

Thermocouples

Operating instruction

1. Application

Thermocouples can preferentially be used in industrial rooms, devices and plants. These are active components and they therefore not at all need a junction for auxiliary power. This junction is often used for the devices of the amplification and evaluation of the measured values. The developing thermovoltage based on the Seebeck-effect depends on the temperature and the characteristic is fixed in the standard DIN EN 60584. Same applies to the permissible limit deviations. In order to avoid faulty measurements it is advisable to perform powerless measurements of the thermovoltage.

2. Assembly and disassembly

Thermocouples can be used with different means of fastening to connect it with the object, which is to be measured (devices, plants, pipings and others). The following table gives some indications.

Types of thermocouples – fastening and transmission of measured values

type	description and fastening	transmission of measured values
210	angle thermocouple, stop flange or adjustable thread joint can be added extra	external cable, connectable inside the connecting head
220	cable thermocouple for screwing-in with adjustable thread joint with metal clamping ring	fixed cable
221	cable thermocouple for screwing-in with additional protective tube and adjustable thread joint with metal clamping ring	fixed cable
230	screwing-in thermocouple with cap nut	external cable, connectable inside the connecting head
240	universal thermocouple without means of fastening, adjustable thread joint or flange can be added extra	external cable, connectable inside the connecting head
244	thermocouple without means of fastening, outer protective tube from metal, inner from ceramic, adjustable thread joint or flange can be added extra	external cable, connectable inside the connecting head
245A	thermocouple with ceramic protective tube Ø22, adjustable thread joint or flange can be added extra	external cable, connectable inside the connecting head
247A	thermocouple with ceramic protective tube Ø15, adjustable thread joint or flange can be added extra	external cable, connectable inside the connecting head
247B	thermocouple with ceramic protective tube Ø10, adjustable thread joint or flange can be added extra	external cable, connectable inside the connecting head
248	thermocouple for screwing-in with mounting boss or cap nut	external cable, connectable inside the connecting head

type	description and fastening	transmission of measured values
254	screwing in thermocouple with fixed thread	external cable, connectable inside the connecting head
257	thermocouple with high pressure protective tube for welding in	external cable, connectable inside the connecting head
258	cable-thermocouple with additional protective tube for welding in	fixed cable
259	cable-thermocouple with thread	fixed cable
260	thermocouple measuring insert, protective tube and connecting head can be added extra	external cable, connectable on the ceramical base
261	thermocouple measuring insert with connecting head, protective tube and clamp thread joint can be added extra	external cable, connectable inside the connecting head
270	sheathed thermocouple for screwing in with mounting boss or cap nut	external cable, connectable on the ceramical base
272	screwing in thermocouple without neck tube	external cable, connectable inside the connecting head
273	sheathed thermocouple measuring insert with connecting head, protective tube and clamp thread joint can be added extra	external cable, connectable inside the connecting head
274	thermocouple with flange, flange size after your order	external cable, connectable inside the connecting head
280	small screwing-in thermocouple	external cable, connectable inside the housing
282	sheathed thermocouple with male or female connector	external cable, connectable at the plug
285	sheathed thermocouple measuring insert, protective tube and connecting head can be added extra	external cable, connectable on the ceramical base
288	sheathed thermocouple with free ends	external cable, connectable on the free ends
290	cable-thermocouple in sheathed design with thread	fixed cable
294	sheathed thermocouple with sleeve and compensating cable	connectable on the free ends
500	sheathed thermocouple with ring from stainless steel and compensating cable	connectable on the free ends
506	small screwing-in thermocouple with plug and integrated transmitter	external cable, connectable at the connector, output signal 4-20 mA
K1T	cable sensor without means of fastening, clamp thread joint or spiral spring can be added extra	fixed cable
K4T	cable sensor for screwing-in, spiral spring can be added extra	fixed cable
K5T	cable sensor with fixed thread, spiral spring can be added extra	fixed cable
K6T	cable sensor with adjustable thread joint, spiral spring can be added extra	fixed cable

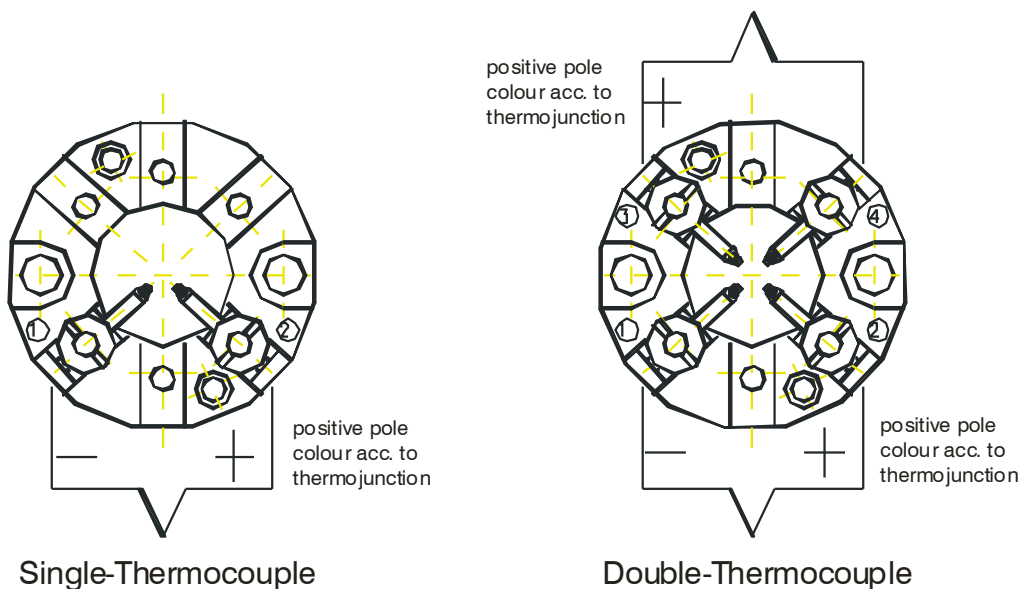
type	description and fastening	transmission of measured values
K7T	angle cable sensor with adjustable thread joint, spiral spring can be added extra	fixed cable
K8T	cable sensor with cap nut, spiral spring can be added extra	fixed cable
K9T	cable sensor with bayonet cap	fixed cable
K10T	cable sensor with square protective tube for fastening on surfaces, spiral spring can be added extra	fixed cable
K11T	cable sensor with clamping band for fastening on surfaces, spiral spring can be added extra	fixed cable
K12T	cable sensor with handle for penetration, spiral spring can be added extra	fixed cable

It is necessary with the choice of the type and kind and size of means of fastening to coordinate it with the connection dimensions of the measuring point. The connection between thermocouple and evaluation device must be given with extension leads. If transmitters are used you can renounce in principle on extension lead.

Please note the thermal, chemical and mechanical loads of installation site for choosing the right material of protective tubes. Protective tubes made from heat-resistant steel can be used up to 1100°C. For higher temperatures ceramical tubes are useful.

Before you can start the assembly or disassembly you must discharge the positive pressure of concerned machines or plants.

Connection diagram for thermocouples with ceramic base for connection head



Colour coding for thermocouples acc. to DIN EN 60584

e.g.	1xK	positive pole green, negative pole white
	1xJ	positive pole black, negative pole white
	1xS	positive pole orange, negative pole white
	1xB	positive pole grey, negative pole white

3. *Start-up*

The thermocouple is able to work after making the connection to the process by screwing in, welding in and others in dependence of the type, and the connection between the terminals clamps and the contacts of the evaluation device by suitable intension leads.

In order to ensure the degree of protection it is necessary to close the cover of the connection head carefully.

The electrical parameters of the evaluation device must agreed with those of the thermocouple. In detail are these:

- type of thermo-junction
- number of thermo-junction (single/ double)

4. *Maintenance and repair*

Thermocouples work maintenance-free. On disturbances of the interior structure the measurement insert is to send back to the manufacturer. He establish whether the thermocouple is repairable.

If disturbances are to be due to the corrosive wear of the protection tube, the whole thermocouple has to be changed. Concerned plant components are to be made positive pressure-free.

5. *Electrical characteristics*

Thermocouples produce voltages in mV. The voltage value depend on the temperature and the type of thermo-junction. That's why it is very important to agree the type of thermo-junction, with the type of extention leads and the evaluation device.

The safety-relevant limit values are:

$$\begin{aligned}U_i &= 15 \text{ V} \\I_i &= 50 \text{ mA} \\P_i &= 200 \text{ mW}\end{aligned}$$

6. *Employment pressures and surface temperatures*

All thermocouples with connection head and without special references can stand an operating pressure til 16 bar. Higher pressures must be agreed with the manufacturer. Pressure load on cable sensors must be agreed with the manufacturer too.

Increased surfaced temperatures cannot be caused by the temperature probes in normal operations and in damage occurrence

7. *Transport*

Thermocouples contain ceramical components. Therefore they must be treated carefully on transport and installation.

For further informationen please use data sheets of special types.