

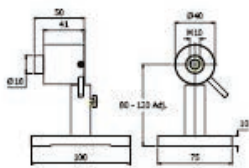
Thermal Low Power Sensors Surface Absorbers for CW and Long Pulse Lasers to 40W



- Models up to 6000W for industrial lasers
- Sensitive thermopile sensors for power detection down to 10 μ W and energy to 2mJ
- High resistant coatings : up to 12KW/cm² at the maximum rated power
- Energy damage threshold up to 250J/cm²
- Energy measurement up to 600 joules
- EMI rejection
- NIST and PTB (Physikalisch-Technische Bundesanstalt) traceability

Sensor Code	Power Range	Max Intermittent Power (2min)	Energy Range	Useful Aperture	Spectral Range	Cooling
A-02-D12-BBF	100 μ W - 200 mW 10 μ W - 20 mW* *by optional plug-in	n.a.	n.a.	Ø 12mm	0.19-0.25 μ m	convection
A-2-D12-BBF	1mW - 2W 100 μ W - 200mW * *by Optional Plug-In	n.a.	0.5mJ-2J	Ø12mm	0.19-25 μ m	convection
A-2-D12-HCB	1mW - 2W 100 μ W - 200mW * *by Optional Plug-In	n.a.	0.5mJ-2J	Ø12mm	0.25-11 μ m	convection
A-10-D12-HCB	10mW - 10W	15W	50mJ-10J	Ø12mm	0.25-11 μ m	convection
A-10-D20-BBF	10mW-10W	15W	50mJ-10J	Ø 20mm	0.19-25 μ m	convection
A-10-D20-HCB	10mW-10W	15W	50mJ-10J	Ø 20mm	0.25-11 μ m	convection
A-40-D25-BBF	10mW - 40W	60W	200mJ-40J	Ø25mm	0.19-25 μ m	convection
A-40-D25-HCB	10mW - 40W	60W	200mJ-40J	Ø25mm	0.25-11 μ m	convection
A-40-D40-HPB	10mW - 40W	60W	200mJ-40J	Ø 40mm	0.25-11 μ m	convection
A-40/200-D25-HPB	100mW - 40W	200W	1J-200J	Ø25mm	0.25-11 μ m	convection
A-40/200-D40-HPB	100mW - 40W	200W	1J-200J	Ø40mm	0.25-11 μ m	convection
A-40/200-D60-HPB	100mW - 40W	200W	1J-200J	Ø60mm	0.25-11 μ m	convection

Sensor A-02-D12-BBF



TYPICAL LASERS:

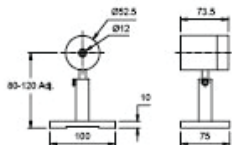
LEDs
Diode
Diode Arrays
Dye
He-Ne
Ion Lasers (Ar+, Kr+)

FEATURES:

- * High Resolution
- * 10 μ W - 200mW or 500 μ J - 200mJ
- * Very High sensitivity
- * Low noise
- * Insensitive to beam position

Max. Continuous Power:	200mW: Standard 20mW by Optional Plug-In *
Power Resolution:	100 μ W at 200 mW f.s. 10 μ W at 20mW f.s. with Plus Monitor (+ AD20 Plug-In) or PC-Link
Max. Energy:	200mJ Long Pulse
Energy Threshold:	50 μ J-500 μ J (BBF)
Available Absorber Types:	BBF: Broadband, flat responsivity
Wavelength Range:	0,19 - 25 μ m (a) (BBF)
Max. Average Power Density:	200 W/cm ² (BBF)
Max. Energy Density on Pulsed Beams:	See Absorption and Damage Thresholds Graphs for Specific Coating
Calibration Accuracy:	\pm 3%
Response Time with Display (0-90%):	3 sec
Linearity:	\pm 1% (b)
NEP(Noise Equivalent Power):	20 μ W at 200 maw f.s. 2 μ W at 20 mW f.s.
Sensitive Diameter:	12mm
Cooling:	Convection (Thermally Stabilized)
Notes :	(*) Optional Plug-In Modules to be ordered separately: - Mod. AD20 for 20 mW full scale a. Calibrated up to 10,6 μ m. b. Detector centrally irradiated @ 50% of useful surface

Sensor A-2-D12-BBF



TYPICAL LASERS :

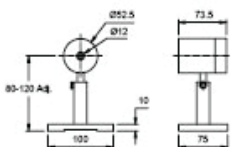
Leds
Diode
Diode Arrays
Dye
He-Ne
Ion Lasers (Ar+, Kr+)

FEATURES :

- * High Resolution
- * 100 μ W -2W or 0,5mJ -2J
- * Very High sensitivity
- * Low noise
- * Insensitive to beam position

Max. Continuous Power:	2W: Standard 200mW by Optional Plug-In *
Power Resolution:	1mW at 2W f.s. 100 μ W at 200mW f.s. (with Plus Monitor and PC-Link)
Max. Energy:	2J Long Pulse
Energy Threshold:	0,5 mJ - 5 mJ
Available Absorber Types:	BBF:Broadband, flat responsivity
Wavelength Range:	0.19 - 25 μ m (a) (BBF)
Max. Average Power Density:	BBF:200 W/cm ² ;
Max. Energy Density on Pulsed Beams:	See Absorption and Damage Thresholds Graphs for Specific Coating
Calibration Accuracy:	\pm 3%
Response Time with Display (0-90%):	3 sec
Linearity:	\pm 1%(b)
NEP(Noise Equivalent Power):	200 μ W at 2 W f.s. 20 μ W at 200 mW f.s.
Sensitive Diameter:	12mm
Cooling:	Convection (Thermally Stabilized)
Notes :	(*) Optional Plug-In Modules to be ordered separately: - Mod. AD2000 for 200 mW full scale a. Calibrated up to 10,6 μ m. b. Detector centrally irradiated @ 50% of useful surface

Sensor A-2-D12-HCB



TYPICAL LASERS :

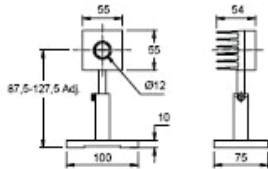
Leds
Diode
Diode Arrays
Dye
He-Ne
Ion Lasers (Ar+, Kr+)

FEATURES :

- * High Resolution
- * 100 μ W -2W or 0,5mJ -2J
- * Very High sensitivity
- * Low noise
- * Insensitive to beam position

Max. Continuous Power:	2W: Standard 200mW by Optional Plug-In *
Power Resolution:	1 mW at 2W f.s. 100 μ W at 200mW f.s.
Max. Energy:	2J (long pulses)
Energy Threshold:	2mJ-10mJ (HCB)
Available Absorber Types:	HCB: Hard Coating, Broadband
Wavelength Range:	0,25 - 11 μ m (a) (HCB)
Max. Average Power Density:	HCB: 2000 W/cm ²
Max. Pulse Energy Density:	See Absorption and Damage Thresholds Graphs
Calibration Accuracy:	\pm 3%
Response Time with Display (0-90%):	3 sec.
Linearity:	\pm 1% (b)
NEP(Noise Equivalent Power):	0,25 mW
Sensitive Diameter:	12 mm
Cooling:	Convection (Thermally Stabilized)
Notes :	(*) Optional Plug-In Modules to be ordered separately: -Mod. AD2000 for 200mW full scale a. Calibrated up to 10,6 μ m. b. Detector centrally irradiated @ 50% of useful surface

Sensor A-10-D12-HCB



TYPICAL LASERS:

Laser Diodes
Diode Arrays
CO₂ –Medical
Dye

High Power Ion Lasers

FEATURES:

* Average Power & Single Pulse

* 10mW – 15W or 25mJ – 10J

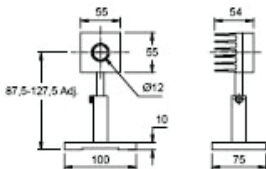
* High sensitivity

* Small size

* Fast response time

Max. Continuous Power:	10 W
Intermittent Power Use:	15 W (a)
Power Resolution:	10 mW (with Plus Monitor)
Max. Energy:	10 J (long pulses)
Energy Threshold:	50 mJ
Available Absorber Types:	HCB: Hard Coating, Broadband
Wavelength Range:	0,25 - 11 µm (b) (HCB)
Max. Average Power Density:	HCB: 2000 W/cm ²
Max. Pulse Energy Density:	See Absorption and Damage Thresholds Graphs
Calibration Accuracy:	± 3%
Response Time with Display (0-90%):	< 1sec.
Linearity:	± 1% (c)
NEP(Noise Equivalent Power):	0,5 mW
Sensitive Diameter:	12 mm
Cooling:	Convection
Notes :	a. 2 minutes max. b. Calibrated up to 10,6 µm c. Detector centrally irradiated @ 50% of useful surface

Sensor A-10-D20-BBF



TYPICAL LASERS:

Diode Lasers
Diode Arrays
CO₂ –Medical
Dye

Copper Vapor

FEATURES:

* Average Power & Single Pulse

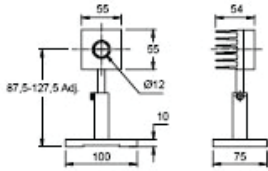
* 10mW – 15W or 25mJ – 10J

* High sensitivity

* Wide spectral range

Max. Continuous Power:	10 W
Intermittent Power Use:	15 W (a)
Power Resolution:	10 mW (with Plus Monitor)
Max. Energy:	10 J (long pulses)
Energy Threshold:	50 mJ
Available Absorber Types:	BBF: Broadband, flat responsivity
Wavelength Range:	0,19 - 25 µm (b) (BBF)
Max. Average Power Density:	BBF: 200 W/cm ² ; HCB: 2000 W/cm ²
Max. Pulse Energy Density:	See absorption and Damage Thresholds Graphs
Calibration Accuracy:	± 3%
Response Time with Display (0-90%):	< 1sec
Linearity:	± 1% (c)
NEP(Noise Equivalent Power):	0,75 mW
Sensitive Diameter:	20 mm
Cooling:	Convection
Notes :	a. 2 minutes max b. Calibrated up to 10,6 µm. c. Detector centrally irradiated @ 50% of useful surface

Sensor A-10-D20-HCB



TYPICAL LASERS :

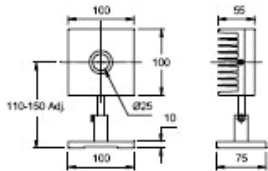
Diode Lasers
Diode Arrays
CO₂ –Medical
Dye
Copper Vapor

FEATURES:

- * Average Power & Single Pulse
- * 10mW – 15W or 25mJ – 10J
- * High sensitivity
- * Wide spectral range

Max. Continuous Power:	10 W
Intermittent Power Use:	15 W (a)
Power Resolution:	10 mW (with Plus Monitor)
Max. Energy:	10 J (long pulses)
Energy Threshold:	50 mJ
Available Absorber Types:	HCB: Hard Coating, Broadband
Wavelength Range:	0,19 - 11 µm (b) (HCB)
Max. Average Power Density:	BBF: 200 W/cm ² ; HCB: 2000 W/cm ²
Max. Pulse Energy Density:	See Absorption and Damage Thresholds Graphs
Calibration Accuracy:	± 3%
Response Time with Display (0-90%):	< 1sec.
Linearity:	± 1% (c)
NEP(Noise Equivalent Power):	0,75 mW
Sensitive Diameter:	20 mm
Cooling:	Convection
Notes :	a. 2 minutes max. b. Calibrated up to 10,6 µm. c. Detector centrally irradiated @ 50% of useful surface

Sensor A-40-D25-BBF



TYPICAL LASERS :

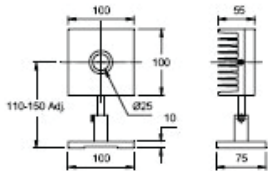
CO₂
Yag(CW or long pulse)
Diode Arrays
Diode Lasers

FEATURES:

- * Average Power & Single Pulse
- * 10mW – 60W or 100m J – 40J
- * Convection Cooled
- * Wide Spectral range

Max. Continuous Power:	40 W
Intermittent Power Use:	60 W (a)
Power Resolution:	10 mW (with Plus Monitor)
Max. Energy:	40 J (long pulses)
Energy Threshold:	200 mJ
Available Absorber Types:	BBF: Broadband, flat responsivity
Wavelength Range:	0,19 - 25 µm (b) (BBF)
Max. Average Power Density:	BBF:200 W/cm ² ; HCB: 2000 W/cm ²
Max. Pulse Energy Density:	See Absorption and Damage Thresholds Graphs
Calibration Accuracy:	± 3%
Response Time with Display (0-90%):	< 1 sec.
Linearity:	± 1% (c)
NEP(Noise Equivalent Power):	5 mW
Sensitive Diameter:	25 mm
Cooling:	Convection
Notes :	a. 2 minutes max. b. Calibrated up to 10,6 µm c. Detector centrally irradiated @ 50% of useful surface

Sensor A-40-D25-HCB



TYPICAL LASERS :

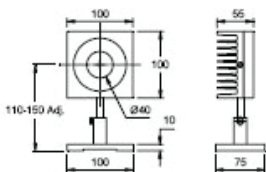
CO2
Yag(CW or long pulse)
Diode Arrays
Diode Lasers

FEATURES :

- * Average Power & Single Pulse
- * 10mW – 60W or 100m J – 40J
- * Convection Cooled
- * Wide Spectral range

Max. Continuous Power:	40 W
Intermittent Power Use:	60 W (a)
Power Resolution:	10 mW (with Plus Monitor)
Max. Energy:	40 J (long pulses)
Energy Threshold:	200 mJ
Available Absorber Types:	HCB: Hard Coating, Broadband
Wavelength Range:	0,19 - 11 μm (b) (HCB)
Max. Average Power Density:	BBF: 200 W/cm ² ; HCB: 2000 W/cm ²
Max. Pulse Energy Density:	See Absorption and Damage Thresholds Graphs
Calibration Accuracy:	$\pm 3\%$
Response Time with Display (0-90%):	< 1sec.
Linearity:	$\pm 1\%$ (c)
NEP(Noise Equivalent Power):	5 mW
Sensitive Diameter:	25 mm
Cooling:	Convection
Notes :	a. Calibrated up to 10,6 μm 2 minutes max b. 2 minutes max c. Detector centrally irradiated @ 50% of useful surface

Sensor A-40-D40-HPB



TYPICAL LASERS :

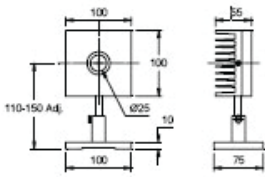
CO2
Yag(CW or long pulse)
Diode Arrays
Diode Lasers

FEATURES :

- * Average Power & Single Pulse
- * 10mW – 60W or 100m J – 40J
- * Convection Cooled
- * Wide Spectral range

Max. Continuous Power:	40 W
Intermittent Power Use:	60 W (a)
Power Resolution:	10 mW (with Plus Monitor)
Max. Energy:	40 J (long pulses)
Energy Threshold:	200 mJ
Available Absorber Types:	HPB: High Power Broadband
Wavelength Range:	0,25 - 11 μm (b)
Max. Average Power Density:	HPB: 4 KW/cm ² @CO2
Max. Pulse Energy Density:	See Absorption and Damage Thresholds Graphs
Calibration Accuracy:	$\pm 3\%$
Response Time with Display (0-90%):	< 1 sec.
Linearity:	$\pm 1\%$ (c)
NEP(Noise Equivalent Power):	5 mW
Sensitive Diameter:	40 mm
Cooling:	Convection
Notes :	a. 2 minutes max b. Calibrated up to 10,6 μm . c. Detector centrally irradiated @ 50% of useful surface

Sensor A-40/200-D25-HPB



TYPICAL LASERS :

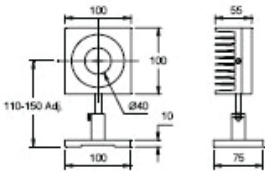
CO2
Yag(CW or long pulse)
Diode Arrays
Diode Lasers

FEATURES:

- * Average Power & Single Pulse
- * 100mW – 200W or 0.25 J – 200J
- * Convection Cooled
- * Wide Spectral range

Max. Continuous Power:	40 W
Intermittent Power Use:	200 W (a)
Power Resolution:	100 mW (with Plus Monitor)
Max. Energy:	200 J (long pulses)
Energy Threshold:	1 J
Available Absorber Types:	HPB: High Power Broadband
Wavelength Range:	0,25 - 11 μm (b)
Max. Average Power Density:	HPB: 4 KW/cm ² @CO2
Max. Pulse Energy Density:	See Absorption and Damage Thresholds Graphs
Calibration Accuracy:	\pm 3%
Response Time with Display (0-90%):	1 sec.
Linearity:	\pm 1% (c)
NEP(Noise Equivalent Power):	20 mW
Sensitive Diameter:	25 mm
Cooling:	Convection
Notes :	a. 2 minutes max b. Calibrated up to 10,6 μm . c. Detector centrally irradiated @ 50% of useful surface

Sensor A-40/200-D40-HPB



TYPICAL LASERS :

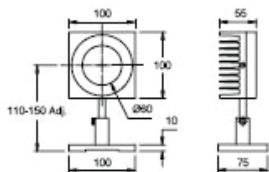
CO2
Yag(CW or long pulse)
Diode Arrays
Diode Lasers

FEATURES :

- * CW, Average Power & Single Pulse
- * 100mW – 200W or 0.25 J – 200J
- * Convection Cooled
- * Wide Spectral Range

Max. Continuous Power:	40 W
Intermittent Power Use:	200 W (c)
Power Resolution:	100 mW (with Plus Monitor)
Max. Energy:	200 J (long pulses)
Energy Threshold:	1 J
Available Absorber Types:	HPB: High Power Broadband
Wavelength Range:	0,25 - 11 μm (b)
Max. Average Power Density:	HPB: 4 kW/cm ² @CO2
Max. Pulse Energy Density:	See Absorption and Damage Thresholds Graphs
Calibration Accuracy:	\pm 3%
Response Time with Display (0-90%):	1 sec.
Linearity:	\pm 1% (c)
NEP(Noise Equivalent Power):	20 mW
Sensitive Diameter:	40 mm
Cooling:	Convection
Notes :	a. 2 minutes max b. Calibrated up to 10,6 μm . c. Detector centrally irradiated @ 50% of useful surface

Sensor A-40/200-D60-HPB



TYPICAL LASERS :

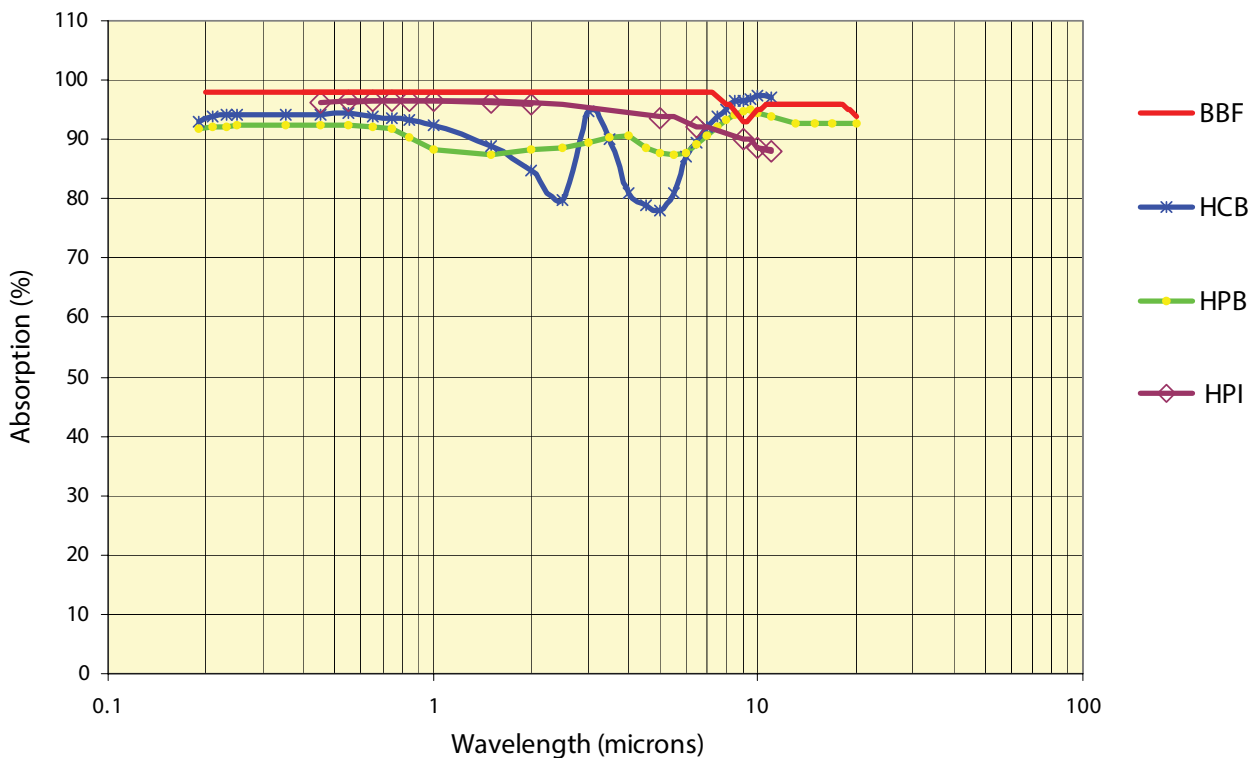
CO₂
 Yag(CW or long pulse)
 Diode Arrays
 Diode Lasers
 IPL

FEATURES :

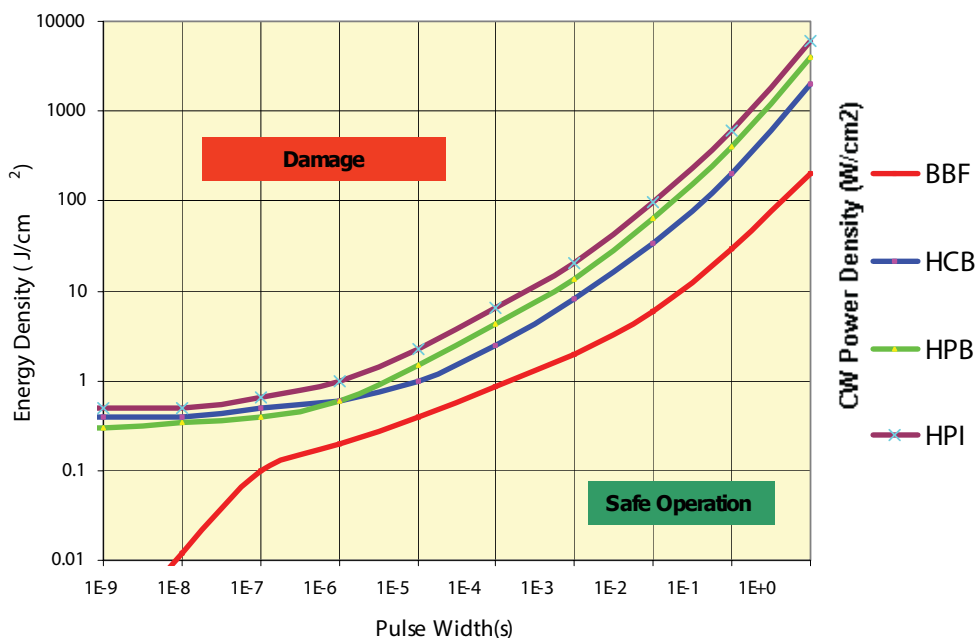
- * Average Power & Single Pulse
- * 100mW – 200W or 0.25 J – 200J
- * Convection Cooled
- * Wide Spectral Range

Max. Continuous Power:	40 W
Intermittent Power Use:	200 W (a)
Power Resolution:	100 mW (with Plus Monitor)
Max. Energy:	200 J (long pulses)
Energy Threshold:	1 J
Available Absorber Types:	HPB: High Power Broadband
Wavelength Range:	0,25 - 11 μ m (b)
Max. Average Power Density:	HPB: 4 KW/cm ² @CO ₂
Max. Pulse Energy Density:	See Absorption and Damage Thresholds Graphs
Calibration Accuracy:	\pm 3%
Response Time with Display (0-90%):	1 sec.
Linearity:	\pm 1% (c)
NEP(Noise Equivalent Power):	20 mW
Sensitive Diameter:	60 mm
Cooling:	Convection
Notes :	a. 2 minutes max b. Calibrated up to 10,6 μ m. c. Detector centrally irradiated @ 50% of useful surface

General Absorption Curves



Pulse Energy Ratings and Damage Thresholds



Notes: Ratings of power and energy densities vary with beam shape, beam diameter and effectively applied powers or energies. On HCB coating some bleach-which will not influence calibration- may occur above 2KW/cm²