

# Non-Contact Infrared Temperature Measurement

for Industrial Process and Research Applications



- Glass
- Steel Processing Billets
- Induction Heating
- Kilns

- Pipe Bending
- Wire Heating
- Semi-conductor Reactors

## Mission

Since the company's founding in 1996, Process Sensors Corporation has focused on the development and implementation of non-contact, moisture measurement instruments for on-line industrial process applications. More recently, we have drawn on our Near Infrared Technology expertise to introduce a comprehensive range of Non-Contact Infrared Temperature Measurement Sensors, Thermal Imaging Systems and Blackbody Calibration Sources.

Our corporate mission is a simple one: to utilize the least complex, most reliable technology in order to provide outstanding value, sound solutions and long term, maintenance-free reliability in industrial environments. Accurate measurement is vital to product quality and cost effective production. The instruments we manufacture and apply are designed to achieve those objectives effectively and economically.

From the outset, PSC has recognized that product excellence would be an important factor in our company's success and growth. Just as important, however is the support and care of our customer base. Therefore, in parallel with development of our products, we aim to always put the consumer at the forefront of our technical and strategic plans.

Process Sensors is very fortunate to have experienced application specialists who can provide unique sensor solutions for both temperature and moisture measurement applications. We have learned to combine product training, installation guidance assistance, and ongoing technical and commercial support to effectively address our customers' needs. PSC is a company totally dedicated to customer support.

Our customers, partners, products and our dedicated employees have built Process Sensors into the world class operation it is today.



## Infrared Radiation Theory and the Application of Infrared Pyrometers

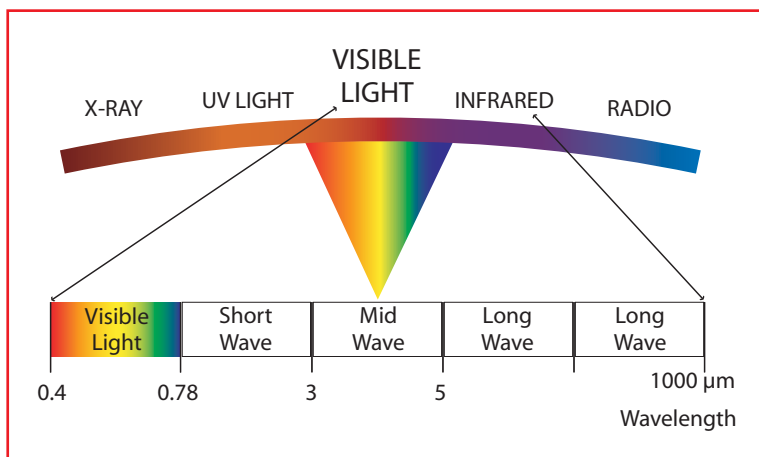
Infrared radiation (IR) is a component of the electromagnetic spectrum that falls between the frequencies of visible light radiation and radio waves.

Electromagnetic radiation is sinusoidal in nature (having a succession of waves or curves) and the components of the total spectrum are differentiated by the frequency bands they occupy.

IR occupies the wave band between 0.78 microns and 1000 microns, although IR sensors at a spectral wavelength of 0.65 $\mu$  (visible light region) are also used to measure temperature.

By focusing the IR energy radiated by a surface onto an IR sensitive detector, it is possible to determine the temperature of the surface by measuring the output from the detector.

Though infrared radiation energy is invisible to the human eye, it is helpful to think of it as visible light because it behaves in an identical manner: it travels in straight lines, and can be reflected, absorbed and attenuated by objects and conditions in its path. The temperature of a glowing hot object (emitting in the visible region) can be determined visually based on its radiated color by a trained human eye.



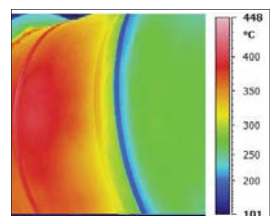
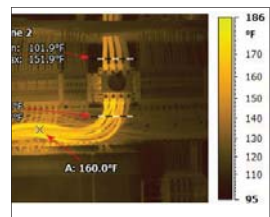
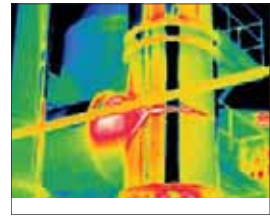
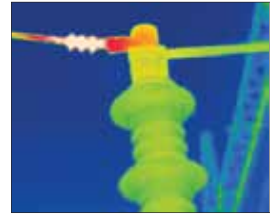
### Rule of Thumb

#### Optimizing IR Measurements for Metal Surfaces

Select the shortest wavelength to raise absolute emissivity and to minimize temperature errors due to changes in emissivity.

Short wavelength: 0.65 to 3  $\mu$   
Medium wavelength: 3 to 5  $\mu$   
Long wavelength: 5  $\mu$ +





## Portable Thermal Imagers That Deliver Unmatched Performance

Process Sensors Portable Thermal Imagers are invaluable tools for detecting anomalies in manufacturing process applications, machine diagnostics and preventive and predictive maintenance. The PTI Portable Camera Series is robust and value driven, and delivers outstanding performance.



The Professional Model **PTI-170** boasts real-time temperature profiling, 5.7X the resolution of 320 x 240 pixel imagers, built-in LED illumination, streaming video, wireless Bluetooth™ voice recording, laser aiming and adjustable focus optics. With a 30HZ frame rate, expandable memory capacity, composite video and a variety of lenses it is unmatched compared to the competition.



The newly improved **PTI-160V** Series with 160 x 120 pixel array detector is intended for slightly less challenging applications, but offers enhanced observation capability with IR+VIS dual-spectrum technology by including a built-in digital camera. Using IR+VIS technology, a thermal image (IR) can be captured and combined with a visual image (VIS).



The **PTI-160** Series is the most economical of all. An excellent value, the Model PTI-160 camera offers the optimal price/performance ratio in a tool that is rated both high performance and easy-to-use. Like all the other cameras in the Portable Series, it is equipped with a specially designed, non-glare flip-up screen that measures 3.5 inches and facilitates viewing at even the most difficult angle.

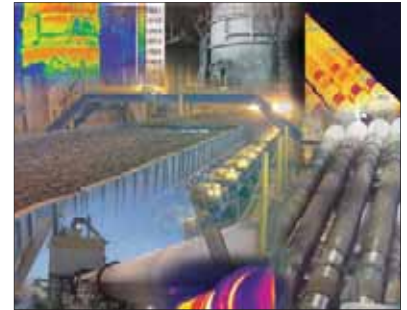
MODEL NUMBER	RESOLUTION	SPECTRAL RESPONSE	FRAME RATE	TEMPERATURE RANGE	MINIMUM FOCUS DISTANCE	LCD DISPLAY	MEMORY
<b>PTI-170</b>	384 x 288	8 –14µm	30 Hz	-4°to 572°F	4" (100mm)	3.5"	2GB SD card
<b>PTI-170-LT</b>	384 x 288	8 –14µm	30 Hz	-4°to 1112°F	4" (100mm)	3.5"	2GB SD card
<b>PTI-170-MT</b>	384 x 288	8 –14µm	30 Hz	-4°to 1832°F	4" (100mm)	3.5"	2GB SD card
<b>PTI-170-HT</b>	384 x 288	8 –14µm	30 Hz	-4°to 2732°F	4" (100mm)	3.5"	2GB SD card
<b>PTI-160V</b>	160 x 120	8 –14µm	30 Hz	-4°to 572°F	4" (100mm)	3.5"	2GB SD card
<b>PTI-160V-LT</b>	160 x 120	8 –14µm	30 Hz	-4°to 1112°F	4" (100mm)	3.5"	2GB SD card
<b>PTI-160V-MT</b>	160 x 120	8 –14µm	30 Hz	-4°to 1832°F	4" (100mm)	3.5"	2GB SD card
<b>PTI-160V-HT</b>	160 x 120	8 –14µm	30 Hz	-4°to 2732°F	4" (100mm)	3.5"	2GB SD card
<b>PTI-160</b>	160 x 120	8 –14µm	30 Hz	-4°to 572°F	4" (100mm)	3.5"	2GB SD card
<b>PTI-160-LT</b>	160 x 120	8 –14µm	30 Hz	-4°to 1112°F	4" (100mm)	3.5"	2GB SD card
<b>PTI-160-MT</b>	160 x 120	8 –14µm	30 Hz	-4°to 1832°F	4" (100mm)	3.5"	2GB SD card
<b>PTI-160-HT</b>	160 x 120	8 –14µm	30 Hz	-4°to 2732°F	4" (100mm)	3.5"	2GB SD card

## PSC Process Thermal Imaging Systems

Process Sensors Thermal Imaging Camera Systems provide thousands of single-point measurements, mapping in multiple colors the thermal distribution of temperatures over an area defined by their optics. Thermal imaging systems are now used routinely to continuously monitor and control industrial processes. To meet this demanding need, Process Sensors offers a comprehensive range of real-time imaging systems covering an overall temperature span from -4°F to 4532°F

The ultra compact, radiometric PSC Surveyor and Metis Vision imaging cameras are designed for compatibility and integration within existing systems and feature simple-to-use intuitive and powerful software. Choose from complete turn-key process control systems, touch screen displays, process interface modules and IR+VIS dual-spectrum features to create custom solutions for every application. The “armored tank” design construction of the industrial stainless steel housings or explosion proof enclosures make these systems virtually indestructible, allowing for operation in the most severe industrial environments.

Known for its ability to produce crisp, clear images, the Metis Vision MV09 features extremely high, drift free stability for high temperature applications with over 300,000 points of measurement. A wide selection of variable focus lenses enables the user to define the measurement area under inspection from a distance. The included comprehensive software allows the selection of points, lines, areas, isotherms, color palettes, alarms and a multitude of other features.



APPLICATIONS	MODEL NUMBER	ARRAY SIZE	TEMPERATURE RANGE	THERMAL SENSITIVITY	FIELD OF VIEW	SPECTRAL RANGE
Glass Ladle Shell Torpedo Cars PC Boards Kiln Shell Paper Web	<b>PSC-160</b>	160 x 120	-4° to 212°F 32° to 482°F 302° to 1652°F Add'l Optional Range: 392° to 2732°F	0.08°C	23°x17°FOV / f=10mm or 6°x5°FOV / f=35.5mm or 41°x31°FOV / f=5.7mm or 72°x52°FOV / f=3.3mm	7.5 – 13µm
Reactors / Vessels Furnace Shell Gypsum Conveying of Bulk Solids Solar Cell Testing	<b>PSC-200</b>	160 x 120	-4° to 212°F 32° to 482°F 302° to 1652°F Add'l Optional Range: 392° to 2732°F	0.08°C	23°x17°FOV / f=10mm or 6°x5°FOV / f=35.5mm or 41°x31°FOV / f=5.7mm or 72°x52°FOV / f=3.3mm	7.5 – 13µm
Fire Protection Thermoforming Molds R&D	<b>PSC-400</b>	382 x 288	-4° to 212°F 32° to 482°F 302° to 1652°F Add'l Optional Range: 392° to 2732°F	0.08°C	32°x24°FOV / f=17mm or 62°x49°FOV / f=8mm or 13°x10°FOV / f=41mm	7.5 – 13µm
	<b>PSC-450</b>	382 x 288	-4° to 212°F 32° to 482°F 302° to 1652°F	0.04°C	32°x24°FOV / f=17mm or 62°x49°FOV / f=8mm or 13°x10°FOV / f=41mm	7.5 – 13µm
Furnace Welding Heat Treating Metal Pouring Streams Composites R&D	<b>MV09</b>	640 x 480	1112° to 2372°F 1382° to 2732°F 1652° to 3272°F Add'l Optional Range: 2192° to 4532°F	1°C	Interchangeable Lenses Define Camera's Rectangular Measurement Area Refer to MV09 Brochure	0.75 – 1.08µm

## The PSC Metis Series

The Metis “Self Contained” series of IR Pyrometers was developed for precision on-line process measurement applications. By utilizing digital signal processing, the Metis line exceeds standard analog pyrometers as far as accuracy, repeatability and wide temperature ranges are concerned.

Precision, adjustable focusable optics allows the Metis to pinpoint very small targets and features advanced sighting capabilities such as through the lens, laser or video. A variety of spectral responses are available for addressing the needs for specific temperature measurement applications, i.e.: Metals, Glass, Semiconductor, Ceramics, Plastics composites etc.

The IP65 extruded aluminum housing with mounting groove allows for easy installation onto a swivel base, adjustable bracket or within a companion heavy duty water cooling jacket for use in harsh environments.

Metis Pyrometers provide analog and digital signals such as 4-20mA, 0-20mA, RS232, RS485 and Profibus. Optionally the product line offers integrally a bright rear LED display, dual relays or fiber optic versions for use in high temperature locations, use in tight spaces or in areas of high magnetic RF fields.



APPLICATIONS	TEMPERATURE RANGE	MODEL NUMBER	SPECTRAL RESPONSE	FIBER OPTIC	OPTICAL ALIGNMENT Laser * Visual  Video	MIN. SPOT SIZE	RESPONSE TIME	OUTPUTS
Metals, Composites, Molten Glass, Graphite, Furnace, Semiconductor, Vacuum	572° to 5612°F (300° to 3100°C)	<b>MQ22</b>	2-color 1.45 to 1.8µm	✓		1.2mm	2ms	4-20mA, 0 to 20mA, RS232, RS485, Optional Profibus
Metals, Composites, Molten Glass, Graphite, Ceramics, Semiconductor, Furnace	1112° to 5792°F, (600° to 3200°C)	<b>MQ11</b>	2-color 0.7 to 1.1µm	✓		1mm	2ms	4-20mA, 0 to 20mA, RS232, RS485, Optional Profibus
Metals, Molten Glass, Composites, Ceramics, Furnace	752° to 5972°F (400° to 3300°C)	<b>MS09</b>	0.7 to 1.1µm	✓		0.35mm	1ms	4-20mA, 0 to 20mA, RS232, RS485, Optional Profibus
Molten Metal Pour Streams, Welding, Semiconductor Wafers	1832° to 3272°F (1000° to 1800°C)	<b>MS06</b>	0.65µm	✓		1.8mm	1ms	4-20mA, 0 to 20mA, RS232, RS485, Optional Profibus
Metals, Vacuum, Laser Applications, Ceramics, Furnace	482° to 5432°F (250° to 3000°C)	<b>MI16</b>	1.6µm	✓		0.35mm	1ms	4-20mA, 0 to 20mA, RS232, RS485, Optional Profibus
Metals, Welding, Ceramics, Composites, Vacuum	248° to 1472°F (120° to 800°C)	<b>MI18</b>	1.8µm	✓		0.7mm	1ms	4-20mA, 0 to 20mA, RS232, RS485, Optional Profibus
Metals, Composites, Graphite, Ceramics	167° to 2372°F (75° to 1300°C)	<b>MP25</b>	2.0 to 2.8µm			0.6mm	3ms	4-20mA, 0 to 20mA, RS232, RS485, Optional Profibus
Metals, Vacuum, Composites, Ceramics	95° to 1832°F, (35° to 1000°C)	<b>MB35</b>	2 to 5µm			0.7mm	3ms	4-20mA, 0 to 20mA, RS232, RS485, Optional Profibus
Sees thru clean flames, Glass Subsurface, Flame Treating, Furnaces	302° to 3632°F (150° to 2000°C)	<b>MB39</b>	3.95µm			1.5mm	10ms, 30ms, 40ms, 100ms	4-20mA, 0 to 20mA, RS232, RS485, Optional Profibus
Boilers, Incinerators, Kilns, Furnaces	482 ° to 3632°F, (250° to 2000°C)	<b>MY45/46</b>	CO <sup>2</sup> GAS			3.3mm	100ms	4-20mA, 0 to 20mA, RS232, RS485, Optional Profibus
Glass Surface	212° to 4532°F (100° to 2500°C)	<b>MY51</b>	5.14µm			1.3mm	5ms, 10ms, 40ms, 100ms	4-20mA, 0 to 20mA, RS232, RS485, Optional Profibus
Thin Polyester Films, Fluoro Carbon Plastics, Thin Glass Surface	122° to 752°F (50° to 400°C)	<b>MY80</b>	8.05µm			2.5mm	100ms to 10 sec	4-20mA, 0 to 20mA, RS232, RS485, Optional Profibus
Paper, Bulk Materials, Textiles, Rubber, Sees thru Calcium Fluoride Window	32° to 752°F (0° to 400°C)	<b>MY81</b>	8 to 10µm			1.7mm	5ms, 30ms, 100ms	4-20mA, 0 to 20mA, RS232, RS485, Optional Profibus
Paper, Bulk Materials, Textiles, Rubber	32° to 1832°F (0° to 1000°C)	<b>MY84</b>	8 to 14µm			1.8mm	100ms	4-20mA, 0 to 20mA, RS232, RS485, Optional Profibus



## Two-Wire, Loop Powered Pyrometers

### PSC-CS-Laser

The PSC-CS-Laser Series are digital two-wire, self-contained IR thermometers with precision dual laser targeting from -22° to 2912°F and optical resolution up to 300:1 with selectable optics. This robust series simplifies installation with two wires and offers fast measurements with ultra-small spot sizes and high accuracy as well as scalable 4-20 mA output in combination with simultaneous alarm output. The PSC-CS-Laser series operates at up to 185°F without cooling, and specially designed, rugged protective hardware assemblies ensure secure operation at higher temperatures. On board emissivity adjustment is easily accessible, or can be accomplished remotely via PSCConnect software.

### DT-40 Series

The innovative designs of PSC Models DT-40L, DT-40G and DT-40F with digital technology, are compact, rugged and based on simplicity of installation. Used in a two-wire loop powered configuration, the sensors' 4-20 mA linear output signal can be easily integrated into existing instrumentation for recording and process control. Integrated USB interface is used for sensor setting parameters. Compact and robust, they feature a laser or green LED to facilitate aiming. Fiber Optic Models DSF-40N and DGF-40N are also available.

- Selection of temperature ranges from -40°C to 3000°C
- Integrated USB interface for sensor parameter settings
- Built-in peak picker
- Robust stainless steel housing

MODEL NUMBER	TEMPERATURE RANGE	SPECTRAL RESPONSE	APPLICATIONS
DT-40L	-40° to 1832°F	8 –14µm	Ovens and Dryers, Thermoforming, Aggregate, Powders and Organics, Paper, Packaging and Food, Textiles, Rubber and Plastics >100mils
DT-40F	572° to 2372°F	3.9µm	Furnace applications. The DT-40F Sensor sights through hot combustible gases and clean flames.
DT-40G	212° to 2192°F	5µm	Glass Industry, Glass Surface Measurement
DT-40G	392° to 2552°F	5µm	
DT-42L	-40° to 1832°F	8 -14µm	Non-metals, Coated Metals, Paper and Packaging, Building Materials, Food Industry, Plastics, Organics
DT-42G	212° to 2372°F 932° to 4532°F	5µm	Glass Industry, Glass Surface Measurement
DS-42N	1112° to 3272°F 1472° to 4532°F	0.8 – 1.1µm	Metals, Hot Rolling Mills, Molten Glass, Ceramics, Furnaces
DS-42N	482° to 2372°F 662° to 3272°F	1.5 – 1.8µm	

### DT-42 Series

The PSC Models DT-42L, DT-42G, DS-42N and DG-42N are digital two-wire self contained pyrometers that offer high performance with value driven pricing. They are designed for quick, simple installation and feature on-board emissivity adjustment capability and a variety of fixed focus optics as well as adjustable sub-temperature ranges. The higher temperature DG/DS-42 Series is equipped with laser sighting. Typical application areas include: steel and metals, heat treating, induction heating, semiconductor, vacuum, welding, furnaces, molten glass, composites and measurement of metal molds.

### DSF-30NG and DSF-34NG Series

The digital fiber optic DSF-30NG and DSF-34NG feature temperature ranges from 1112° to 3272°F and were specially designed for applications in the glass industry. These pyrometers are ideal for temperature measurement in glass tanks, forehearths and feeders, but also prove useful for measurement of metals, furnaces and other high temperature applications. A rugged stainless steel air purge with mounting bracket and a choice of alumina or inconel sight/target tube assembly allows for operation in harsh furnace environments.



## PSC Infrared Sensor Series

### Metis Sensor Series



Ultra high-performance digital pyrometers with extremely small spot size, very fast response speed, focusable laser, through lens or video sighting optics. Transfer standard and 1 or 2-color pyrometer versions. Offered with std. PSCWin software.

32° to 5972°F  
(0° to 3300°C)

### Sirius Series



Digital, self-contained 1-color pyrometer with small spot size, fast response, laser sighting, adjustable or fixed focus optics and analog / digital outputs. Offered with standard PSCWin software.

122° to 3272°F  
(50° to 1800°C)

### PSC-CS-Laser Series



Digital, low cost, high performance, 2-wire loop powered, self-contained IR thermometer with precision dual laser targeting, built-in alarm, ultra small spot size and on-board emissivity adjustment. Offered with fixed focus optics, a variety of IR wavelengths and 4-20mA output.

-22° to 2912°F  
(-30° to 1600°C)

### 40/44 Series



Compact, digital, rugged and simple 2-wire loop powered stainless steel pyrometers with 4-20mA output. Sensor models above 250°C are equipped with green LED or laser aiming. Fixed focus (40 Series) or adjustable focus optics (44 Series) with RS485 communications.

-40° to 4532°F  
(-40° to 2500°C)

### 42 Series



Low cost, self-contained, digital 2-wire loop powered pyrometers with on-board emissivity adjustment, 4-20mA output, fixed focus optics and stainless steel housing. Sensor models above 250°C are equipped with laser aiming.

-40° to 4532°F  
(-40° to 2500°C)

### SSS-Laser Series



2-piece sensor system with dual lasers for precision targeting, fixed focus optics with very small spot size, temperature display, multiple analog/digital outputs and alarms.

-58° to 1787°F  
(-50° to 975°C)

### PSC-SSS Series



Miniaturized low cost, 2-piece IR sensor with temperature display, variety of outputs and IR wavelengths. Field replaceable sensor head operates at ambient temperatures up to 180°C.

-58° to 1787°F  
(-50° to 975°C)

### PSC-CMS Series



Low cost, digital stainless steel compact micro sensor for temperatures up to 1030°C, 8 to 14µm with 0-10 VDC scalable output. Sensing head ambient temperature of 120°C.

-40° to 1886°F  
(-40° to 1030°C)

### PSC-CMS-2W Series



Miniature digital 2-wire loop powered infrared sensor with a variety of IR wavelengths, parameterizing software and scalable 4-20mA output. Sensing head ambient temperature of 125°C.

-22° to 2912°F  
(-30° to 1600°C)

### PSC-CS



Compact, low cost digital 8-14µm IR thermometer with 15:1 FOV, stainless steel housing, built-in alarm scalable 0-10 VDC output.

-40° to 1886°F  
(-40° to 1030°C)

### PSC-DSF-30N



Low cost fiber optic 2-wire loop powered sensor with rugged air purge assembly, 4-20mA output and features designed for glass industry applications. Fixed focus optics.

1112° to 3272°F  
(600° to 1800°C)

### Polaris Heat Switch



High-speed, cost efficient and accurate switching device for hot metal detection. Dual relays, software and adjustable focus optics

572° to 3272°F  
(300° to 1800°C)

### PSC-SSS-Ratio



Fiber optic two-color sensor with temperature display, variety of output signals and laser aiming that sees thru dirty windows and compensates for emissivity. Operates in one or two color mode

1292° to 3272°F  
(700° to 1800°C)

### PSC-2C-1600



High performance, simple to operate, self-contained two-color sensor with large interactive display and integrated protective cooling and air purge housing. An innovative system solution designed to perform with high accuracy in harsh conditions.

1112° to 2912°F  
(600° to 1600°C)

Customizable temperature span can be reduced within overall range

## Process Sensors Blackbody Calibration Sources

PSC offers a unique selection of precise, high performance Blackbody Calibration Sources for calibrating and verifying temperature of pyrometers, thermal imaging systems, spectrophotometers, heat flux meters, radiometers and UFPA detectors. Process Sensors Blackbody Calibration Sources are all about precision. Our first rate blackbodies exhibit high emissivity, high uniformity and high resolution capability. They are extremely stable and offer many unique features including large apertures and fast slew rates.

The innovative design and precision features of each blackbody is the direct result of partnership with our parallel manufacture

of infrared thermometers and thermal imaging camera systems. State of the art design teams work in tandem to craft instruments known for their high quality performance, outstanding value and long term reliability.

The PSC line of blackbody sources has overall capability from subzero  $-5^{\circ}\text{C}$  to  $1700^{\circ}\text{C}$  and includes models that are distinguished by their size, portability or other unique and versatile features. All PSC calibration sources are designed to provide the highest emissivity possible and are traceable to worldwide standard calibration laboratory specifications.

BBS1700	BBS1500	BBS1150	BBS1200 COMPACT
			
High emissivity bench type design stabilizes temperature reading to within $0.5^{\circ}\text{C}$ . For high temperature calibration of IR thermometers, thermal imaging cameras and FPA detectors.	High accuracy with a large 1.57" aperture for on-site precision laboratory calibration or testing. Fast responding heat time reaches operating temperature within 40 minutes of power-up.	Extremely stable, mid to high temp bench type design with large 2" aperture for precision calibration of IR thermometers, thermal imaging devices and spectrophotometers.	Compact, two-piece design for automated calibration configuration. Light weight and portable, and offers excellent stability and high uniformity. Eight aperture sizes increase versatility.
572° to 3092°F (300° to 1700°C) <b>1" (25mm) aperture</b> +0.99 emissivity	932° to 2732°F (500° to 1500°C) <b>1.57" (40mm) aperture</b> +0.993 emissivity	392° to 2102°F (200° to 1150°C) <b>2" (51mm) aperture</b> +0.99 emissivity	122° to 2192°F (50° to 1200°C) <b>Choice of 8 aperture sizes</b> +0.99 emissivity
BBS100-TE	BBS400	BBS400-2	BBS-EX Series
			
Light-weight (8 lbs.) and portable, with the versatility of multiple operating modes and large 4" aperture. Fast slew rates of $0.10^{\circ}\text{C}/\text{S}$ , $-0.08^{\circ}\text{C}/\text{S}$ , and high emissivity/uniformity. Temperature resolution is $0.01^{\circ}\text{C}$	Excellent homogeneity, high precision, and long term stability in a compact one-piece and low-cost design. Temperature resolution to $0.1^{\circ}\text{C}$ with large 5" aperture. Ideal for calibration of portable and fixed thermometers with large spot sizes.	Compact, two-piece design offers portability for calibration of on-line, fixed mounted IR sensors as well as imaging detectors in automated calibration processes. External pyrometer correction adjustment.	Extended area blackbody sources with emitter sizes from $2.5''\times 2.5''$ to $12''\times 12''$ with separate controllers for use as standard radiation sources for collimated scene projection and calibration of focal plane arrays and thermal imaging cameras. Resolution $0.1^{\circ}\text{C}$
32° to 212°F (0° to 100°C) <b>4" (100mm) aperture</b> $0.96 \pm 0.01$ emissivity	Ambient + 41° to 752°F (Ambient + 5° to 400°C) <b>5" (128mm) aperture</b> $0.95 \pm 0.01$ emissivity	Ambient + 122° to 752°F (Ambient + 50° to 400°C) <b>1.18" (30mm) aperture</b> $0.96 \pm 0.01$ emissivity	23° to 932°F $-5^{\circ}$ to $500^{\circ}\text{C}$ <b>Up to 12" x 12"</b> <b>(304mm x 304mm) apertures</b> $0.96 \pm 0.02$ emissivity



## Process Sensors Portable Single Point Non-Contact Thermometers

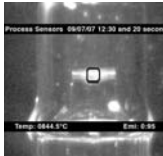
	MODEL NUMBER	TEMPERATURE RANGE	SPECTRAL RESPONSE	ACCURACY	RESPONSE TIME
	<b>PSC-MS Series</b> Most economical, smart IR thermometers with high precision optics, laser sighting, USB interface and software. Built-in alarms. FOV up to 30:1 Accepts K-type thermocouple input.	-25° to 788°F (-32° to 420°C)  -25° to 980°F (-32° to 530°C)  -25° to 1440°F (-32° to 760°C)	8 to 14μm	± 1% of reading	300ms
	<b>Portable Laser Sight Thermometer</b> IR thermometer with crosshair laser sighting, high resolution 75:1 optics, built-in alarms and spot size of 1mm. Large multi-colored temperature display.	-31° to 1652°F (-35° to +900°C)	8 to 14μm	± 0.75% of reading	150ms
	<b>PSC-IRVT Series</b> Professional IR video thermometers with CCD video recording and playback. FOV 50:1 Dull surface measurement for low reflective surface applications	-58° to 1832°F (-50° to 1000°C)  -58° to 2912°F (-50° to 1600°C)	8 to 14μm	± 1.0% of reading	Less than 300ms
	<b>PTLST-20-LT</b> Portable telescopic and dual-laser sighting thermometer with small spot size for general purpose, low reflective surface applications	32° to 2372°F (0° to 1300°C)	8 to 14μm	± 1% of reading	300ms
	<b>PTLST-20-1M/2M</b> Portable telescopic and dual-laser sighting thermometers for mid-high temperature applications. Built-in alarms and optional software	725° to 2912°F (385° to 1600°C)  1202° to 3272°F (650° to 1800°C)	1.0μm  1.6μm	± 0.3% of reading	100ms
	<b>PSC-90 Series</b> Versatile, high performance digital IR thermometers with high accuracy/repeatability, focusable through lens sighting optics and dual temperature displays	1112° to 5432°F (600° to 3000°C) Switchable  1652° to 5432°F (900° to 3000°C) Switchable	0.96μm  0.65μm	± 0.5% of reading	0.5 sec
	<b>PSC-92-2C</b> High performance model for measurement and data logging of surface temperatures. Operates in one- and two-color modes and sights through dirty windows	1112° to 3632°F (600° to 2000°C)	0.9/1.55μm	±2.4% of reading	0.25 sec

# Technical information

## Pyrometer Sighting Methods

To measure accurately, an IR pyrometer must be aimed at the surface or part of the surface of interest. For very large areas such as steel slabs or web processes this does not present a problem, but for smaller surfaces such as wire, pc board components, weld bead etc., a more precise aiming method is required.

Process Sensor's pyrometers can incorporate a variety of sighting methods such as through-lens, where an installer can aim through the same lens that focuses the IR energy on the detector; or laser aiming via a built-in laser beam that illuminates the center of the target area. The pyrometers can also incorporate a video output that presents a picture of the area being measured on the image. A reticle defines the exact spot size of temperature measurement.



Where there is no direct line-of-sight between the pyrometer and the target, a flexible fiber optic cable can be used to carry the IR energy around obstacles and corners. Specifically used in high-strength magnetic fields, high ambient temperature and vacuum environments, it allows the IR sensor's electronics to be placed remotely, outside from these upsetting conditions.

## Lenses and Fiber-Optic Cable

The infrared energy radiated by the target is transferred via focusable lenses either directly on the detector (standard version) or onto one end of a fiber optic cable. For applications where the lens must be refocused during operation, a remote focusable lens is available.

## Focusing

Some pyrometers are designed with adjustable focusing. This does not necessarily mean that the target must be a sharp, clear image in order to obtain an accurate measurement, as would be the case with a camera. Pyrometer focusing is simply intended to permit the pyrometer to "see" the smallest spot size at a given distance. This is helpful when measuring through small openings or for avoiding obstacles in the sight path.

## Sight Path

The sight path is the space between the pyrometer lens and the object being measured. For accurate measurement the sight path must be clear and free of obstacles, steam and water droplets, and heavy concentrations of particles. Devices such as fans and air purges, or careful sighting can usually ensure that this condition is met, but sometimes the use of a Two Color or ratio pyrometer can be helpful.

## Focusing, Sight Path and Field of View

A well designed infrared pyrometer is inherently a very accurate measurement device, but because it measures from a distance,

the focus and field of view (FOV) play an important part in the quality of the measurement, unlike other temperature sensors.

The FOV is an invisible cone that extends from the lens out to infinity. The FOV ratio is the diameter of the cone (Spot size) at a given distance from the lens. It is expressed in inches as a ratio e.g. 20:1, 60:1 etc.

So if a 60:1 FOV pyrometer is focused at a distance of 120", it will gather energy from a 2" dia. area on the object being measured. It will see only a small percentage of energy outside that circular FOV area based on the quality of its optics.

The equation to determine spot size is:

$$\frac{\text{Focus Distance}}{\text{FOV}} = \text{Spot Size}$$

To obtain an accurate temperature measurement, the FOV must be filled, smaller than the target at whatever distance the pyrometer is from the object being measured. The exception to this rule is the Two Color or Ratio Pyrometer which can measure accurately when only part of the FOV is filled. Listed below is an explanation of operation for one and two color pyrometry.

## Single Color Thermometers

1. Depend on the emissivity of the target:
  - Short wavelength selection reduces the effect of emissivity errors for metals
  - Offer a variety of wavelengths for specific applications.
  - Used for low temperature measurements (sub zero temperatures)
2. Measure the average temperature within the field of view:
  - Field of View must be completely filled by the target
  - Focus dependent on the target
  - Affected by dirty windows or dusty atmosphere

## Two Color Thermometers

1. Independent of emissivity of the target - (If emissivity changes proportionally, for each single color wavelength )
2. Measure the weighted peak temperature within the field of view.
  - Tolerates up to 99% blockage of the target
  - Unaffected by dust and other contaminants in the field of view i.e. dirty viewing windows
  - Unaffected by moving targets within the field of view
3. Limited low temperature measurements to about 300° C
4. Higher cost solution compared to Single-Color.

## PSC ACCESSORIES

The circumstances under which Process Sensors pyrometers are used are many and varied. In order to accommodate these differences and to ensure durable, trouble-free operation, we have designed a large comprehensive family of accessories. Some are purely protective, while others simplify a measurement that would otherwise be difficult or impossible. Pictured below is a sampling.

		
<p>Metis Water Cooling Jacket with Separate Air Purge</p>	<p>PSC-SSS-Laser and PSC-CS-Laser Water Cooled Jacket with Separate Air Purge and Adjustable Mtg. Bracket</p>	<p>Surveyor Thermal Imaging Camera Series Water Cooled Jacket with Integrated Air Purge and Separate Adj. Mtg. Bracket</p>
		
<p>42/40/44 Series Cooling Jacket with Integrated Air Purge and Separate Mtg. Bracket</p>	<p>Removable Sealed Window Assembly Includes Sapphire, Quartz, Pyrex or Other Window Types</p>	<p>Plug &amp; Play Module W/Touch Screen Display for Metis or Sirius Sensors</p>
		
<p>Swivel Base Mount for Metis Series</p>	<p>Adjustable Mounting Bracket for Cylindrically Shaped IR Sensors</p>	<p>SC10 Scanning Adapter for Metis or Sirius</p>
		
<p>PSC-SSS Air Purge</p>	<p>Air Purge Assembly For Fiber Optic Lens</p>	<p>Temperature Indicator</p>

### Precision Non-Contact (NIR) Moisture Measuring Systems

Unlike infrared (IR) pyrometers that measure temperature by detecting infrared energy radiated by a particular material, NIR moisture measuring systems aim selected wavelengths of energy at the material and detect the amount of energy **reflected** back from the material. The difference between the amount of reflected NIR energy and the NIR energy generated by the source indicates the amount of moisture and/or other elements remaining in the material.

Process Sensors Corp. **MCT360 NIR Transmitter**, designed in response to industry's need for a high quality sensor at an economical price, provides accurate and repeatable moisture, oil, and coating measurements and communicates directly with computers, controllers and PLCs. The stand alone design eliminates the need for proprietary electronics and greatly reduces installation and maintenance costs. Scanning frames are available to profile webs or conveyed materials.

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