Rod thermoelectric temperature sensor with ceramic protective tube with thermocouple S, B or K without converter, type 113 36 with converter, type 113 36/P

PRODUCT MANUAL

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

APPLICATION

- For remote measuring of high temperatures, especially in incineration plants, furnaces, etc.
- 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-11336P** is issued for them.

DESCRIPTION

The sensor consists of one or two wire thermocouples located in a ceramic four-capillary and protective armature consisting of a lead-bearing steel tube bearing inner and external ceramic tube with four-capillary and thermocouple on one side and head with connecting terminal board or installed two-wire converter (insulated or non-insulated, also in design EExi) on the other side. The head is provided with a sealing outlet for the connection wiring. The external protective ceramic tube is porous (for materials LUNIT 20), the inner ceramic tube is gas-tight. A connecting flange is delivered as sensor accessories; it enables a connection of the sensor and, within a certain range, also an adjustment of the required depth of immersion of the sensor into the measured environment.

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 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 of the said standard.

Measuring range:

Measuring range [°C]		Thermocouple	Material of protective tube
permanently	short-term		
0 to 1000	to 1200	K	LUNIT 20
			LUXAL 203
0 to 1300	to 1500	S	LUNIT 20
0 to 1300	to 1600		LUXAL 203
600 to 1300	to 1500	B	LUNIT 20
600 to 1600	to 1800		LUXAL 203

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 thermocouple without converter or design with insulated converter)

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

Power supply of converter:
DC 24V, from source SELV, e.g. INAP 16, INAP 901

Other data of converter: refer to the enclosed manual

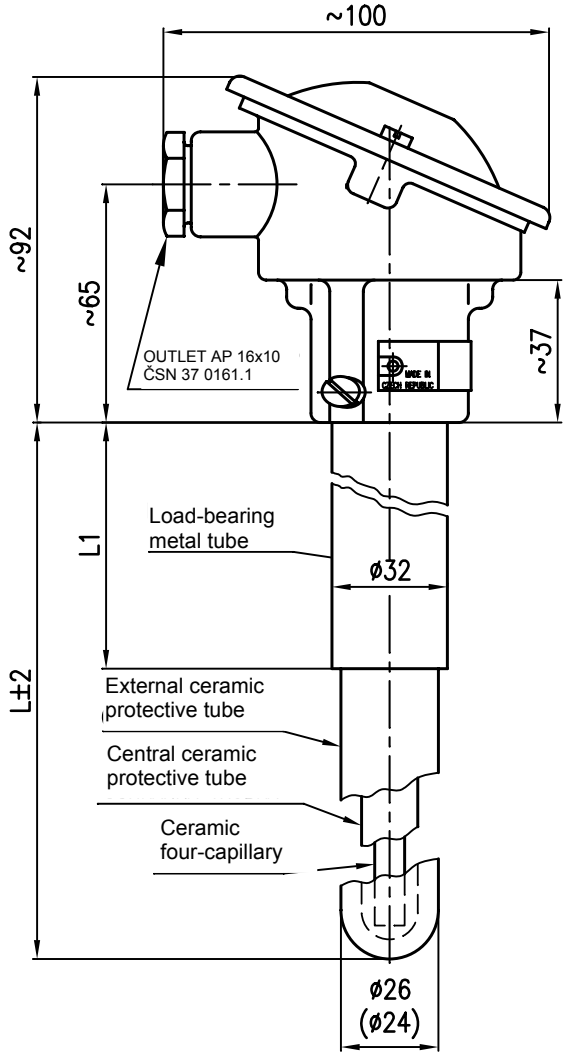
Coverage pursuant to ČSN EN 60529: IP 65

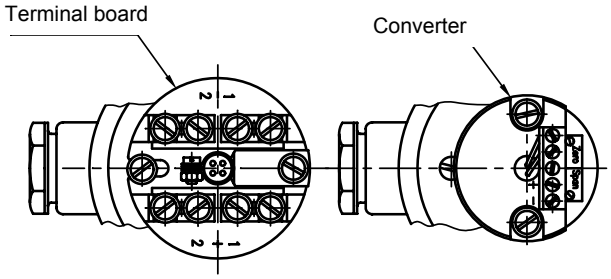
Operation position:
discretionary, the outlet shall not be situated upwards

Type of operation: continuous

Weight:

L 500 mm	L_1 = 200 mm	0.850 kg
L 800 mm	L_1 = 200 mm	1.500 kg
L 1000 mm	L_1 = 400 mm	1.600 kg
L 1600	L_1 = 400 mm	2.470 kg





Applied materials:

load-bearing metal tube: steel class 11, painted with synthetic paint

inner protective tube

∅ 15×2 mm: ceramics LUNIT 73 with content of approx. 60 % Al_2O_3 (it corresponds approximately to sub-group C 610 pursuant to ČSN EN 60672-3) or ceramics LUXAL 203 (min. 99.5 % Al_2O_3)

external protective tube

∅ 26×4mm	ceramics LUNIT 20 with content of approx. 80 % Al_2O_3 (it corresponds to sub-group C 510 pursuant to ČSN EN 60672-3)
or ∅ 24×3mm	ceramics LUXAL 203 (min. 99.5 % Al_2O_3)
head	chromated aluminium alloy painted with aluminium paint
head clamps of the terminal board	brass with Ni surface

CERTIFICATION

113 36/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.

Ambient temperature for sensor head:

for design without converter max. 150 °C for design with converter pursuant to the type of converter (refer to the enclosed manual)

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

Vibrations:

The sensor is designed for environment with insignificant level of vibrations; therefore the parameters are not specified.

METROLOGICAL DATA

Sensor: wire measuring thermocouple pursuant to ČSN EN 60584-1, tolerance class 2 pursuant to ČSN IEC 584-2

- **"S"** (PtRh10 - Pt) ∅ 0.5 mm
- **"B"** (PtRh30 – PtRh6) ∅ 0.5 mm
- **"K"** (NiCr-NiAl) ∅ 1 mm

single or double with 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)

Temperature response time pursuant to ČSN IEC 751 in whirling water

(characteristic value): $\tau_{0.5}$ 250

$\tau_{0.9}$ 350

DESIGNATION

Data on head label

- Trade mark of the manufacturer
- Made in Czech Republic
- Sensor type / tolerance class (only in case of delivery with built-in thermocouple)
- 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 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 purchase order
- Connecting flange and thermocouple as accessories to be ordered separately pursuant to purchase order
- Optional accessories to the sensor with programmable converter
  - Configuration (parameterization) programme pursuant to the required converter
  - Communication modem (for serial port RS 232C) pursuant to the required converter
- Accompanying technical documentation in Czech
  - Product quality and completeness certificate, which also serves as the warranty certificate
  - EC Compliance Certificate (for converter EExi)
  - Calibration sheet (for calibrated designs)
  - Product manual

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

- 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 11/1K3 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 3322-94 and in compliance with ČSN EN 584, 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.

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 the delivery of a connecting flange, type 991, and a separately ordered wire thermocouple is required as accessories to the sensor
- If optional accessories to the sensor with programmable converter are required
- Other (special) requests
- Number of pieces

PURCHASE ORDER EXAMPLE

Standard design:

Rod thermoelectric temperature sensor
with ceramic protective tube, with converter
113 369 K12 / HCF
0 - 1000 °C
5 pcs

Special request:

Rod thermoelectric temperature sensor
with ceramic protective tube, without converter
113 365 719
Nominal length L = 1400 mm
5 pcs

ORDERING ACCESSORIES

The purchase order shall include:

- Name
- Product ordering number
- Other (special) requests
- Number of pieces

PURCHASE ORDER EXAMPLE

Standard design:

Connecting flange

991 UP 32 - 5 pcs
Thermocouple
126764 - 5 pcs

Special request:

Thermocouple
126720 - 5 pcs
L = 1200 mm

TABLE 1 - DESIGN AND ORDERING OF TEMPERATURE SENSORS, TYPE 113 36

SPECIFICATIONS						ORDERING NUMBER 113 36	5	x	xx
Without thermocouple								7	
Wire thermoelectric couple single or double *) pursuant to ČSN EN 60584-1 tolerance class 2 pursuant to ČSN IEC 584-2		"**S**" (PtRh10 - Pt) ∅ 0.5 mm						S	
		"**B**" (PtRh30 – PtRh6) ∅ 0.5 mm						B	
		"**K**" (NiCr-NiAl) ∅ 1 mm						K	
External ceramic protective tube	LUNIT 20 - temperature resistance of armature to 1300 °C (short-term up to 1500 °C) ∅ 26×4mm	Nominal length L [mm]	500	L1 [mm]	200				12
			800		200				13
			1000		400				14
			1600		400				15
			Other *)		Max. 1600				19
	LUXAL 203 - temperature resistance of armature to 1600 °C (short-term up to 1800 °C) ∅ 24×3mm		500		200				22
			800		200				23
			970		400				26
			Other *)		Max. 970				29

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

TABLE 2 - DESIGN OF TEMPERATURE SENSORS WITH CONVERTER, TYPE 113 36/P

SPECIFICATIONS						ORDERING NUMBER 113 36	9	x	xx	/xxx
Wire thermoelectric couple single pursuant to ČSN EN 60584-1 tolerance class 2 pursuant to ČSN IEC 584-2		"**S**" (PtRh10 - Pt) ∅ 0.5 mm						S		
		"**B**" (PtRh30 – PtRh6) ∅ 0.5 mm						B		
		"**K**" (NiCr-NiAl) ∅ 1 mm						K		
External ceramic protective tube	LUNIT 20 - temperature resistance of armature to 1300 °C (short-term up to 1500 °C) ∅ 26×4mm	Nominal length L [mm]	500	L1 [mm]	200				12	
			800		200				13	
			1000		400				14	
			1600		400				15	
			Other *)		Max. 1600				19	
	LUXAL 203 - temperature resistance of armature to 1600 °C (short-term up to 1800 °C) ∅ 24×3mm		500		200				22	
			800		200				23	
			970		400				26	
			Other *)		Max. 970				29	

Converter type		Galvanic separation	EExia	Range [°C]				
Analogue output signal, linear with thermoelectric voltage	APAQ-HCF			Adjustable range		K		/HCF
	APAQ-HCFX *)		•					/HCFX
Programmable output signal, linear with temperature	TK	•		Programmable range				/TK
	TK-ex *)	•	•					/TKX
	IPAQ-H	•						/IPAQH
	IPAQ-HX *)	•	•					/IPAQHX
	MINIPAQ-H							/MINIPAQ
HART protocol linear output signal with temperature	TK-H	•						/TKH
	TK-H-ex *)	•	•					/TKHX
	MESO-H	•						/MESOH
	MESO-HX *)	•	•					/MESOHX
	other *)							/99

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

Note: As a default, the sensors are delivered with converter APAQ-HCF and thermocouple "K". 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 established by the material of the protective tube.

TABLE 3 - ACCESSORIES - to be ordered separately

SPECIFICATIONS				ORDERING NUMBER
Connecting flange				991 UP 32
Wire thermocouple	"**S**" (Ø 0.5 mm)	Nominal length L [mm]	500	126731
			800	126742
			970	126841
			1000	126753
			1600	126764
			Other *)	126720
	"**B**" (Ø 0.5 mm)	Nominal length L [mm]	500	126940
			800	126951
			970	126962
			1000	126973
			1600	126984
			Other *)	126995
	"**K**" (Ø 1 mm)	Nominal length L [mm]	500	127006
			800	127017
			970	127028
			1000	127039
			1600	127050
			Other *)	127061

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

INSTALLATION AND CONNECTION

If you have an independent armature without a converter, install the independently delivered wire thermocouple into the armature of the sensor at first. Remove the ceramic capillary, insert the thermocouple into the holes and remove the capillary back into the sensor (it is beneficial to maintain the ceramic cord wound up around the capillary) and connect the thermocouple to the terminal board.

The sensor installation shall be realized by means of the installation flange.

WARNING

Install the sensor by the metal load-bearing tube!

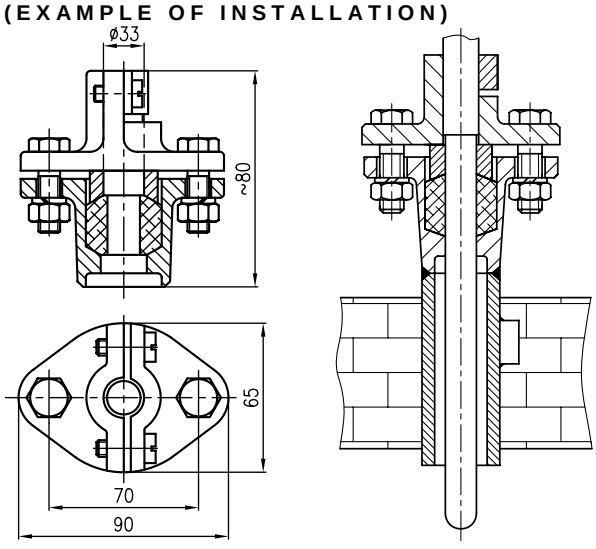
If you install or replace the sensor under operation, slide the in or out the environment with high temperature gradually (speed of approx. 200 mm per 1 minute), so that the ceramic protective tubes do not break due to temperature expansion caused by a fast change of temperature.

If a slow movement of the sensor is not possible, ensure at least slow and uniform pre-heating of the sensor.

FLANGE INSTALLATION

Weld the bottom part of the flange onto the wall of the technological equipment. In the connecting flange, the sensor can be moved back and forth after releasing two screws M6x14, whereby the required sensor immersion can be adjusted.

Figure 1 - CONNECTING FLANGE (EXAMPLE OF INSTALLATION)



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 (sensor with converter) or compensation wiring (sensor without converter) 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. Shielding may only be grounded in one point.

The cable should not be placed together with power cables. It is recommended to support the cable along its length between the sensor and the follow-up device.

⚠ 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 by means of a metal grounded tube.
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.

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

FIGURE 2 - CONNECTION SCHEME OF TEMPERATURE SENSORS

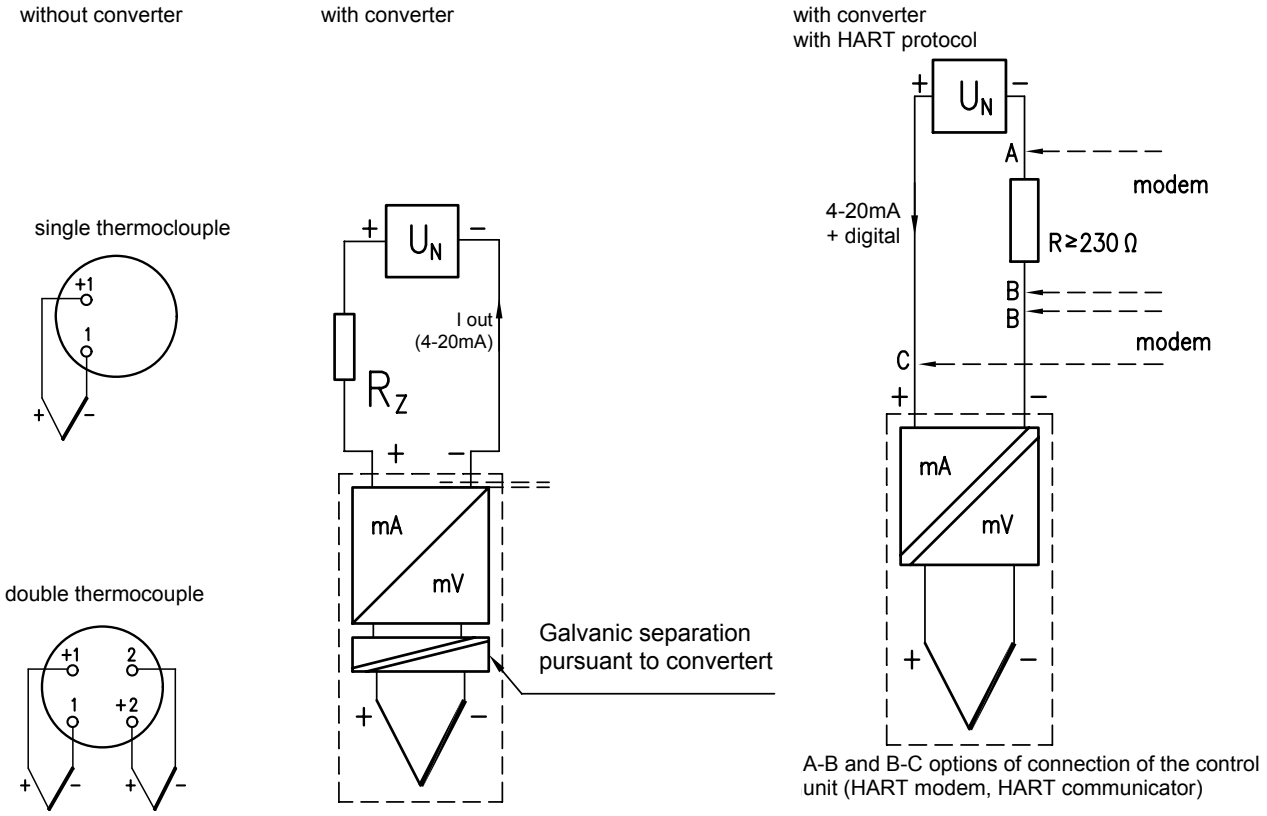
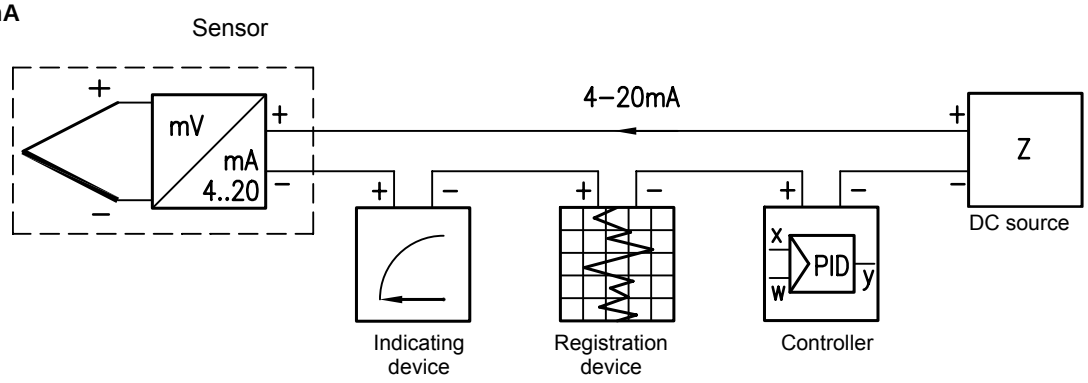


FIGURE 3 - EXAMPLE OF OPERATION CONNECTION OF TEMPERATURE SENSOR WITH CONVERTER IN LOOP 4 - 20 mA



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ZPA NOVÁ PAKA

ZPA Nová Paka, a. s.
Pražská 470
509 39 Nová Paka

tel.: spojovatel: 493 761 111
fax: 493 721 194
e-mail: obchod@zpanp.cz

www.zpanp.cz
bankovní spojení: ČSOB Trutnov
číslo účtu: 271 992 523/0300

IČO: 46 50 48 26
DIČ: CZ46504826