specification |
|---|---|
|  | ▪ One cable entry<br>▪ Protection class: IP 65<br>▪ Material: aluminum, polyester powder coated<br>▪ Seals: silicone<br>▪ Cable entry glands: M20x1.5<br>▪ Sensor inlet thread: M20x1.5(F)<br>▪ Two head transmitters can be mounted. In the standard configuration one transmitter is mounted in the terminal head cover and an additional terminal block is installed directly on the insert.<br>▪ Head color: off white<br>▪ Cap color: off white<br>▪ Weight: single transmitter approx. 340 g<br>dual transmitters approx. 390 g |

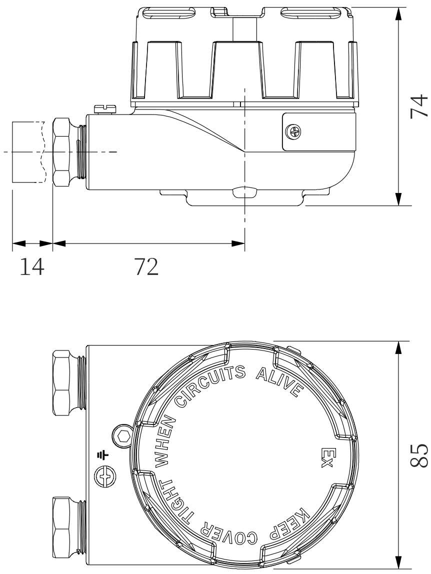
| BK | Specification |
|---|---|
|  | ▪ One cable entry<br>▪ Protection class: IP 65<br>▪ Material: aluminum, paint coated<br>▪ Seals: silicone<br>▪ Cable entry glands: M20x1.5<br>▪ Sensor inlet thread: M20x1.5(F)<br>▪ Head color: silvery<br>▪ Cap color: silvery<br>▪ Weight: approx.210 g |

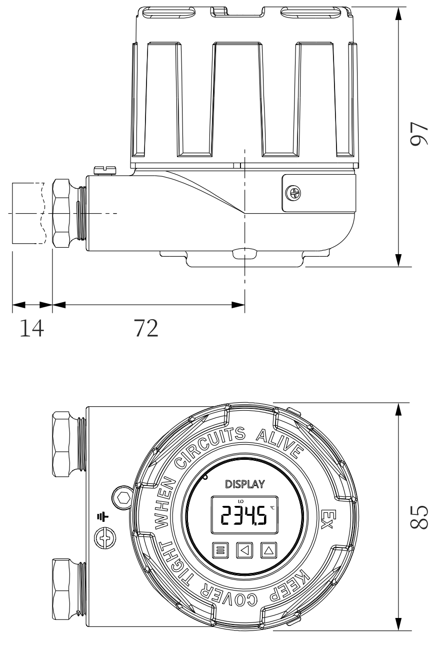
| EX | Specification |
|---|---|
|  | ▪ One cable entry<br>▪ Protection class: IP 67<br>▪ Material: aluminum, polyester powder coated<br>▪ Seals: silicone<br>▪ Cable entry glands: M20x1.5<br>▪ Sensor inlet thread: M20x1.5(F)<br>▪ Head color: off white<br>▪ Cap color: off white<br>▪ Weight: approx. 600 g |

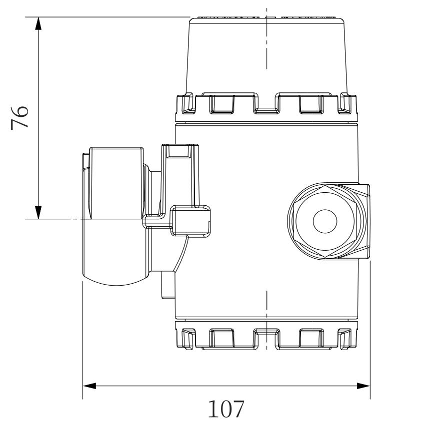
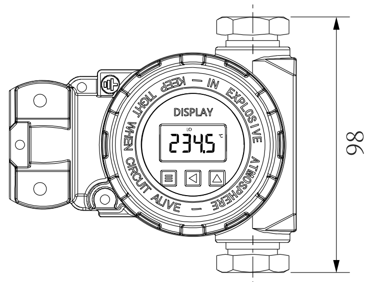
| DX (With display window) | Specification |
|---|---|
|  | ▪ One cable entry<br>▪ Protection class: IP 67<br>▪ Material: aluminum, polyester powder coated<br>▪ Seals: silicone<br>▪ Cable entry glands: M20x1.5<br>▪ Sensor inlet thread: M20x1.5(F)<br>▪ Head color: off white<br>▪ Cap color: off white<br>▪ Weight: approx. 690 g |

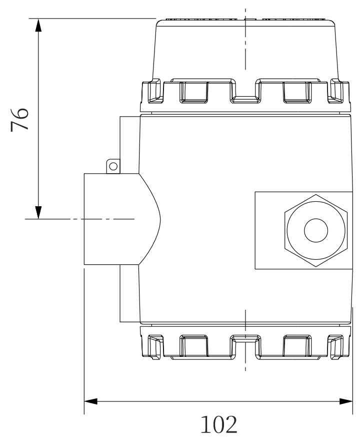
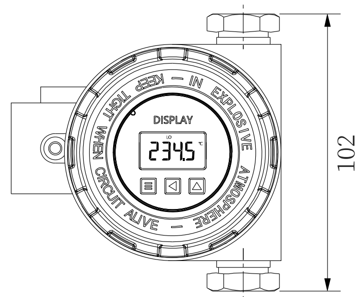
| EY | Specification |
| --- | --- |
|   | ▪ One or two cable entries<br>▪ Protection class: IP 67<br>▪ Material: aluminum, polyester powder coated<br>▪ Seals: silicone<br>▪ Cable entry glands: M20x1.5<br>▪ Sensor inlet thread: M20x1.5(F)<br>▪ Head color: off white<br>▪ Cap color: off white<br>▪ Weight: approx. 730 g |

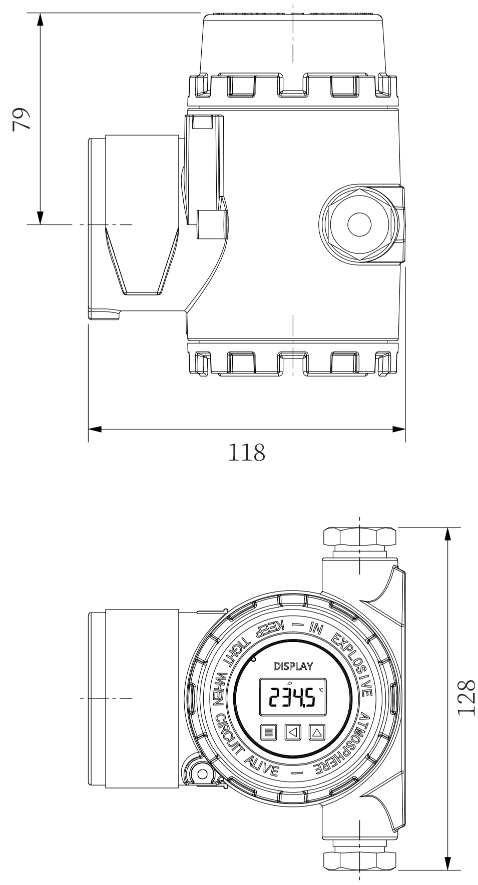
| DY (With display window) | Specification |
| --- | --- |
|   | ▪ One or two cable entries<br>▪ Protection class: IP 67<br>▪ Material:<br>  ▪ aluminum, polyester powder coated<br>  ▪ 316L stainless steel, uncoated<br>▪ Seals: silicone<br>▪ Cable entry glands: M20x1.5<br>▪ Sensor inlet thread: M20x1.5(F)<br>▪ Aluminum head color: off white<br>▪ Aluminum cap color: off white<br>▪ Weight:<br>  ▪ aluminum, approx. 820 g<br>  ▪ 316L stainless stee, approx. 1700 g |

| EA | Specification |
| --- | --- |
|  | ▪ Flameproof version, explosion-protected with one or two cable entries<br>▪ Protection class: IP 67<br>▪ Material: aluminum, polyester powder coated<br>▪ Seals: silicone<br>▪ Cable entry glands: M20x1.5<br>▪ Cable glands adapter:<br>  ▪ M20x1.5(M) – 1/2" NPT(F)<br>  ▪ M20x1.5(M) – M20x1.5(F)<br>  ▪ M20x1.5(M) – G1/2(F)<br>▪ Sensor inlet thread: M20x1.5(F)<br>▪ Head color: off white<br>▪ Cap color: off white<br>▪ Weight: about 630 g |

| DH (With display window) | Specification |
| --- | --- |
|  | ▪ Flameproof version, explosion-protected with one or two cable entries<br>▪ Protection class: IP 67<br>▪ Material:<br>  ▪ aluminum, polyester powder coated<br>  ▪ 316L stainless steel, uncoated<br>▪ Seals: silicone<br>▪ Cable entry glands: M20x1.5<br>▪ Cable glands adapter:<br>  ▪ M20x1.5(M) – 1/2" NPT(F)<br>  ▪ M20x1.5(M) – M20x1.5(F)<br>  ▪ M20x1.5(M) – G1/2(F)<br>▪ Sensor inlet thread: M20x1.5(F)<br>▪ Aluminum head color: off white<br>▪ Aluminum cap color: off white<br>▪ Weight:<br>  ▪ aluminum, about 820 g<br>  ▪ 316L stainless steel, approx. 1800 g |

| DB（With display window） | Specification |
|---|---|
|     | ▪ Two cable entries<br>▪ Protection class：IP 67<br>▪ Material: aluminum, polyester powder coated<br>▪ Seals: silicone<br>▪ Cable entry glands: M20x1.5<br>▪ Sensor inlet thread：M20x1.5（Within F）<br>▪ Head color：off white<br>▪ Cap color：off white<br>▪ Weight：approx. 810 g |

| DG（With display window） | Specification |
|---|---|
|     | ▪ Two cable entries<br>▪ Protection class：IP 67<br>▪ Material: aluminum, polyester powder coated<br>▪ Seals: silicone<br>▪ Cable entry glands: M20x1.5<br>▪ Sensor inlet thread：M20x1.5（Within F）<br>▪ Head color：off white<br>▪ Cap color：off white<br>▪ Weight：approx. 960 g |

| DC (With display window) | Specification |
|---|---|
|  | ▪ Two cable entries<br>▪ Protection class: IP 67<br>▪ Material: aluminum, polyester powder coated<br>▪ Seals: silicone<br>▪ Cable entry glands: M20x1.5<br>▪ Sensor inlet thread: M55x55° –16 threads (F)<br>▪ Head color: off white<br>▪ Cap color: off white<br>▪ Weight: approx. 1400 g |

**Weight**

- Head transmitter : approx. 40 ... 50 g
- Attachable measured value display : approx. 20 g
- DIN rail transmitter : approx. 120 g
- Field housing: see specifications

**Materials**

All the materials used are RoHS-compliant.

- Head housing: polycarbonate (PC)
- DIN rail housing : polyamide (PA66)
- Screw terminals: nickel-plated brass
- Potting compound:
  - Head transmitter : silica gel
  - DIN rail housing : silica gel
- Field housing: see specifications

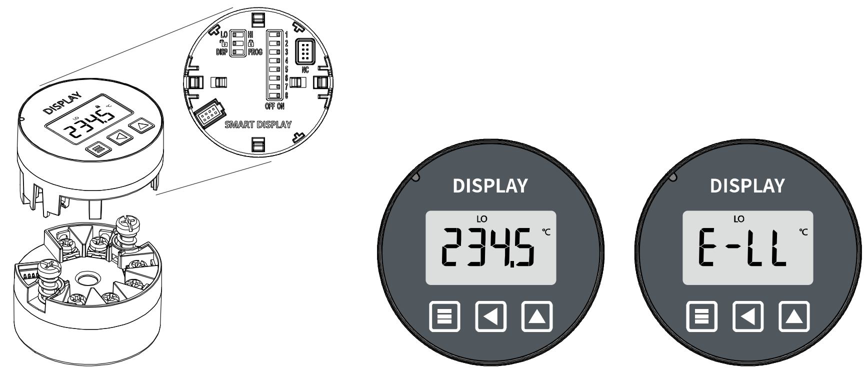
# Operability

## Local operation

### Head transmitter

The head transmitter has no display or operating elements. There is the option of using the attachable measured value display DAE019 together with the head transmitter. When the head transmitter will be ordered with the field mount housing with windows(Dx series), the display is already included.

- The display provides plain-text information on the current measured value, temperature unit, and preset fault output as "low current alarm" or "high current alarm"
- In the event of a fault in the measurement chain, this will be displayed in inverse color showing the channel ident and error number.
- DIP switches can be found on the rear of the display. These enable hardware settings to be made e.g. write protection, set the graduation number and range of measurement.
- The touch button is located on the surface of the display, and can be used to customize software configuration settings for more functions.

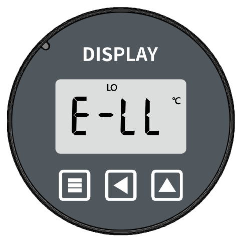



Attachable measured value display DAE019, and the diagram of Error code

If the head transmitter is installed in a field housing and used with a display, an enclosure with a glass window in the cover must be used.

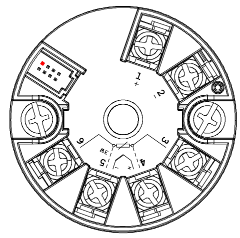
| | Button | Function | Description |
|---|---|---|---|
|  |  | Menu | Used to enter the modification interface, switch options, and confirm |
| |  | Shift | Used for shifting, returning, and saving |
| Diagram of buttons |  | Add | Used for entering menus, data modification, and confirmation |

The button instructions for display DAE019.For detailed,see compact instructions TME series.

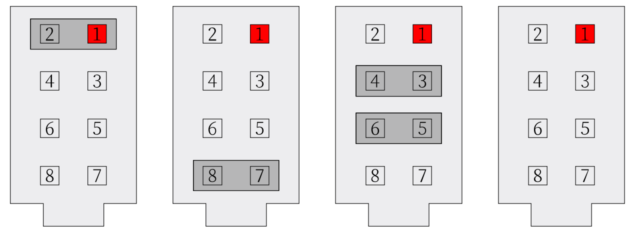
| | Content | State | Description |
|---|---|---|---|
|  | E-HH | Flickering | PV value above "high alarm threshold" |
| | E--H | Display alternately with measured values | PV value above "upper range limit" |
| | E--L | Display alternately with measured values | PV value below "lower range limit" |
| Diagram of Error code | E-LL | Flickering | PV value below "low alarm threshold" |

Explanation of error codes for display DAE019

**Failure output and hardware write protection**: The service interface of the CMS127 transmitter has two internal jumpers. One jumper is used to select the output current in the safe state⩾21.5 mA. If the jumper is not inserted, the output current in the safe state⩽3.6 mA, as specified in NAMUR NE43. The other jumper is used to enable write protection.



CMS127 Service Interface
Pin 1 is marked in red




Security status ⩾ 21.5 mA | Write protect | No function | No function **Default factory status**

● Failure output and hardware write protection functions of TME series

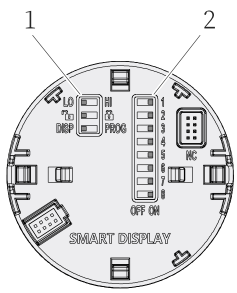
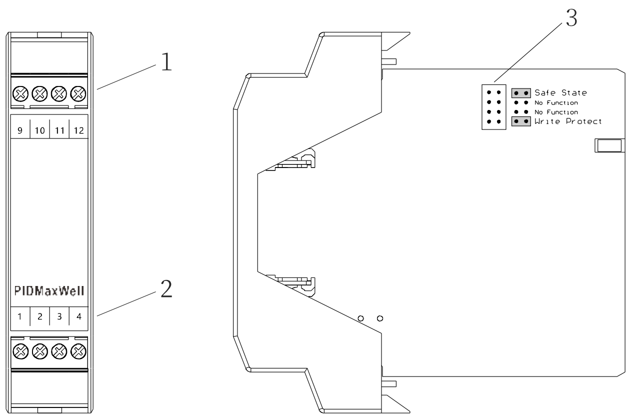



Diagram of DIP switch
**Default factory status**

| DIP | Function | description |
| --- | --- | --- |
| 1: LO/HI, write protection, DISP/PROG | LO ▭ HI | Low current alarm or high current alarm |
| | 🔓 ▭ 🔒 | Write protection switch |
| | DISP ▭ PROG | Display mode or programming mode |
| 2: 1–8, OFF ON | 1, 2 | Set: Pt100、Pt1000、K、E |
| | 3 | Set lower range limit: 0 ℃、-50 ℃ |
| | 4, 5, 6, 7, 8 | Set upper range limit: 10℃、20℃、30℃、40℃、50℃、60℃、70℃、80℃、90℃、100℃、150℃、200℃、250℃、300℃、350℃、400℃、450℃、500℃、550℃、600℃、650℃、700℃、750℃、800℃、850℃、900℃、950℃、1000℃、1100℃、1200℃、1300℃ |

● DAE019 DIP Switch Function Description. For detailed see compact instructions TME series.

**DIN rail transmitter**




| | |
| --- | --- |
| 1: Output terminal | |
| 2: Input terminals | |
| 3: The CMS254 service interface is located inside the chassis and also has failure output adjustment and hardware write protection functions | |

● TRE series internal jumper function description, For detailed see compact instructions TME series.

**For connecting a configuration tool**

The configuration of HART® functions and device-specific parameters takes place via HART®-communication or the CMSxxx service interface of the device. There are special configuration tools from different manufacturers available for this purpose. For more information:400-029-1718

# Model selection

**Equipment Selection**

| | | 1 | 2 | 3 | 4 | 5 | 6 | — | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Temperature transmitter** | **Example :** | **T** | **F** | **E** | **3** | **1** | **0** | **—** | **A** | **0** | **D** | **H** | **A** | **1** | **P** | **1** | **N** | **N** | **S** |
| Type | Head transmitter | T | M | E | | | | | | | | | | | | | | | |
| | Rail transmitter | T | T | E | | | | | | | | | | | | | | | |
| | Field transmitter | T | R | E | | | | | | | | | | | | | | | |
| Output / Isolation | 4 … 20 mA Without isolation 1) | | | | 1 | 1 | 0 | | | | | | | | | | | | |
| | 4 … 20 mA Electrical isolation | | | | 2 | 1 | 0 | | | | | | | | | | | | |
| | 4 … 20 mA + HART Electrical isolation | | | | 3 | 1 | 0 | | | | | | | | | | | | |
| | Customized | | | | X | X | X | | | | | | | | | | | | |
| Approval | For non-hazardous areas | | | | | | | — | A | 0 | | | | | | | | | |
| | For hazardous areas Ex ia IIC T4 … T6 | | | | | | | — | B | 1 | | | | | | | | | |
| | For hazardous areas Ex db IIC T4 … T6 | | | | | | | — | C | 1 | | | | | | | | | |
| Field mount housing | Head or rail transmitter, no housing | | | | | | | | | | N | N | | | | | | | |
| | Head transmitter with display DAE019, no housing | | | | | | | | | | D | N | | | | | | | |
| | B-series, standard flip cover ★ | | | | | | | | | | B | S | | | | | | | |
| | B-series, elevated flip cover | | | | | | | | | | B | H | | | | | | | |
| | B-series, standard cable gland | | | | | | | | | | B | K | | | | | | | |
| | EA 1-chamber, split optional | | | | | | | | | | E | A | | | | | | | |
| | EX 1-chamber | | | | | | | | | | E | X | | | | | | | |
| | EY 1-chamber, split optional | | | | | | | | | | E | Y | | | | | | | |
| | DH 1-chamber, display window, split optional ★ | | | | | | | | | | D | H | | | | | | | |
| | DX 1-chamber, display window | | | | | | | | | | D | X | | | | | | | |
| | DY 1-chamber, display window, split optional ★ | | | | | | | | | | D | Y | | | | | | | |
| | DB 2-chamber, display window ★ | | | | | | | | | | D | B | | | | | | | |
| | DG 2-chamber, display window | | | | | | | | | | D | G | | | | | | | |
| | DC 2-chamber, display window ★ | | | | | | | | | | D | C | | | | | | | |
| | DC 2-chamber, display window, large screen | | | | | | | | | | D | L | | | | | | | |
| Material of field housing | Aluminium alloy | | | | | | | | | | | | A | | | | | | |
| | Stainless steel 316L 2) | | | | | | | | | | | | S | | | | | | |
| Housing interface | Sensor interface and cable entry, M20x1.5 (F) ★ | | | | | | | | | | | | | 1 | | | | | |
| | Sensor interface and cable entry, 1/2" NPT (F) | | | | | | | | | | | | | 2 | | | | | |
| | Customized | | | | | | | | | | | | | X | | | | | |
| Cable connector | No cable connector, IP00 ★ | | | | | | | | | | | | | | N | 0 | | | |
| | Standard, IP65 … IP67, Polyamide, 1 pc ★ | | | | | | | | | | | | | | P | 1 | | | |
| | Standard, IP65 … IP67, Polyamide, 2 pcs ★ | | | | | | | | | | | | | | P | 2 | | | |
| | Standard, IP65 … IP67, Metal nickel plating, 1 pc | | | | | | | | | | | | | | A | 1 | | | |
| | Standard, IP65 … IP67, Metal nickel plating, 2 pcs | | | | | | | | | | | | | | A | 2 | | | |
| | Ex db, IP67, stainless steel, 1 pc | | | | | | | | | | | | | | S | 1 | | | |
| | Ex db, IP67, stainless steel, 2 pcs | | | | | | | | | | | | | | S | 2 | | | |
| | Ex db, IP67, stainless steel, adapter (F), 1 pc | | | | | | | | | | | | | | L | 1 | | | |
| | Ex db, IP67, stainless steel, adapter (F), 2 pcs | | | | | | | | | | | | | | L | 2 | | | |
| Installation bracket | 2-inch pipeline , stainless steel U-bolt bracket | | | | | | | | | | | | | | | | B | | |
| | No bracket ★ | | | | | | | | | | | | | | | | N | | |
| Assembling sensors | No sensors | | | | | | | | | | | | | | | | | N | S |
| | Sensor specified separately and assembled to transmitter | | | | | | | | | | | | | | | | | X | A |

When selecting special specifications, please indicate detailed parameters when placing an order ★ Recommended options

1) Not suitable for intrinsically safe explosion-proof applications 2) Only for DH and DY field housing

# Other

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Revision Record

**Rev: 1.0.7**
Eighth edition, corrected text errors, released in August 2024

**Rev: 1.0.6**
Seventh edition, adding ANSI and IEC color codes for thermocouple temperature measurement wires and connectors, and correcting text errors, published in June 2024

**Rev: 1.0.5**
Sixth edition, corrected selection and text errors, published in April 2024

**Rev: 1.0.4**
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**Rev: 1.0.3**
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**Rev: 1.0.2**
Third edition, corrected text errors, published in March 2024

**Rev: 1.0.1**
Second edition, corrected text errors, published in January 2024

**Rev: 1.0.0**
First edition, published in August 2023

# Product index

**Temperature transmitter kit with display**

    

**Compact temperature transmitters**

   

**Humidity transmitters for HVAC applications**

**Temperature and humidity transmitter**

    

**Multi channel temperature monitors**

    

**Multi channel temperature transmitters**