



# MMG Műszerszerviz Kft.

1036 Budapest, Dereglye u. 1.,

Tel/fax: 204-2252, Tel:203-7443

Web: [www.mmg.hu](http://www.mmg.hu), E-mail: [info@mmg.hu](mailto:info@mmg.hu)

## FOR DESIGNS WITH CONVERTER A MANUAL IS ENCLOSED TO RELEVANT CONVERTER

### 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 63;
- As pressure equipment of category III pursuant to the Decree of the Government 26/2003 Coll. (module of compliance assessment B+D)
- In non-certified design for general temperature measurement
- In certified design as rated gauge for business measurement of steam temperature (e.g. in combination with evaluation units INMAT 51, INMAT 66)
- In design with converter
  - o To convert signal of the resistance sensor to unified output signal 4 to 20 mA or digital signal (converter with HART protocol)
  - o To environment with industrial interference
  - o In explosive environment pursuant to the type of the converter EExi (refer to enclosed converter manual)

The sensors are rated products pursuant to the Act No. 22/1997 Coll. and Compliance Certificates **EC-112620** and **EC-112630** for sensors without converter and **EC-11263P** for sensors with converter are issued for them.

### DESCRIPTION

The sensor consists of a replaceable measuring insert with terminal board or installed two-wire converter (insulated or non-insulated, even in design EExi) and protective armature consisting of the head and heat sink with adapter with screw joint for the connection of the sensor into the weld-on piece of the piping (technological equipment). The head is provided with a lid and sealing outlet for the connection wiring. The measuring insert is formed with a stem tube, into which the measuring resistor with internal wiring is placed and it is electrically insulated from the jacket of the stem tube.

The sensor with converter is supplied from an external source. The installed converter is set-up to the required range at the sensor manufacturer.

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 design pursuant to ČSN EN 61010-1 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, the follow-up (evaluation) device shall comply with Article 6.3 hereof.

#### Measuring range:

Measuring range [°C]	Material of heat sink	Nominal pressure	Internal wiring	Type
0 to 400	15 128	PN 63	Ag	112 62
-70 to 400	1.4541			
0 to 550	15 128		Special alloy	112 63 112 63/P
-70 to 600	1.4541			

Measuring range of the sensor with converter is given by the range of the selected converter.

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

(only measuring insert without converter or design with insulated converter)

**Electrical insulation resistance** pursuant to ČSN IEC 751, Article 4.2.1:

min. 100 MΩ, at 15 to 35°C, max. 80 % of relative humidity

#### Power supply of converter:

DC 24 V from source SELV, e.g. INAP 16, INAP 30, INAP 31 or INAP 901

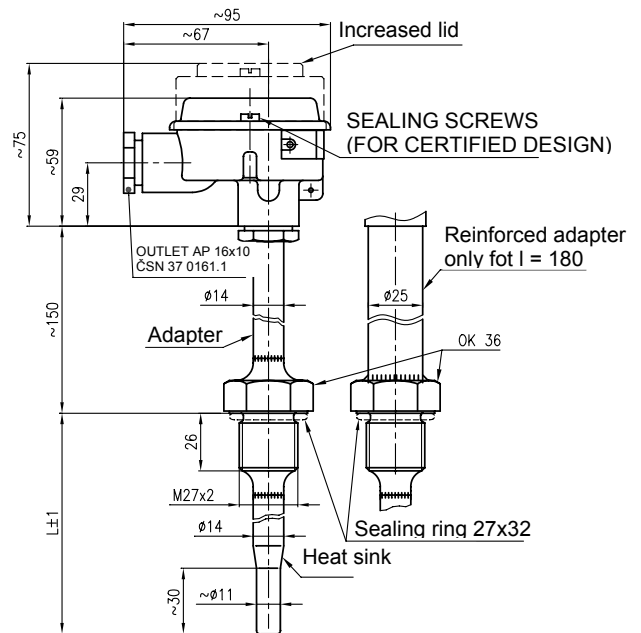
**Other data of converter:** refer to the enclosed manual

**Coverage** pursuant to ČSN EN 60529: IP 65

#### Operation position:

discretionary, the outlet shall not be situated upwards

**Type of operation:** continuous



#### Sensor weight:

with adapter 150	L 160 approx. 0.80 kg
	L 250 0.92 kg
	L 400 1.05 kg
	L 630 1.25 kg
with reinforced adapter 150	L 160 approx. 0.85 kg

#### Used materials:

stem tube of measuring insert	steel 1.4541
heat sink	steel 1.4541 or 15 128 galvanized
adapter	steel class 11 galvanized
head	chromated aluminium alloy and painted with aluminium paint
head clamps of the 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 ČSN EN 60721-3-3 and the following operation conditions

#### Ambient temperature for sensor head:

for design without converter max. 150 °C

for design with converter pursuant to the type of the converter (refer to the enclosed manual)

#### Relative ambient humidity:

10 to 100 % with condensation, with upper limit of water content 29 g H<sub>2</sub>O/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	160*)
Water steam and air	25	8	2.5	1	25
Water	3	3	1.5	0.2	3

\*) with reinforced adapter 150 mm

**Vibrations:**

Nominal length [mm]	160	250	400	630	160*)
Frequency range [Hz]	10 to 500				
without converter					
Drift amplitude [mm]	0.35	0.2	0.2	0.15	0.5
Acceleration amplitude [ms <sup>-2</sup> ]	49.0	39.2	29.4	19.6	68.6
with converter					
Drift amplitude [mm]	0.2	0.15	0.15	0.075	0.2
Acceleration amplitude [ms <sup>-2</sup> ]	29.4	19.6	19.6	9.8	29.4

\*) with reinforced adapter 150 mm

**METROLOGICAL DATA**

**Sensor:** measuring resistor Pt 110 single or double pursuant to connection scheme and Table of design,  $\alpha = 0.00385 [K^{-1}]$ , tolerance class B (or A only for 4-wire) pursuant to ČSN IEC 751

**Internal wiring resistance** at 20 °C:

type 112 62 Ag 0.053  $\Omega/m \pm 10 \%$   
 type 112 63, 112 63/P special alloy 2.45  $\Omega/m \pm 5 \%$

Measured value of internal wiring resistance is identified on the label of the measuring insert in case of the design without converter.

**Maximum current load of measuring resistor:** 5 mA

**Recommended measuring current:** 1 mA

**Output signal of the converter** (linear with measured temperature):

4 to 20 mA (+ digital for HART protocol)

**Calibration depth of immersion:** 200 mm

**Temperature response time** pursuant to ČSN IEC 751 in

whirling water (characteristic value):  $\tau_{0.5}$  29 s  
 $\tau_{0.9}$  95 s

**DESIGNATION:****Data on head label**

- Trade mark of the manufacturer
- Made in Czech Republic
- Type of resistance sensor, nominal value  $R_0$  / tolerance class / configuration of internal wiring wires \*)
- Measuring range or set-up converter range
- Product ordering number
- Coverage
- Mark and decision number about gauge type approval in CMI (for certified design)
- Production time code, for certified design manufacturing number
- Output signal 4 to 20 mA (design with converter)
- Mark of non-explosiveness and No. of the EC Certificate of type test (design with converter EExi)

\*) the configuration of internal wiring wires is not specified for the converter

**Data on the measuring insert label**

- Trade mark of the manufacturer
- Sensor type, nominal value  $R_0$  / tolerance class / configuration of internal wiring wires \*)
- Production time code; manufacturing number for certified designs
- Resistance value of internal wiring (for design without converter)

\*) the configuration of internal wiring wires is not specified for the converter

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

- Official mark of certification

**Data on converter label**

- Sensor type
- Set-up temperature range

**Data on sensor head**

- Mark CE 1015
- Mark CE with identification number of the notified person (for converter EExi)

**CERTIFICATION****112 62**

- Pressure equipment pursuant to the Decree of the Government 26/2003 Coll., EC Certificate of type test SZÚ Brno

**112 63**

- Pressure equipment pursuant to the Decree of the Government 26/2003 Coll., EC Certificate of type test SZÚ Brno
- Type approval of rated gauge TCS 311/92-1139

**112 63/P**

- Pressure equipment pursuant to the Decree of the Government 26/2003 Coll., EC Certificate of type test SZÚ Brno
- Non-explosiveness EExi, EC Certificate of type test pursuant to the Decree of the Government 23/2003 Coll. (according to the converter type)

**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 weld-on piece ordered separately from the catalogue of accessories, type 991
- Optional accessories to the sensor with programmable converter
  - o Configuration (parameterization) programme pursuant to the required converter
  - o Communication modem (for serial port RS 232C) pursuant to the required converter
- Accompanying technical documentation in Czech
  - o Product quality and completeness certificate, which also serves as the warranty certificate
  - o EC Compliance Certificate
  - o Calibration sheet for non-certified calibrated designs
  - o Product manual

If it is established in the purchase contract or agreed otherwise, the following documentation can be delivered with the product, too:

- Copy of the Inspection Certificate 3.1 for the stem tube and heat sink material with the casting number
- Copy of EC Certificate of type test pursuant to the Decree of the Government 26/2003 Coll.
- Copy of EC Certificate of type test pursuant to the Decree of the Government 23/2003 Coll. (for design with converter EExi)
- For certified design
  - o Confirmation about rated gauge certification
  - o Copy of decision about gauge type approval in ČMI

**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 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 with 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.)

**PLACING AN ORDER**

The purchase order shall include

- Name
- Product ordering number

- Measuring range (for another range)
- If calibration is required and in what temperature points
- If certification in temperatures below zero (negative temperatures) is required
- If delivery of weld-on piece pursuant to type 991 is required for the sensor as accessories
- If optional accessories to the sensor with programmable converter are required
- Other (special) requests
- Number of pieces

### ORDER EXAMPLE

#### Standard design:

Resistance temperature sensor with heat sink, with high mechanical resistance 112 630 712 - 6 pcs  
We require the delivery of the confirmation about rated gauge certification for the sensors

#### Special requirement:

Resistance temperature sensor with heat sink with high mechanical resistance  
112 625 722, tolerance class A - 6 pcs

### PLACING AN ORDER OF WELD-ON PIECES

The purchase order shall include

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

**ORDERING NUMBERS OF WELD-ON PIECES, TYPE 991**

Angular weld-on piece - 991 NVS4 M27 13 (material 11 353.0)  
- 991 NVS4 M27 72 (material 1.4541)

Direct weld-on piece - 991 NVP4 M27 13 (material 11 353.0)  
- 991 NVP4 M27 72 (material 1.4541)

**DESIGN OF TEMPERATURE SENSORS WITH HEAT SINK TO 400 °C, TYPE 112 62 - NON-CERTIFIED**

SPECIFICATION				ORDERING NUMBER				
				112 62	5	x	x	x
Measuring resistor pursuant to ČSN IEC 751, tolerance class B		Pt 100/B/2				7		
		2 x Pt 100/B/2				8		
Design of measuring end	With adapter 150 mm	Material of heat sink	15 128				2	
			1.4541				3	
	With reinforced adapter 150 mm		15 128				5	
			1.4541				6	
	Nominal length L [mm]	100 *)						1
		160						2
		250						3
		400						4
		630						5
		Other, max. 3000 mm *)						9

\*) Only as a special request on the basis of an agreement with the manufacturer

**DESIGN OF TEMPERATURE SENSORS WITH HEAT SINK TO 600 °C, TYPE 112 63 - NON-CERTIFIED**

SPECIFICATION				ORDERING NUMBER				
				112 63	5	x	x	x
Measuring resistor pursuant to ČSN IEC 751, tolerance class B or A *)		Pt 100/ /4				7		
		2 x Pt 100/B/2				8		
Design of measuring end	With adapter 150 mm	Material of heat sink	15 128				2	
			1.4541				3	
	With reinforced adapter 150 mm		15 128				5	
			1.4541				6	
	Nominal length L [mm]	100 *)						1
		160						2
		250						3
		400						4
		630						5
		Other, max. 3000 mm*)						9
Measuring resistor pursuant to ČSN IEC 751, tolerance class B		Pt 100/B/4C				7		
		Design of measuring end	With adapter 150 mm	Material of heat sink	15 128			
1.4541							3	
With reinforced adapter 150 mm	15 128						5	
	1.4541						6	
Nominal length L [mm]	160						6	
	250						7	
	400						8	
	630 or other, max. 3000 mm*)						9	

\*) Only as a special request on the basis of an agreement with the manufacturer

**DESIGN OF TEMPERATURE SENSORS WITH HEAT SINK TO 600 °C, TYPE 112 63 - CERTIFIED**

SPECIFICATION				ORDERING NUMBER					
				112 63	0	x	x	x	
Measuring resistor pursuant to ČSN IEC 751, tolerance class B or A *)		Pt 100/ /4				7			
		Design of measuring end	With adapter 150 mm	Material of heat sink	15 128				2
1.4541							3		
Nominal length L [mm]	100 *)							1	
	160							2	
	250						3		
	400						4		
	630						5		
Other, max. 3000 mm *)						9			
Measuring resistor pursuant to ČSN IEC 751, tolerance class B		Pt 100/B/4C				7			
		Design of measuring end	With adapter 150 mm	Material of heat sink	15 128				2
1.4541							3		
Nominal length L [mm]	160							6	
	250							7	
	400							8	
630 or other, max. 3000 mm*)						9			

\*) Only as a special request on the basis of an agreement with the manufacturer

**DESIGN OF TEMPERATURE SENSORS WITH HEAT SINK TO 600 °C WITH CONVERTER, TYPE 112 61/P - NON-CERTIFIED**

SPECIFICATION				ORDERING NUMBER					
				112 63	9	x	x	x	/xxxx
Measuring resistor pursuant to ČSN IEC 751, tolerance class B or A *)		Pt 100/B				B			
		Pt 100/A *)				A			
Design of measuring end	With adapter 150 mm	Material of heat sink	15 128				2		
			1.4541				3		
	With reinforced adapter 150 mm	15 128				5	2		
		1.4541				6	2		
	Nominal length L [mm]	100 *)						1	
		160						2	
		250						3	
400							4		
630							5		
		Other, max. 3000mm*)					9		
Converter type		Galvanic separation	Increased lid	EExia	Range [°C]				
Analogue	INPAL 420				-50 to 50			/07	
					-30 to 70			/55	
					0 to 50			/15	
					0 to 100			/18	
					0 to 150			/19	
					0 to 200			/20	
					0 to 250			/21	
					0 to 400			/23	
					other *)			/99	
	APAQ-HRF				Adjustable range			/HRF	
	APAQ-HRFX *)			•				/HRFX	
Programmable	TK-L		•		Programmable range			/TKL	
	TK-L-ex *)		•	•				/TKLX	
	TK	•	•					/TK	
	TK-ex *)	•	•	•				/TKX	
	IPAQ-H	•	•					/IPAQH	
	IPAQ-HX *)	•	•	•				/IPAQHx	
MINIPAQ-H		•				/MINIPAQ			
HART protocol	TK-H	•	•					/TKH	
	TK-H-ex *)	•	•	•				/TKHX	
	MESO-H	•	•					/MESOH	
	MESO-HX *)	•	•	•				/MESOHX	

\*) Only as a special request on the basis of an agreement with the manufacturer  
 Note: As a default, the sensors are delivered with converter INPAL 420 and specified standard ranges. If another range is requested, the converter APAQ-HRF is used as a default. The required measuring range for converters APAQ and programmable converters shall be specified in the purchase order in wording. Minimum range of measured temperature shall be entered pursuant to the parameters of the converter. The lower and upper limits of the temperature range are given by the material of heat sink pursuant to the table.

**CERTIFICATION PURSUANT TO THE ACT 505/1990 Coll.**

The sensors are certified pursuant to TPM 3342-94. Certified sensors are provided with a label with the official mark of the certification. The label is attached to the ceramic terminal board of the measuring insert.

Upon request of the customer, a confirmation about rated gauge certification may be issued for a certified sensor later on.

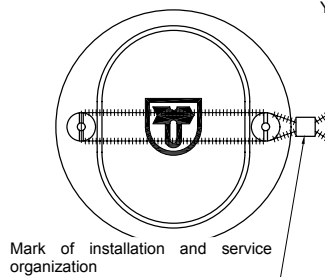
The purchase order shall specify:

- Number of the delivery note, which was supplied with the sensor
- Product ordering number \*)
- Manufacturing number \*)

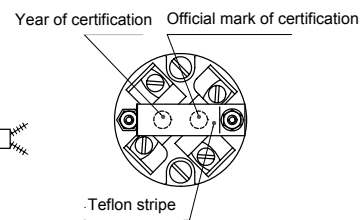
\*) Data provided on the device label

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.

**TYPE OF SECURING SENSOR LID**



**VIEW OF THE TERMINAL BOARD**



## CALIBRATION

Calibration may be performed for the 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 on the enclosed sealing ring on the heat sink of the sensor and connect the sensor by screwing into the weld-on piece on the piping (technological equipment). During the installation, torque of 100 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  $\leq$  DN 50  
(angular installation or installation in bend)

Examples of application of weld-on pieces are provided in figure 1.

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). Recommended distance of the temperature sensor from the installation flange of the flow meter is min. 1 m.

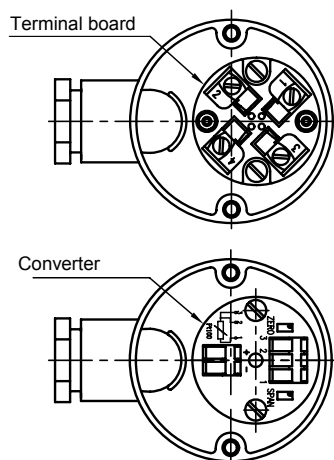
### ELECTRICAL CONNECTION

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 (converter) is accessible after the removal of the lid of the head that is connected with two screws.

Connect the evaluation devices to the sensor with a cable with a double insulation (internal wires with Cu core with the cross section 0.5 to 2.5 mm<sup>2</sup>). 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



**WARNING for sensor with converter EExi**   
EExi parameters shall be complied with pursuant to the enclosed converter manual.  
To ensure safety, a spark-safe source shall be always used pursuant to the converter manual, e.g. INAP 901 ordering number 901 000 101.

Surface temperature of the converter may not exceed maximum surface temperature for that particular temperature class.

If the converter is installed in a dangerous zone, the sensor shall be grounded electrostatically usually with the use of grounded metal piping.

Programmable converter may not be connected to a computer or a HART communicator, if the converter is located in explosive environment.

### INSTALLATION OF RATED GAUGE

The installation, commissioning and service maintenance of rated gauges pursuant to the Act 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, the 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 (and the settlement period of the converter), the equipment is prepared for operation.

## OPERATION AND MAINTENANCE

The sensor does not require any operation and maintenance. In case of rated gauges, the prescribed time for follow-up certification shall be complied with within the intervals identified by the Decree of the Ministry of Industry and Trade 345/2002 Coll. The replacement and connection of sensors to be certified shall be performed by an authorized worker of the installation or service organization, who shall seal the sensors 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 the gauge certification is terminated.

## SPARE PARTS

Spare parts shall be delivered by the manufacturer.

Relevant measuring inserts, adapters or head can be ordered pursuant to the offered price list of spare parts.

Inserts in the tolerance class A are only delivered on the basis of a special requirement.

## 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 selected salvage of electrical waste), can be disposed of to the 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 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.

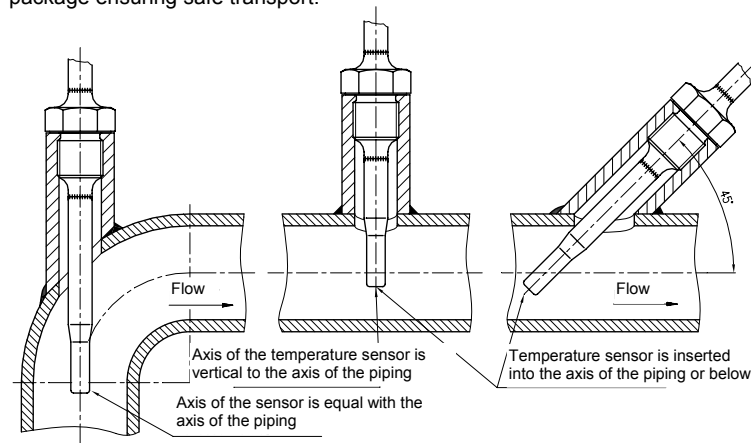


Figure 1 - EXAMPLES OF INSTALLATION OF DIRECT AND ANGULAR WELD-ON PIECES PURSUANT TO ČSN EN 1434-2

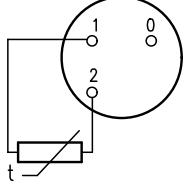


## WARNING

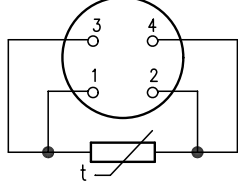
- When using the sensor with an angular weld-on piece, locate the sensor with heat sink at an angle against the direction of flow
- The sensor may not touch the opposite side of the piping
- It is also advantageous to use the temperature sensors in the piping elbow. In such a case, locate the sensor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

**Figure 2 - SCHEME OF CONNECTION OF TEMPERATURE SENSORS**  
without converter with converter

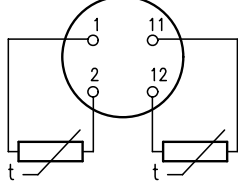
with single measuring resistor  
in two-wire connection  
(Pt 100/B/2)



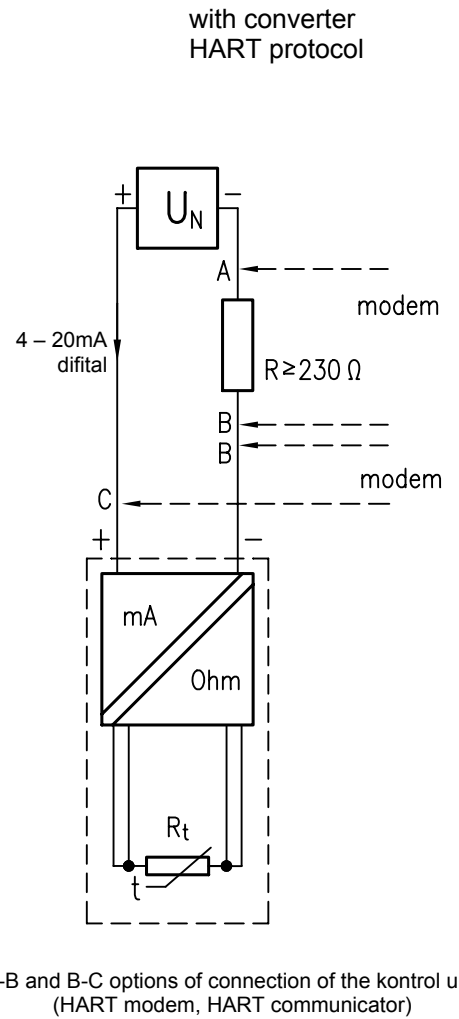
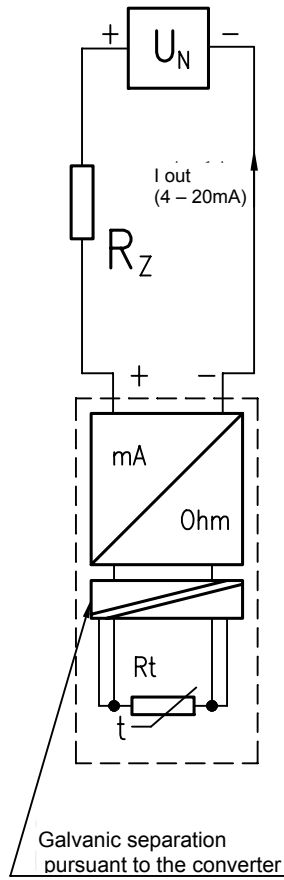
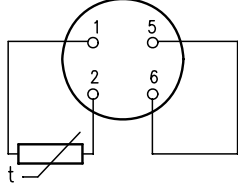
with single measuring resistor  
in four-wire connection  
(Pt 100/ /4)



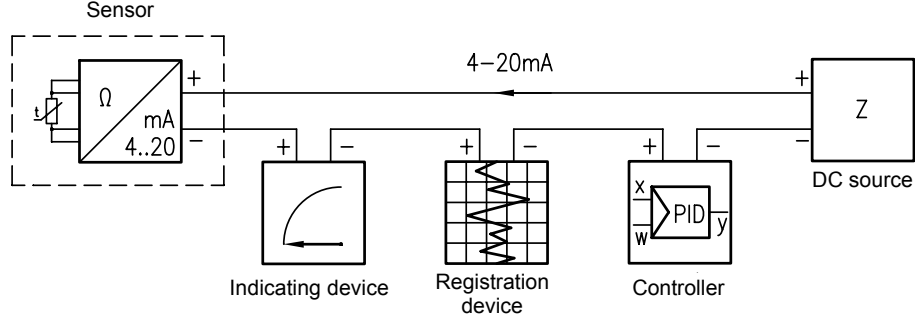
with double measuring resistor  
in two-wire connection  
(2 × Pt 100/B/2)



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



**Figure 3 - EXAMPLE OF OPERATION CONNECTION**  
temperature sensors with converter in loop 4 - 20 mA



**MMG Műszerszerviz Kft.**  
1036 Budapest, Dereglye u. 1.,  
Tel/fax: 204-2252, Tel:203-7443  
Web: [www.mmg.hu](http://www.mmg.hu), E-mail: [info@mmg.hu](mailto:info@mmg.hu)