



# 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 DESIGN WITH CONVERTER A MANUAL IS ENCLOSED TO THE RELEVANT CONVERTER

### APPLICATION

- For remote measurement of temperature of air in indoor and outdoor areas
- In conditions with a danger of explosion Zone 1 and Zone 2 pursuant to ČSN EN 60079-10, with the use of the converter Ex ia or in case of connection to Ex ia of the circuit, the sensor may be used in Zone 0
- In design with converter to convert signal of the resistance sensor to unified output signal 4 to 20mA or digital signal (converter with HART protocol)

The sensors are rated products pursuant to the Act No. 22/1997 Coll. and the Compliance Certificate **EC-112130** is issued for the sensors without converter and **EC-11213P** for the sensors with converter.

### DESCRIPTION

The sensor as a whole forms the fixed closure Ex d. It consists of the stem protection tube with measuring resistor, which is connected to the connecting head by means of a cap flange. In the head, a sensing probe and terminal board or converter (isolated or non-isolated, also in design Ex i) are installed. The installed converter is set-up to the required range at the sensor manufacturer.

The sensor shall be connected onto the wall by means of a holder, where the external terminal for grounding is placed.

To measure temperature, a defined change of the sensor in dependence on the change of temperature of the measured environment is used.

### TECHNICAL DATA

The sensor is designed pursuant to ČSN EN 61140 ed. 2 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 ČSN EN 61010-1, the follow-up (evaluation) device shall comply with Article 6.3 thereof.

**Measuring range:** -40 to 70 °C

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

**Fixed closure** pursuant to ČSN EN 60079-0 ed. 2 and ČSN EN 60079-1:

Ex II 2 G Ex d IIC T6 -40°C ≤ T<sub>a</sub> ≤ 70°C

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

(only design without converter or with isolated converter)

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

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

**Power supply of converter:**

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

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

**Ingress protection** pursuant to ČSN EN 60529: IP 54

**Operation position:**

discretionary; the outlet shall not be situated upwards

**Weight:** approx. 0.65 kg

**Type of operation:** continuous

**Applied materials:**

Stem tube of measuring insert steel 1.4541

Holder steel class 11 with galvanic zinc coating

Head chromated aluminium alloy and painted with grey synthetic semi-polished baking enamel

Internal wiring Cu

Head terminals 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 ČSN EN 60721-3-3 and the following operation conditions.

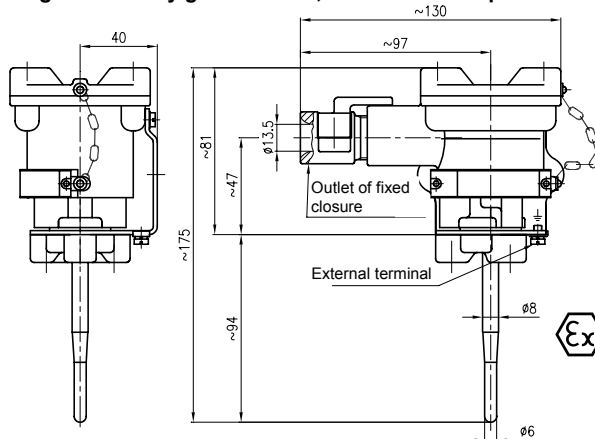
**Ambient temperature:** -40 to 70 °C

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



### WARNING

The user shall guarantee that the maximum surface temperature of the sensor does not reach the temperature of ignition of any gas or steam, which could be present.



**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 air flow:** 25 m/s

**Vibrations:**

Frequency range 10 to 55 Hz

Drift amplitude 0.15 mm

Acceleration amplitude 19.6 ms<sup>-2</sup>

### METROLOGICAL DATA

**Sensing unit:** measuring resistor Pt single or double in connection pursuant to the scheme of connection and table of designs

$\alpha = 0.00385 [K^{-1}]$ , tolerance class B (or A only for 4-wire) pursuant to ČSN IEC 751

**Internal wiring resistance at 20°C:** 0.017 ± 10%

**Maximum current load of measuring resistor:** 3 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:** 90 mm

**Temperature response time** pursuant to ČSN IEC 751 in still air, (characteristic value):

0.5 4.5 min

0.9 16.5 min

### DESIGNATION :

**Data on head label**

- Trademark of the manufacturer
- Made in Czech Republic
- Type of measuring resistor, nominal value R<sub>0</sub> / tolerance class / configuration of wires of internal wiring \*)
- Measuring range of the sensor or pre-set converter range
- Product ordering number
- Ingress protection
- Production time code
- Output signal 4 to 20 mA (design with converter)
- Mark of non-explosiveness
- Ex II 2 G Ex d IIC T6 -40°C ≤ T<sub>a</sub> ≤ 70°C and No. of EC-Type Examination Certificate
- Mark of non-explosiveness and No. of EC-Type Examination Certificate for converter Ex i

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

**Data on converter label**

- Type of measuring resistor
- Set-up temperature range

**Data on head and cover of the sensor**

- Data on performed pressure test

**Data on head of sensor**

- Mark CE 1026
- Mark CE with identification number of notified body (for converter Ex i)
- Type and size of thread for outlet

**CERTIFICATION**

**112 13**

- Non-explosiveness  $\text{Ex II 2 G Ex d IIC T6 - } 40^{\circ}\text{C} \leq \text{Ta} \leq 70^{\circ}\text{C}$ , EC-Type Examination Certificate pursuant to the Decree of the Government 23/2003 Coll. FTZÚ 02 ATEX 0460 + Annex 1

**11213/P**

- Non-explosiveness  $\text{Ex II 2 G Ex d IIC T6 - } 40^{\circ}\text{C} \leq \text{Ta} \leq 70^{\circ}\text{C}$ , EC-Type Examination Certificate pursuant to the Decree of the Government 23/2003 Coll. FTZÚ 02 ATEX 0460 + Annex 1
- Non-explosiveness Ex i, EC-Type Examination Certificate pursuant to the Decree of the Government 23/2003 Coll., (depending on the type of the converter)

**RELIABILITY**

Indicators of reliability in operation conditions and conditions of the environment specified herein

- Mean time of operation between failures 96 000 hours (inf. value)
- Expected service life 10 years

**DELIVERY**

Unless agreed otherwise with the customer, each delivery includes

- Delivery note
- Sensor pursuant to the purchase order
- Rubber sealing ring  $\varnothing$  8 to 10 mm (after an agreement with the manufacturer, sealing ring  $\varnothing$  6 to 8 mm) and appropriate two metal washers for the cable outlet of the head, to which a rubber sealing ring  $\varnothing$  10 to 12 mm is installed)
- 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 Declaration of Conformity
  - o Calibration sheet (for 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 EC-Type Examination Certificate pursuant to the Decree of the Government 23/2003 Coll. (for fixed closure)
- Copy of EC-Type Examination Certificate pursuant to the Decree of the Government 23/2003 Coll. (for converter Ex i)
- Copy of the Inspection Certificate 3.1 for the stem tube material with the casting number

**ORDERING**

The purchase order shall specify

- Name
- Product ordering number
- Measuring range of the converter (for another range)
- If calibration is required and in what temperature points
- If optional accessories to the sensor with programmable converter are required
- Other requirements (documentation, ...)
- Number of pieces

**PURCHASE ORDER EXAMPLE**

**Standard design:**

1. Spatial resistance temperature sensor Ex d 112 135 7B1 6 pcs  
We request calibration in points -20, 0, 20 and 50°C
2. Spatial resistance temperature sensor Ex d with converter 112 139 7B1/55 6 pcs  
Range -30 to 70°C

**Special request:**

1. Spatial resistance temperature sensor Ex d 112 135 7A1 6 pcs
2. Spatial resistance temperature sensor Ex d with converter 112 135 7A1/TH200 6 pcs  
Range 0 to 50°C

**DESIGN OF TEMPERATURE SENSORS, TYPE 112 13**

SPECIFICATION		ORDERING NUMBER				
		112 13	5	x	B	1
Measuring resistor, tolerance class B pursuant to ČSN IEC 751	Pt 100/B/2			7		
	2 × Pt 100/B/2			8		

**DESIGN OF TEMPERATURE SENSORS, TYPE 112 13/P**

SPECIFICATION				ORDERING NUMBER					
				112 13	9	7	x	1	/xxxx
Measuring resistor Pt 100, tolerance class pursuant to ČSN IEC 751							B		
							A		
Converter type		Galvanic separation	Ex	Range [°C]					
Analogue	INPAL 420			0 to 50				/15	
	APAQ-HRF			-30 to 70				/55	
	APAQ-HRFX		•	Adjustable range				/HRF	/HRFX
Programmable	TH 100			Programmable range				/TH100	
	TH 100-ex		•		/TH100X				
	TH 200	•			/TH200				
	TH 200-ex	•	•		/T200X				
	IPAQ-H	•			/IPAQH				
	IPAQ-HX	•	•	/IPAQHX					
	MINIPAQ-HLP			/MINIPAQ					
HART protocol	TH 300	•		/TH300					
	TH 300-ex	•	•	/TH300X					
	MESO-H	•		/MESOH					

	MESO-HX	•	•						/MESOHX
Other *)									/99
Without converter (for converter installation by customer)									/00

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

Note: As a default, the sensors are delivered with converter INPAL 420 and specified default ranges. When another range is required, converter APAQ-HRF is used as a default. Specify the required measuring range for the APAQ converters and programmable converters in the purchase order in wording. Unless the measuring range is defined in the purchase order by the customer, the range from -30 to 70 °C shall be set up.

Minimum range of the measured temperature and the measuring range shall be entered pursuant to the parameters of the converter. The lower limit of the temperature range is -40 °C; the upper limit of the range is 70 °C. With respect to that particular temperature class, it is not permitted to change (increase) the pre-set converter range beyond the said limits later on.

## 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 products may be stored on conditions corresponding to the set of combinations of classes IE 11/1K3 pursuant to ČSN 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).

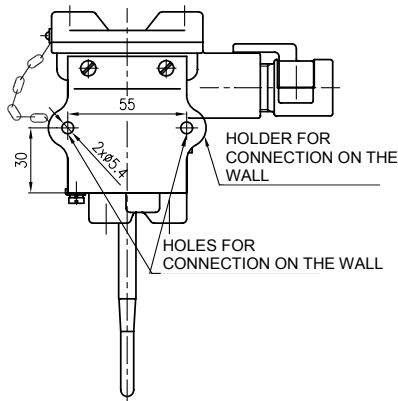
## CALIBRATION

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

The sensors can be connected on the wall with two screws by means of a holder.



### WARNING

Distance of the fixed closure  $\text{Ex}$  II 2 G Ex d IIC T6 from close structures or between the closures shall be at least 40 mm.

### INSTALLATION OF CABLE OUTLET

The cable outlet shall ensure the applicable Ingress Protection and, at the same time, it shall secure the cable against turning over. As a default, it is designed for cables with the external diameter 8 to 12 mm, pursuant to the selected type of the rubber sealing ring. It shall be sealed properly. After tightening the body (screw joint) of the outlet to at least 5 threads, fix the cable with the yoke (shim) against turning over and against spontaneous release of the outlet.



### WARNING

Do not use other sealing rings in the outlet than the original ones delivered by the manufacturer. Do not change the outer diameter of the cable artificially, e.g. by winding electrical insulation tapes around it.

### ELECTRICAL CONNECTION

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

**The sensor installation in the environment with explosive gaseous atmosphere shall be in compliance with the requirements of ČSN EN 60079-14 ed. 2.**

The terminal board of the sensor (converter) is accessible after the removal of the lid of the head, which is connected with two screws.

Connect the evaluation devices to the sensor with a non-armoured cable with double insulation (internal wires with Cu core with cross section 0.5 to 2.5 mm<sup>2</sup>). Seal the cable outlet of the sensor as required in the Article *INSTALLATION OF CABLE OUTLET*.



### WARNING

For electrical connection, do not use independent wires without a jacket. To secure the grade of Ingress Protection in the outlet, the connecting cable shall have circular cross-section. Temperature resistance of the cable shall be in compliance with the ambient temperature!

The cable insulation shall have chemical and mechanical resistance in compliance with the environment, where the cable will be installed. It is recommended supporting the cable along its length between the sensor and the follow-up device. In the conditions with interfering signals, use a shielded cable in the supply circuit. Ground (earth) the shielding in one point only. Do not lead the cable together with power cables.

For the sensors with converter with HART protocol, the maximum length of wiring is identified by the layout of the wires of the connecting cable. The overall length of wiring may be up to 1500 m. A twisted two-wire with shared shielding with the cross-section of the core min. 0.5 mm<sup>2</sup> is required. The HART communicator is connected to the supply loop of the sensor with the converter pursuant to Figure 2. To ensure reliable commutation, there shall be total load resistance of min. 250  $\Omega$  in the circuit of the output loop.



### WARNING

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



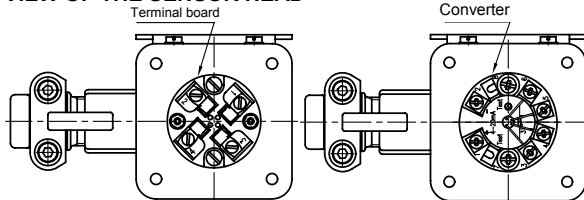
### WARNING for sensor with converter Ex i

Ex i parameters shall be complied with pursuant to the enclosed converter manual.

To ensure safety, an intrinsically 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.

For the installation in a dangerous area, interconnection (bringing to the same potential) is required. To achieve it, you can use the external terminal on the sensor adapter, which enables the connection of the protective wire (wire for mutual interconnection) with cross section of 4 mm<sup>2</sup>.

**VIEW OF THE SENSOR HEAD****CLOSING THE HEAD OF THE FIXED CLOSURE Ex d**

After the electrical connection, close the head of the sensor with four screws. Fan-shaped washers shall be installed under all screws on the head and the outlet. The rest areas of the lid and the head may not be polluted or provided with solidifying paints (with the exception of non-hardening greases). All screws on the sensor and the outlet, which secure the connection of parts of the fixed closure, shall be tightened properly so that the joint between the lid and the head is max. 0.2 mm.

The sensors may be provided with the mark (seal) of the installation and service organization by a worker of the

**COMMISSIONING**

After the installation of the sensor, including closing of the fixed closure and connection of the follow-up 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.

**WARNING**

**Any intervention into the sensor and its design will cause a change of its properties and can result in an explosion!**

**SENSOR UNINSTALLATION**

The installation seal may only be violated by a worker of the installation and service organization.

**WARNING**

**The temperature sensor is in design Ex d and it must be disconnected from the supply source before opening the cover of the head and releasing the cable outlet!**

After the removal of the lid of the head, which is connected with four screws, disconnect the connecting cable.

Before a complete uninstallation of the sensor, release the wire for mutual interconnection from the external terminal on the sensor. By releasing two connecting screws of the holder, the sensor is removed from the wall.

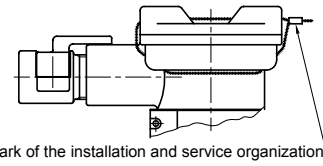
**OUTLET REPLACEMENT**

The cable outlet may only be replaced with a similar type (with securing against pull-out) that is certified for fixed closure Ex d IIC. When replacing the cable outlet, the body of the new outlet shall be tightened with torque of 30–35 Nm. The installation of the cable in the outlet, its sealing and securing against the pull-out shall be realized pursuant to the instruction sheet of the supplier of the outlet and in compliance with the Article *INSTALLATION OF CABLE OUTLET*.

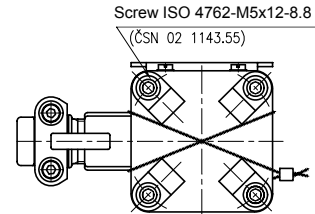
**SPARE PARTS**

The design of the device does not require any delivery of spare parts.

installation and service organization. The type of sealing is illustrated in the figure.

**TYPE OF SECURING THE LID**

Mark of the installation and service organization

**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. 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.

The product and its package do not include any parts that could impact the environment.

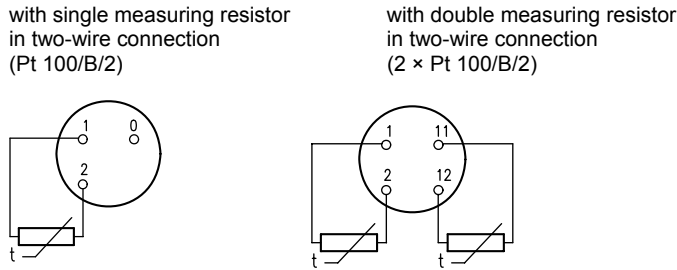
The products that are withdrawn from operation, including their packages (with the exception of products marked as electrical equipment for the purposes of return withdrawal and separate salvage of electrical waste), may be disposed of to sorted or unsorted waste pursuant to the type of waste.

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.

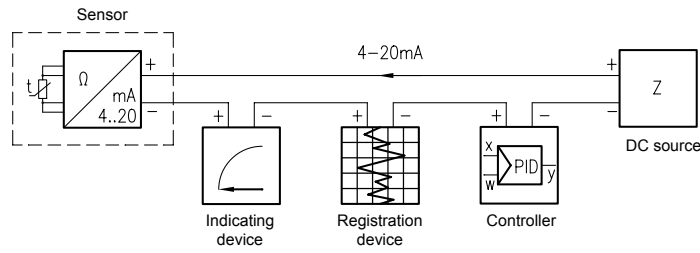
The package of the sensor can be recycled completely.

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

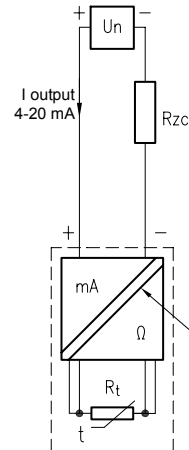
**FIGURE 1 - SCHEME OF CONNECTION OF TEMPERATURE SENSORS without converter**



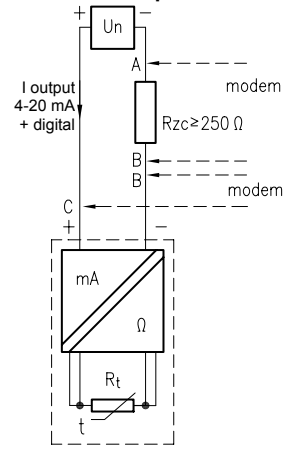
**FIGURE 2 - EXAMPLE OF OPERATION CONNECTION OF TEMPERATURE SENSOR WITH CONVERTER IN LOOP 4 - 20 mA**



**with converter**



**with converter with HART protocol**



GALVANIC SEPARATION PURSUANT TO THE CONVERTER

A-B and B-C options of connection of the control unit (HART modem, HART communicator)

Rzc – Total load resistance, Un – supply voltage



**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