novasens®

sensortechnik

# Operating Instructions


## novasens IR702

**Infrared Temperature Sensor**

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## 1. Description of Device

The digital novasens IR702 infrared temperature sensor is the right choice for precise, non-contact temperature measurement of metals, especially in low temperature ranges.
The following measuring ranges are available: 45°C - 300°C, 250°C - 1000°C, 450°C - 2000°C.

The measured temperature is output via the linear 2-wire 4-20mA output. This output range is compatible with almost any indicator, PID controller, memory recorder, data logger, similar transmitter or PLC.

The sensor can be parameterized via the ModBus protocol and adapted to different metals during operation by setting the emissivity.

## 1.1 Measurement Range / Output Signals

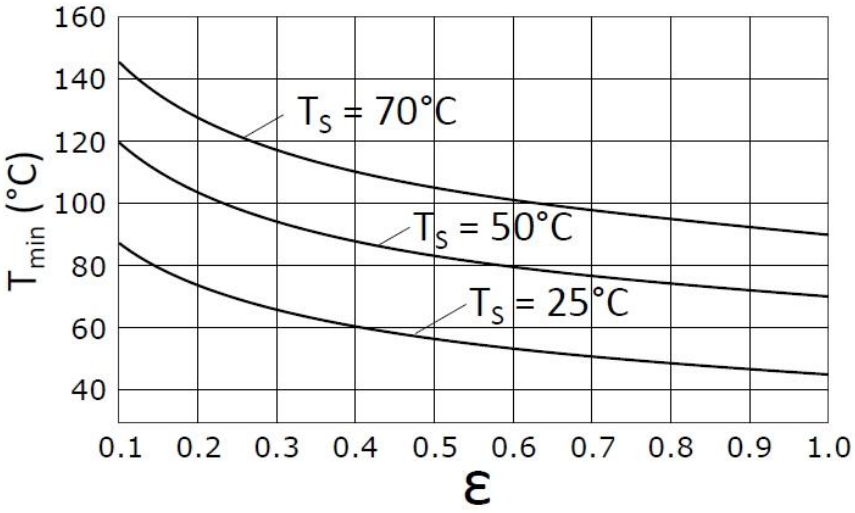
**Available measurement ranges:**

45°C ..... 300°C
250°C ..... 1000°C
450°C ..... 2000°C

**Output table**

| | |
|---|---|
| Object temperature output | Internal sensor temperature output |
| 4-20mA | ModBus |

**Minimum measurable object temperature (only for variant IR702-151-A)**

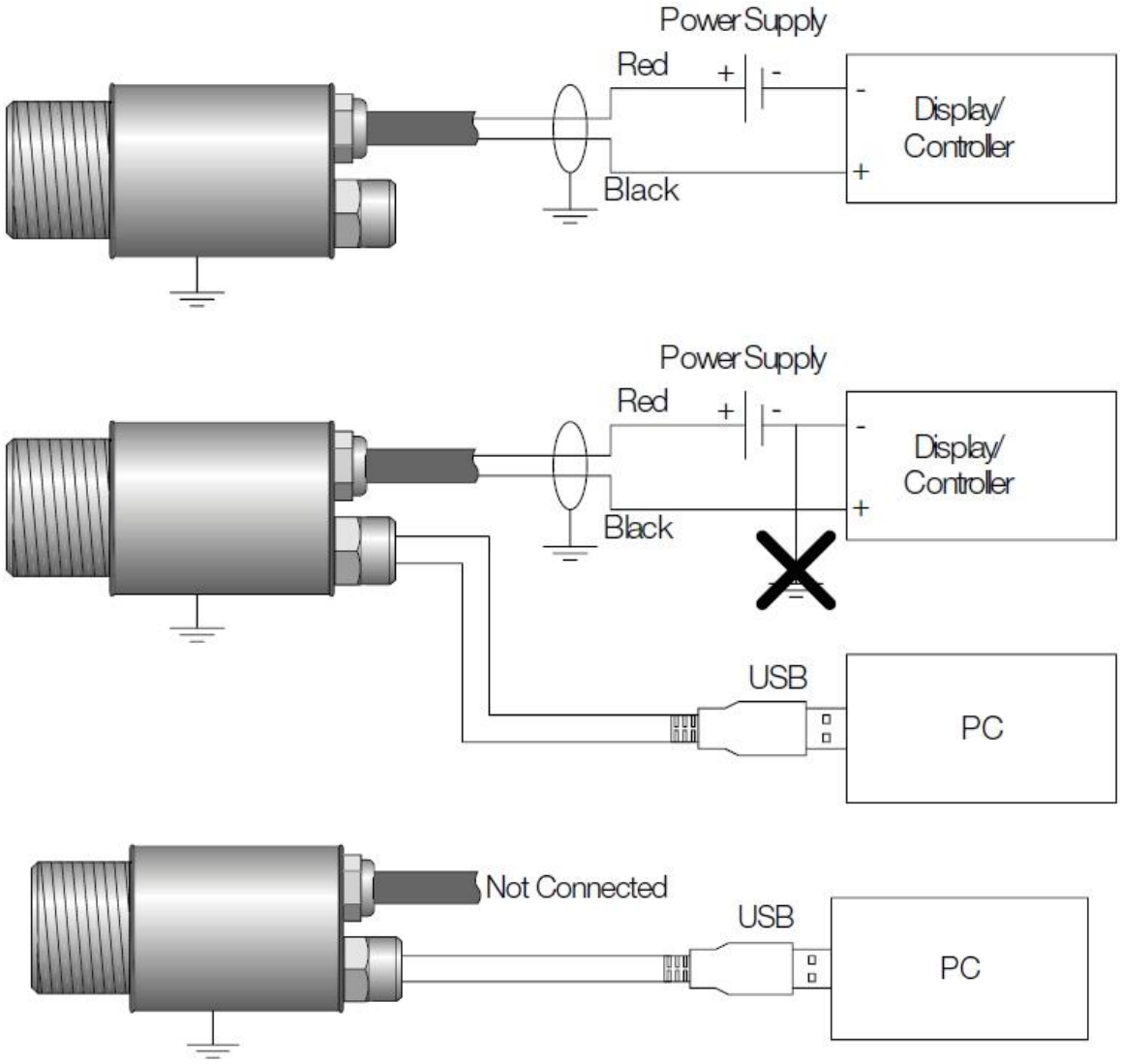



Graph showing the minimum measurable object temperature (Tmin), determined by surface emissivity (ε) and sensor temperature (TS).

## 2. Activation & Installation

## 2.1 Electrical Installation / Circuit Diagram & Connections

The IR702 sensor can be connected in three different ways.
ATTENTION: Please install the required driver software on the PC BEFORE you connect the sensor to the PC via USB cable.
The required software drivers can be found under: https://www.novasens.de/de/downloads-2/




**Cabling**

| Output | Cable number | Cable color | Function |
|---|---|---|---|
| 4-20mA | 1 | Red | Power supply + |
| | 2 | Black | Power supply - |
| | 3 | Bare | Shielding/grounding |

**If required, the sensor can be supplied with a longer 4-20mA cable.**

**Supply Voltage**
**Be sure to use 24VDC (22mA)**

**ATTENTION:** Do not touch any electrically live components with the measurement device or sensor.

**Grounding**
The sensor must only be grounded/shielded at one point, either at the ground wire or at the sensor housing. Check the distance between the sensor and the display/controller.

**USB port**
The sensor only works with the supplied USB cable. Connecting a USB cable other than the one supplied will damage the sensor.

**Electrical Faults**
To reduce electromagnetic interference or "noise" to a minimum, the sensor should be located away from motors, generators and similar devices.

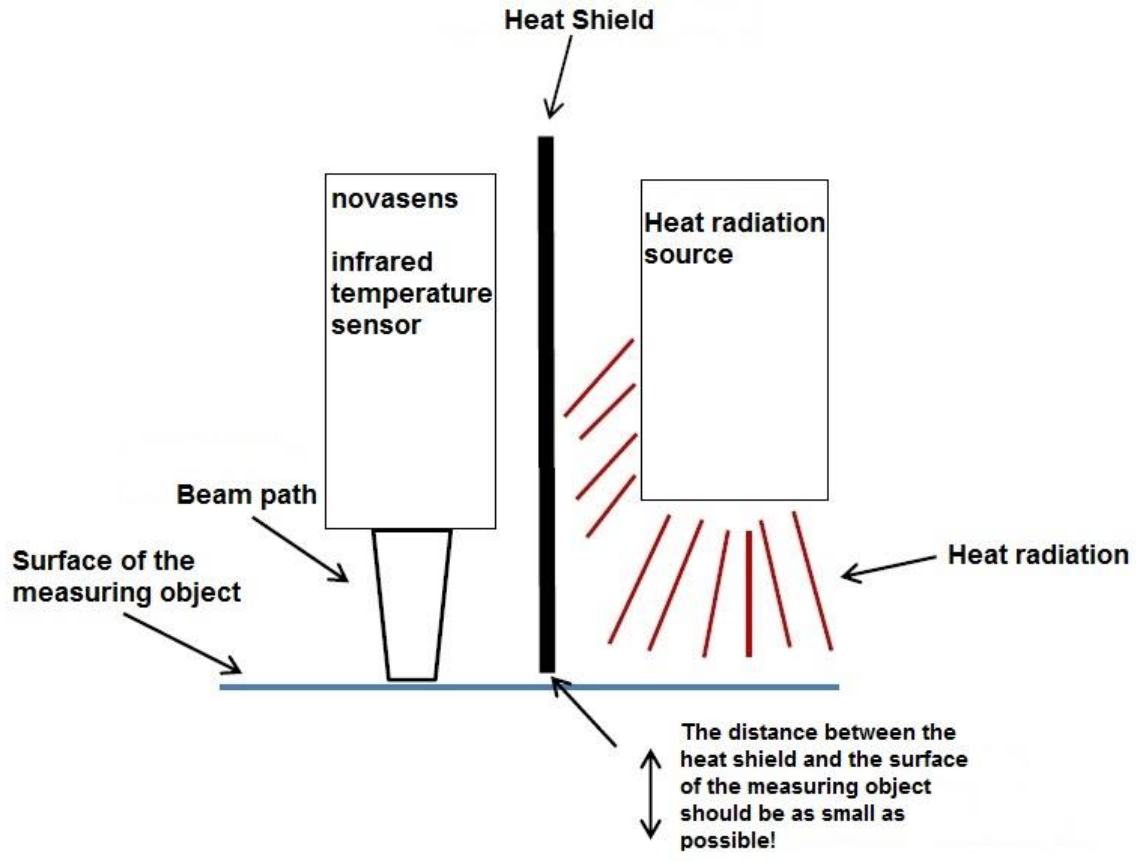
## 2.2 Sensor Assembly / Sensor Orientation & Cleaning

### Sensor Assembly:

The novasens sensors are sensitive, optical measuring instruments. Use only the M20x1 nut attached to the sensor for assembly and fastening.
Do not use excessive mechanical force when attaching and aligning the sensor, otherwise it could be damaged or destroyed.

When installing/replacing the sensors, ensure that the distance and angle to the measuring object are correct.
Place the sensor at a sufficient distance from heat sources such as infrared heaters, hot air blowers, glow coils and heating elements.
In particular, ensure that the radiation from the heat sources does not radiate into the optical beam path between the sensor and the target.

If the measurement results will be impaired by close proximity to a heat source, place some insulation, such as an insulating plate, between the sensor and the heat source.



For use in very hot environments above 70°C ambient temperature is an air-/water-cooled housing required.

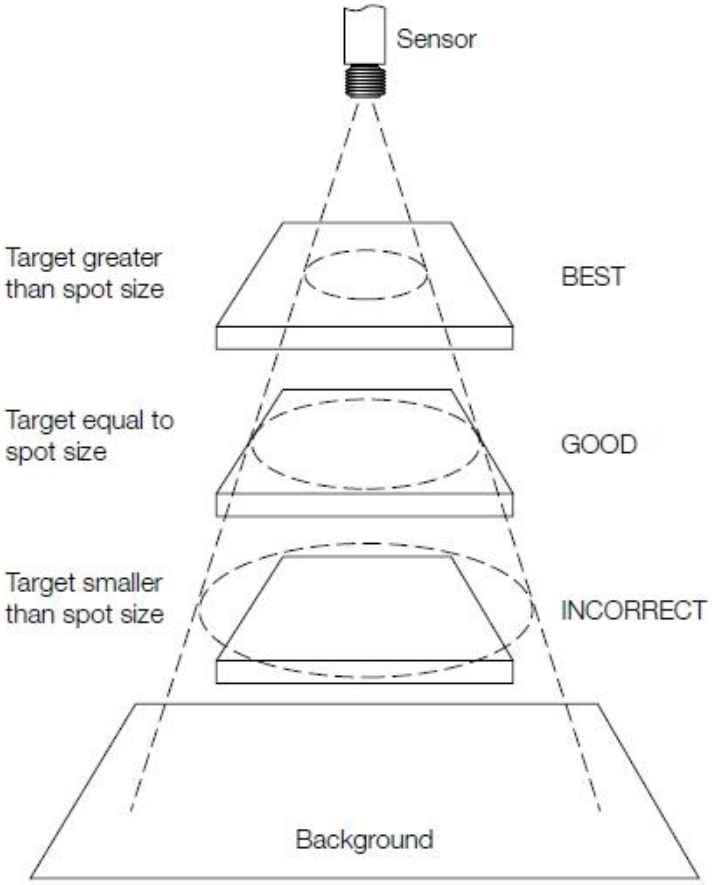
## Sensor Orientation

To achieve an ideal measurement result, set the sensor as much as possible at a 90° angle to the object to be measured (between the sensor's lens and the object to be measured). The sensor can also be mounted at other angles to the object to be measured. The sensor's measurement spot will then change from circular to oval.

A ruler or a caliper may be used to orient the sensor on object to be measured. A laser sighting tool for the IR702 is also optionally available. Place the ruler or caliper at the front of the sensor head and target the object to be measured.

The object to be measured should always fill the sensor's visual field, meaning that the measurement spot should always be smaller or the same size as the object to be measured. The specified measurement distance will be in relation to the front edge of the sensor and the object to be measured.

Keep the sensor lens as free of dust and particles as possible. A dirty lens affects the measurement result. An air purge sleeve for the sensor is optionally available for use in harsh and dirty environments.




## Cleaning the Sensor

Loose particles may be removed using a soft brush or clean compressed air.
The lens itself can be cleaned using a moistened towel or a water-based glass cleaner.
Do not use solvents as cleaning agents under any circumstances. The coating of the germanium lens will deteriorate otherwise and be damaged, which will result in inaccurate results from the sensor.

## 2.3 Temperature measurement and setting

1. Switch on the power supply of the IR702.
   After the sensor has been installed, the temperature compensation must be adapted to the environmental conditions and maintain a temperature equilibrium at all parts of the sensor.
   Let the measuring system adjust for about 20 minutes before you start the initial setting.

2. Make sure the temperature scaling and output signal of the IR702 matches the temperature scaling and input signal of your machine control.
   The 4-20mA output of the IR702 is linearized.

3. Take the reference temperature (e.g. 120°C) from the measuring object with a contact thermometer or an infrared handheld thermometer.
   Make sure that the correct emissivity is set in the infrared handheld thermometer.
   Align the sensor exactly in the direction and distance to the measurement object.
   Make an offset setting / correction in the evaluation of the sensor signal if necessary.

## 2.4 ModBus Commandlist / ModBus via the serial interface

Interface
Baudrate: 9600
Format (bits): 8data, no parity, 1 stop
Reply delay: 20ms

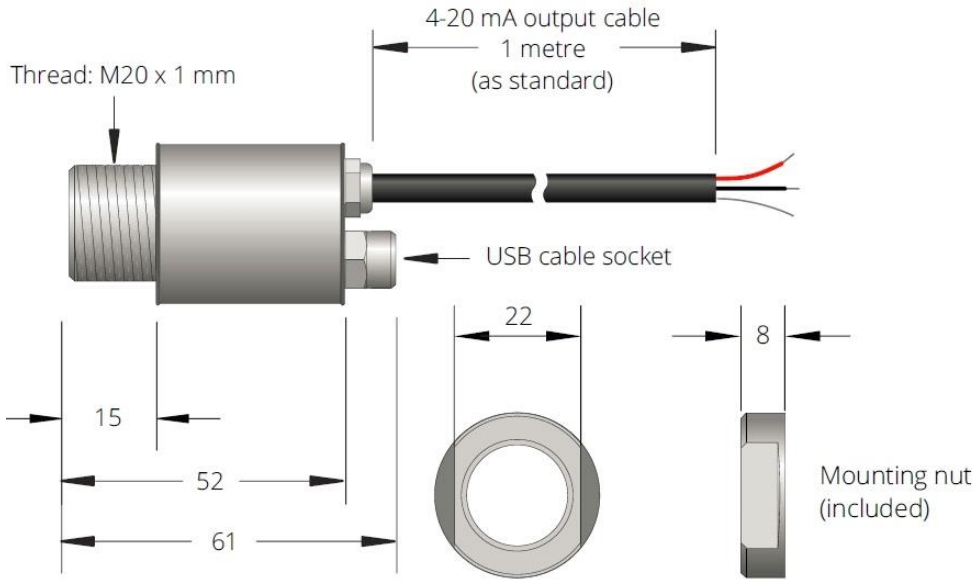
Supported features:
Read register: 0x03, 0x04
Write single register: 0x06
Write multiple register: 0x10

List of ModBus addresses
R=Read, W=Write

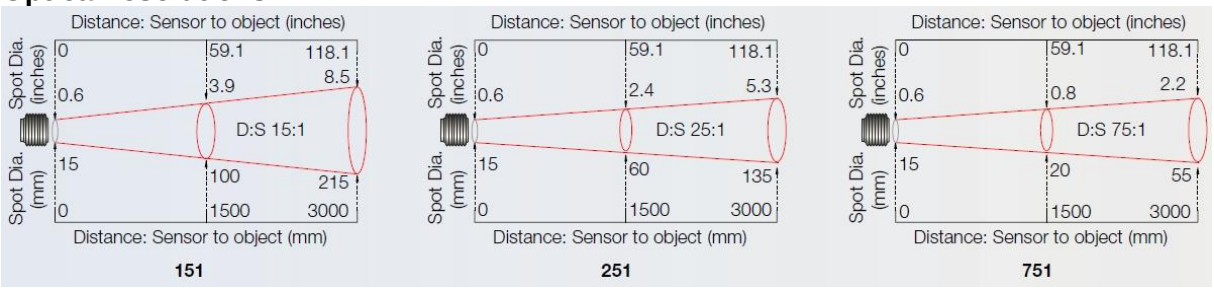
| Adress | Length | Description | R/W |
|---|---|---|---|
| 0x05 | 1 | Modbus slave address | R/W |
| 0x08 | 1 | Emissivity setting from 0.1000 to 1.0000 | R/W |
| 0x0A | 1 | Output scaling: temperature value at 4mA | R/W |
| 0x0B | 1 | Output scaling: temperature value at 20mA | R/W |
| 0x12 | 1 | Temperature measurement object (object temperature) | R |
| 0x14 | 1 | Temperature sensor head (ambient temperature) | R |
| 0x015 | 1 | Sensor status<br>Bit 0: Measurement error<br>Bit 1: Sensor temperature low<br>Bit 2: Sensor temperature high<br>Bit 3: Object temperature low<br>Bit 4: Object temperature high | R |

## 3. Sensor Dimensions and Optical Resolution

### Sensor dimensions




### Optical resolutions




## 4. Technical Data

| | | | |
|---|---|---|---|
| Measurement ranges in °C | 45°C to 300°C<br>250°C to 1000°C<br>450°C to 2000°C | Permissible ambient temperature | 0°C to 70°C |
| Resolution | 1/10°C | Permissible moisture | 95%, without condensation |
| Reaction time | 200ms (T90) | Distance/measurement spot | 15 : 1 \| 25 : 1 \| 75 : 1 |
| Accuracy | +- 1% / +- 1°C of the measured value (depending on which value is greater) | Repeat accuracy | +/ - 0,5% / +- 0,5°C of the measured value (depending on which value is greater) |
| Sensor dimensions | Diameter: 28mm<br>Length: 61mm | Housing material | Stainless Steel |
| Weight with cable | 155 Grams | Sensor cable length | 1 meter (extendable to 30m) |
| Spectral range | 2,2 µm | Outputs | 4 – 20mA, USB 2.0(Modbus-Protocol) |
| Protection class | IP 65 | Power supply | 6-24 VDC (22mA) |
| Maximum circuit impedance | 900 Ohm at 24VDC | 4-20mA output minimum temperature range | 100°C |
| Emissivity correction | 1,0 – 0,1 adjustable | Maximum temperature range of the 4-20mA output | Entire temperature range |

## 5. Accessories / Options

### Attachment for air cooling/lens cleaning

Sensor attachment for use in very hot and harsh environments. Compressed air connection for air cooling and lens cleaning. ArtNr. 07AC

### Attachment Laserpointer

Attachable laser pointer for precise alignment of the sensor over long measuring distances.
ArtNr. 07LP

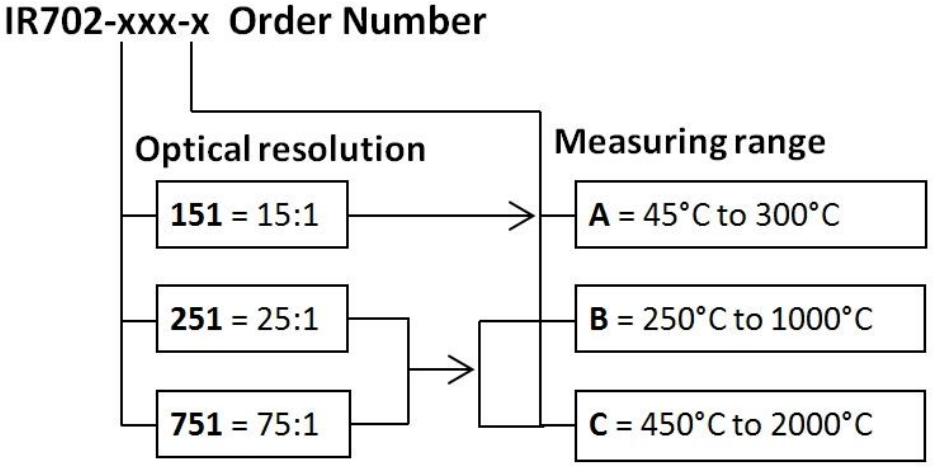
### Attachment for water cooling/lens cleaning

Sensor attachment for use in very hot and dirty environments close to heat sources.
With connection for water cooling and compressed air.
ArtNr. 07WCAC

### Adjustable sensor mount

Adjustable mounting bracket for flexible sensor alignment.
ArtNr. 07AB

### IR702-xxx-x Order Number



## 6. Guarantee

novasens guarantees that products will not exhibit any defects with regard to the material and manufacturing for a period of 24 months from the date of delivery. For repair work, we provide a six-month guarantee for all repaired or replaced device components.

Defects found during the guaranteed period must be reported within 30 days of discovery according to the terms of the guarantee.
Damage caused by improper treatment, opening the device or the use of force is excluded from the guarantee.

All defective products must be shipped at the purchaser's expense and risk.
The guarantee above is the only guarantee provided by novasens.
There are no direct or indirect guarantees.
The purchaser's legal options only apply to the repair or replacement of a defective products that has been reported only.

At their discretion, novasens may:

- repair a device or
- replace the device with one of similar value

If device errors are caused by improper usage, incorrect installation or the use of force, we will issue an invoice the expenses. In the case of repairs, a cost estimate will be provided before repair work is started.

novasens is not liable for any other damage where immediate or unintended damage or consequential damage is involved or the damage was caused by negligence, forbidden changes, self-repair efforts or the misuse of the product by the customer.