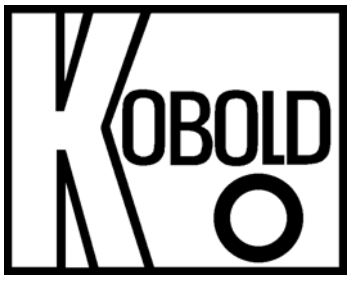
Operating Instructions

for

Stationary Infrared Thermometer

Model: TIR-SN



1. Contents

Manufactured and sold by:

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2. Note

Please read and take note of these operating instructions before unpacking and setting the unit for operation, and follow the instructions precisely as described herein.
The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and with the prevailing regulation applying to procedural safety and the prevention of accidents.

By usage in machines, the measuring unit should be used only then when the machines fulfil the EWG-machine guidelines.

3. Regulated Usage

The TIR-SN pyrometers are easy to use stationary instruments for non-contact surface temperature measuring.
The infrared thermometer is ideally suited for measuring temperatures of non-metallic surfaces and oxidized, anodized or sprayed metallic surfaces.
Before measuring temperatures of bright metallic or other highly reflective surfaces, they should be brought to a state of low reflection by the use of aids such as foil, paint, oil film or similar treatments.

4. Operating Principle

Non-contact temperature measurement is based on the physical effect that every physical object emits electromagnetic radiation when heated. The radiated energy and its characteristic wavelength depend on the temperature of the target surface.
This heat radiation can easily be seen with the naked eye when the target surface is above approximately 550°C, when the target is said to glow. Radiation below the light spectrum of red light is called infrared radiation.

Infrared measuring systems are able to concentrate infrared radiation with a suitable system of lenses and to convert this radiated energy into an electrical signal. The microprocessor receives the radiation characteristics of the target in the form of emissivity.

5. Instrument Inspection

These devices are checked before shipping and sent out in perfect condition. Should damage to a device be visible, we recommend a thorough inspection of the delivery packing. In case of damage, please inform your parcel service/ forwarding agent immediately, as they are responsible for damage incurred during transit.

Scope of supply:
The standard scope of supply contains:
- Infrared thermometer
- Operating instructions

6. Mechanical Connection

An adjustable mounting (see Section 12 Accessories) may be used to mount the instrument in rugged conditions. The parts can be ordered as accessories.

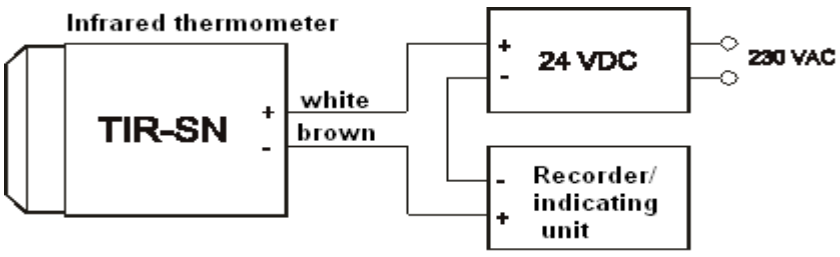
7. Electrical Connection

The instrument requires 24 VDC ± 25% for proper operation. The wiring is reverse polarity protected and covered with an insulated sleeve. The instrument is ready for immediate operation once installed.

Wire colours: White: + 24 VDC
Brown: 0 V
Black: Shield

Typically, the shield is only connected on the instrument side and extended for extension cables, however it is not connected on the supply side (control cabinet). When extension cables are used, the shield is connected between the cables.
Current consumption is between 4 and 20 mA; and acts as the measuring signal at the same time.

Connection example



8. Operation

8.1. Setting the emissivity

For a correct measurement, the emissivity of the target must be known and set on the instrument. The emissivity may be set at the back of the instrument if necessary. Loosen the screw at the back end of the tube and remove the end piece carefully to adjust.

Emissivity (%)

Target	ε (8 - 14 µm)
"Black body"	1
Human skin	0.98
Black matte varnish	0.95
Soot	0.95
Wood	0.8 - 0.92
Masonry, Chamois, rubber, porcelain, ceramics, paper, gypsum, oil paint	0.85 - 0.95
Asphalt	0.85
Textile	0.75 - 0.95
Graphite	0.75 - 0.92
Cement	0.9
Water	0.95
Glass, quartz	0.92
Steel (oxidized)	0.6 - 0.8
Steel (bright)	0.1 - 0.3
Aluminium (bright)	0.02 - 0.15

Differences in surface finishes or roughnesses may cause deviations.

Caution! Emissivity is set to ε = 1.0 from the factory.

Measurement uncertainty increases with low emissivities. In this case, the emissivity should be increased by applying black matte varnish or - if possible - by boring a hole in the target and taking the measurements in this bore hole (apparent increase in ε, cavity radiator affect).

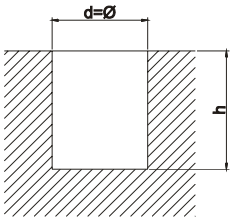
The effective emissivity ε_R of a cylindrical bore hole of diameter d and depth h for a material with emissivity ε can be calculated as follows:

$$\varepsilon_R = \frac{1 + 4 \times \left(h/d\right)}{\left(1/\varepsilon\right) + 4 \times \left(h/d\right)}$$

Example:

ε = 0.6

h/d = 4



The apparent emissivity in the bore hole is ε_R = 0.96.

8.2. Calculating the temperature

Calculating the measuring temperature from the output current:

TIR-SN410:	Temp. [°C] = 6.25 × current [mA] - 25
TIR-SN420:	Temp. [°C] = 12.5 × current [mA] - 50
TIR-SN430:	Temp. [°C] = 20 × current [mA] - 100
TIR-SN450:	Temp. [°C] = 31.25 × current [mA] - 125

9. Technical Information

IR detector:	Thermal chain based on Si
Spectral range:	8 - 14 µm (no interference from steam or CO_2)
Measuring accuracy:	±1.5 % of span at correct emissivity
Repeatability:	0.5 % f. s. ± 2°C
Temperature drift:	0.03 % f. s. /°C in 0 - 60°C range 0.02 % f. s. / C° in > 60° range
Analogue output:	4-20 mA temperature-linear, 2-wire
Max. load:	500 Ω (at 24 VDC)
Response time (t90):	300 ms
Emissivity:	0.4 - 1
Supply voltage:	18 - 30 VDC, 2-wire system (measuring signal)
Residual ripple:	< 50 mV
Operating temperature:	0 to + 70°C
Storage temperature:	- 20 to + 70°C
Housing:	Stainless Steel
Protection:	IP 65 (according to DIN 40050)
Mounting position:	any
Connection cable:	2 m attached cable
Weight:	215 g

10. Ordering Codes

Model	Measuring range	Optics	Application
TIR-SN410	0 to +100 °C	**..G** = optics 300 mm (1:15)	Plastic, rubber, glass, paper, textile, asphalt, liquids, paints, wood, food, **no bright metals**
TIR-SN420	0 to +200 °C		
TIR-SN430	-20°C to +300°C		
TIR-SN450	0 to +500 °C		

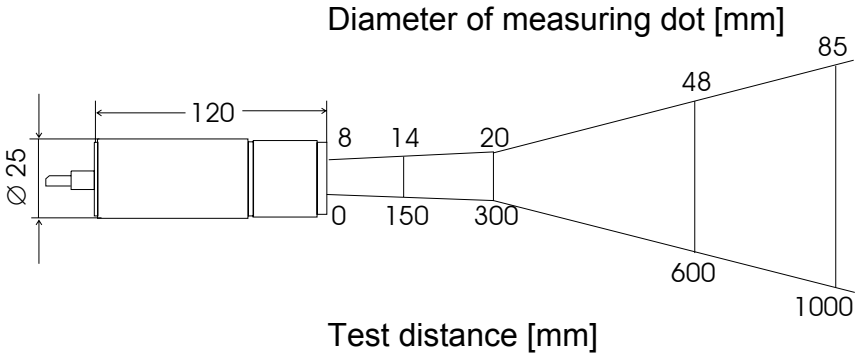
11. Maintenance

The instrument has no parts that require maintenance. If deemed necessary, clean the lens carefully with a soft.
For a more gentle approach, you may instead clean the lens with dry, compressed air containing no oil or dust.

12. Accessories

TIR-ZS100	Adjustable mounting for rugged environments. Material: Stainless Steel
TIR-ZS200	Mounting and alignment support
TIR-ZS300	Installation tube
TIR-ZS400	Stainless steel vent nozzle to prevent dust from depositing on the optics
TIR-ZS500	Bracket for flange system
TIR-ZS600	Tube support with vent nozzle and flange
TIR-ZS700	Bracket with silica glass pane for flange system
TIR-ZS800	Ceramic tube 600 mm closed for flange system
TIR-ZS900	Cooling case with integrated vent nozzle cap for cooling the infrared thermometer and preventing dust deposits on the optics. For connection to cooling water circuit and compressed air. Material: Stainless Steel

13. Dimensions/Measuring Dot Diameter



14. Declaration of Conformance

We, KOBOLD-Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product

Stationary Infrared Thermometer **Model: TIR-SN...**

to which this declaration relates is in conformity with the standards noted below:

EN 50081-1 **Interference emission**

EN 50082-2 **Noise immunity**

In accordance with the general requirements of the guidelines

89/336/EWG **Electromagnetic compatibility**

93/68/EWG **CE mark**

Signed: Date: 15/11/2000

pp. Peters pp. Wenzel