



MMG Műszerszerviz Kft.

1036 Budapest, Dereglye u. 1.,
 Tel/fax: 204-2252, Tel:203-7443
 Web: www.mmg.hu, E-mail: info@mmg.hu

APPLICATION

- For remote measurement of temperature of steady and running liquids (gases and fluids), for which the properties of the heat sink of the sensor are suitable; measurement may be realized up to the temperature determined by heat sink resistance and nominal pressure PN 40;
- As pressure equipment of category III pursuant to the Decree of the Government 26/2003 Coll. (compliance assessment module B+D);
- In uncertified unpaired design for general temperature measurement;
- As rated meter **TCS 321/99-3123**
 - o In certified paired design in systems for measurement of flow of heat transferred by water (in transferring and reversing piping), both sensors in the pair have the same manufacturing number;
 - o In certified unpaired design for business measurement of steam and steam condensate;
 - o For business measurement of gas;
 - o Application of certified sensors is possible e.g. in combination with evaluation units INMAT 51, INMAT 66 etc.

The sensors are rated products pursuant to the Act No. 22/1997 Coll. and Declaration of Conformity **EC-201000** is issued for them.

DESCRIPTION

The sensor consists of an independent heat sink for screwing into angular or direct weld-on piece of the piping, replaceable measuring insert with flange and terminal board and head of type B or small head of type MA provided with a cable outlet for connecting wiring. Stem of the measuring insert is inserted into the heat sink where it is fixed with a sealing screw. For temperature measurement, a defined change of resistance of the sensor is used in dependence on the change of ambient temperature.

TECHNICAL DATA

Design pursuant to ČSN EN 61010-1 as electric equipment of protection class III for the application in networks with category of overvoltage in installation II and pollution grade 2, follow-up (evaluation) device shall comply with Article 6.3 of the said standards.

Measuring range:

- 50 to 200 °C unpaired uncertified sensor
- 0 to 200 °C paired certified sensor
- 50 to 100 °C unpaired certified sensor (gasses)
- 0 to 200 °C unpaired certified sensor (steam and steam condensate)

Electric strength pursuant to ČSN EN 61010-1, Article 6.8.4: 500 V eff

Electric isolation resistance pursuant to ČSN IEC 751, Article 4.2.1:
 min. 100 MΩ at 15 to 35°C, max. 80 % relative humidity

Nominal pressure of heat sink pursuant to ČSN 13 0010: PN 40

Ingress protection pursuant to ČSN EN 60529: IP 65
Operation position:
 discretionary, the outlet shall not be situated upwards

Type of operation: continuous

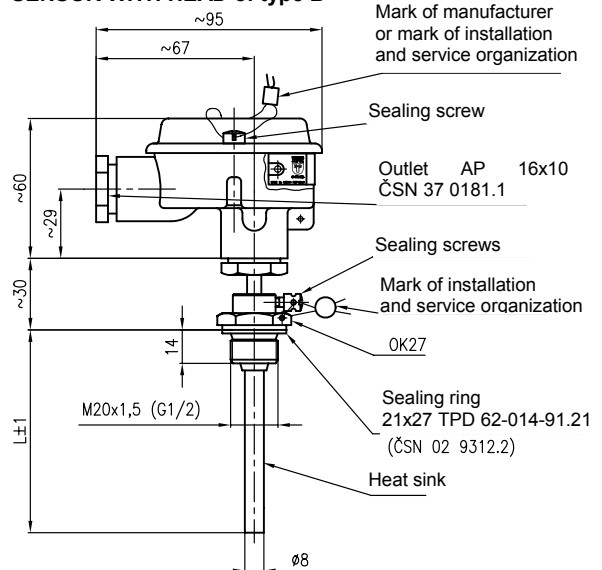
Weight of sensor with heat sink: L 85 approx. 0.353 kg
 L 120 0.364 kg

Weight of independent heat sink: L 85 approx. 0.086 kg
 L 120 0.092 kg

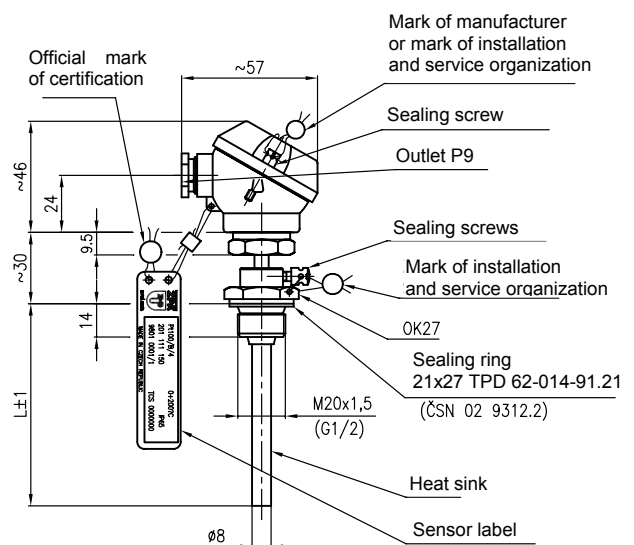
Applied materials:

- stem tube of measuring insert steel 1.4541
- heat sink steel 1.4541 or 1.4571
- head chromated aluminium alloy painted with aluminium paint

SENSOR WITH HEAD of type B



SENSOR WITH SMALL HEAD of type MA



OPERATION CONDITIONS

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

Ambient temperature for sensor head:
 for head of type B -50 to 150 °C
 for head of type MA -40 to 100 °C

Relative ambient humidity:
 10 to 100 % with condensation, with upper level of water content 29 g H₂O/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]		
	85	120	210
Water steam and air	50	40	25
Water	5	5	3

Vibrations:

Nominal length [mm]	85	120	210
Frequency range [Hz]	10 to 500		
Drift amplitude [mm]	0.2	0.15	0.15

Acceleration amplitude [ms ⁻²]	30.0	20.0	20.0
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METROLOGICAL DATA

Sensing probe: measuring resistor Pt 100 or Pt 500 pursuant to scheme of connection and table of designs

$\alpha = 0.00385 [K^{-1}]$, tolerance class B (or A) pursuant to ČSN IEC 751

Tolerance class of accuracy (compliance) of pair pursuant to TPM 3721-93

for maximum difference of output signal of both temperature sensors inserted into pair and located in test medium at the same temperature:

class 4 max. difference 0.05 °C
class 5 max. difference 0.1 °C

Resistance of internal wiring of both Cu wires at 20 °C:
2 x 0.088 Ω/m

Measured value of resistance of internal wiring is specified on label of measuring insert.

Maximum current load of measuring resistor:

for Pt 100 1.0 mA
for Pt 500 1 mA

Recommended measuring current:

for Pt 100 1.0 mA
for Pt 500 0.5 mA

Calibration depth of immersion without heat sink:
100 mm

Temperature response time pursuant to ČSN IEC 751 in whirling water (characteristic value):

	independent measuring insert	with heat sink
$\tau_{0,5}$	5.7 s	$\tau_{0,5}$ 13.0 s
$\tau_{0,9}$	14.6 s	$\tau_{0,9}$ 30.3 s

DESIGNATION:

Data on device label of the sensor

- Trade mark of the manufacturer
- Made in Czech Republic
- Type of sensor, nominal value R_0 / tolerance class / configuration of wires of internal wiring
- Measuring range
- Product ordering number
- Ingress protection
- Mark and number of decision about approval of type of meter in ČMI (for certified design)
- Production time code (for uncertified design)
- Manufacturing number (for certified unpaired design) manufacturing number/1 and /2 (for certified paired design)

Data on label of measuring insert

- Trade mark of the manufacturer
- Type of sensor, nominal value R_0 / tolerance class / configuration of wires of internal wiring
- Production time code (for uncertified design)
- Manufacturing number (for certified unpaired design) manufacturing number/1 and /2 (for certified paired design)
- Value of internal wiring resistance

Data on hexagon of heat sink:

- Nominal pressure
- Heat sink material

Data on stripe connected to terminal board of measuring insert (for certified design)

- Official mark of certification

Data on sensor head

- CE mark

DELIVERY

Paired sensors are delivered in a shared package.

Unless agreed otherwise with the customer, each delivery includes

- Delivery note
- Sensor pursuant to the purchase order
- Sealing ring 21 x 27 TPD 62-014-91
- Suitable weld-on piece ordered independently from the catalogue of accessories, type 991;
- Accompanying technical documentation in Czech:
 - o Product quality and completeness certificate, which also serves as the warranty certificate

- o EC Declaration of Conformity
- o Calibration sheet for uncertified calibrated design
- o Product manual

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 stem tube and heat sink material with the casting number
- For certified design
 - o Confirmation about certification of rated meter
 - o Copy of meter type approval decision in ČMI

PACKING

Both 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 sensors may be transported on conditions corresponding to the set of combinations of classes IE 21 pursuant to ČSN 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 pursuant to ČSN EN 60721-3-1 (i.e. in places with continuous temperature control from 5 to 40 °C and humidity from 5 to 85%, 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).

ORDERING

The purchase order shall specify

- Name
- Product ordering number
- Measuring range (for another range)
- If calibration is required and in what temperature points (only for uncertified designs)
- If certification in temperatures below zero (negative temperatures) is required
- If the delivery of weld-on piece 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 heat sink for heating
201 511 050 - 6 pairs
We request the delivery of the confirmation about certification of the rated meter for the sensors
We request the delivery of 12 pcs of weld-on pieces 991 NVP1 M20 13 for the sensors

Special request:

Resistance temperature sensor with heat sink for heating
201 911 030 - 6 pcs
Nominal length L 160 mm
Installation screw-joint M20 x 1.5
We request the delivery of 6 pcs of weld-on pieces 991 NVS1 M20 13 for the sensors

ORDERING WELD-ON PIECES

The purchase order shall specify

- Name
- Ordering number of weld-on piece
- Number of pieces

ORDERING NUMBERS OF WELD-ON PIECES, type 991

Direct weld-on piece - 991 NVP1 G12 13 (thread G1/2)
- 991 NVP1 M20 13 (thread M20 x 1.5)
Angular weld-on piece - 991 NVS1 G12 13 (thread G1/2)
- 991 NVS1 M20 13 (thread M20 x 1.5)

DESIGN OF TEMPERATURE SENSORS

SPECIFICATIONS					ORDERING NUMBER					
					201	x	x	x	x	x
Connecting thread of heat sink	G 1/2	nominal length of heat sink L [mm]	85		1					
			120		2					
			210		3					
	M20×1.5		other (max. 210) *)		9					
			85		5					
			120		6					
Heat sink material	1.4541 1.4571 *)								1	
									2	
Measuring resistor and tolerance class pursuant to ČSN IEC 751	Pt 100/B/4 Pt 100/A/4 *) Pt 500/B/4 *)								1	
									2	
									3	
Head	type B (pursuant to DIN 43729) type MA (small)								0	
									1	
Unpaired sensor	certified	0 to 200 °C	for steam and steam condensate						10	
		-50 to 100 °C	for gas measurement						20	
	non-certified	-50 to 200 °C	for general application						30	
Paired sensor	certified	0 to 200 °C	for flow of heat	accuracy (compliance) class pursuant to TPM 3721-93	5					50
				4 *)						90

*) Only at a special request after an agreement with the manufacturer

CERTIFICATION PURSUANT TO THE ACT 505/1990 Coll.

Unpaired sensors are certified pursuant to TPM 3342-94, paired sensors pursuant to TPM 3722-93.

Certified sensors are provided with a label with official mark of the certification. The label is connected on the cable of the measuring insert.

At request of the customer, the Confirmation about certification of rated meter can be issued for a certified sensor later on.

The purchase order shall specify:

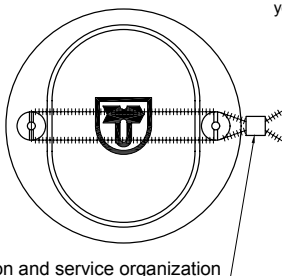
- Number of delivery note that was delivered with the sensor
- Product ordering number *)
- Manufacturing number / pair identification *)

*) Data specified on the device label

The manufacturer performs follow-up certification pursuant to the Act 505/1990 Coll. on metrology, as amended. Follow-up certification shall be ordered with the AMS department of ZPA N. Paka a.s.

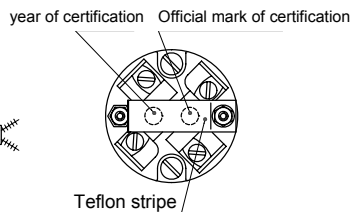
The whole pair bundled together shall be sent for follow-up certification.

TYPE OF SECURING OF SENSOR LID



Mark of installation and service organization

VIEW OF TERMINAL BOARD



MARK OF INSTALLATION AND SERVICE ORGANIZATION

CALIBRATION

The calibration may be realized for sensors, which are not used as parts of rated gauges (i.e. they are not certified). It is realized pursuant to TPM 3342-94 and in compliance with ČSN IEC 751, usually in three temperature points evenly distributed 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.

INSTALLATION AND CONNECTION

SENSOR INSTALLATION

Put the enclosed sealing ring on the heat sink of the sensor and connect it by screwing into the weld-on piece on the piping (technological equipment). During the installation, torque of 70 Nm is recommended.

Recommended application of weld-on pieces:

- Direct weld-on piece
 - for piping DN 65 to DN 250 (vertical installation)
- Angular weld-on piece
 - for piping ≤ DN 50 (angular installation or installation in bend)

Examples of application of weld-on pieces are provided in Figure 1

Slide the stem of the measuring insert of the sensor with head into the heat sink and tighten it with firm tightening of the sealing screw. After tightening, secure the sealing screw with dripping lacquer or paint against spontaneous releasing.

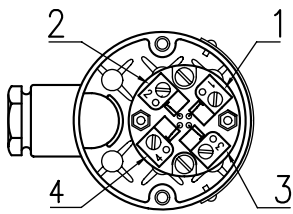
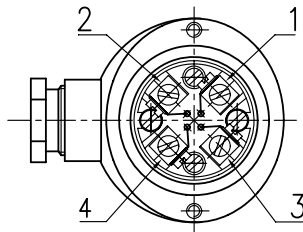
With respect to maintaining metrological properties and the longest possible service life, it is not recommended to install the sensors in places with high turbulence of the medium, which is caused e.g. by a rapid transition from a small diameter of the piping to a larger one (when failing to comply 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. 1 m.

ELECTRICAL CONNECTION

The electrical connection may be only realized by qualified workers pursuant to § 5 of the Decree 50/1978 Coll.

The terminal board of the sensor is accessible after unscrewing the lid of the head, which is connected with two screws.

Connect the evaluation devices to the sensor with a cable with double insulation (internal wires with Cu core with cross section 0.5 to 2.5 mm²). Seal the cable outlet of the sensor properly. In the environment with interfering signals, use shielded cables in the power supply circuit. Unless you can exclude the possibility of influencing the measurement, ground the wiring.

VIEW INTO HEAD of type B**of type MA****INSTALLATION OF RATED METER**

The installation, commissioning and service maintenance of rated meters pursuant to the Act No. 505/1990 Coll., on metrology, may only be realized by a person who is a bearer of a valid Authorization for installation and maintenance of rated gauges issued e.g. in ZPA Nová Paka a.s.

After the installation, certified sensors shall be provided with a mark of the installation and service organization by an authorized worker of the installation and service organization.

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 an operation and maintenance.

In case of rated meters, the prescribed period for follow-up certification shall be complied with within the intervals specified by the Decree of the Ministry of Industry and Trade No. 345/2002 Coll. Replacement and connection of the sensors being certified shall be realized by an authorized worker of the installation or service organization, who shall seal the sensor again.

The official mark on the measuring insert may only be violated by a worker of AMS. If the official mark has been damaged or removed, validity of certification of the meter expires.

SPARE PARTS

Spare parts shall be delivered by the manufacturer. Relevant measuring inserts or head or heat sinks can be ordered pursuant to the offered price list of spare parts. Inserts in the tolerance class A are only delivered as a special request.

WARRANTY

Pursuant to § 429 of the Commercial Code and the provisions of § 620 (2) of the Civil Code, the manufacturer warrants for technical and operation parameters of the product specified in the manual. The warranty period is 24 months from the

receiving of the product by the customer, unless established otherwise in the contract. The 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

They shall be realized in compliance with the Waste Act No. 106/2005 Coll.

Both 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 separated collection of electrical waste), may be disposed of to the sorted or unsorted waste pursuant to the type of waste.

The manufacturer ensures 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 be recycled completely. Metal parts of the products are recycled, non-recyclable plastic materials and electrical waste shall be disposed of in compliance with the aforesaid Act.

WARNING

- **When using the sensor with an angular weld-on piece, locate the sensor with heat sink 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 heat sink against the direction of flow so that the measured medium flows around evenly.**

Figure 1 - EXAMPLES OF INSTALLATION OF DIRECT AND ANGULAR WELD-ON PIECES pursuant to ČSN EN 1434-2

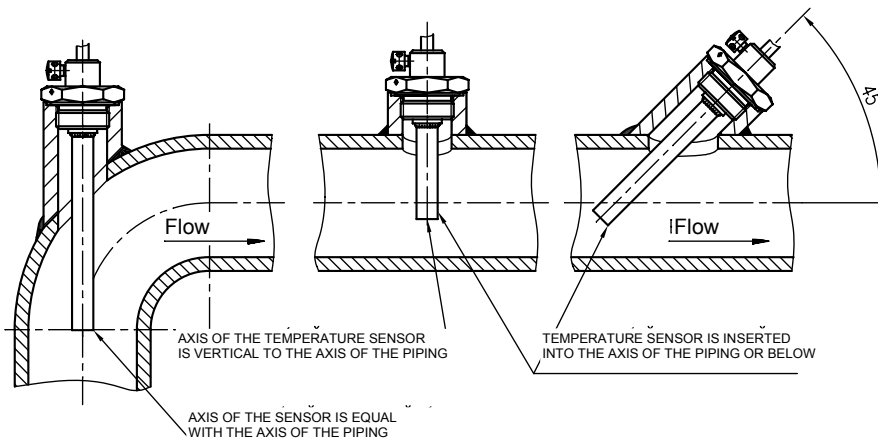
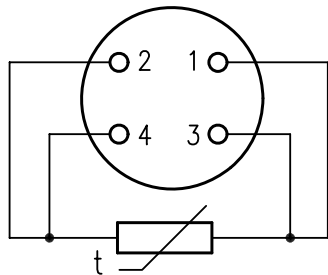


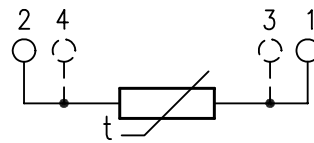
Figure 2 - SCHEME OF CONNECTION OF TEMPERATURE SENSORS

in four-wire connection Pt 100/ I4



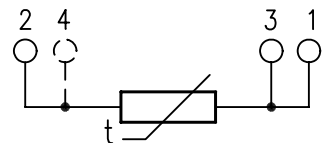
in two-wire connection Pt 100/B/2

(it is made by connection of terminals 1 and 2, terminals 3 and 4 not connected)



in three-wire connection Pt 100/B/3

(it is made by connection of terminals 1, 2 and 3; terminal 4 not connected)



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