

Large area blackbody source for low temperatures cooled and heated by precision thermoelectric modules. 0 ... 170 °C (32 ... 338 °F)

M345X (X4, X6, X8, X12)

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



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. LumaSense supplies a unique selection of very precise calibration sources that are traceable to national standards.

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, LumaSense's M345X Series blackbody calibration sources combine fast slew rates, high emissivity, and unchallenged stability and uniformity. 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 almost 30 years of specialization in this discipline.

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.

The sources are available in emitter sizes ranging from 4x4 inch (101 x 101 mm) up to 12 x 12 inch (305 x 305 mm) and in standard temperature range of 0.00 °C to 170 °C (32 to 338 °F) or 0.00 °C to 150 °C (32 to 302 °F) for M345X12.

LumaSense 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.

Typical Applications

- Infrared Temperature Sensors
- Infrared Thermal Imaging Systems
- Spectrographic Analyzers
- Radiometers
- Flux Meters

Technical Data - M345X4

Measurement Specifications

Temperature Range:	0 ... 170 °C (32 ... 338 °F)
Temperature Uncertainty:	Radiometric Calibration (standard): ± 1 °C @ 8 ... 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 ¹ :	0.05 °C per 8 hours 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:	Radiometric calibration (standard): 1.00 effective emissivity @ 8 ... 14 µm Thermometric Calibration (optional): @ 8 ... 15 µm: 0.9756 ± 0.0039 @ 3 ... 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%/ min 25 °C < T < 100 °C, ~2.5%/ min 100 °C < T < 170 °C, ~3%/ min 0 °C < T < 10 °C
Slew Rate to 0.1 °C Stability:	~10 min for a Δ 10 °C setpoint change

Communications/Interface

Remote Set Point:	RS232
Method of Control:	Digital PID Controller

Environmental Specifications

Operating Ambient Temperature ² :	15 °C ... 30 °C
Cooling:	Fan cooled, air outlet on rear panel
Operating Humidity:	Dew point must be lower than BB setpoint
Blackbody Dimensions (H x W x D):	153 x 153 x 153 mm (6" x 6" x 6")
Controller Dimensions (H x W x D):	195 mm x 432 mm x 576 mm (7.67" x 17" x 22.66")
Method of Mounting:	Bench
Blackbody Weight:	12 lbs (5.44 kg)
Controller Weight:	34 lbs (15.5 kg)
CE Certified:	Yes

Electrical

Power Requirements:	M345X4 – PN 17100-4: 115 V AC @ 50 & 60 Hz M345X4 – PN 17100-5: 230 V AC @ 50 & 60 Hz M345X4D ³ – PN 17100-4D: 115 V AC @ 50 & 60 Hz
---------------------	--

¹Provided stable AC mains voltage and minimum air flow across the exit port or emitter plate.

²Ambient 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 ... 4 minute wait between set points. This permits the heat sink to remain cool.

³"D" indicates 'Differential model' that has an RTD input for measuring a front plate aperture temperature (both supplied by customer).

Reference Numbers

17100-4 M345X4: 0 ... 170 °C, 101 x 101 mm, RS232, 115 V AC @ 50 & 60 Hz

17100-5 M345X4: 0 ... 170 °C, 101 x 101 mm, RS232, 230 V AC @ 50 & 60 Hz

17100-4D M345X4D: 0 ... 170 °C, 101 x 101 mm, RS232, 115 V AC @ 50 & 60 Hz, Differential BBS. Customer must provide external 100 Ohm RTD and external reference plate

Accessories

19140-485 Option: Serial Communication Output RS485

Technical Data - M345X (X6 & X8)

Measurement Specifications

Temperature Range:	0 ... 170 °C (32 ... 338 °F)
Temperature Uncertainty:	Radiometric Calibration (standard): ± 1 °C @ 8 ... 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 ¹ :	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:	Radiometric calibration: 1.00 effective emissivity @ 8 ... 14 µm Thermometric Calibration: @ 8 ... 15 µm: 0.9756 ± 0.0039 @ 3 ... 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%/ min 25 °C < T < 100 °C, ~11%/ min 100 °C < T < 170 °C, ~9%/ min 0 °C < T < 10 °C M345X8 Versions: ~12%/ min 25 °C < T < 100 °C, ~10%/ min 100 °C < T < 170 °C, ~6%/ min 0 °C < T < 10 °C
Slew Rate to 0.1 °C Stability:	~10 min for a Δ 10 °C setpoint change

Communications/Interface

Remote Set Point:	RS232
Method of Control:	Digital PID Controller

Environmental Specifications

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

Electrical

Power Requirements:	M345X6 – PN 16770-2: 115 V AC @ 50 & 60 Hz M345X6 – PN 16770-3: 230 V AC @ 50 & 60 Hz M345X8 – PN 17435-4: 115 V AC @ 50 & 60 Hz M345X8 – PN 17435-7: 230 V AC @ 50 & 60 Hz
---------------------	--

¹Provided stable AC mains voltage and minimum air flow across the exit port or emitter plate.

²Ambient temperature must be ≤ 20 °C to be able to reach 0 °C emitter radiance temperature. Inlet ducts may be connected to a cool source of air at the top of the blackbody if necessary. 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 ... 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

16770-2	M345X6: 0 ... 170 °C, 152 x 152 mm, RS232, 115 V AC @ 50 & 60 Hz	17435-4	M345X8: 0 ... 170 °C, 203 x 203 mm, RS232, 115 V AC @ 50 & 60 Hz
16770-3	M345X6: 0 ... 170 °C, 152 x 152 mm, RS232, 230 V AC @ 50 & 60 Hz	17435-7	M345X8: 0 ... 170 °C, 203 x 203 mm, RS232, 230 V AC @ 50 & 60 Hz

Accessories

19140-485 Option: Serial Communication Output RS485

Technical Data - M345X12

Measurement Specifications

Temperature Range:	0 ... 150 °C (32 ... 302 °F)
Temperature Uncertainty:	Radiometric Calibration (standard): ± 1 °C @ 8 ... 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 ¹ :	0.1 °C per 8 hours 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:	Radiometric calibration: 1.00 effective emissivity @ 8 ... 14 µm Thermometric Calibration: @ 8 ... 15 µm: 0.9756 ± 0.0039 @ 3 ... 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%/min 25 °C < T < 100 °C, ~4%/min 100 °C < T < 150 °C, ~3%/min 0 °C < T < 10 °C descending
Slew Rate to 0.1 °C Stability:	~10 min for a Δ 10 °C setpoint change

Communications/Interface

Remote Set Point:	RS232
Method of Control:	Digital PID Controller

Environmental Specifications

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

Electrical

Power Requirements:	PN 16700-11: 115 V AC @ 50 & 60 Hz PN 16700-22: 230 V AC @ 50 & 60 Hz
---------------------	--

¹Provided stable AC mains voltage and minimum air flow across the exit port or emitter plate.

²Ambient temperature must be ≤ 20 °C to be able to reach 0 °C emitter radiance temperature. Inlet ducts may be connected to a cool source of air at the top of the blackbody if necessary. 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 ... 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

16700-11 0 ... 150 °C, 305 x 305 mm, RS232, 115 V AC @ 50 & 60 Hz

16700-22 0 ... 150 °C, 305 x 305 mm, RS232, 230 V AC @ 50 & 60 Hz

Accessories

19140-485 Option: Serial Communication Output RS485

LumaSense Technologies | An Advanced Energy Company

Temperature and Gas Sensing Solutions

Americas, Australia, Asia
Sales & Service
Santa Clara, CA
Ph: +1 800 631 0176
Fax: +1 408 727 1677

Europe, Middle East, Africa
Sales & Service
Frankfurt, Germany
Ph: +49 69 97373 0
Fax: +49 69 97373 167

India
Sales & Support Center
Mumbai, India
Ph: +91 22 67419203
Fax: +91 22 67419201

China
Sales & Support Center
Shanghai, China
Ph: +86 133 1182 7766
Ph: +86 21 5899 7915

info@lumasenseinc.com

www.lumasenseinc.com

LumaSense Technologies, Inc., reserves the right to change the information in this publication at any time.

©2018 LumaSense Technologies - M345X Blackbody Datasheet-EN - Rev. 11/27/2018
All rights reserved. LumaSense Technologies, Inc., a subsidiary of Advanced Energy Industries, Inc.