



MMG Műszerszerviz Kft.

1036 Budapest, Dereglye u. 1.,

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

Web: www.mmg.hu, E-mail: info@mmg.hu

FOR DESIGNS WITH CONVERTER A MANUAL IS ENCLOSED TO THE 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 selected by the customer are suitable, measurement may be realized up to the temperature and pressure determined by heat sink resistance
- Design with converter
 - o To convert signal of the thermoelectric sensor to unified output signal 4 to 20 mA or digital signal (converter with HART protocol)
 - o In explosive environment pursuant to the type of the converter EExi (refer to enclosed converter manual)

The sensors with converter are rated products pursuant to the Act No. 22/1997 Coll. and Compliance Certificate **EC-11313P** is issued for them.

DESCRIPTION

The sensor consists of a replaceable measuring insert with flange and terminal board or installed two-wire converter (insulated or non-insulated, even in design EExi) and protective armature. The measuring insert is formed by a jacked thermocouple of type "J" or "K" Ø 4.5 mm with centring ring Ø 6 or 8 mm pursuant to the internal diameter of the required heat sink. The protective armature is formed by a head and an adapter with screw joints for the installation of the sensors into the heat sink selected by the customer. The head is provided with a cover with sealing outlet for the connection wiring.

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 thermoelectric voltage of the thermocouple in dependence on the change of temperature of the measured environment is used.

TECHNICAL DATA

The sensor is designed 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:

for thermocouple of type "J" -200 to 800 °C
for thermocouple of type "K" 0 to 1150 °C

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

Electrical insulation resistance pursuant to ČSN EN 61515: min. 1000 MΩ, at ambient temperature 20 ± 15 °C and max. 80 % relative humidity

Power supply of converter:

DC 24V, 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

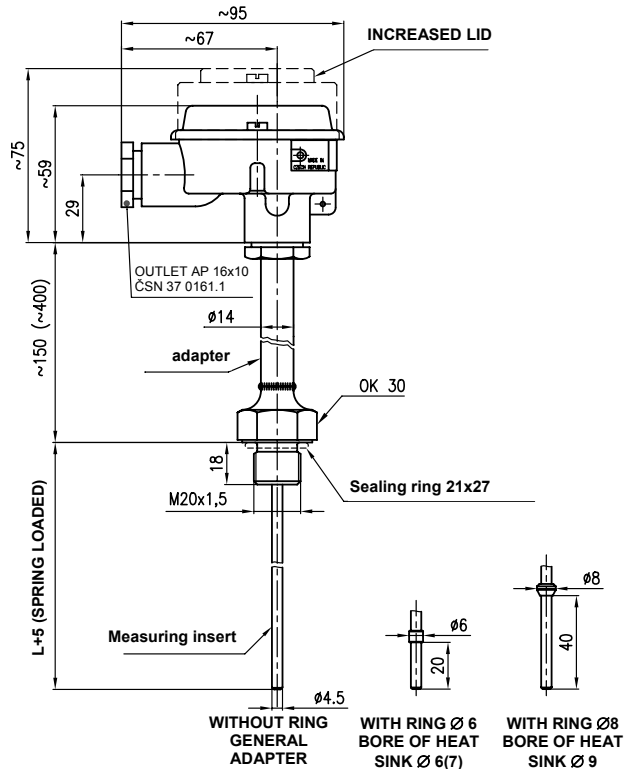
Sensor weight:
with adapter 150

L 100	0.473 kg
L 160	0.480 kg
L 250	0.490 kg
L 400	0.507 kg
L 630	0.532 kg
with adapter 400	L 100 0.748 kg
	L 160 0.795 kg

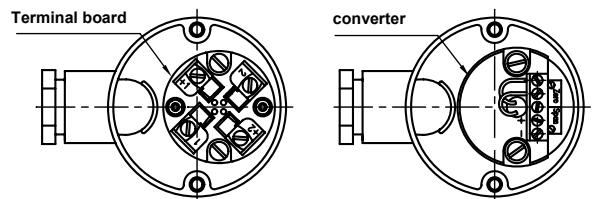
Applied materials:

jacket of measuring insert INCONEL 600

adapter head steel class 11 galvanized chromated aluminium alloy painted with aluminium paint
head clamps of the terminal board brass with Ni surface



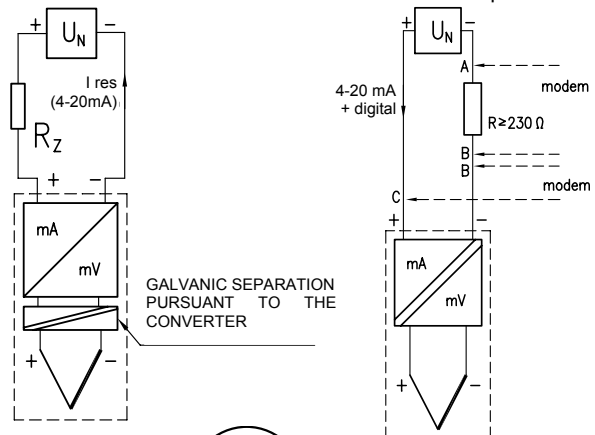
VIEW INTO SENSOR HEAD



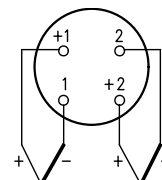
Scheme of connection

with converter

with converter with HART protocol



Without converter



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

CERTIFICATION**113 13/P**

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

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.

Vibrations

Sensors	with limiting bush and heat sinks 991 100... and 991 120... and heat sink 991 150... with nominal length L = 160					with reduced stem and heat sink 991 170...			
	100	160	250	400	630	100	160	160	
Nominal length L [mm]									
Adapter [mm]	150					400		150	400
Frequency range [Hz]	10 to 500								
Drift amplitude [mm]	0.35	0.2	0.2	0.15	0.075	0.075		0.2	0.075
Acceleration amplitude [ms ⁻²]	49.0	29.4	29.4	19.6	9.8	9.8		29.4	9.8

METROLOGICAL DATA

Sensor: measuring thermocouple **J** (Fe-CuNi) or **K** (NiCr-NiAl) pursuant to ČSN EN 60584-1, Ø 4.5 mm, tolerance class 2 pursuant to ČSN IEC 584-2 double with insulated or non-insulated measuring connection for design without converter single with insulated measuring connection for design with converter

Output signal

of analogue converter (linear with thermoelectric voltage):
4 to 20 mA

of programmable converter (linear with measured temperature): 4 to 20 mA (+ digital for HART protocol)

Calibration depth of immersion: 100 mm

Temperature response time pursuant to ČSN IEC 751 in whirling water (characteristic value) without converter:

without heat sink (insulated meas. connection) $\tau_{0.5}$ 3 s

$\tau_{0.9}$ 5 s

with heat sinks 991 100..., 991 110...,

991 120..., 991 130... and 991 150... $\tau_{0.5}$ 60 s

$\tau_{0.9}$ 170 s

with heat sink 991 170...

$\tau_{0.5}$ 30 s

$\tau_{0.9}$ 115 s

DESIGNATION**Data on head label**

- Trade mark of the manufacturer
- Made in Czech Republic
- Sensor type / tolerance class
- Measuring range or set-up converter range
- Product ordering number
- Coverage
- Production time code
- 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)

Data on aluminium label of measuring insert:

- Trade mark of the manufacturer
- Type of thermoelectric sensor
- Tolerance class
- Time code

Data on head of sensor with converter

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

DELIVERY

Unless agreed otherwise with the customer, each delivery includes

- Delivery note
- Sensor pursuant to the purchase order
- Sealing ring 21x27 TPD 62-014-91
- Suitable heat sink and weld-on piece ordered separately pursuant to 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

Ambient temperature for sensor head:

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 H₂O/kg of dry air

Atmospheric pressure:

70 to 106 kPa

Maximum speed of flow of liquids:

according to parameters of the heat sink selected by the customer

- Accompanying technical documentation in Czech
 - o Product quality and completeness certificate, which also serves as the warranty certificate
 - o EC Compliance Certificate (for converter EExi)
 - o Calibration sheet (for calibrated design)
 - o Product manual

If it is established in the purchase contract or agreed otherwise, the following documentation may be also delivered with the product

- Copy of the Inspection Certificate 3.1 for the heat sink material with the casting number
- EC Compliance Certificate for design with converter
- Copy of EC Certificate of type test pursuant to the Decree of the Government 23/2003 Coll. for design with converter EExi

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 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 uninterrupted 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.)

CALIBRATION

It is realized pursuant to TPM 3322-94 and in compliance with ČSN EN 584, usually in three temperature points spread 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 OF TEMPERATURE SENSORS

The purchase order shall include

- Name
- Product ordering number
- Measuring range (only for design with converter)
- If calibration is required and in what temperature points
- If delivery of heat sink and weld-on piece pursuant to type 991 is required to the sensor as accessories
- If optional accessories to the sensor with programmable converter are required
- Other (special) requests
- Number of pieces

PURCHASE ORDER EXAMPLE

Standard design:

Thermoelectric temperature sensor to heat sink,
with thermocouple Ø 4.5 mm
with ring Ø 6 mm
113 135 802 - 6 pcs

Special requirement:

Thermoelectric temperature sensor to heat sink,
with thermocouple Ø 4.5 mm
thermocouple K, nominal length 1000
113 138 889 - 6 pcs

DESIGN OF TEMPERATURE SENSORS TO HEAT SINK, TYPE 113 13

SPECIFICATION			ORDERING NUMBER				
			113 13		x	x	x
Double jacketed thermoelectric couple Ø 4.5 mm pursuant to ČSN EN 60584-1 tolerance class 2 (pursuant to ČSN IEC 584-2)	J (Fe-CuNi)		5				
	K (NiCr-NiAl)		8				
Design of measuring connections	DD grounded			5			
	DU insulated			8			
Design of measuring end	with ring Ø 6 mm				0		
	with ring Ø 8 mm				8		
	without ring (Ø 4.5 mm)				9		
	with adapter 150 mm nominal length L [mm]	100					1
		160					2
		250					3
		400					4
		630					5
	Other, max. 3000 mm *)						9
with adapter 400 mm nominal length L [mm]	100					6	
	160					7	

DESIGN OF TEMPERATURE SENSORS TO HEAT SINK WITH CONVERTER, TYPE 113 13/P

SPECIFICATION			ORDERING NUMBER					
			113 13	9	x	x	x	/xxxx
Single jacketed thermoelectric couple with insulated measuring connection Ø 4.5 mm pursuant to ČSN EN 60584-1 tolerance class 2 (pursuant to ČSN IEC 584-2)	J (Fe-CuNi)		5					
	K (NiCr-NiAl)		8					
Design of measuring end	with ring Ø 6 mm				0			
	with ring Ø 8 mm				8			
	without ring (Ø 4.5 mm)				9			
	with adapter 150 mm nominal length L [mm]	100					1	
		160					2	
		250					3	
		400					4	
		630					5	
	Other, max. 3000 mm *)						9	
with adapter 400 mm nominal length L [mm]	100					6		
	160					7		
Converter type		Galvanic separation	Increased lid	EExia	Range [°C]			
Analogue output signal, linear with thermoelectric voltage	APAQ-HCF				adjustable range		/HCF	
	APAQ-HCFX *)			•			/HCFX	
Programmable output signal, linear with temperature	TK	•	•		programmable range		/TK	
	TK-ex *)	•	•	•			/TKX	
	IPAQ-H	•	•				/IPAQH	
	IPAQ-HX *)	•	•	•			/IPAQHx	
HART protocol output signal, linear with temperature	MINIPAQ-H		•				/MINIPAQ	
	TK-H	•	•				/TKH	
	TK-H-ex *)	•	•	•			/TKHX	
	MESO-H	•	•				/MESOH	
OTHER *)	MESO-HX *)	•	•	•			/MESOHX	
			•				/99	

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

Note: As a default, the sensors are delivered with converter APAQ-HCF. Specify the required measuring range in the purchase order in wording. Minimum range of measured temperature shall be entered pursuant to the parameters of the converter.

Temperature range is from -200 to 800°C for thermocouple J and 0 to 1150°C for thermocouple K.

ORDERING HEAT SINKS AND WELD-ON PIECES

The purchase order shall include:

- Name
- Product ordering number
- Number of pieces

Cylindrical heat sink, screwing type, non-reduced
991 1000 33 20 pcs
Weld-on piece, direct - 991 NVP4 M27 13 – 20 pcs

Ordering number of weld-on pieces, type 991

- Weld-on piece, direct - 991 NVP4 M27 13 (material 11 353.0)
- 991 NVP4 M27 72 (material 1.4541)
- Weld-on piece, angular- 991 NVS4 M27 13 (material 11 353.0)
- 991 NVS4 M27 72 (material 1.4541)

PURCHASE ORDER EXAMPLE

Standard design:

HEAT SINKS RECOMMENDED FOR ASSEMBLY OF TEMPERATURE SENSORS TO HEAT SINK, TYPE 991

SPECIFICATION					ORDERING NUMBER			
					991	xxxx	x	x
Cylindrical heat sink	PN 160	screwing type	non-reduced (ON 02 7210)	L = line / thread M27x2 / sensor thread M20x1.5 / bore Ø 9 mm		1000		
			reduced	L = line / thread M27x2 / sensor thread M20x1.5 / bore Ø 9 / Ø 6.2 mm		1100		
	welding type	non-reduced (ON 02 7212)	L = line / sensor thread M20x1.5 / bore Ø 9 mm		1200			
		reduced	L = line / sensor thread M20x1.5 / bore Ø9 / Ø 6.2 mm		1300			
Conical heat sink	PN 250	bore Ø9	for high speed of flow (ON 02 7215)	only L = 160 / thread M33x2 / M20x1.5 / bore Ø 9 mm		1500		
		bore Ø6.2	for high parameters of operation liquid (ON 02 7217)	only L = 160 / thread M33x2 / M20x1.5 / bore Ø 9 / Ø 6.2 mm		1700		
Material of immersion part of heat sink	15 128.5	maximum operation temperature			550°C		2	
	1.4541				550°C (650°C)**)		3	
	1.4571 *)**)				500°C		4	
	Other *)				pursuant to heat sink material		9	
Nominal length L [mm]	100	L1 [mm]	101	L2 [mm]	79			1
	160		161		139			2
	250		251		229			3
	400		401		379			4
	630		631		610			5
	Other *)							9

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

***) only for heat sinks with codes 1000, 1100, 1200 and 1300

****) maximum operation temperature 650°C only for heat sinks with code 1700

INSTALLATION AND CONNECTION
SENSOR INSTALLATION

Install the sensors by screwing into the relevant heat sink screwed into the weld-on piece on the piping (technological equipment) or welded into the piping wall. Before the installation, put on the enclosed sealing ring in advance. During the installation, torque of 70 Nm is recommended. Examples of installation of direct and angular 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 with outer diameter from 5 to 12 mm, internal wires with Cu core (the sensor with converter) or compensation wiring (the sensor without converter) with the 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 supply circuit. If it is not possible to exclude influencing the measurement, ground the wiring.



WARNING

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



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.

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.

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.

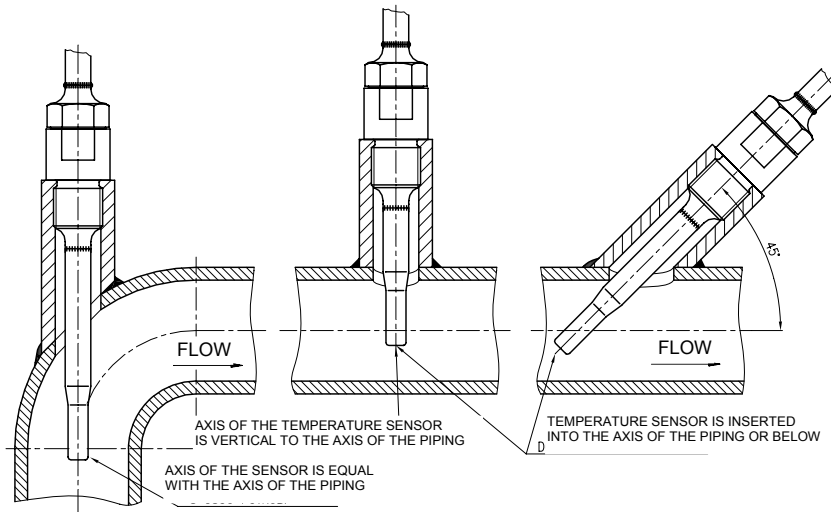
REPAIRS

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), may 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 DESIGN OF MEASURING ENDS OF JACKETED THERMOCOUPLES (schematic display)

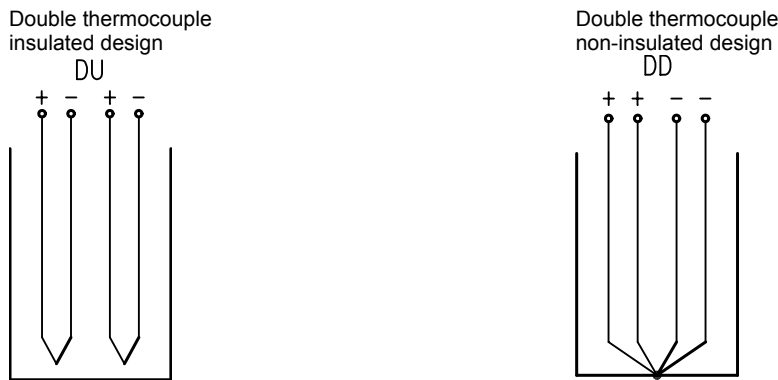
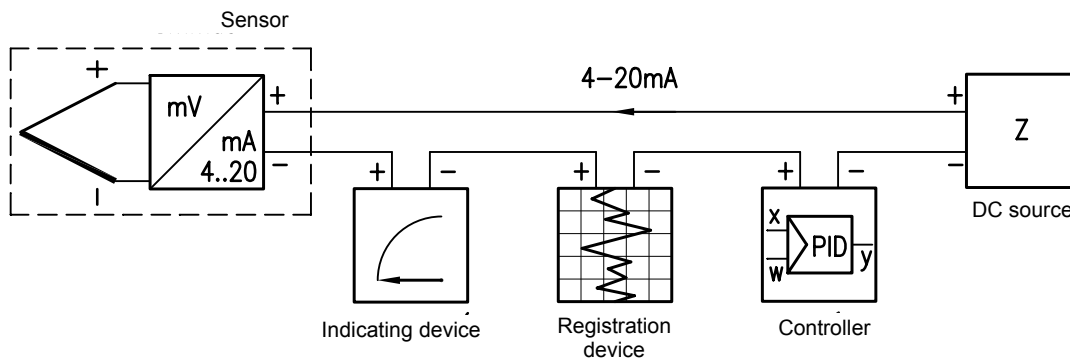


FIGURE 3 - EXAMPLE OF OPERATION CONNECTION temperature sensors with converter in loop 4 - 20 mA



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