

SR Series Self-Contained Two-Color Infrared Thermometers

Introduction

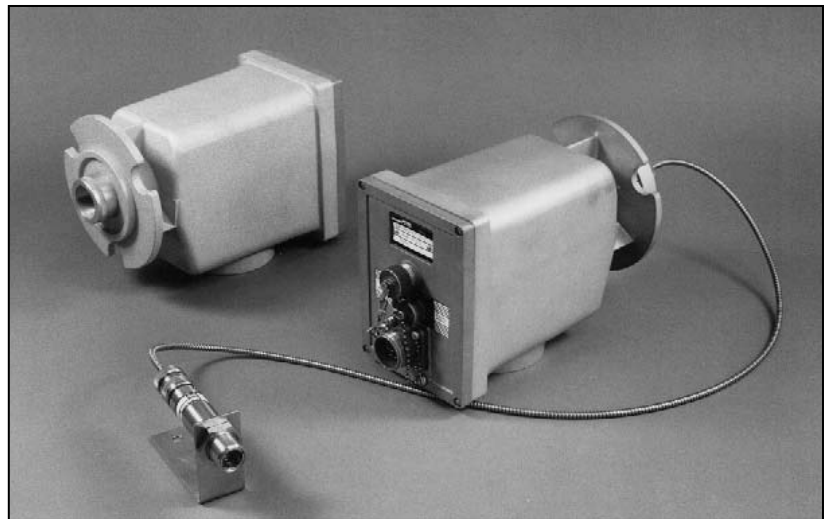
The SR Series infrared thermometer from Ircon is a two-color thermometer system contained within a sensor. This unique self-contained sensor design provides signal processing and conditioning within the instrument and therefore eliminates the need for a separate indicator/processor unit. The SR Series provides a 4-20 mA or 0-10 Vdc temperature output signal directly to the user's own analog or digital display, controller, recorder or computer.

The use of a single unit that doesn't require a separate electronic unit for signal processing has many advantages and benefits. For example, savings of valuable panel space, reduced installation costs especially for multiple units, and elimination of costly duplication of control instrumentation.

In addition, the SR Series offers the advantage of a two color thermometer. It allows reliable temperature measurements for difficult high temperature applications where target emissivity changes; where the target is too small and/or moving and cannot be completely resolved; or for applications where the object is partly obliterated by dust, smoke, or dirty viewing windows. Reliable temperature readings are possible as long as operating wavelengths are affected equally.

The SA is ideally suitable for high temperature measurements and a good choice for molten metal, wire and rod forming, vacuum furnaces, induction heating, and kiln applications. To further extend its versatility, Ircon offers the SR Series in two distinct models - the SLR version and the Fiber Optic version.

The SLR version (Single Lens Reflex) is an instrument which allows you to simply aim at the target, focus and take a reading just as easy as with an SLR camera.



The SR series self-contained, two color infrared thermometers (SLR and Fiber Optic version)

The Fiber Optic version adds the capability to measure difficult-to-reach or obstructed targets through the use of a focusable reimaging lens assembly that is remote from the sensor but is connected to the sensor by a fiber optic cable. This rugged, compact stainless steel focusable reimaging lens has many advantages over typical fixed focus lenses. Ircon's focusable lens permits focusing over a wide range of distances and allows continuous adjustment to resolve the target. The fiber optic cable is designed with a quick connecting device which accurately connects the sensor and reimaging lens. In addition, it also serves to quickly connect Ircon's exclusive high precision illuminator. This high intensity illuminator further aids in pinpointing the precise target to be measured.

Ircon's Fiber Optic SR Series has many other benefits such as offering the flexibility of mounting the reimaging lens in a location best suited to resolve targets or to avoid electrical interferences or obstructions, and can operate in environments up to 400°F (200°C) ambient without expensive cooling requirements.

SR Series

SLR Version

The SR Series SLR Version is a two-color self-contained infrared thermometer which provides non-contact measurement of process temperatures from 1300 to 6500°F (700 to 3500°C), with response times as fast as 0.01 seconds.

This version of the SR Series contains focusable Single Lens Reflex (SLR) optics which allows the user to sight through-the-lens to view a target. A built-in reticle aids in defining the exact spot size to be measured. The focusable optics of this instrument permits temperature measurements from varying distances from the target. Simply focus on the target and it's ready to provide accurate readings. The standard objective lens provided permits a working distance range from 15 inches (380 mm) to infinity. A 9 to 15-inch (230 to 380 mm) close focus lens is optionally available.

The choice of three optical resolutions (D/50, D/100, and D/150) permits measuring targets as small as 0.06 inches (1.5 mm). Additionally, a choice of four response times is available to fit specific application needs.

Components

- Self-contained sensor
- 33 foot (10 m) interconnecting cable (*up to 200 ft or 60 m optionally available*)
- Signal/Power Termination Box
- Integral AC or DC sourced Power Supply (*optional*)

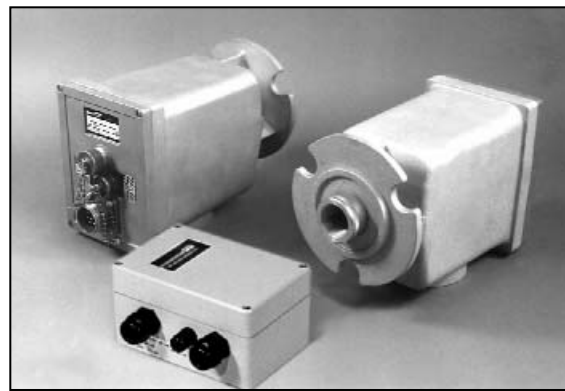
General Features and Benefits

- Completely self-contained two-color thermometer.
- Choice of nine models for measuring temperatures from 1300 to 6500°F (700 to 3500°C) within discrete temperature ranges.
- Focusable, through-the-lens viewing.
- Choice of optical resolution (D/50, D/100, D/150)
- Choice of fast response time 0.01 seconds (or 0.1, 1.0 or 10.0 seconds).
- Choice of output signal (4-20 mA or 0-10 V).
- No separate signal processing electronics required, making this instrument cost effective.
- E-slope adjustment on sensor.
- Invalid alarm indicator lamp and relay contact closure.

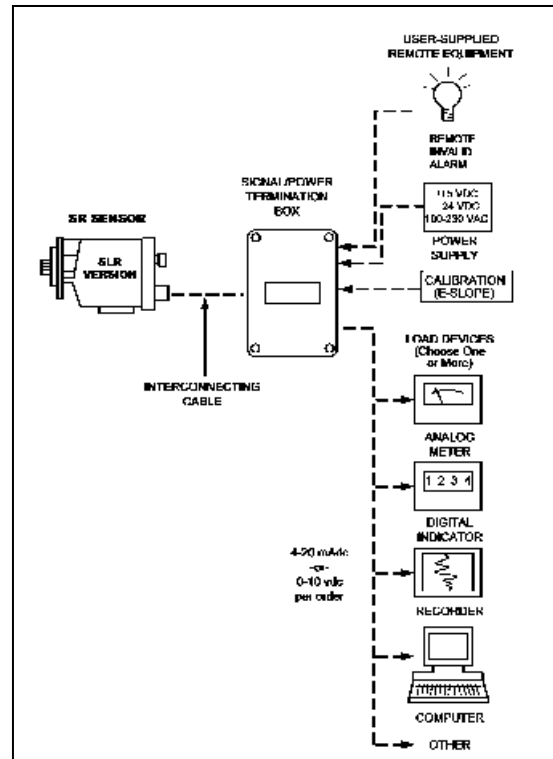
Sensor

The SR Series Sensor is contained within a rugged, gasketed sealed casting which is dust and spray tight and is rated NEMA 4 (IP66). Its integral electro-optical circuitry and sophisticated electronics provides an accurate means

of converting the infrared energy received from a target into a calibrated temperature output signal and, since signal processing is performed internally, the need for a separate processing unit is eliminated. Adjustments are easily made at the rear of the sensor for E-slope calibration. An invalid alarm indicator lamp is provided to alert the operator in case the input signal is insufficient for sensor operation. Additionally, a relay contact closure is included that can be used to operate a remote audible or visual alarm device.



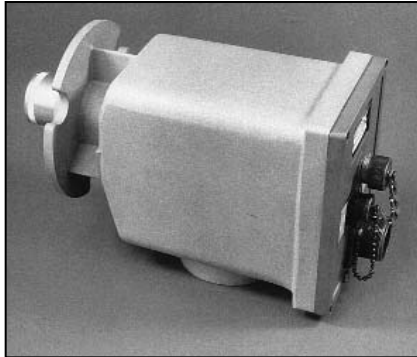
SR Series SLR version with Signal/Power Termination Box



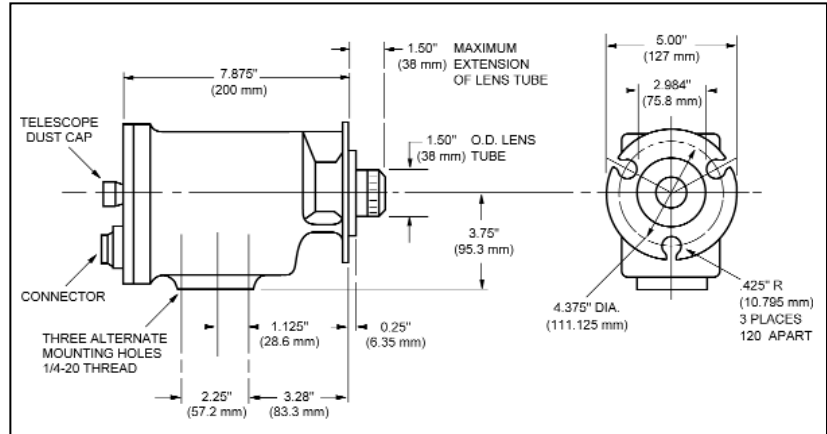
SR Series SLR Version standard system configuration diagram

SR Series

SLR version (continued)



SR Series SLR version self-contained, two-color infrared thermometer



SLR Sensor dimensional drawing

Specifications

0.70 to 1.08 micron and narrow band at 1.08 micron spectral response.

Ambient temperature range from 30 to 130°F (0 to 55°C).

0.75% accuracy of full scale temperature.

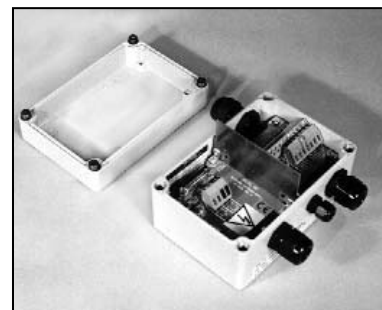
Adjustable E-slope from 0.85 to 1.15; graybody, factory set.

Tolerates approximately 95% reduction in radiation intensity above 1500°F (800°C).

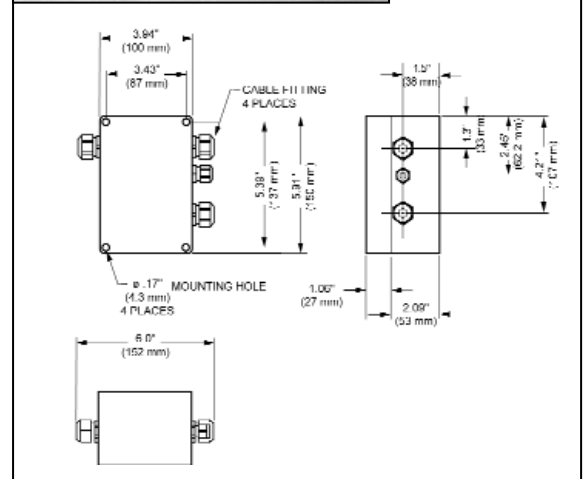
Signal/Power Termination Box

The Signal/Power termination box provides the user with a convenient means to connect sensor output signal, graybody/E-slope calibration switching, power supply, and invalid alarm/contact closure.

The Termination Box will accept, as standard, a customer supplied ± 15 Vdc power supply which is required to power the Sensor. Optionally, the Signal/ Power Termination Box is available with a built-in power supply that accepts either a 24 Vdc or 100 to 230 Vac power input. The power input easily connects to the wiring terminal and powers the sensor through its shielded interconnecting cable. Sensor output signals are transmitted via a 33 foot (10 m) signal cable which is simply terminated at the Signal/Power Termination Box. Convenient access is also provided for a remote invalid alarm, E-slope calibration, and load devices such as indicator/controller, recorder, computer, or other analog instruments.



Signal/Power Termination Box and dimensional drawing



SR Series

SLR Version (continued)

Accessories

Model WA-3 Water Cooling Accessory

Available for cooling the sensor when operating in an environment that exceeds allowable maximum ambient temperatures. Water cooling effectively raises the maximum ambient temperature limit to 165°F (74°C). A nominal water flow of 10 GPH (40 liter/hr) with water temperatures below 90°F (32°C) is suitable for most applications.

Model AA-3 Air Purge

Available to provide a positive flow of air across the lens to keep dust, smoke, and debris from collecting on the lens. This accessory bolts to the front flange of the sensor and can be used in combination with other accessories such as the Model WA-3 Water Cooling Accessory. Generally, about 6 ft.³/min. (0.17 m³/min.) of air flow is suitable for most applications.

Model WJ-5 Water Cooling Jacket

Used to protect the SLR version sensor in ambient temperatures up to 400°F (200°C). The jacket provides water cooling via water circulation in coiled pipe embedded in the jacket walls. An air purge is included and mounted to the front of the enclosure.

Model SB-1 Swivel Mounting Base

Used for installations requiring good line-of-sight adjustment capability. It permits both tilting and panning motions, and can be locked firmly in place when optical alignment is completed.

SLR Version Specifications

Temperature Measuring Range

1300 to 6500°F or 700 to 3500°C
(see ordering information chart for discrete ranges).

Calibration Accuracy

Within 0.75% of full scale temperature or 5°F or 3°C, whichever is greater.

Repeatability

Within 0.3% of full scale temperature.

Response Time (to 95% of full scale output)

0.1, 0.01, 1.0, or 10.0 seconds, as selected.

Analog Output: (referenced to ground)

4 - 20 mAdc (500 ohm max.) or 0-10Vdc
(less than or equal to 1 ohm source, 5 mA max.).



SR Series SLR version shown with air purge and water cooling accessory on swivel mounting base



Model SB-1 Swivel Mounting Base accessory

Spectral Response

(two adjacent wavelength bands)
0.70 to 1.08 microns and narrow band centered at 1.08 microns.

Ambient Temperature Range

(without auxiliary cooling)
30 to 130°F or 0 to 55°C.

Sensor Power Requirements

± 15 Vdc, ± 5% @ 200 mA (customer supplied)
or optional 24 Vdc, ± 5% @ 400 mA
or 100 to 230 Vac, 50/60 Hz @ 200 mA rms.

Optical Resolution

D/50, D/100, or D/150 per model selection

(SLR version specifications continued on pg 5)

SR Series

SLR Version (continued)

Invalid Alarm

LED visual indicator lamp on sensor back-plate; relay contact closure for remote alarm. Contact ratings 24 Vdc, 250 mA.

Signal Reduction Range

Above 1500°F or 800°C will tolerate approximately 95% reduction in radiation intensity due to low emissivity, non-resolved target, or obliterated target.

Calibration (two modes)

Graybody: fixed, factory-set
E-slope: factory-set for tungsten, field-adjustable.

Environmentally Sealed Housing

Cast aluminum construction meets NEMA 4 (IP66) standards.

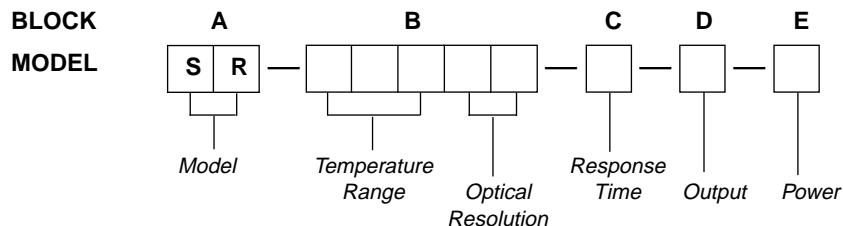
CE Directives:

Meets EMC Directive 89/336/EEC for EMI/RFI and Safety
Compliance tested to
EN 50081-1: 1992 Generic Emissions Standard
EN 50082-1: 1992 Generic Immunity Standard
EN 61010-1: 1993 Safety Standard

SLR Version Ordering Information Chart

How to determine model number: The following is an example of how to select the proper model number. Refer to the chart below for specific information. *For example:* Model SR-24C05-2-0-0 indicates an SR series SLR version two color self-contained thermometer operating within a

temperature range of 900 to 2400°C, with an optical resolution of D/50, response time of 1.0 seconds, a 4-20 mAdc sensor output, and a customer-supplied power supply.



SR Series
BLOCK A

S	R	Model Designation
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SR Series
BLOCK B - Temperature Range and Optical Resolution

2	5	F	0	5	= 1300 to 2500°F D/50
3	2	F	0	5	= 1800 to 3200°F D/50
4	0	F	1	0	= 2000 to 4000°F D/100
6	5	F	1	5	= 2500 to 6500°F D/150

1	4	C	0	5	= 700 to 1400°C D/50
1	6	C	0	5	= 900 to 1600°C D/50
2	0	C	1	0	= 1100 to 2000°C D/100
2	4	C	0	5	= 900 to 2400°C D/50
3	5	C	1	5	= 1500 to 3500°C D/150

BLOCK C - Response Time

0	= 0.1 seconds
1	= 0.01 seconds
2	= 1.0 seconds
3	= 10.0 seconds

BLOCK D - Output

0	= 4 - 20 mAdc (500 ohm max. grounded)
1	= 0 - 10.0 Vdc (less than or equal to 1 ohm source, 5 mA max.)

BLOCK E - Power

0	= Customer-supplied (± 15 Vdc, $\pm 5\%$ @ 200 mA)
1	= 24 Vdc $\pm 5\%$ @ 400 mA
2	= 100 to 230 Vac, 50/60 Hz @ 200 mA rms.

SR Series

SLR Version (continued)

Optical Resolution Formula

The SR series is sensitive to infrared radiation in an area indicated by the Cone of Vision (see diagram).

The diameter of the cone at any point will determine the area of measurement (spot size) at that point. The formula below defines the spot size at the focal point. Simply divide the Working Distance "D" by the Resolution Factor "F" of the instrument to determine the Spot Size "d".

Minimum object size (d)

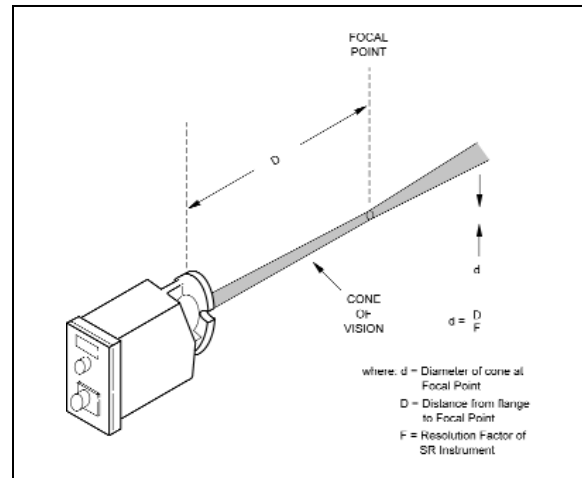
Working distance (D)

Spot size is determined by the formula: $d = \frac{D}{F}$

where: d = Diameter of the cone at Focal Point (Spot Size)

D = Distance from lens to Focal Point

F = Optical Resolution Factor



Cone of Vision diagram

Fiber Optic Version

The Fiber Optic Version of the SR Series allows infrared thermometry to be applied to processes that were never before suitable. In addition to all the features of the SLR version, the Fiber Optic SR version measure difficult-to-reach or obstructed targets through the use of its fiber optic cable and focusable lens assembly. It offers the opportunity to sight on targets where direct sighting is impossible, where electromagnetic interferences are a problem or where extremely high ambient temperatures are present.

The Fiber Optic SR Series' slender, focusable reimaging lens or extension tip and flexible fiber optic cable allows infrared temperature measurement within harsh environments – through smoke, steam, and intense electrical fields – and where line-of-sight is difficult or impossible.

Capable of operating in ambient temperatures to 400°F (200°C) without auxiliary cooling or up to 575°F (300°C) with the extension tip option, the Fiber Optic SR can be applied to a variety of processes where conventional thermometers are difficult to use such as vacuum furnaces, induction heating, welding, and semiconductor processing.

System Components

Self-contained sensor

33-foot (10 m) interconnecting cable (up to 200 feet or 60 m optionally available)

Signal/Power Termination Box

Integral AC or DC sourced Power Supply (optional)

Fiber Optic Cable assembly (standard 3 or 10 feet or 1 or 3 m)

Fiber Optic Features and Benefits

Provides all features of the SLR version plus the following:

Compact, stainless steel focusable reimaging lens assembly fits in tight places, withstands environments to 400°F (200°C) without auxiliary cooling. Two focusable ranges of 6 to 10 in. (150 to 250 mm) or 10 in. (250 mm) to infinity are available.

Extension tip withstands ambient temperatures to 575°F (300°C) for high temperature applications.

Various mounting accessories for reimaging lens or extension tip assembly are available for easy mounting.

Optional air purge simply screws to front of reimaging lens to keep lens clean.

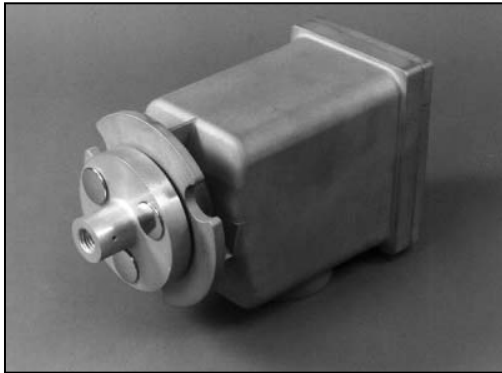
Flexible fiber optic cable assembly provides optical link between sensing head and reimaging lens.

Offers lengths of 3 feet (1m) or 10 feet (3 m) as standard and up to 30 feet (10 m) as special.

Choice of optical resolution (D/30, D/60, or D/30 x D/150) is model selectable.

SR Series

Fiber Optic Version (continued)

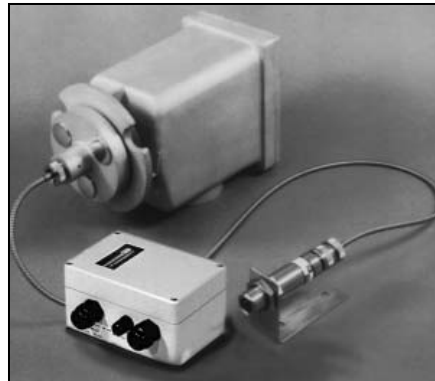


SR Series Fiber Optic two-color infrared thermometer

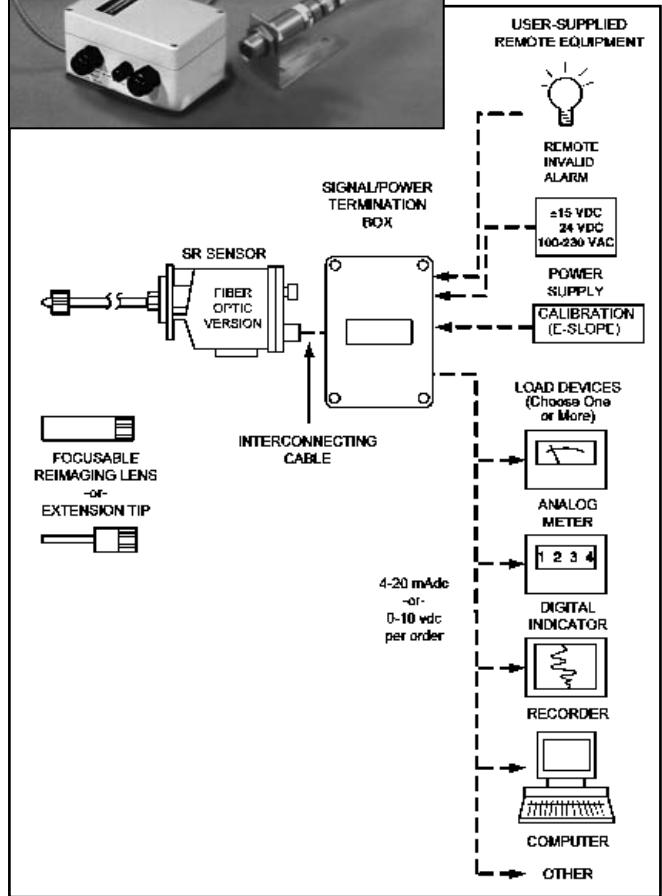
Fiber Optic Sensor

The Fiber Optic version is a two-color self contained infrared thermometer which provides non-contact measurement of process temperatures from 1300 to 6500°F (700 to 3500°C) with response times as fast as 0.01 second.

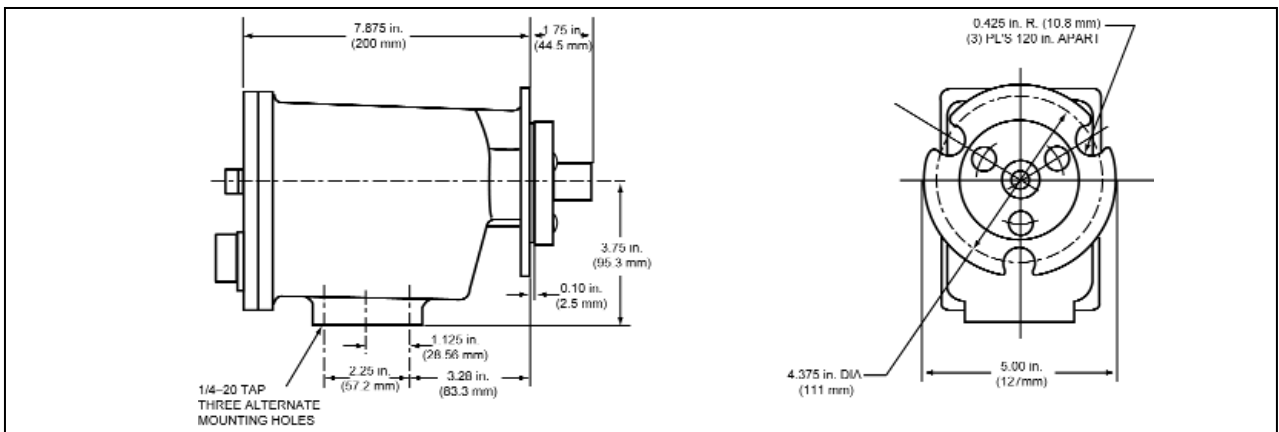
The front end of the Fiber Optic SR sensor is specifically designed to accept the fiber optic cable assembly. The optical elements, detectors, and electronic circuits are contained within this sensor. However, the focusable optics, rather than being an integral part of the sensor, are located in the reimaging lens assembly at the measuring end of the fiber optic cable.



SR Series Fiber Optic with Signal/Power Termination Box shown with Fiber Optic cable and focusable reimaging lens mounted on angle bracket.



SR series fiber optic standard system configuration drawing



Fiber optic sensor dimensional drawing

SR Series

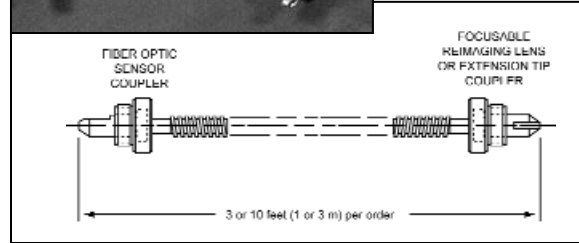
Fiber Optic Version (continued)

Fiber Optic Cable Assembly

The Fiber Optic Cable is the optical link between the target being measured and the sensor. It consists of a 0.08 inch (2.03 mm) diameter fiber bundle protected by a flexible stainless steel armor sheath. Available in 3 foot (1 m) or 10 foot (3 m) lengths and up to 30 foot (10 m) as a special, the cable can be snaked around and through obstructions that would interfere with the sight path of a conventional line-of-sight thermometer. Quick-connect keyed couplings at both ends attach the cable to the sensor and reimaging lens assembly or extension tip.



SR Series fiber optic cable and cable dimensional drawing



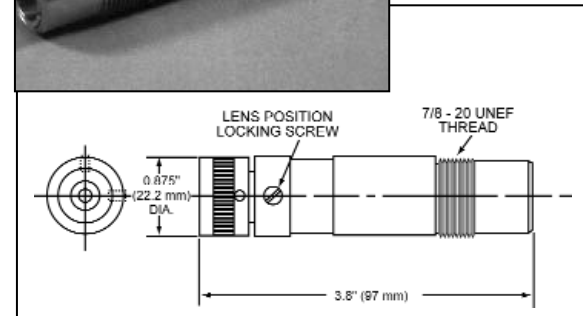
Focusable Reimaging Lens Assembly

The compact stainless steel Focusable Reimaging Lens is designed to handle difficult conditions. It offers a NEMA-4 (IP 66) rating and includes a protective window to guard the optics against exposure to dust, water, spray, and other contaminants. The lens can be used in ambient temperatures up to 400°F (200°C) without cooling.

The focusable reimaging lens permits the measurement of objects from a distance of 10 in. (250 mm) to infinity. A focusable close focus lens is available with a focal range of 6 to 10 inches (150 to 250 mm). In addition to the conventional circular spot size, a rectangular spot size format option is available. The rectangular format, unique to Ircon fiber optics, is ideal for long, narrow targets such as pipe or wire.



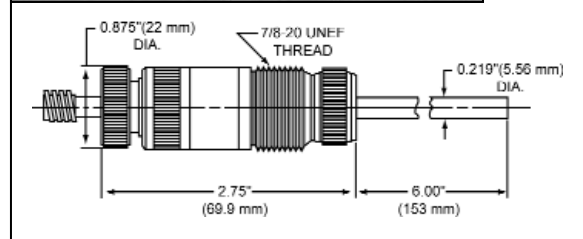
Focusable Reimaging Lens and dimensional drawing



Extension Tip

For applications where the focusable reimaging lens cannot be used, or for high ambient temperatures between 400 and 575°F or 200 and 300°C, as well as for small openings and hard-to-reach objects, an extension tip option is provided.

The Fiber Optic Extension Tip consists of a glass rod covered with a ceramic tube and mounted within a stainless steel ferrule. This rigid probe is 0.22 inches (5.6 mm) in diameter and extends 6 inches (152 mm). Since the glass rod is immune to the electromagnetic field of the coil, it can be inserted between the windings of an induction heating coil without disturbing the field or upsetting the sensor's electronics. The ferrule is designed for easy coupling to the fiber optic cable. The entire extension tip assembly can be mounted easily to the model MB-5 Mounting Bracket or other panels.



Fiber Optic Extension Tip and dimensional drawing

SR Series

Fiber Optic Version (continued)

Fiber Optic Accessories

Air Purge

The Model AA-5 Air Purge attaches to the focusable reimaging lens and protects it from condensation and provides a positive pressure that prevents dust, smoke, and other particulate matter from collecting on the lens. The accessory screws directly to the front end of the reimaging lens. The threaded portion of the air purge can be used for easy mounting to the Model MB-5 Mounting Bracket or into a panel cutout. Generally, 1 ft.³/min. (0.03 m.³/min) of air is suitable for most applications.

Mounting Accessories

Angle Mounting Bracket

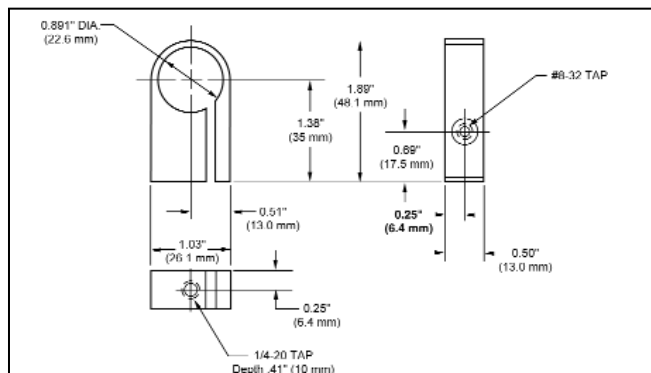
The Model MB-5 Angle Mounting Bracket is a stainless steel angle bracket that serves as an inexpensive mounting base for the reimaging lens assembly or extension tip. The bracket base plate is designed for bolting the bracket to almost any fixed mounting surface. The hole in the bracket face will accept the threaded end of the reimaging lens assembly or extension tip. Two mounting nuts are supplied with either assembly and are generally used to secure these devices to the bracket.

Swivel Mounting Base

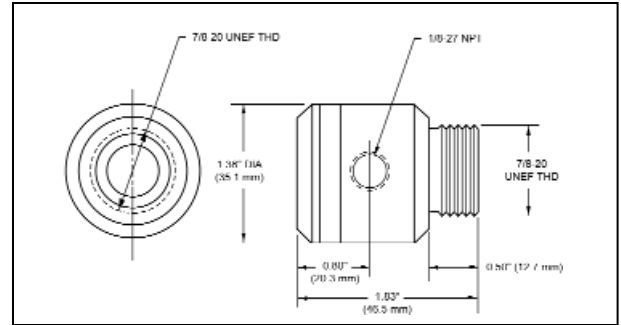
The Model SB-5 Swivel Mounting Base provides an adjustable mounting base for the focusable reimaging lens assembly. This mounting facilitates orienting the lens assembly for correct optical alignment. A locking feature firmly locks the reimaging lens in position when optical alignment is completed or permits realignment when necessary. The Model MC-5 Mounting Clamp accessory (described below) is an integral part of the swivel mounting base.

Mounting Clamp

The Model MC-5 Mounting Clamp is a rugged stainless steel mounting support which can be used to mount the reimaging lens or extension tip to a support structure. It can also be screwed into the mounting base of Model TM-6 Tripod for general laboratory or engineering use.



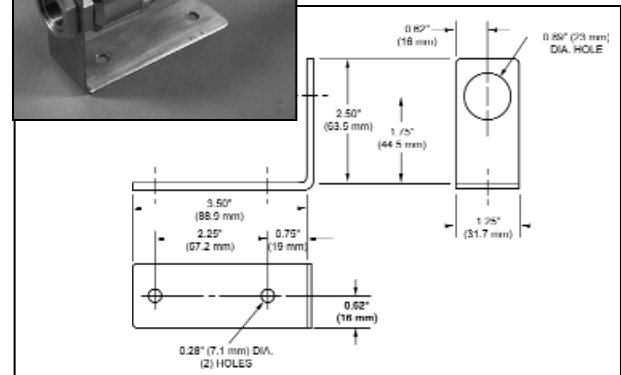
Model MC-5 Mounting Clamp dimensional drawing



Model AA-5 Air Purge dimensional drawing



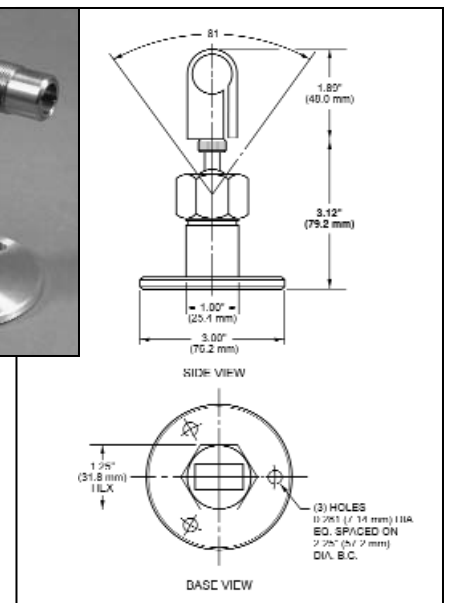
Focusable reimaging lens assembly with air purge mounted in angle bracket.



Model MB-5 Angle Mounting Bracket dimensional drawing



Focusable Reimaging Lens positioned in Mounting Clamp on Swivel Mounting Base shown above



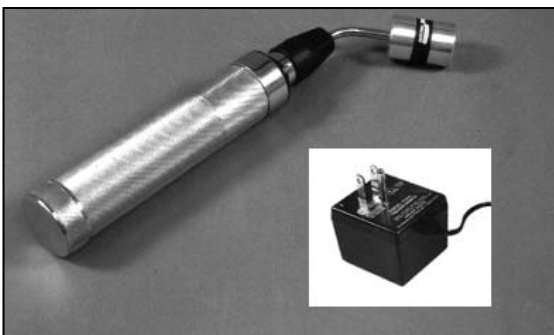
Model SB-5 Mounting Base dimensional drawing

SR Series

Fiber Optic Version (continued)

Illuminator

The Model IL-5 Illuminator is a portable precision device designed to transmit bright light through the fiber optic cable and focusable lens assembly to aid in aligning and focusing the lens on a target object. The light projected on the target accurately defines the spot size to be measured. This compact, hand-held illuminator utilizes a rechargeable battery-powered quartz halogen lamp with variable intensity control. The illuminator utilizes a precision adapter that quickly connects to the fiber optic cable. A battery recharger is supplied with the illuminator.



Model IL-5 Illuminator shown with Charger unit

Model TV-View-VAAC Remote Digital Indicator

The Model TV-View remote digital indicator is optionally available to accept 4 - 20 mA output signals from the SR Series to provide a digital temperature display. The temperature range can be set to match the range of the SR in the field.

Features

Temperature range: Can be calibrated to match any range of SR series, °F or °C

Signal input: 4 - 20 mA (zero to full scale)

Ambient temperature: -17 to 122°F or 0 - 50°C

Display: 5 digit, red LED

A/D conversion rate: 20 readings per second

Input power: 80 - 250 Vac, 50/60 Hz

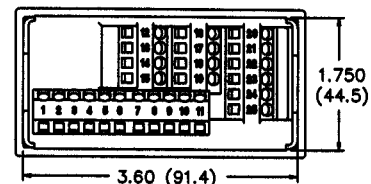
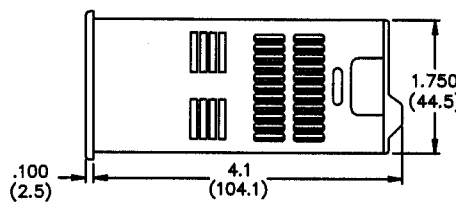
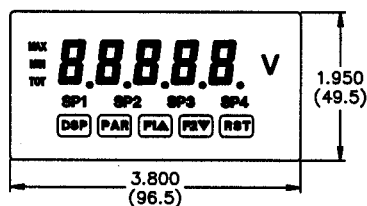
Options available: High and low alarms, RS485 with RS232 output



Model Temp View remote digital indicator

Dimensions in inches (mm)

- Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1" (53.4) H x 5.5" (140) W.



Temp View remote digital indicator dimensional drawing

SR Series

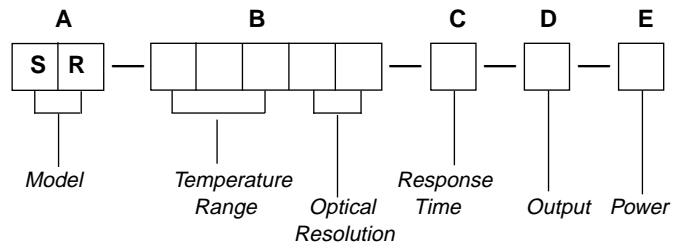
Fiber Optic Version (continued)

Fiber Optic Ordering Information Chart

How to determine model number: The following is an example of how to select the proper model number. Refer to the chart below for specific information. *For example:* Model SR-32FF3-1-1 indicates a fiber optic SR series that operates within a temperature range of 1800 to 3200°F; an optical resolution of D/30; response time of 10 seconds; 0-10.0 Vdc



BLOCK MODEL



BLOCK B - Temperature Range and Fiber Optic options								
Fiber Optic Options	F1	F2	F3	F4	F5	F6	F7	F8
Fiber Length	3 feet	3 feet	3 feet	3 feet	10 feet	10 feet	10 feet	10 feet
Focusable Spot Size	D/30	D/60	D/30 x D/150	-	D/30	D/60	D/30 x D/150	-
Other	-	-	-	Extension Tip	-	-	-	Extension Tip
Temperature Range								
25F = 1300 to 2500°F								
32F = 1800 to 3200°F								
40F = 2000 to 4000°F								
65F = 2500 to 6500°F								
14C = 700 to 1400°C								
16C = 900 to 1600°C								
20C = 1100 to 2000°C								
24C = 900 to 2400°C								
35C = 1500 to 3500°C								

BLOCK C - Response Time

0	= 0.1 second
1	= 0.01 second
2	= 1.0 second
3	= 10.0 seconds

BLOCK D - Output

0	= 4 - 20 mAdc (500 ohm max. grounded)
1	= 0 - 10.0 Vdc (less than or equal to 1 ohm source, 5 mA max.)

BLOCK E - Power

0	= Customer supplied (± 15 Vdc, $\pm 5\%$ @ 200 mA)
1	= 24 Vdc $\pm 5\%$ @ 400 mA
2	= 100 to 230 Vac, 50/60 Hz @ 200 mA rms.

FIBER OPTIC ACCESSORIES

- * Focusable Reimaging Lens assembly
 - Focal range 10 in. or 250 mm to infinity
 - Focal range 6 to 10 in. or 150 to 250 mm
- * Extension Tip

* Note: These accessories are instrument model-dependent. Consult factory before ordering.

AA-5	Air Purge
IL-5-0	Illuminator (includes charger) 115 Vac, 50/60 Hz
IL-5-1	Illuminator (includes charger) 220 Vac, 50 Hz
SB-5	Swivel Mounting Base (includes mounting clamp accessory)
MC-5	Mounting Clamp
MB-5	Angle Mounting Bracket

SR Series

Fiber Optic Version (continued)

Fiber Optic Optical Resolution

Optical Resolution

Focusable Reimaging Lens:

D/30, D/60, D/30 x D/150 per model selection

Extension Tip: D/3

Optical Resolution Formula

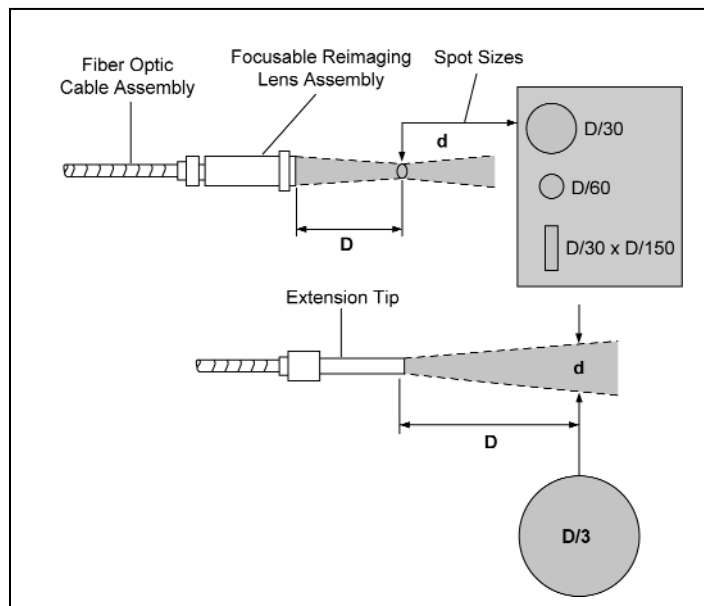
Spot size is determined by the formula

$$d = \frac{D}{F}$$

Where: d = spot size

D = distance from lens or extension tip to focal point

F = optical resolution factor



Fiber Optic Series Specifications

All specifications are identical to the SR Series SLR version *except for the Ambient Temperature Range and Optical Resolution.*

Ambient Temperature Range

Sensor: 30 to 130°F or 0 to 55°C

Reimaging lens assembly:

0 to 400°F or -17 to 200°C

Fiber optic cable assembly:

0 to 400°F or -17 to 200°C

Extension tip: 0 to 575°F or -17 to 300°C



NIST Calibration Provider



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