PROCESS SENSORS CORPORATION

Metis MQ11/MQ22

2-Color Pyrometer Series



Two-Color or Ratio Pyrometers measure temperatures from the ratio of radiation signals of two adjacent wavelengths as opposed to measuring the absolute intensity within one wavelength, i.e. 1-color pyrometers. The advantages and benefits of using 2-color sensors are the following:

- ⇨ **Automatic compensation for viewing though dirty windows, dust and partial smoke between sensor and target.**
- ⇨ **Compensation for changes in target emissivity i.e. gray bodies—targets with the same emissivity on both wavelengths.**
- ⇨ **Measures smaller target than sensor's field of view (FOV) i.e. measures weighted peak temperature within FOV.**
- ⇨ **Unaffected by moving targets within FOV.**

APPLICATIONS

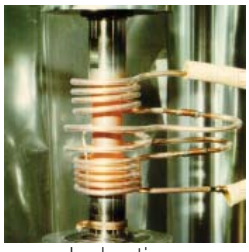
- Induction Heating
- Steel / Metals
- Heat Treating and Annealing
- Kilns
- Vacuum Furnaces
- Welding
- Composites
- Ceramics
- Sintering
- Nuclear
- Research and Development

FEATURES

- Self-Contained, Stand Alone Operation
- Wide Temperature Range Selections from 300 to 3500°C (572 to 6332°F)
- Through Lens Sighting, Laser Aiming, or Video
- Superior Optical Resolution (FOV 250:1)
- Variable Focus Optics For Quick Adjustment
- Fast Response - 2 milliseconds, adjustable
- Simultaneous Analog and Digital Outputs
- Bi-Directional Digital Communications
- Durable IP65 Rated Housing
- Innovative, Rugged Designed Accessories

Typical Applications


Steel Processing


Induction


Kilns

Metis 2-Color Non-contact Infrared Thermometers have universal applications and can also be switched and operated in a 1-Color or single wavelength mode. In 1-Color mode, operators have the choice of deriving the analog output signal from the shorter or longer wavelength or both. Using digital communication, these temperature measurement results can be recorded and compared to quickly determine whether the target is a "gray body" radiator or not. Utilizing Process Sensors' Plug & Play box, the MQ Series can be remotely configured, provide temperature indication, profile trend screen, alarm relays and an assortment of analog and digital outputs, as well as providing a quick disconnect from the sensor to the box.

Table 1: Temperature Ranges and Spectral Responses

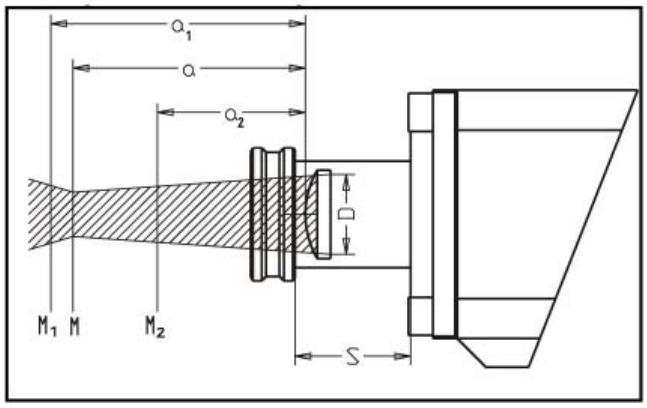
Model	MQ11	MQ22
Spectral Response	0.7 – 1.1 µm	1.45 – 1.8 µm
Temperature Ranges	600 to 1300°C (1112 to 2372°F) 750 to 1800°C (1382 to 2372°F) 800 to 2300°C (1472 to 4172°F) 900 to 2500°C (1652 to 4532°F) 1000 to 3000°C (1832 to 5432°F) 1200 to 3200°C (2192 to 5792°F)	300 to 1000°C (572 to 1832°F) 350 to 1300°C (662 to 2372°F) 400 to 1400°C (752 to 2552°F) 500 to 1800°C (932 to 3272°F) 800 to 2500°C (1472 to 4532°F)



Metis Standard Version

Optical Characteristics

The detector is sensitive to infrared radiation in an area called the Cone of Vision. For the spot size diameter of this area at the shortest, medium and longest distances, when in focus, please refer to **Table 2**. The cone of vision diameter (aperture) at the lens is 17 mm (full scale temperature < 1400°C) and 8 mm for temperature ranges above 1400°C (2552°F). The spot size diameter for distances not given in the table can be calculated by interpolation.



$$M_1 = \frac{a_1}{a}(M+D) - D \qquad M_2 = \frac{a_2}{a}(M-D) + D$$

Table 2: Focusable Lens of Metis Standard Version

Lens Type	Focus Range Distance	Spot Sizes for MQ22 temperature range 300 to 1000°C (572 to 1832°F)	Spot Sizes for all other temperature ranges
OQ11-B0	340 mm	1.5 mm	1 mm
	500 mm	3.1 mm	2 mm
	750 mm	5.0 mm	3.1 mm
	1000 mm	6.9 mm	4.3 mm
	2000 mm	14.3 mm	8.5 mm
	3000 mm	22 mm	13 mm

Fiber-Optic Cable and Lenses

The infrared energy radiated by a target is collimated via the focusable lens either directly onto the Metis detector (standard version) or onto one end of a fiber optic cable. For installations with limited space, there is an adjustable focus miniature lens version. The adjustable focus feature offers the advantage of measuring the smallest spot (focused) or the average temperature of a bigger spot (out of focus) at a user defined distance. The MQ Series lens is BK7 (crown glass). If additional viewing windows are used, they must exhibit good optical transmission characteristics at less than 2 microns.

The spot size of the focusable lenses for use with the Metis MQ Fiber Optic Versions can be taken from **Tables 3 and 4**. The cone of vision diameter (lens aperture) indicated for **Table 3** lenses is 18 mm, and 7 mm in general for **Table 4** lenses. The larger lens assembly OQ25-BO with a diameter of 25 mm provides a smaller spot size and wider focus range than the miniature lens version. Fiber optic versions are equipped with a standard 2.5 m, single mode fiber optic cable, having a core diameter of 0.2 mm, (0.4 mm core for 300 to 1000°C only). Longer cables lengths are available up to 30 meters based on selected temperature ranges.

Focusable Standard Lens—OQ25-BO



Focusable Miniature Lens—OQ12-CO



Table 3: Focusable Standard Lens of Fiber Optic Version

Lens Assembly 25 mm / 1" O.D.	Distance	Spot Size 300 to 1000°C	Spot Size Other temperature ranges
OQ25-B0	140 mm	1 mm	0.5 mm
	500 mm	3.7 mm	2.5 mm
	750 mm	5.6 mm	3.8 mm
	1000 mm	7.7 mm	5 mm
	2000 mm	15.4 mm	10 mm
	3000 mm	23 mm	15 mm

Table 4: Focusable Miniature Lens of Fiber Optic Version

Lens Assembly 12 mm / 0.48" O.D.	Distance	Spot Size 300 to 1000°C	Spot Size Other temperature ranges
OQ12-CO	120 mm	2.2 mm	1.2 mm
	250 mm	5 mm	2.5 mm
	500 mm	12 mm	6 mm

Note: Lens assemblies for shorter distances with smaller spot sizes than shown in Tables 2, 3, 4 may be available upon request. Consult PSC.



Sapphire or Quartz Light probes are available for hard to reach areas and are very prevalent in Semiconductor applications. These can be bare or sheathed with Stainless Steel or Ceramic with wide FOV's of 3:1 or 1:1



Pinpoint the Measurement area with these innovative aiming methods:



Through Lens Sighting Version with Reticle-Defined Target–Great for viewing hot targets and through sight tubes, with dimmable filter for eye protection. Reticle defines spot size of measurement area



Built-in Focusable Red Laser Pointer–Laser provides smallest spot size at focus distance from target. Most popular method, makes focusing quick and easy



Built-in Black and White Video Camera–Facilitates remote viewing and control of the targeted process

Lens focusing procedures

Focusable optics have the flexibility and advantage that the smallest spot size can be achieved at user selectable measurement distance.



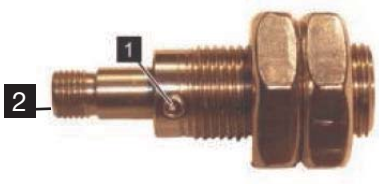
Standard Metis Version: Grasp knurled section on lens focusing tube and turn counterclockwise to loosen. Push in or pull out lens focusing tube to obtain a visibly clear image (through lens or video sighting) or smallest laser point (laser aiming version) at the measuring distance. Turn tube clockwise to lock and secure focus.

Fiber Optic Version: First, loosen the lens position locking knurled nut (1). Then grasp the SMA connector (2) and pull or push in the inner sleeve into the lens assembly. If rear section of lens assembly (inner sleeve) is pressed all the way into forward section of lens assembly, maximum focus distance is obtained. Length increases up to 79 mm when rear sleeve section is withdrawn completely from lens assembly tube (for minimum focus distance).



OQ25-BO Standard Lens Assembly

Miniature Lens Version: Loosen Allen screw (1), grasp SMA connector on fiber optic cable and slide inner sleeve into or out of the lens assembly to achieve smallest laser point at the new focus distance and tighten Allen screw to lock in focus.

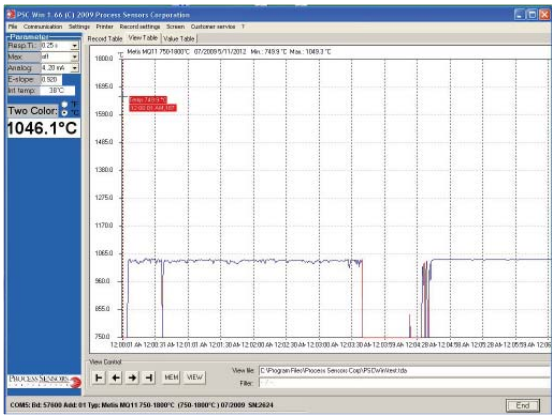


OQ12-CO Miniature Lens Assembly
(not to scale)

Temperature Output Signals: Metis Pyrometers offer a variety of analog and digital output signals for indication, recording, archiving and controlling of measured process temperatures. The isolated analog output is switchable from 4 to 20 mA to 0 to 20mA. The temperature range is scaleable to within the overall temperature range of the IR sensor; minimum span is 50°C. There is a choice of 3 digital communication interfaces: RS232 or RS485 max. 57.6 kBd or Profibus.

Peak Picker Features: For measuring and holding of the highest instant temperature values, a built-in Peak Picker (maximum value storage) is activated to compensate for interruptions in radiation caused by bursts of steam, smoke, dust or spacing between targets. It can be reset automatically or manually by an external contact closure, or periodically by using a preset clear time. In the automatic case, the highest temperature will be held in a dual storage and will be reset in only one of the two storages after the preset clear time to avoid a decrease in the temperature output, in case a short "cold" period occurs at the reset moment.

The Response time is the length of time it takes for the output signal to reach 90% of a step change in measured temperature. It can be adjusted to filter out rapid variations in temperature and achieve a more stable signal for control or display purposes.



The PSCwin Software is available for automatic or manual set up of the pyrometer, for recording, and for saving of graphic or table files. At the same time, these files can be used for quality assurance purposes since the parameter settings are also recorded. Minimum computer requirements are: 500 MHz clock frequency and any Windows® operating system.

Plug & Play Enclosures: For the ultimate in simplicity, the PSC Metis MQ11 and MQ22 are available with a Plug & Play enclosure. The enclosure is a turn key solution to simplify installation, as all the wiring is provided. The first of two Plug & Play enclosures features a 24VDC power supply, 6 foot AC power cord, terminal strip connectors, ON/Off Laser switch, as well as RS232 communications port connection and quick disconnect connectors for the Metis IR sensor head. The second Plug & Play enclosure offers the same features plus a Touch Screen Display that allows set up of all Metis sensor parameters and provides trend screens and optional solid state alarms. Custom modifications are available.



PN#950-060A



PN#950-060A-LCD

Model Selection Guide - Metis MQ11/MQ22

1	2	3	4	5	6	7	8	9	10	11	12
xxxx	xxxx	xxxx	x	x	x	xx	x	x	x	x	x

Block 1: Sensor Model, Spectral Response: MQ11 = 0.7-1.1 µm
MQ22 = 1.45-1.8 µm

Block 2: Beginning Temperature Range: 0300 = 300°C

Block 3: Full Scale Temperature: 1200 = 1200°C Example: 0300 - 1200 = 300°C to 1200°C

Block 4: Method of Aiming: 0 = None
1 = Laser Pointer (Available with non-fiber and fiber-optic versions)
2 = Through the lens viewing (Requires 0 or 2 in Block 9)
3 = B/W Video Camera (Not available with through lens sighting or temperature display)

Block 5: Digital Communication: 1 = RS232
2 = RS485
4 = Profibus Internal
5 = Switchable Communication RS232/RS485 (Requires 1 or 2 in Block 9. Standard with Metis II).

Block 6: Optics/Fiber Optic: 1 = Fixed Focus Optics
2 = Focusable Optics
3 = Fiber Optic Cable 0.2 mm core diameter
4 = Fiber Optic Cable 0.4 mm (starting temp. range of 300°C only)
8 = Remote Controlled Focus

Block 7: Response Time: 23 = 2 ms Adjustable up to 10 s

Block 8: Version: 0 = Standard
1 = Controller Output
7 = Dirty Lens/Dirty Window Detection

Block 9: 0 = Metis I
1 = Metis II with Digital Display
2 = Metis II without Digital Display

Block 10: 0 = None
1 = Additional Analog Output Controller

Block 11: 0 = None
1 = 2 Relays

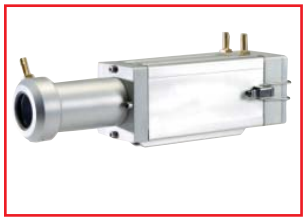
Block 12: Optics Type
Refer to Lens Focus Tables 2, 3 & 4
Example: B = 0Q25-B0

Example:

MQ22-0300-1000-1-1-4-23-0-0-0-0-B

This model number refers to: Model MQ22, temperature range of 300 to 1000ºC, laser pointer, RS232 communication, fiber optic with 0.4mm core diameter, 2 millisecond response and std. Metis Fiber Optic version with focusable optics 0Q25-B0.

Standard and Special Accessories



Water Cooling Jacket with Air Purge
Part No. KG10-00



Swivel Base for Metis Sensor
Part No. HA20-00



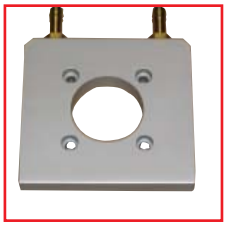
Swivel Base for Water Cooling Jacket
Part No. HA22-00



Adjustable Mounting Bracket
Part No. HA10-00



Fiber Optic Air Purge
Part No. BL14-00



Water Cooled Front Plate
Part No. KG20-00



PVC Interconnecting Cable with USB Connector (RS232)
Part No. AS31-05



PVC Interconnecting Cable with USB Connector (RS485)
Part No. AS10-05



PVC Interconnecting Cable with DB9 Connector
Part No. AK10-05



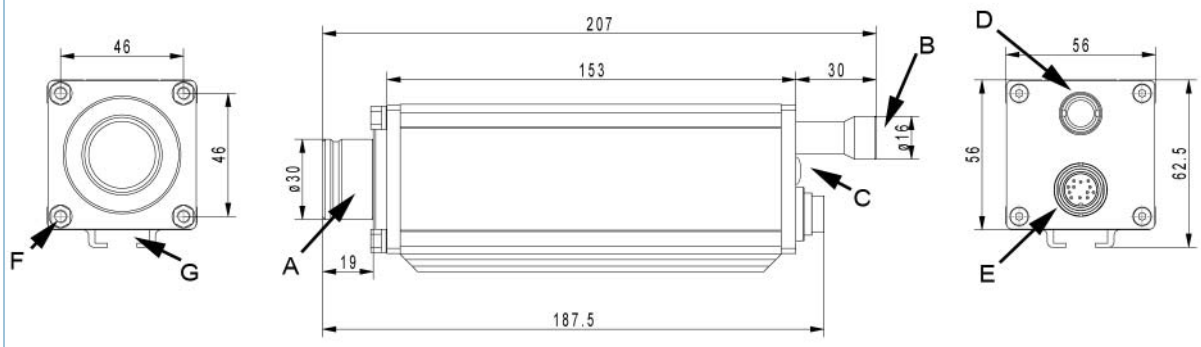
Power Supply
Part No. 950-004

Standard Accessories:	Part No.
5 Meter PVC Interconnecting Cable with USB Connector RS232 Communication	AS31-05
5 Meter PVC Interconnecting Cable with USB Connector RS485 Communication	AS10-05
5 Meter PVC Interconnecting Cable with 90° Connector, Laser Push Button and DB9 Connector	AK10-05
5 Meter PVC Interconnecting Cable with 90° Connector w/o Laser Push Button and DB9 Connector	AK11-05
Adjustable Mounting Bracket	HA10-00
Adjustable Mounting Bracket for Water Cooling Jacket KG10-00	HA12-00
Swivel Mounting Base for Metis Sensing Head	HA20-00
Swivel Mounting Base for Water Cooling Jacket KG10-00	HA22-00
Air Purge Assembly (Mounted to Sensing Head for Fixed Focus Lens)	BL10-00
Air Purge Accessory for Metis Sensing Head with Focusable Lens	BL11-00
Air Purge Assembly (Mounted to Sight Tube of Water Cooling Jacket)	BL12-00
Water Cooling Jacket for Ambient Temperatures Up To 200°C (392°F)	KG10-00
Water Cooled Front Plate for Metis Sensing Head	KG20-00
Protective Hood Including Water Cooled Front Plate	KG31-00
Water Cooling Jacket with Sapphire Window	KG10-04
Power Supply (DIN RAIL) 24VDC @ 1.5 Amps	950-004
Digital Indicator with HI/LOW Alarms	TIC-500

Special Accessories	Item No.
Video Camera Cable Assembly for Metis MQ, length 5 m	AK50-05
5 Meter Teflon High Temperature Cable with 90° Connector and Laser Push Button	AK20-05
Air Purge for Fiber Optic Lens OQ12-CO	BL13-00
Air Purge for Fiber Optic Lens OQ25-BO	BL14-00
Adjustable Mounting Bracket for Fiber Optic Lens OQ12-CO	HA13-00
Adjustable Mounting Bracket for Fiber Optic Lens OQ25-BO	HA14-00
2.5 m Spare Fiber Optic Cable Metis MQ Series, (0.2 mm Core diameter) (except Metis MQ22-300-1000°C)	LL02-02
2.5 m Spare Fiber Optic Cable Metis MQ22-300-1000°C only, (0.4 mm Core diameter)	LL04-02
Plug & Play Enclosure	950-060A
Plug & Play Enclosure with Touch Screen LCD Display	950-060A-LCD

Metis MQ11/Metis MQ22 SPECIFICATIONS & FEATURES

SPECIFICATIONS	
Accuracy: (T_A = 23°C, ε = 1, t_{90} = 1s)	±0.3% of measured value in °C + 1°C Full Scale Temperatures < 1500°C (2732°F) ±0.5% of measured value in °C + 1°C Full Scale Temperatures < 2500°C (4532°F) ±0.7% of measured value in °C + 1°C Full Scale Temperatures < 3200°C (5792°F)
Repeatability:	0.1% of measured value in °C + 1°C (T_A = 23°C, ε = 1, t_{90} = 1 s)
Response Time t_{90}:	2 ms with dynamic adaptation at low signal levels, adjustable up to 10 seconds
Analog Output Signal:	4–20 mA, 0–20mA Switchable, 500 Ω max. load
Digital Interface:	RS232 or RS485 max. 57,6 kBd (Standard Supply), Profibus (optional)
Temperature Resolution:	Analog < 0.1% of Adjusted Temperature Range, Digital 0.1°C
Ambient Temperature Range:	Pyrometer: Operation -10 to 70°C, Storage -20 to 70°C (158°F) Fiber Optic Cable and Lens: 0 to 250°C (482°F)
Slope Adjustment:	0.800 to 1.200 (2 color operation)
Emissivity Adjustment:	0.05 to 1.00 single wavelength
Power Supply:	24 V DC (±15 to 30 VDC)
Isolation:	Power Supply, Analog and Digital Output are galvanically isolated against each other and against housing
Housing and Rating:	Extruded Aluminum Profile, IP 65 per DIN 40 050
Weight:	1 lb. 8 oz. (700 g)
CE Label:	According to EU Directives for Electromagnetic Immunity
Laser Pointer:	650 nm, < 1 mW, Class II per IEC 60825-1-3-4 (Laser version)
Video Camera Module:	NTSC or PAL
Video Signal:	Isolated BAS Signal about 1 VSS at 75 , CCIR Standard, 50 Hz
Resolution:	Black/White 628 x 582 pixel
Field of View:	Approximately 14% x 10% at Focused Distance
Signal Port:	RCA/BNC Connector
Date, Time:	Real Time Clock with 5 year Buffer



A: Focusable Lens
B: Eye Piece (for Models with Sight-Through Optics Only)
C: Operation LED
D: Thru Lens Sighting
E: 12-pin Connector
F: Front-Mount Threads
G: Mounting Rail

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