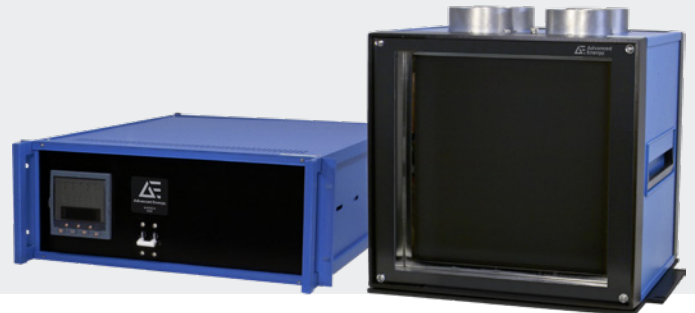


# MIKRON M345X SERIES (X4, X6, X8, AND X12)

Large area blackbody source for low temperatures cooled and heated by precision thermoelectric modules.



Designed to satisfy the exacting parameters of infrared focal plane array detectors, thermal imaging and forward looking infrared (FLIR) systems testing in static and moving scene applications, the Mikron® M345X series blackbody calibration sources combine fast slew rates, high emissivity, and unchallenged stability and uniformity. The M345X series blackbody sources are cooled and heated by precision thermoelectric modules (Peltier method) and are available in absolute or differential configurations. The two piece system is comprised of a bench mount controller and a separate emitter source enclosure.

## PRODUCT HIGHLIGHTS

- High emissivity and uniformity
- Excellent low temperature calibration
- Large aperture sizes
- High accuracy, high resolution
- Manufactured and tested to meet rigid quality control standards

## TYPICAL APPLICATIONS

- Infrared temperature sensors
- Infrared thermal imaging systems
- Spectrographic analyzers
- Radiometers
- Flux meters

## AT A GLANCE

### Temperature Ranges

0.00 to 170°C (X4, X6, and X8)  
0.00 to 150°C (X12)

### Measurement Uncertainty

Radiometric Calibration (standard)  
±1°C @ 8 to 14 μm

Thermometric Calibration (option)  
±0.05°C

### Emissivity

Radiometric Calibration (standard)  
1.00 effective emissivity  
@ 8 to 14 μm

Thermometric Calibration (option)  
@ 8 to 15 μm: 0.9756 ±0.0039  
@ 3 to 5 μm: 0.9713 ±0.0049

### Heated Emitter Shape

Thermally uniform plate

### Aperture Diameter

M345X4: 101 x 101 mm (4" x 4")  
M345X6: 152 x 152 mm (6" x 6")  
M345X8: 203 x 203 mm (8" x 8")  
M345X12: 305 x 305 mm (12" x 12")

OVERVIEW

As part of an extensive range of general purpose and primary standards for testing and calibrating a wide variety of IR devices, the M345X series embodies the accumulated expertise of specialization in this discipline. The sources are available in emitter sizes ranging from 4"x4" (101 x 101 mm) up to 12" x 12" (305 x 305 mm) and in standard temperature range of 0.00 to 170°C (32 to 338°F) or 0.00°C to 150°C (32 to 302°F) for M345X12.

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.

TECHNICAL DATA: M345X4

Measurement Specifications		
Temperature Range	0 to 170°C (32 to 338°F)	
Temperature Uncertainty	Radiometric Calibration (standard):	±1°C @ 8 to 14 μm
	Thermometric Calibration (optional):	±0.05°C
Display Accuracy vs. NIST Calibration	Radiometric Calibration (standard):	±1°C
	Thermometric Calibration (optional):	±0.05°C @ calibration points
Temperature Resolution	0.01°C	
Stability <sup>1</sup>	0.05°C per 8-hour period in still air environment	
Source Non-Uniformity	±0.15°C (excluding 10% border area) up to 50°C, ±0.75°C @ 150°C	
Heated Cavity Shape	Thermally uniform plate	
Exit Port Diameter	101 mm x 101 mm (4" x 4")	
Emissivity ε	Radiometric calibration (standard):	1.00 effective emissivity @ 8 to 14 μm
	Thermometric Calibration (optional):	@ 8 to 15 μm: 0.9756 ±0.0039 and @ 3 to 5 μm: 0.9713 ±0.0049
Calibration Method	Radiometric (standard)	
	Thermometric (optional, must be requested at time of order)	
Temperature Sensor	Precision platinum RTD 1/3 DIN	
Warm-up Time	~15 min from ambient to 100°C	
Slew Rate to 1°C Stability (average)	~5° per min 25°C < T < 100°C	
	~2.5° per min 100°C < T < 170°C	
	~3° per min 0°C < T < 10°C	
Slew Rate to 0.1°C Stability	~10 min for a Δ 10°C setpoint change	

<sup>1</sup> 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
Method of Control	Digital PID controller
Power Requirements	M345X4 (PN 17100-4): 115 VAC @ 50 and 60 Hz
	M345X4 (PN 17100-5): 230 VAC @ 50 and 60 Hz
	M345X4D <sup>1</sup> (PN 17100-4D): 115 VAC @ 50 and 60 Hz

Environmental Specifications	
Operating Ambient Temp <sup>2</sup>	15 to 30°C (59 to 86°F)
Cooling	Fan cooled, air inlet on rear panel
Operating Humidity	Dew point must be lower than blackbody setpoint
Dimensions (H x W x D)	Blackbody: 153 mm x 153 mm x 153 mm (6" x 6" x 6")
	Controller: 195 mm x 432 mm x 576 mm (7.67" x 17" x 22.66")
Weight	Blackbody: 5.44 kg (12 lbs)
	Controller: 15.5 kg (34 lbs)
CE Certified	Yes

- <sup>1</sup> Ambient temperature must be ≤ 20°C to be able to reach 0°C emitter radiance temperature. When operating at ambient temperature of 20°C and need to make the setpoint 0°C, the setpoint must be “walked” down to 0°C.
1. Set the set point to 10°C and wait 2 minutes after it is somewhat stable.
  2. Lower the set point to 5°C, 3°C, 2°C, 1°C, and then 0°C with about a 2 to 4 minute wait between set points. This permits the heat sink to remain cool.
- <sup>1</sup> “D” indicates ‘Differential model’ that has an RTD input for measuring a front plate aperture temperature (both supplied by customer).

REFERENCE NUMBERS

PN	Description
17100-4	M345X4: 0 to 170°C, 101 mm x 101 mm, RS232, 115 VAC @ 50 and 60 Hz
17100-5	M345X4: 0 to 170°C, 101 mm x 101 mm, RS232, 230 VAC @ 50 and 60 Hz
17100-4D	M345X4D: 0 to 170°C, 101 mm x 101 mm, RS232, 115 VAC @ 50 and 60 Hz, Differential BBS. Customer must provide external 100 Ohm RTD and external reference plate

ACCESSORIES

PN	Description
19140-485	Option: Serial Communication Output RS485

TECHNICAL DATA: M345X6 AND M345X8

Measurement Specifications		
Temperature Range	0 to 170°C (32 to 338°F)	
Temperature Uncertainty	Radiometric Calibration (standard):	±1°C @ 8 to 14 μm
	Thermometric Calibration (optional):	±0.05°C
Display Accuracy vs. NIST Calibration	Radiometric Calibration (standard):	±1°C
	Thermometric Calibration (optional):	±0.05°C @ calibration points
Temperature Resolution	0.01°C	
Stability <sup>1</sup>	0.05°C per 8-hour period in still air environment	
Source Non-Uniformity	±0.15°C (excluding 10% border area) up to 50°C, ±0.75°C @ 150°C	
Heated Cavity Shape	Thermally uniform plate	
Exit Port Diameter	M345X6: 152 mm x 152 mm (6" x 6")	
	M345X8: 203 mm x 203 mm (8" x 8")	
Emissivity ε	Radiometric calibration (standard):	1.00 effective emissivity @ 8 to 14 μm
	Thermometric Calibration (optional):	@ 8 to 15 μm: 0.9756 ±0.0039 and @ 3 to 5 μm: 0.9713 ±0.0049
Calibration Method	Radiometric (standard)	
	Thermometric (optional, must be requested at time of order)	
Temperature Sensor	Precision platinum RTD 1/3 DIN	
Warm-up Time	~15 min from ambient to 100°C	
Slew Rate to 1°C Stability (average)	M345X6 Versions	~15° per min 25°C < T < 100°C
		~11° per min 100°C < T < 170°C
		~9° per min 0°C < T < 10°C
	M345X8 Versions	~12° per min 25°C < T < 100°C
		~10° per min 100°C < T < 170°C
		~6° per min 0°C < T < 10°C
Slew Rate to 0.1°C Stability	~10 min for a Δ 10°C setpoint change	

Environmental Specifications	
Operating Ambient Temp <sup>2</sup>	15 to 30°C (59 to 86°F)
Cooling	Fan cooled, air inlet/outlet on top panel
Operating Humidity	Dew point must be lower than blackbody setpoint
Dimensions (H x W x D)	Blackbody: 279.4 mm x 254 mm x 381 mm (11" x 10" x 15")
	Controller: 195 mm x 432 mm x 576 mm (7.67" x 17" x 22.66")
Method of Mounting	Bench
Blackbody Weight	M345X6: 13.1 kg (29 lbs)
	M345X8: 15.9 kg (35 lbs)
Controller Weight	15.5 kg (34 lbs)
CE Certified	Yes

- 1 Provided stable AC mains voltage and minimum air flow across the exit port or emitter plate
- 2 Ambient temperature must be ≤ 20°C to be able to reach 0°C emitter radiance temperature. When operating at ambient temperature of 20°C and need to make the setpoint 0°C, the setpoint must be "walked" down to 0°C.
  1. Set the set point to 10°C and wait 2 minutes after it is somewhat stable.
  2. Lower the set point to 5°C, 3°C, 2°C, 1°C, and then 0°C with about a 2 to 4 minute wait between set points. This permits the heat sink to remain cool.
  3. To minimize hot exhaust air from looping back to the cool air inlets, which will hinder its low temperature capability, it is recommended to add two, 2 foot long hoses connected to either the inlets or outlets.

**TECHNICAL DATA (CONTINUED)**

Communication and Electrical Specifications	
Remote Set Point	RS232
Method of Control	Digital PID controller
Power Requirements	M345X6 (PN 16770-2): 115 VAC @ 50 and 60 Hz
	M345X6 (PN 16770-3): 230 VAC @ 50 and 60 Hz
	M345X8 (PN 17435-4): 115 VAC @ 50 and 60 Hz
	M345X8 (PN 17435-7): 230 VAC @ 50 and 60 Hz

**REFERENCE NUMBERS**

PN	Description
16770-2	M345X6: 0 to 170°C, 152 mm x 152 mm, RS232, 115 VAC @ 50 and 60 Hz
16770-3	M345X6: 0 to 170°C, 152 mm x 152 mm, RS232, 230 VAC @ 50 and 60 Hz
17435-4	M345X8: 0 to 170°C, 203 mm x 203 mm, RS232, 115 VAC @ 50 and 60 Hz
17435-7	M345X8: 0 to 170°C, 203 mm x 203 mm, RS232, 230 VAC @ 50 and 60 Hz

**ACCESSORIES**

PN	Description
19140-485	Option: Serial Communication Output RS485

TECHNICAL DATA: M345X12

Measurement Specifications		
Temperature Range	0 to 150°C (32 to 302°F)	
Temperature Uncertainty	Radiometric Calibration (standard):	±1°C @ 8 to 14 μm
	Thermometric Calibration (optional):	±0.05°C
Display Accuracy vs. NIST Calibration	Radiometric Calibration (standard):	±1°C
	Thermometric Calibration (optional):	±0.05°C @ calibration points
Temperature Resolution	0.01°C	
Stability <sup>1</sup>	0.1°C per 8-hour period in still air environment	
Source Non-Uniformity	±0.15°C (excluding 10% border area) up to 50°C, ±0.75°C @ 150°C	
Heated Cavity Shape	Thermally uniform plate	
Exit Port Diameter	305 mm x 305 mm (12" x 12")	
Emissivity ε	Radiometric calibration (standard):	1.00 effective emissivity @ 8 to 14 μm
	Thermometric Calibration (optional):	@ 8 to 15 μm: 0.9756 ±0.0039 and @ 3 to 5 μm: 0.9713 ±0.0049
Calibration Method	Radiometric (standard)	
	Thermometric (optional, must be requested at time of order)	
Temperature Sensor	Precision platinum RTD 1/3 DIN	
Warm-up Time	~15 min from ambient to 100°C	
Slew Rate to 1°C Stability (average)	~7° per min 25°C < T < 100°C,	
	~4° per min 100°C < T < 150°C	
	~3° per min 0°C < T < 10°C	
Slew Rate to 0.1°C Stability	~10 min for a Δ 10°C setpoint change	

Environmental Specifications	
Operating Ambient Temp <sup>2</sup>	15 to 30°C
Cooling	Fan cooled, air inlet/outlet on top panel
Operating Humidity	Dew point must be lower than blackbody setpoint
Dimensions (H x W x D)	Blackbody: 400 mm x 400 mm x 355.6 mm (15.75" x 15.75" x 14")
	Controller: 195 mm x 432 mm x 576 mm (7.67" x 17" x 22.66")
Method of Mounting	Bench
Weight	Blackbody: 24 kg (52 lbs)
	Controller: 15.5 kg (34 lbs)
CE Certified	Yes

Communication and Electrical Specifications	
Remote Set Point	RS232
Method of Control	Digital PID controller
Power Requirements	PN 16700-11: 115 VAC @ 50 and 60 Hz
	PN 16700-22: 230 VAC @ 50 and 60 Hz

<sup>1</sup> Provided stable AC mains voltage and minimum air flow across the exit port or emitter plate

<sup>2</sup> Ambient temperature must be ≤ 20°C to be able to reach 0°C emitter radiance temperature. When operating at ambient temperature of 20°C and need to make the setpoint 0°C, the setpoint must be "walked" down to 0°C.

1. Set the set point to 10°C and wait 2 minutes after it is somewhat stable.
2. Lower the set point to 5°C, 3°C, 2°C, 1°C, and then 0°C with about a 2 to 4 minute wait between set points. This permits the heat sink to remain cool.
3. To minimize hot exhaust air from looping back to the cool air inlets, which will hinder its low temperature capability, it is recommended to add two, 2 foot long hoses connected to either the inlets or outlets.

## REFERENCE NUMBERS

PN	Description
16700-11	0 to 150°C, 305 mm x 305 mm, RS232, 115 VAC @ 50 and 60 Hz
16700-22	0 to 150°C, 305 mm x 305 mm, RS232, 230 VAC @ 50 and 60 Hz

## ACCESSORIES

PN	Description
19140-485	Option: Serial Communication Output RS485



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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.

PRECISION | POWER | PERFORMANCE

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