

Fast-response Temperature Sensor

Type 5209

with Pt 100 Resistor



Application

Fast-response temperature sensor for measuring rapid changes in temperature in heat exchangers and hot water mixing circuits. Pt 100 measuring resistor. Basic values are according to DIN IEC 751 (DIN 43 760).



The compact heat exchangers and hot water generators only contain a small amount of material, thus having a low heat storage capacity. This means that the medium to be heated changes its temperature rapidly. Under these conditions, fast-response temperature sensors must be used to guarantee stable temperature control. The Type 5209 Temperature Sensor has proven well for this purpose, since it has the following features:

- Optimum transfer function (Fig. 2) featuring a half-time $z_{0.5}$ of 0.75 s and a nine-tenth time $z_{0.9}$ of 2.3 s for measurements in flowing water
- Minimum thermal resistance and low heat capacity
- No air space between measuring insert and immersion tube
- Blow-out-safe sensor tube, immersible between 60 and 240 mm.

The **transfer function** gives information on the good thermal conductivity of the sensor. This function is a time characteristic representing the measured value after a step change in the measured variable. The equation is:

$$\eta = \frac{t_z - t_1}{t_2 - t_1}$$

Where:

- t_z Value measured after a step change in the measured variable after a specific time period z
- t_1 Initial measured value
- t_2 Steady-state measured value

Three times characterize this transfer function:

- **Half-time $z_{0.5}$:** Time necessary for the response curve to reach 50 % of its end value.
- **Nine-tenth time $z_{0.9}$:** Time necessary for the response curve to reach 90 % of its end value.
- **Time τ :** Time necessary for the response curve to reach 63.2 % of its end value.

Version

Type 5209 (Fig. 1) · Fast-response temperature sensor. Immersion-type sensor with Pt 100 resistor. Measuring range 0 to 120 °C. With 300 mm tube; immersion depth 60 mm (min.) to 240 mm (max.); free cable end 2.5 m.

Accessory: Screwed gland G $\frac{3}{4}$.



Fig. 1 · Type 5209 Temperature Sensor

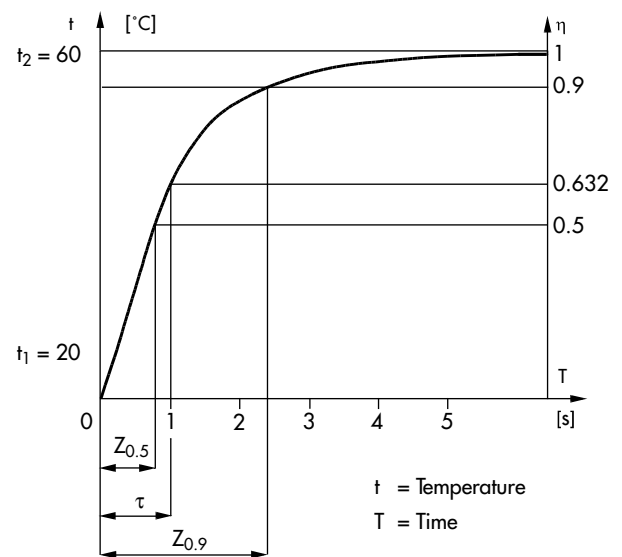


Fig. 2 · Transfer function of the Type 5209 Sensor

Table 1 · Technical data

Temperature sensor	Type	5209
Style	Immersion-type sensor with adjustable screwed gland; free cable end	
Number of resistors	1 Pt 100	
Measuring range	0 to 120 °C	
Perm. medium temperature	0 to 120 °C	
Perm. ambient temperature	-20 to 80 °C	
Nominal pressure	PN 16	
Degree of protection	IP 00	
Length of immersion tube	300 mm	
Immersion depth	60 to 240 mm	
Thread	Screwed gland G 3/4	
Connecting cable length	2.5 m	

Principle of operation

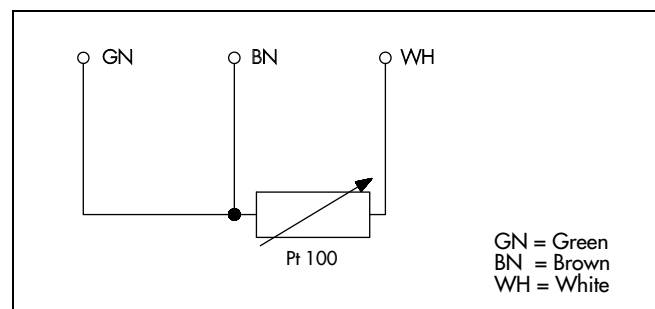
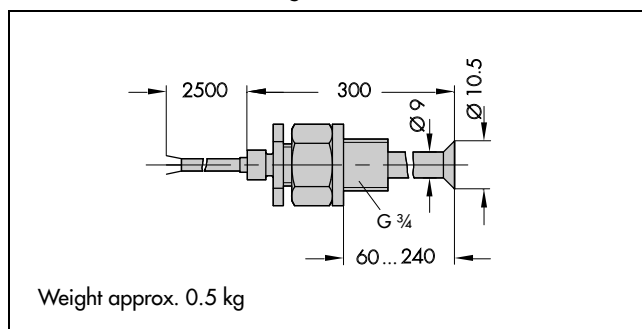
The Type 5209 Fast-response Temperature Sensor is a foil sensor containing a platinum winding which is embedded in two 0.05 mm thick polyamide foils. The measuring insert is located inside the immersion tube having direct physical contact with the thin tube walls. For electrical connection, a 2.5 m cable with free cable ends is available.

In order to guarantee short response times, the sensor is to be immersed as deep as possible into the medium to be controlled without being protected by an additional tube.

The larger diameter of the disc-type sensor tip prevents the immersion tube from sliding out of the screwed gland.

Table 2 Materials (WN = Material Number acc. to DIN)

Immersion tube	Stainless steel WN 1.4571
Screwed gland	Optionally Cu Zn 40 Pb2 or WN 1.4571
Seal	FKM
Connecting cable	Silicone insulation

Electrical connection**Dimensions in mm and weights****Ordering text**

Fast-response Temperature Sensor Type 5209
Screwed gland 1.4571/Brass

Specifications subject to change without notice.



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