



2010

Product Selection
Catalog

Putting the
"Custom"
Back in
Customer

WHO WE ARE & WHAT WE DO

Who we are

- ▶ Manufacturer of OEM laser diode products for analytical, biomedical, & industrial applications
- ▶ Leading force in the laser industry since 1969

What we do

- ▶ Design & manufacture quality OEM laser products
- ▶ Offer modules with UV, violet, blue, green, red, & IR wavelengths
- ▶ Provide modules with circularized beams
- ▶ Offer lasers with active temperature control
- ▶ Make complete customer satisfaction our #1 goal



Thank you for your interest in Power Technology, Inc. The past three decades have been very kind to us. Your proven trust in our products, services, ideas, and expertise have brought us growth beyond our wildest imaginations. We look forward to a continued relationship with you over the decades to come.

Thomas H. Burgess,
CEO

Over 35 Years of Service— Our History of Innovation

Power Technology, Inc. has been a leading force in the laser industry for over three decades. Since 1969, we have been designing and manufacturing high-quality OEM laser products for analytical, biomedical, and industrial applications. Our extensive product line includes laser modules with wavelengths in the ultraviolet, visible, and infrared; temperature stabilized modules; lasers with beam circularization; continuous wave, pulsed, and modulated units; and a wide array of laser options and accessories.

Pick a Color, Any Color— We Bring You Wavelengths Across the Spectrum

Product diversity and versatility are essential ingredients for success. We offer a wide variety of wavelength choices to help ensure that our products meet the needs of your application. These choices include laser products in the ultraviolet, visible (violet, blue, green, and red), and infrared.

Active Temperature Control— Temperature Stabilized Laser Products Are In Demand

Maintaining a constant, optimum operating temperature for a laser diode is essential. Effective thermal management extends the life of a diode and promotes stability of wavelength and optical power. Our more sophisticated modules incorporate a built-in active temperature control circuit, thermoelectric cooler, fan, and PID control loop.

Circular Beams— We Make Elliptical, Astigmatic Beams a Thing of the Past

We offer a number of modules that can incorporate a microlensed laser diode to produce a circular, diffraction-limited beam without correcting prisms. We also offer several modules that employ anamorphic correcting prisms to account for the naturally divergent, elliptical, and astigmatic nature of beams produced by laser diodes. Still other modules can achieve beam circularization by coupling the beam into a fiber optic.

TTL and Analog Modulation— We Offer Beam Modulation Up to 100MHz















To further meet the needs of your application, we offer two types of modulation: TTL and analog. Our TTL lasers are capable of modulation from CW to 100MHz. A benefit of TTL modulation is that users can program it to enable, inhibit, or modulate a laser, making it an excellent resource for synchronized applications. Our analog lasers are capable of modulation from CW to 20MHz. Analog modulation allows users to adjust a laser's output to a desired level from 0 to 100%, providing added control.

Customer Satisfaction— Our Customers Come First

Our ultimate goal is complete customer satisfaction. For over thirty years, we have adhered to this goal, and we will continue our dedication to product development and innovation to bring new solutions to an ever-evolving industry.

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Symbol Key—

	New product
	Product available soon
	Recommended option or accessory
	Analog modulation up to 20MHz
	CW to 100MHz TTL modulation
	CW to 20MHz TTL modulation
	Application notes, data sheets, and/or technical articles available
	Related product
	Lasers that emit energy continuously
	Lasers that yield circular beams
	Mechanical drawings available
	Defined technical term
	DVM-compatible monitoring of a laser's parameters
	Additional information available on our Web site

Please note—

Information contained within Power Technology, Inc.'s Product Selection Catalog is deemed at the time of publication to be accurate and reliable. All pricing, specifications, and product designs are subject to change without notice. Visit our Web site for the latest information on our products.

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POTENTIAL APPLICATIONS

Unique Biomedical Applications

- ▶ MRI & X-ray patient alignment
- ▶ Cellular & tissue fluorescence
- ▶ DNA analysis
- ▶ Particle & droplet sizing
- ▶ Fluorescent microscopy
- ▶ X-ray film marking
- ▶ Confocal microscopy



The needs of our customers are becoming increasingly more specialized, reaching across an ever-evolving range of fields and applications. In fact, our customers approach us daily with needs that extend from the analytical to the industrial to biomedical. Our extensive selection of laser products meets these challenges by

providing users with the necessary tools to make their applications a success. The following are only a few of the clever uses our customers have found for our laser products. We are confident that you, too, will find an exceptional use.

Related Products

Our 532nm IQ5X, LCM-T or LCM-RGB modules may be the perfect solution for your analytical or industrial application. These Nd:YAG modules project highly visible green light, ideal for both indoor and outdoor applications. See page 12 for more information.

Analytical Applications:

A number of analytical applications have flourished with the help of our laser diode modules. For instance, several of our customers have used our distributed feedback (DFB) laser diode products to detect trace amounts of gases. A DFB laser diode can be extremely helpful in monitoring gas content in a critical manufacturing environment, such as an area in which semiconductor wafers are produced. In addition, many of our laser diode modules are perfect for analytical applications ranging from spectroscopy to interferometry to laser-induced fluorescence.

Biomedical Applications:

Customers in the biomedical field have used our laser products in numerous ways to improve the quality of life for their patients. For instance, our lasers have been used for MRI and X-ray patient alignment, cellular and tissue fluorescence, DNA analysis, particle and droplet sizing, flow cytometry, fluorescent microscopy, medical imaging, X-ray film marking, blood analysis, confocal microscopy, and as a pointing source for surgical lasers.

Industrial Applications:

Many of our industrial users have discovered ingenious ways to employ laser products. One such user, a large aircraft manufacturer, is currently using one of our laser modules to assemble large sections of airliners to tight tolerances. Other users have found that infrared lasers serve as ideal illumination sources for machine vision applications. Still others use our laser products for drilling and marking applications.

Customized Applications:

In the ever changing field of photonics, the applications that can benefit from the use of our laser diode products changes and evolves rapidly. With our fully customizable line of products, Power Technology, Inc. can create a laser diode product to fully integrate into your application. From our engineering staff to our custom metal fabrication house, Power Technology, Inc. is your solution for your application's design.

As one of the oldest photonics companies in the United States, we can apply our extensive experience to assist you with your application, no matter how unique it is or what area of business it lies in. Give us a call today to discuss the best solution for you.

INNOVATIONS IN TECHNOLOGY



We understand the importance of bringing our customers the latest in electro-optic technology. We enjoy developing new and unique products, and we welcome opportunities to improve upon our existing technologies.

To bring you the most advanced products possible, we work closely with a number of companies in the electro-optic industry. These relationships, coupled with our own ingenuity and initiative, enable us to offer a wide variety of innovative products. The following are a few of these innovations.

IQ μ - Instrument Quality Microprocessor Controlled Laser Modules:

Our newest lasers incorporate the same outstanding features as our IQ series of modules but offer significant modifications. The new IQ μ comes equipped with an on-board, menu-driven microprocessor that can be controlled by two methods: On-board control or by optional software controlled through an RS232 cable.

Blue & Violet Laser Diode:

Our 440nm blue and 405nm violet modules incorporate patented blue and violet laser diodes to provide an economical means of replacing bulky gas lasers. Our blue and violet modules can meet the needs of most Helium Cadmium, Argon-Ion, and tripled Nd:YAG applications, at a much lower cost, in a smaller package, and in a far more efficient manner. See pages 10-11 for additional information on our blue and violet modules.

Digital Control Options:

Our digital control options are designed to give users more control over a laser's output, wavelength, and temperature. These TTL-compatible options allow modules to interface directly with computerized or electronic control circuits. They have a memory that will retain a module's setting for future use after deactivation.

DFB Diodes:

A typical Fabry-Perot diode yields a broad spectral width and a wavelength that can vary significantly with temperature change. Distributed feedback (DFB) diodes offer an exceptionally stable wavelength and narrow spectral width. We offer DFB diodes centered around a variety of wavelengths. Custom wavelengths are also available.

Fiber Coupled DFB Diodes:

NEW The newest in our line of distributed feedback (DFB) diodes offers an exceptionally stable wavelength and narrow spectral width all in a single mode fiber coupled package! We offer fiber coupled DFB diodes centered around a variety of wavelengths. Custom wavelengths are also available. Our distributed feedback diodes are available as single components or installed into complete modules.

Custom Design House:

We are always eager to build new, custom-designed products based on your unique specifications. To meet our customers' special requirements, we offer a wide range of custom design services for medium to high-quantity orders. Our in-house metal shop and team of electro-optic engineers will gladly work with you to meet your individualized OEM design requirements.

▶ **Blue and violet laser diodes provide an economical means of replacing bulky gas lasers**



Literature Applications

Product data sheets and other informative materials are available from the company or on our Web site.

LASER DIODE PRINCIPLES & DIODE CONFIGURATIONS

Basic Diode Principles

- ▶ Diode specifications typically change from one diode manufacturing lot to another
- ▶ Changes in temperature translate into changes in wavelength & optical power
- ▶ Diodes become more single-mode as you approach their rated power
- ▶ Raw diode power is always greater than the output power of a laser module

A number of questions and misconceptions surround the laser diode. Are all laser diode specifications identical? Do single-mode diodes always operate as single-mode? What effect does temperature change have on wavelength and optical power? The following paragraphs explore these and other common diode questions and principles.

Are all laser diodes with the same model number identical?

Individual diode specifications generally vary from one diode manufacturing lot to another. These variances, typically minor and insignificant, may appear as changes in wavelength or in divergence angles or ratios. During diode manufacturing, variations in materials and layer thickness often account for differences in center wavelength and operating current. To signify potential changes from one diode to another, laser diode manufacturers—like most other manufacturers—allow for tolerances in their specifications. For example, diode manufacturers typically report most visible diode specifications at a center wavelength $\pm 10\text{nm}$. If a specific wavelength is required, we at Power Technology, Inc. offer wavelength selection at a minimal cost.

What effect does temperature change have on wavelength & optical power?

Maintaining an optimum operating temperature for a laser diode can be extremely important. Changes in temperature translate into changes in wavelength and optical power. Unlike gas laser wavelengths—which are determined by atomic transitions—laser diode wavelengths are inherently unstable. The wavelength of a typical Fabry-Perot laser diode typically changes 0.3nm per degree Centigrade. Therefore, for every 3 degrees' change, the wavelength of the laser diode can change nearly 1nm. If operated in constant current mode, diode output power tends to decrease as temperature increases, and diode power can exceed its maximum rating with a decrease in temperature. For this reason, we recommend choosing the automatic power control mode of operation, or using a laser module with active temperature control for constant current mode of operation.

What spectral changes can occur from diode to diode?

One misconception about single-mode diodes is that they are always single-mode. Most single-mode laser diodes operate as such only when driven at or near their recommended operating current. When operated at a lower-than-recommended operating power, a single-mode laser diode can function as if it were multi-mode. For this reason, if single mode output is desired, users should employ a neutral density filter to decrease the intensity of the beam without changing the spectral distribution of the energy.

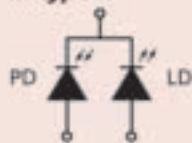
Does raw diode power equal module output power?

When purchasing a laser diode module, keep in mind that the output power of the module will be less than the maximum rated power of the laser diode. This result can be attributed to several factors: optical loss, CDRH safety margins, and general derating of laser modules due to PTI's knowledge and experience regarding certain diodes. Always ask your sales engineer what output power your laser module will have with a particular laser diode installed.

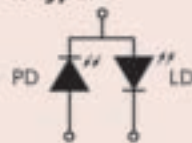
Diode configurations—

The following are the common diode configurations that may be driven in automatic power control mode:

M-type:



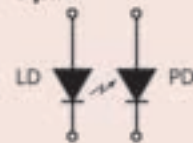
N-type:



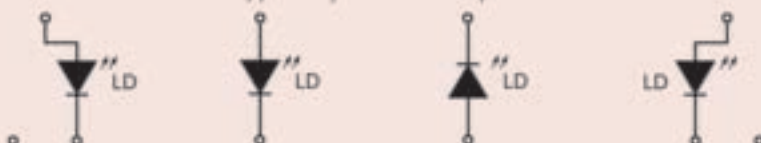
P-type:



4-pin:



Our modules can also support any diode when operated in constant current mode, including the following diode configurations:



Compatible diode types for each of our laser modules can be found within the product specification tables throughout the catalog. If you have a question about diode compatibility, please give us a call.

COMMON WAVELENGTHS & OUTPUT POWERS

The following is a sampling of the most common wavelengths we offer, along with their respective maximum output powers. The information shown below represents only a few of the single-and multi-mode diodes we offer. In fact, we have 100+ wavelength and power combinations available from a variety of the most reputable vendors around the world. If you do not find your desired wavelength below, visit our web site at www.powertechnology.com for a listing of all of our standard diodes, or contact one of our sales representatives for assistance.

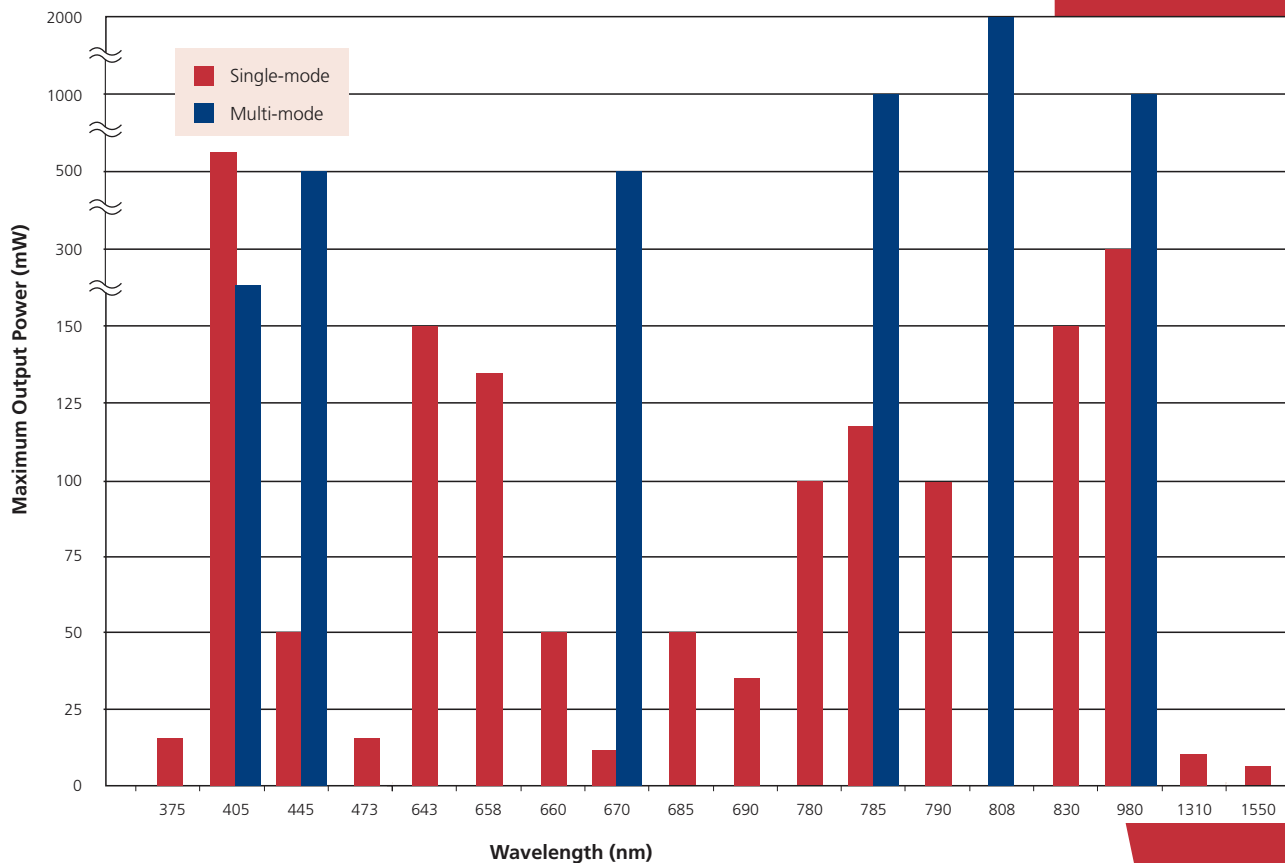


Sampling of available single-mode wavelengths & output powers:

Wavelength (nm)	405	643	658	670	685	780	785	790	830	980	1310	1550
Max. Output Power (mW)	600	150	130	10	50	100	120	100	150	300	10	6
Package Type (mm)	5.6, 9	5.6, 9	5.6	5.6, 9	5.6	9	5.6	9	9	9	5.6	5.6, 9

Sampling of available multi-mode wavelengths & output powers:

Wavelength (nm)	635	670	690	785	808	980
Max. Output Power (mW)	250	up to 1000	<500	1000	2000	1000
Package Type (mm)	9mm, TO-3 w/ TEC	9mm, TO-3 with TEC	9mm, TO-3 with TEC	TO-3	TO-3	TO-3, TO-3 with TEC



PRODUCT SELECTION CHART

The chart below details the most popular features of each laser module and system highlighted in our 2007-2008 Product Selection Catalog. Use this chart as a quick means of determining which PTI lasers can potentially meet the needs of your application. Then further explore the catalog for more specific details regarding each unit.

	LASER MODULE/SYSTEM	CW POWER	ANALOG MODULATION	TTL MODULATION	PULSED	TEMPERATURE CONTROL	CIRCULARIZED BEAM	HIGH POWER (500MW+)	PAGE NUMBER(S)
SPECIALTY UNITS	Blue, Violet, & UV IQ Series	+	+	+	-	std	+	+	10 - 11
	LCM-T / LCM-S Series	std	-	-	-	- / std	std	-	12 - 13
	DTL Series	+	-	-	+	std	std	+	13 - 15
	IQ and IQ _μ Series	+	+	+	-	std	+	+	16 - 17
	Dual Beam Combiner	+	+	+	-	std	+	+	17
	Modules With Fiber	+	-	+	-	std	std	-	20
BASIC OPTICS	PM	std	-	-	-	-	ml	-	22
	RC	std	-	-	-	-	-	-	23
	RS	std	-	-	-	-	-	-	23
	PPM	std	-	-	-	std	ml	-	23
	IQ1C / IQ2C	std	-	-	-	ptc	ml / +	-	23
	SPM Series	std	-	-	-	-	ml	-	24
	PMT	-	-	std	-	-	ml	-	25
	SPMT	-	-	std	-	-	ml	-	25
	PPMT	-	-	std	-	std	ml	-	26
	PMH	-	-	std	-	-	ml	+	26
	IQ1H / IQ2H	std	-	std	-	ptc	ml / +	+	26
	PMA	-	std	-	-	-	ml	-	27
IQ1A / IQ2A	std	std	+	-	ptc	ml / +	+	28	
BEAM CORRECTION	ACM	std	-	-	-	-	std	-	31
	APM	std	-	-	-	std	std	-	31
	ACMT	std	-	std	-	-	std	-	32
	APMT	std	-	std	-	std	std	-	32
HIGH POWER	HAM	std	-	-	-	-	-	std	34
	HPM	std	-	-	-	std	-	std	34
	HSM	std	-	-	-	std	-	std	34
PULSED	ML	-	-	-	std	-	-	+	36
	ILC	-	-	-	std	-	-	-	37
	IPC	-	-	-	std	-	-	-	37 - 38

+ available
 - not available
 ml available by microlens
 std standard
 ptc precision temperature control

SPECIALTY

Products

Blue, Violet, & Ultraviolet Diode Laser Modules	10
IQ μ Series Modules	12
DPSS Ultraviolet, Green, & Infrared Lasers	13
DPSS Green IQ Modules	16
Super Luminescent LED Modules	17
IQ Series Lasers	18
Dual Beam Combiner	19
Infrared Viewing Devices	21

IQ Series Features

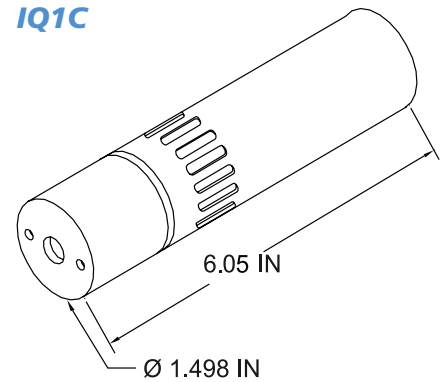
- PID control loop
- Precision current source
- Adjustable focus
- Modulated versions available

BLUE, VIOLET, & ULTRAVIOLET DIODE LASER MODULES



**405nm 320mW
Violet IQ**

IQ1C



Literature Applications

Blue, violet, and UV module datasheets are available in PDF format on our Web site.

A+ Recommended Option

Our G26 lens is diffraction limited between 405nm and 412nm. For other UV and Blue lasers, the G26 provides noticeable improvement in beam quality.

Compact and highly cost-effective, our blue, violet, and UV laser modules are ideal replacements for bulky, inefficient gas lasers. Most applications that use Helium Cadmium, Argon-Ion, and tripled Nd:YAG lasers can

take advantage of this newer, more efficient technology. Applications include laser-induced fluorescence, spectroscopy, microscopy, and interferometry.

Blue, Violet, & Ultraviolet IQ Series—

For applications requiring blue, violet, or ultraviolet output and the ultimate in Power Technology, Inc. temperature stability, our IQ series laser modules are available at 375 ± 5 nm, 405 ± 10 nm, 440 ± 10 nm, and 473 ± 5 nm. Our 473nm 16mW blue module is an efficient, lower noise alternative to 473nm Nd:YAG lasers, while our 445nm 40mW unit is four times more powerful than its predecessor and has proven to be an ideal replacement for outdated blue HeCd lasers. We also offer a new 405nm 500mW IQ, a high power violet unit with superior, diffraction-limited output. In addition, we offer a new circularized 405nm violet IQ with 75mW of output. The unit incorporates highly advanced beam shaping to achieve unmatched beam quality and circularity. For applications not requiring beam circularization, our 100mW elliptical beam version of the 405nm IQ is still available. Also available is our 375nm IQ with 16mW of ultraviolet output, as well as our 445nm 750mW product.

MODULE SPECIFICATIONS	IQ1 C16 (LD1682)	IQ1 C16 (LD1874)	IQ1 C40 (LD1643)	IQ1 C750 (LD1880)	IQ1 C500 (LD1862)	IQ1 C185 (LD1614)	IQ1 C100 (LD1833)	IQ1 C16 (LD1705)
Wavelength (nm)	473 ± 5	488 ± 5	445 ± 10	445 ± 10	405 ± 5	405 ± 10	405 ± 10	375 ± 5
Output Power (mW)	16	16	40	750	500	185	100	16
Dimensions, Ø x L, in	1.50 x 6.2 / 38.05 x 157.5**	1.50 x 6.2 / 38.05 x 157.5**	1.50 x 6.2 / 38.05 x 157.5**	1.50 x 6.2 / 38.05 x 157.5**	1.50 x 6.2 / 38.05 x 157.5**	1.50 x 6.2 / 38.05 x 157.5	1.50 x 6.2 / 38.05 x 157.5**	1.50 x 6.2 / 38.05 x 157.5**
Beam Shape	elliptical***	elliptical***	elliptical***	elliptical***	elliptical***	elliptical	elliptical***	elliptical***
Collim. Beam Size at Exit, 1/e ² (mm)	2.5x 4.0***	2.5 x 4.0***	2.5 x 4.0***	2.5 x 4.0***	TBD	1.3 x 3.0	2.5 x 4.0***	2.5 x 4.0***
Beam Divergence (mrad)	<0.5	<0.5	<0.5	<1	<1	<1	<0.5	<0.5
Operating Voltage (VDC)	8	8	8	8	8	8	8	8
Max. Operating Current (mA)	3000	3000	3000	3000	3000	3000	3000	3000
Recommended Options****	G2	G2	G2	G2	G26	G26	G26	G26
Mounting Brackets	MB6	MB6	MB6	MB6	MB6	MB6	MB6	MB6

*Preliminary data only. Engineering sample.

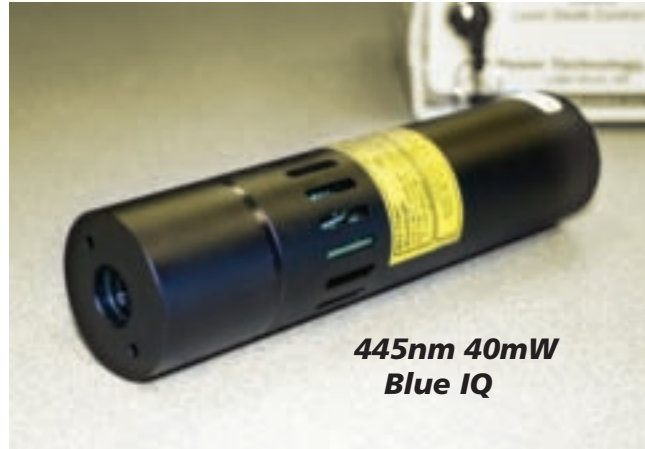
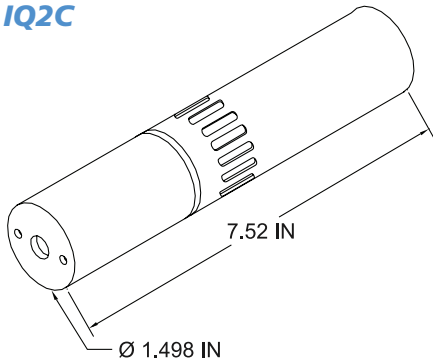
**IQ modules containing anamorphic prisms for beam correction are 7.52" [191.01mm] in length.

***Beam circularization available.

****See pages 46 through 52 for our available options and accessories.

BLUE, VIOLET, & ULTRAVIOLET DIODE LASER MODULES

IQ2C

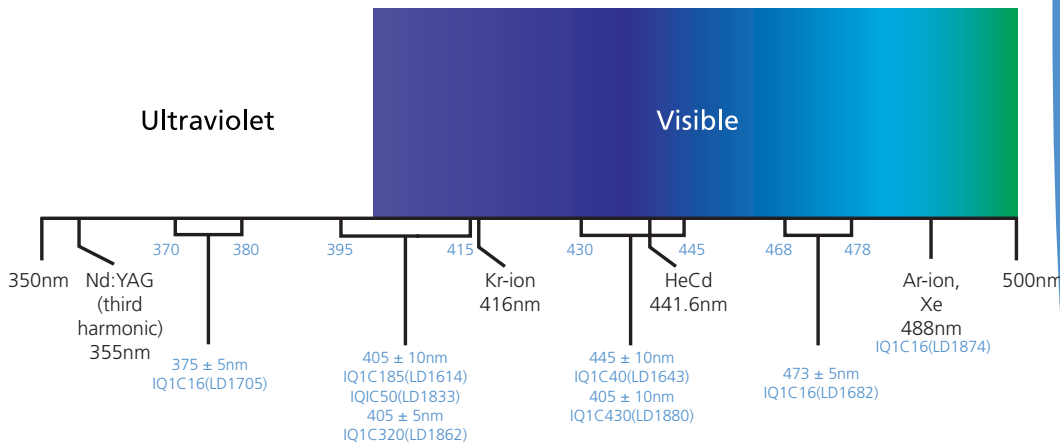


Blue, Violet, & UV Laser Applications

- High-resolution printing
- Laser-induced fluorescence
- Microscopy
- Spectroscopy
- Interferometry
- Display
- Biomedical analysis
- Particle Sizing

Each of our blue, violet, and ultraviolet IQ series modules features a precision current source and a PID control loop to regulate the temperature of the laser diode. This exceptional temperature control helps make our IQ units particularly suited for applications requiring stability of wavelength and output power. Each can operate in either constant current or automatic power control mode and is available with CW or modulated output. Beam circularization is also available.

See page 16 for additional information on our IQ series modules.



Additional information available on our Web site

Note: Lasers with wavelengths below 400nm are Class IIIb products in accordance with CDRH regulations.

Visit our website for
more details on the
Blue IQ!

www.powertechnology.com

IQ μ - INSTRUMENT QUALITY WITH MICROPROCESSOR CONTROL

IQ μ Applications

- Flow Cytometry
- Fluorescence
- Bioanalysis
- Spectroscopy

IQ μ Features

- On board local control
- Monitoring Software
- Multiple Wavelengths
- Analog or TTL Modulation

A+ Recommended Option

To gain even more control of your IQ μ , We recommend using the Graphical User Interface software through a connection of an RS232 or USB cable.



IQ μ Graphical User Interface



The newest in our line of Instrument Quality (IQ) laser modules is the most controllable and stable module to date. This microprocessor controlled module offers precise control over crucial operating parameters by two methods: an on-board, menu driven, local control or a Windows compatible control and **IQ μ Series Laser Modules—**

monitoring software via USB (Universal Serial Bus) or an optional RS-232 interface. The module is available with multiple wavelengths ranging from 375nm to 1600nm.

With output powers of <1mW to 1W and ambient operating temperatures of 0 to 40° C, the module performs extremely well in numerous applications. Some of the applications that can benefit from the reliability, controllability and stability of the IQ μ include flow cytometry, laser-induced fluorescence, bioanalysis, interferometry, Raman spectroscopy, interferometry, high resolution printing, and microscopy.

MODULE SPECIFICATIONS	IQ μ 1C	IQ μ 1H	IQ μ 1A	IQ μ 5C*	IQ μ 5H*
Wavelength (nm)	375-1600	375-1600	375-1600	532	532
Output Power (mW)	0.1 - 1000	0.1 - 1000	0.1 - 1000	<5 - 150	1 - 15
Operating Voltage (VDC)	5 - 15	5 - 15	5 - 15	5 - 8	5 - 12
Max. operating current (mA)	3000	3000	3000	3000	3000
Mod. current above bias (mA)	10 - 1200	10 - 500	10 - 1200	10 - 1200	10 - 500
Temperature stability (°C)	0.02	0.02	0.02	0.02	0.02
Temperature range (°C)	5 - 40	5 - 40	5 - 40	5 - 35	5 - 40
Modulation Specs					
Modulation signal	CW	5 TTL	0-1 V	CW	2 TTL
Max. Modulation rate**	CW	CW - 100 MHz	CW - 70 MHz	CW	CW - 100 MHz
Propagation delay	-	-12ns	-23ns	-	-12ns
Rise/fall times (ns)	-	3ns	6ns***	-	3ns
Input impedance	-	50 ohms	50 or 500 ohms	-	50 ohms
Dimensions Ø x L, in. (mm)	1.5 x 6.05	1.5 x 6.05	1.5 x 6.05	1.5 x 6.55	1.5 x 6.55
Photo diode config. compatibility	9mm, 5.6mm	9mm, 5.6mm	9mm, 5.6mm	-	-
Diode compatibility	M-, N-, P-type	M-, N-, P-type	M-, N-, P-type	-	-
Recommended options	G26, MB6	G26, MB6	G26, L, T, MB6	MB6	G26, MB6

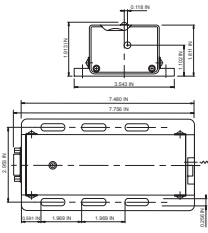
* See page 16 for more information on the IQ μ 5X.

**Maximum modulation frequency and rise/fall times may vary depending on the laser diode chosen.

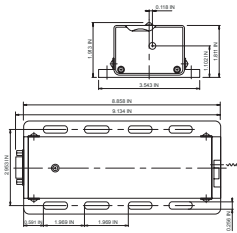
***Not applicable on UV, Violet and Blue modules.

DPSS ULTRAVIOLET, GREEN, & INFRARED LASERS

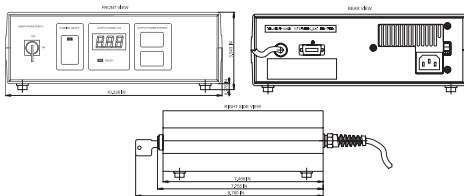
DTL-317 Head



DTL-322 Head



CW DTL Power Supply



CW DTL

CW DTL Features

- Active temperature control
- On/off key switch
- Power adjustment
- Digital power meter
- Emissions indicator
- Remote interlock
- Shutter

LCM-S OEM Laser Module—

Our LCM-S series DPSS modules offer bright green output and an exceptionally narrow spectral width. The low noise LCM-S-111 provides 20mW of output at 532nm, while yielding a noise level of less than 0.5% RMS. The device operates in single longitudinal mode. This module is ideal for a variety of applications, including spectroscopy, holography, and interferometry.

MODULE SPECIFICATIONS	LCM-S-111
Output Power (mW)	11,22,55
Wavelength (nm)	532
Head Dimensions, in. [mm]	2.56 x 1.57 x 1.14 [65 x 40 x 29]
Driver Dimensions, in. [mm]	4.33 x 2.68 x 1.57 [110 x 68 x 40]
Input Voltage (VDC)	4.5 - 6
Beam Waist Diameter (mm, 1/e ²)	0.070 ± 0.007
Beam Diverg. (1/2 angle, 1/e ² , mrad)	5.0 ± 0.5
Noise (10Hz-20MHz)	<0.5% RMS (typ. 0.1%) and <2% p-to-p (typ. 0.5%)

CW DTL Laser Systems—

CW DTL systems feature output powers of 50mW at 532nm and 1W at 1064nm. They include a laser head, turnkey power source, on/off key switch, power adjustment, digital power meter, emissions indicator, remote interlock, and shutter. They also incorporate active temperature control to provide output stability of better than 2% per hour. The operating power on these air-cooled systems can be adjusted manually or from a remote location via a 0 to 5V control voltage. They are ideal for biofluorescence, imaging on film, and other applications requiring wavelength stability.

SYSTEM SPECIFICATIONS	DTL-318	DTL-322
Output Power (mW)	200,350	300, 1000, 2000
Wavelength (nm)	532	1064
Head Dimensions, in. [mm]	3.54 x 9.02 x 1.81 [90 x 229 x 46]	3.54 x 8.86 x 1.81 [90 x 229 x 46]
Power Supply Dimensions, in. [mm]	3.54 x 7.09 x 1.06 [190 x 180 x 27]	10.24 x 7.76 x 3.54 [180 x 80 x 27]
Beam Diameter (typical, mm)	1.8 ± .1	1.2 ± .1
Beam Diverg. (1/2 angle, 1/e ² , mrad)	<.6	<1.6
Output Stability, % / hour	<2	<2
Noise (% , RMS)	<2	<2

A+ Recommended Option

Multimode fiber coupling is available for our CW DTL systems. See page 47 for information on our coupling options.

DPSS ULTRAVIOLET, GREEN, & INFRARED LASERS

DPSS Applications

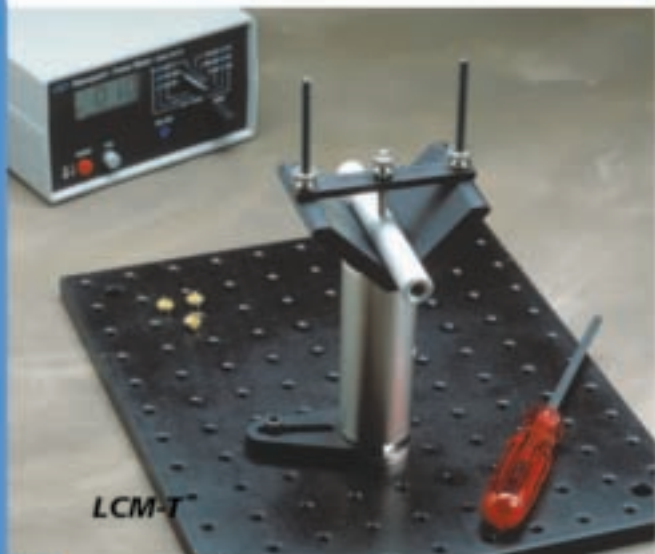
- Holography
- Biofluorescence
- Imaging on film
- Spectroscopy

LCM-T Features

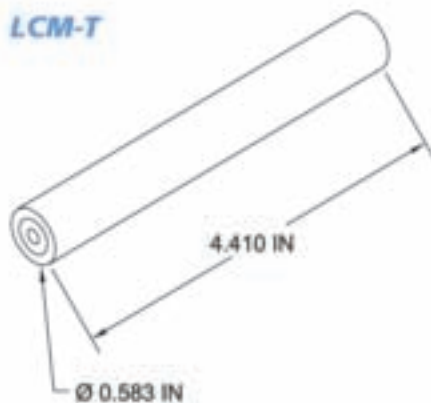
- Output powers of 20mW & 100mW
- Green or IR output

A+ Recommended Option

To cool the laser diode and prolong its life, we recommend heat sinking your LCM-T module. See page 49 for more information on our heat sink option.



LCM-T



Our diode-pumped solid state (DPSS) OEM laser modules and turnkey systems are exceptional alternatives to traditional lamp-pumped lasers. DPSS lasers are inherently wavelength stable and provide a clean, TEM₀₀ quality beam. These superior traits help make DPSS lasers suitable for such demanding applications as biofluorescence and holography.

Available at 1064, 532, 355, and 266nm, our DPSS

lasers offer a variety of wavelengths across the spectrum, making it easy for you to find the ideal solution for your application. Our LCM-T series modules are designed for OEM applications, while our DTL series units are available as turnkey laser systems for the laboratory.

LCM-T Series OEM Laser Modules—

Our compact LCM-T series DPSS laser modules offer a maximum output of 20mW at 532nm and 100mW at 1064nm. An ideal choice for any number of analytical applications, each LCM-T module features an active power stabilization control loop. This control loop constantly monitors the output of the laser module—not the diode—to maintain a stable output power over a wide temperature range.

Each LCM-T module operates from 3.3-3.5VDC and is designed for quick installation, easy operation, and a mean time to failure in excess of 10,000 hours. For end users, an optional CDRH compliant system is available.

MODULE SPECIFICATIONS

	LCM-T-111-20	LCM-T-112-100
Output Power (mW)	20	100
Wavelength (nm)	532	1064
Dimensions, Ø x L, in. [mm]	.58 ± .004 x 4.41 ± .012 [14.81 ± 0.10 x 112.01 ± 0.30]	
Input Voltage (VDC / A)	3.3 - 3.5 / 1.4	
Beam Diameter (mm)	1.0 ± 0.2	
Beam Divergence (half angle, 1/e ² , mrad)	0.6 ± 0.1	1.2 ± 0.2
Stability at Constant Temperature (% / 8 hours)	<2	
Operating Temperature Range (°C)	15 - 35	
Mounting Brackets		

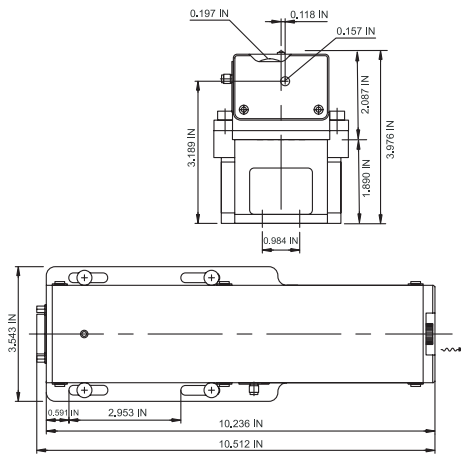
DPSS ULTRAVIOLET, GREEN, & INFRARED LASERS

Q-switched DTL Laser Systems—

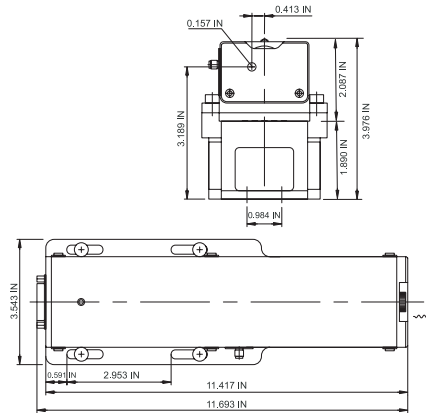
Our Q-switched systems with internal and external triggering feature wavelengths from 266 to 1064nm, giving users a choice of infrared, green, and ultraviolet output. These systems are suitable for applications requiring high peak pulse powers.

SYSTEM SPECIFICATIONS	DTL-382QT	DTL-375QT	DTL-314QT	DTL-324QT
Wavelength (nm)	266	355	532	1064
Head Dimensions, in. [mm]	3.54 x 11.42 x 2.01 [90.00 x 290.00 x 51.00]		3.54 x 10.24 x 2.01 [90.00 x 260.00 x 52.00]	
Power Supply Dim., in. [mm]	3.54 x 10.24 x 7.76 [90.00 x 260.00 x 197.00]	5.91 x 3.15 x 1.70 [150.00 x 80.00 x 43.00]	3.54 x 10.24 x 7.76 [90.00 x 260.00 x 197.00]	
Pulse Energy (μ J)	3	>20 (1kHz)	>20 (1kHz), >3 (10kHz)	>100 (1kHz), >40 (10kHz)
Pulse Length at 1kHz (ns)	<10			
Beam Diameter (typical, mm)	<2	<0.4	<0.4	<1.5
Beam Div. (1/2 angle, 1/e ² , mrad)	–	3.0	1.5	0.8

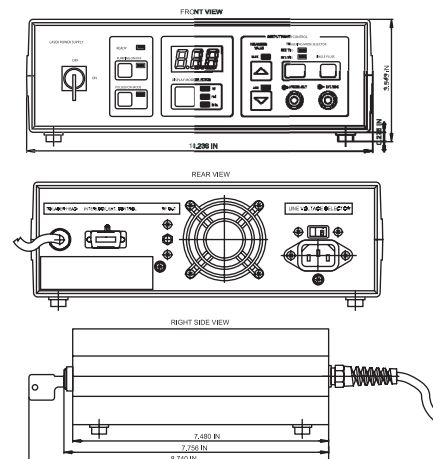
Green & IR AOM Q-switch Head With Heat Sink DTL-314QT & 324QT



UV AOM Q-switch Head With Heat Sink DTL-382QT & 374QT



Q-switched DTL Power Supply



DPSS GREEN IQ LASERS



IQ5X Module Features

- CW, analog modulation, or digital beam modulation
- PID temperature controller
- Precision current source
- Quality glass optics



IQ5C & IQ5H



IQ Green Series Laser Modules—

Our new, Green Instrument Quality (IQ) series laser module has been created specifically to address the needs of high-end OEM applications requiring superior optical quality and ultra-stable wavelengths and output powers. Applications include fluorescence, spectroscopy, microscopy, and bioanalysis. To promote stability of wavelength and output, our IQ modules have always incorporated a precision current source and a PID temperature control loop. The new, improved IQ provides even more stability via several optical and mechanical improvements. In fact, this IQ can now operate at a much wider temperature range. The low operating voltage helps to create less waste heat within the laser module, thereby increasing diode lifetime, efficiency, and reliability. Contact one of our sales engineers today at 501-407-0712 for more information.

	IQ5C(532-150)	IQ5C(532-50)	IQ5C(532-5)	IQ5H(532-5)
Center wavelength	532nm	532nm	532nm	532nm
Output Power(mW)	<120	<50	<5	<5
Output mode: Gaussian	TEM ₀₀	TEM ₀₀	TEM ₀₀	TEM ₀₀
Mod. frequency Range (MHz)	CW - TBD***	CW	CW	CW - TBD***
Rise/fall times (ns)	TBD	TBD	TBD	TBD
Propagation delay	TBD	TBD	TBD	TBD
Control voltage connectory type	SMC	-	-	-
Temperature stability (°C)	0.02	0.02	0.02	0.02
Temperature range (°C)	5 - 35	5 - 40	5 - 40	5 - 40
Polarization state	Linear	Linear	Linear	Linear
Polarization contrast	> 5:1	> 5:1	> 5:1	> 5:1
Residual 1064nm leakage	<0.5%	<0.5%	<1.5%	<1.5%
Operating Voltage (VDC)	5 - 8	5 - 15	5 - 15	5 - 15
Warmup time	<1min	<1min	<1min	<1min
Dimensions Ø x L, in.	1.5 x 6.55	1.5 x 6.55	1.5 x 6.55	1.5 x 6.55
Expected operating lifetime	>4,000 hrs	>4,000 hrs	>4,000 hrs	>4,000 hrs
CDRH Class	Class IIIB	Class IIB	Class IIA	Class IIA
Mounting Brackets	MB6	MB6	MB6	MB6

** Maximum modulation frequency and rise/fall times may vary depending on the laser diode chosen.

*** Not all currents can be achieved at all frequencies. When higher current is achieved, frequency will be lower. When lower current is achieved, frequency will be higher.

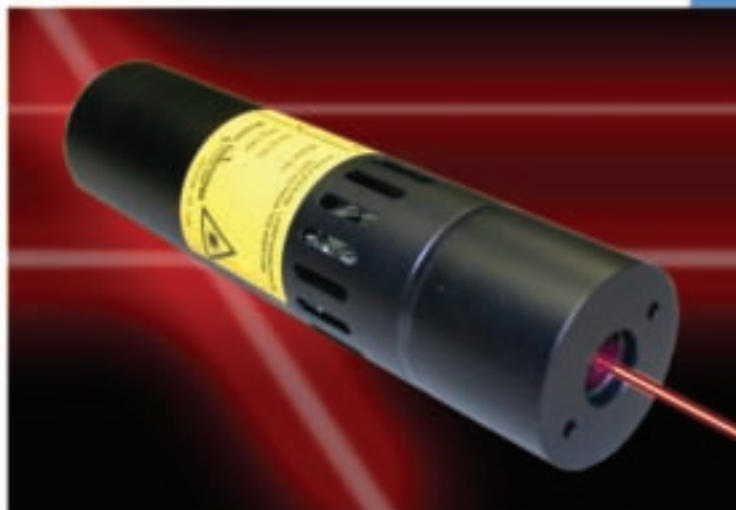
SUPER LUMINESCENT LIGHT EMITTING DIODE MODULES

Features

- High output power
- Low beam divergence
- Near Gaussian spectrum
- Broad emission spectrum
- Low Spectral Ripple

Benefits

- Temperature control
- Higher gain
- Higher current density



Just a few of the applications that can benefit most from Power Technology, Inc.'s new Super Luminescent LED modules are: Optical Coherence Tomography, Atomic Force Microscopy,

Optical Gyros, Fiber Optic Gyros, Optical Measurements, Bragg Grating Sensors, Instrumentation, Telecom and Datacom.

PTI's new Super Luminescent LED module is an ideal light source for Optical Coherence Tomography (OCT), Optical Sensors, and Atomic Force Microscopy. A variety of wavelengths, spectral widths and power levels are available. Wavelengths span from 680nm to 1610nm with powers from 1mW to 60mW. This new line of light sources is based on PTI's industry proven IQ (Instrument Quality) laser diode modules. Since the IQ laser modules were designed for stability and accuracy, they are an ideal host for SLEDs. A SLED is an edge-emitting light source. One of the exceptional qualities of the SLED is its high output power, similar to a laser diode, but with a broad emission spectrum and low coherence, similar to a LED. SLEDs are similar in geometry to lasers.

Applications

- Optical Coherence Tomography
- Atomic force microscopy
- Optical sensors
- Fiber optic gyros
- Optical measurements
- Bragg grating sensors
- Instrumentation
- Telecom and datacom

Product Specifications	IQ1C	IQ4C
Wavelength (nm)	680-1610	680-1610
Output Power (mW)	1-60	1-60
Configuration Space	Free Space	Fiber
Operating Voltage (VDC)	5 - 15*	5 - 15*
Max. operating current (mA)	3000	3000
Mod. current above bias (mA)	10 - 1000**	10 - 1000**
Temperature stability (°C)	0.02	0.02
Temperature range (°C)	5 - 40	5 - 40
Physical diode compatibility	9mm, 5.6mm	9mm, 5.6mm
Dimensions Ø x L, in. (mm)	1.5 x 6.05	1.5 x 8.76
Diode compatibility	M-, N-, P-type, c-mount	M-, N-, P-type
Recommended options	G2, L, T, MB6	MB6

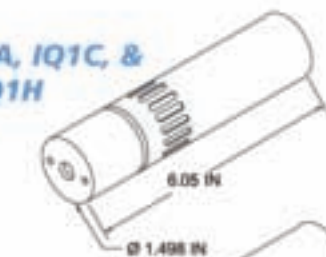
IQ SERIES LASERS & DUAL BEAM COMBINER

IQ Module Features

- CW, analog modulation, or digital beam modulation
- PID temperature controller
- Precision current source
- Circular or elliptical beam
- Quality glass optics
- Wavelengths from 370 to 1600nm



IQ1A, IQ1C, & IQ1H



IQ2A, IQ2C, & IQ2H



IQ laser heads and modules are "Instrument Quality" OEM products with superior thermal and optical specifications. They are excellent choices for any number of applications requiring stability of wavelength

and output power. For applications that can benefit from 2 wavelengths from the same laser beam, we also offer a dual beam combiner.

IQ Series Laser Modules—

For high-end OEM applications requiring superior optical quality and ultra-stable temperatures, wavelengths, and output powers, our newly redesigned IQ laser modules are the perfect solution. Applications include fluorescence, spectroscopy, interferometry, and microscopy. IQ modules feature a precision current source and a PID temperature controller. They can host laser diodes with wavelengths from 370 to 1600nm. They can also operate in either constant current or automatic power control mode and are available with CW or modulated output. The **IQ1C** version operates in CW mode and can deliver up to 1000mA of drive current. The **IQ1H** is capable of 100MHz digital beam modulation, while the **IQ1A** can deliver 70MHz of analog modulation. Each is available with a standard elliptical beam or a circular beam achieved via a micro-lensed diode. Also available are the **IQ2C**, **IQ2H**, and **IQ2A**, alternate models that feature anamorphic prisms to produce a circularized beam. (See page 30 for information on methods of beam correction.)

SPECIFICATIONS	IQ1A/IQ2A	IQ1C/IQ2C	IQ1H/IQ2H	IQ HEAD
Dimensions, Ø x L, in. [mm]	1.50 x 6.05 [38.05 x 153.6] / 1.50 x 7.52 [38.05 x 191.01]	1.50 x 6.05 [38.05 x 153.6] / 1.50 x 7.52 [38.05 x 191.01]	1.50 x 6.05 [38.05 x 153.6] / 1.50 x 7.52 [38.05 x 191.01]	0.75 x 1.51 [19.05 x 38.35]
Operating Voltage (VDC)	5 - 15*	5 - 15*	5 - 15*	diode dependent
Max. Operating Current (mA)	3000	3000	3000	-
Max. Laser Drive Current (mA)	-	1000	-	-
Mod. Frequency Range (MHz)	CW - 70**	-	CW - 100**	-
Mod. Current Above Bias (mA)	10 - 1000***	-	450	diode dependent
Temperature Stability (°C)	.02	.02	.02	controller dependent
Temperature Range (°C)	5 - 40	5 - 40	5 - 40	controller dependent
Rise/Fall (ns)	10**	-	2**	-
Propagation Delay (ns)	20	-	10	-
Physical Diode Compatibility	9mm, 5.6mm	9mm, 5.6mm, c-mount	9mm, 5.6mm	9mm, 5.6mm
Mounting Brackets	MB6	MB6	MB6	

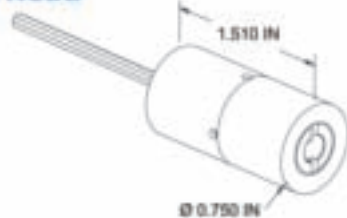
* Optimum IQ performance is achieved from most laser diodes when operated from 5VDC. Please note, however, that our 375nm, 405nm, 440nm, and 473nm lasers require a minimum of 7VDC.

** Maximum modulation frequency and rise/fall times may vary depending on the laser diode chosen.

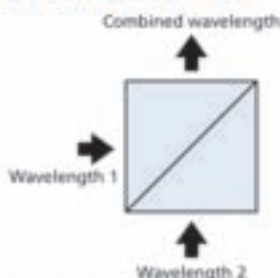
*** Not all currents can be achieved at all frequencies. When higher current is achieved, frequency will be lower. When lower current is achieved, frequency will be higher.

IQ SERIES LASERS & DUAL BEAM COMBINER

IQ Head



Dual Beam Combiner



Dual Beam Combiner

IQ Head Features

- Precision centering
- Integrated TE cooler
- Superior heat dissipation
- Quality glass optics
- Small beam size
- Excellent pointing stability

IQ Laser Head—

The IQ laser head is a separated geometry apart from the laser driver that provides exceptional beam pointing stability and maximum heat transfer from the laser diode to the IQ's base.

- **Thermal stability:** The IQ laser head features a custom-made thermoelectric cooler. Unlike other lasers that pull heat from one side of the laser diode, the heat in the IQ is removed from the diode's largest heat-bearing surface: the bottom.
- **Optical quality:** We use high-quality glass lenses to achieve optical superiority. For added beam quality, users may choose to incorporate a laser diode with integrated microlens to provide a circular, diffraction-limited beam with low divergence. See page 30 for more information on various methods of beam correction.

The IQ head is well-suited for a variety of OEM applications, including instrumentation and spectroscopy. Also available is a complete IQ laser system that includes a power supply, precision temperature controller, and IQ head with integrated thermoelectric cooler.

TE Cooler Specifications

TE Cooler Specifications	IQ Head
I_{max}	2.0 A
V_{max}	8.5V
Q_{max} (TEC)	7.1W
DT_{max}	>48°C

Dual Beam Combiner—

Our dual beam combiner merges the output of two IQ laser heads into a unique, co-linear beam. Beam combining is achieved by employing a polarizing beamsplitter in a reversed configuration. Two beams enter the beamsplitter and emerge as a single beam with random polarization.

Beam combining offers two main advantages;

- Merging similar wavelengths will double the power available at that wavelength.
- The process makes it possible to merge two *different* wavelengths. For example, certain applications require the alignment of infrared beams. Dual beam combining allows users to mix infrared and visible wavelengths for an easy means of alignment.

Most standard diode wavelengths can be combined.

The dual beam combiner is compatible with our IQ laser drive electronics.

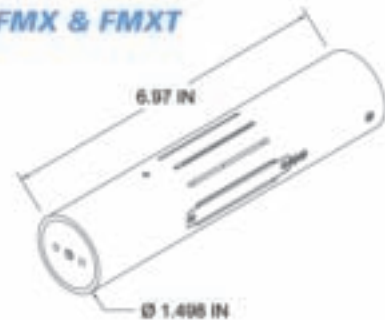
A+ Recommended Option

For additional thermal stability for your IQ head, we recommend incorporating a 40mm heat sink and fan. See page 51 for information on our heat sink.

MODULES WITH INTEGRATED FIBER COUPLED TECHNOLOGY



FMX & FMXT



To bring you the ultimate line of fiber-pigtailed modules, we have integrated fiber coupled technology into one of our most popular packages.

Fiber Coupled Technology—

Fiber coupled technology combines microlensed laser diodes with single-mode fibers. We incorporate this technology into a compact 1.49 x 6.97 inch package, resulting in output that is circularized and diffraction-limited with low divergence. This method yields up to twice the output power and thermal stability of comparable fiber packages.

Fiber coupling eliminates the need for multi-element optics or anamorphic correcting prisms. A simple, high-quality focusing optic works to couple the beam into the fiber, bringing you an efficient means of meeting the needs of your high-volume, cost-sensitive applications.

Our modules with integrated fiber coupling provide a variety of available wavelengths and output powers. CW and modulated versions are available.

SPECIFICATIONS	FMX (XXX-X)*	FMXT (XXX-X)*
Dimensions, Ø x L, in. [mm]	1.50 x 6.97 [38.05 x 177.04]	1.50 x 6.97 [38.05 x 177.04]
Operating Voltage (VDC)	12 ± 1	12 ± 1
Max. Operating Current (mA)	1200	1350
Modulation Frequency Range (MHz)	—	CW - 20
Rise/Fall Times (ns)	—	6/15
Propagation Delay (ns)	—	30
Temperature Stability (°C)	± 5	± 5
Temperature Range (°C)	13 - 32	13 - 32

*Insert a part number from the following chart into the parentheses above to designate a particular wavelength and output power and to, thereby, complete your module name. Ex: FMXT (685-17.5)

PART NUMBER	WAVELENGTH (nm)	OUTPUT POWER (mW)
635-5	635	5
635-17.5	635	17.5
664-25	664	25
685-17.5	685	17.5
780-17.5	780	17.5

Also
Available
in the
IQ4 Series
Modules!

INFRARED VIEWING DEVICES



Our infrared viewers are excellent choices for a variety of applications requiring observation of light emitted by IR sources. Such light sources include GaAs IR LEDs and diode-pumped solid state IR

Infrared Viewers—

We offer five models of infrared viewing devices.

IRVH Hybrid-Intensified Infrared Viewer—

The IRVH(1700) is a hybrid-intensified CCD camera that features an integrated 4-inch TFT-LCD display and an infrared image converter. The unit is designed for viewing radiation in the 350 to 1700nm spectral region. The IRVH enables recording and digitization of images using a PC and may be hand-held or used with a tripod. The unit operates on one AAA and four AA rechargeable batteries (all included), or users may choose to operate it via an AC power adapter, also included. The IRVH is ideal for microscopy, telecommunications, luminescence, art restoration, and fluorescence applications, as well as for a variety of field applications involving the alignment of infrared beams or optical components in near-IR systems.

lasers. For more information on infrared DPSS lasers, see pages 12 through 15.

Applications

- Photo processing
- Thermal imaging
- Semiconductor inspection
- Laser beam alignment
- Forensics & art restoration
- Optical fiber alignment
- Telecommunications
- Fluorescence

Related Products

See pages 13-16 for information on our infrared DPSS lasers.

SPECIFICATIONS	IRVH(1700)	IRVM	IRVE	IRV1(2000) / IRV1(1700)	IRV2(2000) / IRV2(1700) / IRV2(1300)
Spectral Response (nm)	350 - 1700	400 - 1700	400 - 1700	350 - 2000 / 350 - 1700	350 - 2000 / 350 - 1700 / 350 - 1300
System Resolution	300 TV lines	480 TV lines	570 TV lines	40 lp/mm	30 / 60 / 60 / 60 lp/mm
Field of View (degrees)	25 with 1X lens, 12 with 2.5X lens	25	25	30	20 / 38 / 38 / 38 with 1X lens
Lens	1X (F1.4/26mm) or 2.5X (F2/58mm)	F1.1/20mm, c-mount	F1.4/26mm c-mount	F1.0/20mm	1X (F1.4/26mm) or 2.5X (F2/58mm)
Focus (m)	0.15 with 1X lens 0.25 with 2.5X lens	0.15	0.15	.15 to ∞	.15 to ∞
SN Ratio (dB)	>40	46	48	-	-
Video Output	RCA connector	std. composite	std. composite	-	-
Input Voltage (VDC/mA max.)	12/400	12/350	10-14/-	-	3/20
Battery Type	4 x AA, 1 x AAA	4 x AA	-	2 x LR44	1 x AAA
Battery Life (continuous, hours)	1.4 (AA), 50 (AAA)	1	-	18 (typical)	35
Temperature Range (°C)	0 - 40	5 - 40	5 - 40	-10 to +40	-10 to +40

INFRARED VIEWING DEVICES

Accessories (not compatible with all viewers)

- Infrared illuminator
- Infrared filter
- Neutral-density filter
- Microscope adapter
- Iris diaphragm
- Face mask
- AAA battery adapter
- CCD camera option
- C-mount adapter for CCD camera
- 2.5X lens
- 4-inch LCD-TFT monitor

IRVM Infrared Viewer—

The IRVM is a high performance CCD camera that enables viewing and recording of radiation in the 400 to 1700nm spectral range. The IRVM features a built-in 4-inch TFT-LCD monitor for digital viewing of images. Users may operate the device via adapter (included) or four AA rechargeable batteries (also included). The unit may be hand-held or used with a tripod. Applications include night vision, forensics, telecommunications installation, optical components testing, and coupling alignment.

IRVE Infrared CCD Camera—

Our IRVE is a compact CCD camera designed for viewing, registering, and recording radiation in the 400 to 1700nm spectral range. The device incorporates a highly sensitive, low noise silicon CCD sensor with increased sensitivity in near-infrared light regions. The IRVE does not include a TFT-LCD display, so users must supply a monitor for image viewing. Applications include infrared microscopy, infrared luminescence (by ultraviolet stimulation), fluorescence, and art restoration.

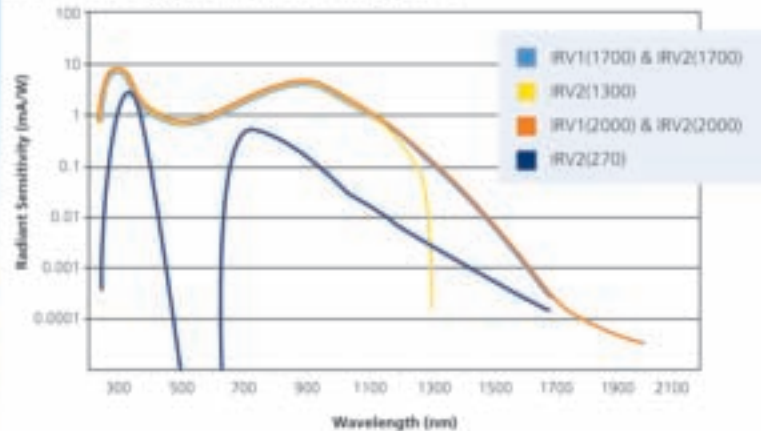
IRV1 Infrared Viewer—

Our IRV1 infrared viewers are available in two versions: one with a spectral response that extends from 350 to 2000nm and one with a 350 to 1700nm spectral response. These miniature devices, which fit comfortably in the palm of your hand, are ideal for applications involving the alignment of infrared beams or optical fibers in a near-IR system. A facemask is available for those requiring hands-free operation. Users may also mount the viewers on a post via the 1/4-20 internal threads, or they may use them as hand-held devices.

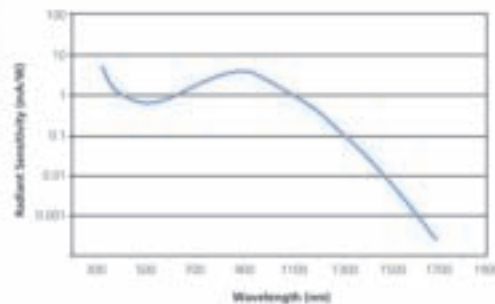
IRV2 Infrared Viewers—

Our IRV2 units are hand-held viewers designed for observing radiation in the 350 to 2000nm, 350 to 1700nm, 350 to 1300nm, or even 270 to 1700nm spectral range. These devices may be post-mounted using their 1/4-20 internal threads or attached to a facemask for hands-free operation.

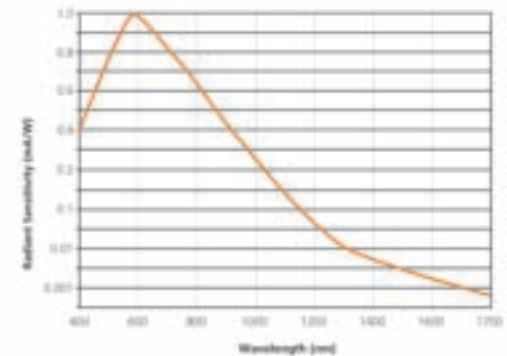
IRV1 & IRV2 Typical Spectral Response:



IRVH Typical Spectral Response:



IRVM & IRVE Typical Spectral Response:



DIODE LASERS

With
Basic Optics

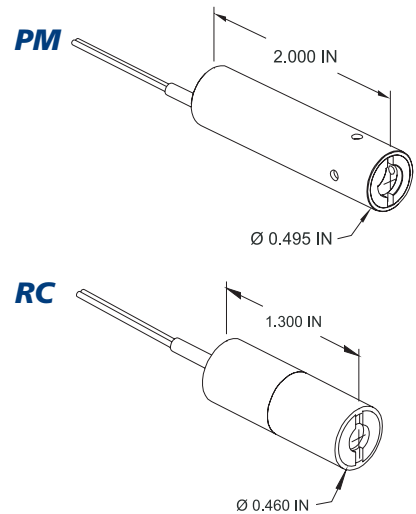
Self-Contained CW Laser Modules	24
CW Lasers With Separated Geometry	26
TTL Modulated Lasers	27
Modulated Vs. Pulsed Laser Modules	28
Analog Modulated Lasers	29

SELF-CONTAINED CW LASER MODULES

- All self-contained CW lasers except the RC & RS are compatible with a circularizing micro lens
- PM can deliver up to 120mA of drive current to N-type or P-type diodes



RC, RS, & PM



Technical Definitions

Continuous wave (CW) lasers: These units emit energy continuously rather than in short pulses.

Recommended Option

For demanding applications involving PM and RS units, additional heat sinking may be necessary. See page 49 for information on our heat sink option.

Self-contained modules include the diode, optics, and power supply housed together in a single case. Each unit incorporates a basic aspheric lens to produce a quasi-collimated beam. Each (with the exception of the RC and RS) can incorporate a microlensed

laser diode. Microlensing circularizes the naturally elliptical light output of a diode without the inclusion of correcting prisms and lenses.

Self-Contained, CW—

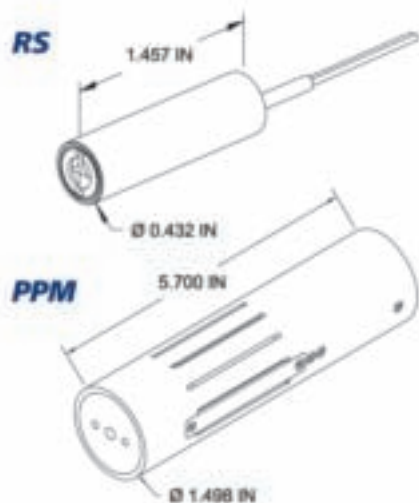
PM Laser Modules:

The PM is an industrial-grade laser module designed for use in standard or rugged OEM environments. The PM contains a precision current source that can deliver up to 120mA of drive current to N-type or P-type laser diodes. For your more demanding applications, we recommend incorporating a heat sink into your unit. See page 49 for information on our heat sink option. The module is ideal for a wide variety of applications, from positioning to alignment to bar code reading. For additional mounting flexibility, we offer SPM series modules that have a separated head and power supply. See page 24 for additional information on our SPM units.

MODULE SPECIFICATIONS	PM	RC	RS	PPM	IQ1 C/IQ2 C
Dimensions, Ø x L, in. [mm]	.50 x 2.0 [12.57 x 50.80]	.46 x 1.30 [11.68 x 33.02]	.43 x 1.46 [10.97 x 37.01]	1.5 x 5.70 [38.05 x 144.78]	1.5 x 6.20 [38.05 x 157.48] / 1.5 x 7.52 [38.05 x 191.01]
Operating Voltage (VDC)	3.3 - 9	3.3 - 9	3.3 - 9	12 ± 1	11 - 14
Max. Operating Current (mA)	120	65	65	1200	3000
Max. Laser Drive Current (mA)	120	60	60	500	1000
Temperature Stability (°C)	–	–	–	.5	.02
Temperature Range (°C)	–	–	–	10 - 35	0 - 40
Physical Diode Compatibility	9mm, 5.6mm	9mm, 5.6mm	9mm, 5.6mm	9mm, 5.6mm	9mm, 5.6mm
Diode Compatibility	N-type & P-type in APC, all in CC	N-type	N-type	N-type & M-type in APC, all in CC	all
Micro lens Compatible	yes	no	no	yes	yes
Recommended Options*	D1, T	L	L	D1, D2, D3, T	D4, D5, D6
Mounting Brackets					

*See pages 46 through 52 for our available options and accessories.

SELF-CONTAINED CW LASER MODULES



- ▶ RC & RS are designed for cost-sensitive OEM applications
- ▶ PPM offers active temperature control to regulate the temperature of the diode
- ▶ IQ1C & IQ2C feature the highest level of temperature stability available in a PTI module

RC Laser Modules:

The RC is designed to meet the needs of the price-sensitive OEM application. The RC offers a choice of wavelength and output power, all in an ultra-compact package. In fact, the RC is our smallest laser module. The unit operates in automatic power control mode.

RS Laser Modules:

Like the RC, the RS is a compact module designed for your cost-sensitive application. The output power of the RS is preset to fall within the range of your desired laser class, and units that are class 3a and below are CDRH certified, provided that users connect to the power source through a switch. The RS operates in automatic power control mode. An optional factory-installed line generating lens is available that is permanently attached to the module at a fixed focal distance. No adjustment of the lens is possible. For particularly demanding applications, we recommend incorporating a heat sink into your RS. See page 49 for information on our heat sink option.

PPM Laser Modules:

The PPM module contains an active temperature control circuit, thermoelectric cooler, and fan to regulate the operating temperature of the diode. The PPM can operate in either constant current or automatic power control mode. Built-in potentiometers enable users to adjust the drive current, laser power, or active temperature control parameters, and a 7-pin connector allows for DVM-compatible monitoring of these parameters. The PPM is ideal for a variety of applications, including alignment and measurement.

For those requiring active monitoring of their PPM, an optional side cover is available that allows users to plug directly into the unit.

IQ1C, IQ2C and IQ4C Laser Modules:

For applications requiring the ultimate in PTI temperature stability, the IQ1C, IQ2C and IQ4C feature a PID loop to control thermoelectric cooler output. These instrument quality modules can deliver up to 1000mA of drive current to 9mm or 5.6mm laser diodes and can operate in either constant current or automatic power control mode. Each allows for DVM-compatible monitoring of temperature and drive current parameters. The IQ1C is available with an elliptical beam or a round beam achieved via a microlensed diode. The IQ2C incorporates anamorphic correcting prisms to produce a circularized beam.



A Recommended + Option

For even intensity or cylindrical line generation for your RS module, give our L option a try. See page 49 for more information.

DVM-Compatible Monitoring

The PPM allows for DVM-compatible monitoring of drive current, output power, and temperature control parameters. The IQ1C and IQ2C enable users to monitor temperature and drive current parameters.

CW LASERS WITH SEPARATED GEOMETRY

- LDP201 drives lasers up to 150mA
- LDP214 drives lasers up to 120mA
- LDP234 is designed to drive P-type laser diodes up to 120mA



SPM With LDP214 Driver



Related Products

See pages 43 through 45 for additional information on our available laser diode drivers.

Instead of being encased in a single unit, the diode and lens of our separated geometry lasers are housed together in their own head assembly, separate from the driver. This configuration provides flexible

mounting in tight spaces and allows for a wide variety of laser head and driver combinations.

Separated Geometry, CW—

SPM Series Lasers:

Members of the SPM family of lasers offer all the advantages of a PM: rugged build, aspheric glass optics, and a versatile nature. In addition, SPM series lasers feature an ultra-compact separated head. With a diameter of only 5.8mm, the SPMC is the smallest PTI head available. See the chart below for additional SPM laser head specifications. Users of SPM series laser heads have a choice of the following power supplies:

- **LDP201:** This power supply—designed for lasers up to 150mA—may operate in either constant current or automatic power control mode. Built-in 3/4 turn potentiometers allow users to adjust the laser power or drive current, depending on the mode of operation. DVM-compatible test points enable monitoring of the laser drive current or photodiode feedback current during operation.
- **LDP214:** The LDP214 is designed to drive lasers up to 120mA that incorporate a back-facet monitor diode. The unit operates in automatic power control mode and, therefore, will adjust to environmental changes to maintain a constant output power. A built-in 3/4 turn potentiometer enables users to adjust the laser power from 0 to the maximum, factory-set laser output.
- **LDP234:** Designed to drive P-type laser diodes up to 120mA, the LDP234 operates in constant current or automatic power control mode. A built-in 3/4 turn potentiometer enables users to adjust the laser power from 0 to the maximum laser setting.

LASER HEAD SPECIFICATIONS	SPM	SPMB	SPMC
Head Dimensions, Ø x L, in. [mm]	.50 x .62 [12.67 x 15.75]	.28 x .73 [6.99 x 18.64]	.23 x .35 [5.80 x 9.00]
Operating Voltage (VDC)	3.3 - 9	3.3 - 9	3.3 - 9
Max. Operating Current (mA)	driver dependent	100	60
Max. Laser Drive Current (mA)	150/120/120*	150/120/120*	60
Physical Diode Compatibility	9mm, 5.6mm	5.6mm	5.6mm
Diode Compatibility	driver dependent	driver dependent	driver dependent
Recommended Options**	C, L	G1, G7	G1, G6

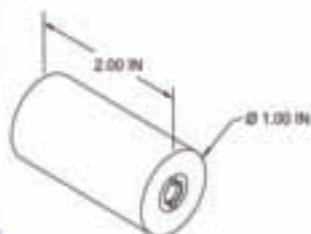
*Users may select any of the laser drivers listed above: LDP201 (150mA max. drive current), LDP214 (120mA), or LDP234 (120mA).

**See pages 46 through 52 for our available options and accessories.

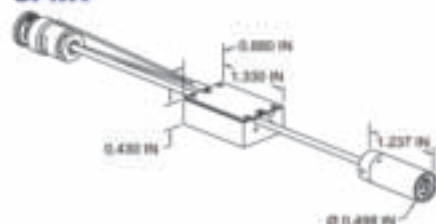
Note: See page 55 for information on building SPM series model numbers.

TTL MODULATED LASERS

PMT



SPMT



➤ SPMT is a separated geometry version of the PMT

**SPMT, PMT,
PPMT, & PMH**

Our modules with digital beam modulation require a 0 or 5VDC, TTL-compatible input signal to control laser

output. TTL modulation can be used to enable, inhibit, or modulate a laser, making it an excellent resource for synchronized applications.

TTL Modulated—

PMT and SPMT Laser Modules:

The PMT and SPMT are versatile choices suitable for a variety of OEM environments. Both operate in constant current mode and are designed for digital beam modulation from CW to 20MHz. The PMT is a self-contained module, while the SPMT features a separated geometry. The PMH offers digital modulation from CW to 100MHz. Also, the PMH offers greater power stability and thermal compensation. The separated geometry configuration promotes easy positioning of the components within the design constraints of your application.

A+ Recommended Option

For more control of your PMT and SPMT parameters, give option X22 (internal 3/4 pot) a try. See page 51 for more information.

MODULE SPECIFICATIONS	PMT	SPMT	PPMT	PMH	IQ1H/IQ2H
Dimensions, Ø x L, in. [mm]	1.0 x 2.05 [25.4 x 52.1]	5 x 1.24 [12.65 x 31.42]	1.5 x 5.7 [38.05 x 144.78]	1.0 x 2.65 [25.4 x 67.31]	1.5 x 6.20 [38.05 x 157.48] / 1.5 x 7.52 [38.05 x 191.01]
Operating Voltage (VDC)	5 ± 0.5	5 ± 0.5	12 ± 1	5 ± 0.5	5 - 14
Max. Operating Current (mA)	280	280	1500	350	3000
Max. Laser Drive Current (mA)	0 - 200	0 - 200	0 - 200	120 bias + 200 mod.	1000 bias + 120 mod.
Mod. Frequency Range (MHz)	CW - 20	CW - 20	CW - 20	CW - 100*	CW - 100*
Rise/Fall Times (ns)	6/15*	6/15*	6/15*	2*	2*
Propagation Delay (ns)	30*	30*	30*	5*	6*
Temperature Stability (°C)	-	-	5	-	.02
Temperature Range (°C)	-	-	10 - 35	-	0 - 40
Control Signal Connector Type	SMC	BNC	BNC	SMC	SMC
Physical Diode Compatibility	9mm, 5.6mm	9mm, 5.6mm	9mm, 5.6mm	9mm, 5.6mm	9mm, 5.6mm
Diode Compatibility	all	all	all	all	all
Recommended Options**	D2, T, X22	D2, T, X25, X26	D2, D3, T	D5, X21, X22, X23	D4, D5, D6

*Maximum modulation frequency and rise/fall times may vary depending on the laser diode chosen.

**See pages 46 through 52 for our available options and accessories.

TTL MODULATED LASERS

PPMT Laser Modules:

Like the PMT, the PPMT is designed for digital beam modulation from CW to 20MHz. However, the PPMT features active temperature control for added power and wavelength stability. The unit operates in constant current mode. Built-in potentiometers enable users to adjust the drive current or active temperature control parameters, and a 7-pin connector allows for DVM-compatible monitoring of these parameters.

PMH Laser Modules:

The PMH offers beam modulation from CW to 100MHz, perfect for demanding applications where power and speed are of utmost importance. The module features digital beam modulation with drive currents up to 120mA.

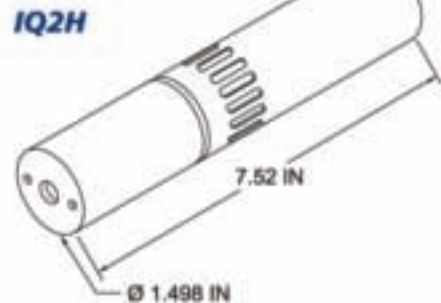
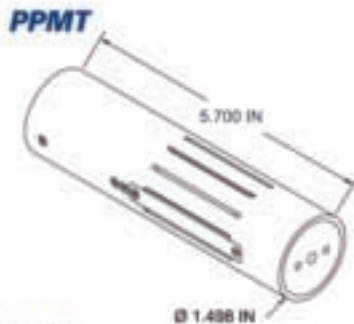
IQ1H & IQ2H Laser Modules:

For applications requiring beam modulation, power, speed, and our highest level of temperature stability available, the IQ1H and IQ2H are ideal solutions. Each incorporates a PID loop to control TE cooler output and features beam modulation from CW to 100MHz. The IQ1H is available with an elliptical beam or a round beam achieved via a microlensed diode. The IQ2H incorporates anamorphic prisms to produce a circular beam.

- ▶ **PPMT provides active temperature control for stability of output and wavelength**
- ▶ **PMH offers high speed beam modulation from CW to 100MHz**
- ▶ **IQ1H is available with an elliptical beam or a round beam achieved via a microlensed diode**
- ▶ **IQ2H incorporates anamorphic correcting prisms to produce a circularized beam**

DVM-Compatible Monitoring

The PPMT, IQ1H, and IQ2H allow for DVM-compatible monitoring of drive current and temperature control.



Modulated Vs. Pulsed Lasers—

Pulsed lasers emit energy in a series of short bursts, or pulses, rather than in a continuous stream. Each pulse is essentially a bright flash of light, much like the flash of a camera, emitted at the wavelength of the diode. The limited "on" time of a pulser is due to its relatively high output level. Although each pulse is brief, lasting anywhere from nanoseconds to a few microseconds, these lasers typically deliver several Watts of peak power per pulse. The pulse length depends on the user's application and the amount of time the diode can operate at that level without damage. Pulsed lasers are inactive between each pulse. This "off" time allows the laser diode to cool down in preparation for another pulse.

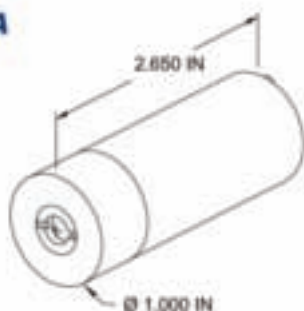
Pulsed lasers require a trigger signal to operate. The trigger may be user-supplied or generated within the laser itself. If user-supplied, the individual will receive a maximum rate (repetition rate) at which he or she can safely trigger the pulse without damaging the laser. If the laser contains an internal trigger circuit, the repetition rate will be preset at the factory, and users need only supply power to the laser to operate it.

Modulated lasers, on the other hand, do not have a limited "on" time. They can be modulated to respond much more rapidly than pulsed lasers, although peak output power cannot match that of pulsers. Several of our laser diode modules employ one of two types of modulation: analog or TTL. Analog modulation allows users to adjust a laser's output to a desired level from less than 5% to 100% of its maximum. A DC voltage of 0 to 1 Volt generates this desired output, and this voltage can be modulated at a relatively high rate, up to 20MHz in some cases. Analog modulators attempt to follow the shape of the 0 to 1 Volt input signal with 0 to 100% laser output, limited only by how fast the modulator can respond and drive the laser.

TTL modulators emit 100% of their power when a TTL "0" (0 VDC) is input and less than 5% of their power when a TTL "1" (5 VDC) is input. Unlike analog modulated lasers, TTL modulated lasers cannot produce any level of fractional power. They are either ON or OFF. TTL modulators are designed primarily for applications requiring speed.

ANALOG MODULATED LASERS

PMA



► PMA is the perfect solution for such applications as testing & fluorescence

Our analog modulated lasers are capable of modulation from CW up to 20MHz. Analog modulation allows users

to adjust a laser's output to a desired level from <5% to 100% of its maximum, providing added control.

Analog Modulated—

PMA Laser Modules:

The PMA supports analog beam modulation from CW to 50kHz with bias currents from 0 to 120mA and modulation currents from 0 to 200mA. Please note that the unit's combined bias current and modulation current cannot exceed 300mA. The PMA allows for DVM-compatible monitoring of the module's drive current and output power. The unit serves as the perfect solution to any number of applications, including laser-induced fluorescence, testing, and biomedical procedures.

**DVM-
Compatible
Monitoring**

The PMA contains a connector that allows for DVM-compatible monitoring of the unit's drive current and output power.

MODULE SPECIFICATIONS	PMA	IQ1A/IQ2A
Dimensions, Ø x L, in. [mm]	1.00 x 2.65 [25.40 x 67.31]	1.50 x 6.05 [38.05 x 153.6] / 1.50 x 7.52 [38.05 x 191.01]
Operating Voltage (VDC)	5 ± .5	5 - 14
Max. Operating Current (mA)	370	3000
Modulation Current Above Bias (mA)	120 bias + 200 mod.*	1000 bias + 200 mod.
Modulation Frequency Range (kHz)	CW - 50**	CW - 20**
Rise/Fall Times (ns)	10/14**	6**
Propagation Delay (ns)	22**	18**
Temperature Stability (°C)	-	.02
Temperature Range (°C)	-	0 - 40
Control Signal Connector Type	SMC	SMC
Physical Diode Compatibility	9mm, 5.6mm	9mm, 5.6mm
Diode Compatibility	all	all
Mounting Bracket		

*Bias current plus modulation current cannot exceed 300mA.

**Maximum modulation frequency and rise/fall times may vary depending on the laser diode chosen. To achieve maximum modulation speed, some light may be visible in the 'off' state.

ANALOG MODULATED LASERS

IQ1A & IQ2A Laser Modules:

For applications requiring beam modulation and an ultra-stable temperature, the IQ1A and IQ2A are ideal choices. These instrument quality modules incorporate a PID temperature controller and precision current source and feature analog beam modulation from CW to 20MHz. Each allows for DVM-compatible monitoring of temperature and drive current parameters. The IQ1A is available with an elliptical beam or a round beam achieved via a microlensed diode. The IQ2A incorporates anamorphic correcting prisms to produce a circular beam. See page 30 for additional information on beam correction.

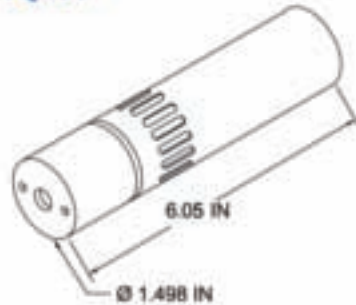
► **IQ1A & IQ2A are ideal for applications requiring beam modulation & ultra-stable temperatures**

DVM-

Compatible Monitoring

The IQ1A and IQ2A enable users to monitor temperature and drive current parameters.

IQ1A



IQ2A



The
ultimate
in temperature
stability



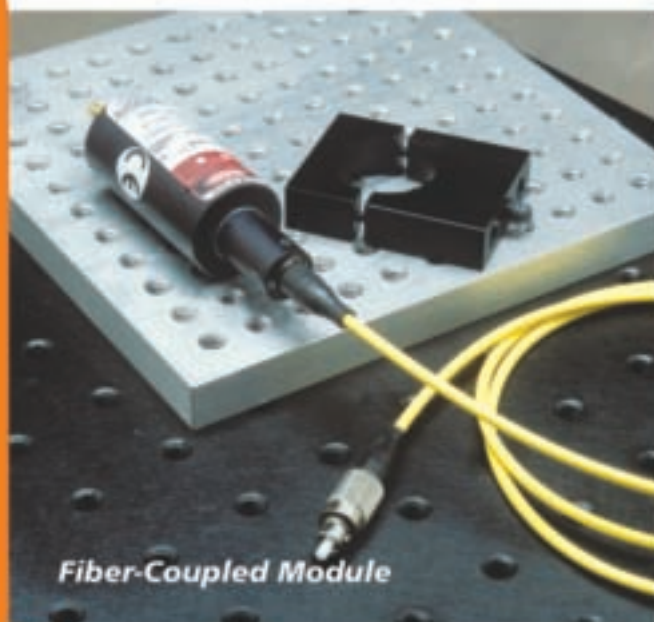
DIODE LASERS *With* Beam Correction

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OPTICAL CORRECTION METHODS

3 Methods of Beam Correction

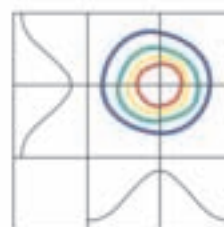
- ▶ Microlensing
- ▶ Using a pair of anamorphic correcting prisms
- ▶ Coupling a laser beam into a fiber optic



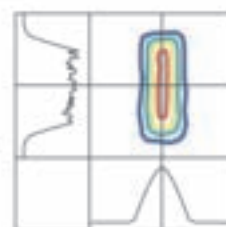
Fiber-Coupled Module

A laser diode naturally produces a beam that is divergent, elliptical, and astigmatic. Our advanced optical procedures correct for these deficiencies, and our more sophisticated lasers can produce a beam that is circular and diffraction-limited with low divergence.

Round vs. Elliptical Output



Round output achieved via microlensing



Output resulting from standard optics

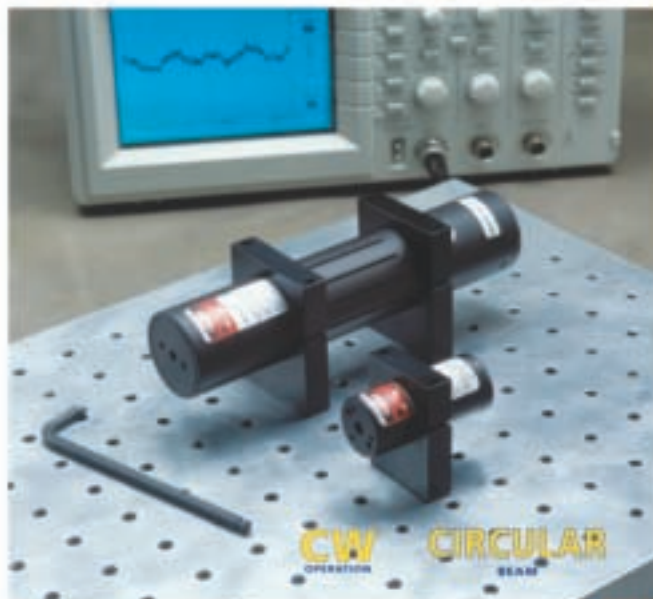
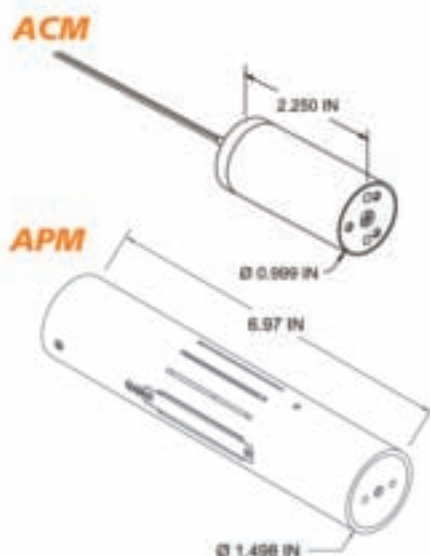
Whether your application requires a module with anamorphic correcting prisms, or a laser diode complete with microlens, we can help make your application a success.

Optical Correction Methods—

We employ three methods to improve laser beam quality:

- ▶ We can integrate a highly advanced microlens into a variety of our packages. Microlensing circularizes the naturally elliptical light output of a laser diode. The microlensed diode emits a circular, diffraction-limited beam without the inclusion of correcting prisms and lenses. In addition, the extremely high entrance NA (numerical aperture) of the microlens captures virtually all of the optical energy available from the laser diode. The microlens is compatible with a number of our lasers, including the IQ1A, IQ1C, IQ1H, IQ head, PM, PMA, PMH, PMT, PPM, PPMT, SPM, and SPMT.
- ▶ Another method of beam circularization employs a pair of anamorphic correcting prisms. By adjusting the angles of the prisms and incorporating a circular aperture, we can circularize an elliptical beam. For astigmatic correction, we use a weak cylindrical lens after the collimating lens. Employing both of these methods results in a cost-effective means of correcting a beam.
- ▶ A method of both circularizing an elliptical beam and correcting astigmatism involves coupling a laser beam into a fiber optic. This method yields a superior, circular beam with low light scattering and no residual astigmatism.

CW LASER MODULES WITH BEAM CORRECTION



- ▶ ACM is a compact, economical alternative to gas lasers
- ▶ APM combines active temperature control with beam circularization

Circularized Beam, CW—

ACM Laser Modules:

The ACM is an excellent replacement for large, inefficient gas lasers. The unit yields a round beam that imitates a gas laser's naturally circular beam while offering several advantages: compact size, lighter weight, and dramatically lower power consumption. The ACM achieves its beam circularization via a pair of anamorphic correcting prisms, an astigmatic lens, and an output aperture. The unit operates in automatic power control mode and serves as an ideal OEM component for positioning, alignment, and measurement applications.

APM Laser Modules:

The APM module not only offers a circularized beam, but it includes an active temperature control circuit, TE cooler, and fan to control the diode's operating temperature. These temperature control mechanisms—in addition to promoting stability of wavelength and output power—help to extend the life of the diode.

The APM operates in constant current mode or automatic power control mode. Built-in potentiometers enable users to adjust or change the drive current, laser power, or active temperature control parameters, and a 7-pin connector allows for DVM-compatible monitoring of these parameters.

DVM- Compatible Monitoring

The APM contains a 7-pin connector that allows for DVM-compatible monitoring of the drive current, output power, and active temperature control parameters.

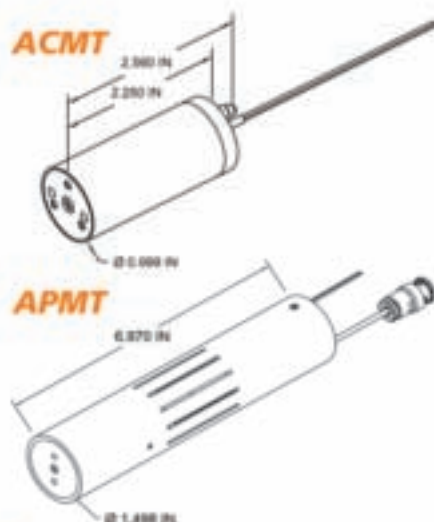
Round
beam
laser
modules

MODULE SPECIFICATIONS	ACM	APM
Dimensions, Ø x L, in. [mm]	1.00 x 2.25 [25.37 x 57.15]	1.50 x 6.97 [38.05 x 177.04]
Operating Voltage (VDC)	3.3 - 9	12 ± 1
Max. Operating Current (mA)	120	1350
Max. Laser Drive Current (mA)	120	500
Temperature Stability (°C)	—	5
Temperature Range (°C)	—	10 - 35
Physical Diode Compatibility	9mm, 5.6mm	9mm, 5.6mm
Diode Compatibility	N-type & P-type in APC, all in CC	M-type & N-type in APC, all in CC
Beam Size At Exit, 1λ ² (mm)	2.7	2.7
Recommended Options*	D1, T, X12	D1, D2, D3, T
Mounting Bracket		

*See pages 46 through 52 for our available options and accessories.

TTL MODULATED LASERS WITH BEAM CORRECTION

- ▶ ACMT incorporates both digital beam modulation & beam circularizing optics
- ▶ APMT features a round beam, beam modulation, & temperature control



DVM- Compatible Monitoring

The APMT contains a 7-pin connector that allows for DVM-compatible monitoring of the drive current, output power, and active temperature control parameters.

Circularized Beam, TTL Modulated—

ACMT Laser Modules:

The ACMT incorporates digital beam modulation and anamorphic correcting prisms, yielding a high-quality, circularized beam. The unit is designed for digital beam modulation from CW to 20MHz and operates in constant current mode at a factory preset, customer-specified output power. Optional potentiometers are available for amplitude control.

APMT Laser Modules:

In addition to beam modulation and circularizing optics, the APMT provides active temperature control to maintain a stable operating temperature for the laser diode. The APMT operates in constant current mode and is designed for external TTL modulation from CW to 20MHz. Built-in potentiometers enable users to adjust or change the drive current amplitude, output power, or active temperature control parameters, and a 7-pin connector allows for DVM-compatible monitoring of these parameters.

MODULE SPECIFICATIONS	ACMT	APMT
Dimensions, Ø x L, in. [mm]	1.00 x 2.25 [25.37 x 57.15]*	1.50 x 6.97 [38.05 x 177.04]
Operating Voltage (VDC)	5 ± 0.5	12 ± 1
Max. Operating Current (mA)	240	1350
Max. Laser Drive Current (mA)	200	200
Modulation Frequency Range (MHz)	CW - 20	CW - 20
Rise/Fall Times (ns)	6/15	6/15
Propagation Delay (ns)	30	30
Temperature Stability (°C)	-	5
Temperature Range (°C)	-	10 - 35
Control Voltage Connector Type	SMC	BNC
Physical Diode Compatibility	9mm, 5.6mm	9mm, 5.6mm
Diode Compatibility	all	all
Beam Size At Exit, 1/e ² (mm)	2.7	2.7
Recommended Options**	D2, T, X22, X25, X26	D2, D3, T
Mounting Bracket		

*For models above 200mA, the unit measures 3.25" [82.55mm] in length.

**See pages 46 through 52 for our available options and accessories.

Round
beam
plus
digital
beam
modulation

HIGH POWER

Diode Laser Modules

High Power CW Laser Modules	36
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HIGH POWER CW LASER MODULES

- ▶ HAM contains an internal fan & heat sink for thermal management
- ▶ HPM & HSM offer temperature control circuitry in addition to an internal fan & heat sink



HAM & HPM

Ø 1.75 IN

7.87 IN

HSM

9.790 IN

Ø 1.75 IN

Our HAM, HPM, and HSM modules have a typical operating current greater than 500mA. These units are excellent choices for any number of power-hungry

applications, including high-resolution printing, imaging, illumination, and biomedical analysis.

High Power, CW—

HAM Laser Modules:

The HAM is designed for use with high power laser diodes with current requirements over 500mA. The HAM operates in either constant current or automatic power control mode, depending on the type of diode selected. For effective thermal management, the unit also contains an internal fan and heat sink.

HPM & HSM Laser Modules:

In addition to the internal fan and heat sink used by the HAM, our HPM and HSM modules incorporate an active temperature control circuit for those laser diodes with a built-in thermoelectric cooler. The HPM offers 1000mA of drive current, while the HSM features 2000mA. Both units operate in either constant current or automatic power control mode, depending on the type of diode selected.

Recommended Option

To achieve a higher level of control over your HAM parameters, we recommend Options X16 (external 12 pot) and X22 (internal 3/4 pot). See page 51 for information on our wide selection of X options.

MODULE SPECIFICATIONS	HAM	HPM	HSM
Dimensions, Ø x L, in. [mm]	1.75 x 7.87 [44.45 x 199.90]	1.75 x 7.87 [44.45 x 199.90]	1.75 x 9.79 [44.45 x 248.67]
Operating Voltage (VDC)	12 ± .25	12 ± .25	12 ± .25
Max. Operating Current (mA)	2400	3200	4200
Max. Laser Drive Current (mA)	2000	1000	2000
Physical Diode Compatibility	9mm, TO-3, C Block	TO-3 with TEC	TO-3 with TEC
Diode Compatibility	M-type, N-type, & 4-pin in APC, all in CC	M-type, N-type, & 4-pin in APC, all in CC	M-type, N-type, & 4-pin in APC, all in CC
Recommended Options*	D1, D2, X12, X16, X22, X26	D1, D2, X22, X26	D1, D2, X12, X16, X22, X26

*See pages 46 through 52 for our available options and accessories.

PULSED

Diode Laser Modules

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ML SERIES PULSED LASER MODULES

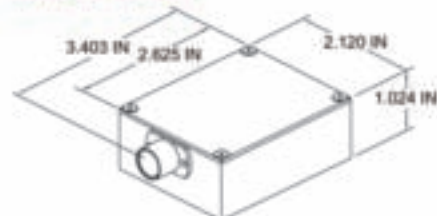
- Offer high peak output powers of up to 100W
- Require only a DC input voltage & TTL timing trigger to operate
- Offer a variety of wavelengths to meet your pulsed laser diode needs



MLA Pulser



MLH Pulser



Our ML, ILC, and IPC pulsed laser modules feature peak output powers of up to 100W. In addition, they offer pulse widths ranging from 7 to 500ns with fast rise and fall times. The compact design of these mod-

ules provides users with the flexibility to incorporate them into a variety of OEM products.

Technical Definition

Pulsed lasers: These lasers emit energy in a series of short bursts, or pulses, and are inactive between each pulse.

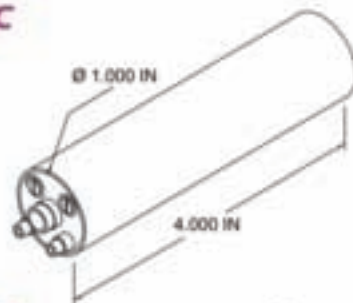
ML Series—

The ML family of pulsed laser modules offers peak output powers of up to 100W at 905nm. These units include the laser diode, focusing lens, and pulse drive electronics and require only a regulated DC input voltage and a TTL timing trigger to operate. ML series pulsers are ideal for applications requiring high peak pulse powers, such as rangefinding and LIDAR.

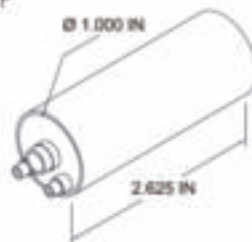
MODULE SPECIFICATIONS	ML20A15	ML40H15	ML60H15	ML100H15
Dimensions, W x L x H, in. / mm	2.12 x 3.40 x 0.58 / 53.85 x 86.44 x 14.73	2.12 x 3.40 x 1.02 / 53.85 x 86.44 x 26.01	2.12 x 3.40 x 1.02 / 53.85 x 86.44 x 26.01	2.12 x 3.40 x 1.02 / 53.85 x 86.44 x 26.01
Peak Output Power (W)	20	40	60	100
Pulse Width (ns)	15	15	15	15
Max. Pulse Repetition Frequency (kHz)	10	10	6	5
Operating Voltage (VDC)	9 - 14.5	9 - 14.5	9 - 14.5	9 - 14.5
Max. Operating Current (mA)	100	150	120	150
Max. Laser Drive Current (mA)	17000	17000	20000	21000

ILC & IPC SERIES PULSED LASER MODULES

ILC



IPC



- ▶ ILC pulsers contain an internal power supply that allows for either a built-in trigger pulse or a user-supplied trigger
- ▶ IPC pulsers do not incorporate an internal power supply

ILC & IPC Series—

Our ILC and IPC pulsers offer peak pulse currents from 1 to 105A and pulse widths from 7 to 200ns. Available wavelengths include 850, 905, 1064, and 1550nm. Pulsers in the ILC family contain an internal power supply that allows for either a built-in trigger pulse or a user-supplied trigger. IPC pulsers do not incorporate an internal power supply, so users must supply a trigger pulse and a bias voltage. Both series are temperature compensated to regulate output power, and both are suitable for any number of applications, including rangefinding, atmospheric communications, LIDAR, and biomedical analysis.

PULSER SPECIFICATIONS		IL9C	IL10C	IL20C	IL25C	IL30C	IL40C	IL60C	IL75C
Dimensions, Ø x L, in. / mm		1.0 x 4.0 / 25.4 x 101.6	1.0 x 4.0 / 25.4 x 101.6	1.0 x 4.0 / 25.4 x 101.6	1.0 x 4.0 / 25.4 x 101.6	1.0 x 4.0 / 25.4 x 101.6	1.25 x 4.0 / 31.75 x 101.6	1.25 x 4.0 / 31.75 x 101.6	1.25 x 4.0 / 31.75 x 101.6
Pulse Current (adjustable, A)		1 - 9	6 - 11	11 - 22	14 - 27.5	16 - 33	22 - 44	33 - 66	41 - 82.5
7-50ns	Rise Time (ns, typical)	2	2	3	4	4	5	5	8
	Fall Time (ns, typical)	2	3	5	6	6	7	8	10
51-200ns	Rise Time (ns, typical)	12	14	16	18	28	20	22	24
	Fall Time (ns, typical)	14	16	18	20	20	22	26	28
Max. Pulse Rate (kpps)	External Trigger	50	40	30	20	20	20	15	10
	Internal Clock	20	20	20	20	20	20	20	20
Propagation Delay (ns)		10	10	10	10	10	10	10	10
Supply Voltage (VDC)		12 - 24	12 - 24	12 - 24	12 - 24	12 - 24	12 - 24	12 - 24	12 - 24
Physical Diode Compatibility		9 & 5.6mm 8.32, 10.32	9 & 5.6mm 8.32, 10.32	9 & 5.6mm 8.32, 10.32	9 & 5.6mm 8.32, 10.32	9 & 5.6mm 8.32, 10.32	9 & 5.6mm 8.32, 10.32	9 & 5.6mm 8.32, 10.32	9 & 5.6mm 8.32, 10.32
Mounting Brackets									

ILC & IPC SERIES PULSED LASER MODULES

PULSER SPECIFICATIONS		IP9C	IP10C	IP20C	IP25C	IP30C	IP40C	IP60C	IP75C	IP100C
Dimensions, Ø x L, in. / mm		1.0 x 2.63 / 25.4 x 66.68	1.0 x 2.63 / 25.4 x 66.68	1.0 x 2.63 / 25.4 x 66.68	1.0 x 2.63 / 25.4 x 66.68	1.0 x 2.63 / 25.4 x 66.68	1.25 x 2.63 / 31.75 x 66.68	1.25 x 2.63 / 31.75 x 66.68	1.25 x 2.63 / 31.75 x 66.68	1.25 x 2.63 / 31.75 x 66.68
Pulse Current (adjustable, A)		1 - 9	6 - 11	11 - 22	14 - 27.5	16 - 33	22 - 44	33 - 66	41 - 82.5	55 - 105
7-50ns	Rise Time (ns, typical)	2	2	3	4	4	5	5	8	10
	Fall Time (ns, typical)	2	3	5	6	6	7	8	10	12
51-200ns	Rise Time (ns, typical)	12	14	16	18	28	20	22	24	26
	Fall Time (ns, typical)	14	16	18	20	20	22	26	28	30
Max. Pulse Rate (kpps)		100-1000	100	100	100	100	75	50	40	30
Propagation Delay (ns)		10	10	10	10	10	10	10	10	10
Physical Diode Compatibility		9 & 5.6mm 8:32, 10:32	9 & 5.6mm 8:32, 10:32	9 & 5.6mm 8:32, 10:32	9 & 5.6mm 8:32, 10:32	9 & 5.6mm 8:32, 10:32	9 & 5.6mm 8:32, 10:32	9 & 5.6mm 8:32, 10:32	9 & 5.6mm 8:32, 10:32	9 & 5.6mm 8:32, 10:32

*User-supplied
trigger
required*

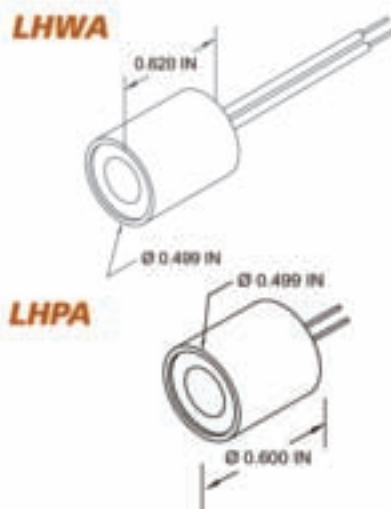


COMPONENTS & Sub-Assemblies

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HEAD ASSEMBLIES & TRANSMISSION LINE

- ▶ LHWx series heads contain flying leads to connect to your power source
- ▶ LHPx heads contain pin-out leads



Laser Diode Head Assemblies—

We offer two versions of each of four laser diode head assemblies. The LHWx version of each head contains flying leads to connect to your power source, while the LHPx version offers pin-out leads. Aside from variations in leads, the two versions of heads A through C differ only in their dimensions. The G head assembly is unique in that LHWG or LHPG users can replace the laser diode. Models A through C do not permit replacement of the diode.

LASER HEAD SPECIFICATIONS		A	B	C	G
Dimensions, Ø x L, in. [mm]	LHW	.50 x .62 [12.67 x 15.75]	.28 x .73 [6.99 x 18.64]	.23 x .35 [5.80 x 9.00]	.50 x 1.00 [12.67 x 25.40]
	LHP	.50 x .60 [12.67 x 15.24]	.28 x .50 [6.99 x 12.60]	.23 x .28 [5.84 x 7.11]	.50 x 1.00 [12.67 x 25.40]
Max. Output Power (mW)		—	5	1	80
Recommended Options*		C, G1, G2, G3, G7, L	G1, G7	G1, G6	C

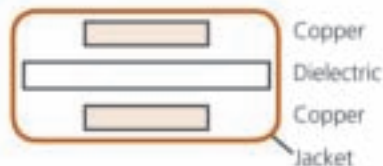
*See pages 46 through 52 for our available options and accessories.

Low-Impedance Transmission Line—

Our low-impedance transmission line serves as a means of remotely driving pulsed laser diodes. This method of transmission is especially suited for high current pulses with fast rise and fall times. Transmission lines preserve pulse shape while minimizing power loss.

Each of our parallel plate transmission lines is constructed of two layers of copper and three layers of insulation. These materials form a flat, flexible "sandwich" structure with an operating temperature of up to 105°C and a minimum bend radius of 1 inch.

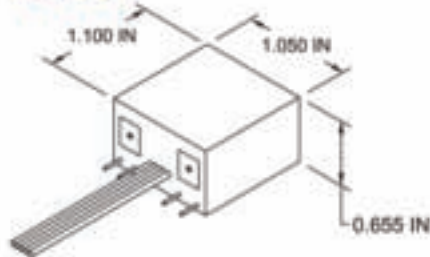
We offer three choices of transmission line. The SL 1.7 line has an exceptionally low impedance value of only 1.7 ohms. SL 2.5 has an impedance value of 2.5 ohms, while SL 4—our standard transmission line—offers an impedance of 4.0 ohms. Custom configurations and impedances are also available.



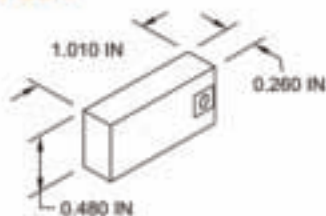
SPECIFICATIONS	SL 1.7	SL 2.5	SL 4
Conductor Dimensions (in.)	1.25 x 0.01	0.75 x 0.01	0.375 x 0.01
Overall Dimensions (in.)	1.3 x 0.06	0.8 x 0.06	0.4 + .050 or -.020 x 0.06 + .050 or -.020
Impedance (Ω)	1.7	2.5	4.0
Resistance (mΩ/ft)	1.1	2.2	4.4
Capacitance (nF/ft)	1.5	0.95	0.5
Inductance (nH/ft)	4	6	10

OEM LASER DIODE DRIVERS

LDP201



LDP214



LDP201, LDP214, & TMD219

- ▶ LDP201 is designed to drive laser diodes up to 150mA
- ▶ LDP214 drives lasers up to 120mA that incorporate a back-facet monitor diode

Laser Diode Drivers—

Users have a variety of choices when selecting a laser diode driver.

- ▶ **LDP201:** This power supply—designed to drive laser diodes up to 150mA—may operate in either automatic power control or constant current mode. Built-in 3/4 turn potentiometers enable users to adjust the laser power or drive current, depending on the mode of operation. DVM-compatible test points allow users to monitor the laser drive current or photodiode feedback current during operation.
- ▶ **LDP214:** The LDP214 is designed to drive laser diodes up to 120mA that incorporate a back-facet monitor diode. The unit operates in either constant current or automatic power control mode. A built-in 3/4 turn potentiometer enables users to adjust the laser power from 0 to the maximum system setting.



The LDP201, 252, and 305 contain DVM-compatible test points. Users can monitor drive current using the LDP305 and either drive current or photodiode feedback current using the LDP201 and LDP252.

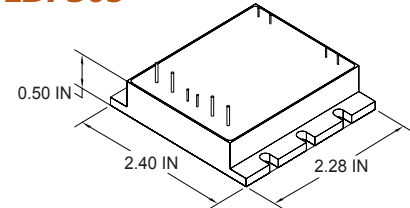
SPECIFICATIONS	LDP201	LDP214
Dimensions, W x L x H, in. [mm]	1.05 x 1.10 x .66 [26.67 x 27.94 x 16.64]	.48 x 1.01 x .26 [12.19 x 25.65 x 6.60]
Operating Voltage (VDC)	3.3 - 9.0	3.3 - 9.0
Max. Operating Current (mA)	150	120
Max. Current to Diode (mA)	150	120
Min. CW Drive Current (mA)	-	-
Std. Photodiode Feedback (µA)	750	750
Max. Photodiode Feedback (mA)	up to 3.5	up to 3.5
Operating Mode	APC or CC	APC or CC
Output	CW	CW
Modulation Trigger Signal	-	-
Diode Compatibility	M- & N-type & 4-pin in APC, all in CC	M- & N-type in APC, all in CC

OEM LASER DIODE DRIVERS

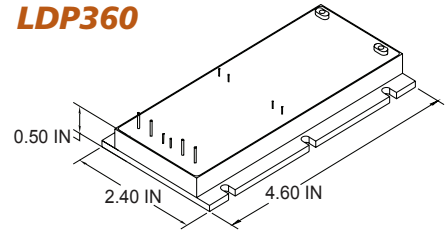
- ▶ LDP305 is capable of both analog & digital modulation
- ▶ LDP360 is designed to drive extremely high-power laser diodes



LDP305



LDP360



- ▶ **LDP305:** The LDP305 is a 10A current source designed for high-power laser diodes. The unit can drive single or multi-facet laser diodes up to a compliance voltage of +30V. Two configurations are available: a single power source configuration and one that requires two DC power sources. The single power source configuration allows a maximum voltage of 30V and a minimum of 7V. A relatively high level of heat is generated using this set-up. The dual power source configuration allows a maximum voltage of 30V for laser current and a minimum voltage equal to .5V + the laser diode's forward voltage drop. This configuration requires a second source to supply 5V for control circuitry use. This set-up results in minimal heat generation.

Analog modulation is standard and capable of CW to 12kHz. This feature allows for full control of the unit's output from 0 to full power with a DC voltage from 0 to 1.0V. The LDP305 is also capable of digital modulation up to 350Hz. DVM-compatible test points allow users to monitor drive current during operation.

- ▶ **LDP360:** The LDP360 is a 40A current source designed to drive our most powerful laser diodes. Analog modulation is standard and capable of CW to 12kHz. The unit operates in constant current mode. DVM-compatible test points allow users to monitor the laser drive current during operation.

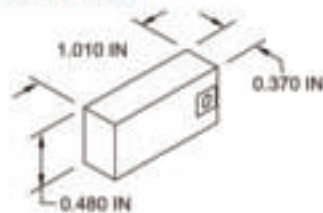
SPECIFICATIONS	LDP203	LDP234	TMD219-100/200	LDP252
Dimensions, W x L x H, in. / mm	.48 x 1.01 x .37 / 12.19 x 25.65 x 9.40	.48 x 1.01 x .37 / 12.19 x 25.65 x 9.40	.88 x 1.33 x .48 / 22.35 x 33.78 x 12.07	1.49 x 4.00 x .96 / 37.72 x 101.60 x 25.02
Operating Voltage (VDC)	5.0 - 9.0	3.3 - 9.0	5 ± .5	3.3 - 9.0
Max. Operating Current (mA)	2500	120	140 / 280	2550
Max. Current to Diode (mA)	2500	120	100 / 200	2500
Min. CW Drive Current (mA)	–	–	20 / 40	–
Std. Photodiode Feedback (µA)	750	–	–	750
Max. Photodiode Feedback (mA)	up to 3.5	–	–	up to 3.5
Operating Mode	APC or CC	APC or CC	CC	APC or CC
Output	CW	CW	Modulated	CW
Modulation Trigger Signal	–	–	External TTL	–
Diode Compatibility	M- & N-type & 4-pin in APC, all in CC	P-type	all in CC	M- & N-type & 4-pin in APC, all in CC

OEM LASER DIODE DRIVERS

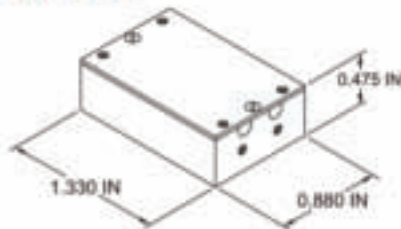
- **LDP234:** Designed to drive P-type laser diodes up to 120mA, the LDP234 power supply operates in either constant current or automatic power control mode. A built-in 3/4 turn potentiometer enables users to adjust the laser power from 0 to the maximum system setting.
- **TMD219-100 and TMD219-200:** Our TMD drivers operate from CW to 20MHz. The TMD219-100 can drive laser diodes up to 100mA, while the TMD219-200 can drive them up to 200mA. Each power supply operates in constant current mode and can be modulated from an external user-supplied TTL trigger. Optional potentiometer controls are available to provide adjustable drive current.
- **LDP252:** Designed for high-power laser diodes up to 2500mA, the LDP252 power supply may operate in either automatic power control or constant current mode. Built-in 3/4 turn potentiometers enable users to adjust the laser power (or drive current). DVM-compatible test points allow users to monitor the laser drive current or the photodiode feedback current during operation.

- **LDP234 is designed to drive P-type laser diodes up to 120mA**
- **TMD219-100 can drive laser diodes up to 100mA, while the TMD219-200 can drive them up to 200mA**
- **LDP252 is designed to drive high-power laser diodes up to 2500mA**

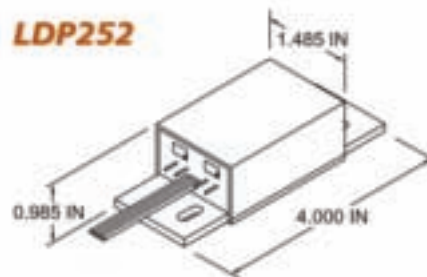
LDP234



TMD219



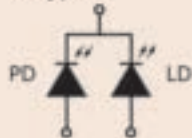
LDP252



Diode Configurations—

The following are the common diode configurations that may be driven in automatic power control mode.

M-type:



N-type:



P-type:



4-pin:



Our modules can support any diode when operated in constant current mode.



Compatible diode types for each of our laser modules can be found within the product specification tables throughout the catalog. If you have a question about diode compatibility, please give us a call.

OPTIONS & Accessories

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Accessories	54

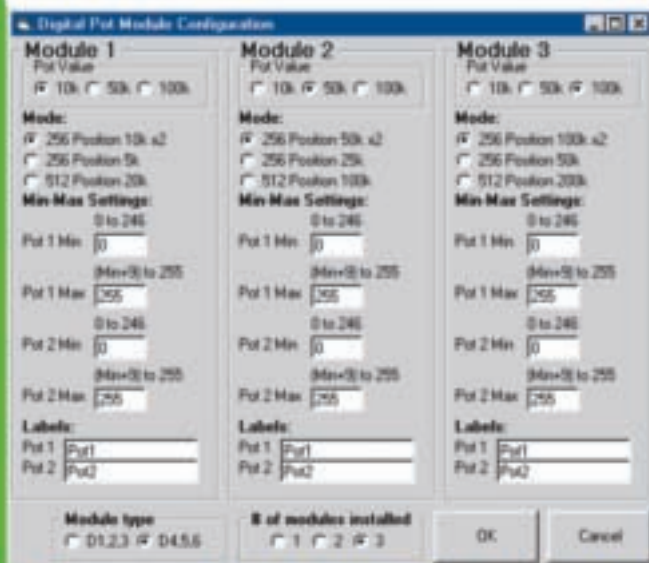
OPTIONS

C Option

- Centers the beam axially with the laser module's housing
- Available for the following modules: PM, PMT, SPM, & SPMT

D Option

- Settings stored in nonvolatile memory
- Works with customer-supplied computer or control circuit
- Compatible with our DigiPot controller software



DigiPot Software Configuration Menu

Our vast array of options and accessories help ensure that you have the perfect solution for your OEM needs. Give us a call today to discuss which of these

product enhancements will best suit the demands of your application.

Options—

A Option: Apertures

An aperture is a stop placed on the end of a laser module to block parts of the laser beam. The result is a projected spot that is circular in nature. Option C is automatically applied to a laser module when users purchase Option A. The A option is compatible with the following modules: ACM, APM, IQ1A, IQ1C, IQ1H, PM, PMT, PPM, SPM, and all modulated versions of these units.

C Option: Beam Centering

Option C is available for applications requiring a centered beam. This option involves moving the laser diode in relation to the lens to center the beam at a customer-specified distance. This method of centering is available for the following modules: PM, PMT, PPMT, SPM, and SPMT.

D Option: Digital Control

Modules compatible with our digital control options can interface directly with computerized or electronic control circuits. This interface promotes precise control of a laser's output power, wavelength, or temperature. Our TTL-compatible D options have a memory that will retain a module's setting for future use after deactivation. They can be used as a one-time calibration of a laser's settings or as a means of dynamically altering these settings as new needs arise.

A variety of digital control options are available. Options D1, D2, and D3 are economical, lower resolution choices that provide up to 100 possible adjustment positions. Options D4, D5, and D6 offer more precision and higher resolution and are capable of either 256 or 512 adjustment positions.

In addition, we offer DigiPot controller software to aid users in making their digital control options work for them. The DigiPot software configuration menu (see image above) enables you to set up your software for proper operation and communication with your digital control options. You have two choices for creating your software configuration. You may (1) load an existing, factory-supplied configuration file, or you may (2) create your own configuration based on the design of your unit. Using either method, you have the option of setting minimum and maximum pot travel values, preventing you from going outside of a specified range. A separate window provides access to position controls for all available pots. These controls allow you to read existing pot positions and to write new ones.

The DigiPot software is currently compatible with Windows 95, 98, and 2000. Give one of our sales engineers a call to discuss any compatibility issues you may have.

OPTIONS

D Option: Digital Control (Continued)

OPTION	DESCRIPTION	RESOLUTION
D1	Digital Automatic Power Control	100 steps
D2	Digital Constant Current Control	100 steps
D3	Digital Temperature Control	100 steps
D4	High Resolution Digital Automatic Power Control	256 steps
D4b	High Resolution Digital Automatic Power Control	512 steps
D5	High Resolution Digital Constant Current Control	256 steps
D5b	High Resolution Digital Constant Current Control	512 steps
D6	High Resolution Digital Temperature Control	256 steps
D6b	High Resolution Digital Temperature Control	512 steps

E Option: External Fan Switch

A fan switch is used to disable a laser's internal fan, resulting in less optical noise. This option is available for APM, APMT, PPM, and PPMT modules. The addition of this option negates the diode warranty.

F Option: Fiber Coupling

Fiber coupling is a method used to couple a laser's output into a fiber optic. We couple fibers directly to the laser module, not the diode. Depending on the laser assembly ordered, the module will contain a length of single mode or multimode fiber, along with the appropriate connectors. The standard fiber length is 1 meter, but longer fibers are also available by special order.

A single mode fiber allows light to travel along a single path through the middle of the fiber core. This type of fiber is typically used for applications requiring ultra-high quality light output and is available as an option for many of our temperature controlled laser modules. For single mode fibers, we recommend a 4µm core for visible wavelengths and a 9µm core for IR wavelengths. Each of our fibers has a 3mm jacket. All single mode fibers are permanently attached to the module and can be terminated in an ST or FC connector.

A multimode fiber enables light waves to travel simultaneously along multiple paths within the core. Because the core of a multi-mode fiber is larger than that of a single mode, multimode fibers tend to be useful for less wavelength-sensitive applications. For multimode fiber applications, we offer 50µm, 62.5µm, 100µm, and 200+µm fibers. Each can be terminated in an FC or SMA connector. SMA is standard. Our F1 multimode fiber coupling option provides a removable fiber, while the remaining options below provide fibers that are permanently attached to the module.

- Single mode fibers allow light to travel along a single path through the middle of the fiber core
- Multimode fibers enable light waves to travel simultaneously along multiple paths within the core

FC Connector



OPTION	DESCRIPTION	FIBER POLISH
F1	Multimode fiber with SMA 905 connector	Physical contact
F2	Single mode fiber with FC connector	Physical contact
F7	Multimode fiber with FC connector	Physical contact

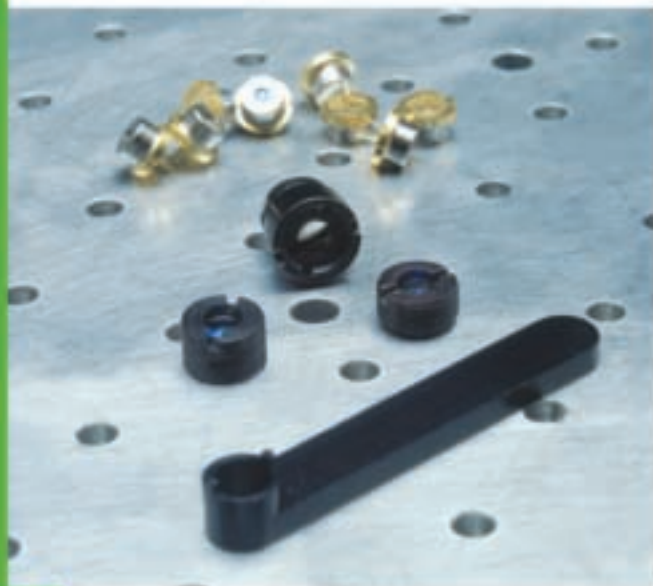
SMA Connector



OPTIONS

G Option Features

- ▶ Anti-reflection coatings
- ▶ Focal lengths from 2mm to 30mm



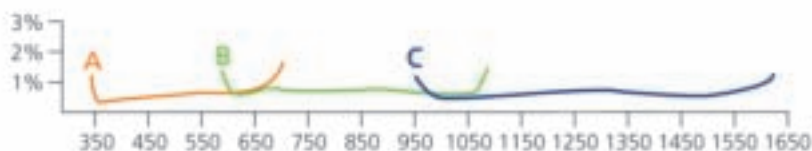
G Option: Glass Optics

Our glass lenses offer anti-reflection coatings and focal lengths ranging from 2 to 30mm. Our standard lens, G3, is suitable for most modules and applications, although we offer a wide variety of lenses that may be substituted, often at no additional cost. Our new G26 is available for use with violet modules in the 405 to 412nm range only. Users who incorporate this lens into their violet module will achieve far superior, diffraction-limited beam quality. For more information on our violet modules, see page 10.

LENS OPTION #	CLEAR APERTURE (mm)	NUMERICAL APERTURE	EFFECTIVE FOCAL LENGTH (mm)	LENS OPTION #	CLEAR APERTURE (mm)	NUMERICAL APERTURE	EFFECTIVE FOCAL LENGTH (mm)
G1A, G1B, G1C*	2.00	0.50	2.00	G11B	4.49	0.50	4.49
G2A, G2B, G2C*	4.95	0.55	4.51	G16	4.00	0.50	4.00
G2L-1H	4.50	0.50	4.50	G17	9.10	0.30	15.00
G2M-1K	4.89	0.53	4.60	G18	6.60	0.33	10.00
G3A, G3B, G3C*	5.00	0.40	6.24	G19	7.00	0.30	12.50
G3B-1	5.64	0.40	6.25	G20	3.30	0.55	3.00
G4B, G4C*	8.00	0.50	8.00	G21	4.10	0.38	5.40
G5B	5.50	0.25	11.00	G22	4.93	0.30	7.96
G6B	3.40	0.14	12.00	G24	5.25	0.09	30.00
G7A, G7B, G7C*	3.70	0.30	6.16	G26**	4.80	0.60	4.02
G7B-1C	4.70	0.40	6.25	G27	9.00	0.15	27.00
G8B	5.00	0.16	15.36	GM	4.30	0.48	4.48
G9B	5.50	0.15	18.40	G50	3.60	0.65	2.75
G10B	5.46	0.39	7.00				

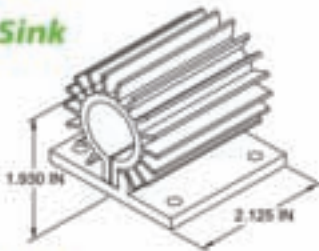
* Differences in these lenses lie in their coatings. "A" coatings are designed for use with wavelengths in the 350 to 600nm range. "B" coatings are designed for wavelengths in the 600 to 1000nm range. "C" coatings are for wavelengths from 1000 to 1600nm.

** G26 lenses used only with diodes in the violet and UV range.

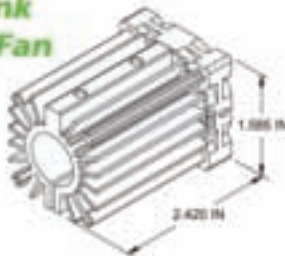


OPTIONS

Heat Sink



Heat Sink With Fan



L Option

- ▶ Even intensity optics produce a uniform line that is bright from end to end
- ▶ Cylindrical optics produce a line with power concentrated in the center

H Option: Heat Sink

A heat sink is used to cool the laser diode when the ambient temperature is too high. When the diode generates too much internal heat, the heat sink dissipates the heat away from it.

We offer two versions of our heatsink: a standard model and one that enables users to incorporate a fan into their unit. Both models are suitable for any module with a diameter less than 0.75 inch (19mm).

K Option: Kapton Tape

Kapton tape is used to isolate the laser module case electrically when mounting.

L Option: Line Generation

We use two types of optics to generate lines: even intensity and cylindrical.

- ▶ **Even Intensity Optics:** An even intensity line generator produces a superior, uniform line that is as bright on the ends as it is in the center. Even intensity optics are suitable for applications ranging from machine vision to road inspection to 3-D mapping.
- ▶ **Cylindrical Optics:** Cylindrical optics are the most cost-effective means of generating lines. They transform a simple laser dot into a single bright line with power concentrated in the center. This traditional form of optics is ideal for any number of applications, including research and microlithography.

Line generators add less than .3 inch to the length of a module. These devices may be operated in a wide range of optical powers and wavelengths.

Even Intensity Optics:

LENS PART#	APPROX. LINE LENGTH AT 12"	FULL FAN ANGLE
L70	53mm	10°
L71	107mm	20°
L72	163mm	30°
L73	252mm	45°
L74	352mm	60°
L75	610mm	90°

Cylindrical Optics:

LENS PART#	APPROX. LINE LENGTH AT 12"	FULL FAN ANGLE	LENS PART#	APPROX. LINE LENGTH AT 12"	FULL FAN ANGLE
L0	15mm	2.8°	L13	102mm	19°
L9	21mm	4.0°	L5	124mm	23°
L8	29mm	5.5°	L4	152mm	28°
L7	40mm	7.6°	L2	198mm	36°
L6	80mm	15°	L1	352mm	60°
L3	96mm	18°	L10	610mm	90°

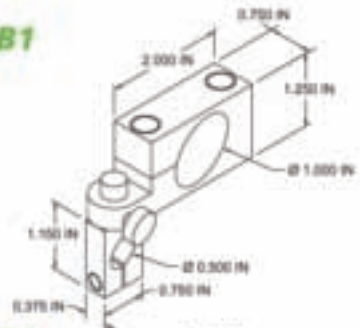
OPTIONS

MB Option Features

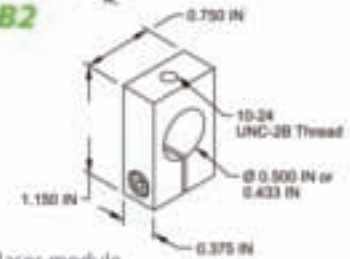
- ▶ Promotes precise mounting of laser modules
- ▶ 5 models to choose from
- ▶ Fixed & multidirectional models available



MB1



MB2

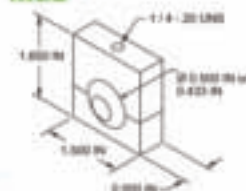


MB Option: Mounting Brackets

We offer a number of brackets for precise mounting of your laser module.

- ▶ **MB1** is a multidirectional, single-axis mounting bracket that accommodates modules 12.7mm (.5 inch) in diameter. MB1 is ideal for use with PM and RS lasers.
- ▶ **MB2** is a fixed mounting bracket that features a split ring clamp. This bracket is available in two sizes. MB2c—suitable for RS lasers—secures modules 11mm (.43 inch) in diameter, while MB2a—an excellent choice for PM lasers—accommodates modules 12.7mm (.5 inch) in diameter.
- ▶ **MB3** provides the highest level of adjustment of all the mounting brackets. This bracket is multidirectional and features a freely rotating brass ball. The ball allows for 80° conical rotation and is available in two sizes. The MB3c secures modules 11mm (.43 inch) in diameter, such as the RS, while the MB3a is suitable for modules 12.7mm (.5 inch) in diameter, such as the PM.
- ▶ **MB5** and **MB6** are fixed brackets that feature three 1/4-20 mounting holes on the bottom. These holes not only make it easier to incorporate a module into an application, but they also enable a laser to attach firmly to an optical bench. MB5 accommodates modules 25.4mm (1 inch) in diameter and is ideal for PMA, PMT, PMH, ACM, and ACMT lasers. MB6 secures modules 38mm (1.5 inch) in diameter and is suitable for APM, APMT, IQ1A, IQ1C, IQ1H, PPM, and PPMT units. Option MB6 includes two brackets for optimum stability.
- ▶ **MB8, MB9, MB10** are the latest mounting brackets from PTI. They are multidirectional on both the X and Y axes. This series of brackets features 34° of rotation on the X and Y axes on the centerline of the module. They are available in three different sizes: .75 in, 1 in and 1.5 in. This allows for better alignment of the laser beam to your application's demands.

MB3



MB5



MB6



MB8



MB9

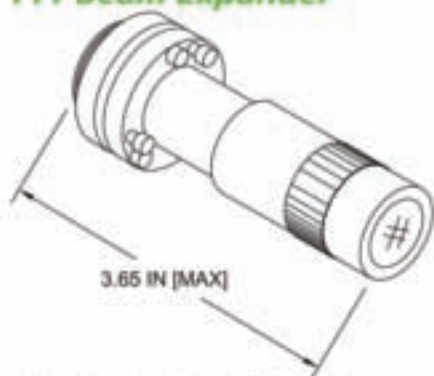


MB10



OPTIONS

T11 Beam Expander



▶ Telescope collimators are used to reduce, enlarge, or collimate output beams

N Option: No Drive Electronics

Option N allows users to purchase a module without drive electronics and, therefore, without a laser diode warranty. This option does not yield any cost savings for users.

R Option: Wavefront Analysis Report

A wavefront analysis report details the measurement of a laser's optical properties. Each report provides data regarding wavefront quality, M² value, and beam size divergence. Customers may select from a standard text report (Option R1) or an advanced graphical report (Option R2, R3, or R4). Option R2 includes the standard text of R1 in addition to graphical representations of intensity, far field, and wavefront. R3 includes a beam profile graphic, while R4 provides a graphical representation of wavelength as measured on an optical spectrum analyzer.

S Option: PM Module Switch

This switch—available only for the PM module—includes an LED on the indicator and provides an easy means for users to turn a laser on or off. Please note that this device is not CDRH certified.

T Option: Telescope Collimators

Telescope collimators are used to reduce, enlarge, or collimate output beams. They may also be used to focus beams on small areas at long distances. We offer a wide selection of compact telescope accessories that attach to the front end of a laser module. Telescopes are available as options for the following modules: PM, APM, ACM, PPM, SPM, and all modulated versions of these lasers.

Mechanical Drawing

Please contact us for drawings of each of our telescopes.

SIMPLE BEAM REDUCERS		BEAM EXPANDERS (18mm OUTPUT APERTURE)	
T19	0.17X	T7	4X beam expanding with threaded end for additional optics
T13	0.25X	T11	4X beam expanding/collimating telescope
T16	0.33X	T9	6X beam expanding/collimating telescope
T25	0.40X	T20	6X beam expanding with threaded end for additional optics
T6	0.50X	T17	7.5X beam expanding/collimating telescope

W Option: Inhibit

The W option is a circuit that allows users to inhibit laser power temporarily from a remote location.

X Option: Adjustment Potentiometer

The X option represents a wide range of electronic control adjustments that you can make to a laser. This option typically applies to lasers driven by the LDP201 and LDP252 power supplies but may be compatible with other modules. Consult the factory for information regarding compatibility.

Two adjustment potentiometers are available: 12 turn pot and 3/4 turn pot. The 12 turn pot offers higher control and finer resolution than the 3/4 turn pot. Both are available internally or externally.

AUTOMATIC POWER CONTROL MODE		CONSTANT CURRENT MODE		TEMPERATURE CONTROL	
X11	Internal fixed	X21	Internal fixed	X41	Internal fixed
X12	Internal 3/4 turn pot	X22	Internal 3/4 turn pot	X42	Internal 3/4 turn pot
X13	Internal 12 turn pot	X23	Internal 12 turn pot	X43	Internal turn 12 pot
X14	External fixed	X24	External fixed	X44	External fixed
X15	External 3/4 turn pot	X25	External 3/4 turn pot	X45	External 3/4 turn pot
X16	External 12 turn pot	X26	External 12 turn pot	X46	External 12 turn pot

Y Option: Enable

The Y option is an enable circuit that allows for remote on/off control of a laser.

Two adjustment pots available: 12 turn & 3/4 turn

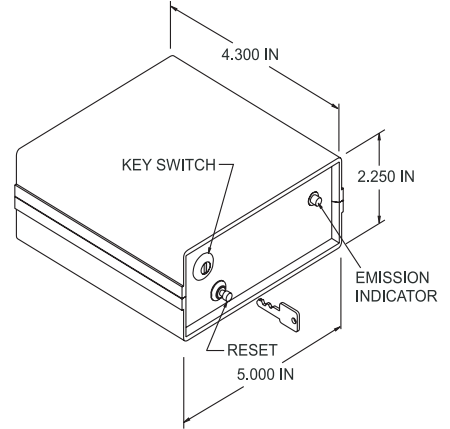
ACCESSORIES

LDCU Features

- Power on/off key switch
- Emission indicator
- 5-second activation delay
- Beam blocker
- Remote interlock & connector
- Manual reset button for class 4 systems
- 120 or 220V AC input
- 3.3, 5 or 12V DC output



Class 4 LDCU



Accessories—

Laser Diode Control Unit:

The Laser Diode Control Unit (LDCU) is a turnkey power source that contains U. S. government mandated safety features. The LDCU enables us to offer original equipment manufacturer (OEM) laser products as complete laser systems.

An OEM product is one that is sold for integration into another product. OEM products do not incorporate CDRH (Center for Devices and Radiological Health) mandated safety features. Original equipment manufacturers may purchase these products from us without any accompanying safety features or power supplies and are responsible for integrating their own safety features.

End users, on the other hand, must purchase an LDCU to meet the U. S. government requirements for laser systems. A complete laser system is exactly what its name implies: a system complete with laser, power source, and government required safety features. End users are defined as those not directly integrating a laser into another product. This description includes universities, research settings, and those using lasers on optical benches.

The LDCU incorporates the following safety features to comply with government regulations for class 3B (or below) laser systems: a power on/off key switch, emission indicator, 5-second activation delay, beam blocker, and remote interlock and connector. In addition, class 4 LDCU systems include a manual reset button on the front panel.

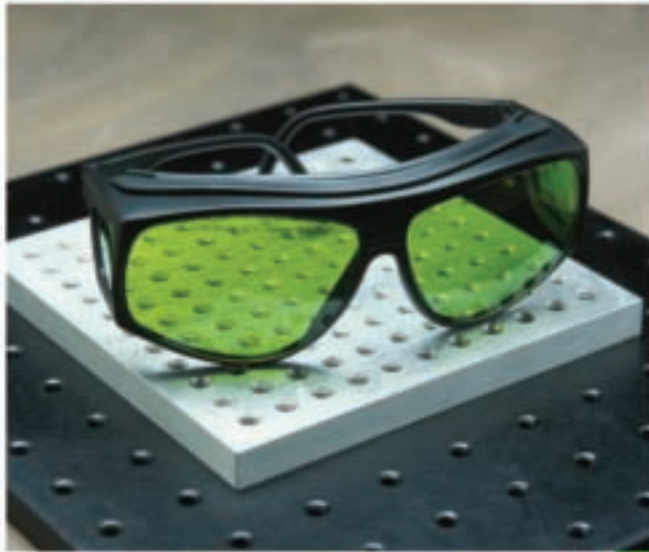
We offer several versions of the LDCU, each designed to accommodate laser modules with one of the following output voltages: 3.3, 5, 8 and 12VDC. Input voltages of 120 and 220VAC are available. A DB-9 (9-pin) connector is located on the rear panel of the LDCU. A bare wire adapter is available should your laser module not incorporate a DB-9 connector.

We have integrated all required safety features into the LDCU. Operating a laser head without an LDCU is contrary to government regulations. See page 62 for additional information regarding CDRH requirements.

Now **CE** compliant!

SPECIFICATIONS	LDCU 3	LDCU 5	LDCU 8	LDCU 12	LDCU 3 • CLASS 4	LDCU 5 • CLASS 4	LDCU 8 • CLASS 4	LDCU 12 • CLASS 4
Output Voltage (VDC)	3.3	5	8	12	3.3	5	8	12
Max. Operating Current (A)	3	3	2.4	2.4	5	5	4	4
Input Voltage (VAC)	120	120	120	120	120/220	120/220	120/220	120/220
Dimensions, W x L x H, in. [mm]	5.00 x 4.30 x 2.25 [127.00 x 109.22 x 57.15]							
Used With	LCM-T	PM and IQ Series	Lasers at 375nm, 405nm, 445nm, 473nm	APM/PPM	Lasers above 500mW	Lasers above 500mW	Lasers at 375nm, 405nm, 445nm, 473nm	HAM/HSM/HPM

ACCESSORIES



PTI Laser Safety Eyewear Features

- ▶ Durable
- ▶ 6 models to choose from
- ▶ Surface Scratches have no effect on filter safety
- ▶ Will not photo-bleach or degrade over time

Laser Safety Eyewear

In an effort to enhance our already high safety standards, Power Technology, Inc. is pleased to offer Laser Safety Eyewear to be used in conjunction with Power Technology, Inc.'s laser modules. Our eyewear provides optimal protection for a large variety of laser applications.

- Polycarbonate Lenses are hardcoated and durable.
- Laser protection and absorptive dyes molded into the plastic.
- Non-reflective technology—energy is absorbed for a minimum of 10 seconds before loss of protection.
- All of Power Technology, Inc.'s Laser Safety Eyewear includes a protective case, cleaning cloth and lanyard.
- Lens dyes are based on decades of research and innovation in chemistry.
- Eyewear will not photobleach or degrade over time.
- Surface scratches have no affect on the filter safety.

If you are concerned about which filter is right for you, just contact one of Power Technology, Inc.'s technical representatives to assist you in finding the best filter for your application.

There are five main filter classifications, but of those five, there are several choices in regard to optical density, visible light transmission, wavelength, etc.

Protection Levels

All frame styles are available with the following lenses in the designated wavelengths. When ordering, please use the designated part number for your desired level of protection.

Lenses:

- 1.) 375nm-532nm
- 2.) 635nm-670nm • 785nm
- 3.) 785nm-830nm
- 4.) 840nm-1080nm
- 5.) 1152nm-1550nm

Alignment lenses are also available with all of our frames and are available only within the visible spectrum.

For additional information, please visit our laser safety page on our website.



Literature Applications

Datasheets and other informative materials are available on our Web site.

GENERAL Information

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Distributor Information	63

TECHNICAL TERMS

Our 2007-2008 Product Selection Catalog incorporates a number of terms that are helpful to understand if you are to make an informed decision regarding your laser product needs. The following are descriptions of the most common terms. Please contact us if you have any unanswered questions concerning an unfamiliar product feature or characteristic.



are to make an informed decision regarding your laser product needs. The following are descriptions of the most common terms. Please contact

- **Analog modulation:** Analog modulation is a type of modulation that requires an analog input signal to vary the output power of a laser. Our analog lasers are capable of modulation from CW to 20MHz. A benefit of analog modulation is that it allows users to adjust a laser's output to a desired level from <5% to 100% of its maximum.
- **Automatic power control mode:** Laser diode drivers operating in this mode have a photodiode mounted inside the laser diode package. The photodiode generates a feedback signal that allows gauging and adjustment of the current supply, keeping the output power of the laser constant over temperature changes and time.
- **Bias current:** Bias current is the steady current applied to a laser diode to overcome the threshold current of the laser diode.
- **Constant current mode:** Laser diode drivers operating in this mode do not utilize a photodiode. Instead, they provide a set level of current to the diode. The diode output power will drift when the temperature changes due to the inherent properties of the semiconductor material. A thermoelectric cooler can help prevent power and wavelength drift by stabilizing the operating temperature of the laser diode.
- **Continuous wave (CW) laser modules:** These modules emit energy continuously rather than in short pulses. Continuous wave applications require the laser to be on 100% of the time.
- **Fiber coupling:** Fiber coupling is a method by which PTI can launch a laser's output into a single-mode or multi-mode fiber optic.
- **Modulated lasers:** These laser modules allow users to vary the output power of a laser by varying a control voltage. The laser is activated only when needed. Beam modulation may be used to synchronize a laser with an analytical instrument or camera. Several of our laser diode modules employ one of two types of modulation: analog or TTL.
- **Pulsed lasers:** These lasers emit energy in a series of short bursts, or pulses, and are inactive between each pulse. Pulsed lasers—not to be confused with modulated lasers—typically deliver several Watts of peak power per pulse.
- **Self-contained lasers:** These laser modules, considered our standard/base units, include the laser, optics, and power supply in a single case.
- **Separated geometry lasers:** These lasers offer added flexibility by housing the diode and lens in their own laser head assembly, separate from the power supply. This configuration gives users a choice among laser head sizes and makes incorporation into an application easier.
- **Thermoelectric (TE) cooler:** A TE cooler is a device that helps maintain a cool, stable temperature for a laser diode. The benefits of temperature control include prolonging the life of the laser diode, maintaining a stable output power, and promoting wavelength stability.
- **TTL modulation:** TTL modulation is a type of modulation that requires a 0 or 5VDC, TTL-compatible input signal to control laser output. Unlike analog modulated lasers, TTL modulated lasers cannot produce any level of fractional power. They are either ON or OFF. A benefit of TTL modulation is that users can program it to enable, inhibit, or modulate a laser.

ORDERING INFORMATION

How to Build Model Numbers—

The chart below details standard methods for building model numbers. Model numbers are determined by the laser desired, output power, diode part number, and options selected. Feel free to give us a call if you need help in constructing your number.

SELF-CONTAINED CW UNITS & MODULATED UNITS	SEPARATED GEOMETRY CW UNITS	ILC & IPC PULSED UNITS
Laser X (X) X X 1 2 3 4	Laser X (X) X X - Drive - X 1 2 3 4 5	Driver X C X - X - X 1 2 3 4
Laser: Laser module or system	Laser: Laser module or system	Driver: Driver type
Digit 1: Maximum output power*	Digit 1: Maximum output power*	Digit 1: Model designation (Amps)
Digit 2: Laser diode part number	Digit 2: Laser diode part number	Digit 2: Pulse width range (ns)**
Digit 3: 1st option number	Digit 3: 1st option number	Digit 3: Laser diode mechanical package
Digit 4: 2nd option number	Digit 4: 2nd option number	Digit 4: 1st option number
Example: PPM25(1406)D1L1	Digit 5: Power supply option number Example: SPMB03(1034)L1-201-D1	Example: IP10C200(400-10-52)

*The output power of a laser module is always less than the raw diode power. We recommend that you leave this portion of your model number blank, and contact a sales representative for assistance.

** For a variable pulse width range, specify as "minimum" / "maximum." Example: 100/200

Tips For Custom-Building the Right Laser Module For Your OEM Application—

With so many laser products to choose from, users may have a difficult time deciding which module, diode, features, and accessories best suit their needs. If you are unsure how to go about selecting the right laser products for your application, explore the recommended steps below, or give one of our sales engineers a call.

- To construct the ideal laser for your application, first select a diode that meets your requirements for wavelength and output power. Our lasers typically come standard with a 670nm 5mW diode. If this diode does not meet your requirements, visit our Web site at www.powertechnology.com for a list of our standard laser diodes. 

The following diodes are more likely to be in stock and will typically result in a higher cost savings for our customers: **635nm** (5, 10, 15, and 35mW), **658nm** (35mW), **670nm** (5mW), **690nm** (35mW), **780nm** (15mW), **785nm** (75mW), **790nm** (100mW), **830nm** (40 and 150mW), **980nm** (50 and 250+ mW), **1310nm** (5 and 10mW), and **1550nm** (6mW). However, we offer a variety of additional wavelengths, many with output powers that exceed 1W. See page 7 for additional information on the more common diodes we offer, along with their respective maximum output powers.

- After selecting your diode, choose a module with the size and features necessary to suit your application. Refer to the Product Selection Chart on page 8 to explore some of the most popular features of our modules. Be sure to confirm that the diode and module that you have selected are compatible with one another. Most compatibility issues are related to a diode's package type, power supply requirements, and current requirements.
- Finally, select options and accessories to customize and enhance your laser module. To learn more about our vast array of product enhancements, see our Options and Accessories section beginning on page 46.

ORDERING INFORMATION

Placing an Order—

If possible, please have the following information on hand when ordering:

- ▶ Name or model number of the laser product that you are interested in, the laser diode part number, and ideas for potential options or features that will benefit your application
- ▶ P. O. number
- ▶ Credit card number, expiration date, and exact name on card
- ▶ Delivery address, contact name, and phone number

Order Requirements—

All payments are to be made in U.S. dollars. All orders are subject to a minimum invoice value. The domestic minimum is \$200, and the export minimum is \$500. Orders below the minimum are subject to a processing fee of \$20 (domestic) or \$100 (export).

Delivery—

We ship via UPS (standard), FedEx, and DHL. Please let us know if you have a preferred method of shipping. For rush orders, we will gladly ship via overnight courier for an additional charge.

Warranty Return Policy—

If your product is defective, you may return it during its designated warranty period for a prompt exchange or repair. All electronics (laser modules) and most bare diodes carry a warranty of one year. For information on warranty exceptions regarding bare diodes, please give one of our sales engineers a call at **501-407-0712**.

To return a product, please contact one of our sales representatives to request a Return Material Authorization (RMA) number. Requests for refunds and exchanges cannot be processed without a valid RMA number. Please have the following information available when requesting an RMA number: product model number, serial number, and a description of the problem. The company-issued RMA number must be prominently displayed on the returned package.

No returns will be accepted "collect" or "C. O. D." On all warranty returns, we will pay the shipping charges on the return of merchandise to the customer.

Call
today!

CUSTOM LASER REQUEST FORM

For your convenience, simply photocopy this page, fill in the necessary information, and fax it to us at 501-407-0036.

One of our sales engineers will contact you promptly with ideas and quotations for the ideal laser product for your application.

(Check all that apply.)

I am interested in the following wavelengths.

- 266-355nm 370-450nm
 532nm 630-690nm
 745-980nm 1000-1400nm
 above 1400nm
 specific wavelength(s) _____

I need output power

- below 5mW 5-10mW
 15-35mW 40-100mW
 150-500mW 1000mW or above
 specific power level(s) _____

I am interested in the following options.

- circular beam
 temperature control
 fiber optic delivery
 computer control
 line generating optics
 other _____

I currently work in

- OEM manufacturing
 product development for emerging application(s)
 research/university setting
 other _____

I have the following custom product requirements. (if necessary, please fax us a drawing.) _____

My application is _____

I'm also interested in _____

Additional comments _____

Name _____

Company/Organization _____

Address _____

City _____

State _____ Zip _____

Country _____

Phone _____ Ext. _____

Fax _____

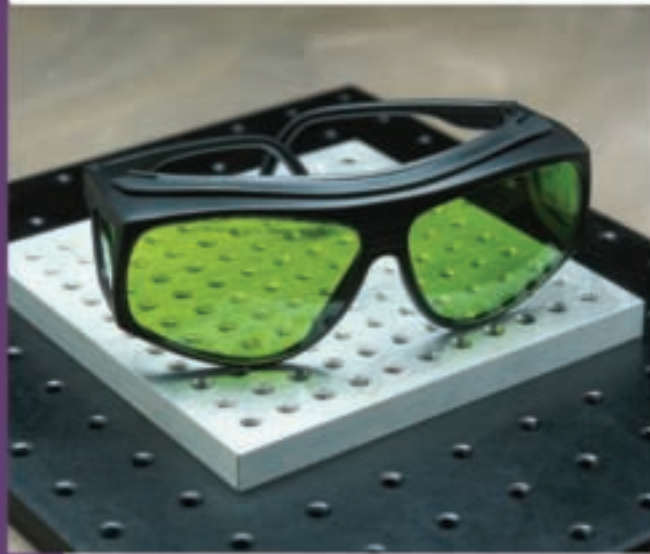
Email _____

*For
medium
to high
quantity
orders*

CDRH, SAFETY, & HANDLING

Safety

- ▶ Never look directly into the laser beam.
- ▶ Take precaution to eliminate exposure to direct or reflected laser light.
- ▶ Operate the laser in a safe, controlled area.



Handling

- ▶ Do not adjust the focus on lasers operating in automatic power control mode at full power.
- ▶ When laser diodes are present, do not operate equipment that may generate high frequency electrical surges.
- ▶ Do not touch the laser lens, as contamination and scratches may result in distortion & decreased output power.

Center For Devices & Radiological Health—

The United States Food and Drug Administration's Center for Devices and Radiological Health (CDRH) is the agency responsible for enforcing federal regulations regarding radiation-emitting devices in the U.S. Because laser light is a form of radiation, it is monitored by CDRH, and we at Power Technology, Inc. have an obligation to the government, to ourselves, and, most importantly, to our customers to ensure that our products adhere to these regulations. Protecting consumers and complying with federal guidelines are our top priorities.

The Code of Federal Regulations (CFR) is the set of government guidelines set forth by CDRH that manufacturers of various products must follow. Specifically, guidelines 21 CFR 1040.10 and 1040.11 detail the standards that all laser products must meet. To comply with federal regulations, all laser system manufacturers must ensure that their products contain mandated safety features, register their products with CDRH, and properly label each device with its respective warning data.

Laser products are regulated by CDRH based on the level of radiation emitted at a particular wavelength. They are grouped into specific classes according to their maximum emission level.

Class I Laser (Class I Laser Product)	Class II Laser Laser Radiation. The eye can normally avert with aversive mechanisms.	Class III Laser Laser Radiation The high-power laser beam.	Class IIIb Laser Laser Radiation. The eye can normally avert with aversive mechanisms, but the beam is capable of causing eye injury with optical instruments.	Class IV Laser Laser Radiation Laser beam can cause eye injury.	Class IV Laser Laser Radiation Laser beam can cause eye injury.	Class IV Laser Laser Radiation Laser beam can cause eye injury.
One of the above labels is affixed to the laser head.	One of the above labels is affixed to the laser head.	One of the above labels is affixed to the laser head.	One of the above labels is affixed to the laser head.	One of the above labels is affixed to the laser head.	One of the above labels is affixed to the laser head.	One of the above labels is affixed to the laser head.

Please note that OEM laser products are subject to different requirements than those applicable to laser systems. Because we are primarily a manufacturer of products designed for incorporation into a customer's end-product, a number of our units do not include government mandated safety features. The original equipment manufacturer is responsible for incorporating safety features to meet CDRH guidelines.

Laser Diode Control Unit—

The Laser Diode Control Unit (LDCU) is a turnkey power source that enables us to offer OEM laser products as complete laser systems. The LDCU incorporates a number of CDRH mandated safety features, including an emission indicator and 5-second activation delay, to bring end users into compliance with U. S. government regulations. Original equipment manufacturers are responsible for integrating their own safety features to meet government standards. See page 52 to learn more about the LDCU.

DISTRIBUTOR INFORMATION

To meet the needs of our international customers, we give you the opportunity to work with a local distributor. Our network of international distributors offer you the convenience of dealing with a representative in your own time zone, the satisfaction of working with a trained professional, and the comfort of speaking with someone in a familiar language.

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Fax: 011-31297266134
Email: hengsdijk@laser2000.nl
Territory: Belgium, Netherlands,
Luxembourg

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Fax: 886-2 8919-1684
Email: cynthia@onset-eo.com
Territory: Taiwan

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