Instruction Manual

RS Pro Infrared Temperature Sensor

Stock Number: 161-8103

Introduction

The RS Pro Infrared Temperature Sensor is a device for measuring the temperature of the surface of a solid or liquid without contact. Its extremely small size makes it ideal for installation where space is restricted.

The sensor works by detecting infrared energy that is emitted by the target object. The temperature is shown on the sensor's built-in OLED display, and can be monitored continuously via the DC voltage output, e.g. with industrial process instrumentation. The sensor also has a configurable alarm output.

Specifications

GENERAL

Measurable Temperature Range	0 to 1000°C
Analogue Output	Selectable 0-5, 1-5 or 0-10 V DC, linear with measured temperature
Alarm Output	Open collector with adjustable temperature threshold and hysteresis
Field of View	15:1 divergent optics
Accuracy	± 1.5% of reading or ± 1.5°C, whichever is greater
Repeatability	± 0.5% of reading or ± 0.5°C, whichever is greater
Response Time	250 ms
Emissivity	Adjustable via display and buttons
Emissivity Setting Range	0.20 to 1.00
Max Temperature Span (Linear Output)	1000°C
Min Temperature Span (Linear Output)	100°C
Spectral Range	8-14 µm
Supply Voltage	24 V DC (max 28 V DC)
Min. Supply Voltage (at Sensor)	6 V DC (12 V DC if the output is set to 0-10 V)
Max Current Draw (Sensor)	30 mA
Open Collector Alarm Output	6 to 24 V DC, 50 mA max (see Electrical Installation)

ENVIRONMENTAL

Environmental Rating	IP65
Ambient Temperature Range	0°C to 70°C
Relative Humidity	95% max. non-condensing

CONFORMITY

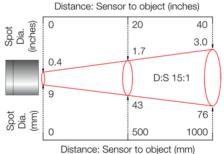|	
Electromagnetic Compatibility (EMC)	EN61326-1, EN61326-2-3 (Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements - Industrial)
RoHS Compliant	Yes

CONFIGURATION

Configurable Parameters	Temperature range (analogue output) Alarm output threshold and hysteresis Emissivity setting Reflection compensation (e.g. target in oven/furnace)
Temperature Units	°C / °F
Signal Processing	Averaging Period (0.25 to 60 seconds)
Peak / Valley Hold	Hold Period (0.25 to 1200 seconds)

MECHANICAL SPECIFICATIONS

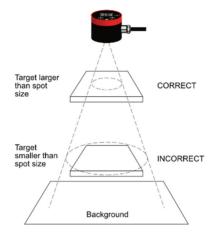| Construction	Black anodised aluminium and red ABS
Cable Length	1 metre
Weight with Cable	65 g

Optics (Field of View)

The sensor measures the average temperature within a spot. The size of this spot depends on the distance between the sensor and the target surface.

The sensor may be used at longer distances than shown, and will measure a larger spot. The measurement accuracy is not affected by the measurement distance.

Every part matters

Target Size

The size of the measured spot must not be larger than the target. The sensor should be positioned so that the measured spot size is smaller than the target.

Ambient Temperature

The sensing head may be used in ambient temperatures of up to 70°C. Avoid thermal shock. Allow 20 minutes for the unit to adjust to large changes in ambient temperature.

Atmospheric Quality

Smoke, fumes, dust and steam can contaminate the lens and cause errors in temperature measurement. In these types of environment the optional air purge collar should be used to help keep the lens clean.

Optional Accessories

An adjustable mounting bracket and air purge collar are available. These may be ordered at any time and added on-site.
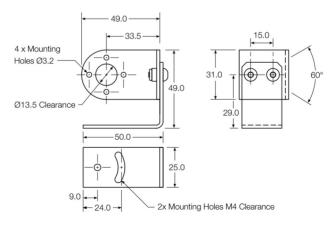
Mechanical Installation

The sensor can be attached to brackets or mountings of your own design, or you can use the optional mounting bracket accessories shown below. Use two M3 mounting screws (included) to fix the sensor to a mounting plate or bracket with a third, central hole for the sensor to "see" through. We recommend a hole of diameter 13 to 16 mm in a mounting plate of up to 2 mm thickness. Ensure the mounting does not obstruct the sensor's field of view (FOV); refer to the optical diagram in Specifications and allow a clear area twice the size of the FOV cone for maximum accuracy.

Dimensions and Connections

Open collector output for alarm,
6 to 24 V DC, 50 mA max

30.0

13.3

AL
(Yellow)

Protection
diode

Optical field of
view

PWR+
(Red)

Power supply
24 V DC

+
−

2 x mounting holes
M3 x 0.5 mm
Depth 7 mm

PWR-
(Blue)

31.0 21.5

238.6

Ø 3.2
nominal

OP+
(Green)

−
+

Configurable 0-5, 1-5 or 0-10 V DC
output, linear with measured
temperature, for display or controller

Mounting Bracket (RS Stock No. 905-8777)

49.0

33.5

4 x Mounting
Holes Ø3.2

15.0

49.0

31.0

60°

Ø13.5 Clearance

29.0

50.0

25.0

9.0

24.0

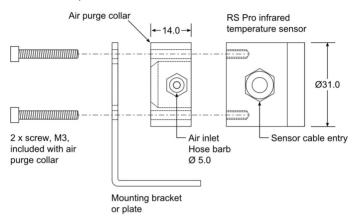2x Mounting Holes M4 Clearance

5

Air Purge Collar (RS Stock No. 905-8770)

The optional air purge collar is used to keep dust, fumes, moisture and other contaminants away from the lens. Air flows into the hose barb fitting and out of the front aperture. Air flow should be 5 to 15 litres per minute. Clean or "instrument" air is recommended.

Two M3 screws (included) secure both the air purge collar and the sensor to the mounting.

Wiring

Check the length of the cable run between the temperature sensor and the measurement instrument. If necessary, the cable can be extended using a shielded cable with 4 or more cores (3 if the alarm output is not used). Ensure the shield is also extended.

Electrical Installation

Use a 24 V DC power supply.

Connect power between the PWR+ and PWR- wires. Do not apply voltage to the incorrect wires as this will damage the sensor. See "Dimensions and Connections" for wiring.

If using the alarm output, choose a load that draws no more than 50 mA when powered from 1.2 to 24 V DC. For example, if the alarm supply voltage is 24 V DC, ensure the load is at least 480 Ω (24 V / 0.05 A = 480 Ω).

Ensure the supply voltage is suitable for the selected output type. For the 0-10 V DC output, the supply voltage must be 12 to 24 V DC.

The temperature output is a voltage signal measured between OP+ and PWR-. The output voltage is linear with measured temperature. The output voltage range is configurable in the sensor's Settings menu.

Grounding

The sensor is tested to industrial standards for electromagnetic compatibility (EMC) as shown in Specifications. For maximum protection against electromagnetic interference, the sensor must be connected to earth at one point, either the cable shield termination or the metal sensor housing, but not both.

To minimise electromagnetic interference or "noise", the sensor should be mounted away from sources of electromagnetic interference such as motors and generators.
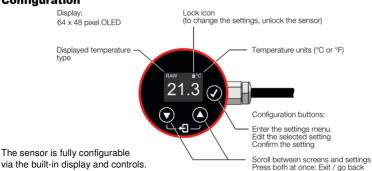
Operation

Once the sensor is in position and the appropriate power, air, water and cable connections are secure, the system is ready for continuous operation by completing the following simple steps:

1. Turn on the power supply
2. Turn on the connected measurement instrument
3. Read or monitor the temperature

IMPORTANT

- If the sensor is exposed to significant changes in ambient temperature (hot to cold, or cold to hot), allow 20 minutes for the sensor body temperature to stabilise before taking or recording measurements.
- Do not operate the sensor near strong electromagnetic fields (e.g. around arc welders or induction heaters). Electromagnetic interference can cause measurement errors.
- Wires must be connected only to the correct terminals. Check all connections before applying power.
- Do not damage the cable, as this could provide a path for moisture and vapour into the sensor.
- Always turn off the power before modifying electrical connections.
- Do not attempt to open the sensor. There are no user-serviceable parts inside. This will damage the sensor and invalidate the warranty.

Configuration

Display:
64 x 48 pixel OLED

Lock icon
(to change the settings, unlock the sensor)

Displayed temperature type

Temperature units (°C or °F)

RAW °C
21.3

Configuration buttons:

Enter the settings menu
Edit the selected setting
Confirm the setting

The sensor is fully configurable via the built-in display and controls.

Scroll between screens and settings
Press both at once: Exit / go back

Settings

Press the tick button to enter the settings menu. By default the sensor is locked, and the settings can be viewed but not adjusted. To edit the settings, scroll to "**Enter PIN**" (press Down once). The PIN is **8103.**

Emissivity	Emissivity Setting	Enter the emissivity setting (between 0.2 and 1.0). The emissivity setting should match the emissivity of the target surface. This can be determined experimentally by comparing measurements with a trusted contact probe, or estimated using an emissivity table.
		Non-reflective non-metals, such as rubber, foods, thick plastics, organic materials and painted surfaces, generally have a high emissivity, around 0.95. This is the default setting.
		Bare, clean metal surfaces can have a very low emissivity, and are often difficult to measure accurately. If possible, a measurable area of the surface should be painted or coated to reduce reflections and increase the emissivity.
	Reflected Energy / **Reflected Temperature**	In most applications, the target surface has the same surroundings as the sensor (for example, it is in the same room). In this case, Reflected Energy Compensation should remain Disabled for an accurate measurement.
		However, if the sensor is positioned outside an oven or furnace, with the target object inside, the reflection of the hot furnace interior can affect the measurement. In this case, Reflected Energy Compensation should be Enabled and Reflected Temperature should be set to the temperature inside the oven or furnace.
Filtering	Filtering settings are applied to the sensor's voltage and alarm outputs. They are optionally applied to the temperature display too (see Settings - Display).	
	Average Period	To slow the response time of the sensor, or to reduce fluctuations or noise on the measurement, enter an averaging period (in seconds) here.
	Hold Mode / **Hold Period**	If required, hold processing can be applied by setting Hold Mode to "Peak" or "Valley" and setting the hold period (in seconds). This is useful if the temperature reading is interrupted by gaps between moving objects, or by an obstruction.
Voltage Output	Set the temperature limits for the voltage output, and the output voltage range (choose from 0-5, 1-5 or 0-10 V DC).	

Alarm Output	Set Point	The temperature at which the alarm will be triggered. The display flashes while the alarm is triggered.
	Hysteresis	In Auto Reset mode, this is the temperature difference between the Set Point and the reset level.
	Reset Mode	Manual: Press any button to acknowledge the alarm and deactivate the alarm output. The display keeps flashing until the alarm is reset. To reset the alarm, go to Settings → Reset Alarm. Auto: The alarm will be reset automatically when the temperature passes the reset level.
	Alarm Trigger	HI: The alarm is triggered if the temperature is higher than the Set Point. LO: The alarm is triggered if the temperature is lower than the Set Point.
	Output Mode	Active HI: In an **alarm condition**, the alarm wire AL will sink current to ground through the attached load (e.g. a relay). Active LO: In a **non-alarm** condition, the alarm wire AL will sink current as above.
	Temperature Reference	Measured: The temperature of the target object. Internal: The temperature inside the housing of the RS Pro Infrared Temperature Sensor. This can be used to indicate the ambient temperature where the sensor is mounted.
Display	Displayed Temperature	RAW: Measured temperature without averaging or hold processing FIL: Includes averaging and hold processing AVG: Includes averaging only This setting does not affect the sensor's outputs.
	Temperature Units	Select Celsius or Fahrenheit. Units are changed throughout the sensor's interface.
	Screen Saver	If enabled, the sensor's display turns itself off after 1 minute of inactivity. Press any key to turn the display on again. The display will still turn on and flash if the alarm is triggered.
	Rotation	Change this setting from "Normal" to "Inverted" to make the display easy to read if the sensor is installed upside-down.
Reset Alarm		In Manual Reset Mode, after the alarm has been triggered and acknowledged, this function allows the alarm to be triggered again.
Enter PIN / Lock Sensor		Enter the PIN to unlock the sensor and change the settings. The PIN is **8103**. When configuration is complete, lock the settings again by selecting **Lock Sensor.**

Calibration

Every sensor is calibrated to within the published specification at the time of manufacturing.

Maintenance

Our customer service representatives are available for application assistance, calibration, repair, and solutions to specific problems. Contact our Service Department before returning any equipment. In many cases, problems can be solved over the telephone. If the sensor is not performing as it should, try to match the symptom below to the problem. If the table does not help, call RS for further advice.

Troubleshooting

Symptom	Probable Cause	Solution
No output or display	No power to the sensor	Check the power supply and wiring
Inaccurate measured temperature	Target too small for sensor's field of view	Ensure the sensor's view is completely filled by the target. Position the sensor closer to the target to measure a smaller area.
	Incorrect emissivity setting	Choose the correct emissivity setting for the target material. See "Emissivity" for more information
	Target is a reflective metal surface	Try using a low emissivity setting, or paint or coat a measurable area of the target to make it non-reflective
	Field of view obstruction	Remove obstruction; ensure sensor has a clear view of target
	Dust or condensation on lens	Ensure lens is clean and dry. Clean gently with a soft lens cloth and water. If problem recurs, consider using an air purge collar.
Voltage output does not match displayed temperature	Output temperature scale mismatch	Check the output range and scale in Voltage Output settings; ensure the output scale matches the input range of the measurement instrument
No alarm output	Incorrect wiring or configuration	Check electrical connections (see Installation), Reset Alarm, and Alarm Output settings
Cannot change settings	Sensor is locked (padlock icon is displayed)	Go to Settings – Enter PIN to unlock the sensor

Guarantee

For RS Pro Warranty Terms & Conditions please visit our website: www.RSPro.com

FOR MORE INFORMATION VISIT THIS SITE

www.RSPro.com