

## TEMPERATURE MEASUREMENT VIA SENSORS (TF01 - TF02)

Precision in the measurement and regulation of temperature is, especially with surface-related technologies, of a fundamental importance for the future quality of the treated product.

In storage vessels that maintain exactly a certain liquid temperature, this means avoiding a decay of the characteristics of process fluids such as freezing, crystallization or increased viscosity.

### OBJECTIVES

- Temperature adjustment for process automation ( e.g., maintaining the desired process temperature)
- Temperature surveillance to avoid potential hazards for the process, process liquid ( e.g., damage due to excessive temperature) and for the vessel ( e.g., thermal damage)

With suitable temperature sensors and electronic circuits, you can easily and cost-effectively create a system to regulate and monitor the temperature of liquids.

The temperature sensors operates based on the built-in PT100 sensor. The temperature is measured via the changes in temperature resistance of the PT100 sensor.

At 0°C, the sensor has an exact resistance value of 100Ω.  
The sensor resistance varies linearly with a rise in temperature.

An appropriate electronic system conducts a constant low-voltage direct current through the resistor and measures the descending voltage. According to Ohm's law ( $R = U/I$ ), one can determine the resistance value and, thus, the temperature.

To connect electronic systems to PT100 sensors, 2, 3 or 4 wire conductors can be used. We opted for a 4-wire lead connection, which allows to compensate lead resistance.

To prevent substantially distorted measurement results due to lead resistance, especially for very long leads, the connection between the temperature probes and the electronic system should not exceed 50 m and it should be made for a maximum line with 3-wire or 4-wire leads. Thermal transformers can also be interposed, with standard output signals of 4... 20 mA.

### SENSOR WITH FLEXIBLE CABLE (TF01)

Temperature sensors with a flexible PFA protective sheath (6 mm) and a standard length of 1.6 m (other lengths are also possible) have a maximum resistance to chemicals and can be used up to a maximum temperature of 200°C. Suitable for use in clean rooms and physiologically inoffensive areas, these temperature sensors can be fixed at the measurement point in plants and containers, even in very confined spaces. The PT100 sensor is located at the end of the flexible sheath and it has an active measuring length of 50 mm.

### SOG OUTPUT

In the flexible temperature sensors, the connecting wires of the PT100 sensor are naked when they come out of the head of the protective sheath.



### SMG 00 OUTPUT 00

The MG 00 terminal (IP 64 protection rating) at the end of the flexible protective sheath allows a cable to be seamlessly connected.



### SENSOR WITH RIGID SHEATH SENSORS (TF02)

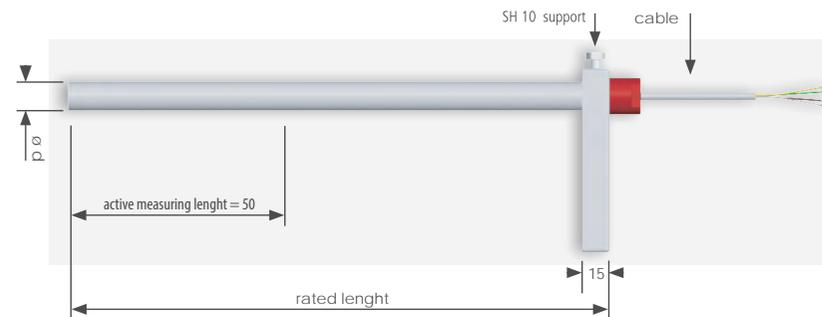
Rigid tubular sheath sensors come in several materials. Standard lengths: 300, 500 and 800 mm. Other lengths on request.

Terminal casing in two variants that can come equipped with different gaskets for cable connections. Temperature sensors elements can be replaced by the customer.

MODEL	MATERIAL	LOGO	Ø	MAX TEMP. USE
TF02	Stainless steel (nr.1.4571)	B	11	100 °C
TF02	Polypropylene (PP)	F	90 °C	
TF02	Polytetrafluoroethylene (PTFE)	G	12	100 °C
TF02	Polyvinyl fluoride (PVDF)	L	16	100 °C
TF01	Perfluoroalkoxy (PFA)	M	6 (tube)	200 °C

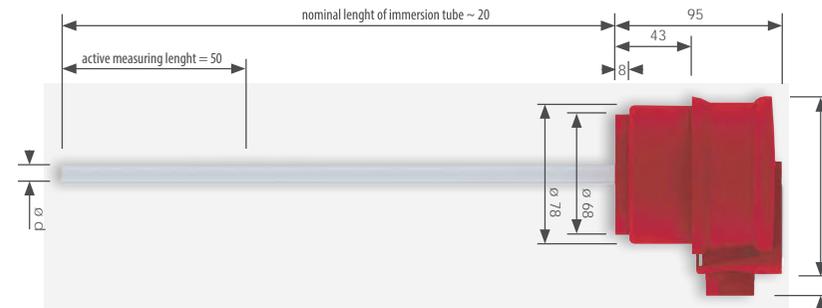
### PG OUTPUT WITH CABLE LENGTH 1600mm

The cable (1.6 m standard length) comes out via a leak-tight screw connection (IP64 protection rating); other cable lengths are available on request. The SH10 support attached to the immersion tube allows you to adjust the height of the immersion tube as desired and to easily attach the temperature sensors to the edge of the vessel.



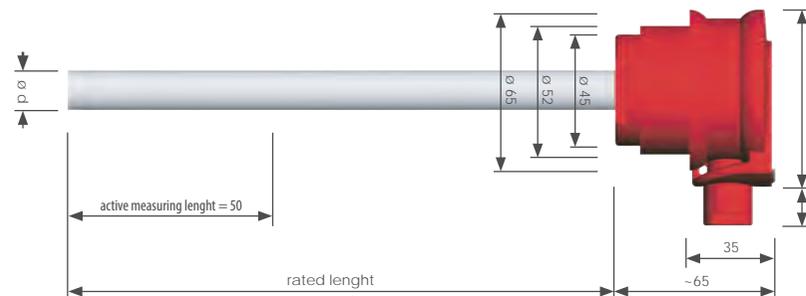
### BC OUTPUT WITH A 100x95mm BOX

The BC PP terminal casing is used for connection of the cable and has a protection rating of IP65 (protected against water jets) according to EN 60529. At extreme thermal stresses (>80°C) or under if subjected to highly oxidising chemical agents (e.g., chromium electrolytes or HNO3 solutions) the BC/L PVDF terminal casing should be used. The cable can be connected by unscrewing the cover using the SB mounting key.



### LC OUTPUT WITH AN SH10 SUPPORT AND A 71.5x65mm BOX

The small LC PP or LC/L PVDF terminal casing is used to connect the cable and it has an IP65 protection rating (protected against water jets) according to EN 60529. The cable can be connected by unscrewing the cover with the SL mounting key.



### CODING

TF01 160 / output type - sheath material (M);

TF02 Rated length - output type - sheath material.



## ETB200 TEMPERATURE LIMITER WITH A TF24 TEMPERATURE SENSOR

The ETB 200 temperature limiter monitors the temperature of process fluids in plants at a set limit value. If this value is exceeded, the built-in relay switches (AC230/2A with fuse) to the safe operating state and the backlighting of the LC display turns from white into red.

The operating state of the temperature limiter can be determined based on the colour of the display, if the monitored temperature falls below the set value again, in accordance with DINEN14597, the temperature limiters must be reset manually on the device. Optionally, you can connect an external unlock button.

In addition to the main relay, another switching relay is available, which can be used as an early alarm via a settable temperature, before the limit value is reached.

The enabled analogue output (0/4... 20mA or 0/2... 10V DC) allows you to check and analyse the measured temperature with a PLC, for example.

The device is easy to install in the electrical cabinet, due to the 5VA power outlet and the wide-range mains power supply, at a voltage supply of 20... 250V AC/DC.

The temperature limiter is mounted on the DIN rail. The wiring has screw terminals with a cable section of 2.5mm<sup>2</sup> max. The allowed ambient temperature is 0... +55°C.

The slim polyamide casing, measuring 22.5 x 109 x 125mm (L xHx P) has an IP 20 protection rating.

The temperature of the limiter can be easily adjusted from the front button and it is displayed on the large alphanumeric LC display.

The maximum measurement range is -100... 600°C (0.2% accuracy, referred to the entire measuring range), where the temperature sensor to be connected covers a temperature range of -20... 200° C.

The permissible temperature limiter according to DINEN14597, in combination with our TF24-160/SMG00-M certified temperature sensor, is a standard temperature limitation system.

The electromagnetic compatibility of electronic components shall be checked in accordance with EN61326 and their functional safety according to SIL 2 as per EN61508.

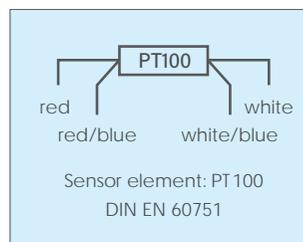
The 4-wire PT100 sensor element (TF24) is located in a flexible PFA fluoropropylene protection tube, with a diameter of 6mm and a rated length of 1.6 m. The small MG00 plastic box (IP64 protection rating) at the end of the PFA allows a seamless connection of the cable. The maximum operating temperature of the temperature probe is 200°C.



ETB200  
Temperature limiter



Temperature sensor with a  
flexible protective tube  
and MG00 output (TF24)



### CODING

ETB200 Code 221.X.000130  
TF24 - 160/SMG00-M Code 211.X.000610