Available in:
✔ **Production Quantities**
✔ **Custom Configurations**

Silicon Photodiodes

UNMOUNTED SILICON PHOTODIODES

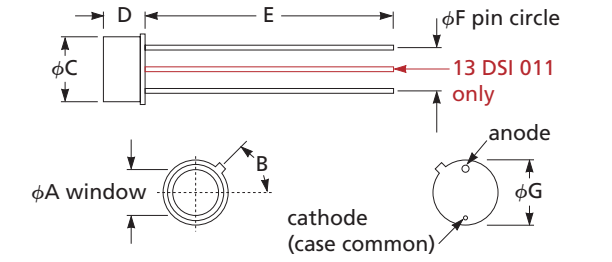
Single-element planar-diffused silicon photodiodes are ideal for general-purpose medium- to high-speed applications.

- Low dark current and high linearity ensure accurate detection of power levels from visible into the near-infrared.
- Photodiodes are sealed in a metal can with cover glass to ensure reliable operation.
- 10-mm^2 and 100-mm^2 silicon photodiodes are available in a rugged BNC-connectorized housing that accepts 25-mm-diameter band pass filters and snap-on filter holder when used with a 13 DMA 015 adaptor.

SPECIFICATIONS: SILICON PHOTODIODES

Spectral Response: 350–1100 nm

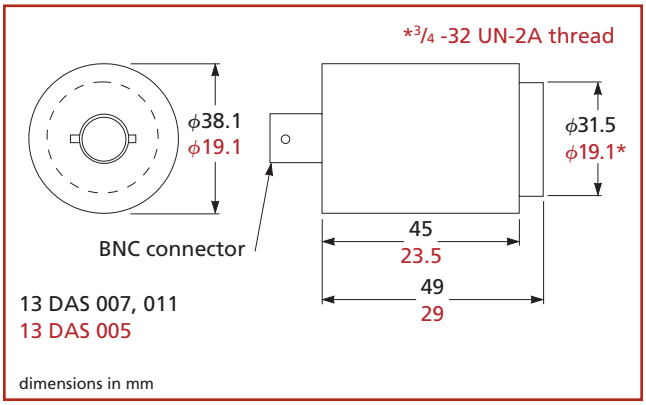
Responsivity: 0.45 A/W @ 830 nm nominal



dimension in mm

PRODUCT	ϕA	B	ϕC	D	E	ϕF	ϕG
13 DSI 001, 003	3.90	45°	4.72	3.73	~13	2.54	5.40
13 DSI 005, 007	6.10	45°	8.26	4.95	~38	5.08	9.14
13 DSI 009	10.92	N/A	12.35	5.38	~38	7.50	14.00
13 DSI 011	15.37	N/A	18.29	5.72	~10	12.70	20.22

13 DSI series silicon photodiodes



13 DAS series mounted silicon photodiodes

Silicon Photodiodes

Active Area (mm^2)	Active ϕ (mm)	Dark Current[1] V_{rb} = 1 V (nA)	Voltage Breakdown (V)	R_{shunt} V_{rb} = 0 (MΩ)	Capacitance V_{rb}=0 (pF)	NEP[2] at 830 nm (W/√Hz)	Package Type	PRODUCT NUMBER
0.31	0.6	0.7	60	300	10	1.5×10^{-14}	TO-46	13 DSI 001
1.00	1.1	0.9	40	120	25	2.3×10^{-14}	TO-46	13 DSI 003
3.10	2.0	3.1	30	60	72	3.3×10^{-14}	TO-5	13 DSI 005
10.00	3.6	10.0	20	40	230	4.1×10^{-14}	TO-5	13 DSI 007
31.00	6.3	31.0	15	10	713	8.1×10^{-14}	TO-8	13 DSI 009
100.00	11.4	110.0	10	4	2300	1.3×10^{-13}	TO-75	13 DSI 011 13 DSI 011/C[3]
10.00	3.6	10.0	20	40	230	4.1×10^{-14}	Mounted, ϕ19.5	13 DAS 005
10.00	3.6	10.0	20	40	230	4.1×10^{-14}	Mounted, ϕ31.5	13 DAS 007
100.00	11.4	110.0	10	4	2300	1.3×10^{-13}	Mounted, ϕ31.5	13 DAS 011 13 DAS 011/C[3]
Adaptor for Snap-on Filter Holder								13 DMA 015

[1] Measured at 25°C. [2] Noise Equivalent Power.
[3] The 13 DSI 011/C and 13 DAS 011/C offers NIST traceability from 400 to 1100 nm at 10-nm intervals. Absolute accuracy of the calibration is better than ± 5%.
Note: Germanium photodiodes are available by special order. Contact your nearest Melles Griot sales office for information.

Available in:
✔ **Production Quantities**
✔ **Custom Configurations**

High-Speed Silicon PIN Photodiodes

Melles Griot silicon PIN photodiodes are ideal for low-intensity high-bandwidth applications such as fiber-optic communications and data links, video systems, and industrial sensing.

- Excellent high-frequency response; rise times are as fast as 0.35 nsec with an appropriate transimpedance amplifier.
- The photodiodes are available unmounted for integration into custom detection systems.
- Post-mountable versions interface directly to Melles Griot snap-on filter mounts and 13 AMP 007 high-frequency amplifiers.
- Internal batteries eliminate the need for an external power supply (mounted version only).

SPECIFICATIONS:
HIGH-SPEED SILICON PIN PHOTODIODES

Spectral Response: 350–1100 nm

Bias: −9 Vdc (included in 13 DAH assemblies)

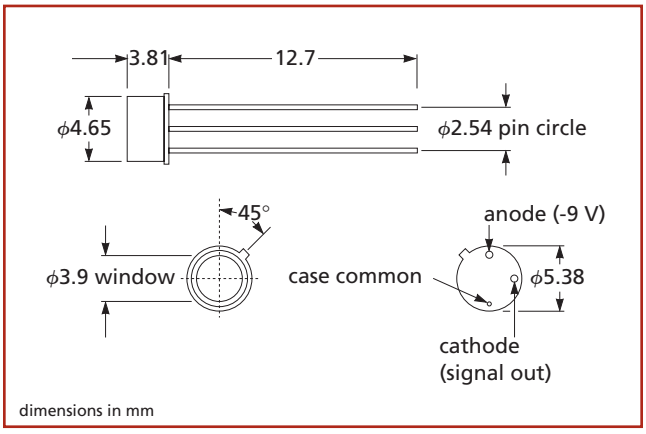
Battery Type (mounted only):

3, 3-Vdc lithium batteries; 9 Vdc total

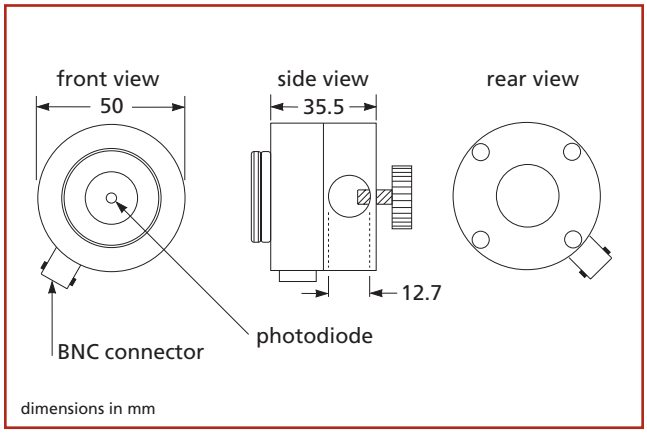
Termination (mounted only): 50 Ω

Temperature:

−10° to +50° C (operating)
−35° to +75° C (storage)



13 DSH high-speed silicon PIN photodiode



13 DAH high-speed mounted silicon PIN photodiode

High-Speed Silicon PIN Photodiodes[1]

ϕ (mm)	Rise Time at −9 Vdc (nsec)	NEP[2] at −9 Vdc (W/√Hz)	Dark Current at −9 Vdc (nA)	Capacitance at −9 Vdc (pF)	Breakdown Voltage min at 10 μA	Response at 830 nm (A/W)	PRODUCT NUMBER Mounted[3]	PRODUCT NUMBER Unmounted
0.23	0.35 typ 1.0 max	6.3×10^{-15}	0.02 typ 1.0 max	1.0 typ	30	0.35 typ 0.4 max	13 DAH 001	13 DSH 001
0.5	1.0 typ 2.0 max	9.0×10^{-15}	0.05 typ 1.0 max	2.5 typ	30	0.35 typ 0.4 max	13 DAH 003	13 DSH 003
1.0	2.5 typ 3.5 max	2.2×10^{-14}	0.25 typ 1.0 max	5.5 typ	30	0.35 typ 0.4 max	13 DAH 005	13 DSH 005

[1] All specifications listed for an ambient temperature of 22°C.
[2] Noise equivalent power
[3] A 50 Ω termination is required for mounted 13 DAH series.

Available in:
✔ **Production Quantities**
✔ **Custom Configurations**

Universal Modular Mounts for Photodiodes

The universal modular mount and accessories have been designed for easy mounting and simple connection. These mounts provide a convenient interface to filters, apertures, and other optical components.

UNIVERSAL DETECTOR MOUNT

The universal detector mount is post-mountable for quick photodiode installation or replacement, and it is supplied with adaptors for TO-5, TO-8, TO-46, and TO-75 style cans.

Electrical connections are easily made by using sleeved pin sockets. A BNC socket provides a standard interface for external sensing circuitry.

STACKABLE SNAP-ON FILTER MOUNTS

Stackable filter mounts enable a 25-mm or 1-inch filter, an aperture, or various optical components to be snapped onto the front of the universal detector mount. The 13 DMA 009 adaptor fits into this mount. Mounted pinhole details can be found in Chapter 29, *Microscope Components, Spatial Filters, and Apertures*.

LARGE SLIT ASSEMBLY

This 100-μm × 15-μm precision slit mounted on a 25-mm-diameter brass disc fits directly into a snap-on filter mount.

IRIS-DIAPHRAGM ASSEMBLY

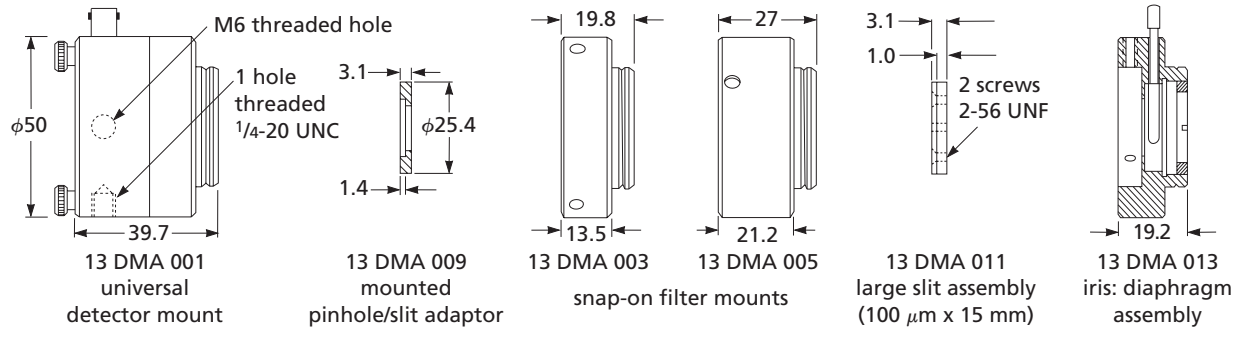
The iris-diaphragm assembly provides a continuously variable circular aperture from 0.8 mm to 15.0 mm. It attaches directly to the universal detector mount or snap-on filter mount.

Universal Modular Mounts for Photodiodes

	PRODUCT NUMBER
Universal Detector Mount	13 DMA 001
Stackable Snap-on Filter Mounts	
For Filters up to 7-mm Thick	13 DMA 003
For Filters up to 14-mm Thick	13 DMA 005
Adaptor for Mounted Pinholes and Slits	13 DMA 009
Large Slit Assembly (100 μm × 15 μm)	13 DMA 011
Iris-Diaphragm Assembly	13 DMA 013

DIODE LASERS

For a complete listing of diode lasers and driver/controller devices, see Chapter 45, *Diode Laser Assemblies* and Chapter 46, *Laboratory Diode Laser Drivers.*



Universal modular mounting system

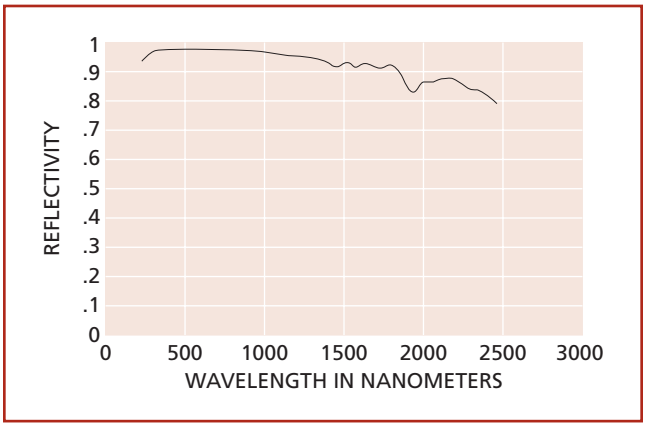
Available in:
✔ **Production Quantities**
✔ **Custom Configurations**

Integrating-Sphere Systems

Melles Griot integrating spheres effectively homogenize radiation, regardless of original spatial content and direction. A complete range of photodiodes, port accessories, and mounting components ensure quick and easy setup of these spheres.

- Ports are available for mounting photodetectors, photoemitters, sample targets, and relay optics.
- The 152-mm-diameter sphere has a 38.1-mm diameter entrance port and a 19-mm exit port. Exit port has a detachable opal-glass diffuser. The smaller 67-mm sphere has 8.7-mm diameter entrance and exit ports.
- Post-mountable via a ¼-20 UNC mounting hole (convertible to an M6 hole using the 07 RAD 515 post adaptor).

Calibrated integrating-sphere/detector assemblies are ideal companions for the universal power meter described, in Chapter 50, *Power and Energy Meters*.



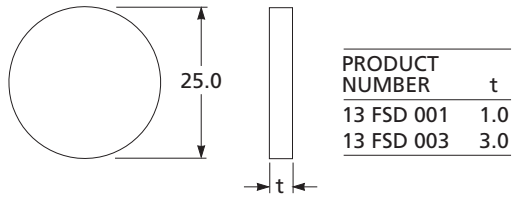
Characteristics of integrating sphere coating

System Performance

TIA Gain (V/A)	Bandwidth (kHz)	Current Noise (A rms)	NEP (Watts rms) Det/Amp Only[1]	NEP (Watts rms) System[2]
10^3	45	20×10^{-8}	4.4×10^{-8}	8.0×10^{-7}
10^6	35	9.0×10^{-11}	2.0×10^{-10}	5.0×10^{-9}
10^9	0.1	1.2×10^{-10}	2.7×10^{-12}	4.0×10^{-11}

[1]*Assumes a responsivity of 0.45 A/W.*
[2]*For a system consisting of 13 DAS 011 and 13 AMP 003. Assumes sphere reflectance of 98%, with 100 mm² photodiode active area.*

OPTIONAL ACCESSORIES

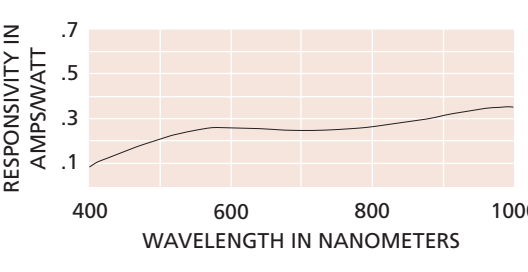


PRODUCT NUMBER	t
13 FSD 001	1.0
13 FSD 003	3.0

13 FSD 001 and 003 filters for photodiodes

Opal-glass diffusers eliminate signal amplitude errors caused by non uniformity and spatial drifting in the incident beam.

Response-flattening filters compensate for the variation in the wavelength response of silicon. They improve detector response uniformity to ±10% between 550 nm and 850 nm.

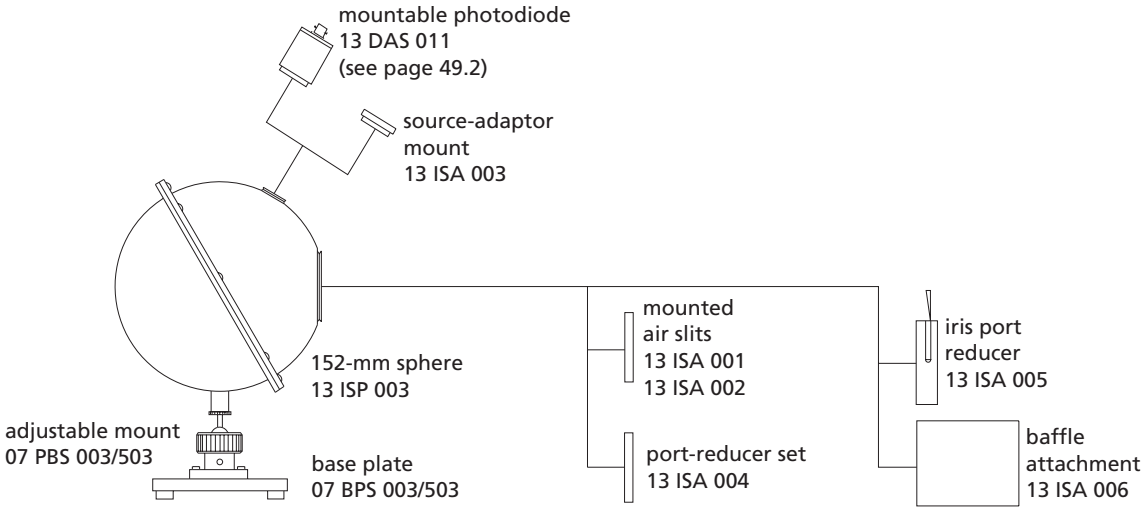


Performance of a silicon detector with response-flattening filter

67-mm and 152-mm Integrating Spheres

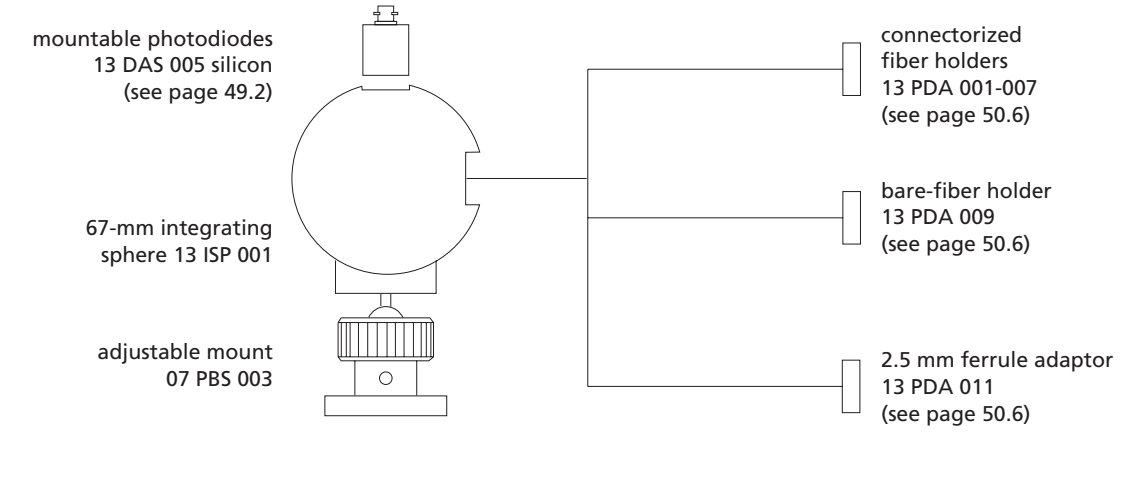
	PRODUCT NUMBER
Response-flattening Filters	13 FSD 001
Opal Glass Diffusers	13 FSD 003

Note: 07 PBS 003 adjustable mount and 07 BPS 003 base plate must be ordered separately. *See page 49.7*



integrated detector packages are available with NIST traceable calibration in chapter 50.

152-mm Integrating sphere system configuration



integrated detector packages are available with NIST traceable calibration in chapter 50.

67-mm Integrating sphere system configuration

INTEGRATING-SPHERE MOUNTING ACCESSORIES

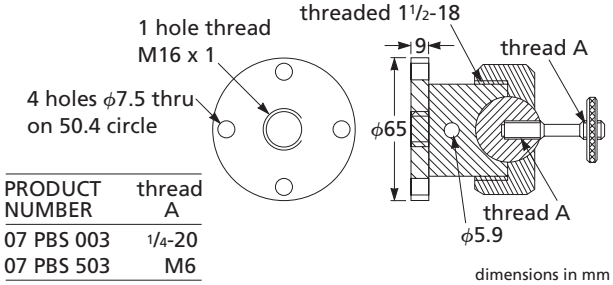
Adjustable Mounts

These mounts provide 360 degrees of rotation about the vertical axis and an inclination of 35 degrees from the vertical axis.

The inch version is directly compatible with the 152-mm integrating sphere and universal base plates.

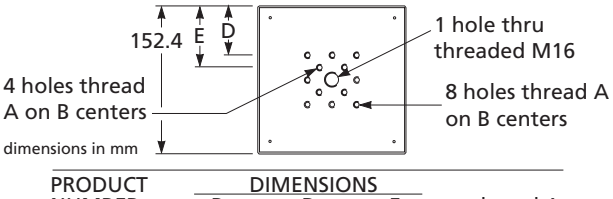
Universal Base Plates

These free-standing 152-mm square base plates allow easy positioning of components in an optical beam path.



PRODUCT NUMBER	thread A
07 PBS 003	1/4-20
07 PBS 503	M6

Adjustable integrating-sphere mount



PRODUCT NUMBER	DIMENSIONS B	D	E	thread A
07 BPS 003	25.4	50.8	63.5	1/4-20
07 BPS 503	25.0	51.2	63.7	M6

Universal integrating-sphere base plate

INTEGRATING-SPHERE PORT ACCESSORIES

The following port accessories are fully compatible with the Melles Griot 152-mm integrating sphere (13 ISP 003).

Precision Air Slits

These slits are ideal for spatial characterization of lasers and broadband sources (0.1 and 1.0 widths). They mount directly to the entrance port of the integrating sphere, limiting the incoming light.

Source Adaptor Mounts

These mounts, designed to mount many Melles Griot diode lasers, result in a uniform intensity profile at the exit port of the 152-mm integrating sphere.

Port Reducer Set

Reducing port size offers control of input beam size and limits background noise caused by stray light.

Adjustable-Iris Port Reducer

The reducers enable aperture size to be optimized when the sphere is configured to provide uniform illumination. The entrance port diameter can be set between 1.2 mm and 36 mm.

Baffle Attachment

This stackable section of 50-mm baffle has a 38.1-mm clear aperture. It is used to limit the effective field of view when measuring large or uncollimated beams.

Integrating-Sphere Port and Accessories

	PRODUCT NUMBER
67-mm Integrating Sphere	13 ISP 001
152-mm Integrating Sphere with Opal-Glass Diffuser	13 ISP 003
Precision Slits	
0.1 mm × 25 mm	13 ISA 001
1.0 mm × 25 mm	13 ISA 002
Source Adaptor Mounts for 06 GIC Series Diode Lasers	13 ISA 003
Port Reducer Set (includes 5, 7, 10, and 25 mm apertures)	13 ISA 004
Adjustable-Iris Port Reducer	13 ISA 005
Baffle Attachment	13 ISA 006
Adjustable Mounts (inch/metric)	07 PBS 003/505
Universal Base Plates (inch/metric)	07 BPS 003/503

Available in:
✔ **Production Quantities**
✔ **Custom Configurations**

Large-Dynamic-Range Amplifiers

Melles Griot offers a large-dynamic-range amplifier for use as a general-purpose current amplifier with photodiodes and other detectors.

- Nine gain settings from 10 Ω to 1G Ω ensure accurate detection from 1 pA to 100 mA.
- The amplifiers operate for eight hours from a set of fully charged NiCd batteries.
- A 3-½ digit backlit LCD gives direct readout of photocurrent, range setting, and battery status.

The amplifier also features offset adjustment to null background readings, a BNC signal monitor for utility purposes, and a plug-in power supply for operation and battery charging.

SPECIFICATIONS: LARGE-DYNAMIC-RANGE AMPLIFIERS

Input/Output
Accuracy: ± 1% all ranges
Input Current Range: pA–100 mA
Input Connector Type: BNC
Range Selection: 9-position switch, 2 nA–100 mA
Monitor Out: – 2 V to +2 V full scale
Output Connector Type: BNC

Offset Current Trimpot Range: – 2 mA to +2 mA

Display Type: 3½ digit LCD with backlighting

Power Requirements
Voltage: 115 Vac, /A for 230 Vac
Frequency: 50–60 Hz **or:** 8 AA-size nickel-cadmium rechargeable batteries

Environment
Operating Temperature Range: +10° to +35°C
Storage Temperature Range: – 20° to +55°C

Dimensions (W × H × D):
133 mm × 83 mm × 140 mm (5.25 in. × 3.25 in. × 5.5 in.)

Performance Variation with Range

Range	Resolution	Transimpedance Gain (V/A)	Frequency Response (dc to kHz)	Full Bandwidth Current Noise (A rms)
100 mA	0.1mA	10^1	45	900 nA
20 mA	0.01 mA	10^2	45	90 nA
2 mA	0.001 mA	10^3	45	20 nA
200 μA	0.1 μA	10^4	45	2 nA
20 μA	0.01 μA	10^5	45	300 pA
2 μA	0.001 μA	10^6	35	70 pA
200 nA	0.1 nA	10^7	10	20 pA
20 nA	0.01 nA	10^8	1	3 pA
2 nA	0.001 nA	10^9	0.1	0.5 pA

Large-Dynamic-Range Amplifiers

	PRODUCT NUMBER
Including Power Supply for 110 Vac	13 AMP 003
Including Power Supply for 220 Vac	13 AMP 003/A

Performance Variation with Detector Size

DETECTOR PRODUCT NUMBER[1]	Diameter ϕ (mm)	Bandwidth (kHz) Amplifier Gain (V/A) 10^3	10^6	10^9	Current Noise (A rms) Amplifier Gain (V/A) 10^3	10^6	10^9	NEP[2] (W rms) Amplifier Gain (V/A) 10^3	10^6	10^9
13 DSI 001	0.6	45	35	0.1	2.0×10^{-8}	9.8×10^{-11}	7.1×10^{-13}	4.4×10^{-8}	2.2×10^{-10}	1.6×10^{-12}
13 DSI 003	1.1	45	35	0.1	2.0×10^{-8}	1.2×10^{-10}	7.9×10^{-13}	4.4×10^{-8}	2.7×10^{-10}	1.8×10^{-12}
13 DSI 005	2.0	45	35	0.1	2.0×10^{-8}	1.5×10^{-10}	9.0×10^{-13}	4.4×10^{-8}	3.3×10^{-10}	2.0×10^{-12}
13 DSI 007	3.6	45	35	0.1	2.0×10^{-8}	2.6×10^{-10}	1.4×10^{-12}	4.4×10^{-8}	5.8×10^{-10}	3.1×10^{-12}
13 DSI 009	6.3	45	35	0.1	2.0×10^{-8}	5.7×10^{-10}	2.3×10^{-12}	4.4×10^{-8}	1.3×10^{-9}	5.1×10^{-12}
	11.4	45	35	0.1	2.0×10^{-8}	1.2×10^{-9}	3.5×10^{-12}	4.4×10^{-8}	2.7×10^{-9}	7.8×10^{-12}

[1] The table shows the combined performance of Melles Griot silicon photodiodes with the 13 AMP 003 large-dynamic-range-amplifier.
[2] Noise equivalent power values are for a responsivity of 0.45 A/W.

Available in:
✔ **Production Quantities**
✔ **Custom Configurations**

Wide-Bandwidth Amplifier

The Melles Griot wide-bandwidth amplifier is a general-purpose current amplifier for operating photodiodes in both photovoltaic and photoconductive modes. This amplifier includes switch-selectable 115/230 Vac operation.

- Frequency response: dc to 5 MHz, maximum
- Accurate photocurrent detection from 100 pA to 2 mA
- Variable bias, ±10 V adjustable in 1-V increments
- 3½ digit backlit LCD to display photocurrent and range setting
- Front-panel offset adjustment to null background readings.
- BNC signal monitor and switch-selectable 115/230 Vac operation

Performance Variation with Range

Range	Resolution	Transimpedance Gain (V/A)	Frequency Response (dc to kHz)	Full Bandwidth Current Noise (A rms)
2 mA	0.001 mA	10^3	5000	100 nA
200 μA	0.1 μA	10^4	1000	12 nA
20 μA	0.01 μA	10^5	300	1.5 nA
2 μA	0.001 μA	10^6	75	180 pA
200 nA	0.1 nA	10^7	15	32 pA

Wide-Bandwidth Amplifier

	PRODUCT NUMBER
Wide-Bandwidth Amplifier	13 AMP 005

SPECIFICATIONS: WIDE-BANDWIDTH AMPLIFIER

Input/Output

Accuracy: ±1% all ranges

Input Current Range: 100 pA–2 mA

Input Connector Type: BNC

Range Selection: 5-position switch, 200 nA–2 mA

Monitor Out:
−2 V to +2 V, with 50-Ω termination
−4 V to +4 V unterminated

Output Impedance: 50 Ω

Output Connector Type: BNC

Offset Current Range:
(high) −50 μA to +50 μA
(low) −5 μA to +5 μA

Display Type: 3½ digit LCD with backlighting

Power Requirements

Voltage: 115 Vac +10%, -20% and 230 Vac ±10%
rear panel switch selectable

Frequency: 50–60 Hz

Environmental

OperatingTemperature Range: +10° to +35°C

Storage Temperature Range: −40° to +55°C

Dimensions (W × H × D):
133 mm × 83 mm × 140 mm (5.25 in. × 3.25 in. × 5.5 in.)

Performance Variation with Detector Size

DETECTOR PRODUCT NUMBER[1]	Diameter ϕ (mm)	−3dB Response (kHz) at −5 V_{rb} Amplifier Gain (V/A) 10^3	10^6	10^9	Current Noise (A rms) at −5 V_{rb} Amplifier Gain (V/A) 10^3	10^6	10^9	NEP[2] (W rms) at −5 V_{rb} Amplifier Gain (V/A) 10^3	10^6	10^9
13 DSI 001	0.6	5000	450	15.0	100×10^{-9}	2.1×10^{-9}	36×10^{-12}	222×10^{-9}	4.7×10^{-9}	80×10^{-12}
13 DSI 003	1.1	5000	450	15.0	110×10^{-9}	2.3×10^{-9}	38×10^{-12}	244×10^{-9}	5.1×10^{-9}	85×10^{-12}
13 DSI 005	2.0	3800	440	15.3	115×10^{-9}	2.6×10^{-9}	44×10^{-12}	255×10^{-9}	5.8×10^{-9}	100×10^{-12}
13 DSI 007	3.6	3500	400	15.5	125×10^{-9}	3.2×10^{-9}	55×10^{-12}	277×10^{-9}	7.1×10^{-9}	115×10^{-12}
13 DSI 009	6.3	3000	340	15.8	145×10^{-9}	5.0×10^{-9}	65×10^{-12}	322×10^{-9}	11.1×10^{-9}	145×10^{-12}
13 DSI 011	11.4	2000	220	16.5	170×10^{-9}	7.7×10^{-9}	130×10^{-12}	377×10^{-9}	17.1×10^{-9}	290×10^{-12}

[1] The table shows the combined performance of Melles Griot silicon photodiodes with the 13 AMP 005 wide-bandwidth-amplifier.
[2] Noise equivalent power values are for a responsivity of 0.45 A/W.

Available in:
✔ **Production Quantities**
✔ **Custom Configurations**

High-Frequency Amplifier

The 13 AMP 007 is a low-noise ac-coupled high-frequency voltage or current amplifier.

- High-frequency response ranges from 4 kHz to >300 MHz.
- The amplifier accepts input currents up to 160 μA and input voltages up to 8 mV.

SPECIFICATIONS: HIGH-FREQUENCY AMPLIFIER

All specifications apply over the full bandwidth.

Frequency Response: 4 kHz to >350 MHz (−3dB)

Maximum Output Voltage: 1 V p-p into 50 Ω

Input and Output Connector Type: BNC

Input and Output Impedance: 50 Ω

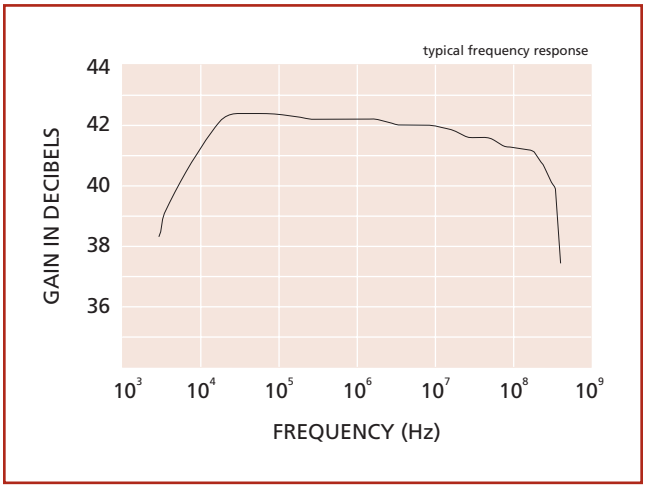
Transimpedance Mode
- **Transimpedance Gain:** 6250 V/A
- **Maximum Input Current:** 160 μA
- **Output Noise:** 3.2 mV rms
- **Input-Referred Noise:** 24 pA/√Hz
- **Bias Adjustment:** −20 V to +20 V

Voltage Amplification Mode
- **Voltage Gain:** 125
- **Maximum Input Voltage:** 8 mV
- **Output Noise:** 3.2 mV rms
- **Input Referred Noise:** 1.2 nV/√Hz

Power Requirements
- **Voltage:** 115 Vac +10%, -20% and 230 Vac ±10% rear panel switch selectable
- **Frequency:** 50–60 Hz
- **Power:** 3 W

Environmental
- **Operating Temperature Range:** +10° to +35°C
- **Storage Temperature Range:** −40° to +55°C

Dimensions (W × H × D):
91 mm × 48.3 mm × 143 mm (3.6 in. × 1.9 in. × 5.6 in.)



Typical frequency response of the 13 AMP 007 high-frequency amplifier

Performance Variation with Detector Type

DETECTOR PRODUCT NUMBER[1]	Rise time at −9 V_{rb} (nsec)	NEP[2] at −9 V_{rb} (W/√Hz)
13 DAH 001	1	48×10^{-12}
13 DAH 003	1.25	48×10^{-12}
13 DAH 005	1.50	48×10^{-12}

[1]Combined performance for Melles Griot high-speed silicon photodiodes and the 13 AMP 007.

[2]Rise-time and noise equivalent power values are for a transimpedance gain of 6250 V/A and a detector responsivity of 0.5 A/W.

High-Frequency Amplifier

	PRODUCT NUMBER
High-Frequency Amplifier	13 AMP 007