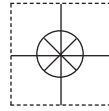


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OS137 SERIES **Miniature Non-Contact Infrared** **Temperature Sensor/Transmitter**



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It is the policy of OMEGA Engineering, Inc. to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, human applications.



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CAUTION & SAFETY INFORMATION

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

The Installation category is one (1).

There is no user replaceable fuse in this product.

The output terminals of this product are for use with equipment (digital meters, chart recorders, etc.) which have no accessible live parts. Such equipment should comply with all the applicable safety requirements.

Do not operate the equipment in flammable or explosive environments.

The unit comes with a 1.82 m (6') shielded cable for power and output connections. The cable is a multi-conductor, 24 AWG stranded wire with the rating of 600 VDC, 205°C (401°F) Teflon® insulation.

Power must be disconnected before making any electrical connections.

The recommended power supply should be VDE or UL approved. Rating: 12-24 VDC @ 50 mA minimum power with overload protection.

The supply voltage to the transmitter should not exceed 24 VDC.

SAFETY WARNINGS AND IEC SYMBOLS

This device is marked with international safety and hazardous symbols in accordance with IEC1010. 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.

IEC Symbol

Description



Caution - Refer to the accompanying document(s).



Direct Current



Laser Symbol

SECTION 1 - INTRODUCTION

The OS137 Series is a precision, miniature infrared transmitter. It measures temperature via non-contact, and provides an analog output proportional to the measured temperature. The OS137 Series is offered in three temperature ranges: 0 to 100°C (32 to 212°F), -18 to 260°C (0 to 500°F) and -18 to 538°C (0 to 1000°F). The analog output is offered as 4 to 20 mA, 0 to 5 Vdc, 0 to 10 Vdc, 10 mV/degree C or F, or K type thermocouple.

The unit provides adjustable emissivity from 0.5 to 1.0, 10 to 1 optical field of view, and field adjustable alarm output.

The super-compact design, 25.4 mm OD x 127 mm length (1.0" OD x 5.0" L) is ideal to measure temperature in confined, and hard to reach places. The Stainless Steel housing is NEMA-4 rated. The unit comes standard with a 1.82 m (6') shielded cable.

SECTION 2 – INSTALLATION

2.1 – Unpacking

Remove the packing list and verify that you have received all your equipment. If you have any questions about the shipment, please call OMEGA Customer Service at:

1-800-622-2378 or 203-359-1660. We can also be reached on the internet at www.omega.com
email: cservice@omega.com

When you receive the shipment, inspect the container and the equipment for any signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE:

The carrier will not honor any damage claims unless all the shipping materials are saved for inspection. After examination and removal of contents, save packing material and carton in the event that reshipment is necessary.

The following items are supplied in the box:

- The infrared transmitter, OS137 with the 1.82 m (6') shielded cable.
- Two mounting nuts
- The User's Guide

The following describes the ordering information:

OS137 - * - ** , where

- * means:

- 1 : 0 to 100°C (32 to 212°F) temperature range
- 2 : -18 to 260°C (0 to 500°F) temperature range
- 3 : -18 to 538°C (0 to 1000°F) temperature range

- ** means:
- MA : 4 to 20 mA current output
- V1 : 0 to 5 Vdc output
- V2 : 0 to 10 Vdc output
- K : K type thermocouple output
- MVC : 10 mV/°C output
- MVF : 10 mV/°F output

The following table lists the optional accessories:

Accessories	
Model No.	Description
OS137-MB	Mounting Bracket
OS137-WC	Water/Air Cooling Jacket with Built-in Air Purge Collar
OS137-AP	Air Purge Collar
OS137-LS	Laser Sighting
PSR-24S	Regulated 24 VDC (400 mA) Power Supply
CAL-3-IR	NIST Traceable Calibration

2.2 – Electrical Connection

The shielded cable provides the power and output connections. Fig 2-1 shows the wiring diagram for different analog outputs. Fig. 2-2 shows alarm output connections.

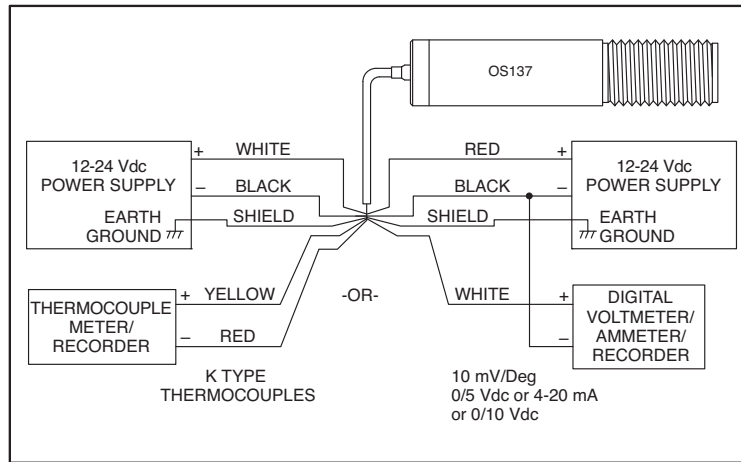


Figure 2-1. General Wiring Diagram

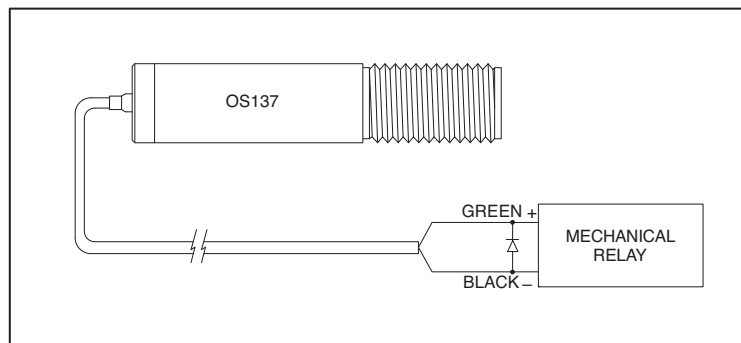


Figure 2-2. Alarm Output Wiring Diagram

SECTION 3 – OPERATION

3.1 – Measuring Temperature

Before starting to measure temperature, make sure the following check list is met:

- ✓ The power and output connections are made (Fig 2-1).
- ✓ The target is larger than the optical field of view of the transmitter (Fig 3-1).
- ✓ Use the Laser Sighting accessory (optional), to align the transmitter to the center of the target area.
- ✓ Remove the End Cap to get to the Emissivity Single Turn Pot (Fig. 3-2). Set the Emissivity Pot based on the target surface. Then put back the End Cap.
- ✓ Make sure the output load is within the product specification.

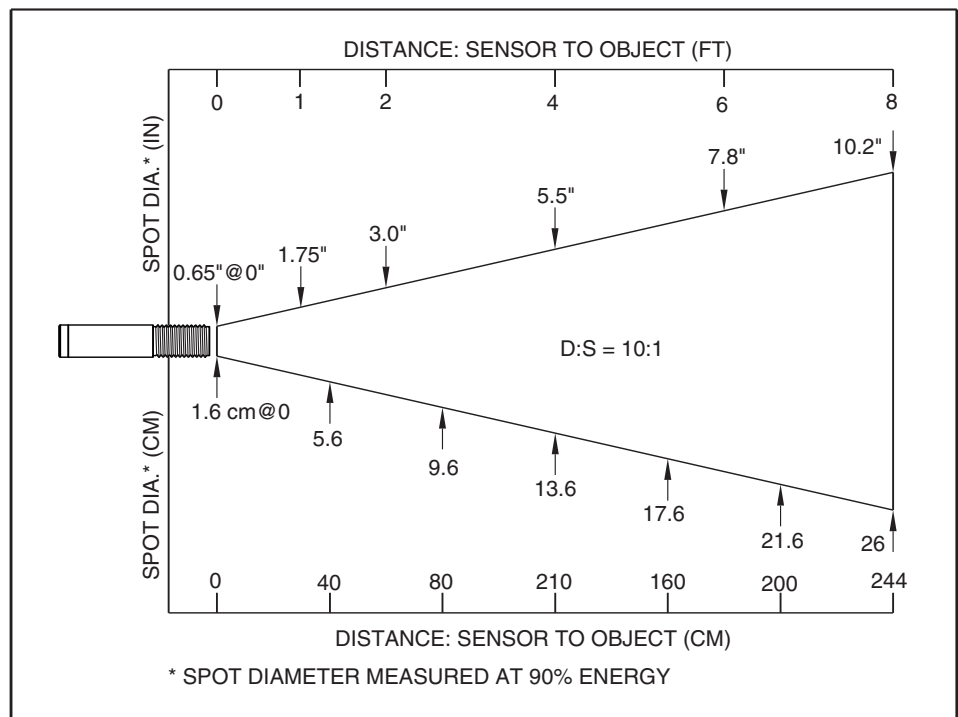


Figure 3-1. Optical Field of View

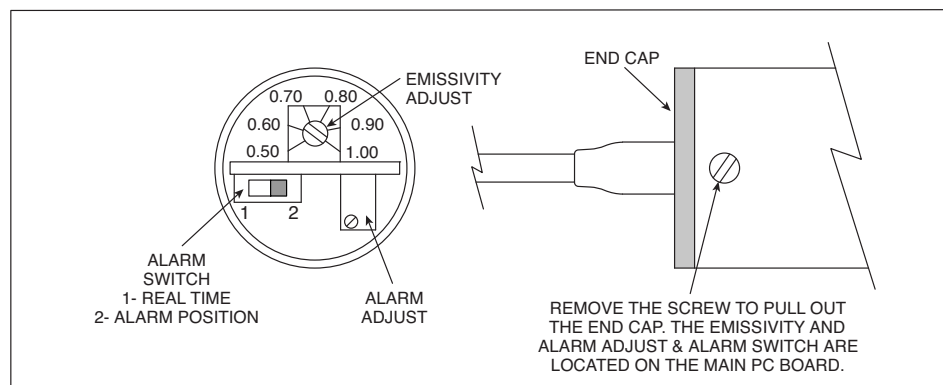


Figure 3-2. Location of Emissivity & Alarm Adjust and Alarm Switch

3.2 – Ambient Temperature

The transmitter can operate in an ambient temperature of 0 to 70°C (32 to 158°F) without any water cool jacket. It can operate from 0 to 200°C (32 to 392°F) with the water cool jacket accessory, OS137-WC (Fig 3-6 & 3-7). It can operate up to 110°C (230°F) with air cooling.

There is a warm up period of 1 to 2 minutes after power up. After the warm up period, temperature measurement can be made.

When the ambient temperature around the transmitter changes abruptly, the sensor head goes through a thermal shock. It takes a certain amount of time for the sensor head to get stabilized to the new ambient temperature. For example, it takes about 30 minutes for the transmitter to stabilize from the 25°C to 50°C (77°F to 122°F) ambient temperature.

3.3 - Atmospheric Quality

Environments with smoke, dust, and fumes dirty up the optical lens, and cause erroneous temperature readings. To keep the surface of the optical lens clean, the air purge collar accessory is recommended, OS137-AP (Fig 3-4).

The following figures show the Mounting Bracket (OS137-MB), Air Purge Collar (OS137-AP), Stainless Steel Housing and Water/Air Cool Jacket (OS137-WC), with built-in air purge collar.

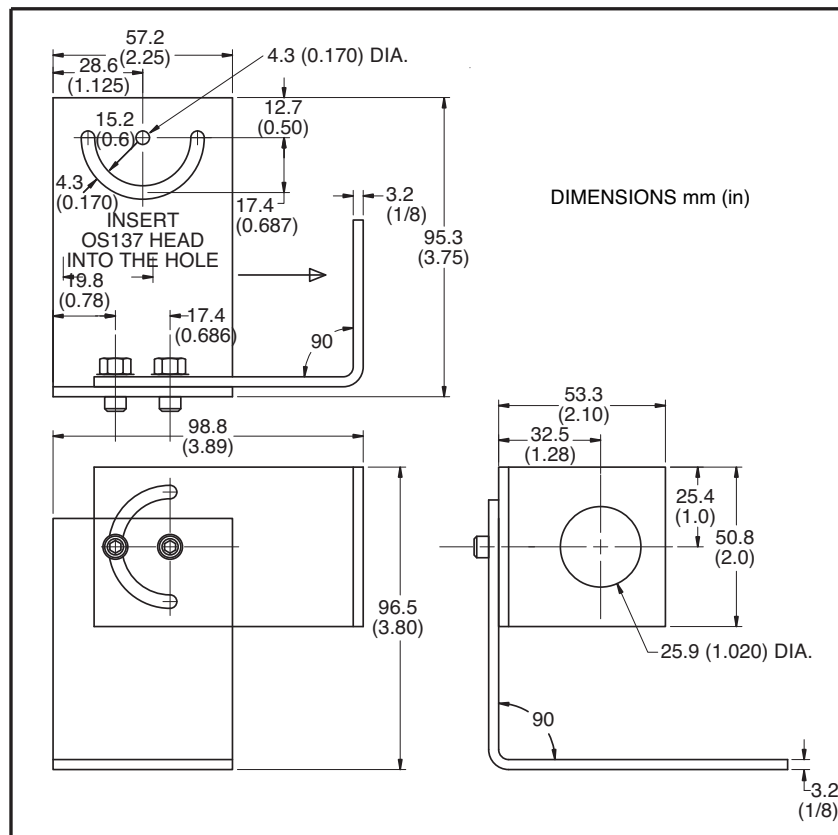


Figure 3-3. Mounting Bracket, OS137-MB

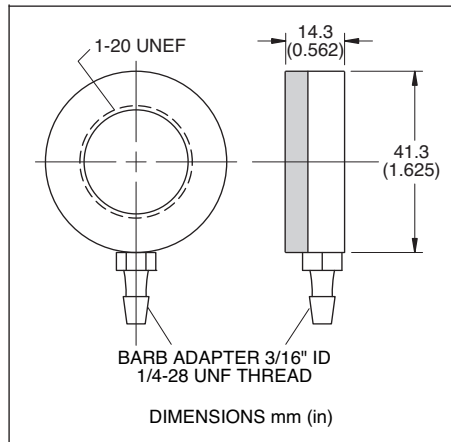


Figure 3-4. Air Purge Collar, OS137-AP

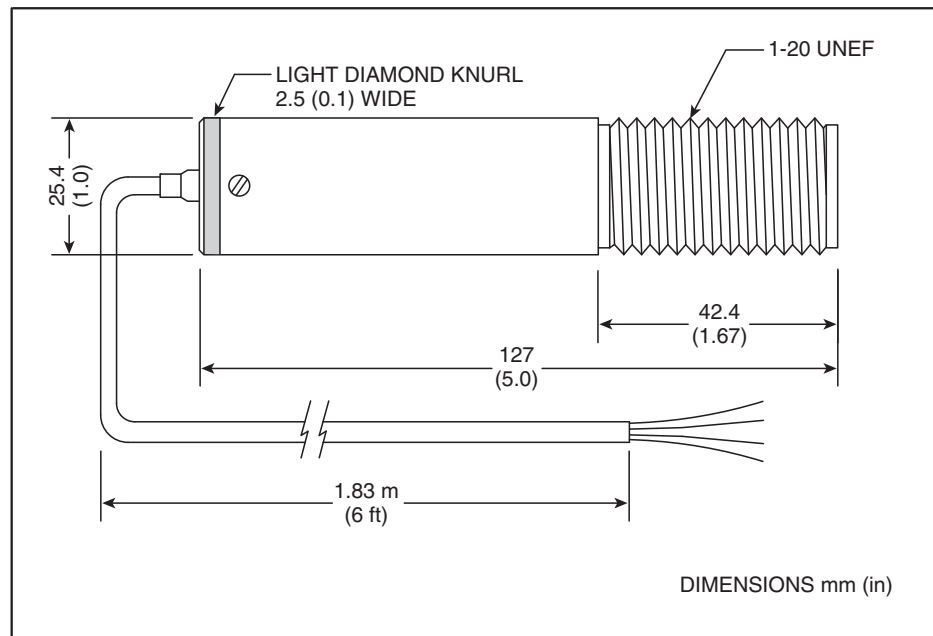


Figure 3-5. Stainless Steel Housing

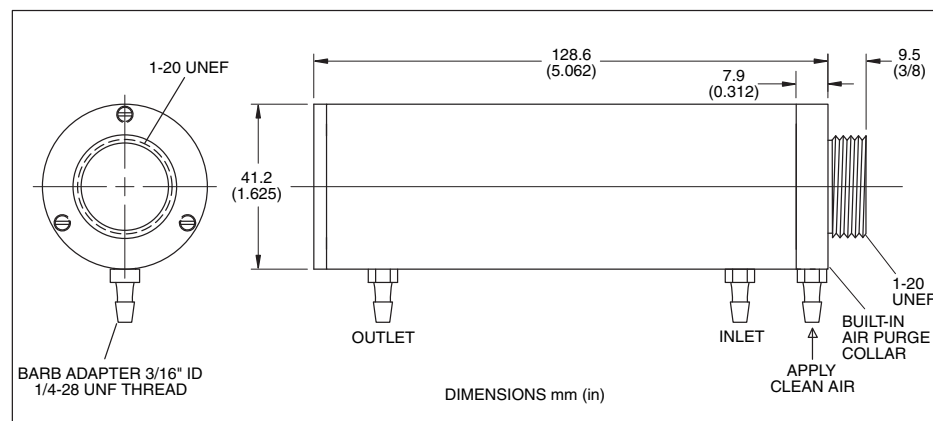


Figure 3-6. Water/Air Cool Jacket, OS137-WC

3.4 Alarm Setting

The unit provides 0-100% alarm setpoint adjustment. Here is an example of an alarm setting:

- An OS137-3-MA (4/20 mA output), the alarm is to be set at 204°C (400°F) temperature.
- Connect the alarm output as shown in Fig. 2-2.
- Remove the End Cap to get to the Alarm Switch and the Alarm Adjust (Fig. 3-2).
- Set the Slide Switch on the main board to the Alarm position (2).
- Measure the analog output, and adjust the Alarm Potentiometer until the output reads 10.4 mA which is 40% (204°C, 400°F) of the temperature range -18 to 538°C, (0 to 1000°F)
[$10.4\text{mA} = \frac{40 \times (20-4)}{100} + 4$]
- Set the Alarm Slide Switch back to the Real Time position (1).
- If the temperature reading is below the alarm setpoint, the Alarm Output stays low, otherwise it goes high (Alarm Condition).
- The Alarm Output can drive an external mechanical relay.

SECTION 4 - LASER SIGHT ACCESSORY

4.1 – Warnings and Caution

CAUTION:

You may receive harmful laser radiation exposure if you do not adhere to the warnings listed below:

- USE OF CONTROLS OR ADJUSTMENTS OR PERFORMANCE OF PROCEDURES OTHER THAN THOSE SPECIFIED IN THIS GUIDE MAY RESULT IN HAZARDOUS RADIATION EXPOSURE.
- DO NOT LOOK AT THE LASER BEAM COMING OUT OF THE LENS OR VIEW IT DIRECTLY WITH OPTICAL INSTRUMENTS – EYE DAMAGE CAN RESULT.
- USE EXTREME CAUTION WHEN OPERATING THE LASER SIGHT ACCESSORY.
- NEVER POINT THE LASER ACCESSORY AT A PERSON.
- KEEP THE LASER SIGHT ACCESSORY OUT OF REACH OF ALL CHILDREN.

WARNING:

Do not attempt to open the laser sight accessory. There are no user serviceable parts inside.

4.2 – Operating the Laser Sight Accessory

The laser sight accessory screws onto the front of the transmitter sensor head. This accessory is only used for alignment of the transmitter head to the target area. After the alignment process, the accessory has to be removed from the front of the transmitter head before temperature measurement is made.

The laser sight accessory is powered from a small, compact battery pack (included with the accessory). Connect the battery pack to the accessory using the cable provided. Aim at the target, and turn on the battery power using the slide switch on the battery pack. Adjust the sensor head position so that the laser beam points to the center of the target area. Turn off the battery pack, and remove the laser sighting accessory from the sensor head (Fig 4-1).

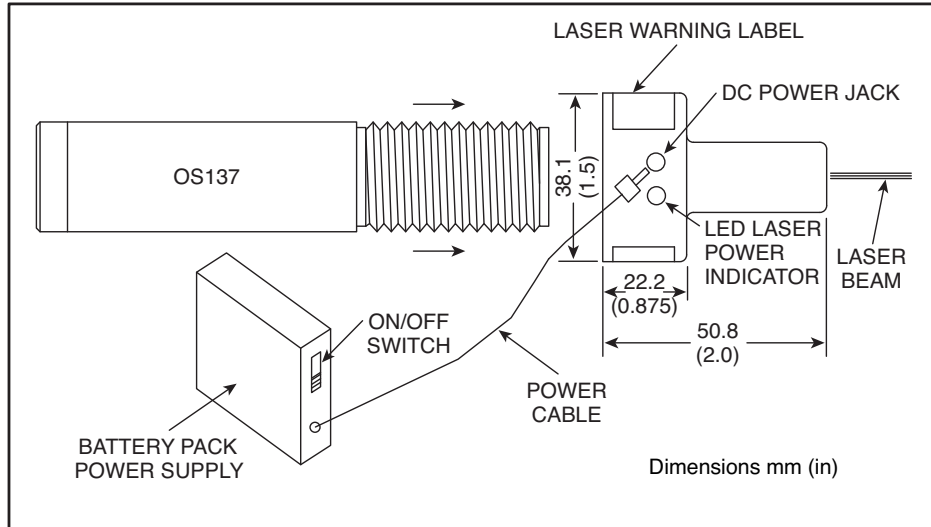


Figure 4-1. Laser Sighting Accessory, OS137-L5

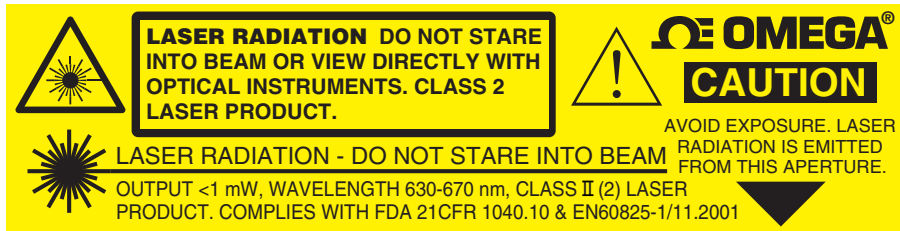


Figure 4-2. Laser Warning Label

SECTION 5 – SPECIFICATIONS

5.1 - General

Temperature Range:	
OS137-1	0 to 100°C (32 to 212°F)
OS137-2	-18 to 260°C (0 to 500°F)
OS137-3	-18 to 538°C (0 to 1000°F)
Accuracy: @22°C (72°F) ambient Emissivity of 0.95 or greater	1.5% of Rdg or 2.0°C (3.5°F) whichever is greater
Repeatability:	1% of Rdg or 1.0°C (2.0°F) whichever is greater
Field of View:	10 to 1
Spectral Response:	8 to 14 microns
Response Time:	150 msec, 0 to 63% of final value
Emissivity:	0.5 to 1.0, adjustable via Single Turn Pot
Alarm Output:	Voltage, 100 mA Drive
Alarm Set Point:	0 to 100% Adj., set via Pot
Analog output:	
MA	4 to 20 mA
V1	0 to 5 Vdc
V2	0 to 10 Vdc
K	K type thermocouple, compensated
MVC	10 mV/°C
MVF	10 mV/°F
Output Load Requirements:	
Min. Load (0 to 5 Vdc)	2 K-Ohms
Min. Load (0 to 10 Vdc)	4 K-Ohms
Max. Load (4 to 20 mA)	(Power Supply – 4)/20 mA
Min. Load (10 mV/Deg)	10 K-Ohms
Min. Load (K T/C)	100 K-Ohms
Operating Ambient Temperature:	
No Water Cooling	0 to 70°C (32 to 158°F)
With Water Cooling (OS136-WC)	0 to 200°C (32 to 392°F)
With Air Cooling (OS136-WC)	0 to 110°C (32 to 230°F)
Operating Relative Humidity:	Less than 95% RH, non-condensing
Water Flow Rate for OS136-WC:	0.25 GPM, room temperature, minimum
Air Flow Rate for OS136-WC	5 CFM (2.4 liters/sec)
Warm up Period:	1 to 2 minutes
Thermal Shock:	About 30 minutes for 25°C (77°F) abrupt ambient temperature change
Air Flow Rate for Air Purge Collar	1 CFM (0.5 liters/sec.)
Transmitter Housing:	Stainless Steel 316, NEMA-4 & IP65 rated
Power:	12 to 24 VDC @ 50 mA
Dimensions:	25.4 OD x 127 L mm (1.0" OD x 5.0" L)
Weight:	0.80 lb (363 g)

5.2 - Laser Sight Accessory

Laser Wavelength (Color):	630 - 670 nm (red)
Operating Distance:	Up to 9.1 m (30 ft)
Max. Laser Power Output:	Less than 1 mW @ 22°C (72°F) ambient
European Classification:	Class 2, EN60825-1/11.2001
FDA Classification:	Class II Laser Product. Complies with 21 CFR 1040.10
Laser Beam Diameter:	Less than 5 mm
Beam Divergence:	Less than 2 mrad
Operating Temperature:	0 to 50°C (32 to 122°F)
Operating Relative Humidity:	Less than 95% RH, non-condensing
Power Switch:	ON/OFF, Slide Switch on the battery pack
Power Indicator:	Red LED
Power:	Battery pack, 3 VDC
Caution & Certification Label:	Located on the head sight circumference
Identification Label:	Located on the head sight circumference
Aperture Label:	Located on the head sight circumference
Dimensions:	38 OD x 50.8 L mm (1.5" OD x 2" L)

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

NONMETALS

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

NOTES:



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.

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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.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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- ☑ Heating Cable
- ☑ Cartridge & Strip Heaters
- ☑ Immersion & Band Heaters
- ☑ Flexible Heaters
- ☑ Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- ☑ Metering & Control Instrumentation
- ☑ Refractometers
- ☑ Pumps & Tubing
- ☑ Air, Soil & Water Monitors
- ☑ Industrial Water & Wastewater Treatment
- ☑ pH, Conductivity & Dissolved Oxygen Instruments