

# MTC12

## CABLE THERMOCOUPLES

MTC12 series temperature sensors are the basic design of cable temperature sensors. They represent an economically viable solution at the cost of some compromise in sensor performance. The parameters of the sensor are determined by the type of cable used.

The measuring element is a thermocouple of the J, K, L 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 or DIN 43 710 for L thermocouple.

### General Information (Table 12.1)

|   |                                                     |                                                           |
|---|-----------------------------------------------------|-----------------------------------------------------------|
|   | Insulation class acc. ČSN EN 60529                  | IP50 (connector),<br>IP00 (Stripped ends, measuring part) |
| ① | <b>Cable thermocouple</b>                           |                                                           |
|   | Min. bending radius                                 | 15 × outer cable diameter                                 |
| ② | <b>Bead</b>                                         |                                                           |
|   | Material                                            | Ceramic C610                                              |
| ③ | <b>Anti-fraying cable ring (for braided cables)</b> |                                                           |
|   | Material                                            | Stainless steel                                           |
| ④ | <b>Stripped ends</b>                                |                                                           |
| ⑤ | <b>Connector</b>                                    |                                                           |

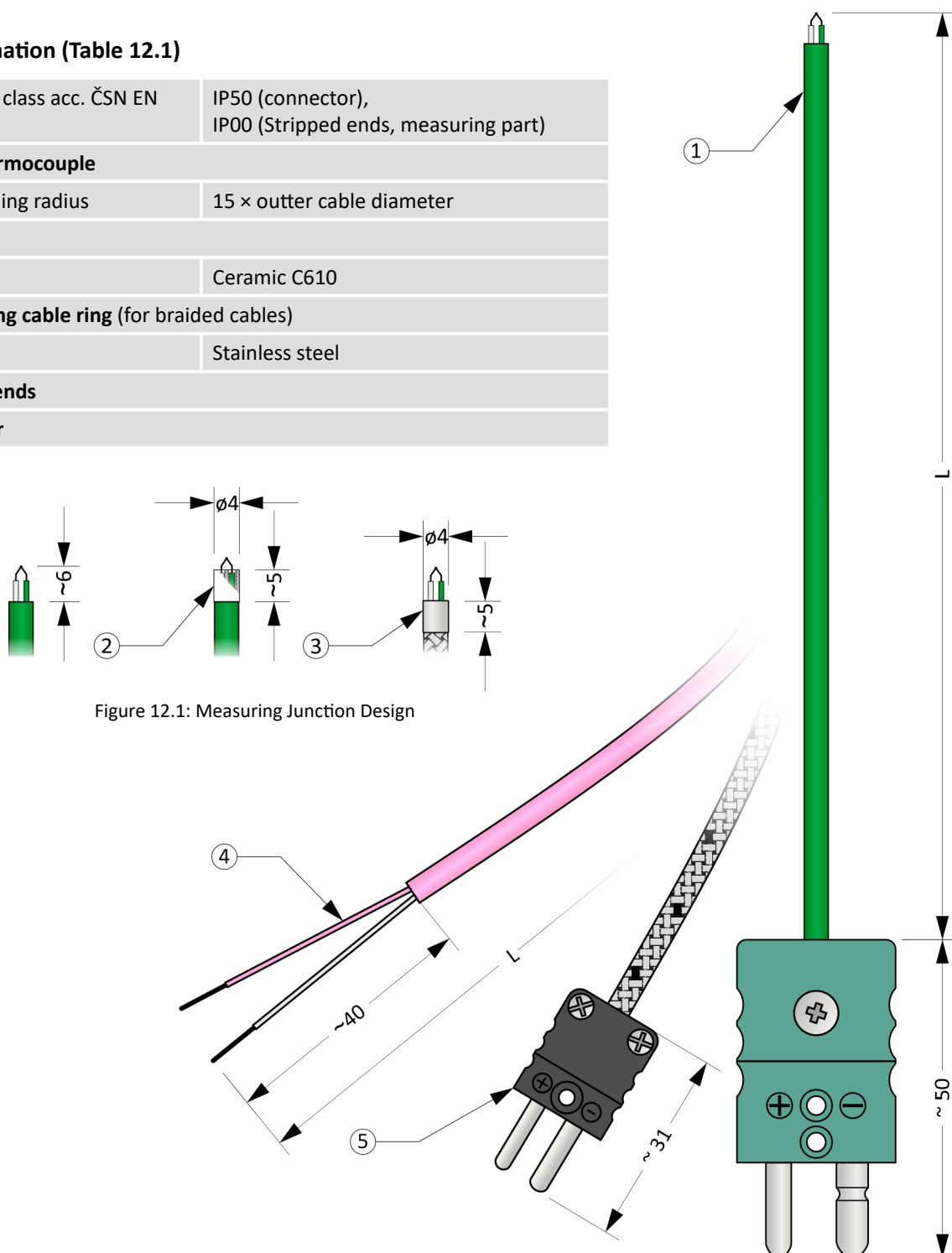


Figure 12.2: MTC12

## Optional Parameters Including the Creation of an Order Code (Table 12.2)

| Pos. | Code                                                                                | MTC12 - ① ② - ③ - ④                                            |
|------|-------------------------------------------------------------------------------------|----------------------------------------------------------------|
| ①    | <b>Thermocouple type J, accuracy class 2 acc. ČSN EN 60584-1 ed. 2 - cable type</b> |                                                                |
|      | A                                                                                   | Cable SLSL 2 x 0,22 mm <sup>2</sup> , stranded                 |
|      | C                                                                                   | Cable TSL 2 x 0,22 mm <sup>2</sup> , stranded                  |
|      | B                                                                                   | Cable TT oval 2 x 0,75 mm <sup>2</sup> , stranded              |
|      | 2                                                                                   | Cable GLGL wrap 2 x 0,2 mm, solid                              |
|      | 3                                                                                   | Cable GLGL wrap 2 x 0,5 mm, solid                              |
|      | 8                                                                                   | Cable GHGHV 2 x 0,22 mm <sup>2</sup> , stranded                |
|      | M                                                                                   | Cable TCuT 2 x 0,22 mm <sup>2</sup> , stranded                 |
|      | <b>Thermocouple type K, accuracy class 2 acc. ČSN EN 60584-1 ed. 2 - cable type</b> |                                                                |
|      | F                                                                                   | Cable TT oval 2 x 0,2 mm, solid                                |
|      | H                                                                                   | Cable TT oval 2 x 0,5 mm, solid                                |
|      | I                                                                                   | Cable TcuT 2 x 0,22 mm <sup>2</sup> , stranded                 |
|      | 0                                                                                   | Cable GLGL wrap 2 x 0,2 mm, solid                              |
|      | 1                                                                                   | Cable GLGL wrap 2 x 0,5 mm, solid                              |
|      | 4                                                                                   | Cable GHGH oval 2 x 0,5 mm, solid                              |
|      | 5                                                                                   | Cable GHGH oval 2 x 1,0 mm, solid                              |
|      | 6                                                                                   | Cable GHGHV 2 x 1,0 mm, solid                                  |
|      | 7                                                                                   | Cable GHGHV 2 x 0,22 mm <sup>2</sup> , stranded                |
|      | L                                                                                   | Cable KFKF 1400 oval 2 x 0,8 mm, solid                         |
|      | <b>Thermocouple type L, acc. DIN 43 710 - cable type</b>                            |                                                                |
|      | D                                                                                   | Cable TSL 2 x 0,22 mm <sup>2</sup> , stranded                  |
|      | G                                                                                   | Cable TT oval 2 x 0,5 mm <sup>2</sup> , stranded               |
|      | 9                                                                                   | Cable GHGHV 2 x 0,22 mm <sup>2</sup> , stranded                |
|      | <b>Thermocouple type N, accuracy class 2 acc. ČSN EN 60584-1 ed. 2 - cable type</b> |                                                                |
|      | E                                                                                   | Cable TSL 2 x 0,22 mm <sup>2</sup> , stranded                  |
|      | J                                                                                   | Cable TcuT 2 x 0,22 mm <sup>2</sup> , stranded                 |
|      | K                                                                                   | Cable GHGHV 2 x 0,22 mm <sup>2</sup> , stranded                |
| ②    | <b>Measuring Junction Design</b>                                                    |                                                                |
|      | 0                                                                                   | Without ceramic bead                                           |
|      | 1                                                                                   | With ceramic bead                                              |
| ③    | <b>Sensor length L [cm]</b>                                                         |                                                                |
|      | xxx                                                                                 | Selectable range from 50 cm to 450 cm (in 1 cm increments)     |
|      | xxx                                                                                 | Selectable range from 460 cm to 3 500 cm (in 10 cm increments) |
| ④    | <b>Design of the cold junction</b>                                                  |                                                                |
|      | 0                                                                                   | Stripped ends, length 40 mm                                    |
|      | 1                                                                                   | Standard connector, MTCK-S type, plug                          |
|      | 2                                                                                   | Standard connector, MTCK-S type, plug + socket                 |
|      | 3                                                                                   | Miniature connector, MTCK-M type, plug                         |
|      | 4                                                                                   | Miniature connector, MTCK-M type, plug + socket                |
|      | 5                                                                                   | Ceramic standard connector, MTCK-CS type, plug                 |
|      | 6                                                                                   | Ceramic standard connector, MTCK-CS type, plug + socket        |
|      | 7                                                                                   | Ceramic miniature connector, MTCK-CM type, plug                |
|      | 8                                                                                   | Ceramic miniature connector, MTCK-CM type, plug + socket       |

Order code example: MTC12-00-500-0

... Thermocouple type K, accuracy class 2, GLGL wrap 2 x 0,2 mm, solid

... Without ceramic bead

... Sensor length L = 500 cm

... Stripped ends

Approximate weight of the product: MTC12-00-500-0 ... 0,2 kg

### Recommended Maximum Temperatures of Sensor Parts (Table 12.3)

| Sensor part                  | Insulation type | Continuous operation              | Short-term operation |
|------------------------------|-----------------|-----------------------------------|----------------------|
| Thermocouple - measuring end | SLSL            | -60 ... 180 °C                    | -                    |
|                              | TSL             | -60 ... 180 °C                    | -                    |
|                              | TT              | -200 ... 205 °C                   | -                    |
|                              | TCuT            | -200 ... 205 °C                   | -                    |
|                              | GLGL            | -200 ... 400 °C                   | -                    |
|                              | GHGH            | -40 ... 600 °C                    | -                    |
|                              | GHGHV           | -40 ... 600 °C                    | -                    |
|                              | KFKF 1400       | -40 ... 1200 °C                   | < 1400 °C            |
| Connectors MTCK-S, MTCK-M    |                 | See cable insulation, max. 220 °C | -                    |
| Connectors MTCK-CS, MTCK-CM  |                 | See cable insulation, max. 650 °C | -                    |

### Cable Parameters (Table 12.4)

| Insulation                                                                    | Number x cross-section / dia. of wires                                           | Outer dia. / size of cable                                           | Pros and cons                                                                                   |
|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| SLSL<br>(silicone / silicone)                                                 | 2 x 0,22 mm <sup>2</sup>                                                         | ~ 3,8 mm                                                             | ↗ Great flexibility<br>↘ Low mechanical resistance                                              |
| TSL<br>(teflon FEP / silicone)                                                | 2 x 0,22 mm <sup>2</sup>                                                         | ~ 3,7 mm                                                             | ↗ Great flexibility, resistant to weak chemicals<br>↘ Low mechanical resistance                 |
| TT oval<br>(teflon FEP / teflon FEP)                                          | 2 x 0,2 mm<br>2 x 0,5 mm<br>2 x 0,50 mm <sup>2</sup><br>2 x 0,75 mm <sup>2</sup> | ~ 1,3 x 2,0 mm<br>~ 1,6 x 3,4 mm<br>~ 2,0 x 3,5 mm<br>~ 2,4 x 4,2 mm | ↗ Great flexibility<br>↘ Low mechanical resistance                                              |
| TCuT<br>(teflon FEP / tinned copper wire braid / teflon FEP)                  | 2 x 0,22 mm <sup>2</sup>                                                         | ~ 3,0 mm                                                             | ↗ Great flexibility, resistant to weak chemicals, screening                                     |
| GLGL wrap<br>(glass fiber braid / glass fiber braid)                          | 2 x 0,2 mm<br>2 x 0,5 mm                                                         | ~ 0,6 x 1,0 mm<br>~ 1,1 x 1,9 mm                                     | ↗ Good flexibility<br>↘ Low moisture resistance, low abrasion resistance                        |
| GHGH<br>(glass fiber braid / glass fiber braid)                               | 2 x 0,5 mm<br>2 x 1,0 mm                                                         | ~ 1,5 x 2,4 mm<br>~ 1,8 x 3,1 mm                                     | ↗ Long durability<br>↘ Low flexibility, low moisture resistance, low abrasion resistance        |
| GHGHV<br>(glass fiber braid / glass fiber braid / stainless steel wire braid) | 2 x 0,22 mm <sup>2</sup><br>2 x 1,0 mm                                           | ~ 3,0 mm<br>~ 2,5 x 4,0 mm                                           | ↗ Long durability, very good flexibility, good abrasion resistance<br>↘ Low moisture resistance |
| KFKF 1400<br>(ceramic braid / ceramic braid)                                  | 2 x 0,8 mm                                                                       | ~ 4,5 mm                                                             | ↗ Long durability<br>↘ Low flexibility, low moisture resistance, low abrasion resistance        |

### Length Tolerances (Table 12.5)

| Length L                        | Tolerance L              |
|---------------------------------|--------------------------|
| $50 \leq L \leq 250 \text{ cm}$ | $\pm 1 \text{ cm}$       |
| $250 < L \leq 500 \text{ cm}$   | $\pm 1,5 \text{ cm}$     |
| $500 < L \leq 3500 \text{ cm}$  | $\pm 0,5 \% \text{ z L}$ |

### Installation And Operating Instructions

The cable is used for mechanical fixing.

The electrical connection of the sensor is shown in Figures 12.3 and 12.4. The output signal is a thermoelectric voltage, the value of which is according to the ČSN EN 60584-1 ed. 2 or DIN 43 710 for L thermocouple.

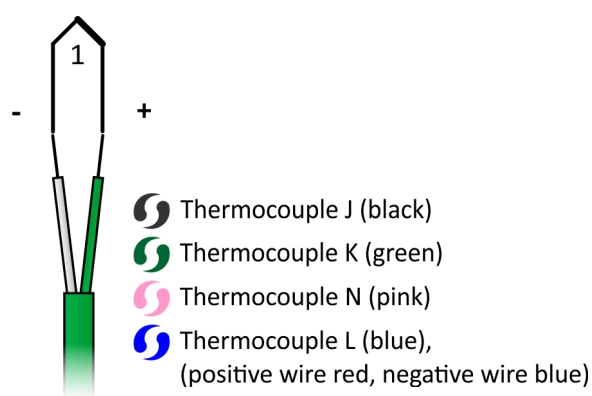


Figure 12.3: Single thermocouple wiring diagram

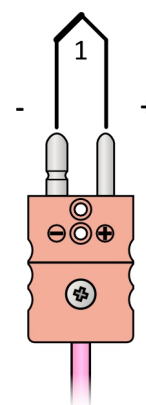


Figure 12.4: Connector wiring diagram