Operating Instructions

for

Infrared Thermometer stationary

Model: TIR-SN

We don’t accept warranty and liability claims neither upon this publication nor in case of improper treatment of the described products.

The document may contain technical inaccuracies and typographical errors. The content will be revised on a regular basis. These changes will be implemented in later versions. The described products can be improved and changed at any time without prior notice.

1. Contents

Manufactured and sold by:
KOBOLD Instruments Inc
1801 Parkway View Drive
Pittsburgh PA 15205-1422
Tel.: 412-788-2830
Fax: 412-788-4890
E-Mail: info@koboldusa.com
Internet: www.koboldusa.com

2. Note

Please read these operating instructions before unpacking and putting the unit into operation. 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 in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EC-machine guidelines.

3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

Scope of delivery:
The standard delivery includes:

- Infrared Thermometer stationary model: TIR-SN
- Operating Instructions

4. Regulation Use

Any use of the Infrared Stationary Thermometer, model: TIR-SN, which exceeds the manufacturer's specification, may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

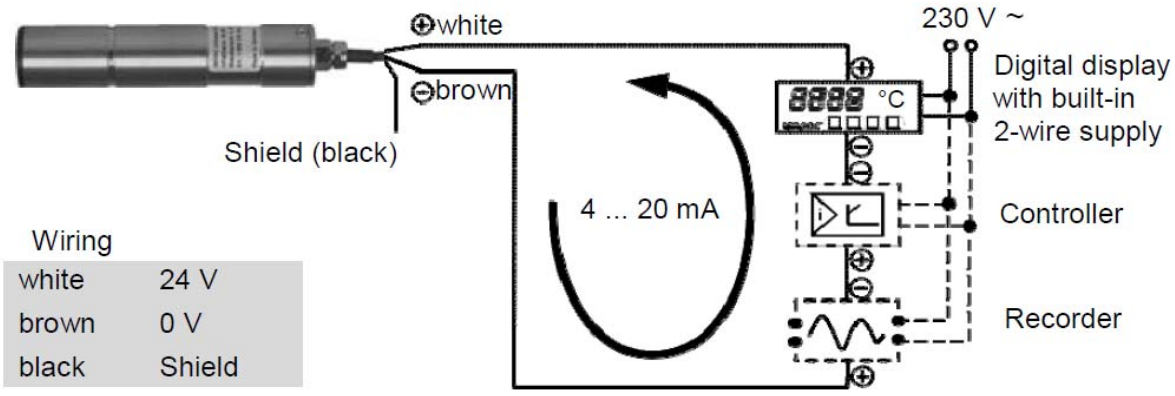
5. Operating Principle

The TIR-SN is a stationary pyrometer for non-contact temperature measurement of non-metallic surfaces or painted, coated or anodised metals.
The very small housing dimensions enable the integration of the pyrometer into compact production machines; the 2-wire technique enables very easy electrical connection.
The solid and robust design of the instrument guarantees high operational safety even in rough industrial environments.

6. Electrical Connection

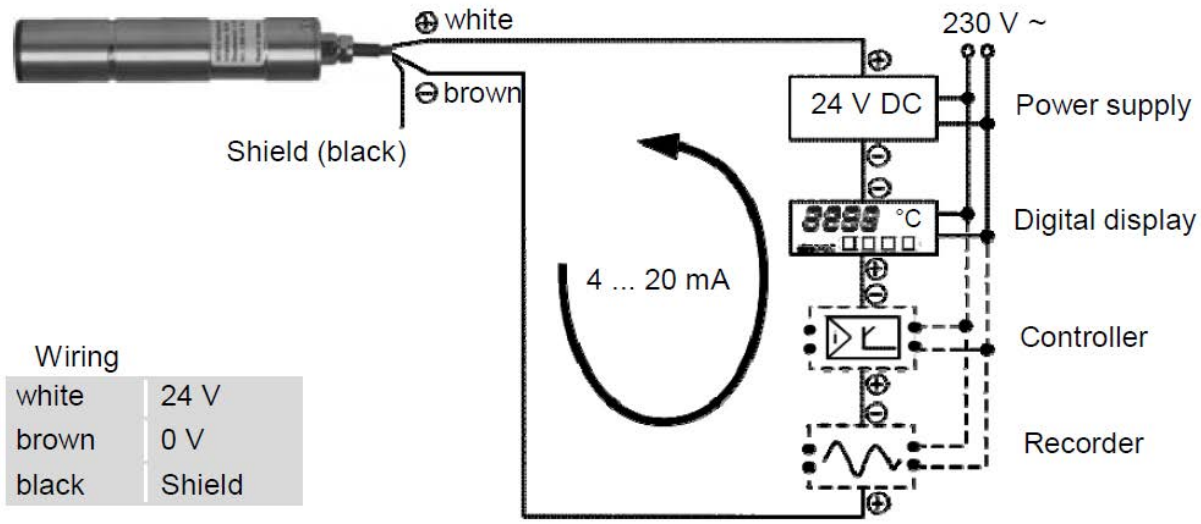
The instruments series TIR-SN are supplied by 24 VDC (range:18 - 30VDC). When connecting the device to the power supply ensure correct polarity. The power consumption (in this case 4 - 20 mA) is also the measuring signal. The instrument doesn't need any time for starting or preheating and is immediately ready for operation. To switch off the instrument, interrupt the instrument's power supply.
To meet the electromagnetic requirements (EMV), a shielded connecting cable must be used. The shield of the connecting cable has to be connected only on the pyrometer's side. On side of the power supply (switch board) the shield must be open to avoid ground loops.

Example for wiring using a digital display with integrated power supply:



Wiring	
white	24 V
brown	0 V
black	Shield

Example for wiring using an external power supply:

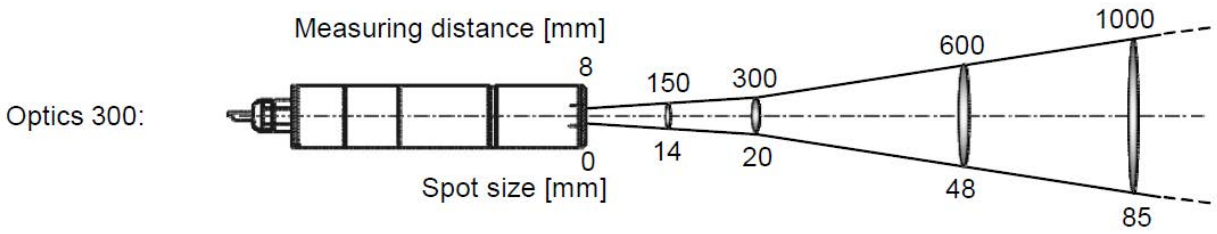


Wiring	
white	24 V
brown	0 V
black	Shield

Note:
Additional analyzing instruments, e.g. controllers, recorders, etc can be connected in series as shown in drawing above.

7. Optics

The pyrometers are equipped with one of the following optics. These lenses are focusing to certain distances, i.e. in these distances each lens achieves its smallest spot size in relation to the measuring distance. The spot size will change in any other distance (shorter or longer). Please notice that the measuring object must be as least as big as the spot size.
The name of the optics (e.g. optics 300) shows the measuring distance in mm (e.g. 300 mm) in which it has the smallest spot size in relation to its measuring distance (TIR-SN, e.g. 20 mm).
The following drawings show the size of the spots in mm in dependence of the measuring distance. Values between the mentioned data can be calculated by interpolation. The spot size for measuring distance 0 is the aperture diameter of the optics.



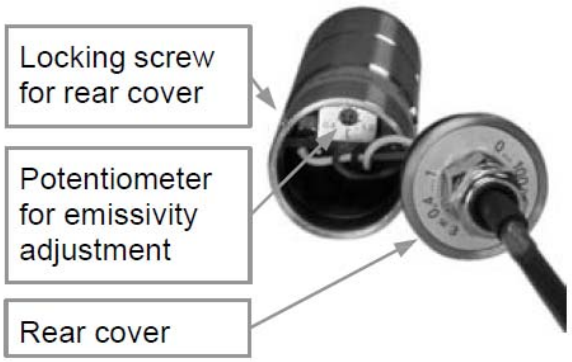
8. Emissivity

For a correct measurement it is necessary to adjust the emissivity ε. This *emissivity* is the relationship between the emission of a real object and the emission of a black body radiation source (this is an object which absorbs all incoming rays and has an emissivity of 100%) at the same temperature. Different materials have different emissivities ranging between 0% and 100% (settings at the pyrometer between 40 and 100%). Additionally the emissivity is dependant on the surface condition of the material, the spectral range of the pyrometer and the measuring temperature. The emissivity setting of the pyrometer has to be adjusted accordingly. Typical emissivity values of various common materials for the two spectral ranges of the instruments are listed in the emissivity table below. The tolerance of the emissivity values for each material is mainly dependent on the surface conditions. Rough surfaces have higher emissivities.

Note!
The pyrometer is factory set to an emissivity of 100%.

To adjust the emissivity factor to your own purpose, you have to remove the *rear cover* by unscrew the *locking screw*. Remove the cover carefully. In the tube there is a scale that can be turned with a small screwdriver. Adjust the emissivity factor to your desire. After that, push the cable carefully back in the tube, put the cover on the tube and tighten the locking screw for the cover.

The following table may give a first information of the correct setting of the emissivity.



Measuring object	ε (at 8 ... 14 µm)
"Black body	100%
Human skin	98%
Black dull varnish	95%
Carbon soot	95%
Wood	80 ... 92%
Paper	92 ... 95%
Asphalt	85%
Glass / quartz glass	72 ... 87%
Textile	75 ... 95%
Graphite	75 ... 92%
Cement	90%
Water	95%

Measuring object	ε (at 5.14 µm)
Glass / quartz glass	97%

Measuring object	ε (at 8 ... 14 µm)
Brickwork	85 ... 95%
Fire clay	
Rubber	
Porcelain	
Ceramics	
Varnish	
Plaster	
Oil paint	
Steel (oxidized)	60 ... 80%
Steel (smooth)	10 ... 30%
Aluminium (smooth)	2 ... 15%
Aluminium (anodized)	96%

9. Maintenance

9.1 Safety

Attention during pyrometer services:
Should the pyrometer be integrated in a running machine process the machine has to be switched off and secured against restart before servicing the pyrometer.

9.2 Service

The pyrometers do not have any parts which require regular service, only the lens has to be kept clean. The lens can be cleaned with a soft cloth in combination with alcohol (do not use acid solutions or dilution). Also standard cloths for cleaning glasses or photo objectives can be used. The Germanium lens of the TIR-SN has an anti-reflective coating which appears slightly colored. Be extremely careful - this layer can easily be rubbed off - this will greatly affect the measuring results!

10. Trouble shooting

Before sending the pyrometer for repair, try to find the error and to solve the problem with the help of the following list.

Temperature indication too low

- Incorrect alignment of the pyrometer to the object

⇒ New correct alignment to achieve the max. temperature signal

- Measuring object smaller than spot size

⇒ check measuring distance, smallest spot size is at nominal measuring distance (see 7)

- Emissivity set too high

⇒ Set lower correct emissivity corresponding to the material (see 8)

- Lens contaminated

⇒ Clean lens carefully (see 9.2)

Temperature indication too high

- Emissivity set too low

⇒ Set lower correct emissivity corresponding to the material (see 8)

- The measurement is influenced by reflections of hot machine parts

⇒ Use mechanical construction to avoid the influence of the interfering radiation

Measuring errors

- Indicated temperature is decreasing during the use of the pyrometer, contamination of the lens

⇒ Clean lens. Recommendation: use of air purge

- Indicated temperature is decreasing during the use of the pyrometer, although the air purge unit is used. Probably compressed air is not clean or air failed

⇒ Clean the lens and use clean, dry and oil free compressed air

- HF-interferences

⇒ Correct the connection of the cable shield (see 6)

- Instrument overheated

⇒ Use cooling jacket with air or water cooling

11. Technical data

Spectral range:	8 ... 14 µm
Optics:	Ge lense
Output:	4 ... 20 mA, load independent current, temperature linear
Max. load:	500 Ω at 24 V power supply
Emissivity ε:	0,4 ...1; adjustable
Response time t_{90}:	300 ms
Uncertainty:	1.5 % of measuring range/°C (ε = 1, TU = 23 °C)
Repeatability:	1% of measuring range
Temp. dependence:	0...60 °C: 0.03% of measuring range per °C (23 °C)
Distance ratio:	15:1
Power supply:	24 VDC ± 25% stabilised, ripple <50 mV
Ambient temperature:	0...70 °C
Storage temperature:	-20...70 °C
Housing:	stainless steel
Protection:	IP65 (DIN 40050)
Weight:	215 g
Connection cable:	2 m length, fixed
CE label:	according to EU directives about electromagnetic immunity

12. Order Codes/Accessories

Model	Measuring range	Optics	Infrared detector	Applications
TIR-SN410... **TIR-SN420...** **TIR-SN430...** **TIR-SN450…**	0…+100 °C 0…+200 °C -20…+300 °C 0…+500 °C	**..G** = optic 300 mm (1:115) (standard)	Thermopile spectral range: 8-14 µm	Plastics, rubber, paper, ceramics, food, fluids, painted parts, asphalt, wood, glass, coated materials **no bright metal**

Numerous accessories guarantee easy installation of the pyrometers. The Following overview shows a selection of suitable accessories:

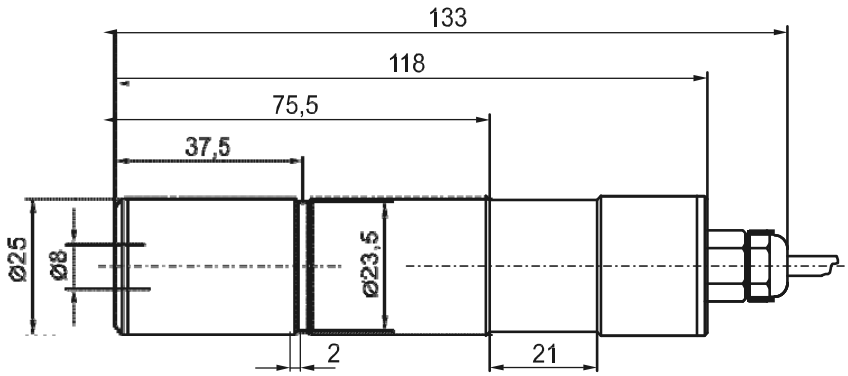
Mounting supports

Air purges

Water cooling jackets

TIR-ZS100	Adjustable mounting for rough environment. Material stainless steel
TIR-ZS200	Installation and alignment support
TIR-ZS300	Installation tube
TIR-ZS400	Stainless steel vent nozzle to prevent dust depositing on optics
TIR-ZS500	Bracket for flange system
TIR-ZS600	Tube support with vent nozzle and flange
TIR-ZS700	Bracket with silicea glas spane for flange system
TIR-ZS800	Ceramic tube 600 mm closed for flange system, max. 1600 °C
TIR-ZS900	Cooling housing with integrated vent nozzle for cooling the infrared thermometer and preventing dust depositing on optics. For connection to cooling water circuit and compressed air. Material stainless steel

13. Dimensions



14. EU 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 61326-1:2013
Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

Also the following EU guidelines are fulfilled:

2014/30/EU	**EMC Directive**
2011/65/EU	**RoHS** (category 9)
2015/863/EU	Delegated Directive (RoHS III)

Hofheim, 11 Sept. 2019

H. Peters
General Manager

M. Wenzel
Proxy Holder