



**ALF SENSOR SPÓŁKA JAWNA**



## **INSTRUCTION MANUAL**

version 2.8

### **RESISTANCE THERMOMETERS AND THERMOCOUPLES WITH CONNECTION CABLE**

TOP-PTKbm-13.../Exi

TOP-KKbm-16.../Exi

TOP-KZKbm-17.../Exi

TOP-PKGbm-21.../Exi

TOP-PZKbm-23.../Exi

TOP-PKbm-32.../Exi

TOP-Kbm-35.../Exi

TOP-SpWKbm-50.../Exi

TOP-WTW-92.../Exi

TER-PKbm-37.../Exi

TER-PZKbm-38.../Exi

TER-PKbm-40.../Exi

TER-TP-WTWKb-42.../Exi

TER-PKbm-56.../Exi

TER-SpWKbm-84.../Exi

TER-WTW-93.../Exi

## 1. CATALOGUE CARD

1.1 Technical parameters

1.2 Ordering instructions

(Space for a thermometer or thermocouple catalogue card)

## 2. APPLICATION

Resistance thermometers and thermocouples with connection cable, connected to particular instruments, are designed for measurement, record or control temperature of gases, liquids and solids. The construction and used materials allow using thermometers in places exposed to vibrations, aggressive medium and temperatures up to 300°C, depending on the execution.

In a tag point sensors can be:

- threaded using a process connection fitting (type TOP-PKGKbm, TER-PKGKbm),
- fast mounted using eg. in injection moulds using process connection fitting with a bayonet socket (type TOP-PZKbm, TER-PZKbm),
- mounted using a band (type TOP-SpWKbm, TER-SpWKbm),
- installed on pipelines and pressure vessels using additional protection tube assuring leakproofness and strength
- without protection tube, for temperature measurement in ambient conditions

In intrinsic safe version resistance thermometers type TOP-.../Exi and thermocouples type TER-.../Exi, can be installed in explosion danger zone and have designation  $\text{Ex}$  II 1/2 G Ex ia IIC T6 and  $\text{Ex}$  II 1 D Ex iaD 20 T85°C– certification KDB 04 ATEX 037X. In zone 0 shall be only outer protection tube of sensor. Cable shall be placed in zone 1 or 2 only.

A limit between zones is process connection (threaded or flanged) mounted on outer protection tube.

## 3. PRINCIPLE OF OPERATION

The measuring elements of the resistor thermometer are the Pt-100, Pt-500, Pt-1000 having characteristics complying to EN 60751 Class B, A, 1/3 B.

A thermocouple consists of two electric heterogeneous thermoelectrodes, connected together. Spot of the connection acts as hot measuring junction. Spot of the connection is situated in an environment of different temperature than cold junction, a thermoelectric power appears between junctions. This power is proportional to difference between temperatures, according to thermoelectric characteristic specified in the norm EN 60584.

The particular medium temperature measurement is done by resistance or thermoelectric power measurement.

#### 4. DESIGN

A temperature sensor is composed of (as is shown on the figures in catalogue cards) metal outer protection tube with or without process connection fitting and with connection cable.

Inside protection tube the resistor or hot junction are placed. Sensor can be threaded using process connection fitting or bayonet socket for fast assembling to a tag point. Cable, which is fixed for good to the sensor, is made of Cu cord with or without screen, with rubber, silicone, teflon or glass fibre insulation of 2, 3 or 4 wire configuration. Cable is finished with endings allowing to connect cooperative instruments.

#### 5. COOPERATIVE INSTRUMENTS

Sensors can cooperate with any instruments adjusted to work with resistance thermometer or thermocouple. For intrinsic safe versions of resistance thermometer type TOP-.../Exi and thermocouple TER-.../Exi retain „ia” intrinsic safe category only cooperating with approved circuits of „ia” category acc. EN 60079-11. In case of cooperation with „ib” category circuits, the intrinsic safe category must be lowered to „ib”.

#### 6. EQUIPMENT

Basic equipment of thermometer consists of:

- Instruction manual
- Guarantee card
- Certification ATEX (for intrinsic safe version)
- Declaration of conformity (for intrinsic safe version)

#### 7. TECHNICAL ACCEPTANCE

Approval and authorization for operation by Quality Control Department of manufacturer is done basing on control sensor conformity with standards EN 60079-0; EN 60079-11; EN 61241-11; EN 61241-0.

#### 8. GUARANTEE

Manufacturer guarantees proper operation of resistance thermometer and thermocouples under condition of operating instrument according to requirements issued in this instruction manual.

## 9. STORAGE AND TRANSPORTATION

Temperature sensors should be stored in closed rooms at temperature from +5°C to +50°C and humidity maximum 80%. Transport of goods should be done by canvas cover means of transport.

## 10. MOUNTING

Resistance thermometers and thermocouples with process connection fitting type TOP-PKGKbm are installed in systems aggregates, pressure vessels and pipelines of industry and laboratory installations, using threaded connection fitting for a tag point fixing.

A clasp lock resistance thermometer type TOP-PZKbm or thermocouple TER-PZKbm have been designed for mounting mostly in movable machine parts and instruments particularly in injection mould.

Threaded bayonet socket is fixed to a tag point, where a measurement is taken. Second part of the bayonet socket act as thermometer with spring shielding flexible connecting cable with a cab attached to threaded fitting. The cab can be displaced along spring what allows easy fitting thermometer immersion depth to tag point depth. Dimensions of the tag point are specified on fig. 1.

Resistance thermometer type TOP-SpWKbm or thermocouple TER-SpWKbm are fixed on pipeline using supplied band.

For assembling sensors of intrinsic safe version and to assure appropriate temperature class, one should take under consideration a heat conductivity of sensor protection tube and ambient temperature „Ta“. Mounting sensors in explosion dangers zones should be followed according to operating rules of flame proof instruments included in EN 60079-14 „Electrical instruments in explosion danger zones. Choice, installation, maintenance and repair of electrical instruments used in explosion danger zones.“

User, after rebuilding them in a future place of work, should check if maximum ambient temperature of the sensor protection tube, under maximum measuring temperature, do not exceed an authorized temperature value for environmental steam and gases specified in table 1 of norm EN 60079.

## 11. USE AND MAINTENANCE

When sensors operate according to the catalogue card conditions, they do not need any maintenance treatment. In case of suspicion that sensor do not operate properly, one should place thermometer or thermocouple end in known temperature (eg. 0°C) and measure its resistance and compare resulting value with value included in EN 60751 or EN 60584.

**ATTENTION! Using cable of 2-wire configuration of resistance thermometer one should take into consideration resistance of connection cable.**

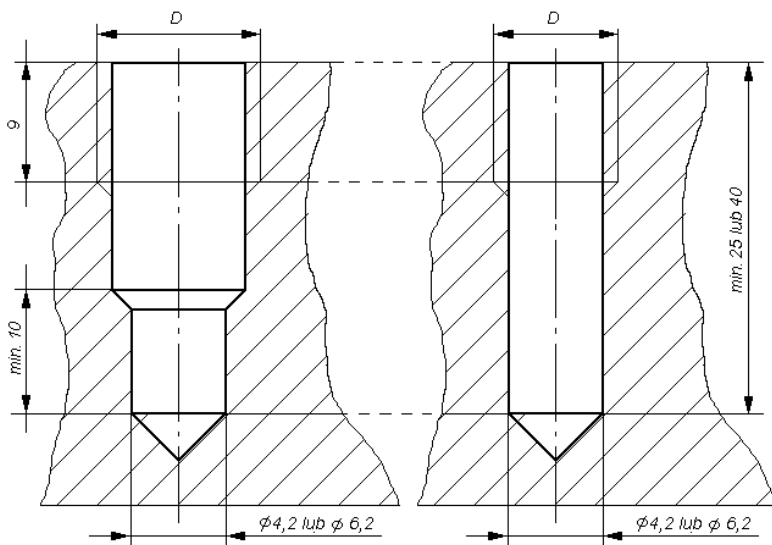


Figure 1. Tag point

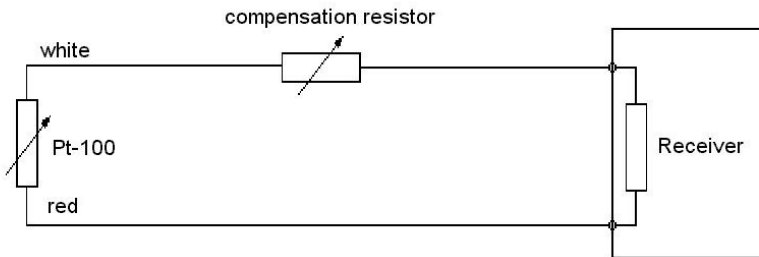


Figure 2. Connection of 2-wire line.  
 Adjust compensation resistor value to value specified in receiver instruction manual.  
 Usually it is value 10Ω or 20Ω.

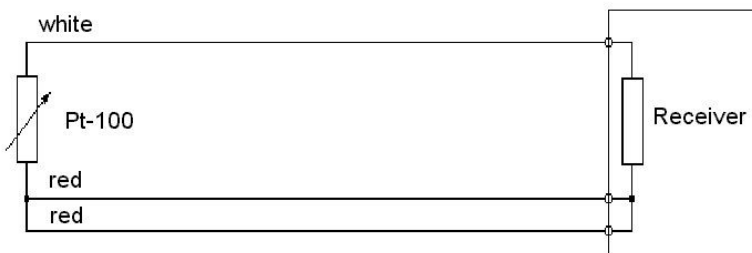


Figure 3. Connection of 3-wire line

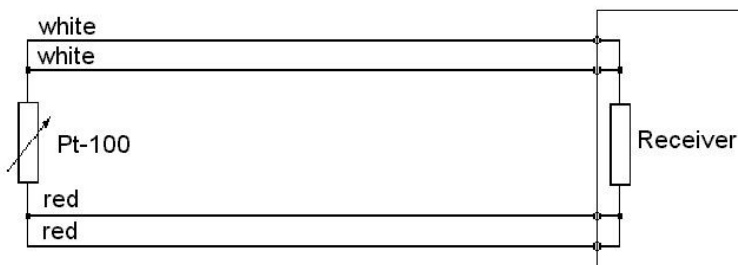


Figure 4. Connection of 4-wire line  
 This line totally eliminates connection cable resistance influence,  
 particularly useful for switching configurations.

11.1 Electrical parameters for intrinsically safe resistance thermometers with connection cable.

$C_i = 80nF$ ;  $L_i = 400\mu H$ ;  $U_i = 10mV$ ;  $I_i = 10mA$ ;  $P_i = 0,1W$

## 12. Temperature Clas

a) When mounting explosion-proof sensor, the thermal conduction of the thermowell and ambient temperature „ $T_a$ ” should be taken into consideration, to make provision for a suitable temperature class of the temperature sensor.

Temperature clas	Max. surface temperature	Combustion temperature
T1	450°C	>450°C
T2	300°C	>300°C<450°C
T3	200°C	>200°C<300°C
T4	135°C	>135°C<200°C
T5	100°C	>100°C<135°C
T6	85°C	>85°C<100°C

Table 1 Sensors temperature class

### b) **Temperature limitations in the presence of flammable dusts.**

The maximum temperature of a temperature sensor surface should not cross two thirds of the ignition temperature of dust mixture with air given in °C.

**The maximum temperature of the temperature sensor surface, should not cross the value lower by 75 K from the minimum temperature of ignition of layer of a given dust having the thickness from 5 mm to 50 mm. If the layer of dust can built-up on the sensor, having the thickness from 5 mm to 50 mm, then the maximum admissible temperature of the surface should be lowered adequately according to EN 61241-0.**

## 12. OPERATING INSTRUCTIONS

12.1. Thermometers type TOP-.../Exi as well as thermocouples type TER-.../Exi retain „ia” intrinsic safe category only by cooperation with approved intrinsic safe circuits of „ia” category acc. PN-EN 60079-11.

- 12.2. In case of cooperation with „ib“ category circuits acc. PN-EN 60079-11, the intrinsic safe category must be lowered to „ib“.

#### FINAL REMARK

In case of any troubles in starting or operation of thermometers, our company will provide you technical information or advices related to the encountered problems.

