

MIKRON M390

High temperature blackbody calibration source with temperature range of 300 to 3000°C



AT A GLANCE

The Mikron® M390 ultra-fast high temperature blackbody calibrator is without parallel in its capability to produce very high temperature, high emissivity targets, and at the same time stabilize at the required temperature within a few minutes. The cavity is a graphite tube target with a 25 mm (1") diameter with an effective emissivity of 1.0 from 0.65 to 1.8 μm . Target temperature is sensed by a rapid response Impac® infrared thermometer which drives a PID controller to regulate the target temperature precisely to the desired value.

PRODUCT HIGHLIGHTS

- High effective emissivity 1.0 @ 0.65 to 1.8 μm
- High accuracy
- Excellent stability $\pm 1^\circ\text{C}$ per 8-hour period
- Fast slew rate
- Wide temperature range
- Manufactured and tested to meet rigid quality control standards
- Furnished with certificate of calibration traceable to NIST
- RS232 (standard) or RS485 serial communication output

TYPICAL APPLICATIONS

- Infrared temperature sensors
- Infrared thermal imaging systems
- Spectroradiometers
- High energy photon generators
- Solar radiance simulation
- Optical pyrometer

Temperature Range

M390-A2 – PN 14029-A2
600 to 2300°C (1112 to 4172°F)

M390-B2 – PN 14029-B2
600 to 2600°C (1112 to 4712°F)

M390-C2 – PN 14029-C2
600 to 3000°C (1112 to 5432°F)

M390-L1 – PN 14029-L1
300 to 2000°C (572 to 3632°F)

Measurement Uncertainty

$\pm 0.25\%$ of reading $\pm 1^\circ\text{C}$

Emissivity

Effective 1.0 @ 0.6 to 1.8 μm

Heated Cavity Shape

Closed end graphite tube 292 mm (11.5") long with approximately 127 mm (5") heated length (field replaceable)

Exit Port Diameter

25 mm (1")

OVERVIEW

Blackbody calibration sources are infrared radiators used for calibrating and verifying the output signals of infrared thermometers (pyrometers), thermal imaging systems, heat flux measurement systems, or spectrographic analysis systems. Advanced Energy supplies a unique selection of very precise calibration sources that are traceable to national standards. Quotations for custom designs and variations are available upon request.

Mikron calibration sources have long been the gold standard to calibrate the instruments that keep your operations up and running. These blackbodies are superior because of the emissivity values, homogeneous emission areas, and a wide range

of different sized apertures to adapt to the desired target area. In addition, fast heat-up times and high temperature stability are guaranteed. The quality of our calibration sources is guaranteed by tests, burn-in times, and radiometric calibrations. On most models, a certificate is provided to document the traceability to the international temperature scale ITS90 and NIST.

The source and the controller are housed in separate modules, which allow the source to be positioned in a location remote from the controller such as in an environmental test chamber, or to be used in tests which involve long path lengths. Each module is fitted with a carrying handle and can be comfortably carried to manufacturing plant or field research locations.

TECHNICAL DATA

Measurement Specifications	
Temperature Range ¹	M390-A2 – PN 14029-A2: 600 to 2300°C (1112 to 4172°F)
	M390-B2 – PN 14029-B2: 600 to 2600°C (1112 to 4712°F)
	M390-C2 – PN 14029-C2: 600 to 3000°C (1112 to 5432°F)
	M390-L1 – PN 14029-L1: 300 to 2000°C (572 to 3632°F)
Temperature Uncertainty ²	±0.25% of reading ±1°C
Temperature Resolution	1°C
Stability ³	±1°C
Source Non-Uniformity	Non-uniformity: ±0.1% ± 1°C of reading within the center ½ of diameter
Heated Cavity Shape	Closed end graphite tube 292 mm (11.5”) long with approximately 127 mm (5”) heated length (field replaceable)
Exit Port Diameter	25 mm (1”)
Emissivity ε	1.0 (effective from 0.6 to 1.8 μm)
	~0.96 (effective from 3 to 15 μm)
Calibration Method	Standard: Radiometric (pyrometric)
Temperature Sensor	Custom infrared thermometer Impac IGA 6
Warm-up Time	5 minutes from 600 to 2300°C, typical
Slew Rate to 1°C Stability	~325°C / min 600 to 1100°C
	~700°C / min T > 1100°C

¹ NIST traceable calibration up to 2700°C. Temperatures > 2700°C are provided on a 'best effort' basis only.
² Accuracy calibration performed radiometrically, the uncertainty of emissivity and transfer standard are already included
³ Provided stable AC mains voltage and minimum air flow across the exit port or emitter plate.

TECHNICAL DATA (CONTINUED)

Communication and Electrical Specifications	
Remote Set Point	RS232 serial communication output standard, RS485 optional
Method of Control	Digital PID controller
Power Requirements	M390-A2 – PN 14029-A2: 15k VA 1 ph
	M390-B2 – PN 14029-B2: 15k VA 1 ph
	M390-C2 – PN 14029-C2: 24k VA 1 ph
	M390-L1 – PN 14029-L1: 15k VA 1 ph
	208 to 230 VAC @ 50 and 60 Hz, 15k VA or 24k VA (depends on model)
Power Connector (Customer Supplied) ¹	15k VA: Must use plug that complies with IEC-309 @ 75 Amps @ 220 / 230 VAC
	24k VA: Must use plug that complies with IEC-309 @ 125 Amps @ 220 / 230 VAC

Environmental Specifications	
Operating Ambient Temp	0 to 44°C (32 to 110°F)
Cooling	Water cooled. Standard (garden) hose connections on rear, 3.8 lpm (1 gpm minimum, 2 gpm recommended)
Cooling Inlet Pressure	90 PSI (621 kPa) maximum. Customer is responsible to provide pressure safety valves at inlet and outlet. Outlet (drain) must not be blocked
Purge Gas	Argon High Purity (99.99% pure)
Purge Gas Inlet Pressure	25 PSI (172 kPa) maximum. Customer is responsible to provide over pressure safety valves at inlet
Heating Element Type	Graphite tube with argon gas purge, 226 L/h (8 to 10 cfh)
Operating Humidity	0 to 90% RH non-condensing
Dimensions (H x W x D)	1710 x 560 x 820 mm (67.3 x 22 x 32.3 in)
Weight	182 kg (400 lb)
CE Certified	Yes

¹ Customer supplied direct, fuse box wiring or connectors.

REFERENCE NUMBERS

PN	Description
14029-A2	M390-A2, 600 to 2300°C, 25 mm, 208 to 230 VAC @ 50 and 60 Hz 1 ph 15k VA
14029-B2	M390-B2, 600 to 2600°C, 25 mm, 208 to 230 VAC @ 50 and 60 Hz 1 ph 15k VA
14029-C2	M390-C2, 600 to 3000°C, 25 mm, 208 to 230 VAC @ 50 and 60 Hz 1 ph 24k VA
14029-L1	M390-L1, 300 to 2000°C, 25 mm, 208 to 230 VAC @ 50 & 60 Hz 1 ph 15k VA

ACCESSORIES

PN	Description
14002-1	Cold aperture wheel assembly, 6 apertures 25.4 to 2.54 mm, for M300, M305, M330, M335, M39
14002	Cold aperture wheel assembly, 6 apertures 50 to 1.56 mm, for M300, M305, M330, M335, M390
19140-485	Serial Communication Output RS485 (built-in ex works) for M300, M305, M315X, M335, M345X, M360, M360A, M390
3840820	IGA 12-TSP, 1570 nm, 250" 1400°C, through lens sighting, laser targeting, focusable Optics 2
3840810	IS 12-TSP, 940 nm, 600 to 2520°C, through lens sighting, laser targeting, focusable Optics 2
3840820	IS 12-TSP, 940 nm, 600 to 3000°C, through lens sighting, laser targeting, focusable Optics 2
3840760	IS 12-TSP, 650 nm, 850 to 2520°C, through lens sighting, focusable Optics 2
14880-4SP1	Replacement cavity kit for M390-A2,B2,C2,L1
14880-4SP2	Replacement electrodes, quartz tube, o-rings kit for M390-A2,B2,C2,L1



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ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

AE's power solutions enable customer innovation in complex semiconductor and industrial thin film plasma manufacturing processes, demanding high and low voltage applications, and temperature-critical thermal processes.

With deep applications know-how and responsive service and support across the globe, AE builds collaborative partnerships to meet rapid technological developments, propel growth for its customers and power the future of technology.

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