High Power Laser Diode Portfolio

Custom Business Solutions

The Power to Transform™

IPG Single Emitter Technology: Best in Class

Single Emitter Diodes vs. Bar Diodes

Parameter	Bar/ Bar-Stack	IPG Single Emitter Pump
Individual emitter output power, W	1 - 2	6 -10
Coupling efficiency, %	75 - 50 bar / stack	90 - 95
MTBF, hrs • **CW** • **QCW**	 5,000 - 10,000 2,000 - 5,000	 >200,000 >200,000
WPE, % (in fiber)	25 - 35	50 - 60

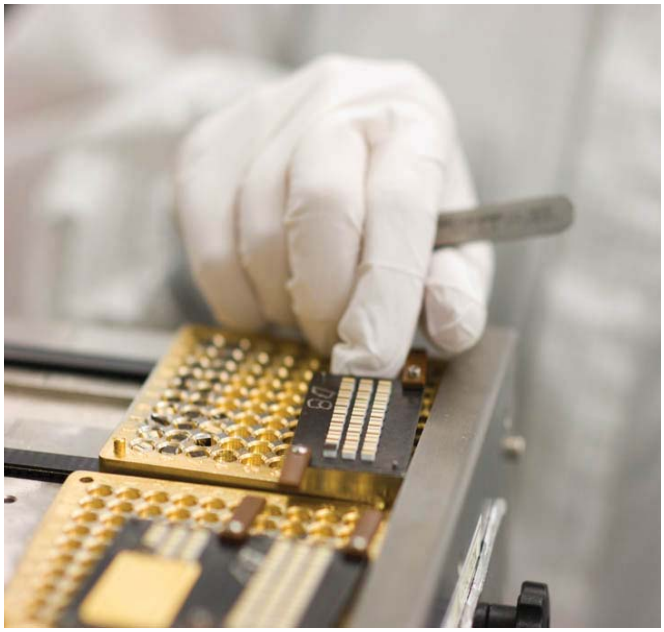
Laser diode bars, also known as monolithic laser diode arrays, combine multiple single emitters in one large area mono-crystal device. Usually, the number of emitters in bars varies from 10 to 100. Thus all single emitters share the thermal heat and electrical current. Strong thermal and electrical cross-talk significantly limit the lifetimes of bars and put constraints on their performance. The lifetimes of bars or bar-stacks are generally limited by the lifetime of the weakest emitting element.

The single emitter pumping solution is free of these drawbacks. Single emitter pumps form an ensemble of independent individual pumping elements. Contrary to the bar pumping approach, failure of any number of single emitter pumps does not affect the performance and reliability of the rest of pumping ensemble.

Unprecedented Brightness, Power and Reliability

IPG takes advantage of technologies and vast experiences from the mature telecommunications industry. That sets IPG apart from competing industrial products which pump using short-lived diode bars and bar-stacks. Our single emitter pumps are manufactured with telecom materials, technology and quality - they are qualified by universal telecommunications industry standards.

As a result, IPG single emitter diodes offer an order of magnitude higher brightness and up to two times greater power efficiency compared to bars and bar-stack pumps. Unlike diode bar-stacks that require complicated and unreliable micro-channel cooling, IPG single emitter pumps use simple, low pressure water cooling. In many cases, IPG pumps can efficiently operate even using simplest air-cooling methods.



IPG's Lifetime Reliability Program

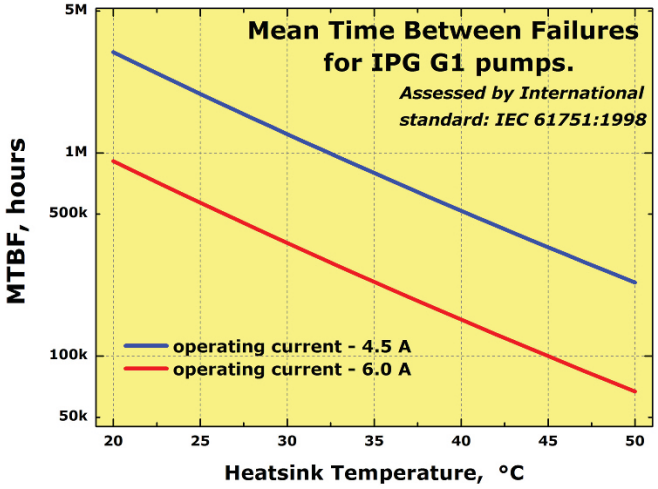
Largest Producer of High Quality Laser Diodes

Outstanding performance and high manufacturing volume of IPG pumps do not compromise their reliability.

The quality of pumps is ensured by IPG's extensive quality/ reliability program. Every diode undergoes rigorous screening, also known as burn-in, at highly accelerated stress conditions. Before shipping to customers, IPG runs 100% of their diodes for hundreds of hours at heatsink temperatures exceeding normal operating temperatures by >50°C and driving current in excess of normal conditions by 50%. These procedures effectively screen for devices susceptible to premature degradation and minimize in-field failures.

IPG's reliability program ensures excellent in-field reliability of industrial and other lasers. During 2006 less than 0.5% of the in-field population of pumps was reported to have failed.

IPG's diode burn-in stations



Industry Leading Burn-in Experience and Capacity

IPG's reliability program is a key component of IPG's quality commitment to customers. IPG continues to invest in it's burn-in operations every year. Presently IPG's burn-in facility is capable of simultaneous screening over 65,000 diodes.

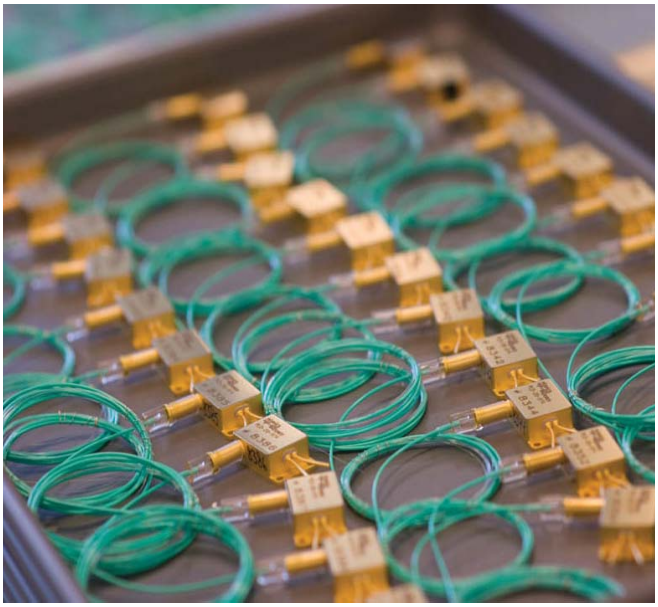
IPG's unique knowledge of pump diode reliability is combined with high volume manufacturing experience. Over the last 15 years, IPG has accumulated a reliability file comprised of over several billion device-hours real-time. None of our competitors in the industrial or telecommunications arenas has reported such extensive reliability data.

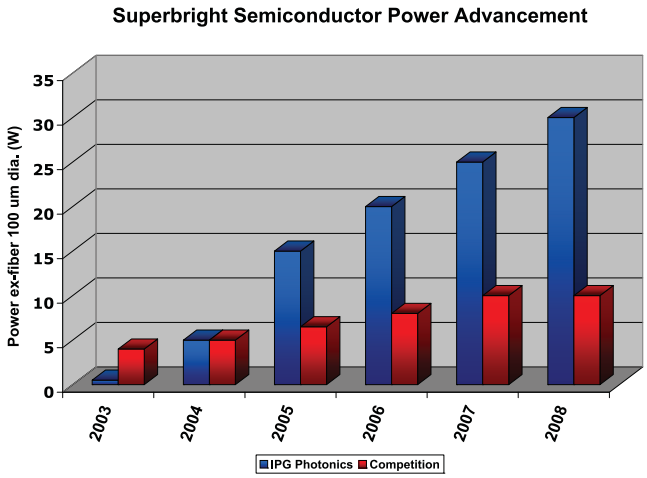
High Performance and Reliability of Single Emitter Technology

The performance advantages of single emitter pumps do not compromise their reliability. IPG's pumps are qualified by stringent telecommunications reliability methodologies and have MTBFs of greater than 200,000 hours.

Unlike laser bars for which lifetimes drop dramatically under quasi-CW driving conditions (typical operating conditions in most industrial applications), single emitter diodes have similar reliability being driven in CW or quasi-CW operation modes.

IPG's hermetically sealed pumps are not affected by the harshest industrial environments including humidity, dust or vibration. The high reliability of IPG's single emitter pumps is proven by their excellent in-field reliability record.





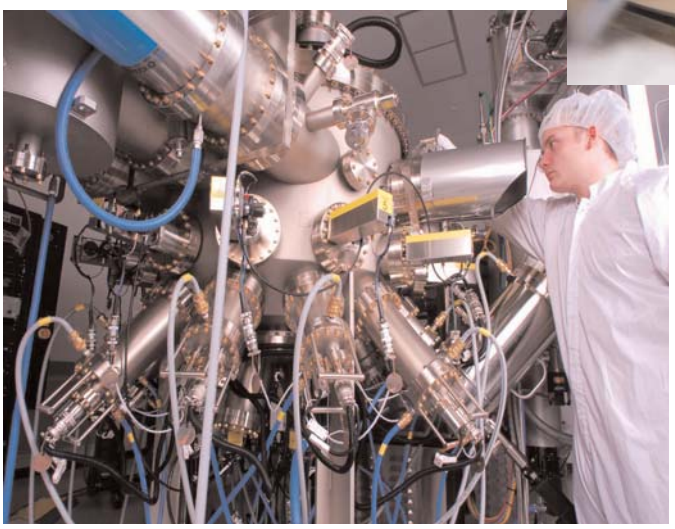
IPG Industrial Fiber Lasers Utilize Distributed Pumping Architecture

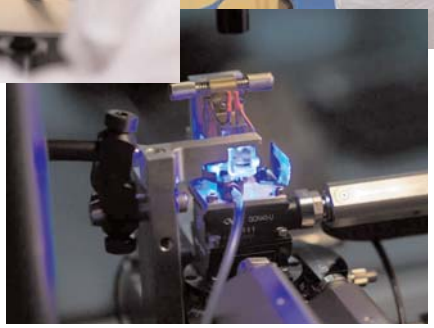
Distributed pumping offers stability and simplicity unprecedented in the industry, as well as virtually unlimited redundancy and flexibility. IPG's pumping method is alignment-free and is the only truly service-free pumping solution. This solution offers unlimited scalability and opportunity to utilize modular design. Most of these features are not available in disc and rod diode-pumped lasers.

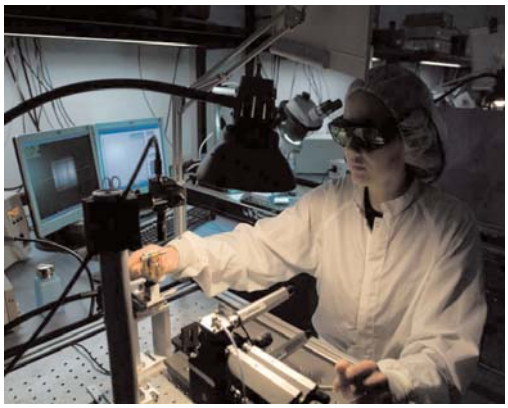
Vertically-Integrated Innovation and Capabilities

High-Precision Value Added Manufacturing

IPG's core competency is its own fully vertically integrated diode laser manufacturing. All production steps starting with Molecular Beam Epitaxy (MBE) growth of aluminum gallium arsenide wafers to diode packaging operations are done in-house. IPG leads the industry worldwide with higher educated manufacturing personnel and over 100,000 sq. ft. clean-room production facilities in the USA, Germany and Russia with over 200 manufacturing personnel. All of the manufacturing operations are paperless and allow full traceability to ensure the highest quality control unmatched in the industry.







Manufacturing Capacity

IPG owns numerous proprietary technologies and processes that ensure the performance and reliability of our high power laser diodes. IPG also has the industry's shortest "development to manufacturing" cycle. IPG's manufacturing processes, especially back-end operations, are highly automated. In 2007, IPG further increased the redundancy of manufacturing by bringing on-line three new multi-chamber MBE reactors. The combination of these factors makes IPG the world's largest single emitter diode pump manufacturer for industrial, telecommunications, medical and special applications.

Applications

Dental

Diode Pumping

Direct Diode Lasers and Fiber Lasers

Graphic Arts/ Printing

Life and Health Sciences

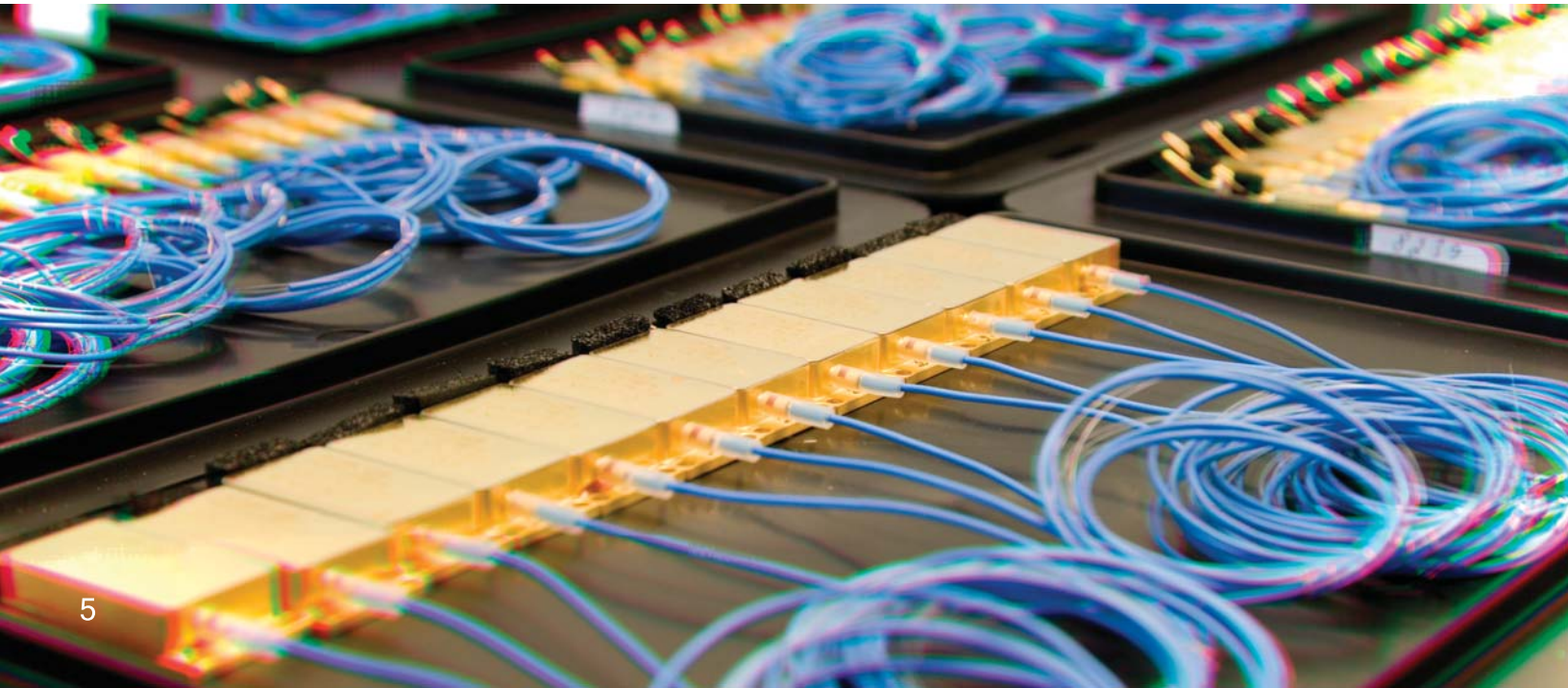
Materials Processing

Medical

Microwelding

Photovoltaic

And Custom Applications



IPG Photonics: Developing Custom Business Solutions to

- Reduce Risk
- Accelerate time to market
- Tailored Efficiencies
- Lower cost of ownership

IPG Photonics is an innovative OEM supplier of high power laser diodes, modules and fiber lasers. IPG is also a vertically integrated operation. This allows for the ability to develop specialty products, even for pioneering and niche markets. Incorporating different levels of integration and customization allow IPG to create a fully tailored custom business solution for a full range of applications. With steadfast engineering, operations and sales teams, IPG Photonics strives to exceed our customer's expectations by consistently providing innovative quality products and outstanding service while maintaining a focus on continuous improvement.

Typical Laser Diode Characteristics

	Symbol	iPLD-5	iPLD-9	iPLD-10	iPLD-15	iPLD-20	iPLD-30
Nominal Output Power	W	5W	9W	10W	15W	20W	30W
Wavelength	nm	915-980	915-980	915-980	915-980	915-980	915-980
Numerical Aperature	NA	0.12	0.12	0.12	0.12	0.12	0.12
Fiber Core Diameter	um	105	105	105	105	105	105

Product and performace are typical and subject to change without notice. Information contained herein shall legally bind IPG only if it is specifically incorporated into the terms and conditions of a sales agreement.

Anything Else is a Compromise.