



Gooch & Housego



OL Series 466 Automated Low Light Level Integrating Sphere Calibration Standard

GENERAL

The OL Series 466 Automated Low-Light-Level Integrating Sphere Calibration Standard is designed for accurately calibrating very sensitive instruments such as microphotometers, telephotometers, image intensifiers, and imaging spectroradiometers for photometric, radiometric, or spectroradiometric response at moderate to extremely low light levels. It serves as a highly accurate, large area, uniform, diffusely radiating source with a near normal luminance that can be varied over decades with essentially constant color temperature.

The OL Series 466 consists of an optics head and a separate microprocessor controlled luminance display/lamp power supply/motor controller console (OL 462-C Controller). This enables remote location of either unit, which facilitates alignment or positioning of the source with respect to the device to be calibrated. The source module/optics head is designed such that it can be configured with integrating spheres having diameters of 4, 6, 8, 12 and 18 inches with exit (radiating) ports of 1, 1½, 2, 3 and 6 inches, respectively.

OPTICS HEAD

The OL 466 is based on a dual integrating sphere design, with the arrangement of these spheres in series. The exit port of the first sphere, or primary sphere, produces a uniform beam into the entrance port of the secondary sphere. A baffle tube connects the exit port of the primary sphere to the entrance port of the secondary sphere, and an aperture in the baffle tube determines how much light is allowed into the secondary sphere, thus the maximum luminance at the radiating port can range over several decades depending on the size of the aperture installed. The aperture is not used to determine the true luminance at the exit port of the secondary sphere but merely scale it by the desired amount. A precision silicon detector-filter combination with an accurate photopic response mounted in the wall of the primary sphere tracks the luminance in the primary sphere at higher levels for accuracy purposes, and the luminance display is scaled to indicate the actual luminance at the exit port of the secondary sphere. The actual luminance of the exit port is calibrated via measurements, and then the monitor detector gain is scaled appropriately via a calibration factor programmed into memory.

Contact: orlandosales@goochandhousego.com

The optics head has a 150-W tungsten-halogen, reflectorized lamp with a motorized, computer controlled, variable aperture between the lamp and the entrance port of the primary sphere. This combination provides for continuous adjustment of the sphere luminance over a range of more than 10^6 , which is tracked and displayed by the OL 462-C Controller. The in-line sphere port concept with an intermediate spider baffle provides for exceptional uniformity in the near normal luminance across the radiating port.

A motorized, computer-controlled shutter is located between the lamp and the entrance port of the primary sphere. The luminance/radiance output can be switched between zero and any desired level without adjustment or lamp changes.

An optional filter holder mounted at the exit port accommodates alignment targets, filters, de-coupling diffusers, etc. for specific user requirements. Spectral shaping filters can be utilized to simulate various sources such as illuminates A, B, C, D65, etc. In addition to luminance and color temperature, the OL Series 466 can be obtained with calibration for spectral radiance over the 350 to 1100 nm wavelength range.

CONTROLLER

The microprocessor based OL 462 Controller performs all the system interface and monitoring functions. An automatic ramp up/ down function eliminates potentially dangerous current surges to the lamp. Luminance, color temperature, lamp current and operational prompts are displayed on a two line by 20 character alphanumeric vacuum-fluorescent display. A 20-key keypad, rotary encoder knob, and main system power switch are also located on the front panel for easy access to all system functions. Luminance is displayed with 5 digit resolution in units specified by the user. As an option, the display can be factory programmed to read out in virtually any pertinent units the user desires. The Controller computes the color temperature of the source and displays lamp current or color temperature over the range of 2000 to 3000K. The luminance, color temperature, and lamp current can also be set by an external computer via the standard RS-232C interface. RS-422 and GPIB (IEEE-488) interfaces are also available. An internal microprocessor controlled lamp timer enables the user to track the number of hours the lamp has been in operation.

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Integrating Sphere Calibration Standard



OL 466-OH OPTICS HEAD						
Luminance Uncertainty $\pm 2\%$ relative to NIST Color Temperature Range.....2000 to 3000 K Color Temperature Uncertainty ± 25 K Minimum Luminance (verified).....0.001 fL Source Stability @ 2856 K Short Term $\pm 0.5\%$ Long Term $\pm 2\%$ 100 hours/1 year Spectral Radiance Uncertainty @ 550 nm..... $\pm 2\%$ relative to NIST Sphere Coating (reflectance) $> 99\%$ (350 to 1100 nm) Variable Aperture Automated Micrometer (Motorized) Shutter Automated (Open/Closed)						
OL 462-C CONTROLLER						
Luminance Display (5 digits) fL or cd/m^2 * Luminance Display Range 1 E-8 to 50,000 fL (Auto-ranging) Lamp Current Display 4 digits Range.....0 to 6.500 amperes DC Power Cycle60 second ramp function Accuracy..... $\pm 0.05\%$ @ 6.500 amperes Regulation $\pm 0.01\%$ for 10% line variation Temperature Regulation..... $\pm 0.025\%/10^\circ\text{C}$ Lamp Timer 0 to 1000 hours Operating Temperature Range..... 15° to 35°C Operating Humidity Range..... 10% to 85% (noncondensing) Power (user selectable)..... 115 or 230 VAC $\pm 10\%$, 50/60 Hz Size $18'' \times 18'' \times 5\frac{1}{4}''$ Weight.....39 lbs. *Luminance can be displayed in other units.						
LUMINANCE LEVELS (nominal)						
Model Number	Sphere Diameter	Exit Port Diameter	Uniformity	Maximum Luminance		Display Resolution
				@ 2856 K	@ 3000 K	
OL 466-4	4"	1"	$\pm 1.0\%$	80 fL	130 fL	0.5 E-7 fL
OL 466-6	6"	1½"	$\pm 1.0\%$	40 fL	70 fL	0.4 E-7 fL
OL 466-8	8"	2"	$\pm 1.0\%$	29 fL	40 fL	0.2 E-7 fL
OL 466-12	12"	3"	$\pm 1.0\%$	14 fL	23 fL	1.0 E-7 fL
OL 466-18	18"	6"	$\pm 2.0\%$	4 fL	7 fL	1.0 E-8 fL
Other configurations available upon request.						
CALIBRATION OPTIONS						
OL 466-X.....luminance, color temperature OL 466-X-1luminance, color temperature, ^{1/} spectral radiance (350 to 1100 nm) OL 466-X-U uncalibrated * Note: "X" designates the diameter of the integrating sphere. ^{1/} Spectral radiance measured at a color temperature of ~3000K unless otherwise specified.						

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