LUMASENSE™
TECHNOLOGIES

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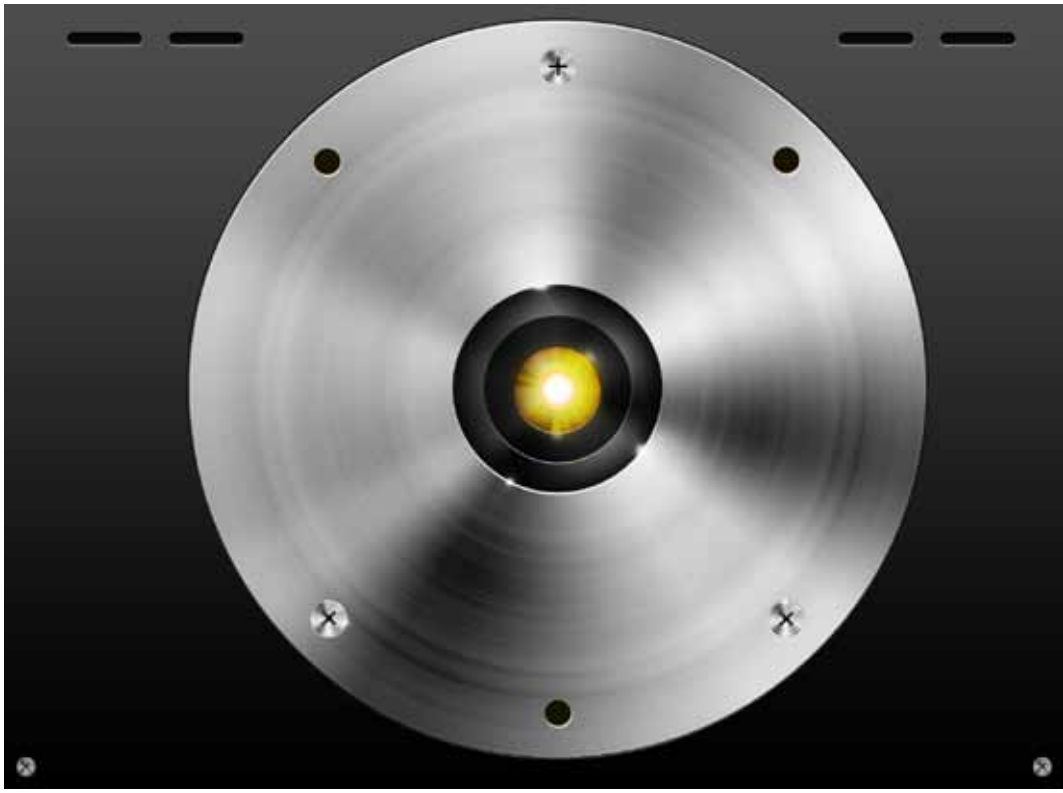

TEMPERATURE CALIBRATION SOURCES

Highly accurate calibration equipment for pyrometers, thermal imaging cameras, radiometers, heatflux and spectrographic measurement sytems.

Calibration sources are infrared radiators with fixed or adjustable temperatures, which are used for the calibration or verification of the correct temperature indication of pyrometers, thermal imaging systems, heatflux measurement systems or spectrographic analysis systems. Depending on the model of the calibration source, single temperature points or temperature curves of an infrared measurement device can be monitored and recorded.

LumaSense Technologies, Inc. supplies a unique selection of very precise calibration sources that are traceable to national standards. LumaSense 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 pyrometric calibrations. If possible, a certificate is provided to document the traceability to the international temperature scale ITS90.

Portable Versions

Type	M316	Mobile Calibration Unit
		*(If used with IGA-12-C Control Pyrometer) CE 
Temperature Ranges	**($T_{ambient}$+5°C) ... 300°C**	***250 ... 1300°C** ***550 ... 1300°C**
Benefits	Two piece ultra-portable calibration source with indicating controller.	Extremely fast, mobile calibration unit with control pyrometer and laptop /calibration software.
Heated emitter shape	Thermally uniform plate	Thermally uniform plate
Standard calibration method	pyrometric	pyrometric [3]
Emissivity (ε_{eff}=effective / ε=real)[1] in calibration spectral range[2]	ε_{eff} = 1.00 8 - 14 µm	ε_{eff} = 1.00 0.78 - 1.1 µm / 1.45 - 1.7 µm
Aperture diameter/ Surface area	57 mm	10 mm
Temperature uncertainty	±0.5% of reading ±1°C	0.3°C
Average warm-up time	10 minutes from room temperature to 200°C	< 5 s (1300°C)
Dimensions (HxWxD) / Weight:	Blackbody Module: 203 mm x 89 mm x 98 mm Controller: 102 mm x 178 mm x 127mm Blackbody Module: 0.82kg (1.8 lbs.) Controller: 1.2kg (2.7 lbs.)	Calibration unit: 368 mm x 443 mm x 634 mm / 40 kg Control pyrometer: 135.5 mm x 78.5 mm x 255 mm

Low Temperature Versions up to 150°C (302°F)

Type	IRC 45...IRC 150	M340
	CE 	CE 
Temperature Ranges	**45°C** (IRC 45) **70°C** (IRC 70) **75°C** (IRC 75) **95°C** (IRC 95) **100°C** (IRC 100) **110°C** (IRC 110) **120°C** (IRC 120) **140°C** (IRC 140) **150°C** (IRC 150)	**-20 ... 150°C**
Benefits	Small, easy to use. Large surface area and fixed temperature. Ideal for benches and multiple, calibration fix temperature setpoints. Minimum temperature deviation.	Compact, portable, for low temperatures. Very high temperature stability. Optional calibration port versions available.
Heated emitter shape	Thermally uniform plate	Thermally uniform plate
Standard calibration method	contact-thermometric	pyrometric
Emissivity (ε_{eff}=effective / ε=real)[1] in calibration spectral range[2]	ε= 0.98 ± 0.004 2 - 5.4 µm; 8 - 14 µm	ε_{eff} = 1.00 8 - 14 µm
Aperture diameter/ Surface area	50.8 mm	51 mm / 2 inches
Temperature uncertainty	0.4°C (IRC 45-120); 0.5°C (IRC 140,150)	1°C
Average warm-up time	max. 5 (IRC 45) up to 30 min. (IRC 150)	6 min (to -15 or 100°C)
Dimensions (HxWxD) / Weight:	143.5 mm x 81 mm x 64.5 mm / 0.85 kg	167 mm x 280 mm x 280 mm / 7.1 kg

1) For radiometric calibrated sources, the emissivity tolerances are included in the temperature uncertainty value.
2) For emissivities of other wavelength temperature correction tables are available, see „Technical Specifications".
3) Large area calibration sources with temperatures up to 400°C can optionally be calibrated thermometrically.

Low Temperature Versions up to 450°C (842°F)

Type	M310-HT	M315-HT
		
Temperature Ranges	**($T_{ambient}$+5°C) ... 450°C**	**($T_{ambient}$+5°C) ... 450°C**
Benefits	Compact, portable calibration source with very large surface area.	M310-HT with 2 separate modules for increased flexibility in positioning in limited space environments.
Heated emitter shape	Thermally uniform plate	Thermally uniform plate
Standard calibration method	pyrometric	pyrometric
Emissivity (ε_{eff}=effective / ε=real)[1] in calibration spectral range[2]	ε_{eff} = 1.00 8 - 14 µm	ε_{eff} = 1.00 8 - 14 µm
Aperture diameter/ Surface area	76 mm / 3 inches	76 mm / 3 inches
Temperature uncertainty	0.25% of reading +1°C	0.25% of reading +1°C
Average warm-up time	30 min (to 300°C)	30 min (to 300°C)
Dimensions (HxWxD) / Weight:	178 mm x 279 mm x 178 mm / 5.6 kg	Calibration source: 178 mm x 279 mm x 178 mm / 4.9 kg Controller: 178 mm x 279 mm x 178 mm / 3.2 kg

Large Area Versions

M315X, -HT (X4, X6, X8, X12)	**M345X** (X4, X4D, X6, X8, X12)	**M345X-LC** (X4, X6, X8)
		
($T_{ambient}$+5°C) ... 400°C **($T_{ambient}$+5°C) ... 600°C** (M315X-HT)	**0 ... 170°C** (X4, X4D, X6, X8) **0 ... 150°C** (X12)	**-40 ... 100°C**
Large area sources for calibrating thermal imaging systems, aerial mapping / surveillance equipment and spectrophotometers.	Large area sources for low temperatures. Cooled and heated by precision thermoelectric modules.	Liquid cooled version of M345X for very low temperatures.
Thermally uniform plate	Thermally uniform plate	Thermally uniform plate
pyrometric[3]	pyrometric[3]	Thermometric only
400°C version: ε_{eff} = 1.00, 8 - 14 µm HT Version: ε_{eff} = 1.00, 1 - 1.7 µm; ε_{eff} = 0.975, 8 - 14 µm	ε_{eff} = 1.00 8 - 14 µm	0.9756 @ 8-15 µm 8 - 14 µm
X4: 101 mm x101 mm; X6: 152 mm x152 mm; X8: 203 mm x203 mm; X12: 305 mm x 305 mm	X4/X4D: 101 mm x 101 mm; X6: 152 mm x 152 mm; X8: 203 mm x 203 mm; X12: 305 mm x 305 mm	X4: 101 mm x 101 mm; X6: 152 mm x 152 mm; X8: 203 mm x 203 mm
1°C (<100°C) to 1.3°C (at 400°C)	1°C	1°C
60 min (to 400°C, 600°C)	10 min (to 100°C)	15 min (X4, X6 to -40°C; X8, X12 to -20°C)
X4: 280 mm x 254 mm x 280 mm to X12: 510 mm x 660 mm x 585 mm Controller: 178 mm x 483 mm x 593 mm	X4/X4D: 153 mm x153 mmx153 mm to X12: 400 mm x 400 mm x 356 mm Controller: 178 mm x 483 mm x 593 mm	X4: 197 mm x 190 mm x 165 mm X8: 267 mm x 254 mm x 203 mm Controller: 178 mm x 483 mm x 593 mm

1) For radiometric calibrated sources, the emissivity tolerances are included in the temperature uncertainty value.
2) For emissivities of other wavelength temperature correction tables are available, see „Technical Specifications".
3) Large area calibration sources with temperatures up to 400°C can optionally be calibrated thermometrically.

Mid Temperature Versions up to 1150°C (2102°F)

Type	M300	M305	M360
			
Temperature Ranges	**200 ... 1150°C**	**100 ... 1000°C**	**50 ... 1100°C**
Benefits	Large calibration source with high emissivity for calibration indipendent of the wavelength.	Compact design of the M300 with smaller cavity shape and temperature range.	Very wide temperature range. 2 separate, portable modules.
Heated emitter shape	Spherical	Spherical	Spherical
Standard calibration method	pyrometric	pyrometric	pyrometric
Emissivity (ε_{eff}=effective / ε=real)[1] in calibration spectral range[2]	ε_{eff} = 1.00 0.65 - 15 µm	ε_{eff} = 1.00 8 - 14 µm (<230°C); 0.7-1.8 µm (>230°C)	ε_{eff} = 1.00 8 - 14 µm (< 230°C); 0.7 - 1.8 µm (> 230°C)
Aperture diameter/ Surface area	51 mm	25 mm	25 mm
Temperature uncertainty	0.25% of reading +1°C	0.2% of reading +1°C	0.2% of reading +1°C
Average warm-up time	60 min (to 1000°C)	40 min (to 700°C)	60 min (to 700°C)
Dimensions (HxWxD) / Weight:	640 mm x 500 mm x 550 mm / 80 kg	270 mm x 430 mm x 370 mm / 25 kg	Calib. source: 305 mm x 273 mm x 368 mm / 17.8 kg Controller: 167 mm x 280 mm x 280 mm / 5 kg

High Temperature Versions

Type	M330-US / M330-EU	M335	M390
			
Temperature Ranges	**300 ... 1700°C**	**300 ... 1500°C**	**600 ... 2300°C** (A1; A2) **600 ... 2600°C** (B1; B2) **600 ... 3000°C** (C1; C2) **300 ... 2000°C** (L1) **600 ... 3000°C** (S; 2 piece)
Benefits	High temperature calibration source with specially manufactured heating elements.	High temperature, very quick heat-up time.	Calibration source for extremely high temperatures at very quick heat-up time.
Heated emitter shape	Closed end tube	Closed end tube	Closed end tube
Standard calibration method	pyrometric	pyrometric	pyrometric
Emissivity (ε_{eff}=effective / ε=real)[1] in calibration spectral range[2]	ε_{eff} = 1.00 0.65 - 1.8 µm	ε_{eff} = 1.00 0.65 - 1.8 µm	ε_{eff} = 1.00 0.6 - 1.8 µm ε_{eff} = 0.96 3 - 15 µm
Aperture diameter/ Surface area	25 mm	16.5 mm	16 mm (A1, B1, C1); 25 mm (A2, B2, C2, S)
Temperature uncertainty	0.25% of reading +1°C	0.4% of reading +1°C	0.25% of reading +1°C
Average warm-up time	45 min (up to 300°C) 80 min (300-1600°C)	30 min (to 1200°C)	5 min (to 2300°C)
Dimensions (HxWxD) / Weight:	640 mm x 500 mm x 550 mm / 80 kg	290 mm x 495 mm x 550 mm / 28 kg	1710 mm x 560 mm x 820 mm / 182 kg

1) For radiometric calibrated sources, the emissivity tolerances are included in the temperature uncertainty value.
2) For emissivities of other wavelength temperature correction tables are available, see „Technical Specifications".
3) Large area calibration sources with temperatures up to 400°C can optionally be calibrated thermometrically.

Reference Numbers

Type	Interface	115 V AC	208 V AC	230 V AC
Portable Versions				
M316	–	14499	–	14499-2
Large Area Versions				
M315X4-HT	RS232	19230-3	–	19230-1
M315X6-HT	RS485	–	–	19100-4
M315X8-HT	RS232	–	19200-4 (NA)	19200-5 (EU)
M315X12-HT	RS232	–	18769-4 (NA)	18769-3 (EU)
M315X4	RS232[3]	19180-4	–	19180-1
M315X6	RS232[3]	19100-3	–	–
M315X8	RS232[3]	19200-7	–	–
M315X12	RS232[3]	–	–	19080-5
M345X4	RS232[3]	17100-4	–	17100-5
M345X4D	RS232[3]	17100-4D	–	17100-5D
M345X6	RS232[3]	16770-2	–	16770-3
M345X8	RS232[3]	17435-4	–	17435-7
M345X12	RS232[3]	16700-11	–	16700-22
M345X4-LC	RS485	17100-7F	–	–
M345X6-LC	RS232	20214-1	–	20214-2
M345X8-LC	RS232	20253-1	–	20253-250
Low Temperature Versions up to 150°C (302°F)				
IRC 45	–	–	–	3 891 130
IRC 70	–	–	–	3 891 140
IRC 75	–	–	–	3 891 150
IRC 95	–	–	–	3 891 160
IRC 100	–	–	–	3 891 170
IRC 110	–	–	–	3 891 180
IRC 120	–	–	–	3 890 410
IRC 140	–	–	–	3 891 190
IRC 150	–	–	–	3 891 200
M340	–[1]	14750-4	–	14750-5
Low Temperature Versions up to 450°C (842°F)				
M310-HT	RS232	14760-111202	–	14760-221212
M315-HT	–	14960-4	–	14960-3
Mid Temperature Versions up to 1150°C (2102°F)				
M300	RS232[3]	–	–	18680-3
M305	RS232[3]	14430-1	–	14430-2
M360	RS232[3]	14920-1	–	14920-2
High Temperature Versions				
M330-US	RS232	–	–	18670-1 (NA)
M330-EU	RS232	–	–	3 801 200
M335	RS232[3]	14900-1	–	14900-2
M390-A1	–[3]	–	–	14029-A1
M390-A2	–[3]	–	–	14029-A2
M390-B1	–[3]	–	–	14029-B1
M390-B2	–[3]	–	–	14029-B2
M390-C1	–[3]	–	–	14029-C1
M390-C2	–[3]	–	–	14029-C2
M390-L1	–[3]	–	–	14029-L1
M390-S	–[3]	–	–	18519-1

1) Optional with RS232 or RS485 2) Optional with RS232 3) Optional with RS485 4) With optional calibration port

Additional Models and Options

3 890 420	Case for IRC calibration sources (IRC 45 - 150)
3 826 600	Infrared radiation unit for mobile calibrations, with metal band, up to 1300°C (RS232/485, 400 V AC)
3 826 610	Laptop for mobile infrared radiation unit, incl. USB-RS232-converter and Software InfraJust (installed)
3 826 380	Calibration Software InfraJust
3 826 620	Replacement metal band for mobile infrared radiation unit, up to 1300°C
3 826 630	Pyrometer adjustment base for mobile infrared radiation unit
3 840 400	IS 12-C Control Pyrometer f. mobile infrared radiation unit, 550 - 1300°C, through-lens-sighting, laser targeting, adjustment base, connect. cable
3 840 410	IGA 12-C Control Pyrometer f. mobile infrared radiation unit, 250 - 1300°C, through-lens-sighting, laser targeting, adjustment base, connec. cable
3 840 710	IS 12-TSP Transfer-Standard-Pyrometer, 940 nm, 600 - 2520°C
3 840 720	IS 12-TSP Transfer-Standard-Pyrometer IS, 940 nm, 600 - 3000°C
3 840 760	IS 12-TSP Transfer-Standard-Pyrometer IS, 650 nm, 850 - 2520°C
3 840 810	IS 12-TSP Transfer-Standard-Pyrometer 1570 nm, 200 - 1020°C
3 840 820	IS 12-TSP Transfer-Standard-Pyrometer, 1570 nm, 250 - 1400°C
19140-485	Option: serial communication output RS485 for M300, M305, M315X, M335, M345X, M360, M360A, M390
15479-485	Option: serial communication output RS485 for M340
15479-232	Option: built-in serial communication output RS232 for M315
14002-1	Cold aperture wheel assembly, 6 apertures 25.4 - 2.54 mm, for M300, M305, M330, M335, M390
14002	Cold aperture wheel assembly, 6 apertures 50 - 1.56 mm, for M300, M305, M330, M335, M390
6 894 030	Universal mounting flange

Accessories

To calibrate or verify the field of view of pyrometers, radiation measurement devices or thermal imagers, apertures of defined diameters are needed in the majority of cases.

With the water-cooled wheel assembly 2 models each with 6 different diameters from 2.54 mm to 25.4 mm or 2 to 50 mm are available, which can be easily attached to calibration sources. Different diameters are selectable by rotating the aperture. The wheel assembly is cooled by water or dry air to reduce the influence of the background temperature.

Transfer-Standard-Pyrometer

The accuracy of a calibration source is likely to drift over the course of time from the defined specification. If high accuracy is needed in the long term, verification of the radiator on a regular basis is mandatory.

This verification is achieved by using a special pyrometer which is built to meet the high accuracy specifications and is used to transfer temperature data from a primary infrared source to other calibration sources.

This high accuracy is achieved by the IMPAC transfer standard pyrometer IS 12-TSP or IGA 12-TSP. It is specifically designed for exact verification of a blackbody source. The TSP instruments are available for temperature measurement between 200 and 2550°C. Featuring a resolution of only 0.01°C (10 mK) and the required extremely high accuracy and long term stability, this unit provides the basis for a reliable and long lasting operation of a calibration-source and guarantees the back-traceability to the international temperature scale ITS90.

To guarantee the sophisticated specifications of the TSP pyrometer, it should be returned to LumaSense Technologies for inspection on a regular basis. Due to the robust design of the unit, we recommend inspection intervals of two years.

IS 12-TSP
with power supply and robust carrying case

IS 12-TSP
IGA 12-TSP

Technical Specifications

Temperature range

Calibration sources are available for temperature ranges from -40 to 3000°C.

Emissivity

The emissivity is stated depending on the calibration method used for the radiation source. Using pyrometric calibration, the effective emissivity (ε_{eff}) normally equals 1. Using thermometric contact calibration, the actual emissivity (ε) given is always below 1.

Calibration spectral range

The stated emissivity is only valid in the specified spectral range. To calibrate measurement devices in a different spectral range, a temperature correction table has to be applied.

Radiation-calibration method

Pyrometric calibration of a radiation source: The emitted radiated temperature of a calibration source is measured with a highly accurate non-contact transfer-standard-pyrometer using $\varepsilon = 1$. The temperature indication of the calibration source is then adjusted to the measured temperature of this pyrometer. This results in an effective emissivity of the calibration source in a defined spectral range of $\varepsilon_{eff} = 1$ (as an exception in 2 cases the emissivity of the transfer-standard-pyrometer is set to a value smaller than 1, so that this value is also the effective emissivity (ε_{eff}) of the blackbody calibration source).

Contact thermometric calibration of a radiation source: the emitter temperature of the calibration source is measured and indicated by a built-in high precision thermocouple. An additional hole in the emitter could be used to check the temperature with a certified reference probe.

Aperture / emitter area

The aperture is defined as the maximum usable diameter of the radiation source opening for calibration. In the case of large-area radiation sources, the emitter area is usable for calibration. The size of the aperture, respectively the emitter area, has to be chosen depending on the spot size of the infrared measurement device to be calibrated. It also has to be significantly larger than the spot size.

Uncertainty of temperature

Indication of the tolerance of the accuracy.

Average warm up time

The average warm up time gives the time period needed to indicate the usability of the radiation source at the stated temperature.

Dimensions / weight

The dimensions and the weight of the calibration source indicate the usage as a portable or stationary instrument.

Service

The mission of the LumaSense services organization is to deliver consistent world-class customer support so you can focus on your business. Our highly trained customer care agents, engineers, scientists and PhDs are ready to help with:

- Technical and product support
- Order, shipment, repair and parts
- Field Services including installation and maintenance
- Warranty Services
- LumaServ™ Extended Warranty and maintenance agreements

With a 50-year history of creating efficiencies through light-based measurement, LumaSense Technologies, Inc., delivers innovative temperature and gas sensing instruments for the energy, industrial, clean technology and commercial markets. We are a trusted partner to both end-user and original equipment manufacturers. By drawing on our proven technologies and deep industry expertise we develop state-of-the-art infrared and fiber optic temperature sensors, radiometric thermal imagers and gas analyzers. Beyond providing precision engineered products, our customers turn to us knowing our commitment to their success comes first. With expert application understanding and a growing portfolio of products, LumaSense can combine several technologies together into novel solutions even for the most complex environments.

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