MTC11

MINERAL INSULATED METAL-SHEATHED THERMOCOUPLES

Temperature sensors of the MTC11 series are flexible and robust sensors with a fast temperature response 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 with compensation cable. The sheath is flexible and the sensor can be easily adapted to the measurement place.

General Information (Table 11.1)

	Insulation class acc. ČSN EN 60529	IP50 (connector), IP00 (stripped ends) IP6X (transition part) IP68 (measuring part in length N)
①	**Common metal thermocouple (stem)**	
	Design	Mineral insulated metal-sheathed thermocouple according to the ČSN EN 61515 ed.2
	Min. bending radius	10 × øA
②	**Transition part**	
③	**Spring**	
④	**Compensation cable**	
	Min. bending radius	15 × outer diameter of the cable
⑤	**Additional armor protection**	
⑥	**Individual compensation wires**	
⑦	**Stripped ends**	
⑧	**Connector**	

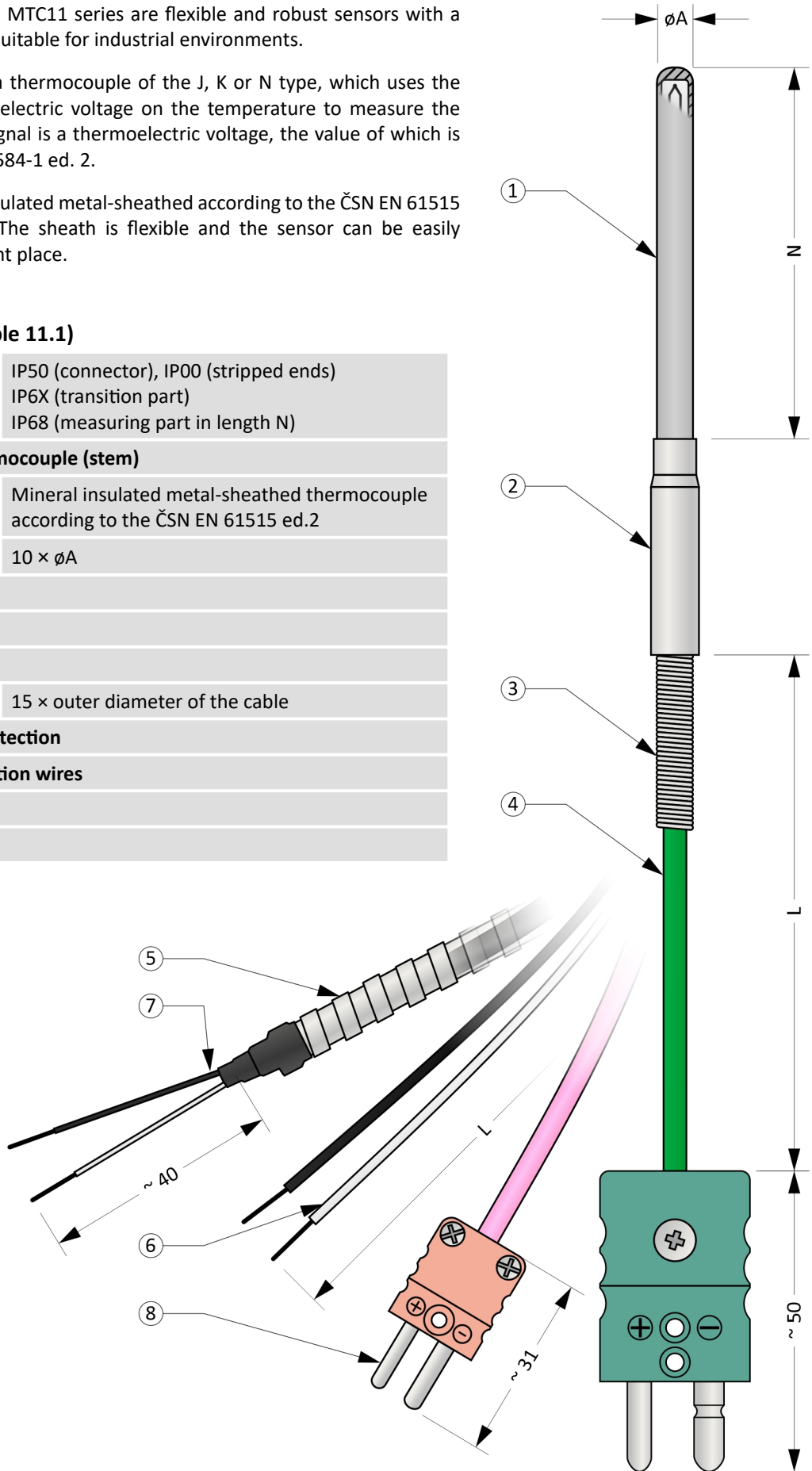


Figure 11.1: MTC11

Optional Parameters Including the Creation of an Order Code (Table 11.2)

Pos.	Code	MTC11 - ❶❷ - ❸ - ❹ - ❺❻
❶		**Thermocouple type of dia. A = 1,0 mm (thermocouples acc. ČSN EN 60584-1 ed. 2)**
	H	1 x „J“, sheath material 1.4541
	G	1 x „K“, sheath material 2.4816
	I	1 x „N“, sheath material 2.4816
		Thermocouple type of dia. A = 1,5 mm (thermocouples acc. ČSN EN 60584-1 ed. 2)
	F	1 x „J“, sheath material 1.4541
	E	1 x „K“, sheath material 2.4816
	J	1 x „N“, sheath material 2.4816
		Thermocouple type of dia. A = 2,0 mm (thermocouples acc. ČSN EN 60584-1 ed. 2)
	7	1 x „J“, sheath material 1.4541
	6	1 x „K“, sheath material 2.4816
	K	1 x „N“, sheath material 2.4816
		Thermocouple type of dia. A = 3,0 mm (thermocouples acc. ČSN EN 60584-1 ed. 2)
	1	1 x „J“, sheath material 1.4541
	0	1 x „K“, sheath material 2.4816
	L	1 x „N“, sheath material 2.4816
	9	2 x „J“, sheath material 1.4541
	8	2 x „K“, sheath material 2.4816
	M	2 x „N“, sheath material 2.4816
		Thermocouple type of dia. A = 4,5 mm (thermocouples acc. ČSN EN 60584-1 ed. 2)
	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
		Thermocouple type of dia. A = 6,0 mm (thermocouples acc. ČSN EN 60584-1 ed. 2)
	3	1 x „J“, sheath material 1.4541
	2	1 x „K“, sheath material 2.4816
	P	1 x „N“, sheath material 2.4816
	D	2 x „J“, sheath material 1.4541
	C	2 x „K“, sheath material 2.4816
	Q	2 x „N“, sheath material 2.4816
❷		**Measuring junction design and thermocouple accuracy class acc. ČSN EN 60584-1 ed. 2**
	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 11.2 on the next page

Continuation of table 11.2 from the previous page

Pos.	Code	MTC11 - ❶❷ - ❸ - ❹ - ❺❻
❸		**Nominal length N [mm]**
	xxx	Selectable range from 50 mm to 4 500 mm (in 1 mm increments)
	xxx	Selectable range from 4501 mm to 50 000 mm (in 100 mm increments)
❹		**Cable length L [cm]**
	SLxxx	Individual insulated compensation wires (FEP), selectable range from 10 cm to 100 cm (in 1 cm increments) — Only combination is possible for this option: ❺ ... S; ❻ ... 0
	xxx	Compensation cable, selectable range from 10 cm to 450 cm (in 1 cm increments)
	xxx	Compensation cable, selectable range from 460 cm to 5 000 cm (in 10 cm increments)
	Axxx	Compensation cable with additional armor protection, selectable range from 10 cm to 450 cm (in 1 cm increments) — Only for øA ≥ 2 mm
	Axxx	Compensation cable with additional armor protection, selectable range from 460 cm to 600 cm (in 10 cm increments) — Only for øA ≥ 2 mm
❺		**Compensation cable insulation type** — Only combination is possible for this option: ❹ ... SLxxx
	S	Teflon FEP
	0	Polyvinyl chloride PVC / Polyvinyl chloride PVC (JJ) — Only for single thermocouple J, K type.
	1	Silicone / silicone (SLSL) — Only for single thermocouple J, K type.
	2	Silicone / glass fiber braid / galvanized steel wire braid (SLGLP) — Only for single thermocouple J, K type.
	3	Glass fiber braid / glass fiber braid / galvanized steel wire braid (GLGLP) — Only for single thermocouple.
	4	Teflon FEP / silicone (TSL) — Only for single thermocouple.
	5	Teflon FEP / Cu braid / teflon FEP (TCuT) — Only for single thermocouple.
	A	Teflon FEP / glass fiber braid / stainless steel wire braid (TGLV) — Only for double thermocouple.
❻		**Design of the cold junction - single thermocouples**
	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
		Design of the cold junction - double thermocouples
	0	Stripped ends, length 40 mm
	A	Standard double connector, MTCK-DS type, plug
	B	Standard double connector, MTCK-DS type, plug + socket
	C	Miniature double connector, MTCK-DM type, plug
	D	Miniature double connector, MTCK-DM type, plug + socket

Order code example: MTC11-00-500-500-00

... 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
... Compensation cable length L = 500 cm
... Cable insulation type JJ
... Stripped ends

Approximate weight of the product: MTC11-00-500-500-00 ... 0,3 kg

Length Tolerances (Table 11.3)

Length N, L	Tolerance N	Tolerance L
50 ≤ (N, L) ≤ 1500 mm	± 2 mm	± 10 mm
1500 < (N, L) ≤ 2500 mm	± 3 mm	± 10 mm
2500 < (N, L) ≤ 5000 mm	± 5 mm	± 15 mm
5000 < (N, L) ≤ 50000 mm	± 0,5 % of N	± 0,5 % of N

Diameter tolerance (Table 11.4)

Stem diameter A	Tolerance A
1 ≤ A ≤ 4,5 mm	± 0,05 mm
4,5 < A mm	± 0,06 mm

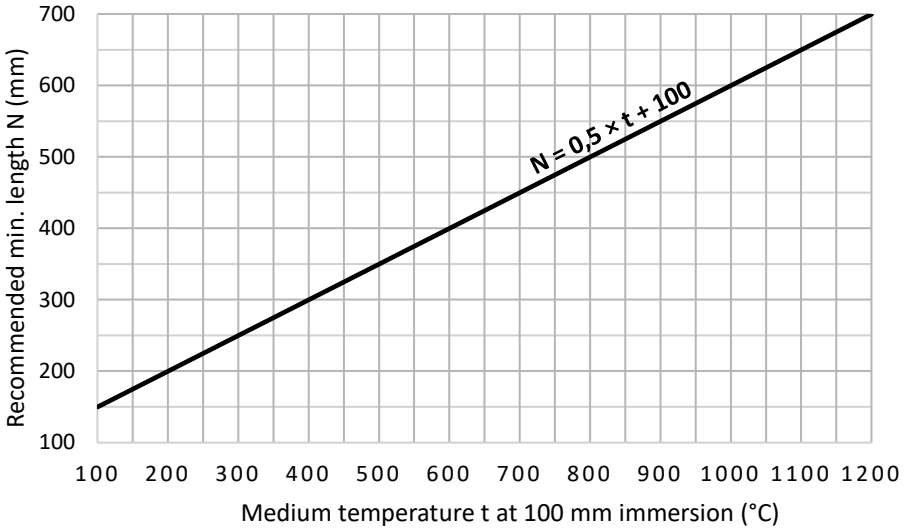
Recommended Maximum Temperatures of Sensor Parts (Table 11.5)

Sensor part	Sheat dia. / insulation type	Continuous operation	Short-term operation
Compensation cable	JJ	-10 ... 105 °C	-
	SLSL nebo SL	-60 ... 180 °C	-
	SLGLP	-60 ... 180 °C	-
	GLGLP	-200 ... 400 °C	-
	TSL	-60 ... 180 °C	-
	TCuT	-200 ... 205 °C	-
	TGLV	-200 ... 205 °C	-
Transition part		< 165 °C	-
Connectors MTCK-S, MTCK-M		See cable insulation, max. 220 °C	-
Connectors MTCK-CS, MTCK-CM		See cable insulation	-
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.

Recommended Min. Sensor Length (Chart 11.1)

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.



Compensation Cable Overview (Table 11.6)

Compensation cables are in accuracy class 2 and meet the requirements of the ČSN EN 60584-3 standard.

Type	Insulation	Number x cross-section of wires	Cable outer diameter	Pros and cons
JX KCA	JJ	2 x 0,22 mm²	~ 3,6 mm	↗ Good flexibility, moisture resistant ↘ No shielding, unsuitable for higher temperatures
	SLSL	2 x 0,22 mm²	~ 3,8 mm	↗ Great flexibility, moisture resistant ↘ No shielding, low mechanical resistance
	SLGLP	2 x 0,22 mm²	~ 3,7 mm	↗ Moisture resistant, high mechanical resistance
JX KCA NC	GLGLP	2 x 0,22 mm²	~ 3,5 mm	↗ High mechanical resistance, suitable for higher temperatures ↘ Low moisture resistance
	TSL	2 x 0,22 mm²	~ 3,6 mm	↗ Great flexibility, moisture resistant ↘ No shielding, low mechanical resistance
	TCuT	2 x 0,22 mm²	~ 3,0 mm	↗ Moisture resistant
	TGLV	4 x 0,22 mm²	~ 3,7 mm	↗ Moisture resistant, high mechanical resistance
JX KCA NC	FEP	1 x 0,22 mm² (+) 1 x 0,22 mm² (-)	~ 1,2 mm	Individual conductors

Measuring Junction Design

Figure 11.3: Blunt tip

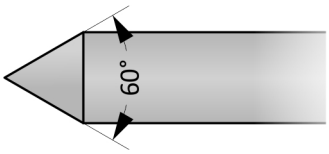


Figure 11.4: Sharp tip

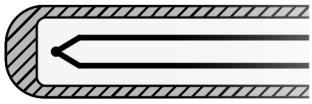


Figure 11.5: Thermocouple isolated from the sheath

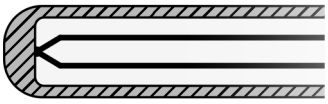
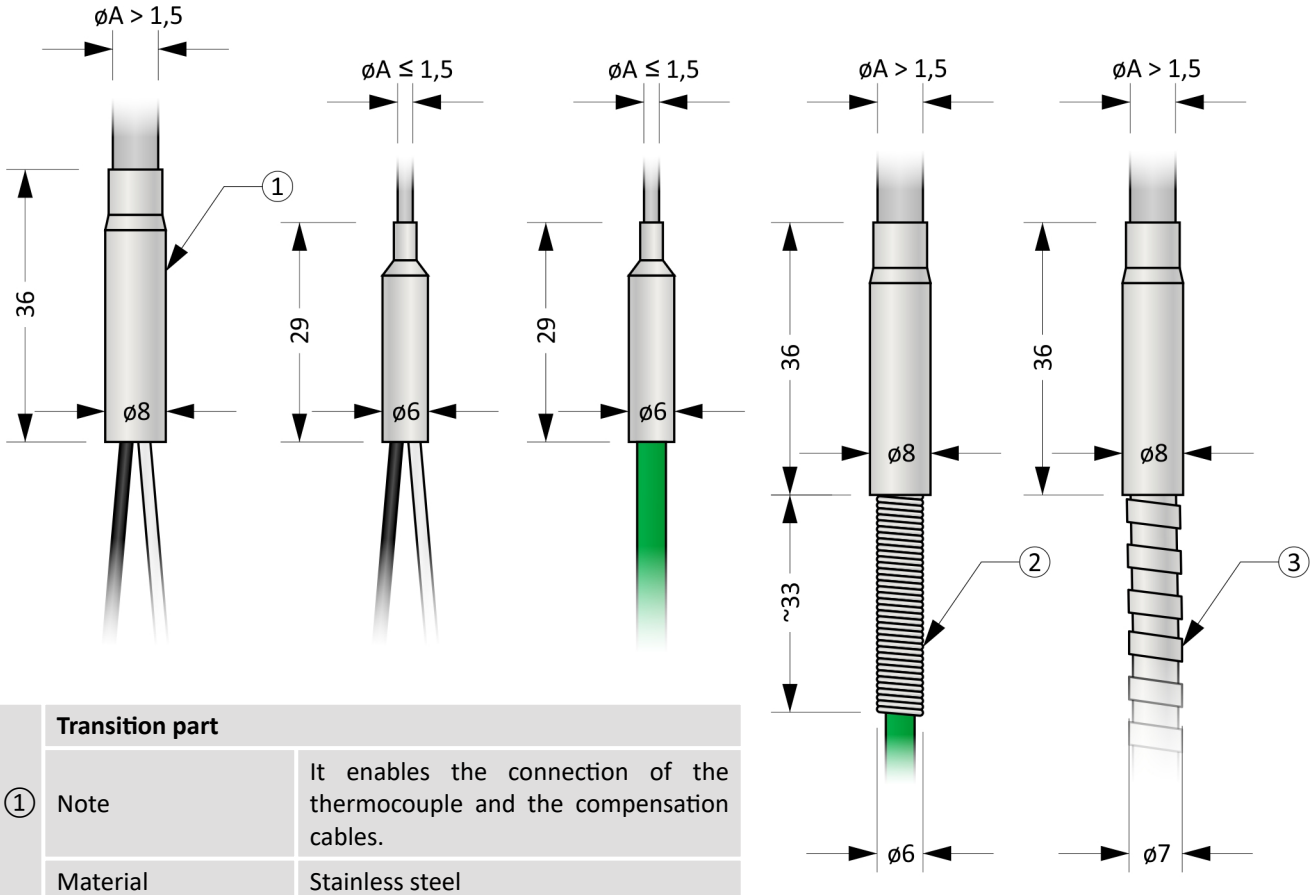


Figure 11.6: Thermocouple connected to the sheath

Design of the transition part (Table 11.7)



①	**Transition part**	
	Note	It enables the connection of the thermocouple and the compensation cables.
	Material	Stainless steel
②	**Spring**	
	Note	It is only used for thermocouples with a diameter of 2 mm and above. It reduces the wear of the cable at the point of exit from the trasition part.
	Material	Stainless steel
③	**Additional armor protection**	
	Note	It increases the mechanical resistance of the cable.
	Material	Stainless steel
	Properties	Flexible, does not prevent the ingress of moisture

Figure 11.2: Transition part design options.

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 11.7 to 11.10. The output signal is thermoelectric voltage. The dependence of temperature on thermoelectric voltage is given by the standard ČSN EN 60584-1 ed. 2.

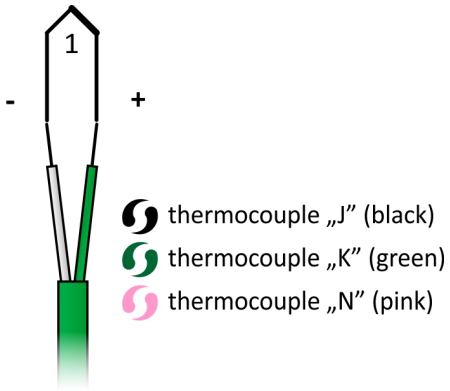


Figure 11.7: Single thermocouple wiring diagram

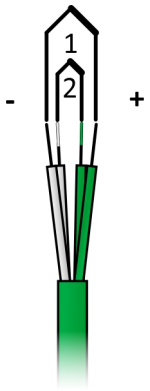


Figure 11.8: Double thermocouple wiring diagram

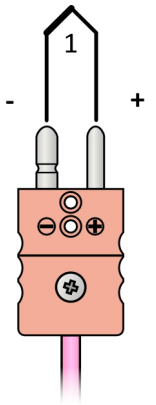


Figure 11.9: Connector wiring diagram

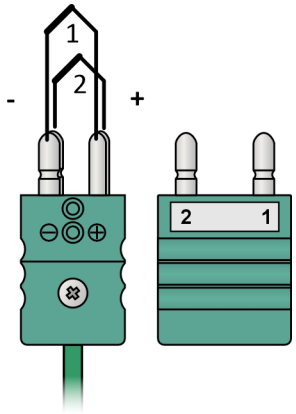


Figure 11.10: Double connector wiring diagram

Blank Page