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ΩΞ OMEGA™

User's Guide

SP-001, SP-002
Ultra Miniature IR Smart Probe

ΩΕ OMEGA™

Servicing North America:

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Notes Warnings, and Cautions

If the equipment is used in a manner not specified in this manual, the protection provided by the equipment may be impaired.

Do not operate the equipment in flammable or explosive environments.

It is important to read and follow all the precautions and instructions in this manual before operating or commissioning this device as it contains important information relating to safety and EMC. Failure to follow all the safety precautions may result in injury and / or damage to your equipment.

The following labels identify information that is especially important to note:

Note: Provides you with information that is important to successfully setup and use the SP-001.

Caution or Warning: Tells you about the risk of electrical shock.

Caution, Warning, or Important: Tells you of circumstances that can affect the instruments functionality and must refer to accompanying documents.

Tip: Provides you helpful hints.

Introduction

Description

The Omega Smart IR Temperature Probe is a miniature infrared sensor that measures the surface temperature of a solid or liquid without contact. It can measure non-metal surfaces between -70 to 380°C (-94 to 716°F). It also features a built-in sensor to measure the ambient temperature of the probe itself.

Materials including paper, thick plastics, rubber, food and organic materials, as well as painted metals and most dirty, rusty or oily surfaces, are measured accurately, safely and cleanly.

The Smart Probe is packaged into a rugged 12 mm OD x 67 mm long compact, stainless steel, IP67 (NEMA 6) housing - designed for heavy industrial use while taking up the least amount of space for easy installation. Standard features include: easy configuration through free Sync configuration software, adjustable emissivity and filtering, and a wide operating temperature range of -40°C to 85°C.

We've integrated an advanced suite of IIoT centric featured electronics called Smart Core. These features enable plug and play connectivity, fully featured alarms and notifications, data assurance, and data storage of up to 1499 sensor readings.

Included with Your SP-001 / SP-002

• SP-001 / SP-002
• Quick Start Guide
• Two Mounting Nuts

Additional Material Needed

• Smart Interface (IF-001-0) or Wireless Transmitter
• Computer / Laptop with Windows OS
• Omega Sync software
    (Downloadable on the Omega Website)

Optional Materials

• Secondary temperature measurement device.
    (RTD, Thermocouple, etc.)

Manuals / Software

The latest User Manual, Quick Start Guide, and Omega Sync software are available to download on the Omega website.

Figure 1

Input / Output Pin Layout

The following pin layout depicts a rearview of the SP-001 / SP-002.
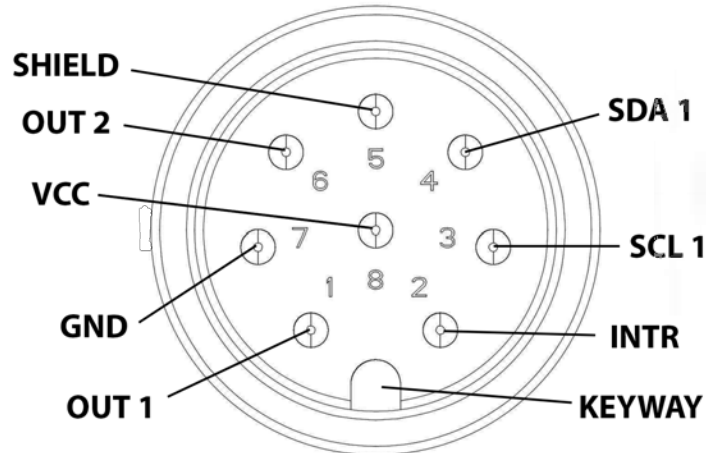
Figure 2

Function	Description
OUT 1	Output enabled models
INTR	Smart Sensor INTR signal
SCL 1	Smart sensor SCL signal
SDA 1	Smart Sensor SDA signal
SHIELD	Connected to metal housing
OUT 2	Output enabled models
GND	Power return
VCC	3.3 Vdc

Optical Chart

The optical chart below indicates the nominal target spot diameter at any given distance from the sensing head and assumes 90% energy. **Figure 3** reflects the SP-001 with a field of view of 6:1. **Figure 4** reflects the SP-002 with a field of view of 10:1.

Figure 3

Figure 4

Preparation

The installation Process consists of the following stages:

- **Preparation**
- **Mechanical Installation**
- **Software Setup**

Please read the following sections thoroughly before proceeding with the installation.
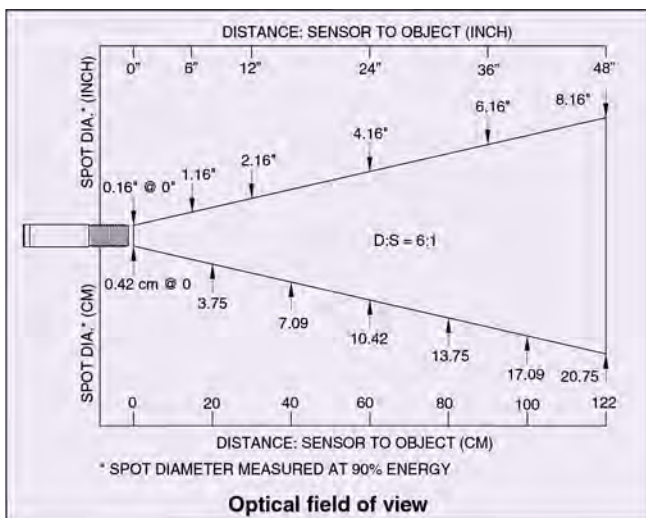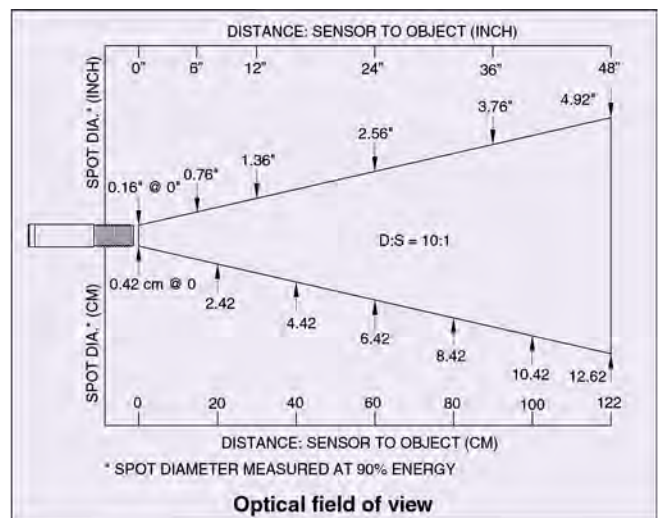
Positioning

Ensure that the sensor is positioned so that it is focused on the target only.
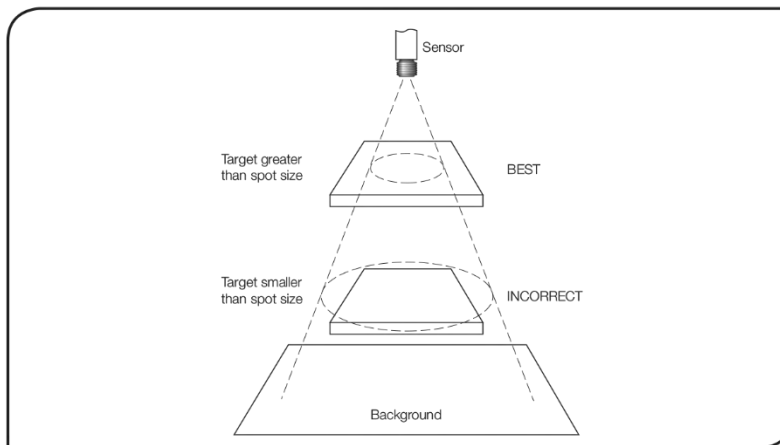
Figure 5

Distance and Spot Size

The size of the area (spot size) to be measured determines the distance between the sensor and the target. The spot size must not be larger than the target. The sensor should be mounted so that the measured spot size is smaller than the target.

Note 🖙 **Note:** A mounting bracket for the SP-001 / SP-002 is sold separately.

Ambient Temperature

The sensor is designed to operate in ambient temperatures from -40°C to 85°C (-40°F to 185°F).

⚠ **Caution:** To avoid thermal shock, allow 20 minutes for the unit to adjust to large changes in ambient temperature.

Atmospheric Quality

Smoke, fumes, or dust can contaminate the lens and cause errors in temperature measurement.

Electrical Interference

To minimize electromagnetic interference or "noise," the sensor should be mounted away from motors and generators.

Mechanical Installation

The SP-001 / SP-002 requires a Smart Interface (IF-001-0) or Wireless Transmitter to connect to your computer. Locate the position of the keyway as a guide on the SP-001 / SP-002 prior to making the connection. See **Figure 6.**

Figure 6

The sensor can be mounted on brackets, clamps or cutouts of your own design or you can use the fixed and adjustable Omega mounting bracket accessory: SP-001-MB.

Figure 7

Note: SP-001-MB accessory is sold separately.

Software Setup

Ensure Omega Sync is running before continuing. The SP-001 / SP-002 Infrared Smart Sensor is configured exclusively through the Omega Sync software. To connect your SP-001 / SP-002 to Omega Sync, follow these instructions.

Note: Omega Sync is available to download on the Omega website.

Connecting to Omega Sync – Automatic Detect
Once the SP-001 / SP-002 and Smart Interface are connected to your computer, Omega Sync will automatically detect it and begin displaying temperature readings.

Note: If you have successfully connected your SP-001 / SP-002 to Omega Sync, skip ahead to section Setting Emissivity. If you were not successful in connecting your device, proceed to **Connecting to Omega Sync – Manual**.

Connecting to Omega Sync – Manual
If Omega Sync does not automatically detect your device, follow these instructions to manually connect your device.

Step 1: Click on the [+] icon located on the top left of the Omega Sync interface.

Step 2: Proceed through the Add Device Wizard and click End Device / Probe. See **Figure 8**.

Figure 8

Note: The connection type and parameters must be accurate for a proper connection to be established. Failure to accurately setup communication parameters may result in communication errors.
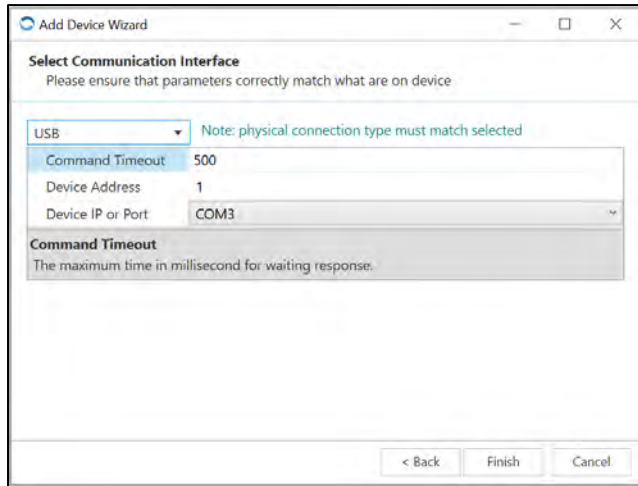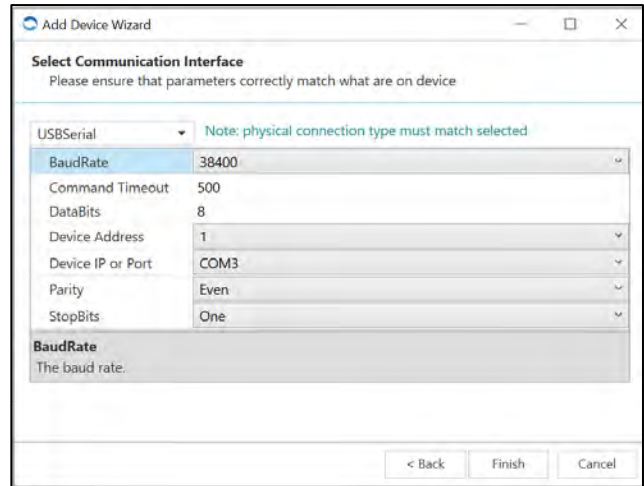

Figure 9

Figure 10

Communication Interface

- **Connection Type:** Select the type of connection you have between your SP-001 / SP-002 and your computer. USB connection is displayed in **Figure 9**. USB Serial connection is displayed in **Figure 10**.
- **Command Timeout:** The maximum time (in milliseconds) for a command to be completed before the command is aborted.

Note: The default command timeout is 500 milliseconds. It is recommended that this section be left alone to avoid communication errors.

- **Device Address:** If your Smart Interface is part of a Network, enter the Network Address here. The default network address is 1 for most devices. Please refer to the manual of your Smart Interface for more information.

Note: The default Device Address is 1. This should only be changed when seeking a specific Bus Network.

- **Device IP or Port:** The COM port number that your device is connected to on your computer.

Step 4: Adjust the communication parameters to the intended settings. Click **Finish**.

Important: The following parameters should NOT be changed.

- **BaudRate:** Controls bits per second
- **DataBits:** The number of 'bits' in each character sent.
- **Parity:** A means of checking correctness of character by adding an extra 'bit' to the character and setting the value based on all the other bits in the character.
- **StopBits:** The number of 'bits' used to indicate the end of the character.

Setting Emissivity

This manual will outline three ways to set the emissivity of the SP-001 / SP-002:

• **Known Emissivity Value**

• **Setting Emissivity Value via Emissivity Table**

• **Setting Emissivity via Secondary Temperature Device**

Note ☞ **Note:** The default factory setting for emissivity is set to 1.
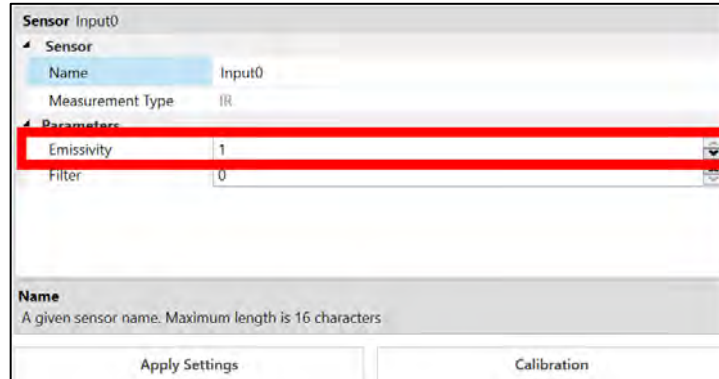

Figure 11

Known Emissivity Value

If the emissivity of the target material is already known, you may enter it in the **Emissivity Dropdown** and click **Apply Settings** to finalize changes. See **Figure 11**.

Setting Emissivity via Emissivity Table

For a list of reference materials and their corresponding emissivity values, refer to the **Emissivity Table** in **Appendix A**. Enter the corresponding value in the **Emissivity Dropdown** and click **Apply Settings** to finalize. See **Figure 11**.

Setting Emissivity via Secondary Temperature Device

Note ☞ **Note:** Ensure the SP-001 / SP-002 is connected to Omega Sync and pointed at the material being measured at a distance that covers the entire field of view.

Step 1: Click **Calibration.** See **Figure 12**.

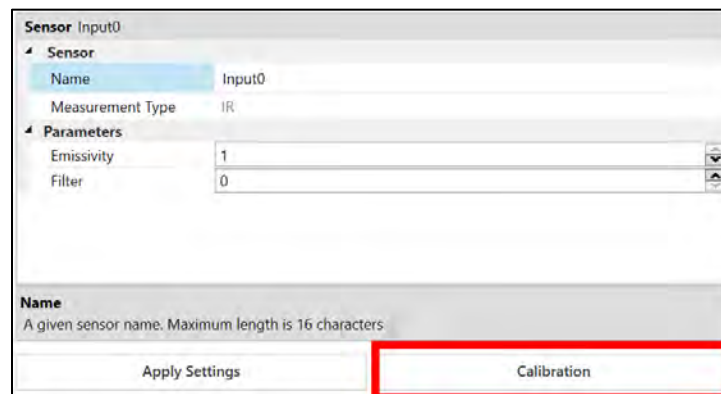*Figure 12*

Step 2: Use a secondary device to measure the temperature of the target material being measured by the SP-001 / SP-002.

Tip ☞ **Tip:** Recommended devices to measure the temperature of the target material include a thermocouple, RTD, etc.

Step 3: Once the target temperature has been determined, enter the target temperature into Omega Sync. See **Figure 13**.
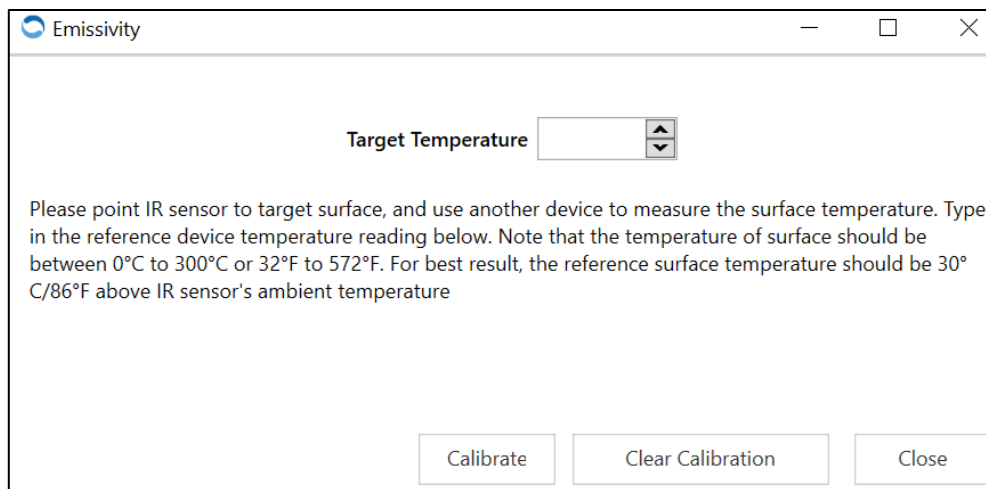
Figure 13

Step 4: Click **Calibrate** to set the emissivity changed and exit out of the calibration pop-up. Click **Apply Settings** to finalize.

Note 🖙 **Note:** When you click **Calibrate**, the emissivity value in **Figure 11** will change according to the value of the **Target Surface Temperature** entered.

Adjusting Spike and Noise Suppression

Filter settings are set to the following default factory settings:

Filter Settings: Low

Filter Settings		Response Time (Seconds)
Off	0	0.3
Low	1	0.4
Medium	2	0.5
High	3	1.5

These parameters provide a response time of 0.4 seconds.
To change the Filter settings, click the corresponding dropdown displayed in **Figure 14** and the table provided.
Click **Apply Settings** when you are satisfied with the settings to finalize.
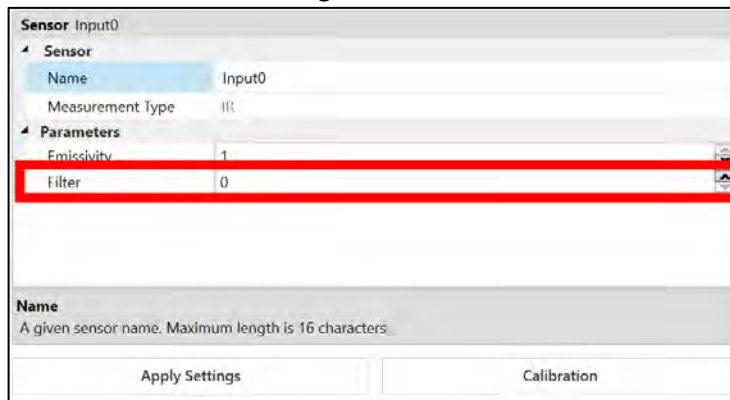
Figure 14

Alarm Setting

The SP-001 offers software adjustable alarms for your smart sensor. To begin alarm setup, follow these instructions.

Step 1: Click the [bell] icon next to the input you would like to customize.

Figure 15

Step 2: Customize alarm settings to your satisfaction. See **Figure 16**.

Figure 16

Once you have customized the settings for your preferred alarm, click the [+] icon to add the alarm to your list, and click **Save** to finalize.

Appendix A - Emissivity Table

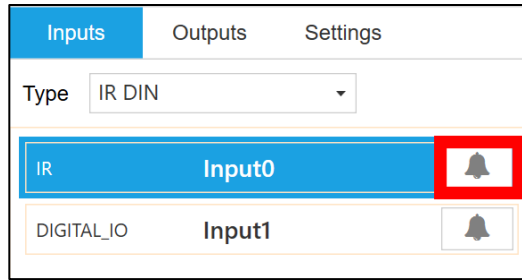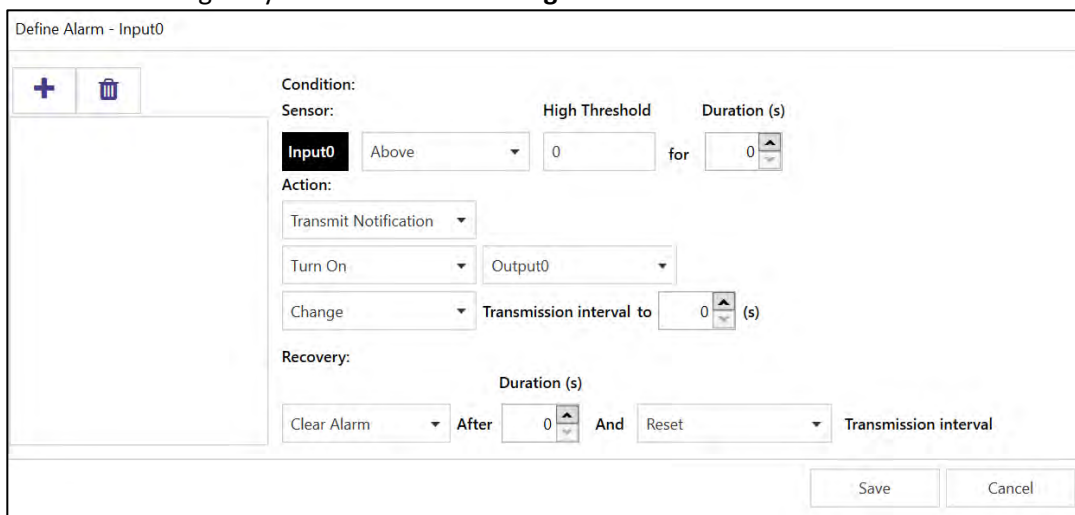|	Material	Emissivity (ε)
Metals	Aluminum − pure highly polished plate	0.04 to 0.06
	Aluminum − heavily oxidized	0.20 to 0.31
	Aluminum − commercial sheet	0.09
	Brass − dull plate	0.22
	Brass − highly polished, 73.2% Cu, 26.7% Zn	0.03
	Chromium − polished	0.08 to 0.36
	Copper − polished	0.05
	Copper − heated at 600°C (1112°F)	0.57
	Gold − pure, highly polished or liquid	0.02 to 0.04
	Iron and steel (excluding stainless) − polished iron	0.14 to 0.38
	Iron and steel (excluding stainless) − polished cast iron	0.21
	Iron and steel (excluding stainless) − polished wrought iron	0.28
	Iron and steel (excluding stainless) − oxidized dull wrought iron	0.94
	Iron and steel (excluding stainless) − rusted iron plate	0.69
	Iron and steel (excluding stainless) − polished steel	0.07
	Iron and steel (excluding stainless) − polished steel oxidized at 600°C (1112°F)	0.79
	Iron and steel (excluding stainless) − rolled sheet steel	0.66
	Iron and steel (excluding stainless) − rough steel plate	0.94 to 0.97
	Lead − gray and oxidized	0.28
	Mercury	0.09 to 0.12
	Molybdenum filament	0.10 to 0.20
	Nickel − polished	0.07
	Nickel − oxidized at 649 to 1254°C (1200 to 2290°F)	0.59 to 0.86
	Platinum − pure polished plate	0.05 to 0.10
	Platinum − wire	0.07 to 0.18
	Silver − pure and polished	0.02 to 0.03
	Stainless steel − polished	0.07
	Stainless steel − Type 301 at 232 to 941°C (450 to 1725°F)	0.54 to 0.63
	Tin − bright	0.06
	Tungsten − filament	0.39
	Zinc − polished commercial pure	0.05
	Zinc − galvanized sheet	0.23

Material	Emissivity (ε)
Asbestos Board.	0.96
Asphalt, tar, pitch.	0.95 to 1.00
Brick – red and rough.	0.93
Brick – fireclay.	0.75
Carbon – filament.	0.53
Carbon – lampblack - rough deposit.	0.78 to 0.84
Glass - Pyrex, lead, soda.	0.85 to 0.95
Marble – polished light gray.	0.93
Paints, lacquers, and varnishes – Black matte shellac.	0.91
Paints, lacquers, and varnishes – aluminum paints.	0.27 to 0.67
Paints, lacquers, and varnishes – flat black lacquer.	0.96 to 0.98
Paints, lacquers, and varnishes – white enamel varnish.	0.91
Porcelain – glazed.	0.92
Quartz – opaque.	0.68 to 0.92
Roofing Paper.	0.91
Tape – Masking.	0.95
Water.	0.95 to 0.96
Wood – planed oak.	0.90

(Non-Metals)

Specifications

General Specifications

Measured Temperature Range:	-70 to +380°C (-94 to 716°F)
Accuracy @ Ambient of 0-50°C (32 to 122°F):	1°C (1.8°F) or 1% of reading, whichever is greater
Accuracy Over Entire Ambient Operating Range:	4°C (3.6 °F) or 3% of reading, whichever is greater
Repeatability:	1°C (1.8°F) or 1% of reading
Field of View:	SP-001 is 6:1
	SP-002 is 10:1
Spectral Response:	5.5 to 14 microns
Emissivity:	0.01 to 1.00, software adjustable
Response Time:	30 to 1500 msec, adjustable
Outputs:	2x Open Drain 100 mA max
Power:	3.3 Vdc, 0.05 W max
Operating Temperature:	-40 to 85°C (-40 to 185°F) less than 95% RH, non-condensing
Housing:	Stainless steel, IP 67 (NEMA 6)
Dimensions:	12 OD x 114 mm L (0.47" x 4.49")
Weight:	35 g (1.2 oz)

Vibration Test	
Frequency Range	10 Hz to 500 Hz
Acceleration	10 g
Duration	45 min per axis
Sweep	1 octave/min

Safety and Regulatory Compliance

CE:

The product herewith complies with the essential requirements and other relevant provisions of the EMC Directive 2014/30/EU, and the Low Voltage Directive 2014/35/EU, and carries the CE-marking accordingly

The following CE Mark $C\epsilon$ (!) is affixed to this equipment.

The CE declaration is available at the website listed on the cover page of this manual.

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY / DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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