

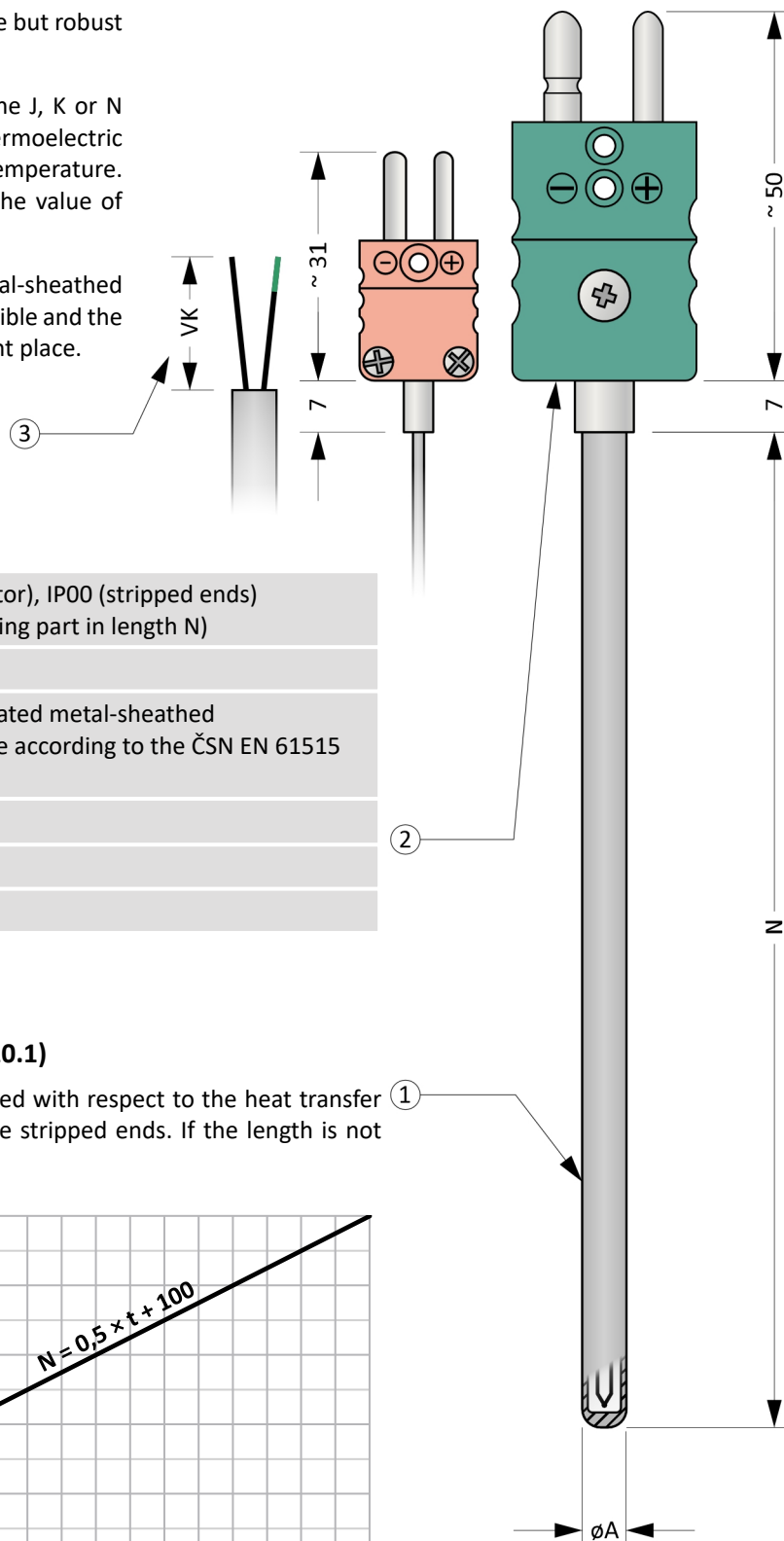
# MTC10

## MINERAL INSULATED METAL-SHEATHED THERMOCOUPLES

The MTC10 series consists of mechanically simple but robust sensors suitable for industrial environments.

The measuring element is a thermocouple of the J, K or N type, which uses the dependence of the thermoelectric voltage on the temperature to measure the temperature. The output signal is a thermoelectric voltage, the value of which is according to the ČSN EN 60584-1 ed. 2.

Thermocouple is mineral insulated metal-sheathed according to the ČSN EN 61515. The sheath is flexible and the sensor can be easily adapted to the measurement place.



### General Information (Table 10.1)

|   |                                         |                                                                                  |
|---|-----------------------------------------|----------------------------------------------------------------------------------|
|   | Insulation class acc. ČSN EN 60529      | IP50 (connector), IP00 (stripped ends)<br>IP68 (measuring part in length N)      |
|   | <b>Common metal thermocouple (stem)</b> |                                                                                  |
| ① | Design                                  | Mineral insulated metal-sheathed thermocouple according to the ČSN EN 61515 ed.2 |
|   | Min. bending radius                     | $10 \times \phi A$                                                               |
| ② | <b>Connector</b>                        |                                                                                  |
| ③ | <b>Loose conductors</b>                 |                                                                                  |

### Recommended Min. Sensor Length (Chart 10.1)

The minimum recommended length is determined with respect to the heat transfer from the measuring end to the connector or the stripped ends. If the length is not observed, there is a risk of overheating.

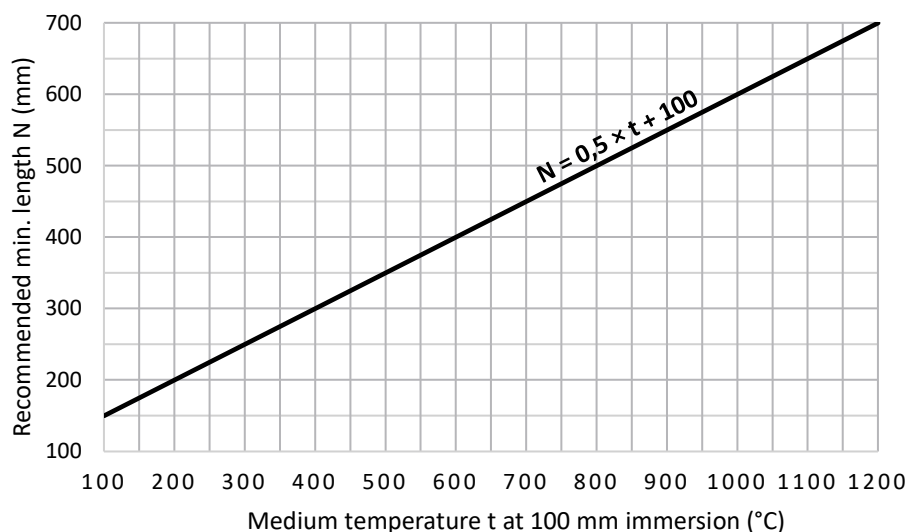


Figure 10.1: MTC10

## Optional Parameters Including the Creation of an Order Code (Table 10.2)

| Pos. | Code | MTC10 - ① ② - ③ - ④                                                                        |
|------|------|--------------------------------------------------------------------------------------------|
| ①    |      | <b>Thermocouple type of dia. A = 1,0 mm (thermocouples acc. ČSN EN 60584-1 ed. 2)</b>      |
|      | H    | 1 x „J“, sheath material 1.4541                                                            |
|      | G    | 1 x „K“, sheath material 2.4816                                                            |
|      | I    | 1 x „N“, sheath material 2.4816                                                            |
|      |      | <b>Thermocouple type of dia. A = 1,5 mm (thermocouples acc. ČSN EN 60584-1 ed. 2)</b>      |
|      | F    | 1 x „J“, sheath material 1.4541                                                            |
|      | E    | 1 x „K“, sheath material 2.4816                                                            |
|      | J    | 1 x „N“, sheath material 2.4816                                                            |
|      |      | <b>Thermocouple type of dia. A = 2,0 mm (thermocouples acc. ČSN EN 60584-1 ed. 2)</b>      |
|      | D    | 1 x „J“, sheath material 1.4541                                                            |
|      | C    | 1 x „K“, sheath material 2.4816                                                            |
|      | K    | 1 x „N“, sheath material 2.4816                                                            |
|      |      | <b>Thermocouple type of dia. A = 3,0 mm (thermocouples acc. ČSN EN 60584-1 ed. 2)</b>      |
|      | 1    | 1 x „J“, sheath material 1.4541                                                            |
|      | 0    | 1 x „K“, sheath material 2.4816                                                            |
|      | L    | 1 x „N“, sheath material 2.4816                                                            |
|      | 7    | 2 x „J“, sheath material 1.4541                                                            |
|      | 6    | 2 x „K“, sheath material 2.4816                                                            |
|      | M    | 2 x „N“, sheath material 2.4816                                                            |
|      |      | <b>Thermocouple type of dia. A = 4,5 mm (thermocouples acc. ČSN EN 60584-1 ed. 2)</b>      |
|      | 5    | 1 x „J“, sheath material 1.4541                                                            |
|      | 4    | 1 x „K“, sheath material 2.4816                                                            |
|      | N    | 1 x „N“, sheath material 2.4816                                                            |
|      | B    | 2 x „J“, sheath material 1.4541                                                            |
|      | A    | 2 x „K“, sheath material 2.4816                                                            |
|      | O    | 2 x „N“, sheath material 2.4816                                                            |
|      |      | <b>Thermocouple type of dia. A = 6,0 mm (thermocouples acc. ČSN EN 60584-1 ed. 2)</b>      |
|      | 3    | 1 x „J“, sheath material 1.4541                                                            |
|      | 2    | 1 x „K“, sheath material 2.4816                                                            |
|      | P    | 1 x „N“, sheath material 2.4816                                                            |
|      | 9    | 2 x „J“, sheath material 1.4541                                                            |
|      | 8    | 2 x „K“, sheath material 2.4816                                                            |
|      | Q    | 2 x „N“, sheath material 2.4816                                                            |
| ②    |      | <b>Measuring junction design and thermocouple accuracy class acc. ČSN EN 60584-1 ed. 2</b> |
|      | 1    | Accuracy class 1, thermocouple isolated from the sheath, blunt tip                         |
|      | 5    | Accuracy class 1, thermocouple isolated from the sheath, sharp tip                         |
|      | 3    | Accuracy class 1, thermocouple connected to the sheath, blunt tip                          |
|      | 7    | Accuracy class 1, thermocouple connected to the sheath, sharp tip                          |
|      | 0    | Accuracy class 2, thermocouple isolated from the sheath, blunt tip                         |
|      | 4    | Accuracy class 2, thermocouple isolated from the sheath, sharp tip                         |
|      | 2    | Accuracy class 2, thermocouple connected to the sheath, blunt tip                          |
|      | 6    | Accuracy class 2, thermocouple connected to the sheath, sharp tip                          |

Continuation of table 10.2 on the next page

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| Pos. | Code                                              | MTC10 - ① ② - ③ - ④                                                                                                         |
|------|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| ③    | <b>Nominal length N [mm]</b>                      |                                                                                                                             |
|      | xxx                                               | Selectable range from 50 mm to 4 500 mm (in 5 mm increments)                                                                |
|      | xxx                                               | Selectable range from 4501 mm to 50 000 mm (in 100 mm increments)                                                           |
| ④    | <b>Cold junction desing - single thermocouple</b> |                                                                                                                             |
|      | VKxxx                                             | Loose conductors, selectable range from 10 mm to 200 mm in 5 mm increments (only 10 mm or 15 mm for $1 \leq A \leq 1,5$ mm) |
|      | 1                                                 | Standard connector, type MTCK-S, plug (for $A \geq 3$ mm)                                                                   |
|      | 2                                                 | Standard connector, type MTCK-S, plug + socket (for $A \geq 3$ mm)                                                          |
|      | 3                                                 | Miniature connector, MTCK-M type, plug (for $A \leq 3$ mm)                                                                  |
|      | 4                                                 | Miniature connector, MTCK-M type, plug + socket (for $A \leq 3$ mm)                                                         |
|      | 5                                                 | Ceramic standard connector, MTCK-CS type, plug (for $A \geq 3$ mm)                                                          |
|      | 6                                                 | Ceramic standard connector, MTCK-CS type, plug + socket (for $A \geq 3$ mm)                                                 |
|      | 7                                                 | Ceramic miniature connector, MTCK-CM type, plug (for $A \leq 3$ mm)                                                         |
|      | 8                                                 | Ceramic miniature connector, MTCK-CM type, plug + socket (for $A \leq 3$ mm)                                                |
|      | <b>Cold junction desing - double thermocouple</b> |                                                                                                                             |
|      | VKxxx                                             | Loose conductors, selectable range from 10 mm to 200 mm in 5 mm increments (only 10 mm or 15 mm for $1 \leq A \leq 1,5$ mm) |
|      | A                                                 | Standard double connector, MTCK-DS type, plug (for $A \geq 3$ mm)                                                           |
|      | B                                                 | Standard double connector, MTCK-DS type, plug + socket (for $A \geq 3$ mm)                                                  |
|      | C                                                 | Miniature double connector, MTCK-DM type, plug (for $A \leq 3$ mm)                                                          |
|      | D                                                 | Miniature double connector, MTCK-DM type, plug + socket (for $A \leq 3$ mm)                                                 |

Order code example: MTC10-00-500-VK15

... 1 x „K“, sheath dia. A = 3,0 mm, sheath material 2.4816 (INCONEL 600)

... Accuracy class 2, thermocouple isolated from the sheath, blunt tip

... Nominal length N = 500 mm

... Stripped ends of 15 mm

Approximate weight of the product: MTC10-00-500-VK15 ... 0,2 kg

### Length Tolerances (Table 10.3)

| Nominal length N         | Tolerance N      |
|--------------------------|------------------|
| $50 \leq N \leq 1500$ mm | $\pm 2$ mm       |
| $1500 < N \leq 2500$ mm  | $\pm 3$ mm       |
| $2500 < N \leq 5000$ mm  | $\pm 5$ mm       |
| $5000 < N \leq 50000$ mm | $\pm 0,5$ % of N |

### Diameter tolerance (Table 10.4)

| Stem diameter A        | Tolerance A   |
|------------------------|---------------|
| $1 \leq A \leq 4,5$ mm | $\pm 0,05$ mm |
| $4,5 < A$ mm           | $\pm 0,06$ mm |

**Recommended Maximum Temperatures of Sensor Parts (Table 10.5)**

| Sensor part                                      | Sheat dia. | Continuous operation | Short-term operation |
|--------------------------------------------------|------------|----------------------|----------------------|
| Stripped ends                                    |            | < 120 °C             | -                    |
| Connectors MTCK-S, MTCK-M and MTCK-DS            |            | < 160 °C             | -                    |
| Connectors MTCK-CS and MTCK-CM                   |            | < 500 °C*            | -                    |
| Thermocouple type „J“ measuring junction         | 1 mm       | < 220 °C             | < 260 °C             |
|                                                  | 1,5 mm     | < 400 °C             | < 440 °C             |
|                                                  | 2 mm       | < 440 °C             | < 490 °C             |
|                                                  | 3 mm       | < 470 °C             | < 520 °C             |
|                                                  | 4,5 mm     | < 550 °C             | < 620 °C             |
|                                                  | 6 mm       | < 650 °C             | < 720 °C             |
| Thermocouple type „K“ and „N“ measuring junction | 1 mm       | < 600 °C             | < 650 °C             |
|                                                  | 1,5 mm     | < 800 °C             | < 850 °C             |
|                                                  | 2 mm       | < 900 °C             | < 950 °C             |
|                                                  | 3 mm       | < 980 °C             | < 1050 °C            |
|                                                  | 4,5 mm     | < 1080 °C            | < 1140 °C            |
|                                                  | 6 mm       | < 1140 °C            | < 1200 °C            |

Notes: Operating temperatures are related to temperature measurement in a chemically inert environment. The values are determined empirically.  
 (\*) Once the cold junction is exposed to temperatures above 120 °C, the sensor will no longer be resistant to moisture penetration.

### Measuring Junction Design



Figure 10.2: Blunt tip

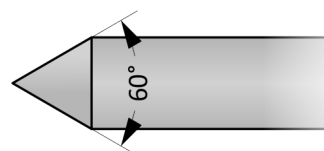


Figure 10.3: Sharp tip



Figure 10.4: Thermocouple isolated from the sheath



Figure 10.5: Thermocouple connected to the sheath

## Installation And Operating Instructions

The sensor's stem is used for mechanical fastening. Other parts cannot be used.

The electrical connection of the sensor is shown in Figures 10.6 to 10.9. The output signal is thermoelectric voltage. The dependence of temperature on thermoelectric voltage is given by the standard ČSN EN 60584-1 ed. 2.

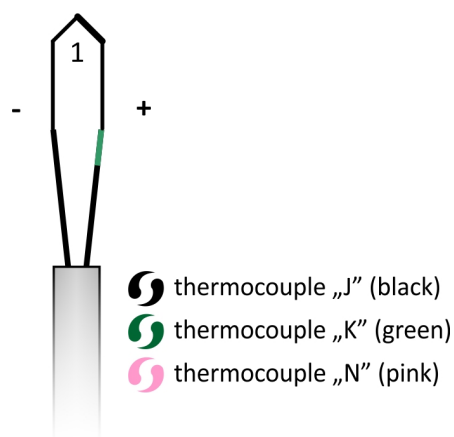


Figure 10.6: Single thermocouple wiring diagram

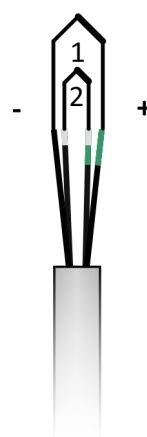


Figure 10.7: Double thermocouple wiring diagram

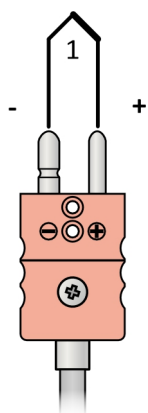


Figure 10.8: Connector wiring diagram

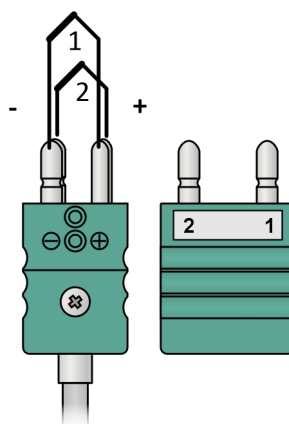


Figure 10.9: Double connector wiring diagram

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