Universal Optical Power Meter

The Melles Griot universal optical power meter, an easy-to-use instrument, consists of a controller, a detector, and a range of accessories.

- High-sensitivity power measurements for free-space and fiber-optic beam-delivery systems
- Measurements from a few pW to 2 W with an attenuating filter and appropriate detector
- NIST traceable accuracy of ±3%
- Visible, near-infrared, and telecommunications wavelengths measured with the appropriate detectors
- Accessories available for ST, SC, FC, SMA connectors, bare fiber, and 2.5-mm fiber ferrule.

CONTROLLER/DISPLAY

- The power meter measures average, true rms, ac rms, peak-to-peak, and peak power.
- Measurements displayed in watts, dB-m, or detector current.
- The menu-driven front panel simplifies use.
- IEEE option allows for incorporation into automated test and data acquisition systems.
- Analog output is included for use with oscilloscopes, chart recorders, and A/D converters.

SILICON AND GERMANIUM DETECTOR OPTIONS

- Each detector head is spectrally calibrated with calibration data stored in a unique memory module within the detector head.
- An attenuation filter, whose spectral response is held within the memory, is supplied with each detector head.
- For measuring the power of laser-line generators and divergent, inhomogeneous, or large beam sources, Melles Griot offers a choice of integrating spheres calibrated from 400 nm to 1800 nm with either a silicon or germanium detector head.

HOW TO ORDER

To order a universal optical power meter, select the 13 PDC 001 controller. Append suffix /IEEE for the IEEE 488.2 interface option. Select required detector, stand or mount, and fiber adaptors from the options shown on page 50.7.

SPECIFICATIONS:
UNIVERSAL OPTICAL POWER METER CONTROLLER

Display Resolution: 4 digits

Range: 8 decades, TIA gains of 10^3–10^{10} V/A

Bandwidth: 50 kHz max–30 Hz min, range dependent

Zero drift: ±0.1% of full scale

Displays:
Digital: LCD, 64×192 pixel
Analog: Precision backlit mirror scale

Analog Output:
±1 V max; transfer function displayed on LCD

Power Requirements:
Voltage:
115 Vac +10%, −20%, 230 Vac ±10%, rear-panel selector switch
Frequency: 50–60 Hz

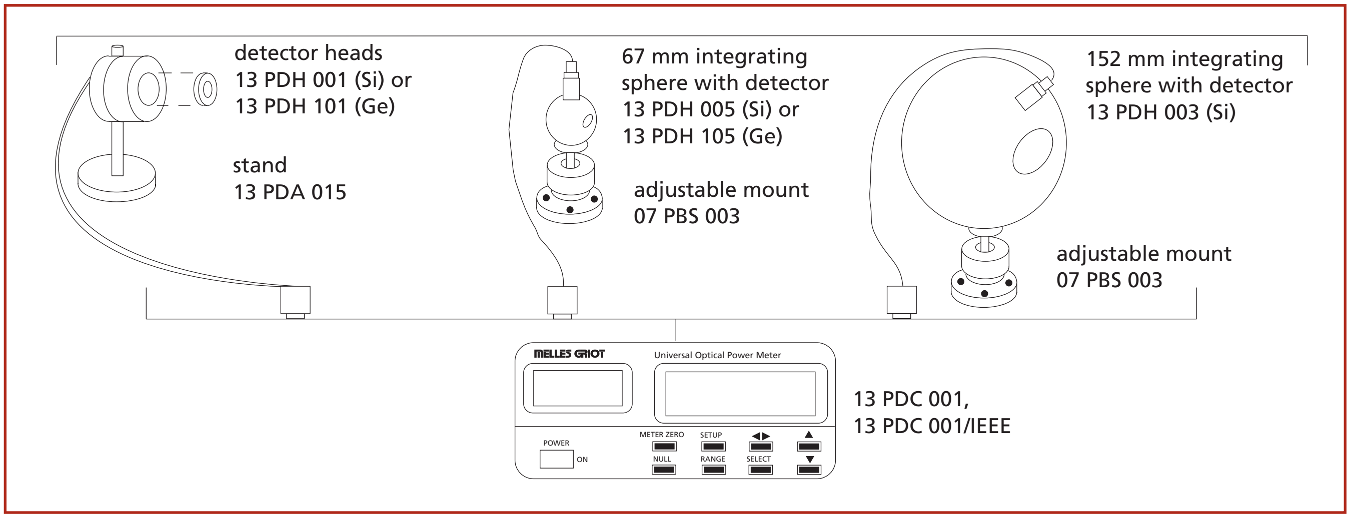
Dimensions (W×H×D):
191 mm ×133 mm×108 mm (7.5 in.×5.3 in.×4.3 in.)

Weight: 2.5 kg (5.5 lb)

Temperature
+15° to +35°C (operating)
−20° to +50°C (storage)

Safety: CE compliant

Universal optical power meter controller

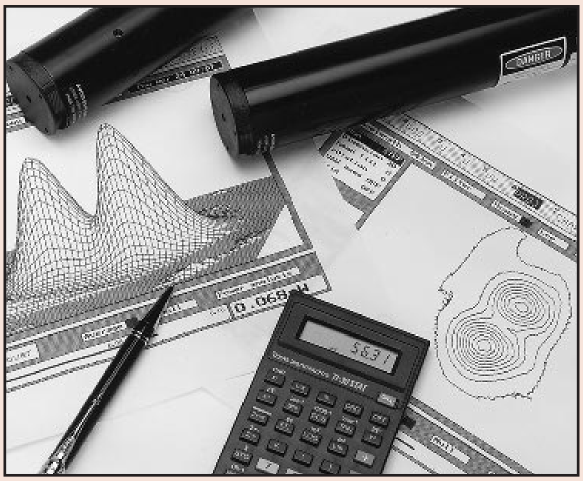


Detector options for the universal optical power meter

PHOTODIODES INTEGRATING SPHERES, AND AMPLIFIERS

For information on the complete Melles Griot line of photodiodes and high-frequency, wide-bandwidth, and large-dynamic-range amplifiers, see Chapter 49, *Photodiodes, Integrating Spheres, and Amplifiers.*

LASER BEAM CHARACTERIZATION



For information on a wide variety of instruments that measure beam width, intensity profile, pointing stability, and other parameters, see Chapter 48, *Laser Beam Characterization.*

Laser-Beam Characterization

Photodiodes, Integrating Spheres & Amplifiers

Power & Energy Meters

Universal Optical Power Meter Controllers

	PRODUCT NUMBER
Without IEEE Interface	13 PDC 001
With IEEE Interface	13 PDC 001/IEEE

Note: A controller system comprises, at a minimum , a controller, detector, and stand.

Detectors for Universal Optical Power Meter

Detector Options[1]	Wavelength (nm)	Power	NEP[2]	Accuracy[3] (%)	PRODUCT NUMBER
Silicon		@ 630 nm			
Detector Head Only	400–1100	5 pW–1 mW	5 pW	±3	13 PDH 001
(10-mm clear aperture)		5 nW–2 W	5 nW	±5	
		(with attenuator)	(with attenuator)	(with attenuator)	
152-mm Integrating Sphere and Detector	400–1100	2 nW –400 mW	2 nW	±10	13 PDH 003
67-mm Integrating Sphere and Detector	400–1100	250 pW–50 mW	250 pW	±10	13 PDH 005
Germanium		@ 1500 nm			
Detector Head	800–1800	10 nW–1 mW	10 nW	±5	13 PDH 101
(4.8-mm clear aperture)		10 μW–200 mW	10 μW	±10	
		(with attenuator)	(with attenuator)	(with attenuator)	
67-mm Integrating Sphere and Detector	800–1800	500 nW–50 mW	500 nW	±10	13 PDH 105

[1] All detectors have an integrated cable ≥1.5 m long.
[2] Specified at peak response.
[3] 1% of reading or full scale, whichever is greater.

Fiber Adaptors*

	PRODUCT NUMBER
ST Connector Adaptor	13 PDA 001
SC Connector Adaptor	13 PDA 003
FC Connector Adaptor	13 PDA 005
SMA Connector Adaptor	13 PDA 007
Bare-Fiber Connector Adaptor	13 PDA 009
2.5-mm Ferrule Adaptor	13 PDA 011

**Compatible with detector heads 13PDH 001, 005, 101, 105. Requires 13 PDA 013 for use with 13 PDH 003.*

Power Meter Accessories

Power Meter Accessories	PRODUCT NUMBER
Fiber Adaptor Interface for 152-mm Integrating Sphere	13 PDA 013
Stand for Either Silicon or Germanium Detector Heads	13 PDA 015
Adjustable Mount for Either 67 or 152-mm Integrating Sphere (inch/metric)	07 PBS 003 / 07 PBS 503
Universal Base Plates (inch/metric)	07 BPS 003 / 07 BPS 503

FUNDAMENTALS OF INTEGRATING SPHERES

In many photodetector applications it is necessary to measure the absolute or relative intensity of a divergent source or an inhomogeneous beam that is much larger than the active area of a photodetector. In those situations, integrating spheres are used to scramble or average light by multiple diffuse reflections in order to obtain meaningful intensity measurements. An integrating sphere is a hollow sphere (often aluminum) whose entire inner surface is uniformly coated with a layer of material that has a high diffuse reflectance.

When light from a source enters an integrating sphere, it loses all memory of direction and polarization. At the exit port, the light intensity is uniform and diffuse. Although other methods have been developed to deal with the problems of averaging the intensity of an inhomogeneous source or of a wide-angle beam, an integrating sphere is the best solution in many applications. In fact, the only real differences between the integrating spheres of today and the spheres of many years ago are the improved quality and stability of the diffuse reflective coatings.

PERFORMANCE CHARACTERISTICS

Throughput and stability are two meaningful figures of merit for integrating spheres. Throughput is defined as the ratio of the flux exiting the sphere to the flux entering the sphere. It is determined by the size of the input and exit ports relative to the sphere area and by the reflectivity:

$$\text{Throughput} = \frac{A_e R}{\left[1 - R\left(1 - A_p\right)\right]}$$

where A_e is the area of the exit port divided by the total sphere area

R is the reflectance of the coating

A_p is the total area of all ports divided by total sphere area.

Stability is the reciprocal of the change in throughput with respect to the change in reflectivity of the coating. This is an important parameter since, in certain operating environments, the reflectivity of the coating may degrade slightly over a long period of time and the degradation may be nonuniform over the sphere surface. A small change in the reflectivity of a low-stability sphere will result in a large change in throughput. Therefore, a low-stability sphere is less likely to give an accurate, reproducible reading than a high-stability sphere. Stability is related to throughput. A high-throughput sphere is inherently less stable than a lower throughput sphere because of the nonlinear dependence of throughput on reflectivity.

Stable spheres have reflectivity values of 90% or less, whereas low-stability (high-throughput) spheres typically have reflectivities of 79% or higher. For example, a typical low-throughput sphere with a 90% reflectivity coating will have an inherent stability of 0.5, whereas an identical high-throughput sphere with a 99% reflectivity coating will have a stability factor of 0.05.

Integrating spheres are available as components in Chapter 49, *Photodiodes, Integrating Spheres, and Amplifiers.*