

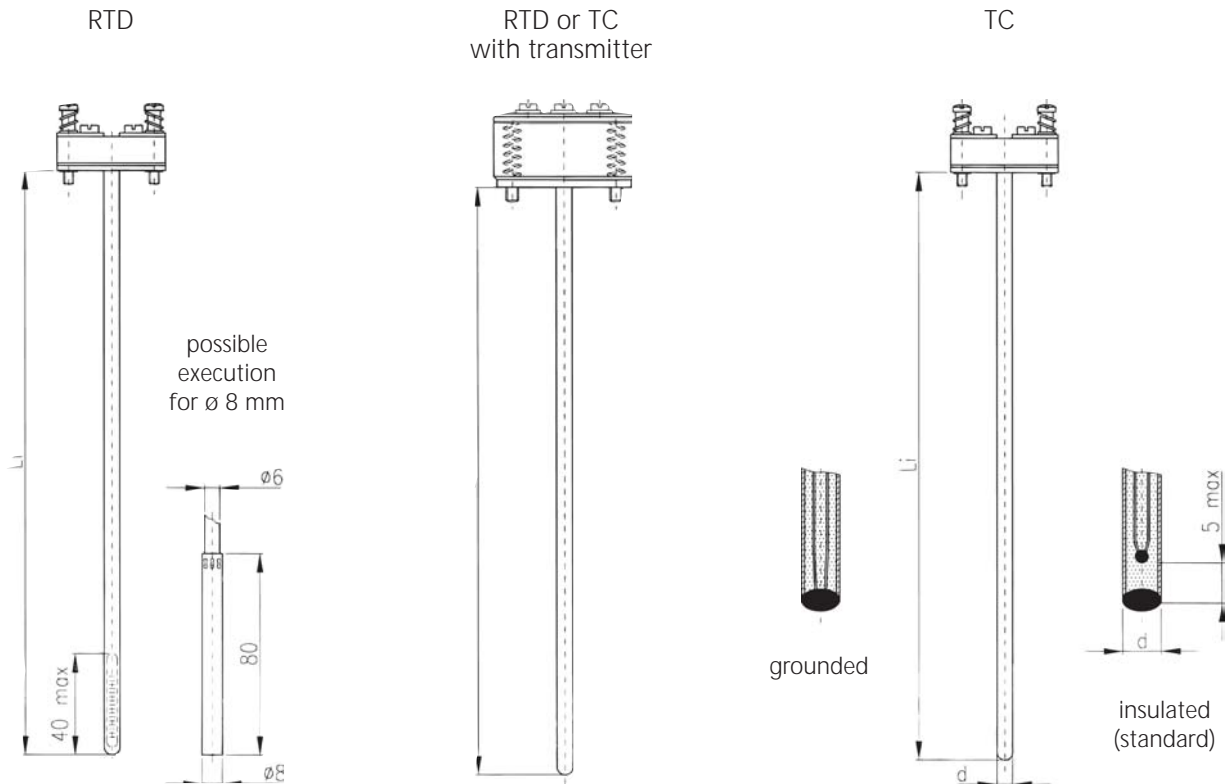
# Thermo-Sensor

FT S 01-E-8.02

# RÜEGER

Insets (RTDs and thermocouples) with mineral insulation, without thermowells, according to DIN 43735, DIN 43762, IEC 751 (RTD) and IEC 584 (TC)

Type **S 01**



## Applications

- For mounting in thermowells
- Insets may also be mounted in direct contact with the medium, on condition that the electrical terminal block is protected against environmental influences (working conditions to be checked!)
- Special executions for explosive environments ATEX certified : **CE** 0081 **Ex** II 2 G/D

## Description

The sensors incorporated in all these insets are protected by a metal sheath. They can be of 2 types: resistance

temperature detectors (RTDs) or thermocouples (TCs). In each case, the sensor supplies an electrical signal corresponding to the temperature. The connection head carries a ceramic terminal block for connecting the wires, attached by 2 screws with springs. The travel of this spring mounting assures best thermal conductivity, compensation of length tolerances in thermowells and protection against vibration.

When mounted in thermowells, insets can be simply replaced, without removing the thermowell from the pipe and without any process interruption.

For explosive environments, executions meeting the requirements of EN 50014 "Electrical apparatus for potentially explosive atmospheres (general requirements)", EN 50018 (flameproof enclosure "d"), EN 50019 (increased safety "e") or EN 50020 (intrinsic safety "i") are available.

## Thermo-Sensor Definition of type S 01

### Technical data

#### 1. Limiting temperatures (°C) for insets:

| Sensors  | 1.5 to<br>3.2 mm dia. | 3.3 to<br>8 mm dia. | EExi, EExd,<br>all dia. |
|----------|-----------------------|---------------------|-------------------------|
| Pt 100 * | - 200...+ 550         | - 200...+ 600       | - 200...+ 500           |
| Pt 1000  | - 40... + 400         | - 40... + 400       | -                       |
| J,       | - 200...+ 600         | - 200...+ 750       | - 40... + 500           |
| E        | - 200...+ 700         | - 200...+ 800       | - 200...+ 500           |
| K, N     | - 200...+ 800         | - 200...+ 1100      | - 200...+ 500           |

\* Pt 100 - 200... + 850°C, Cl. B, as option

#### 2. Precision classes:

RTD according to IEC 751

|               |                                                  |
|---------------|--------------------------------------------------|
| class A       | +/- (0.15 + 0.002 ltl)                           |
| class B       | +/- (0.3 + 0.005 ltl)                            |
| class 1/2 DIN | +/- (0.15 + 0.005 ltl)                           |
| class 1/3 DIN | +/- (0.1 + 0.005 ltl)                            |
| TC            | according to IEC 584-2                           |
| class 1       |                                                  |
| E             | -40 ... + 800 [°C] +/- 1.5°C or +/- (0.004 ltl)  |
| J             | -40 ... + 750 [°C] +/- 1.5°C or +/- (0.004 ltl)  |
| K/N           | -40 ... +1000 [°C] +/- 1.5°C or +/- (0.004 ltl)  |
| class 2       |                                                  |
| E             | -40 ... + 900 [°C] +/- 2.5°C or +/- (0.0075 ltl) |
| J             | -40 ... + 750 [°C] +/- 2.5°C or +/- (0.0075 ltl) |
| K/N           | -40 ... +1200 [°C] +/- 2.5°C or +/- (0.0075 ltl) |
| class 3       |                                                  |
| E             | -200 ... + 40 [°C] +/- 2.5°C or +/- (0.015 ltl)  |
| J             | doesn't exist                                    |
| K/N           | -200 ... + 40 [°C] +/- 2.5°C or +/- (0.015 ltl)  |

ltl = absolute value of measuring range

For temperatures between -130°C and -40°C, the tolerances may exceed those indicated under class 3.

#### 3. Inset sheath:

The sensors (RTDs or thermocouples) within the insets are embedded in a compacted MgO powder protected by a metal sheath. This sheath is free of pores, and can be bent at limited curvature.

Important: avoid bending the metal sheath at a point less than 50 mm from the tip.

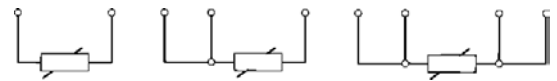
#### 4. Terminal block:

Ceramic, attached to the connection head by two M4 screws with springs, giving up to 10 mm of travel. The diameter and spacing of the screws correspond to head types A and B.

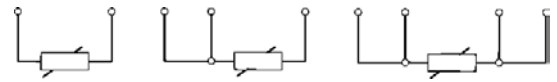
#### 5. Identification of measurement circuits on terminal block and/or marking plate:

RTD:

(with color identification marking according to IEC 751) white



black yellow black black yellow black black yellow yellow



Remark: "yellow" and "black" are used for double element.

**Thermocouple:** type of thermocouple is identified by color code; positive conductor marked "+" in black.

#### Colors for thermocouples

| Type | conductor "+" | conductor "-" |
|------|---------------|---------------|
| E    | violet        | white         |
| J    | black         | white         |
| K    | green         | white         |
| N    | pink          | white         |

according to IEC 584.

#### 6. Indicative values for resistances of conductors incorporated in insets at +15 to +35°C (for cable length):

For 3 mm dia.: approx. 0.28 /m.

For 6 mm dia.: approx. 0.07 /m.

#### 7. Resistance of insulation at +15 to +35°C (according to IEC 751):

100 M with U 100 VDC

#### 8. Sensitive length of inset:

For RTDs: max. 40 mm for all diameters of inset sheath.

For thermocouples: approximately equal to the external diameter of the inset sheath, but not more than 5 mm.

#### 9. Response time:

The values given are for insets without thermowell. This is the time by which the reaction of the inset lags the change in temperature;

t<sub>0,5</sub> time necessary for the variation in temperature to attain 50% of its total value.

t<sub>0,9</sub> time necessary for the variation in temperature to attain 90% of its total value.

The response times given below are indicative only, and can vary by 30% or more, according to manufacturing tolerances.

**Response time:**

| Inset        | in water<br>approx. 0.2 m/s |       | in air<br>approx. 1 m/s |       |
|--------------|-----------------------------|-------|-------------------------|-------|
|              | t0.5                        | t0.9  | t0.5                    | t0.9  |
| TR 3 mm dia. | 1.6 s                       | 5.5 s | 25 s                    | 86 s  |
| TC 3 mm dia. | 1.2 s                       | 3.2 s | 22 s                    | 70 s  |
| TR 6 mm dia. | 5 s                         | 16 s  | 60 s                    | 200 s |
| TC 6 mm dia. | 3.5 s                       | 10 s  | 55 s                    | 170 s |

**10. Immersion length:**

To avoid errors due to conduction and radiation, the following minimum immersion lengths are recommended:

| Inset        | in liquid | in gas/vapour |
|--------------|-----------|---------------|
| TR 3 mm dia. | 45 mm     | 55 mm         |
| TC 3 mm dia. | 15 mm     | 25 mm         |
| TR 6 mm dia. | 60 mm     | 75 mm         |
| TC 6 mm dia. | 30 mm     | 50 mm         |

**11. Vibration resistance:**

The resistance to vibration of these insets is at least that required under the "severe conditions" referred to in IEC 751, par. 4.4.2 (30 m/s<sup>2</sup>), 10-500 Hz, during 150 hours in 2 axes.

**12. Insets for explosive environments:**

The inset must be located in zone 1 (class 1 div. 1) or zone 2 (class 1 div. 2) but not in zone 0.

All insets suitable for explosion-proof applications are provided with marking plates. When ordering components for existing installations, always give the technical data relative to the corresponding equipment supplied previously.

RÜEGER SA shall not be responsible for the consequences of any application not conforming to the regulations or recommendations concerning explosive environments.

For transmitter options please refer to transmitters' board on our Thermo-Sensor manufacturing range.

**Type of protection "flameproof enclosure", for EExd execution: EEx d IIC T6\*, LCIE 02 ATEX 6138**

The system comprises an EExd connection head, a lag extension and an inset with clearance according to EN 50018, and a type-approved cable gland. The sensor marking plate gives directions on use of the probes in explosive environments. No particular restrictions apply to the measuring circuits. The connection head is provided with ground terminals.

**Type of protection "increased safety", for EExe execution: EEx e IIC T6\*, LCIE 02 ATEX 6032 X**

The temperature sensor is fitted with one or two measuring circuits. These are tested for dielectric strength by applying 500 VAC between the circuit(s) and ground and between the measuring circuits themselves. The system is designed according to EN 50019.

**Type of protection "intrinsic safety", for EExi execution: EEx ia IIC T6\*, LCIE 02 ATEX 6139 X**

The temperature sensor is fitted with one or two measuring circuits. These are tested for dielectric strength by applying 500 VAC between the circuit(s) and ground, and between the measuring circuits themselves. The sensor marking plate gives directions on use of the probes in intrinsic safety measuring circuits. Equipment connected on the output side of probes shall be appropriately type-approved; its power and heat loss shall meet the requirements of EN 50020. The connection head is provided with a screw terminal for connecting to ground.

\* For transmitter options, please refer to transmitter's board on our Thermo-Sensor Manufacturing range.



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