

DM Series

High Power IR and Green Lasers *Nd:YLF & Nd:YAG*



Features

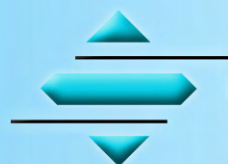
- Diode Pumped Technology
- Highest Energy per Pulse (up to 60mJ at 1 kHz)
- High Stability (<1% RMS) for YLF
- Compact, Rugged, Industrial Design
- Uniform Beam Profile
- Long Diode Lifetime (10,000 hours)
- Quick pump chamber changeover time
- Low Cost of Ownership
- Pulse Rate from Single Shot to 10 kHz (YLF Based)
- Pulse Rate from 1 kHz to 30 kHz (YAG Based)
- RS-232 Interface
- Computer Control Software Included

Optional Features

- Twin Pulse Operation - Separation from 500 μ s to \sim 1 μ s
- Fiber Coupled Output
- TEM₀₀ / TEM₀₁ Mode Output
- Output Power Monitor
- Power Attenuator

Applications

- PDP Lithography (ITO film removal/patterning of plasma displays)
- Laser Direct Writing
- Color Mask Patterning for TFT LCD
- Laser annealing of semiconductor
- Welding Marking, Engraving, and Cutting
- FPD and semiconductor dicing/trimming
- Laser Heated Diamond Anvil Cell (LHDAC)
- Pumping of Ti:Sapphire & Dye Lasers
- High Speed Imaging
- Particle Image Velocimetry (PIV)
- Materials Processing
- Entertainment/Show Industry



Photronics Industries

International, Inc.

The Pioneer of Intra-Cavity Solid-State Harmonic Lasers

Photonics Industries' DM Series diode pumped Q-switched lasers offer a compact, stable, robust, "hands-free" system with the long-term reliability that the manufacturing industry demands. Utilizing our patented harmonic generation and power scaling technologies, the DM Series has been designed to provide a high power, high quality, laser with the diversity to meet the most demanding requirements.

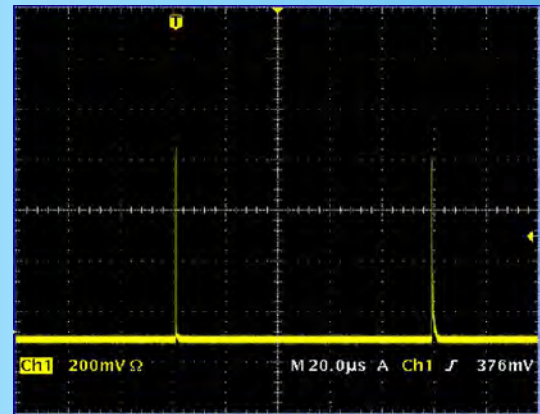
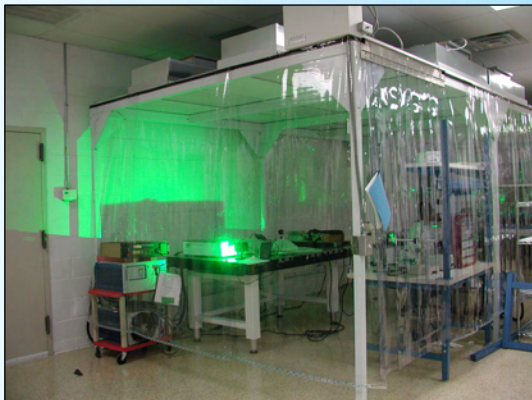
This DM series of lasers are available with a choice of the Nd:YLF or Nd:YAG platforms. This variety allows our customers to have the ability to select a laser that best fits their application

System Reliability

Photonics Industries is committed to providing a highly reliable laser to our customers. The laser resonator, which is assembled in a clean room environment, is hermetically sealed in order to prevent dust and condensation from damaging the laser crystals and optics. Since our inception in 1993, Photonics Industries' has pioneered intracavity harmonic generation. Our patented intracavity harmonic generation results in a large beam diameter on the harmonic crystal, which significantly increases the crystal lifetime, compared to external harmonic generation. This technique also minimizes the amount of optical components needed to generate the Green wavelength.

High Performance

By utilizing our proprietary, patented design, our DM Series Nd:YLF laser delivers the highest efficiency and the highest pulse energy output commercially available. The single pumping head produces at least twice as much pulse energy as the next closest competitor's. Uniform beam distribution is ideal for many applications, including: Ti:Sapphire,



Twin Pulse - Separation of 100μs

Dye laser pumping, and Particle Image Velocimetry (PIV). The DM Series provides nearly 100% conversion efficiency from the IR to Green wavelength. This results in significantly lower consumable usage and lower running costs.

Fiber Coupled, Twin Pulse and TEM₀₀ Output Options

Optional features include the fiber coupled option where the fiber core diameter can range from 0.1mm to 1mm. Photonics Industries' patented pulse energy control feature allows users to vary the pulse energy from 20% to 100% with approximately the same beam characteristics, and every pulse can be controlled individually. The multi-pulse option, including "twin pulse", can be used for PIV applications where it is advantageous if both pulses come from the same laser resonator. This ensures the same beam intensity distribution for two individual pulses and co-linear beam propagation, with a variable pulse separation from 500 μs to 1μs.

User-Friendly Operation

All laser functions and every pulse can be individually controlled via the laser controller's front panel or RS-232 computer interface. DM computer control software is included with each laser. The DM Series laser system produces the highest energy-per-pulse, yet only requires single-phase 110 or 220 VAC power utilities. In addition, each DM laser is provided with a compact closed-loop chiller.

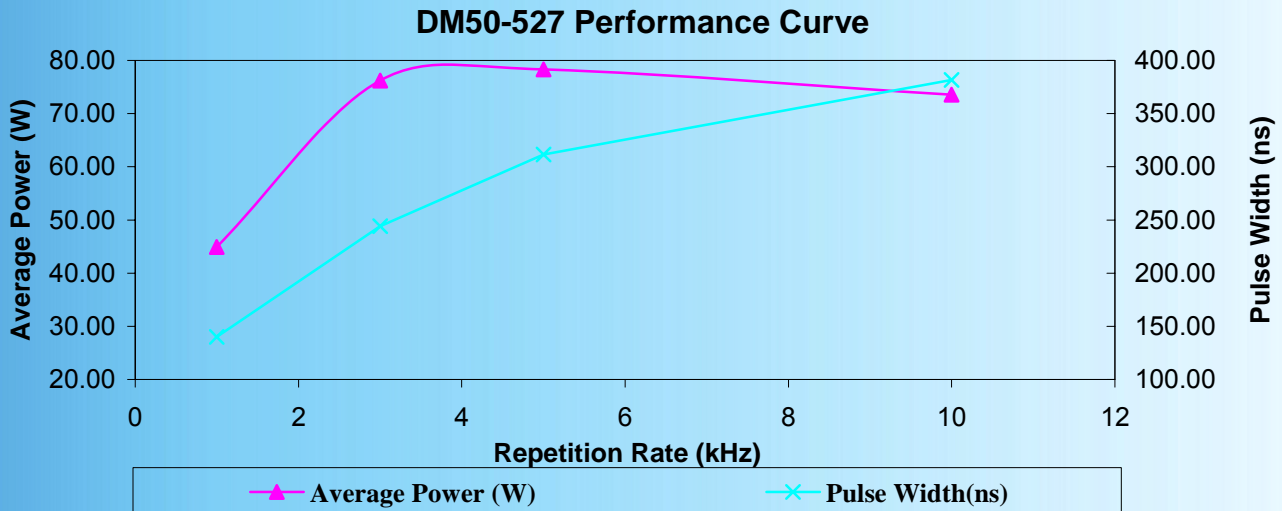
Nd:YLF Systems

Photonics Industries' Nd:YLF DM Series diode pumped Q-switched Green lasers offer the HIGHEST PULSE ENERGY at high repetition rates (kHz). Photonics Industries was the first manufacturer to introduce lamp-pumped, intra-cavity doubled, Q-switched Nd:YLF lasers that produced a pulse energy of over 20 mJ at 1 kHz. With our DM Series of diode-pumped Nd:YLF lasers, we continue to lead the industry with the highest energy-per-pulse (up to 60mJ at 1 kHz) in its class. The DM series allows us to offer the best commercially available Green lasers with field proven reliability.

DM30-1053-CW		
Wavelength (nm)	1053	
Mode	TEM ₀₁	TEM ₀₀
Power (w)	60	50
M ²	< 2.5	< 1.2
Power Instability	< 0. 5% (< 0. 3% typical)	
Beam Diameter (at window)	~3.0 mm	~3.0 mm
Polarization	Horizontal	Horizontal
Beam Divergence	< 3 mrad	< 3 mrad
Roundness	> 90% roundness	> 90% roundness
Gaussian Fit	N / A	> 90% roundness

	DM10-527	DM15-527	DM20-527	DM30-527	DM40-527	DM50-527	DM60-527
Wavelength (nm)	527	527	527	527	527	527	527
Average Power (W) @ 3kHz	14	22	30	45	60	75	90
Pulse Energy (mJ) @ 1kHz	10	15	20	30	40	50	60
Pulse Width (ns) @ 1kHz (nominal)	220	200	180	150	150	130	100
Beam Diameter (mm)	2	2	4	4	4	4	4
Polarization	Horizontal*	Horizontal*	Vertical	Vertical	Vertical	Vertical	Vertical
M ²	13-18						
Beam Divergence	8 mrad						
Beam Pointing Stability	<20 µrad						
Pulse to Pulse Instability	0.5% rms						
Long Term Instability	0.5% rms						
Operating Pulse Rate	Single Shot to 10Khz						

* Vertical polarization also available



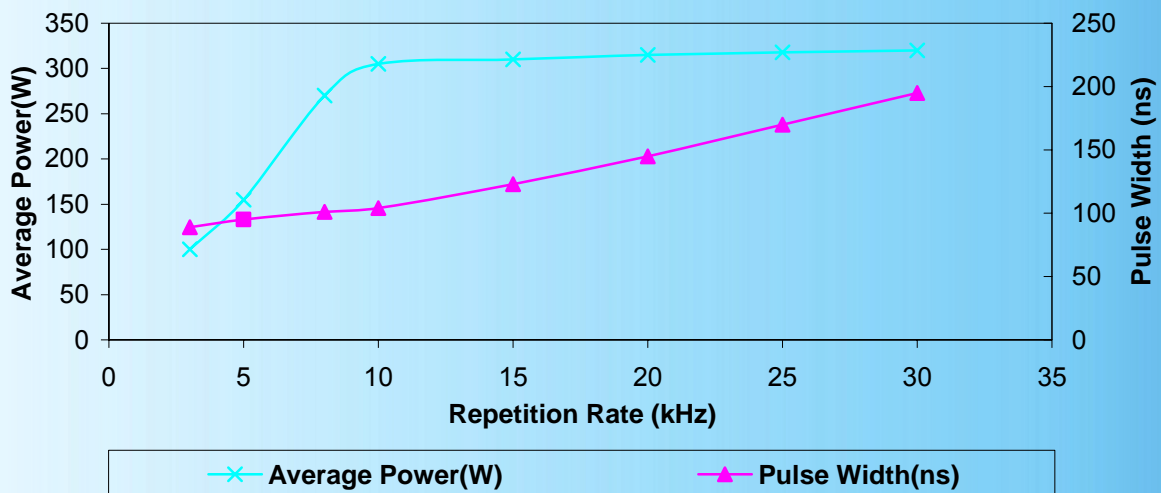
Nd:YAG Systems

Leveraging another of Photonics Industries' core competencies – power scaling – we are able to offer some of the highest power IR and Green YAG based lasers for a variety of novel industrial materials processing applications. Uniform beam distribution is ideal for many applications, including: Laser direct Writing, and Annealing. Nd:YAG DM Series are available with average powers up to 400W (10 kHz) at 1064nm and up to 150W (10 kHz) at 532nm.

	DM150-1064	DM300-1064
Wavelength (nm)	1064	1064
Average Power (W) @ 10 kHz	150	300
Pulse Energy (mJ) @ 10 kHz	15	30
Pulse Width (nominal)	60 to 240 ns	40 to 160 ns
Beam Diameter (mm)	4mm	
Polarization	Non-polarized	
Beam divergence	10 mrad	
Operating Pulse Rate	3kHz to 30kHz	
Pulse to Pulse Instability	3% rms	
Long Term Instability	3% rms	

	DM50-532	DM100-532	DM150-532
Wavelength (nm)	532	532	532
Average Power (W) @ 10kHz	50	100	150
Pulse Energy (mJ) @ 10kHz	5	10	15
Pulse Width (nominal)	80 to 150 ns	80 to 120 ns	80 to 120 ns
Beam Diameter (mm)	3mm		
Polarization	Horizontal		
M ²	30-35		~50
Beam divergence	10 mrad		
Operating Pulse Rate	3kHz to 30kHz		
Pulse to Pulse Instability	3% rms		
Long Term Instability	3% rms		

DM300-1064 Nd:YAG Laser Performance

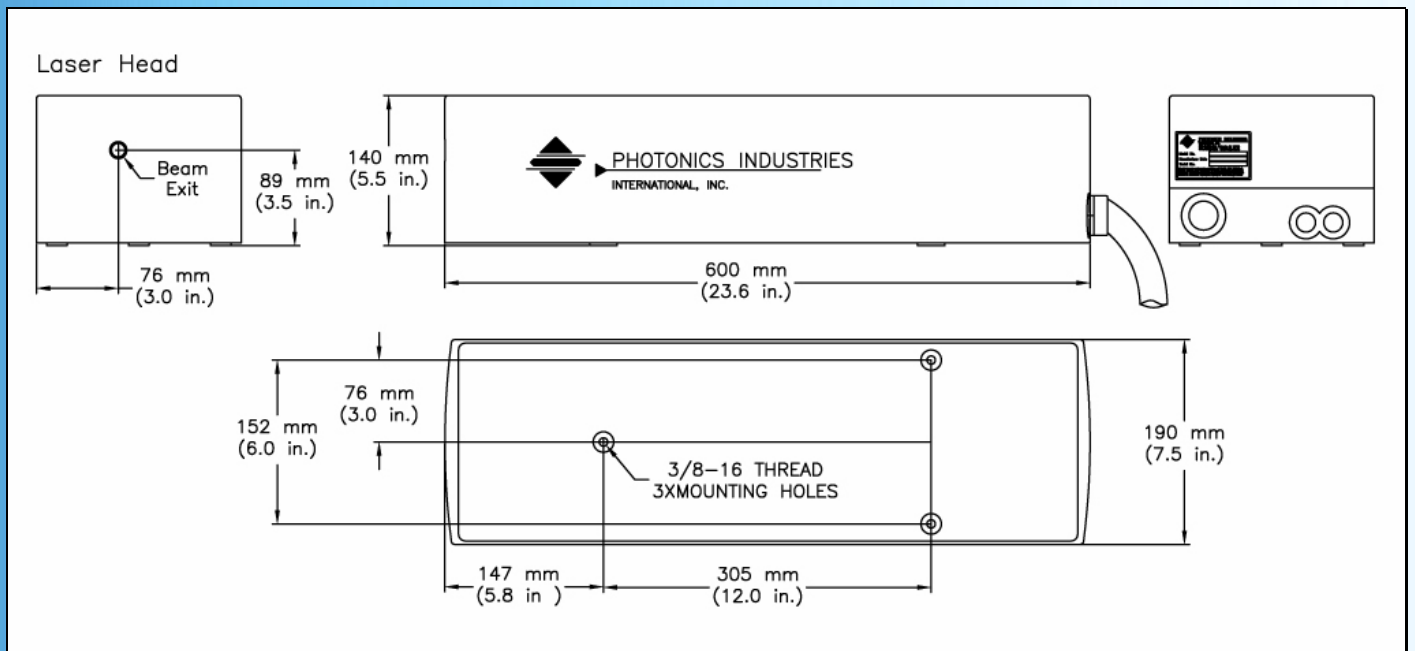


Common Specifications

All DM lasers require a water chiller in order to maintain proper operating temperatures. Choices of air-to-water and water-to-water chillers are available. Please contact the factory to find which chiller will best meet your specifications.

	Width	Length	Height	Weight
Laser Head	190 mm (7.50 in)	600 mm (23.6 in)	140 mm (5.5 in)	20 kg/44 lbs
Laser Controller	483 mm (19 in)	476 mm (18.75 in)	133 mm (5.25 in)*	12.7 kg/28 lbs**
Electrical Requirement	single phase, 3kVA***			
Ambient Temperature	15 to 30 C (59 to 86 F) Operating Range			
Umbilical Length	3 Meters (10 Feet)			

- * DM100 and up: 312mm
- ** DM100 and up: 27kg
- *** DM100 and up: 6kVA



In order to continuously improve our product catalog, we reserve the right to change all specifications without prior notice. Please contact the factory for the most recent dimensions.

Optional Features

Twin Pulse Operation

For PIV applications, there are several key advantages to using a single laser resonator. This method guarantees collinear output of the pulse sets, as well as plane of polarization. The single laser is more compact, and has fewer components, which results in reduced maintenance cost and increased Mean Time Between Failure (MTBF) reliability over a dual head laser system.

The user-friendly interface can accept a single external trigger signal, typically produced by the CCD Camera, which will then produce two laser pulses.

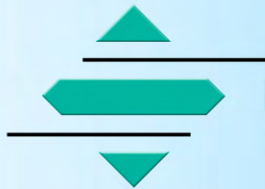
- Proprietary Design, Specific to PIV Applications
- Twin Pulse Separation, t down to $\sim 1\mu\text{s}$
- Twin Pulse Set at kHz Rates – e.g., at 500Hz get 1000 pulses/second
- Energy of Each of Two(2) Pulses Easily Selected

For pulse separation less than $\sim 1\mu\text{s}$, a dual head version is available. Please contact Photonics Industries for more information.

WARRANTY

Photonics Industries International, Inc. offers a limited warranty for all DC Series laser systems. All components and assemblies are guaranteed to be free of defects in materials and workmanship for the duration of the warranty period. Please contact our sales office, or visit our website for complete details on our standard and extended warranty coverage.

Due to Photonics Industries' commitment to continuous product improvement, Specifications are subject to change without notice.



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Photonics Industries conforms to provisions of US 21 CFR 1040.10 & 1040.11 and is made under one or more US patents listed below: 7,346,092; 7,082,149; 7,079,557; 6,999,483; 6,980,574; 6,961,355; 6,842,293; 6,762,405; 6,690,692; 6,587,487; 6,584,487; 6,366,596; 6,327,281; 6,356,578; 6,246,707; 6,229,839; 6,108,356; 6,061,370; 6,028,620; 5,936,938; 5,898,717 and Pending Patents

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