Resistance temperature sensor with thermowell, with very high mechanical resistance to 400 °C and to 600 °C type 112 82

PRODUCT MANUAL

APPLICATION

- For remote measurement of temperature of steady and running liquids (gases and fluids), for which properties of the thermowell of the sensor are suitable, measurement may be realized up to the temperature determined by thermowell resistance and nominal pressure PN 63
- For the environment, where mechanical resistance is required pursuant to EN 60068-2-6 (class AH2) and seismic capability of the electrical equipment of the safety system of the nuclear power stations pursuant to IEC 980 (MVZ level SL-2)

DESCRIPTION

The sensor consists of a replaceable measuring insert and protective armature consisting of a head and a thermowell with an adapter and screw joint for the connection of the sensor into the nipple of the piping (technological equipment). The thermowell of the sensor is made with respect to a very high mechanical resistance. The head is provided with a cover and a sealing outlet for the connecting wiring. The measuring insert consists of a stem tube terminated with a flange with a terminal board. Into the steam tube, a measuring resistor with internal wiring is inserted and it is electrically insulated from the jacket of the stem tube.
To measure temperature, a defined change of sensor resistance in dependence on the change of temperature of the measured environment is used.

TECHNICAL DATA

The sensor is designed pursuant to EN 61140 as an electrical equipment of protection class III for the application in networks with the category of overvoltage in the installation II and pollution grade 2 pursuant to EN 61010-1, the follow-up (evaluation) device shall comply with Article 6.3 of the said standard.

Measuring range:

Measuring range [°C]	Thermowell material	Nominal pressure	Internal wiring
0 to 400	12 022	PN 63	Ag
-70 to 400	1.4541		
0 to 550	15 128		Special alloy
-70 to 600	1.4541		

Electrical strength pursuant to EN 61010-1 Article 6.8.3:
500 V eff
Electrical insulation resistance pursuant to EN 60751, min. 100 MΩ, at 15 to 35°C, max. 80 % relative humidity min 100 V DC

Ingress protection pursuant to EN 60529: IP 65

Sensor weight:

L 160	approx. 0.75 kg
L 250	0.85 kg
L 400	0.95 kg
L 630	1.15 kg

Operation position:
discretionary, the outlet shall not be situated upwards

Type of operation: continuous

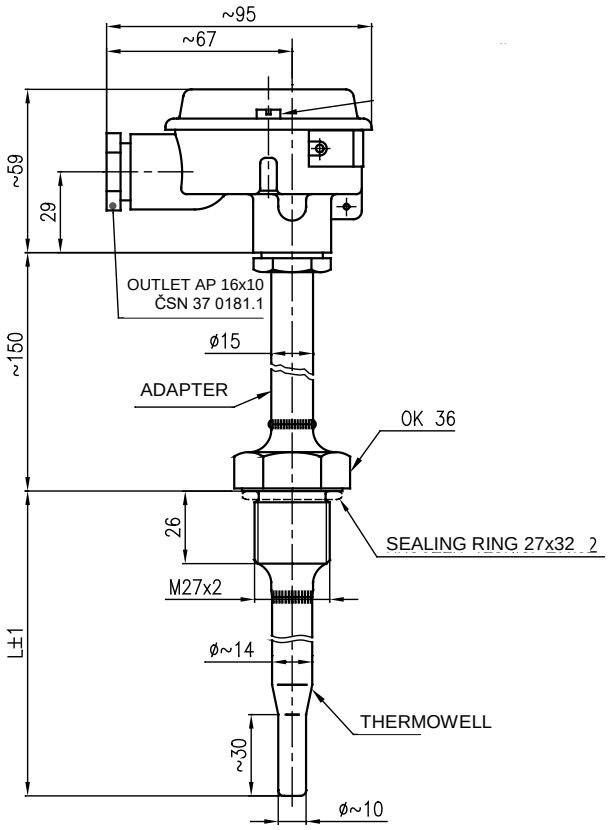
Applied materials:

Steam tube of measuring insert	steel 1.4541
Thermowell	steel 1.4541 or 15 128 galvanized
Adapter	steel class 11 galvanized
Head	chromated aluminium alloy and painted with aluminium varnish
Head clamps of terminal board	brass with Ni surface

OPERATION CONDITIONS

The environment is defined by the group of parameters and their severity grades IE 36 pursuant to EN 60721-3-3 and the following operation conditions.

Ambient temperature for sensor head: max. 150 °C



Relative ambient humidity:
10 to 100 % with condensation, with upper limit of water content of 29 g H_2O/kg of dry air

Atmospheric pressure: 70 to 106 kPa

Maximum speed of flow of liquids:

Maximum speed of flow [m/s]	Nominal length [mm]			
	160	250	400	630
Water steam and air	25	8	2.5	1
Water	3	3	1.5	0.2

Vibrations:

Internal wiring	Ag	Spec. alloy	Ag or special alloy		
Nominal length [mm]	160	160	250	400	630
Frequency range [Hz]	10 to 500				
Drift amplitude [mm]	0.4	0.5	0.35	0.2	0.15
Acceleration amplitude [ms^{-2}]	58.0	68.6	49.0	29.4	19.6

METROLOGICAL DATA

Sensing probe: Measuring resistor Pt 100 single or double pursuant to the connection scheme and table of designs α = 0.00385 [K^{-1}], tolerance class B (or A only for 4-wire) pursuant to EN 60751

Internal wiring resistance at 20 °C:

Ag	0.053 Ω/m ± 10 %
Special alloy	2.45 Ω/m ± 5%

The measured resistance value of the internal wiring is specified on the label of the measuring insert.
Maximum current load of measuring resistance: 5 mA
Recommended measuring current: 1 mA
Calibration depth of immersion: 200 mm
Temperature response time pursuant to EN 60751 in whirling water (characteristic value): $\tau_{0.5}$ 29 s
$\tau_{0.9}$ 95 s

DESIGNATION

Data on head label
- Trademark of the manufacturer
- Made in Czech Republic
- Type of resistance sensor, nominal value R_0 / tolerance class / configuration of wires of internal wiring
- Measuring range
- Product ordering number
- Ingress protection
- Time code (Serial number for calibrated design, design with tolerance class A)

Data on label of measuring insert
- Trademark of the manufacturer
- Type of sensor, nominal value R_0 / tolerance class / configuration of wires of internal wiring
- Time code (Serial number for calibrated design, design with tolerance class A)
- Resistance value of internal wiring

Data on connection screw joint of the thermowell
- Material of immersion part of the thermowell
- Nominal pressure
- Control mark about performed pressure test

DELIVERY

Unless agreed otherwise with the customer, each delivery includes
- Delivery note
- Sensor pursuant to the purchase order
- Sealing ring Cu 27x32x1.5 (ČSN 02 9310.2)
- Suitable nipples ordered independently from the catalogue of accessories, type 991;
- Accompanying technical documentation in Czech
  - o Product manual
  - o Product quality and completeness certificate, which also serves as the warranty certificate

If it is established in the purchase contract or agreed otherwise, the following documentation can be also delivered with the product
- Copy of the Inspection Certificate 3.1 for the thermowell material with the heat number
- Declaration of Conformity with purchase order 2.1 acc. to EN 10204
- Test report about the seismic and the vibration qualification
- Calibration sheet (for calibrated design)

RELIABILITY

Indicators of reliability in operation conditions and ambient conditions specified herein
- Medium time of operation between failures 96 000 hours (inf. value)

Expected service life 10 years

CALIBRATION

It is realized pursuant to TPM 3342-94 and in compliance with EN 60751, usually in three temperature points spread evenly within the operation range of the sensor or in the points according to the requirement of the customer. Calibration sheets with measured data are issued for calibrated sensors.

ORDERING TEMPERATURE SENSORS

The purchase order shall specify
- Name
- Product ordering number
- If calibration is required and in what temperature points
- If the delivery of nipples pursuant to the type 991 is required for the sensor as accessories
- Other (special) requirements
- Number of pieces or pairs

PURCHASE ORDER EXAMPLE

Standard design:

Resistance temperature sensor with thermowell, with very high mechanical resistance
112 826 732
6 pcs

Special requirement:

Resistance temperature sensor with thermowell, with very high mechanical resistance
112 821 731, tolerance class A
6 pcs

ORDERING ACCESSORIES

The purchase order shall specify
- Name
- Ordering number of the nipple
- Number of pieces

ORDERING EXAMPLE

Standard design:

Nipple
991 NVP4 M27 72
6 pcs

Special requirement:

Nipple
991 NVP4 M27 99
material 1.5415
6 pcs

PACKING

Both the sensors and accessories are delivered in a packing ensuring resistance to the impact of thermal effects and mechanical effects pursuant to controlled packing regulations.

TRANSPORT

The converters may be transported on conditions corresponding to the set of combinations of classes IE 21 pursuant to EN 60721-3-2 (i.e. by airplanes and trucks, in premises that are ventilated and protected against atmospheric conditions).

STORAGE

The sensors may be stored on conditions corresponding to the set of combinations of classes IE 11/1K3 pursuant to EN 60721-3-1 (i.e. in places with temperature from -5 to 45 °C and humidity from 5 to 95%, without a special threat of an attack with biological agents, with vibrations of small significance and not situated close to sources of dust and sand).

TABLE 1 - DESIGN OF TEMPERATURE SENSORS WITH THERMOWELL TO 400 °C

SPECIFICATIONS			ORDERING NUMBER				
			112 82	6	x	x	x
Measuring resistor pursuant to EN 60751, tolerance class B		Pt 100/B/2			1		
		2 x Pt 100/B/2			2		
Design of measuring end	Thermowell material	12 022				1	
		1.4541				3	
	Nominal length L [mm]	100 *)					0
		160					1
		250					2
		400					3
		630					4
		Other, max. 1000 mm *)					9

*) Only as a special requirement after an agreement with the manufacturer

TABLE 2 - DESIGN OF TEMPERATURE SENSORS WITH THERMOWELL TO 600 °C

SPECIFICATIONS			ORDERING NUMBER				
			112 82	6	x	x	x
Measuring resistor pursuant to EN 60751, tolerance class B or A *) **)		2x Pt 100/B/2			6		
		Pt 100/ /4			7		
		Pt 100/B/4C			8		
Design of measuring end	Thermowell material	15 128				2	
		1.4541				3	
	Nominal length L [mm]	100 *)					0
		160					1
		250					2
		400					3
		630					4
		Other, max. 1000 mm *)					9

*) Only as a special requirement after an agreement with the manufacturer
Tolerance class A only in four-wire connection

TABLE 3 - ADDITIONAL REQUIREMENT FOR DESIGN OF TEMPERATURE SENSORS, TYPE 112 81

REQUIREMENT FOR OTHER DOCUMENTATION	CODE
Copy of the Inspection Certificate 3.1 acc to EN 10204 for material of stem tube with the heat number	/3.1
Declaration of Conformity with purchase order 2.1 pursuant to EN 10204	/2.1

TABLE 4 - ACCESSORIES -OVERVIEW OF DESIGNS OF RECOMMENDED NIPPLE, TYPE 991 (order separately)

SPECIFIKACE				OBJEDNACÍ ČÍSLO				
				991	xxx	x	xxx	xx
Shape	direct				NVP			
	oblique (chamfer 45°)				NVS			
PN	160					4		
Internal thread	M27x2						M27	
Material	1.0308 **)	maximum operation temperature [°C]	300 (only PN 40)					13
	15 128.5 **)		550					51
	1.4541		550					72
	other *)							99

*) only as a special requirement after an agreement with the manufacturer
**) nipple surface treatment: conservation by fat - by oil

TABLE 5 - OVERVIEW OF SEALING RINGS, TYPE 991, SUPPLIED FOR TEMPERATURE SENSORS

EXTERNAL FIXING THREAD OF THERMOWELL	SEALING RING			
	DIMENSION [mm] Ød × ØD × t	MATERIAL	NUMBER	ORDERING NUMBER
M20×1.5	21×27×2	copper	1 pcs	991 TK 27

The sealing ring is supplied to each sensor by default. The sealing ring can also be ordered separately using ordering number.

INSTALLATION AND CONNECTION

SENSOR INSTALLATION

On the thermowell of the sensor, put on the enclosed sealing ring and connect the sensor by screwing it into the nipple on the piping (technological equipment). During the installation, torque of 100 Nm is recommended.
Recommended application of nipples:

Direct nipple
- for piping DN 65 to DN 250 (perpendicular installation)

Oblique nipple
- for piping ≤ DN 50 (angular installation or installation in bend)

Examples of application of nipples are specified in figure 2.

With respect to maintaining metrological properties and the longest possible service life, it is not recommended to install the sensors in places with high turbulence of the medium, which is caused e.g. by a rapid transition from a small diameter of the piping to a larger one (when failing to comply with the required shape and dimensions of diffuser behind the flow meter), etc. Recommended distance of the temperature sensor from the installation flange of the flow meter is min. 1m.

ELECTRICAL CONNECTION

The electrical connection may be only realized by qualified workers.
The terminal board of the sensor is accessible after the removal of the cover of the head that is connected with two screws.
Connect the evaluation devices to the sensor with a cable with a double insulation with outer diameter from 5 to 12 mm, (internal wires with Cu core with the cross section 0.5 **to** 2.5 mm^2). Seal the cable outlet of the sensor properly. In the environment with interfering signals, use shielded cables in the supply circuit. If it is not possible to exclude influencing the measurement, ground the wiring.

VIEW INTO SENSOR HEAD

TERMINAL BOARD

COMMISSIONING

After the sensor installation and connection of the follow-up (evaluation) device to the supply voltage, the equipment is prepared for operation.

OPERATION AND MAINTENANCE

The sensor does not require any operation and maintenance.

SPARE PARTS

Spare parts shall be delivered by the manufacturer.
Relevant measuring inserts, thermowells or head can be ordered pursuant to the offered price list of spare parts.
The inserts in the tolerance class A are only delivered at a special requirement.

WARRANTY

The warranty period is 24 months from the receiving of the product by the customer, unless established otherwise in the contract. Rejection of defects shall be enforced in writing at the manufacturer within the warranty period. The rejecting side shall identify the product name, ordering and manufacturing numbers, date of issue and number of the delivery note, clear description of the occurring defect and the subject of the claim. If the rejecting side is invited to send the device for repair, it shall do so in the original package of the manufacturer and/or in another package ensuring safe transport.
The warranty shall not apply to defects caused by unauthorized intervention into the device, its forced mechanical damage or failure to comply with operation conditions of the product and the product manual.

REPAIRS

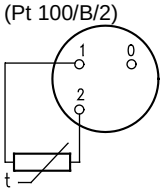
The sensors shall be repaired by the manufacturer. They shall be sent for repair in the original or equal package without accessories.

DISABLING AND LIQUIDATION

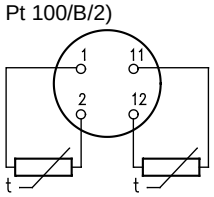
The product and its package do not include any parts that could impact the environment.
Products that are withdrawn from operation, including their packages (with the exception of products marked as electrical equipment for the purposes of return withdrawal and separate salvage of electrical waste), may be disposed of to sorted or unsorted waste pursuant to the type of waste.
The manufacturer realizes free return withdrawal of marked electrical equipment (from 13.8.2005) from the consumer and points out the danger connected with their illegal disposal. The package of the sensor can by recycled completely. Metal parts of the products are recycled, non-recyclable plastic materials and electrical waste shall be disposed of in accordance with applicable legislation.

FIGURE 1 - CONNECTION SCHEME OF TEMPERATURE SENSORS

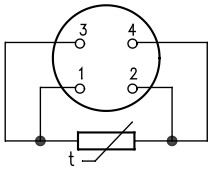
with single measuring resistor in two-wire connection (Pt 100/B/2)



with double measuring resistor in two-wire connection (2 × Pt 100/B/2)



with single measuring resistor in four-wire connection (Pt 100/ /4)



with single measuring resistor in connection with auxiliary loop (Pt 100/B/4C)

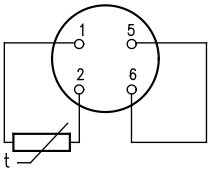
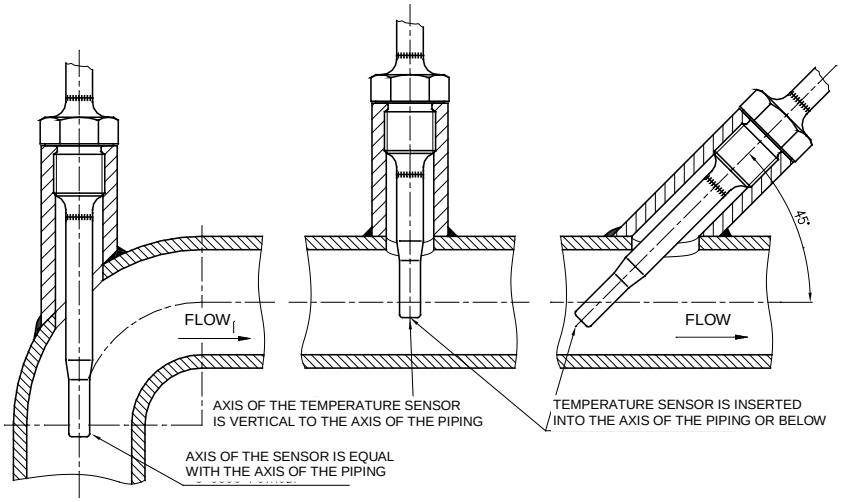


FIGURE 2 - EXAMPLES OF INSTALLATION OF DIRECT AND OBLIQUE NIPPLES PURSUANT TO EN 1434-2



WARNING

- **When using the sensor with an oblique nipple, locate the sensor with thermowell at an angle against the direction of flow**
- **The sensor may not touch the opposite side of the piping**
- **It is also advantageous to use the temperature sensors in the piping elbow. In such a case, locate the sensor with the thermowell against the direction of flow so that the measured medium flows around evenly.**

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