The Laser and Electro-Optics Manufacturers' Association

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February 7, 2011

VIA E-MAIL
Timothy Mooney
Office of Exporter Services
Regulatory Policy Division
Bureau of Industry and Security
Department of Commerce
1401 Constitution Avenue, NW
Room 2705
Washington DC 20230

Attn: Notice of Inquiry – CCL

Dear Mr. Mooney:

On behalf of a consortium of U.S. laser manufacturers, LEOMA is pleased to present these comments in response to the Bureau of Industry and Security's request for public comment in Federal Register, vol. 75, number 236, page 76664, December 9, 2010. This consortium includes some of the largest manufacturers of lasers, including Coherent Inc. IPG Photonics Corporation, JDS Uniphase Corporation and Newport Corporation, representing combined sales of over $1 billion.

The goal of this letter is to comment on the proposed "tiered" system for the Commerce Control List (CCL), to suggest updated controls for consistency with developing technology and foreign availability, and to increase the clarity of section 6A005 of Category 6 of the CCL. LEOMA has strong concerns regarding any possible classification of 6A005 as Tier 1. We believe it is not justified and we present the reasons why a combination of Tier 2 and Tier 3 are appropriate classifications for 6A005.

It has been five years since the last major revision of laser export controls, and the technology has advanced considerably during that time. In particular, the commercial availability of lasers offered by manufacturers located within Wassenaar countries has proliferated, and the capability of Chinese and other non-Wassenaar laser manufacturers has increased very significantly, such that many lasers that were not commercially available outside Wassenaar countries five years ago are now readily available.

We thank you for your attention to our comments, and remain at your disposal to answer any questions you may have.

Sincerely,

Breck Hitz
Executive Director

Enclosures: Comments
Appendix I-Foreign Availability Non-Wassenaar Countries
Appendix II-Foreign Availability Wassenaar Countries

I. Comments on "Tiering" of Items on CCL:

LEOMA proposes that ECCN 6A005 be considered Tier 2 or Tier 3 for the following reasons:

A. Placing 6A005 in Tier 1 will imperil the cooperative enforcement of export controls among nations participating in the Wassenaar Arrangement: Unilateral export controls are not in our country's interest. Unilateral export controls would undermine our industries' competitiveness on the global stage, and would be far less effective than the multilateral Wassenaar Arrangement in keeping dangerous items from the hands of our potential enemies.

   Placing 6A005 items in Tier 1 would be a dramatic tightening off the current controls, which allow any Wassenaar country to export lasers freely to another Wassenaar country without license. Yet we have seen time and time again that any such "rollback" – tightening of the controls – is firmly opposed around the table at Wassenaar. Putting this proposition forward at Wassenaar is not only a recipe for certain failure, it would engender further hostility toward future propositions that the U.S. puts forward.

B. Lasers have significant foreign availability: Virtually all lasers, components and optical equipment manufactured in the United States are currently manufactured in volume with the same performance criteria in Germany and/or Russia and/or Japan and/or the U.K., and many are manufactured in a number of other Wassenaar countries as well. As a result, such lasers, components and optical equipment should fall under Tier 2. Further, many lasers, components and optical equipment controlled by 6A005 are available in non-Wassenaar countries, which items should fall under Tier 3.

   LEOMA has conducted a preliminary survey of lasers available outside of the United States. Those available in Wassenaar countries are in Appendix 2 and those available in non-Wassenaar countries are in Appendix 1.

   We also note that LEOMA members have non-U.S. subsidiaries which developed some of the laser technologies outside of the U.S. but produce them or crucial components for them in the United States. For example, IPG Photonics developed CW and pulsed high power fiber lasers controlled under 6A005 in Russia and Germany; they are manufactured there and now in the in the United States.

C. Items in 6A005 do not meet the criteria for Tier 1 items: Tier 1 items are:

   > *"(a) weapons of mass destruction (WMD), (b) WMD-capable unmanned delivery systems; (c) plants, facilities or items specially designed for producing or using WMDs, special nuclear materials or WMD-capable unmanned delivery systems; or (d) items almost exclusively available from*

the United States and which provide a critical military or intelligence advantage to the United States".

Items controlled under 6A005 are intended for commercial or research use, and not for WMD. Generally, lasers are industrial tools used to treat materials, for example by marking, drilling, cutting, welding, annealing and brazing them. Lasers also find countless uses in everyday commerce, for example by measuring stress in airplane wings and bridge structures, by texturizing the surfaces of hard-disk drives for computers, and by creating the plates to print newspapers. Lasers are essential tools in science, from fusion research to astronomy. And surgeons use lasers to restore patients' eyesight, to destroy cancerous tumors, and to make incisions no scalpel could attempt. These lasers are not candidates for WMD-capable unmanned delivery systems.

To the best knowledge of the LEOMA members, the lasers controlled by 6A005 were not specially designed for producing or using WMDs, special nuclear materials or WMD-capable unmanned delivery systems.

As explained above, almost all of the items controlled by 6A005 are available in Wassenaar or non-Wassenaar countries, and therefore Tier 1 is not an appropriate classification for 6A005, because they are not "almost exclusively available" in the United States. Further, it certainly cannot be the case that every controlled item in 6A005 provides a critical military or intelligence advantage to the United States. Therefore, LEOMA submits that it would be arbitrary and unnecessary to treat the entire 6A005 list as Tier 1.

LEOMA suggests that if there are specific items controlled by 6A005 that provide a critical military or intelligence advantage to the United States and are available only in the United States or that meet criteria a, b or c of Tier 1, that the Administration highlight those items for a discussion regarding special treatment and control.

D. <u>6A005 Items Are Not on the Sensitive List or Very Sensitive List of the Wassenaar Treaty:</u> The items controlled by 6A005 are on the Basic List of dual use items under the Wassenaar Arrangement. Not one item in 6A005 is on the Sensitive List or Very Sensitive List. This supports the argument that 6A005 is not appropriate for Tier 1 classification. LEOMA submits that the complete absence of any 6A005 item on the two special Wassenaar annexes is compelling and objective evidence that 6A005 items do not provide a critical military or intelligence advantage to the United States or any of the other treaty countries.

E. <u>It is contrary to the Goals of the Administration's Export Control Initiative to Require Licenses on Current 6A005 Items to most Wassenaar Countries:</u> The Administration is urged to not arbitrarily or unnecessarily classify all 6A005 items as Tier 1. Currently, most 6A005 items are controlled for National Security reasons and do not require a license to be exported to most Wassenaar Countries.

However, if all 6A005 items are classified under Tier 1, they would require a license to export them to Europe, Australia, South Korea and Japan. Treating 6A005 items as Tier 1 would substantially increase the burdens on U.S. exporters, reduce U.S. exports at a cost of hundreds if not thousands of U.S. jobs. Moreover, it would benefit foreign competitors and provide incentive to use non-U.S. production facilities. As noted above, most items currently are or can be manufactured in Germany, the U.K., Russia and/or Japan. Any increase in controls on items in 6A005 should be justified by the Administration, rather than putting the onus on industry to explain the absence of critical military or intelligence significance.

II. Proposal for Revised Text of 6A005

LEOMA respectfully suggests the following revisions to 6A005 based upon our comments in support of Tier 2 and Tier 3 classification for 6A005 *(proposed changes are in italics)*:

6A005 (somewhere in the introductory paragraphs)

All controls in 6A005 are Tier 2 unless explicitly specified otherwise.

There are virtually no lasers manufactured in the United States that cannot be duplicated in Germany and/or Russia and/or Japan and/or the U.K.

a.6.a.1.a. *'Wall-plug efficiency' exceeding 12% and output power exceeding 200 W; or*
a.6.a.1.b. *Tier 3. 'Wall-plug efficiency' exceeding 12% and output power exceeding 100 W; or*

At least one Chinese manufacturer offers a 200-W fiber laser with $M^2 < 1.2$:

- Raycus 200 W Fiber Laser datasheet in Appendix 1

a.8.a. *Output wavelength exceeding 1,555 nm and output power exceeding 30 W*
a.8.b. *Tier 3. Output wavelength exceeding 1,555 nm and output power exceeding 1 W*

At least one Israeli manufacturer offers a 30-W fiber laser with wavelength greater that 1,555 nm:

- OptiSiv CWFL 1550-10
- OptiSiv CWFL 2000-30

b.3.b.1.a. *Output energy exceeding 12.5 J and "peak power" exceeding 1250 MW; or*
b.3.b.1.b. *Tier 3. Output energy exceeding 1.5 J and "peak power" exceeding 150 W; or*

At least one Chinese manufacturer offers a green Q-switched Nd:YAG laser capable of producing 12.5 J and 1250 MW at 532 nm, and therefore exceeding the current control limits of 1.5J and 150 W:

- BeamTech SGR Extra 25 datasheet from BeamTech website included in Appendix 1

b.6.b.1.a.1. *"Peak power" exceeding 2500 MW*
b.6.b.1.a.2. *Tier 3. "Peak power" exceeding 100 MW*

At least one Chinese manufacturer offers a Q-switched Nd:YAG laser capable of producing 2500 MW of peak power at 1064 nm, and therefore exceeding the current control limit of 100 MW peak:

- BeamTech SGR Extra 25 datasheet from BeamTech website included in Appendix 1

b.6.b.2.a.1. *"Peak power" exceeding 2500 MW*
b.6.b.2.a.2. *Tier 3. "Peak power" exceeding 400 MW*
b.6.b.2.d.1. *Output energy exceeding 25 J per pulse; or*
b.6.b.2.d.2. *Tier 3. Output energy exceeding 4 J per pulse*

At least one Chinese manufacturer offers a Q-switched Nd:YAG laser capable of producing 2500 MW of peak power and 25 J per pulse at 1064 nm, and therefore exceeding the current control limit of 100 MW peak and 4 J per pulse:

- BeamTech SGR Extra 25 datasheet from BeamTech website included in Appendix 1

c.1.b.1.a. *Average or CW output power exceeding 1.5 W;*
c.1.b.1.b. *Tier 3. Average or CW output power exceeding 1W;*

Several manufacturers – one in China, one in Belarus – offer tunable lasers in this spectral range that exceed the current 1 W control.

- BeamTech SGR series datasheet in Appendix 1
- Solar OPO datasheet in Appendix 1

d.1.b.1. *Wavelength of less than 1,400 nm and*
d.1.b.1.a. *average or CW output power, exceeding 30 W;*
d.1.b.1.b. *Tier 3. Wavelength of less than 1,400 nm and average or CW output power, exceeding 15 W*

There are several multimode diodes in this spectral range, available from at least two Chinese manufacturers that exceed the current 15-W control level:

- HTOE FLMM-0980-9*1-022W 22 W datasheet in Appendix 1
- HTOE FLMM-0808-9*1-025W 25 W datasheet in Appendix 1
- BWT K81DA4C-30.00W-FS 30 W datasheet in Appendix 1
- BWT K98SA3F-25.00W-R 25 W datasheet in Appendix 1
- BWT K98DA4C-30.00W-FS 30 W datasheet in Appendix 1

d.1.b.2. *Wavelength equal to or greater than 1,400 nm and less than 1,900 nm and*
d.1.b.2.a. *average or CW output power, exceeding 8 W;*
d.1.b.2.b. *Tier 3. average or CW output power, exceeding 2.5 W;*

There is at least one product available from a Chinese manufacturer that exceeds the current 2.5-W control level:

- HTOE FLMM-1450-9 8 W datasheet in Appendix 1

III. Comments on How to Make CCL More Clear and Positive

Because one of the goals of export-control reform is to "reflect internationally accepted standards," we propose that the following note be added to the introductory notes of 6A005:

> *6. Measurement of "laser" wavelength in 6A005 shall be consistent with ISO 13695; measurement of "laser" power, energy, and temporal characteristics shall be consistent with ISO 11554.*

Several paragraphs in 6A005 differentiate between "single transverse mode" and "multiple transverse mode," but neither term is defined, leading to ambiguity and confusion. For greater clarity, we propose that the following note be added to the introductory notes of 6A005:

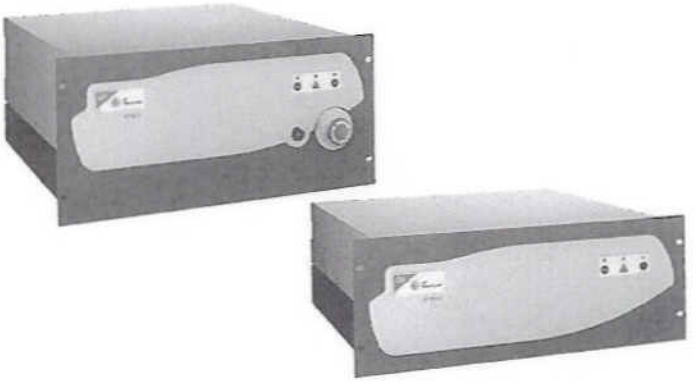
> *7. Any "laser" producing a beam whose measured M-square (M^2) value is less than 1.2 is defined as producing a "single transverse mode" output. Any laser producing a beam whose measured M-square value is equal to or greater than 1.2 is defined as producing a "multiple transverse mode" output. The measurement of M-square shall be consistent with ISO 11146.*

Again for the purpose of increased clarity, we propose that the following be added immediately after paragraph b.6.b.1.b.2.:

***Note 1**. Some "lasers" (e.g., Q-switched Nd:YAG "lasers") can be excited by a continuous source or by a pulsed source. The wording of paragraphs b.6.b.1.b above, and b.6.b.1.c. and b.6.b.1.d. below, is intended to place different controls on pulse-excited "lasers" (b.6.b.1.b.) and on continuously excited "lasers" (b.6.b.1.c. and b.6.b.1.d.).*

JK Fiber Lasers

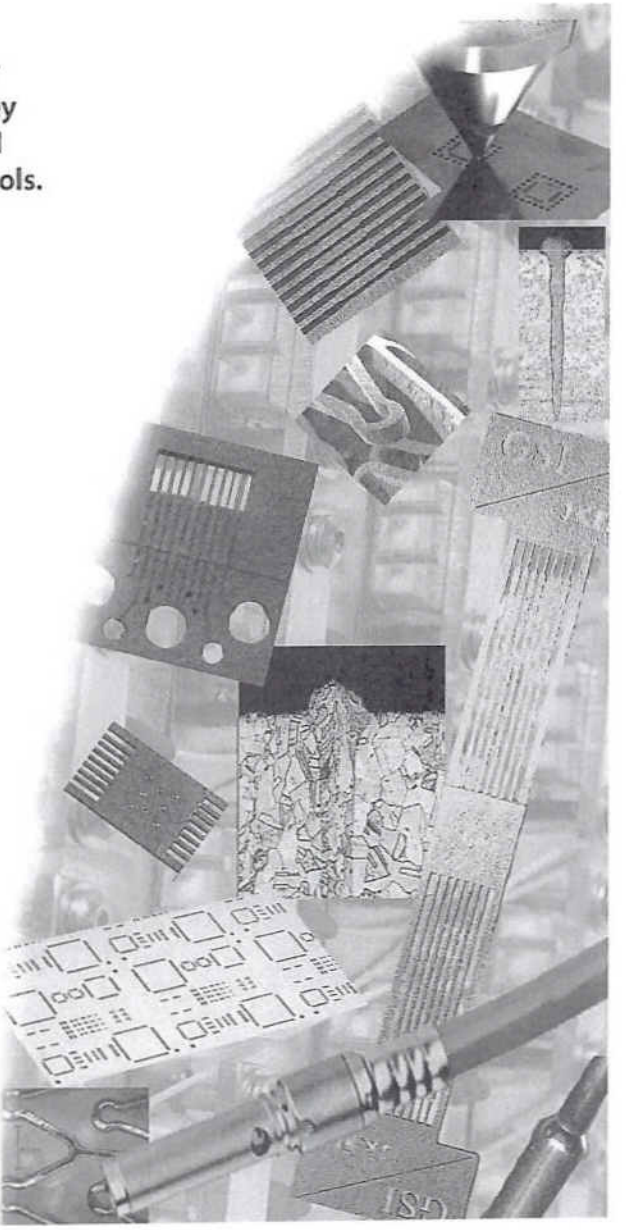
A range of ytterbium industrial fiber lasers for rack mounting



The JK Fiber Laser Range provides the ultimate laser solution for industrial applications. Offering absolute power and control, they combine ease of integration, a powerful user interface, patented processing technology and an integrated range of processing tools.

- ❑ 50W - 400W CW output powers
- ❑ TEM_{00} $M^2<1.1$, single mode fiber beam delivery
- ❑ Range of Cutting and Welding Heads
- ❑ FiberView™ software Graphical User Interface
- ❑ Patented Back reflection protection
- ❑ Easy integration and interfacing
- ❑ High reliability, zero maintenance system
- ❑ FiberPierce™ peak power enhancement option
- ❑ Fast modulation and Pulse Shaping
- ❑ Applications and sample support

GSI™ JK™ Fiber Lasers

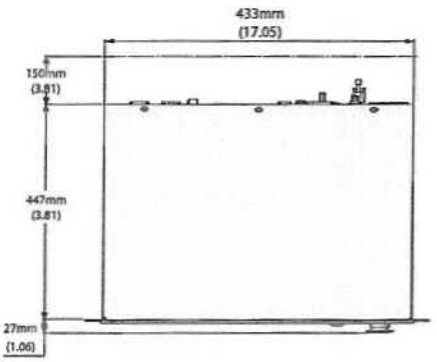


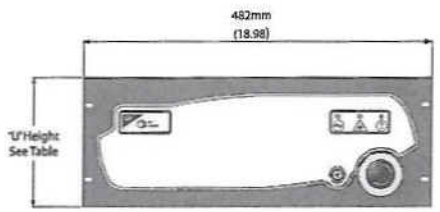
Fiber Lasers for Industrial Applications

In the JK range of Fiber Lasers, GSI Group offers the advantages of fiber lasers including single-mode beam quality, high efficiency, compactness and simplicity. Furthermore, drawing on the experience of our lamp-pumped JK laser range we can deliver these as a truly industrial package, with applications support, sample processing and a range of beam delivery options.

Performance Data					
Model	JK50FL	JK100FL	JK200FL	JK300FL	JK400FL
Average Output Power (W)	50	100	200	300	400
Operatiing Modes	CW, Modulated and Peak power enhancement		CW and Modulated		
Output power range	20 - 100%	10 - 100%			
Long term Output power stability	+/- 1.5% typical (+/- 3% specified)				
Wavelength (nm)	1080 +/- 10				
Linewidth (nm)	<2				
Polarisation	Un-Polarised				
Modulation Capability	Unlimited Pulse Shapes, Ramping, Process Cycle				
Min. Rise / Fall Time (µs)	5				
Max. Modulation Frequency (kHz)	50				
Max. Peak Power (W)	100	200	200	300	400
Fiber Optic Beam Delivery					
Ouput Fiber Type	Single Mode				
Beam Quality	$TEM_{00}M^2<1.1$				
General					
Electrical					
Electrical Supply (Hz)	100 - 264 VAC / 47 - 63				
Power consumption*(W)	250	400	800	1200	1600
Physical					
Height - Air cooled	6U	6U	6U	7U	-
Height - Water Cooled	4U	4U	4U	5U	5U
Environment / Cooling					
Ambient Temperature - Air Cooled (°C)	5 - 35		5 - 25		-
Max. Water Temperature / Pressure (°C/Bar)	25 / 6				
Max. Humidity	85% RH @ 20°C, 50% RH @ 40°C, non-condensing				
Interface					
Standard Interfaces	Serial - RS232, Parallel - Machine Interface				

*Water cooled. Add 30W for air cooled version





Dimensions in mm (inches)
1U = 44.5mm (1.75")

Product Code Selection Guide

Model		1 a, b, c		2 a, b, c
JK200FL	-	EVW		5RWE

1 a) Package :	O	Basic (indicators only)
	B	Extended (E-stop and Keyswitch)
	E	Local Manual Control
b) Options :	P	FiberPierce™ (only available for JK50FL and JK100FL)
	V	**Visible Pointing Diode**
	T	**Flat-Top Beam Profile**
c) Cooling :	A	Air
	W	Water
2 a) Fiber length :	2	2 meters
	5	5 meters (Standard)
	10	10 meters
b) Conduit type :	R	Rugged
	F	Flexible
	W	Window or Collimation lens focal length
c) O/P Optic :	25	25mm for 3.5mm 1/e² beam diameter
	35	35mm for 5mm diameter

Specifications are subject to change.

Please Consult Product Centre for complete details.

www.gsiglasers.com

GSI JK™ Fiber Lasers

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United Kingdom

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Single Mode Fiber Lasers

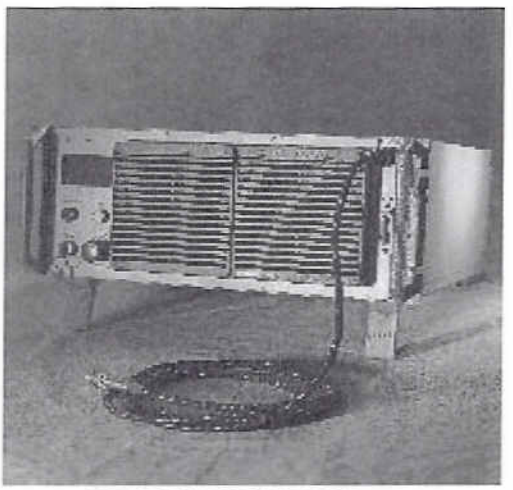
for Industrial and Scientific Applications

IPG PHOTONICS

The Power to Transform™

IPG's Single Mode Fiber Lasers Advantages

IPG's YLR-SM Series represents a break-through generation of diode pumped single mode CW Ytterbium fiber lasers of near infrared spectral range (~1070nm) with a unique combination of high power, ideal beam quality, fiber delivery, high wall-plug efficiency, compactness and reliability.



YLR-200-SM 200W CW Fiber Laser

These lasers possess a reliability that is unmatched by conventional solid state or gas laser. Selectivity of operating wavelengths, ultra-low amplitude noise, high stability and ultra-long pump diode lifetime completes an impressive list of advantages of this modern fiber laser system. The YLR-SM Series was developed to meet fast growing demand of industrial, R&D and medical markets for a compact, robust, turnkey and maintenance-free solution that can be easily integrated into an industrial manufacturing system, scientific experiment, OEM machine or an automated production line.

Main Features:

- ✓ **10W to 2kW Output Optical Power**
- ✓ **TEM_{00} (M^2<1.1) Beam Quality**
- ✓ **Over 25% Wall-Plug Efficiency**
- ✓ **Maintenance Free Operation**
- ✓ **Compact 'Plug & Play' Design**
- ✓ **Air or Water Cooled Versions**
- ✓ **Estimated Diode Lifetime > 100,000 hrs**
- ✓ **Single Mode Fiber Delivery**
- ✓ **CW or Modulated Operation**
- ✓ **Extended Warranty Program**

Practical and convenient front panel interface and RS232 or parallel and analog interfaces easily allow you to integrate this fiber laser to your setup. Each laser is provided with an integrated single-mode fiber delivery cable, of customer selected length, terminated by state-of-the-art output collimator or by industrial QBH-connector.

Users can customize the YLR-SM Series to meet their requirements by selecting output power, wavelength, polarization, delivery fiber length, cooling method and computer interface. All YLR Series laser systems are factory sealed so there is no need for alignment or maintenance. The laser system plugs into a standard power line, and can operate immediately. An another attractive features are no warm up time (laser could operate from "cold" start immediately) and ability to directly modulate laser up to 50kHz.

Typical Specifications

Optical Parameters

	Unit	YLR-50	YLR-100	YLR-200	YLR-500-SM	YLR-1000-SM
Nominal Output Power	W	50	100	200	500	1000*
Mode of Operation			C.W or directly modulated			
Beam Quality	M^2	<1.05	<1.05	<1.1	<1.1	<1.15
Linewidth	nm	<2	<3	<3	<4	<5
Polarization		random**	random**	random**	random**	random
Output Power Stability	%	+/-2	+/-2	+/-2	+/-2	+/-2

Electrical Parameters

	Unit	YLR-50	YLR-100	YLR-200	YLR-500-SM	YLR-1000-SM
Electrical Requirements	V AC	110-230	110-230	110-230	190-250	360-520
Typical Power Consumption	W	200	400	800	2000	4000
Standard Interfaces			Digital I/O, Analog			
Direct Modulation	kHz	0-50	0-50	0-50	0-5	0-5

General Parameters

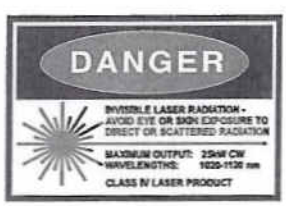
	Unit	YLR-50	YLR-100	YLR-200	YLR-500-SM	YLR-1000-SM
Cooling Method ***	V AC	air or water	air or water	air or water	water	water
Cooling Water Temperature Range	°C	20-30	20-30	20-30	20-30	20-30
Dimensions (W x H x D)	cm	3RU 19"	3RU 19"	4RU 19"	6RU 19"	60x80x80
Weight	kg	25	30	40	50	150

* Output power up to 2kW available on request with single mode (TEM_{00}) output. Please contact IPG Photonics with your requirements.

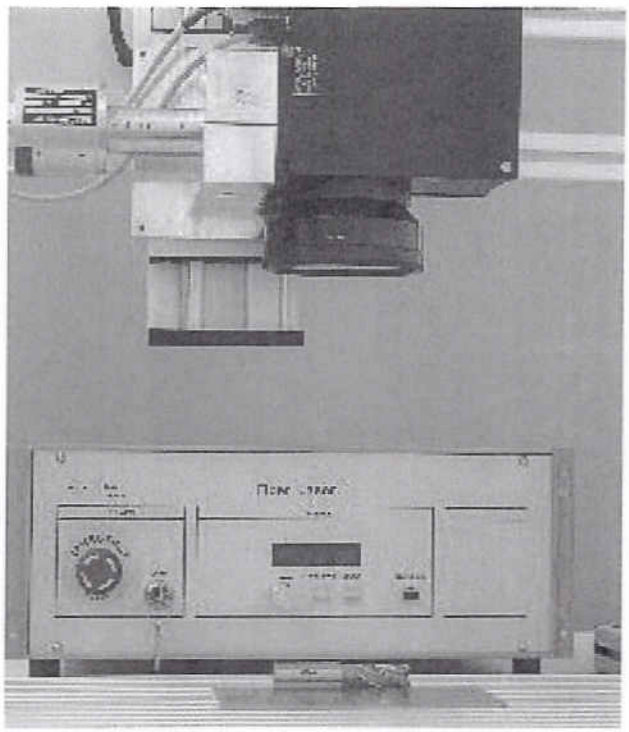
** Linear polarization is available on request for up to 500W output power.

*** Customer can select cooling method.

Legal notices: All product information is believed to be accurate and is 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. Some specific combinations of options may not be available. The user assumes all risks and liability whatsoever in connection with use of a product or its application. IPG, IPG Photonics and IPG Photonics logo are trademarks of IPG Photonics Corporation. Other trademarks are property of their respective holders. © IPG Photonics Corporation. All rights reserved.



IPG YLR Lasers Offer Versatility and Ease of Integration



YLR-200-SM laser integrated with a scanner in an engraving machine

Compact in size, user-friendly, highly reliable, and broadly versatile, IPG's diode-pumped fiber lasers bring revolutionary solutions to multiple applications. Depending on output optics used, spot sizes of less than 10 µm can be achieved by keeping focal lengths of more than 200 mm. This leads to large working areas for galvo scanning systems and user-friendly long working distances. Already 50-100 W output powers at 10-20 µm spot size is enough for fine cutting applications such as cutting of coronal stents or hole drilling.

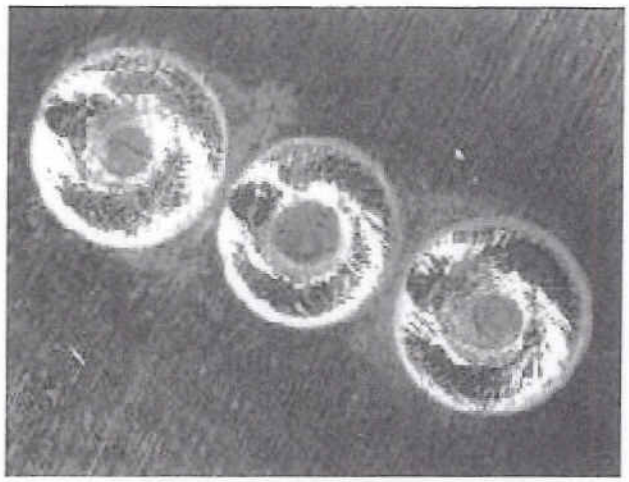
IPG single mode fiber lasers can be quickly integrated into a variety of different work stations including robots, cartesian co-ordinate systems and high speed scanners. These units can be provide with integrated collimators or plug and play connectors that plug into available standard beam delivery systems. In many cases the lasers can replace conventional YAG and gas lasers on existing work stations to allow the user to take advantage of the tremendous reliability and cost savings that this technology offers. For new systems, IPG can recommend an integrator from a long list of qualified system integrators familiar with our technology.

Due to small spot sizes of down to 10 µm, the heat affected zone stays small and fine contours are able to be cut. Precision spot and seam welding applications for all metals are done with either direct optics or galvo scanning heads.

Depending on needed spot diameters, working distances and material properties, IPG's single mode YLR-SM lasers cover all applications of precision spot and seam welding applications in fine mechanics, electronics and medical device industries.

YLR-1000-SM 1kW fiber laser integrated in a cutting cell

Flexibility for a Variety of Applications

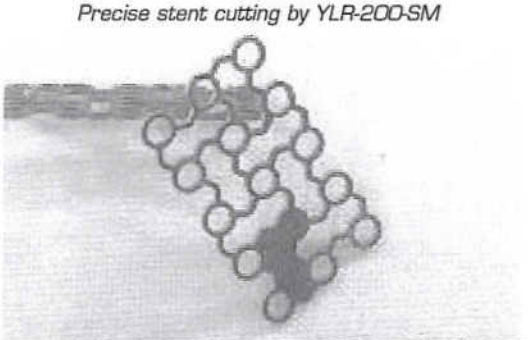


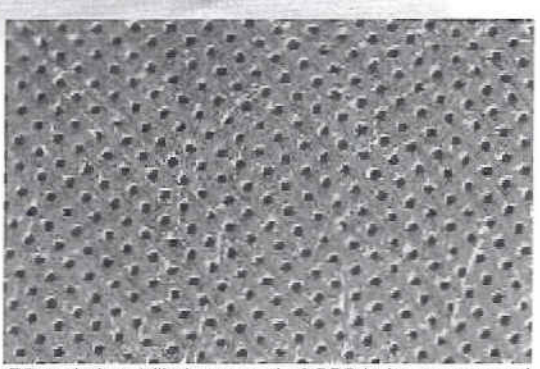
Copper contacts welding sample

Single mode fiber lasers have gained rapid acceptance on a large variety of welding applications including batteries, medical assemblies, fuel cells, wire welding, flexures for hard disc drives, and thicker assemblies such as transmission components where deep narrow welds are required. The optimization is very rapid as these lasers can operate in a continuous mode or a modulated mode, with no spot size change over the 10%-105% dynamic operating range. The low divergence allows for long working distances that makes focus control very forgiving and repeatable. On single spot welds, the pulse duration can be set from a few microseconds to continuous operation and operate up to 50 kHertz. The control of both spot size and heat control cannot be matched by any other industrial material processing laser.

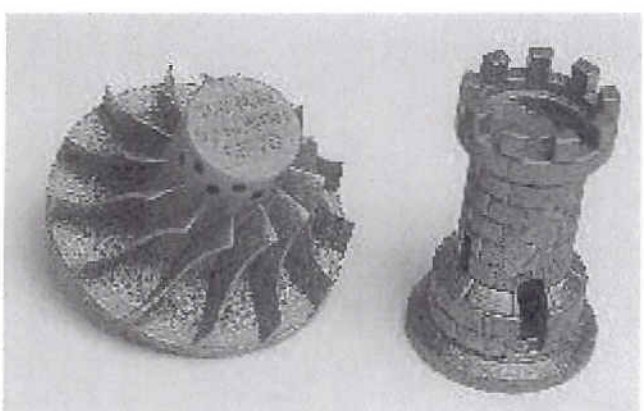
On cutting applications, single mode fiber lasers are utilized for precise cutting of very delicate structures such as stents, silicon wafers, surgical knifes as well as thicker materials at the higher power levels. Because of the high fluence, only possible with single mode fiber lasers, combined with long standoff distance fiber lasers are achieving speeds and heat profiles never before achieved with laser processing. When operating in the modulated mode, these lasers are ideal for producing small holes at a rapid rate. For example, 50 micron holes in .012" Titanium at a rate of 300 holes per second with a 600 Watt single mode fiber laser. In drilling holes required by the printing and engraving industries, single mode fiber lasers have become the dominant technology achieving precise holes at rates above 100 kHertz.

Precise stent cutting by YLR-200-SM





50um holes drilled at speed of 300 holes per second



3D stereo-lithography samples

Fiber lasers are also used extensively by OEMs offering sintering machines to produce three-dimensional parts from metal powders. On this application the consistent CW power that can be focused to a very precise spot size (in case of single mode laser down to ~10 micron) is ideal for manufacturing very precise parts while minimizing the powder consumption. IPG`s YLR series has been widely deployed for this unique application over last few years.

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The Power to Transform™

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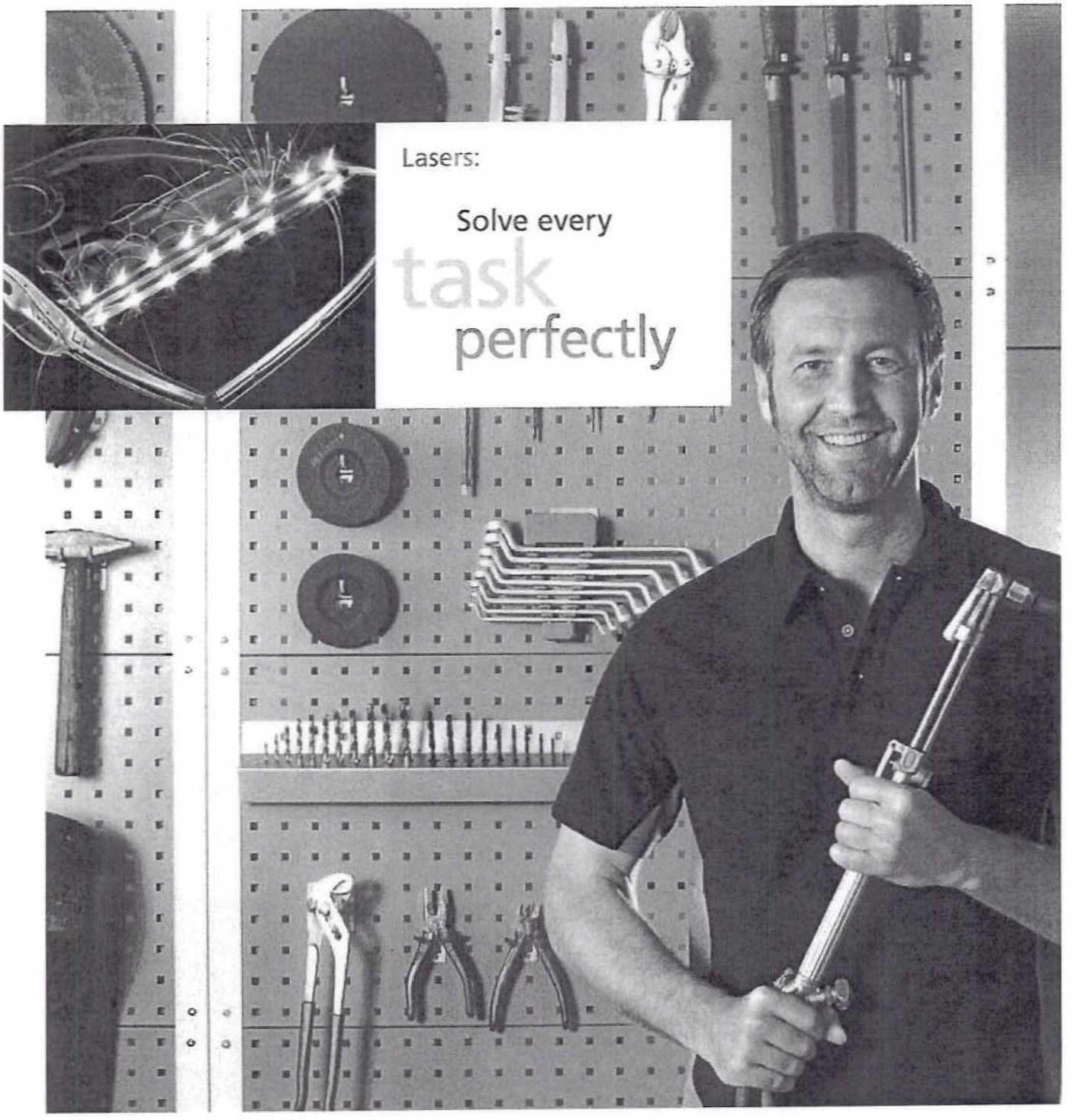

TRUMPF

Machine Tools/Power Tools
Laser Technology/Electronics
Medical Technology

State-of-the-art laser technology.

The TRUMPF Group ranks among the world's leading manufacturers of laser and production technology. Our innovations set the standard in the development of laser technology, machine tools and power tools for sheet metal fabrication, and medical technology. Our customers have relied on the superior quality of our technical solutions since 1923. Today's TRUMPF Laser GmbH + Co. KG began in 1971 in Schramberg, Germany, with the development of a solid-state laser. This was followed in 1985 by TRUMPF's first CO_2 laser with a power of 1 kW. Today, we are the technology and world market leader in industrial lasers and laser systems. We continually develop new processes and increasingly powerful laser sources and systems, and consistently apply these developments to innovations targeting our cus-

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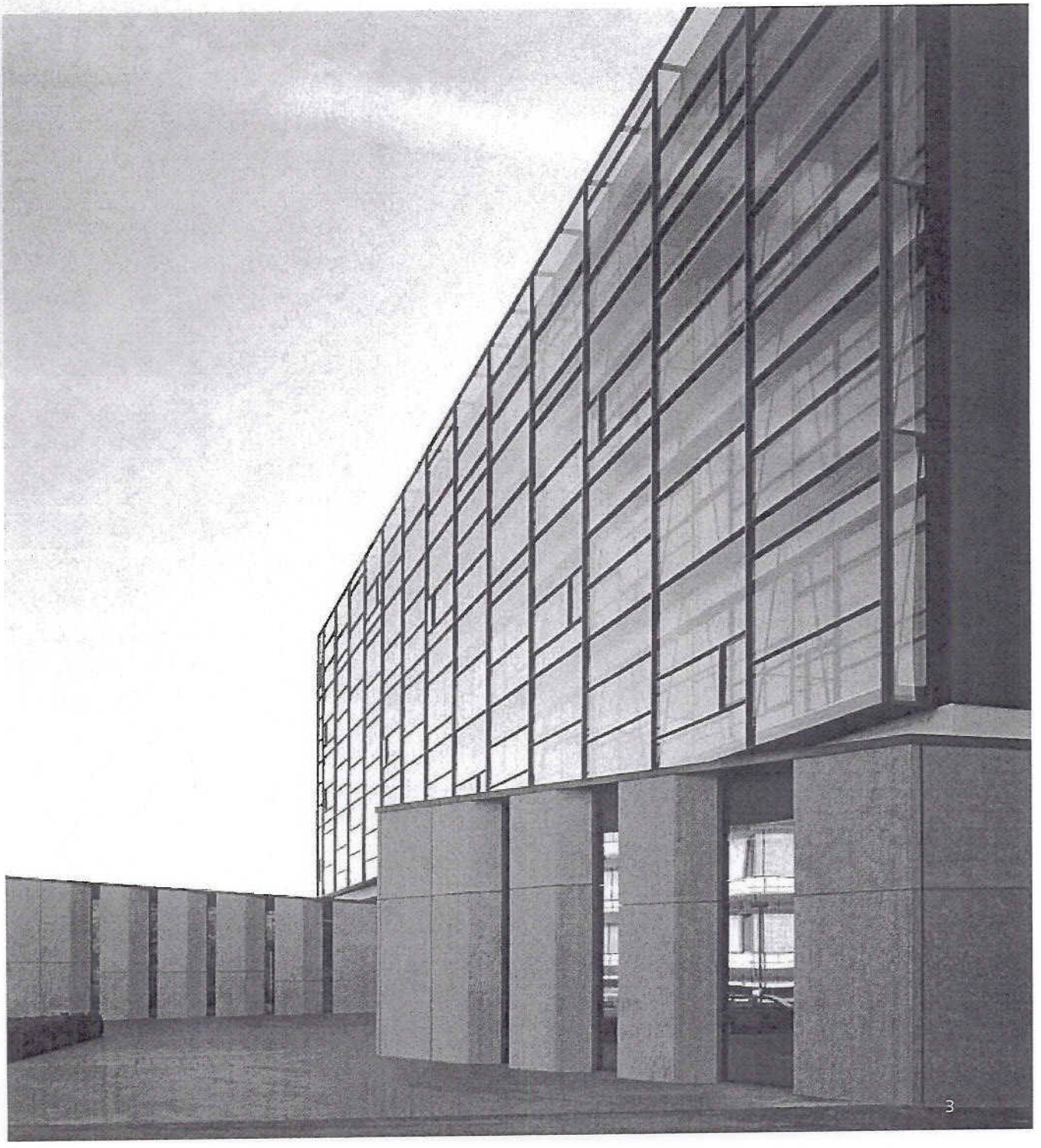
tomers' requirements. You can count on us for all of your projects. Our comprehensive services include feasibility studies performed in our application laboratories, laser processing and design consultation, and formulating a start-to-finish concept for your plant. Even if you just want information about a new focusing optics – we speak your language.



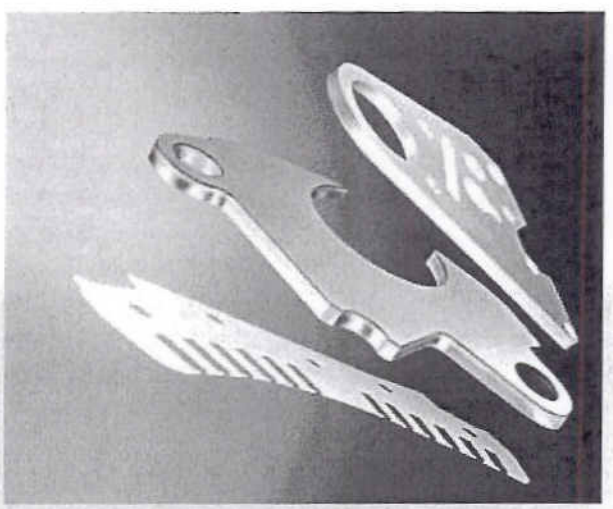
The all-rounder.

The laser is the most universal tool available for cutting, welding, marking, drilling, coating, hardening, and performing structural processing work on surfaces. A laser operates without contact, and with no wear and tear. Therefore, the heat-affected zone and component distortion produced by lasers is extraordinarily small. Refinishing work is usually unnecessary.

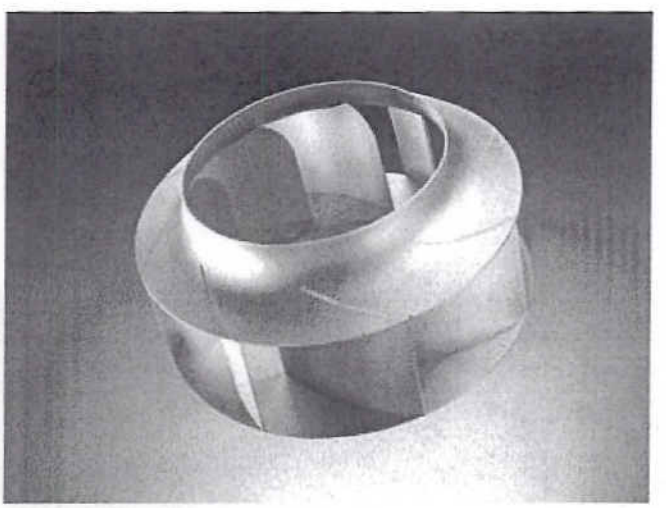
TRUMPF lasers have the flexibility to be used in a variety of applications, allowing for short processing times with optimum processing quality. Precision and a high level of automation go hand in hand when using amplified light.

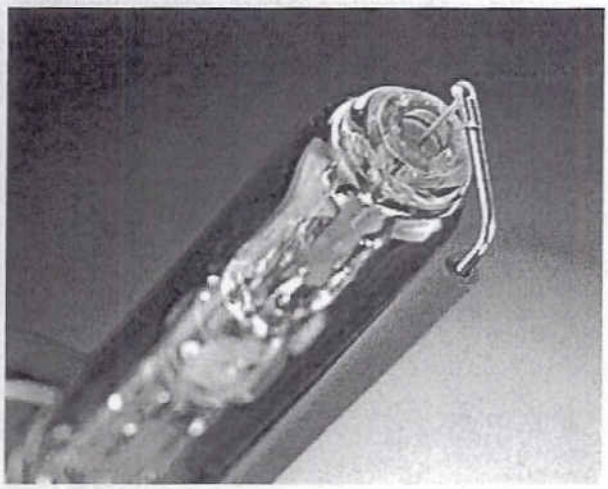
TRUMPF lasers have proven themselves ten thousand times under today's toughest manufacturing conditions and in a wide range of industries, including automotive manufacturing, automotive supply, aerospace, electronic entertainment media, precision mechanics, and medical technology. Lasers are used for processing a wide variety of products, including car bodies, transmission, exhaust and control system components, sensors, tubes and profiles, electronic components, and solar cells. Our lasers repair and coat tools and molds, and can mark anything from pacemakers to apples.

Laser cutting, from thin to thick.

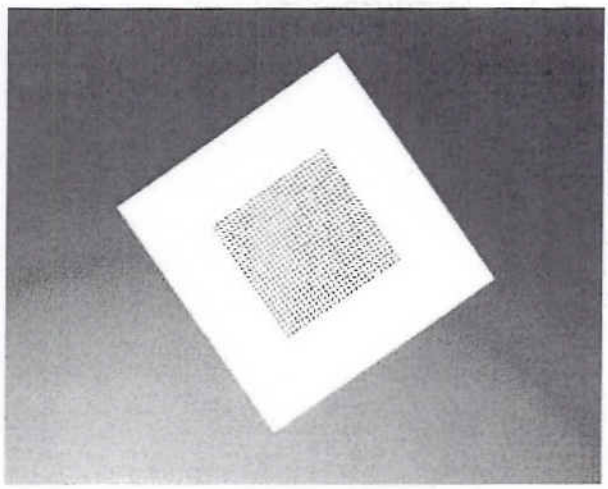


Narrow, high-strength laser weld seams.





Filigree spot welds.



Creating the smallest of holes with the highest precision.

Everything from a single source.

When you use TRUMPF lasers, you benefit from our decades of practical experience in all laser-related fields. With TRUMPF, after all, you get it all from a single source – everything from laser units, beam guidance components, and focusing optics, to software and complete systems. Our components can also be adapted to every job and easily integrated into your plant setup.

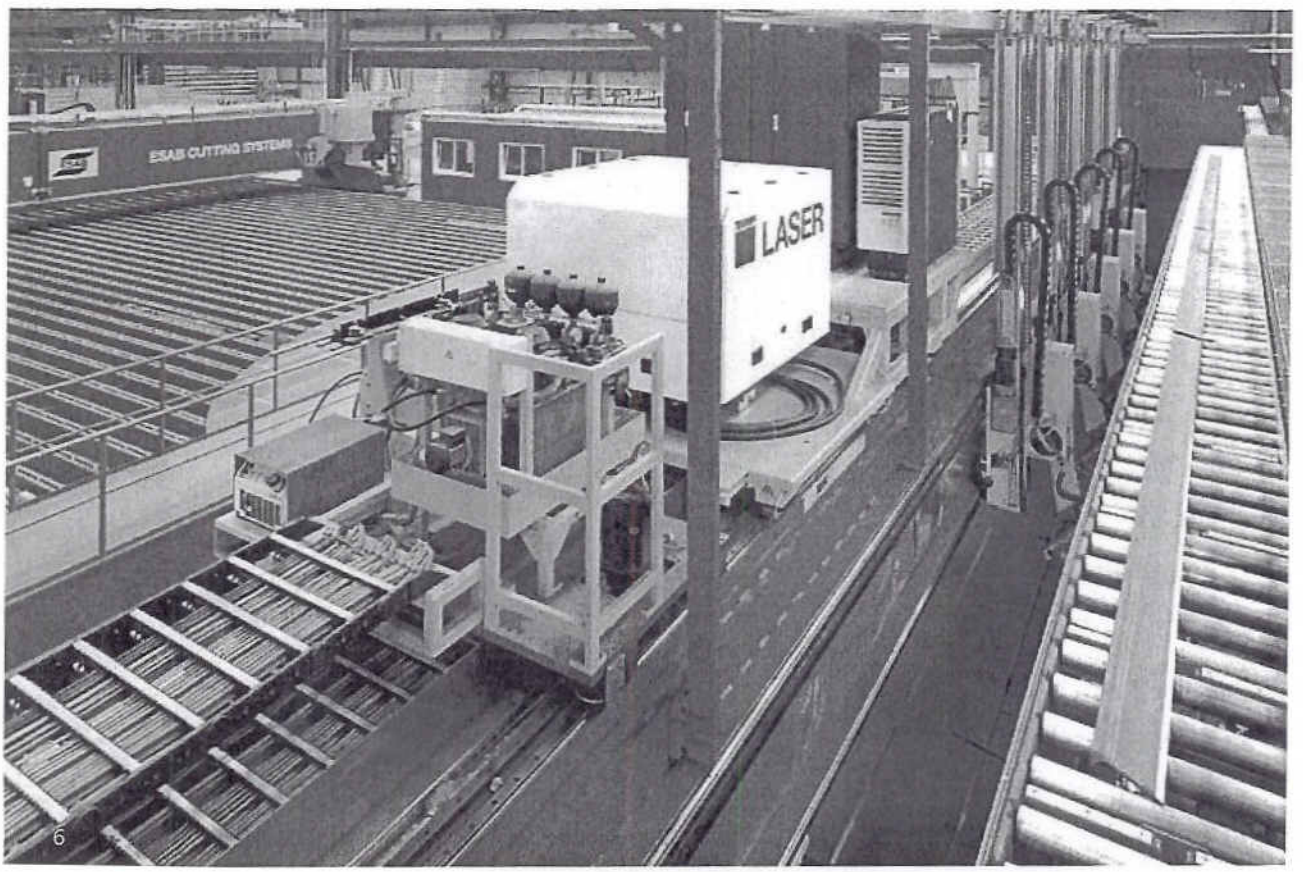
Service right from the start.

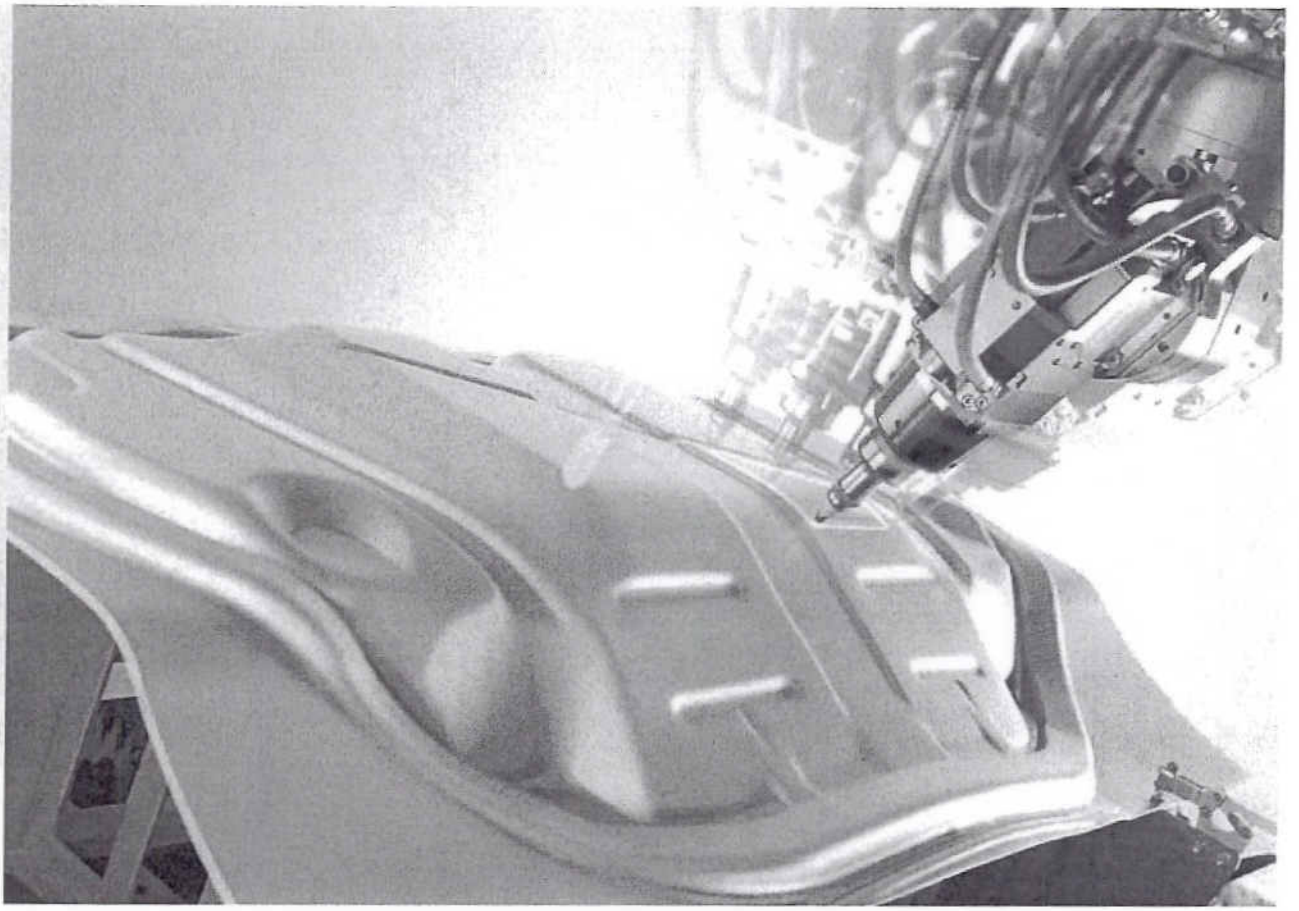
Our service begins even before you decide to buy a laser or laser system. We maintain application laboratories worldwide, where we can determine the feasibility of your desired application and show you what laser technology can do for your production processes. It goes without saying that – even after you purchase a TRUMPF laser – our application specialists will continue to assist you with application technology, incorporating lasers into component design and optimizing your production sequences.

TRUMPF CO_2 lasers:

Efficient and economical.

CO_2 lasers have been used for decades as the standard tool for processing an enormous variety of materials efficiently and economically. Worldwide, over 16,000 of our beam sources are used day in and day out, providing reliable service for cutting, welding, or surface treatment of two and three-dimensional workpieces.





Easy integration.

Their compact, sturdy design and open interface architecture make it easy to integrate TRUMPF CO_2 lasers into production systems. They can even be used on moving machine assemblies. Our lasers deliver top-notch quality and a high level of productivity.

Versatility.

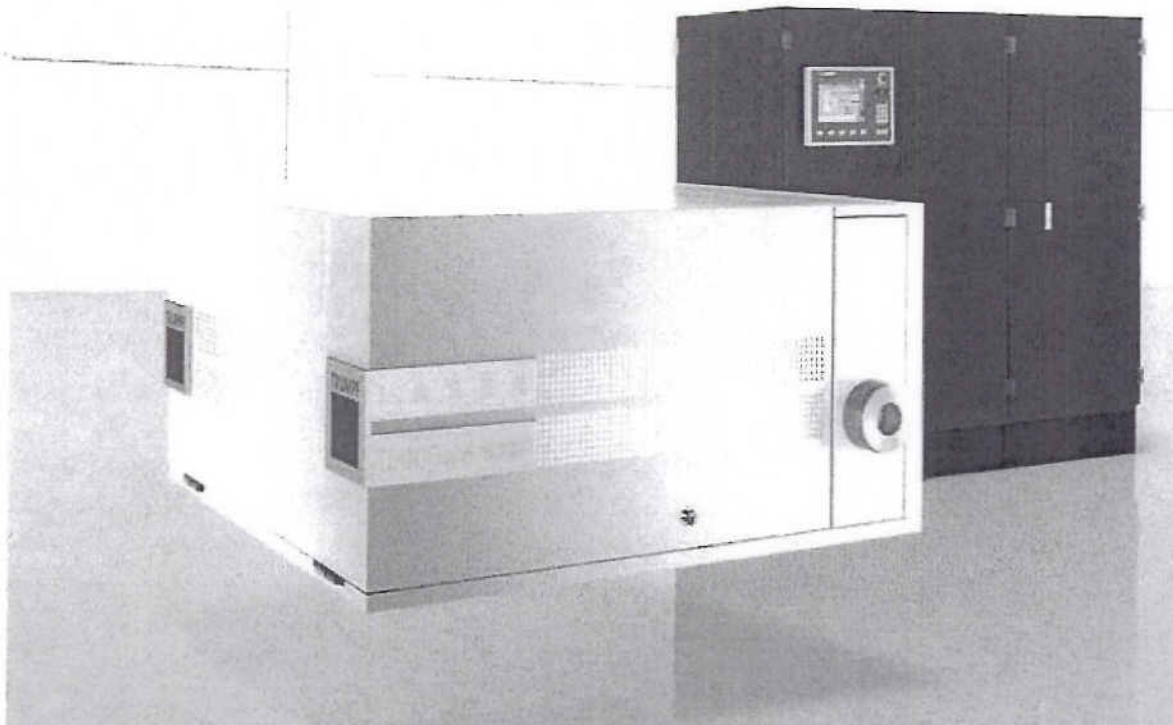
The TRUMPF portfolio consists of TruFlow fast axial-flow lasers and TruCoax diffusion-cooled lasers. Their broad range of output options and outstanding beam characteristics make it easier to optimize the beam source with respect to your production process.

Lasers in the lower output range provide an economical means of cutting thin sheet metal and non-metal materials such as wood, paper, or plastics, and are also suitable for melting glass or perforating ceramic substrates. CO_2 lasers with output greater than 2 kW may be used to cut 2-D or 3-D sheet metal components and for welding tubes, profiles, and components of transmissions or exhaust systems. Lasers in this performance class are also the preferred choice for applying or melting down anti-abrasion layers.

TruFlow lasers in the highest output range, from 12 to 20 kW, may be used for reliable welding of thick sheet metal in applications such as shipbuilding, construction machinery, or the production of transmission components for commercial vehicles.

TruFlow:

One series, many applications.



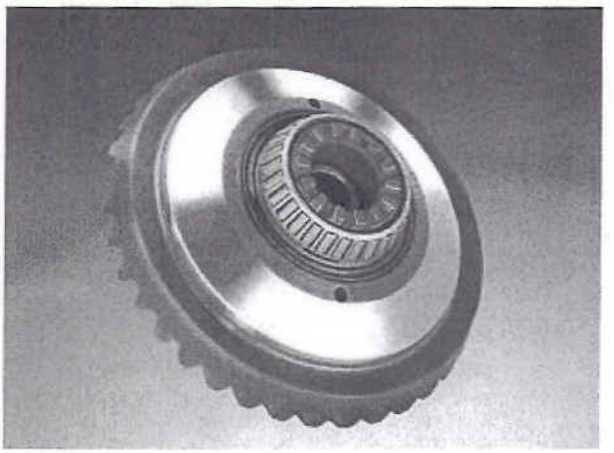
	TruFlow 700	TruFlow 1200	TruFlow 1500	TruFlow 2000	TruFlow 2700	TruFlow 3200	TruFlow 3600	TruFlow 4000
Laser power	700 W	1,200 W	1,500 W	2,000 W	2,700 W	3,200 W	3,600 W	4,000 W
Beam quality K (M^2)	0.6 (1.67)[1]	0.6 (1.67)[1]	0.6 (1.67)[1]	0.6 (1.67)[1]	0.6 (1.67)[1]	0.6 (1.67)[1]	0.6 (1.67)[1]	0.5 (2.0)[1]
Nominal power consumption[2]	23 kW	23 kW	23 kW	27 kW	34 kW	36 kW	42 kW	44 kW
Dimensions beam source								
Length	1,185 mm	1,185 mm	1,185 mm	1,185 mm	1,185 mm	1,185 mm	1,185 mm	1,185 mm
Width	1,150 mm	1,150 mm	1,150 mm	1,150 mm	1,150 mm	1,150 mm	1,150 mm	1,150 mm
Height	650 mm	650 mm	650 mm	650 mm	650 mm	650 mm	650 mm	650 mm

	TruFlow 5000	TruFlow 6000	TruFlow 7000	TruFlow 8000	TruFlow 12000	TruFlow 15000	TruFlow 20000
Laser power	5,000 W	6,000 W	7,000 W	8,000 W	12,000 W	15,000 W	20,000 W
Beam quality K (M^2)	0.55 (1.82)[1]	0.55 (1.82)	0.55 (1.82)[1]	0.52 (1.9)	0.26 (3.8)	0.24 (4.2)	0.22 (4.5)
Nominal power consumption[2]	56 kW	68 kW	80 kW	105 kW	120 kW	155 kW	200 kW
Dimensions beam source							
Length	1,185 mm	1,185 mm	1,185 mm	1,185 mm	1,665 mm	1,665 mm	1,665 mm
Width	1,150 mm	1,150 mm	1,150 mm	1,150 mm	1,524 mm	1,524 mm	1,524 mm
Height	650 mm	650 mm	650 mm	650 mm	1,100 mm	1,100 mm	1,100 mm

Valid for all laser types above:

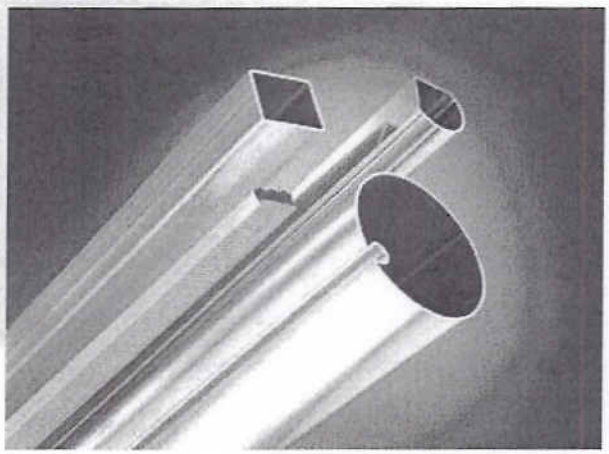
Wavelength	10.6 µm (further more on demand)
Output stability, according to the nominal power:	± 2 %

[1] The HQ lasers have a beam quality of K = 0.9 resp. M^2 = 1.1. Their laser power is approx. 10 % lower than the stated values.
[2] Laser without cooling system.

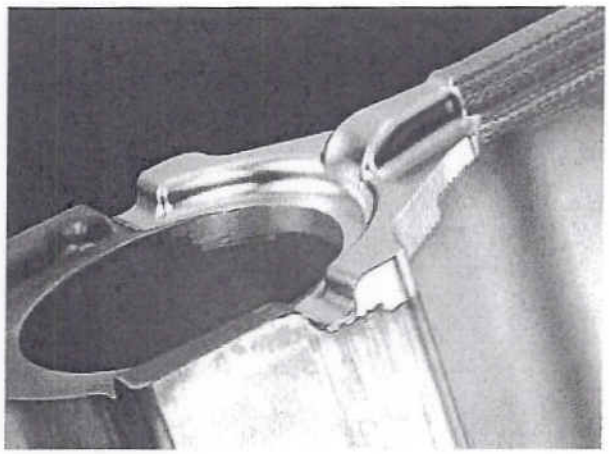


Laser welded transmission component.

TruFlow Series lasers offer you the highest level of availability and productivity – qualities that remain reliable even under the toughest production conditions. Output is available between 700 and 20,000 W, a range covering an immense array of applications. TruFlow lasers generate smooth cutting edges at high advance speeds and narrow cutting kerfs. They can also be used to create narrow welded seams with a small heat-affected zone, thereby maintaining a very low thermal load on the component.



Welding and cutting of tubes and profiles.



Powder coating of a die-forging tool.

Universal and specialized.

The modular construction of the entire series lets you tailor your TruFlow laser specifically to your application. Its wide range of output options allows you to select the beam parameters required for a given application. In addition to its standard lasers for cutting and welding, TRUMPF also offers solutions tailored to specific tasks within an application, such as lasers with especially high focusability, or beam sources that can be optimized for specific surface applications.

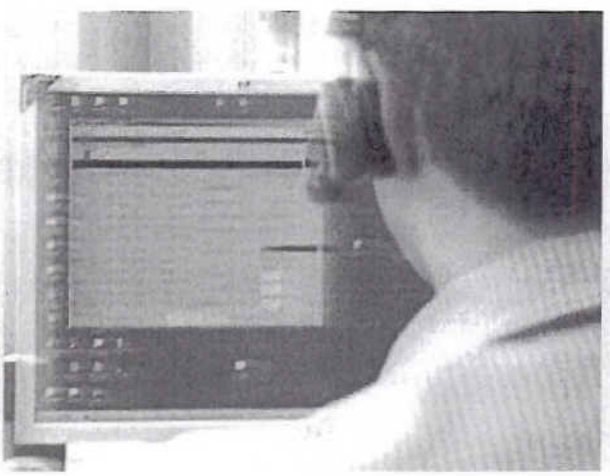
Compact, reliable, robust.

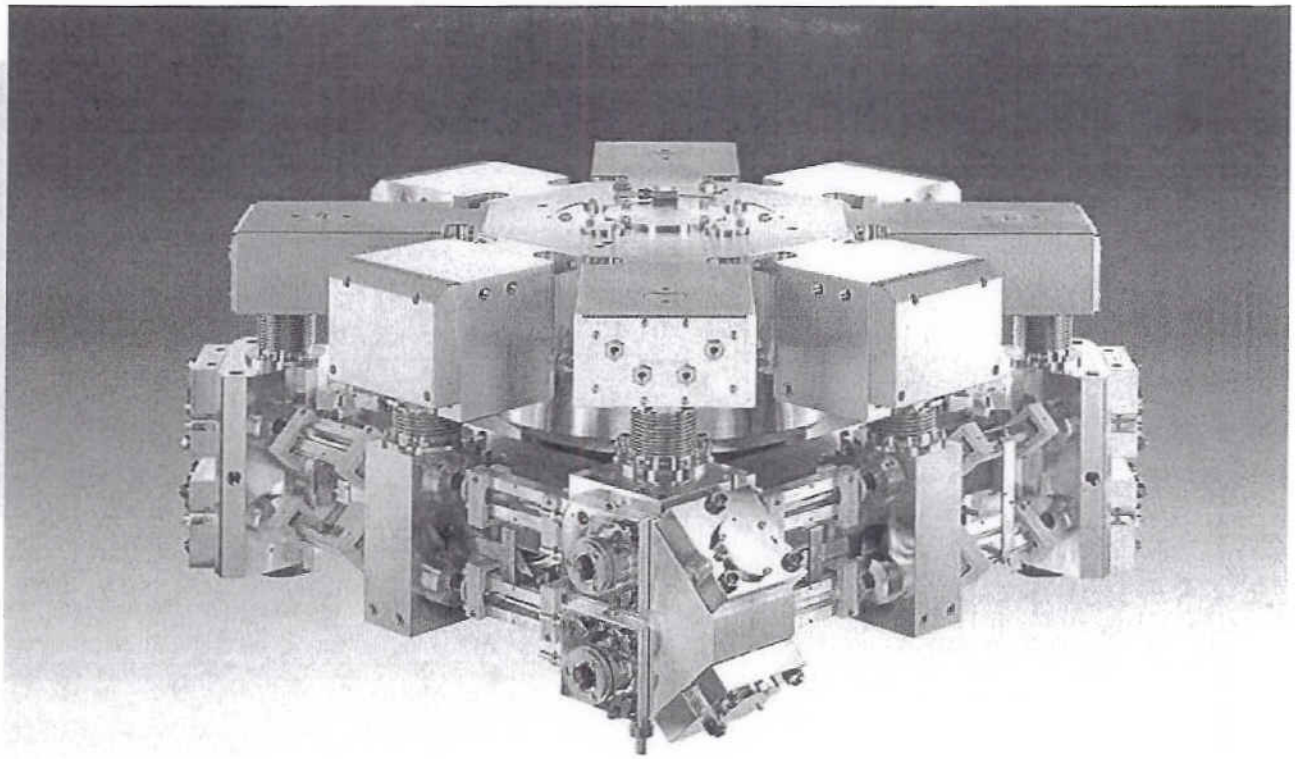
The compact, square design of the TruFlow laser resonator maximizes resonator length, allowing you to optimize beam characteristics, while minimizing overall dimensions. All major resonator components are water-cooled and offer a high level of thermo-dynamic stability, ensuring that TruFlow lasers are up to the challenge of the tough conditions of day-to-day industrial operations. TruFlow lasers are extraordinarily reliable, even on moving machine assemblies.

Efficient.

TruFlow lasers utilize only capacitive high-frequency excitation. It is the cleanest and most reliable form of laser excitation, providing high efficiency, constant beam parameters, and excellent laser output control.

Since it is magnetically suspended, the turbo radial blower is not subject to wear and tear, and is virtually maintenance-free. By continuously recirculating the laser gas, the blower provides high efficiency cooling and a high level of overall laser value.





Readily mixed.

Instead of using individual gas bottles, you can also use a premix gas bottle.

Easy operation.

All TruFlow lasers are run from the same control unit, and can be operated using an intuitive user interface. For integration into a higher-level production system control, the laser control unit is available with Profibus interface, or with analog interfaces for laser power and pulse frequency. For the ease of operation, the control reminds you of any maintenance interval that might come up.

TruCoax:

High performance in a little package.

	TruCoax 1000	TruCoax 2000
Laser power	1,000 W	2,000 W
Beam quality K (M^2)	0.9 (1.1)	0.9 (1.1)
Nominal power consumption[1]	20 kW	33 kW
Dimensions beam source		
Length	1,300 mm	1,840 mm
Width	430 mm	500 mm
Height	320 mm	540 mm

Valid for all laser types above:

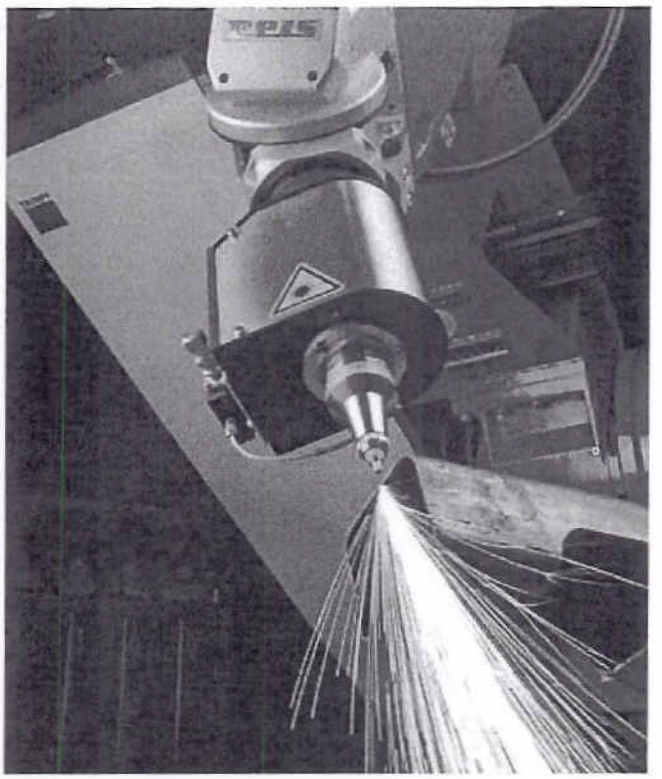
Wavelength	10.6 µm
Output stability, according to the nominal power	± 2 %

[1] Laser without cooling system.

Our TruCoax CO_2 laser is diffusion-cooled and provides a high level of beam quality at a laser power of up to 2,000 W.

TruCoax lasers are so compact that they can easily fit on the frame of a machine, and can even be combined with robotic systems. Part of what makes this possible is the design of the resonator. Its walls release the heat that is generated, and two coaxial, nested metal tubes act as high-frequency electrodes and as cooling elements.

Yet another advantage of the TruCoax laser is that the gas which is premixed in a small bottle is stored in the resonator. Plus, the TruCoax uses so little gas that you only need to replace the bottle every 1.5 to 2 years. It's hard to imagine how laser processing could be more user-friendly, or involve less maintenance.



TRUMPF solid-state lasers:

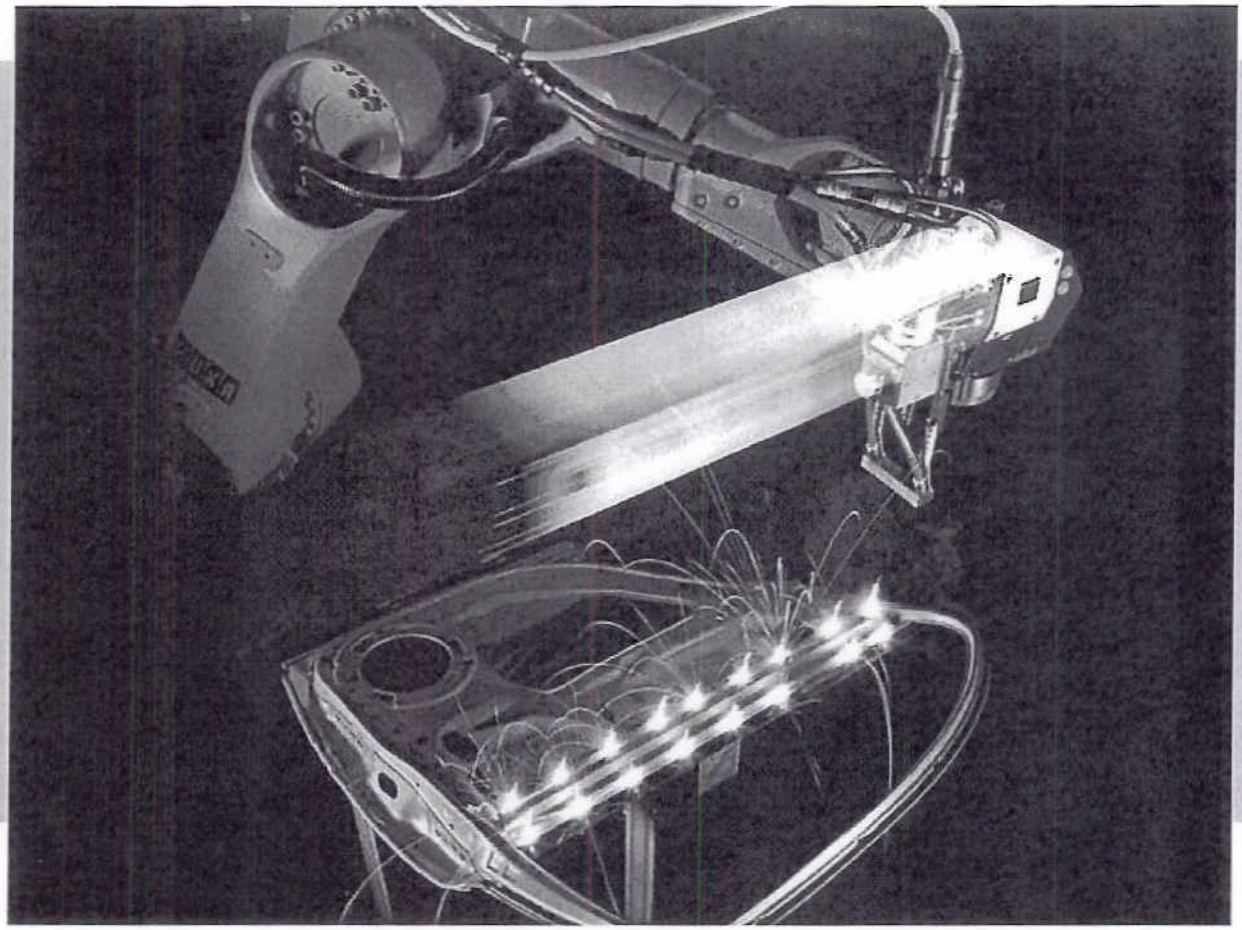
Versatility through diversity.

The power of TRUMPF solid-state lasers ranges from 20 to 16,000 W. Depending on the model, our solid-state lasers function according to either continuous wave or pulse operation. For pulse operation, the duration of the pulse can be in milliseconds, microseconds, nanoseconds, or even picoseconds, making these models suitable for an enormous variety of applications.

For welding or cutting, in the automotive industry, for aerospace applications, or even in heavy manufacturing: TruDisk lasers are the right choice for high-quality processing of metals and high laser power with extremely good beam quality.

The primary application for TruPulse lasers is spot and seam welding. "Cold" welding with TruPulse lasers is especially practical for components that tolerate only very low heat input and distortion. Materials with high melting points can be welded as easily as those with higher thermal conductivity. TruPulse lasers can also be used for cutting extremely fine contours in both metals and non-metals alike.

Our TruMicro lasers are suitable any time you need a controlled, highly precise, and reproducible means of removing material with a laser. For remote cutting, structuring, and drilling metals, semiconductors, and ceramics, our diode-pumped TruMicro lasers are specifically developed to meet the needs of microproduction technology.



Flexible.

The major advantage of solid-state laser technology is that the laser beam can be coupled with fiber-optic cables. Flexible laser light cables conduct the beam from its source to the processing site. Integrating lasers into production facilities or robotic equipment also showcases the advantages of laser light cable technology.

Intelligent design.

Our solid-state lasers give you fast, dynamic control, allowing laser power to be digitally controlled in real time, to achieve reproducible results from the very first second. All of the interfaces typically needed for communicating with external control units are at your disposal.

Intuitive.

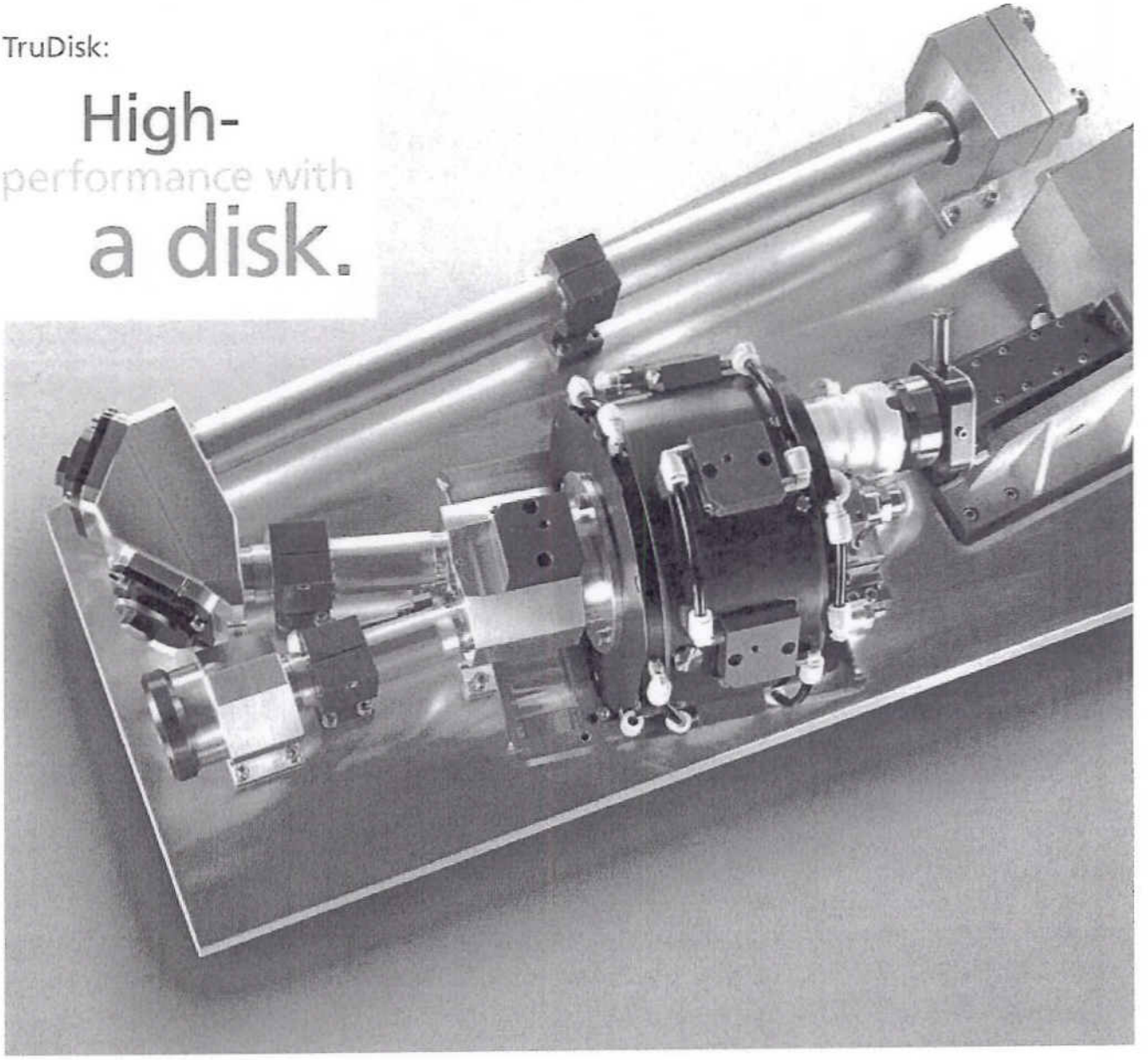
A touch screen and turn-push button are used to operate lasers through a user interface that is clearly structured and self-explanatory. The convenient operating panel can be separated from the laser, so that you can take it directly to the processing site and control all laser functions from there. Operating software allows you to store up to 200 programs, edit and scale pulse shapes, and use a single command to initiate ramping.

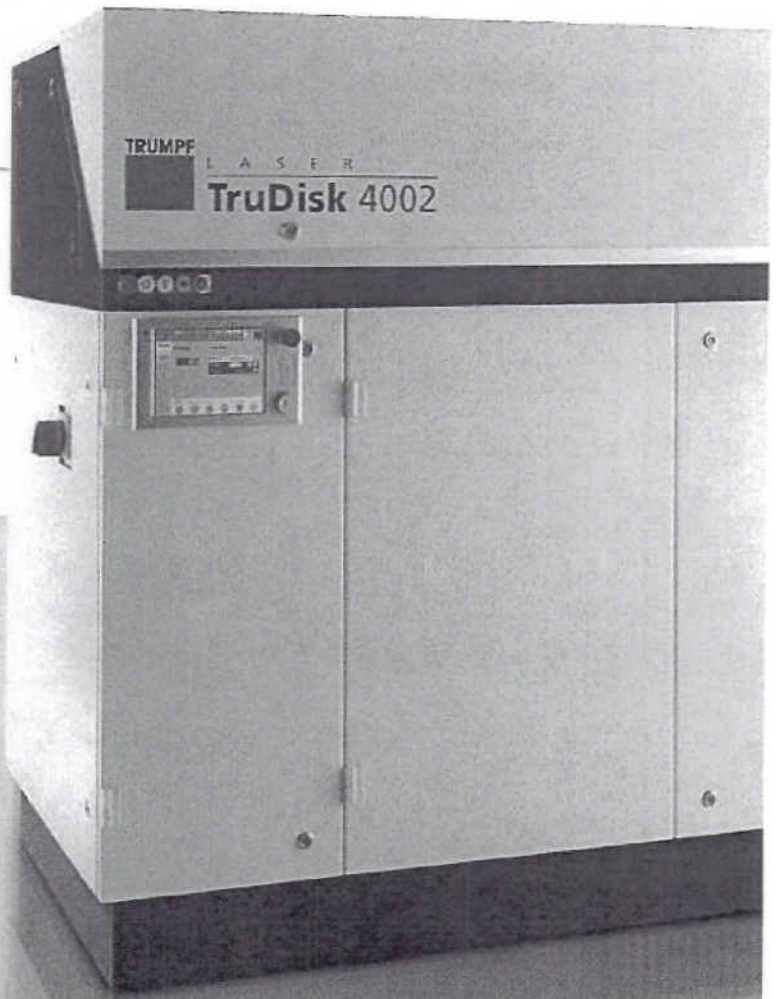
Secure data transmission.

Thanks to its Telepresence Portal, TRUMPF offers you unique solid-state laser services throughout the world, with over hundreds of continuously measured values available through secure remote access. As a result, our service experts can quickly troubleshoot and assess any error, often eliminating the problem immediately.

TruDisk:

High-performance with a disk.

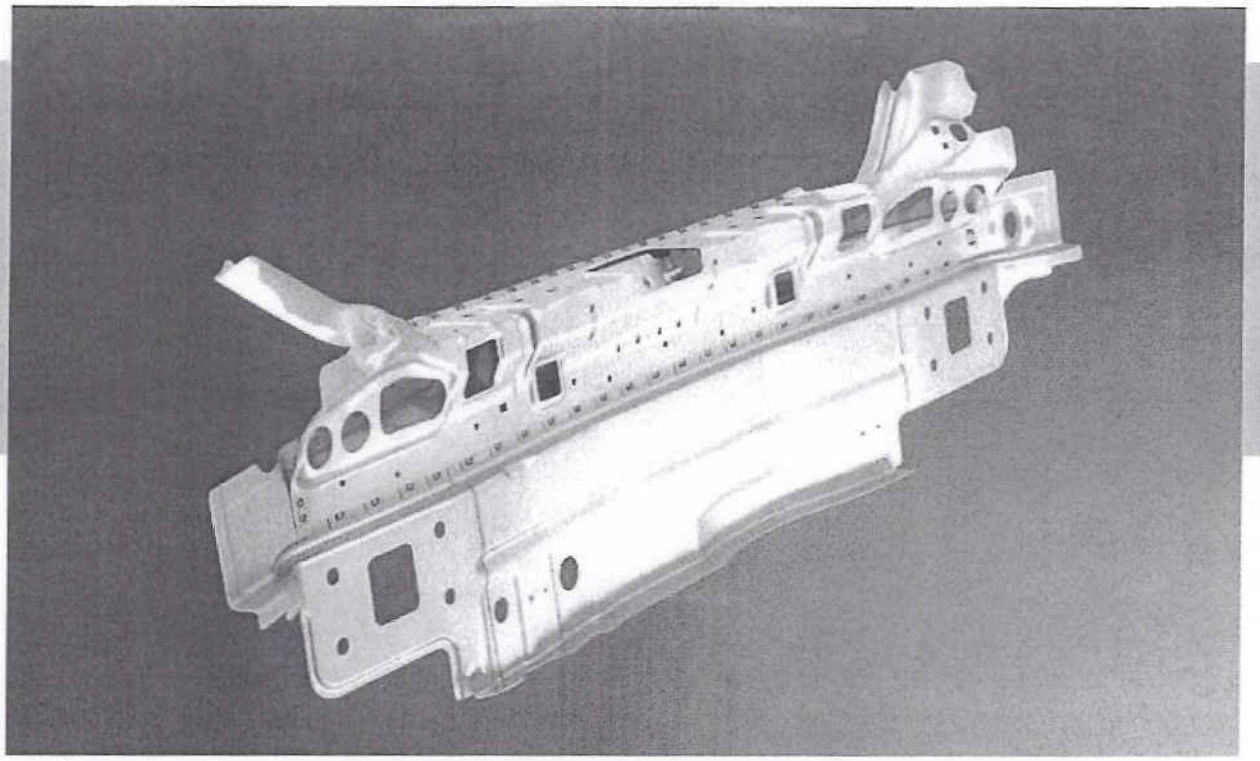




	TruDisk 1000	TruDisk 2002	TruDisk 2602	TruDisk 3302	TruDisk 4002	TruDisk 5302
Laser device						
Laser power	1,000 W	2,000 W[1]	2,600 W[1]	3,300 W[1]	4,000 W	5,300 W[2]
Beam quality[4]	2 mm · mrad	8 mm · mrad	8 mm · mrad	8 mm · mrad	8 mm · mrad	8 mm · mrad
Min.ø laser light cable	50 µm	200 µm	200 µm	200 µm	200 µm	200 µm
Consumption						
Nominal power consumption	5 kW	10 kW	13 kW	16 kW	19 kW	26 kW
Cooling water temperature range	5 – 20 °C	5 – 20 °C	5 – 20 °C	5 – 20 °C	5 – 20 °C	5 – 20 °C
Dimensions						
Width	1,460 mm	1,600 mm	1,600 mm	1,600 mm	1,600 mm	1,990 mm
Height	1,350 mm	1,550 mm	1,550 mm	1,550 mm	1,550 mm	1,550 mm
Depth	730 mm	950 mm	950 mm	950 mm	950 mm	1,200 mm

[1] optionally upgradable on up to 4,000 W
[2] optionally upgradable on up to 8,000 W
[3] optionally upgradable on 12,000 W
[4] optional beam quality of 4 mm · mrad at laser powers from 2,000 W to 6,000 W, from 12,000 W optional beam quality of 8 mm · mrad possible.

	TruDisk 6602	TruDisk 8002	TruDisk 10002	TruDisk 12003	TruDisk 16003
Laser device					
Laser power	6,600 W[2]	8,000 W	10,000 W[3]	12,000 W	16,000 W
Beam quality[4]	8 mm · mrad	8 mm · mrad	8 mm · mrad	12 mm · mrad	12 mm · mrad
Min.ø laser light cable	200 µm	200 µm	200 µm	300 µm	300 µm
Consumption					
Nominal power consumption	33 kW	39 kW	49 kW	60 kW	80 kW
Cooling water temperature range	5 – 20 °C	5 – 20 °C	5 – 20 °C	5 – 20 °C	5 – 20 °C
Dimensions					
Width	1,990 mm	1,990 mm	2,800 mm	2,800 mm	2,800 mm
Height	1,550 mm	1,550 mm	1,600 mm	1,600 mm	1,600 mm
Depth	1,200 mm	1,200 mm	1,400 mm	1,400 mm	1,400 mm



Scanner welded car body part.

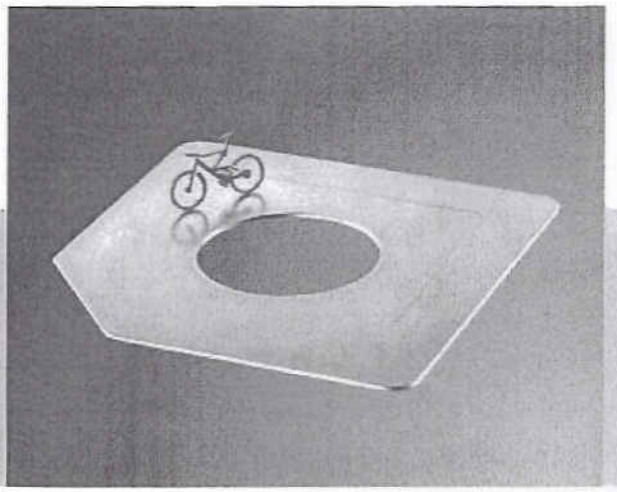
Powerful and efficient.

The new TruDisk generation of disk lasers is even more powerful, cost-effective and compact than before, and offers you numerous advantages for the efficient part production. Laser powers range from one to 16 kW and, because of their disk geometry, TruDisk lasers have best beam quality in the high multi-kilowatt range. With most of the units you can choose between two beam qualities, so you always have the laser best suited to your individual production task. The excitation of the new TruDisk lasers is provided by extremely long-lasting laser diodes made by TRUMPF. This enables a high degree of laser efficiency and minimizes operating costs.

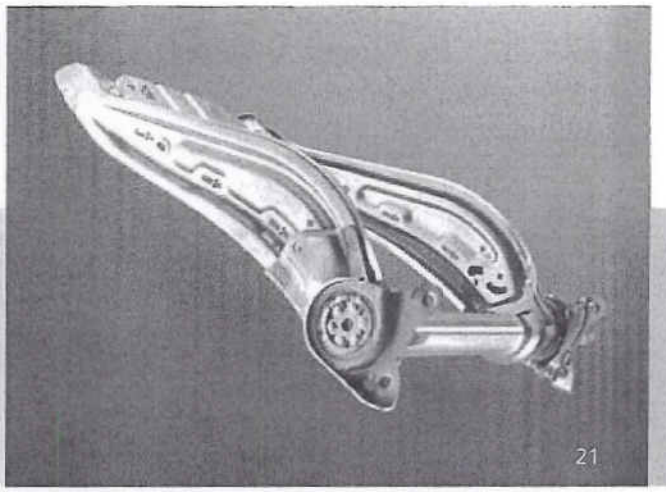
Modular and compact.

Beam generation, beam guidance, power supply, cooling and control of the TruDisk lasers are all modular in design and are located inside a compact housing. Everything is thought through and coordinated down to the smallest detail – for maximum availability and easy maintenance.

Precision cutting with TruDisk.



Laser welded seat structure.

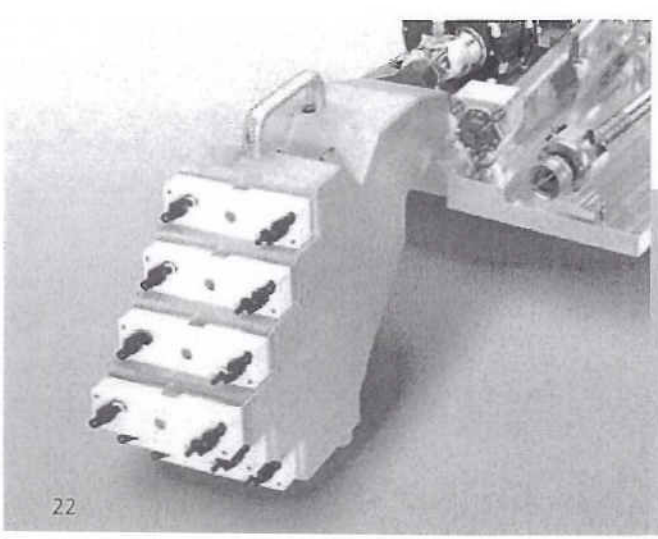


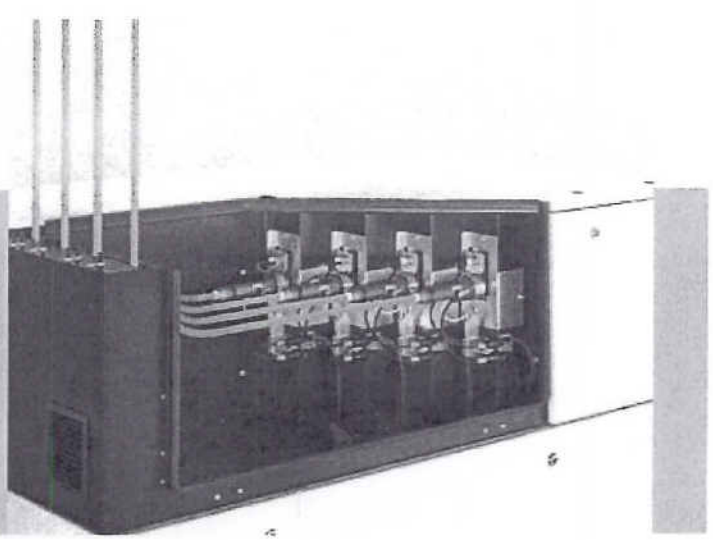
Reliable processing.

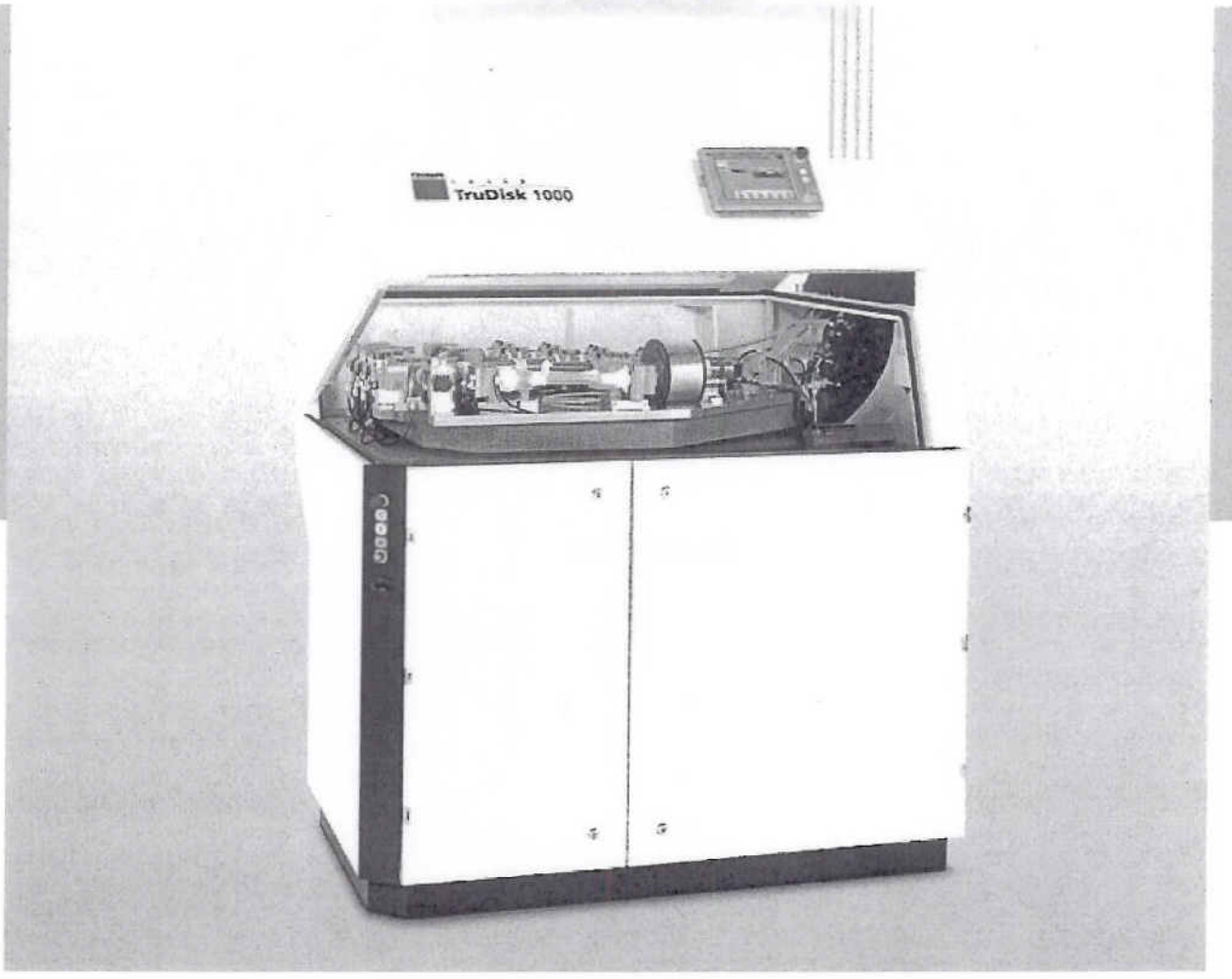
When scaling the laser power, the internal laser power density of the TruDisk lasers always lies within a secure range.
Its patented resonator design makes the TruDisk laser resistant to back reflections on all optic components, so they remain extremely stable during the production process. Thanks to the absolute laser power control, you get reproducible production results at all times.

Customizable and upgradable.

The integrated beam guidance design can be customized, both in regards to the number of outputs as well as to „energy and time sharing" options. Up to six laser light cables can be connected to a TruDisk – and they can also be easily reconnected even if you are working at the other outputs. The laser power of the disk lasers can also be individually configured – and the modular design means they can easily be upgraded later, on-site – in only a few hours.

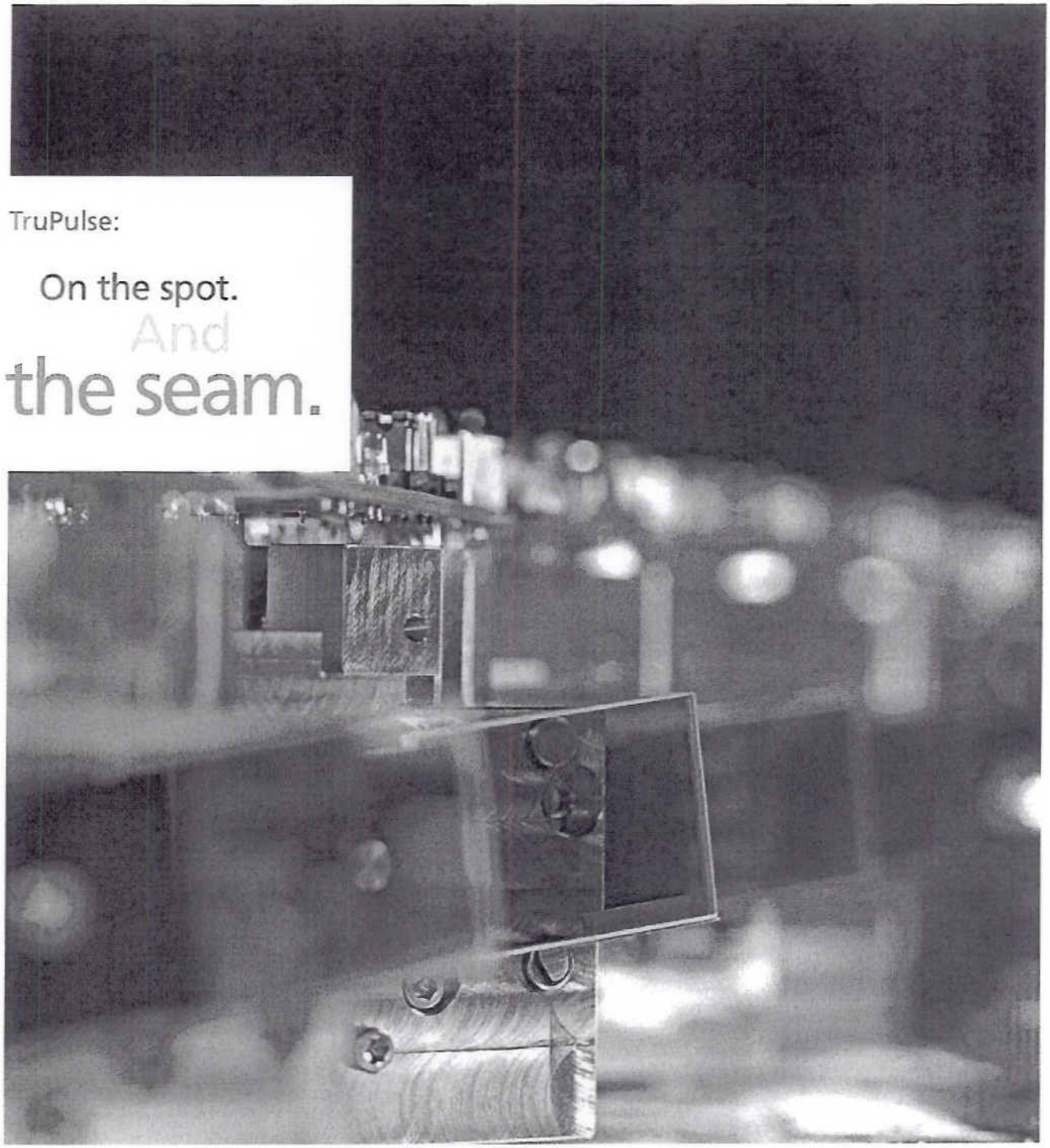


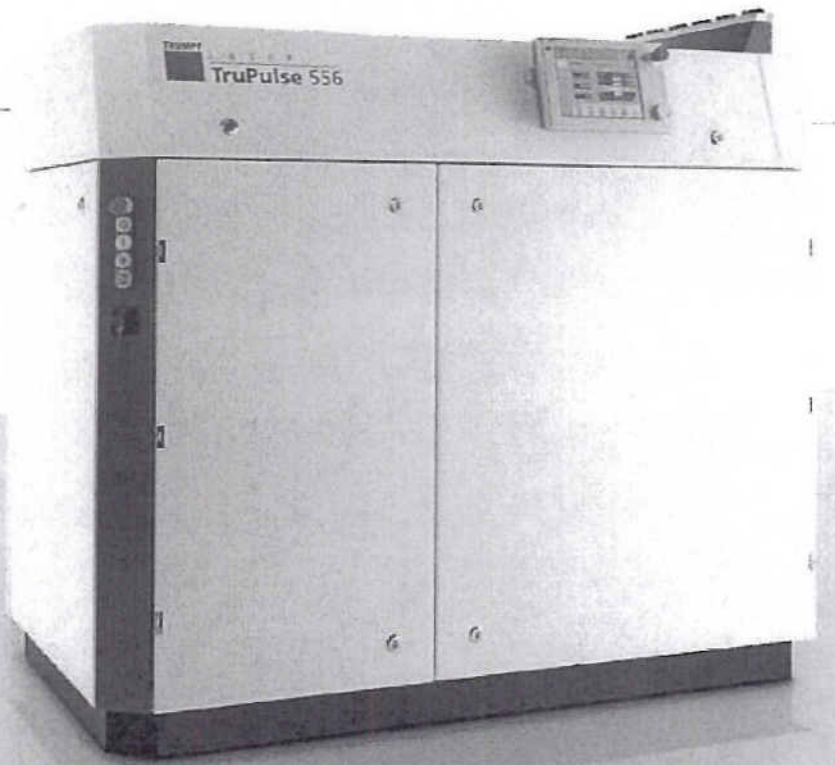




Always ready.

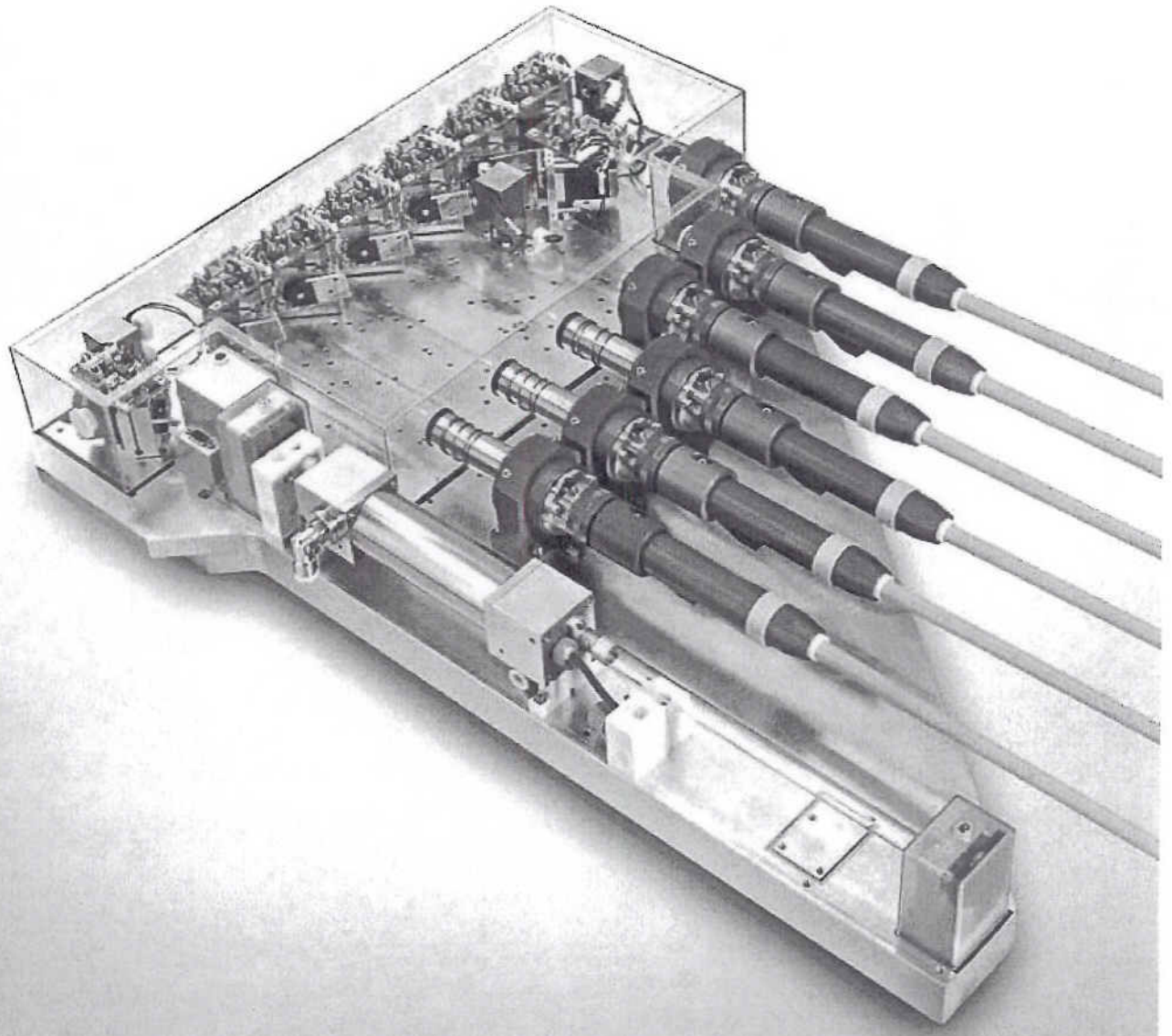
The new passively cooled pump modules of the TruDisk laser are ultra-long-lasting. This means they are no longer considered consumables, and operating costs can therefore be kept to a minimum. In the unlikely event that a module fails, the pump diodes instantly cover for each other: the power of the remaining modules is automatically increased so that there is no loss of power at the workpiece. You can then replace the failed pump module in an orderly manner without interrupting production – in a matter of minutes, and in just a few steps.


TruPulse:
On the spot.
And
the seam.



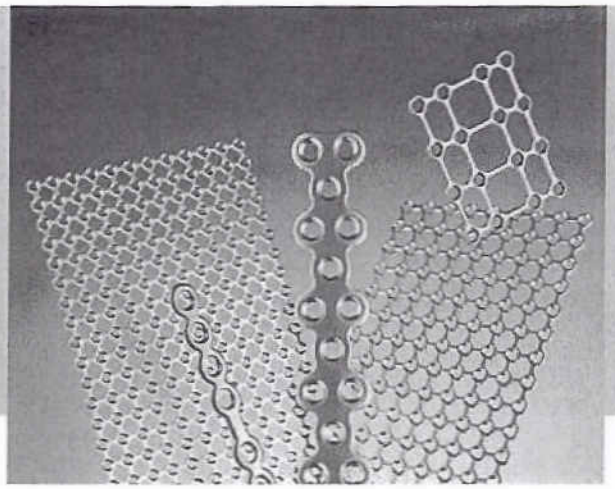
	TruPulse 21	TruPulse 33	TruPulse 44	TruPulse 62	TruPulse 74	TruPulse 103
Laser device						
Average power[1]	20 W	30 W	40 W	60 | 65 W	70 | 70 W	95 | 95 | 90 W
Max. pulse power	1,5 kW	3 kW	3 kW	3 | 5 kW	4 | 6 kW	5 | 6 | 8 kW
Max. pulse energy	15 J	30 J	30 J	20 | 50 J	30 | 60 J	30 | 60 | 90 J
Pulse duration	0.2 – 50 ms	0.2 – 50 ms	0.2 – 50 ms	0.2 – 50 ms	0.3 – 50 ms	0.3 – 50 ms
Beam quality	4 mm · mrad	12 mm · mrad	16 mm · mrad	8 mm · mrad	16 mm · mrad	12 mm · mrad
Min. ø laser light cable	100 µm	300 µm	400 µm	200 µm	400 µm	300 µm
Consumption						
Nominal power consumption A | W[2]	1.7 | 1.6 kW	1.6 | 1.5 kW	1.9 | 1.7 kW	3.0 | 2.8 kW	2.7 | 2.6 kW	4.0 | 3.8 kW
Max. cooling water consumption at 15 °C	0.2 m³/h	0.2 m³/h	0.2 m³/h	0.2 m³/h	0.2 m³/h	0.2 m³/h
Cooling water temperature range	6 – 30 °C	6 – 30 °C	6 – 30 °C	6 – 28 °C	6 – 28 °C	6 – 28 °C
Installation						
Cabinet	A	A	A	B | B/C	B | B/C	B | B/C | C

[1] At workpiece, controlled over entire life of lamps, depending on pulse duration and pulse power setting.
[2] A = air cooled | W = water cooled.

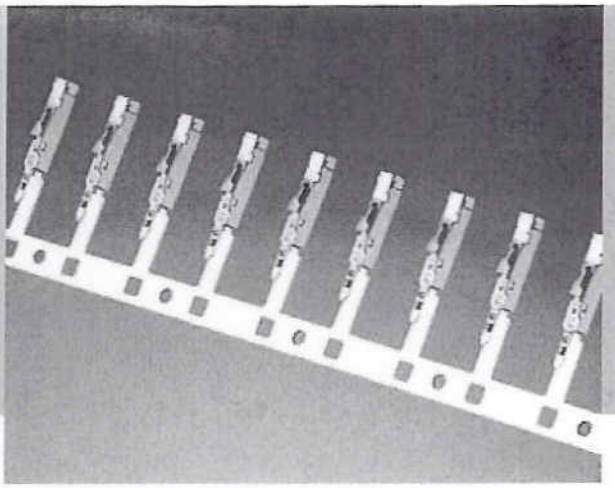


	TruPulse 106	TruPulse 124	TruPulse 156	TruPulse 203	TruPulse 304	TruPulse 556
Laser device						
Average power[1]	110 W	140 | 125 | 110 W	150 | 160 | 140 W	200 W	300 W	530 W
Max. pulse power	4 kW	6 | 6 | 9 kW	6 | 6 | 10 kW	6 | 8 kW	10 | 10 kW	10 | 10 kW
Max. pulse energy	30 J	30 | 70 | 90 J	30 | 80 | 120 J	55 | 90 J	60 | 90 J	60 | 100 J
Pulse duration	0.3 – 50 ms	0.3 – 50 ms	0.3 – 50 ms	0.3 – 50 ms	0.3 – 50 ms	0.3 – 50 ms
Beam quality	25 mm · mrad	16 mm · mrad	25 mm · mrad	12 mm · mrad	16 mm · mrad	25 mm · mrad
Min. ø laser light cable	600 µm	400 µm	600 µm	300 µm	400 µm	600 µm
Consumption						
Nominal power consumption A | W[2]	3.9 | 3.8 kW	3.9 | 3.8 kW	4.8 | 4.7 kW	7.8 kW	10.1 kW	16.7 kW
Max. cooling water consumption at 15 °C	0.2 m³/h	0.2 m³/h	0.2 m³/h	0.4 m³/h	0.5 m³/h	0.7 m³/h
Cooling water temperature range	6 – 28 °C	6 – 28 °C	6 – 28 °C	6 – 28 °C	6 – 28 °C	6 – 28 °C
Installation						
Cabinet	B	B | B/C | C	B | B/C | C	D	D/D+	D/D+

[1] At workpiece, controlled over entire life of lamps, depending on pulse duration and pulse power setting.
[2] A = air cooled | W = water cooled.



Cutting of the finest contours on titanium implants.



Laser welded connectors.

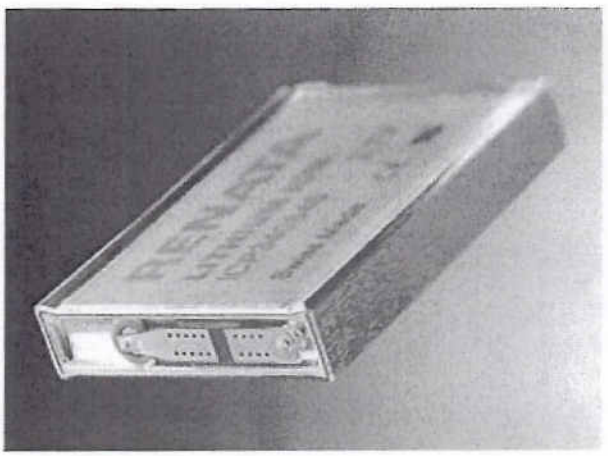
Finely tuned.

Several kilowatts of pulse power for a few milliseconds let you weld and cut in situations where other processes fail. Whether in terms of power, energy, or focusability, the TruPulse Series covers the entire parameter range for welding and cutting. With pulse powers as high as 10 kW, pulse duration between 0.2 and 50 ms, and pulse energy running up to a maximum of 120 J, these lasers are universal tools for use in both manual and automated applications.

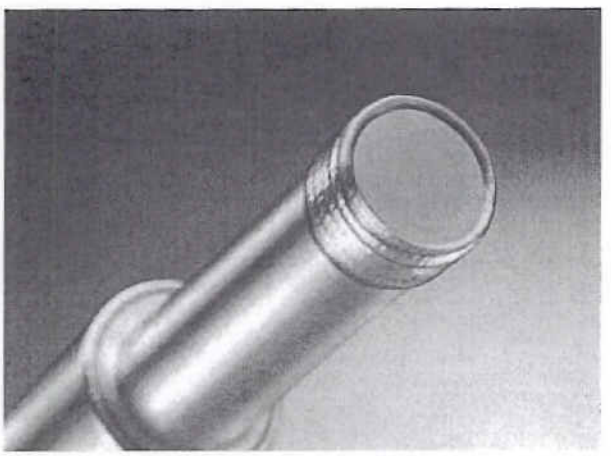
Modular.

Beam generation, beam guidance, power supply, cooling, and control units are all set up as modules in a system that has been thought out and tested in great detail. One laser can service up to six processing stations, either in parallel or in sequence. For TruPulse lasers with powers of up to 150 W, you decide whether to use air or water cooling for your laser unit.

Laser welded battery.



Laser deposition welding on beryllium-copper.



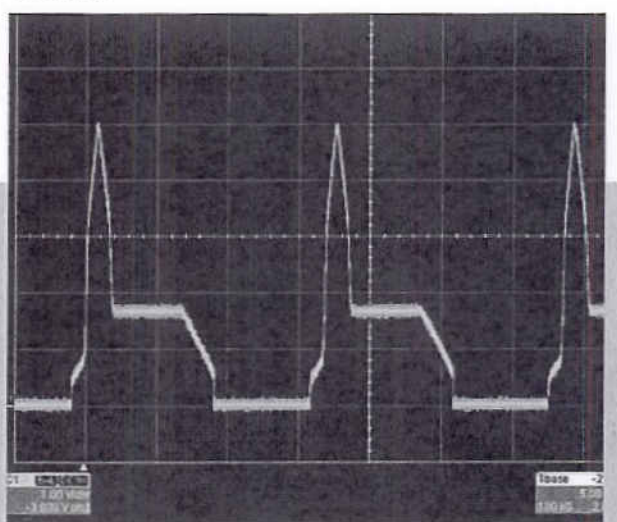
Cabinet	A	B	C	D	D+
Dimensions					
Width	485 mm	980 mm	980 mm	1,500 mm	1,500 mm
Height	700 mm	1,220 mm	1,220 mm	1,370 mm	1,370 mm
Depth	800 mm	505 mm	715 mm	730 mm	990 mm

Best results.

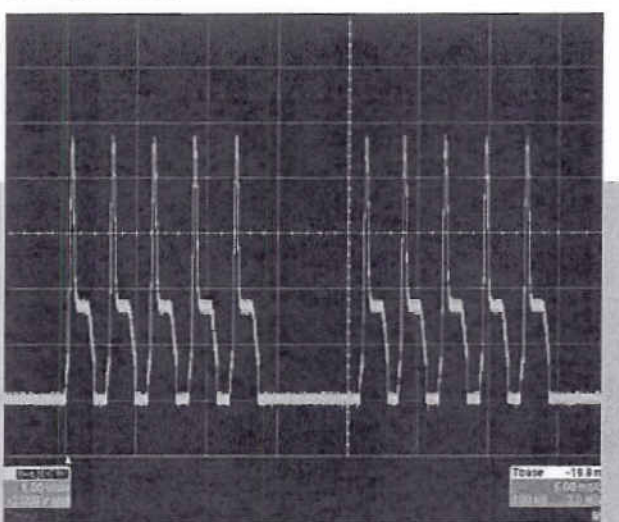
The power supply is highly dynamic, enabling ultra-short pulse rise times, and in conjunction with fast, real-time power control, provides high pulse-to-pulse stability – keeping your processing results constant at all times.

Laser pulse frequency is typically limited by pulse energy and average power. The Power Regulated Burst, however, lets you considerably exceed the average power for a short time and keep the welding time within a processing cycle to a minimum. Long Pulse Welding also opens up new possibilities, allowing you to generate a welding seam within a single laser pulse by quickly moving either the workpiece or laser beam.

Pulse shapes.



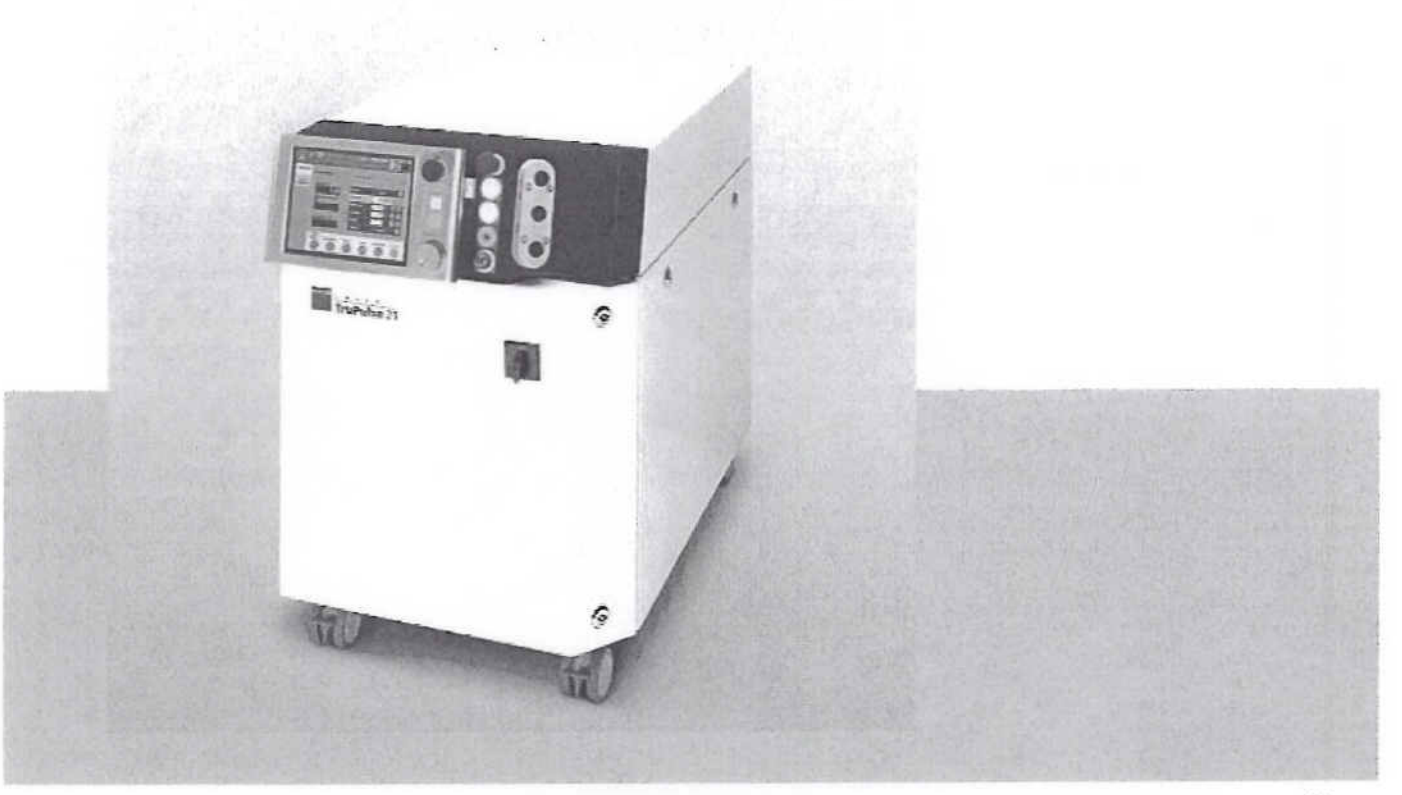
Power Regulated Burst.

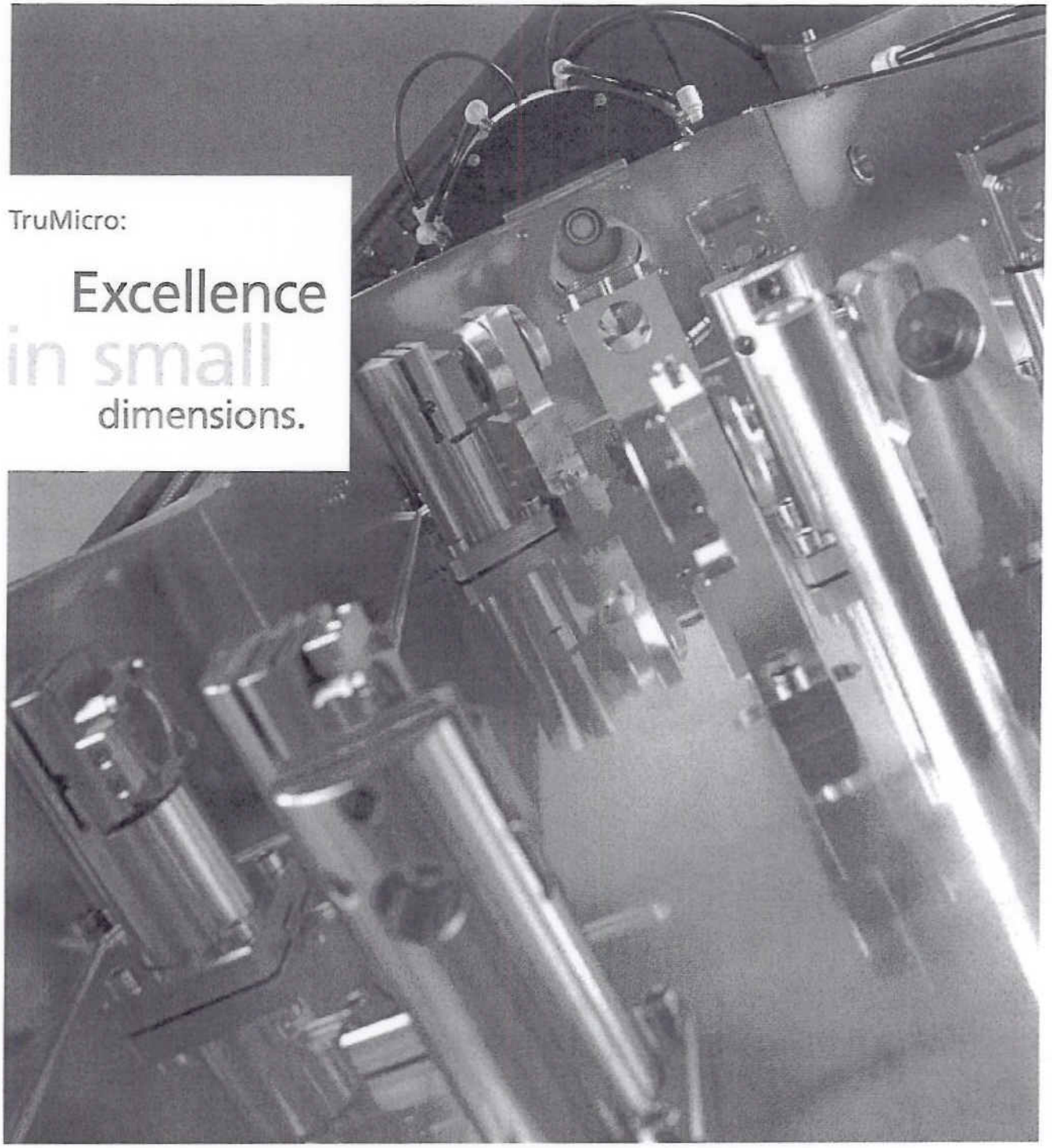


Helpful.

The application wizard „Weldassist" will help you optimize your welding parameters. If this is not sufficient, TRUMPF application specialists will be there for you with help and advice.

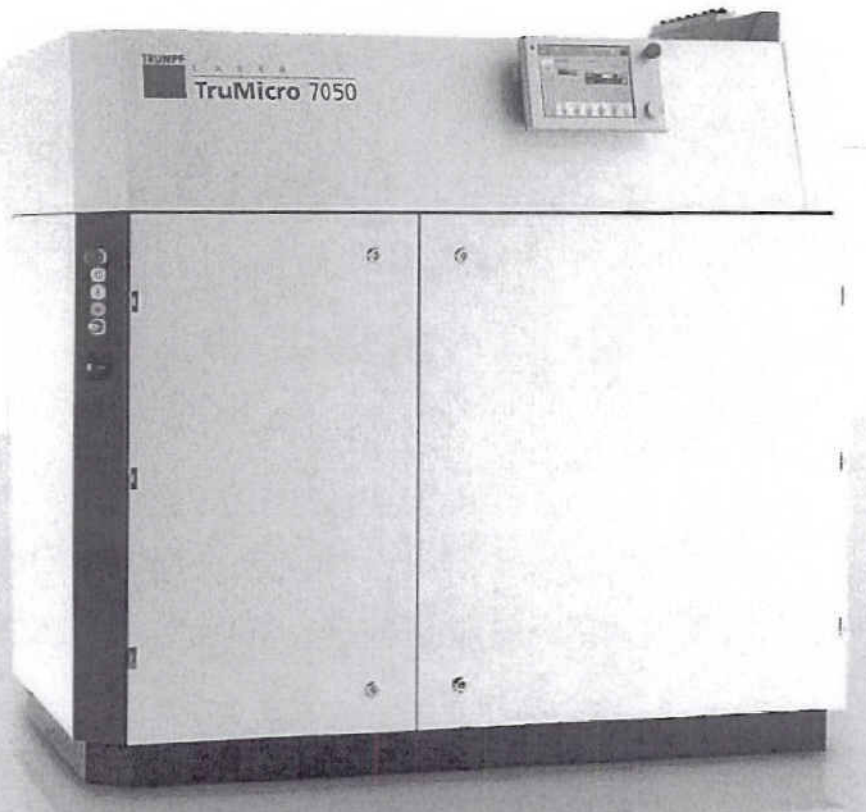
If the components you are processing with your laser must meet strict standards, our software module „Datastore" will help you record and evaluate your quality-related laser parameters.





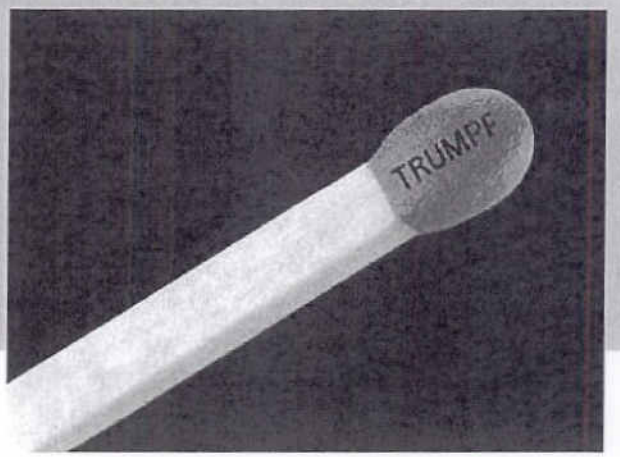
TruMicro:

Excellence in small dimensions.

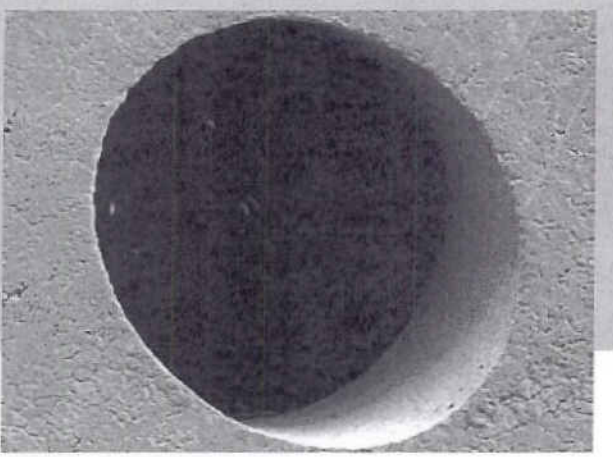


	TruMicro 5050	TruMicro 5250	TruMicro 5350	TruMicro 7050	TruMicro 7250
Laser device					
Wavelenght	1030 nm	515 nm	343 nm	1030 nm	515 nm
Max. average power	50 W	25 W	15 W	750 W	400 W
Beam quality	$M^2 < 1,3$	$M^2 < 1,3$	$M^2 < 1,3$	$M^2 < 13$ (LLK 01[1])	$M^2 < 13$ (LLK 01[1])
Polarisation ratio	Linear > 500:1	Linear > 500:1	Linear > 500:1		
Pulse duration	< 10 ps	< 10 ps	< 10 ps	30 – 700 ns[2]	300 – 1500 ns[2]
Max. pulse energy	250 µJ	125 µJ	75 µJ	50 mJ	10 mJ
Repetition rate	max. 400 kHz	max. 400 kHz	max. 400 kHz	5 – 50 kHz	5 – 100 kHz
Consumption					
Nominal power consumption	2.3 kW	2.3 kW	2.3 kW	5 kW	5 kW
Max. cooling water consumption at 18 °C	0.3 m³/h	0.3 m³/h	0.3 m³/h	0.9 m³/h	0.9 m³/h
Cooling water temperature range	6 – 18 °C	6 – 18 °C	6 – 18 °C	5 – 20 °C	5 – 20 °C
Dimensions					
Laser head	upon request	upon request	upon request		
Supply unit					
Width	650 mm	650 mm	650 mm	1,460 mm	1,460 mm
Height	1,150 mm	1,150 mm	1,150 mm	1,350 mm	1,350 mm
Depth	1,210 mm	1,210 mm	1,210 mm	730 mm	730 mm

[1] The minimum fiber diameter depends on the pulse duration.
[2] Definite pulse duration on delivery.



Cold processing with picosecond pulses on a match-head.



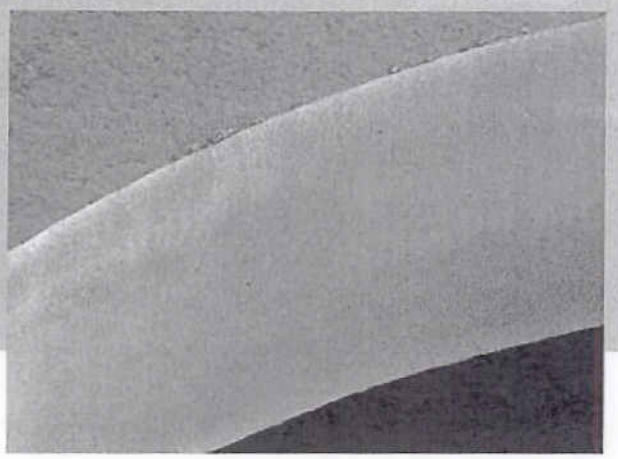
Drill-hole in stainless steel using TruMicro 5050.

TruMicro Series 5000: Shorter than short.

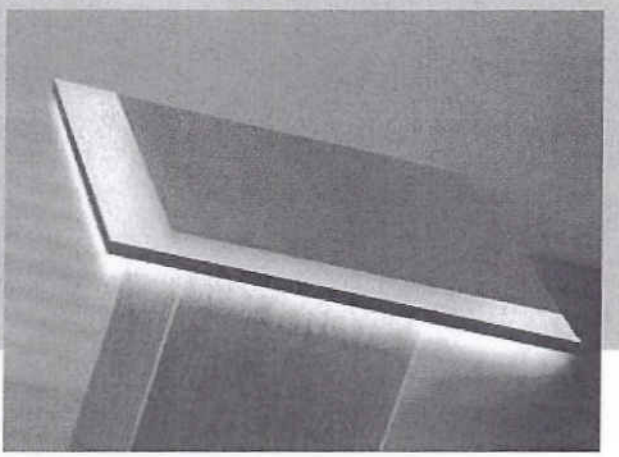
The TruMicro Series 5000 is used for material ablation wherever mechanical or thermal influences, such as micro-cracks, burrs or deposits, are unacceptable or refinishing work must be avoided. These lasers enable micro processing with an ideal combination of quality, productivity and profitability.

The decisive benefits of the TruMicro Series 5000 are short pulse durations which are smaller than 10 ps and their easy average power scaling, at pulse energies of up to 250 µJ. It is the unique combination of fiber and disk laser technology that enables penetration into these performance classes. Intensification of the picosecond pulses of a fiber laser with a disk laser is superior to other technologies in terms of laser power and pulse energy, while simultaneously retaining excellent beam quality.

The high peak pulse power of the TruMicro 5050 of 50 W with an infrared wavelength translates to high throughput times. With the TruMicro 5250 and 5350 you have two variants at your disposal, with outputs of 25 W in the green spectral range and 15 W in the ultraviolet spectral range. As a result, semiconductor materials, die-electrics and plastics are processed with outstanding quality and high throughput. In addition, a laser can operate several workstations simultaneously. And the overall cost of disk lasers from the TruMicro Series 5000 remains incredibly low throughout their entire service life.



Cutting edge of a silicon wafer processed with TruMicro 5250.



Border deletion on a thin-film solar cell with TruMicro 7050.

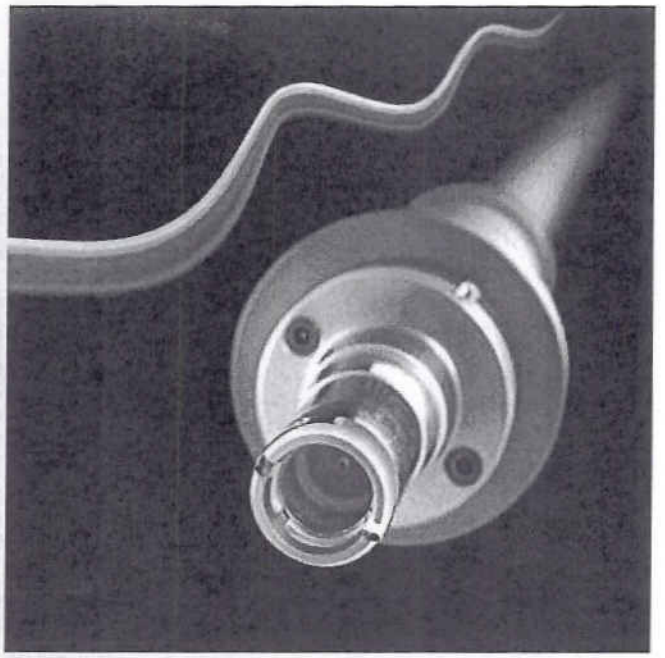
TruMicro Series 7000: Short and productive.

The lasers in the TruMicro Series 7000 combine short pulses with high peak pulse powers. With these outputs – which are especially high for short pulsed lasers – you can quickly ablate large surface layers, create micro-drilled holes or even cut with the highest throughput.

With pulse durations ranging from several tens to several hundreds of nanoseconds, the TruMicro Series 7000 achieves laser powers of up to 750 W. The disk laser technology used here features a combination of short pulses and high pulse energies together with excellent beam quality. This enables remote processing, i.e. fast positioning of the laser beam with the aid of a scanner, for precision processes such as fine cutting or drilling the tiniest of holes.

The TruMicro Series 7000 is ideal for integration into production plants. The laser and supply unit form a compact device, and beam delivery to the focussing optics takes place via our flexible laser light cable. Beam switches and splitters are integrated into the laser unit, enabling laser power to be optimized during processing as well as between workstations.

Beam guidance and optics for solid-state lasers.

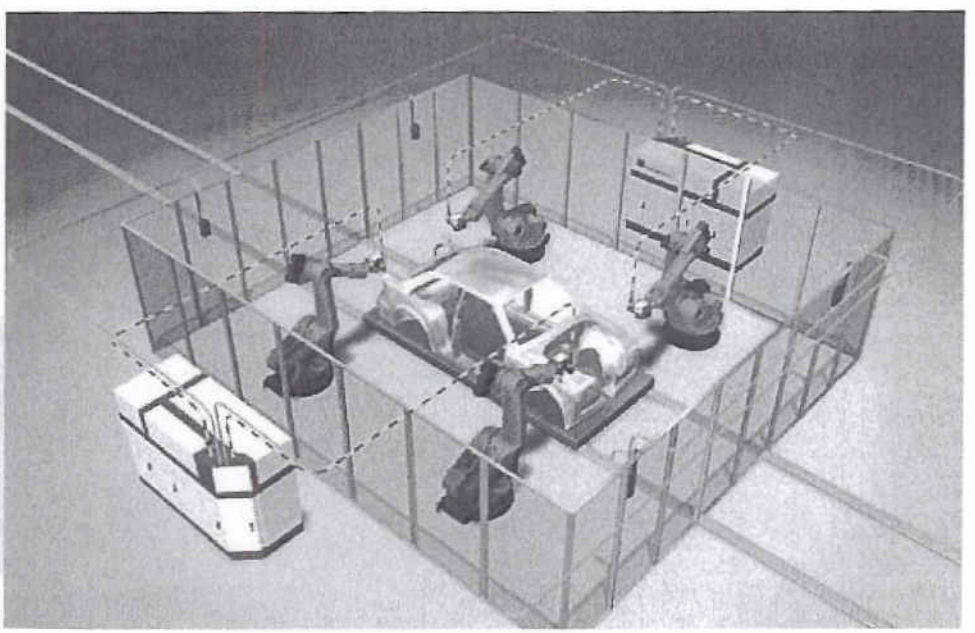


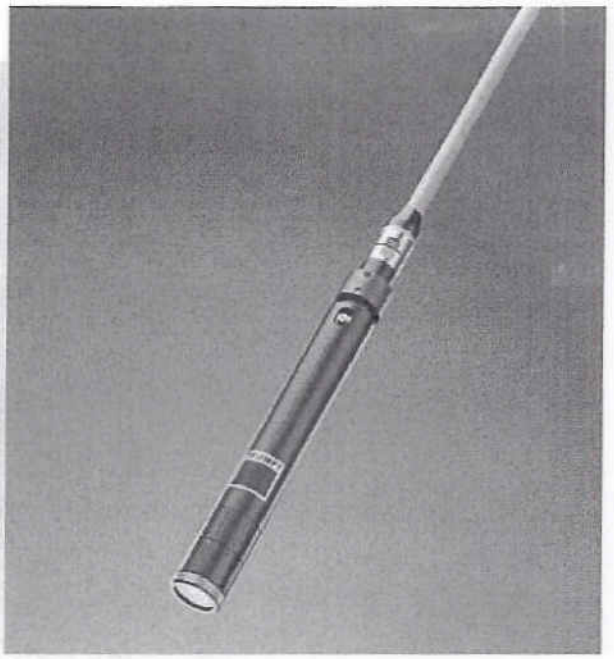
Flexible light transportation: The laser light cable.

Feeding the beam through a laser light cable makes it possible for the solid-state laser to be located away from the processing station. All that is required at the actual processing site are optics that focus the laser light on the workpiece and that can be easily integrated. The beam can be switched at the laser unit to a different output, or split into as many as six outputs, making it possible to supply up to six processing stations at once. The laser light cable can be easily connected by yourself, plug & play.

The TRUMPF LaserNetwork.

Link and distribute intelligently – the TRUMPF LaserNetwork gives you the flexibility you need to effectively use the energy available from one or more lasers at several processing stations. This allows you to make better use of individual laser capacity, increasing facility availability. The laser light cable transmits the necessary information about the laser unit and guidance system, even when you switch the cable from one outlet to another. The entire security circuit is monitored continuously, guaranteeing laser safety.





Focusing optics BEO D25.

Focusing optics BEO with D35 with camera.

The right optics for every job.

We offer an extensive line of focusing optics, for anything from welding and cutting to drilling and ablating applications. A variety of options are available for adapting all TRUMPF optics to any need.

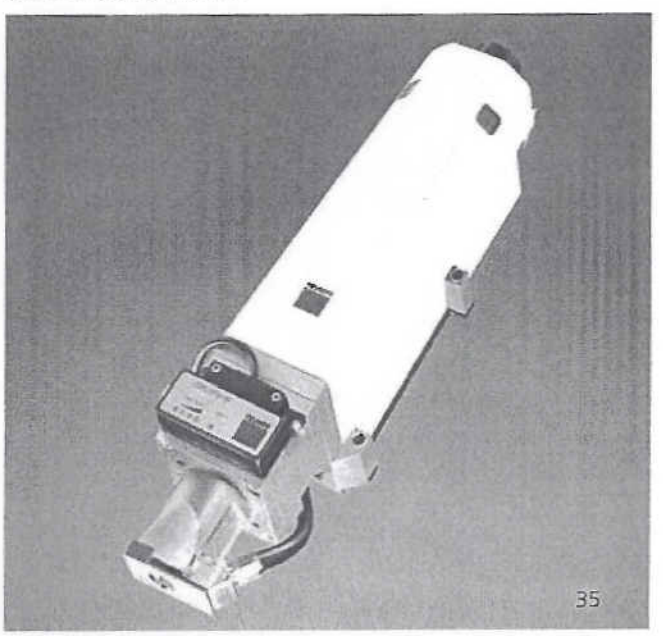
Robust and proven.

The series of BEO focusing optics consists of three basic models that differ in terms of their size and collimation focal length. Dependent on the laser you use, you will achieve a focal diameter between 10 µm and 1 mm. The BEO D25, the most compact focusing optics of the series, is used in welding applications with pulsed lasers, with outputs of up to 200 W. It is especially suited for integration into automated assembly systems. The BEO D35 can be used for welding, cutting, or drilling, in combination with pulsed or cw solid-state lasers that have powers in the kilowatt range. The BEO D70 focusing optics shows its strengths at large operating distances, when the focal diameter is small.

Monitored.

The optical construction of the controlled focusing optics of the CFO Series is similar to that of the BEO Series, but with the addition of sensors that monitor the functions of the optics. These sensors monitor the degree of contamination of the cover slide, the temperature and flow of cooling water and inert gas, as well as cross-jet pressure. TRUMPF service specialists can use our Telepresence service to call up monitoring data upon request, allowing them to troubleshoot, assess, and eliminate errors occurring anywhere along the beam path.

Controlled focusing optics CFO.



Programmable.

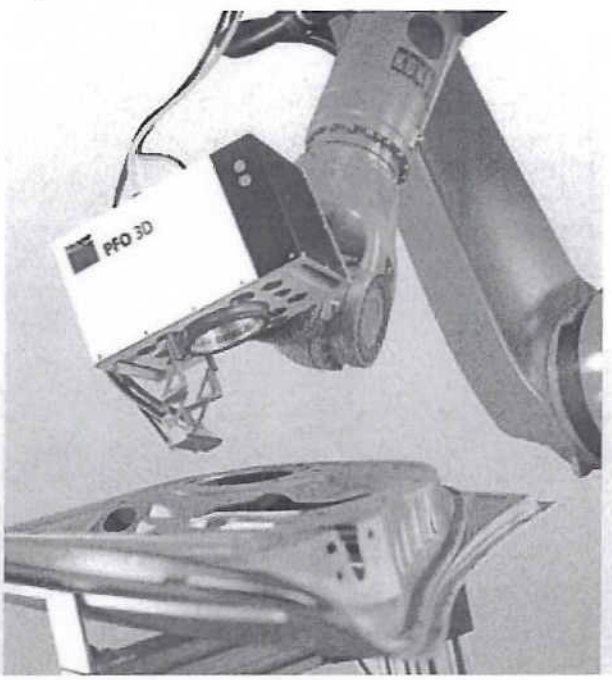
Programmable focusing optics of the PFO Series are scanner optics used for welding. Two mirrors are used to position the laser beam within the operating field. The mirror angles can be changed through a highly precise and dynamic process. In conjunction with pulsed or cw solid-state lasers, this system can be used for spot and seam welding, without having to move the workpiece or the focusing optics. The F-theta lens makes it possible to obtain constant focal conditions – and thus identical processing quality – for every point within the processing field.

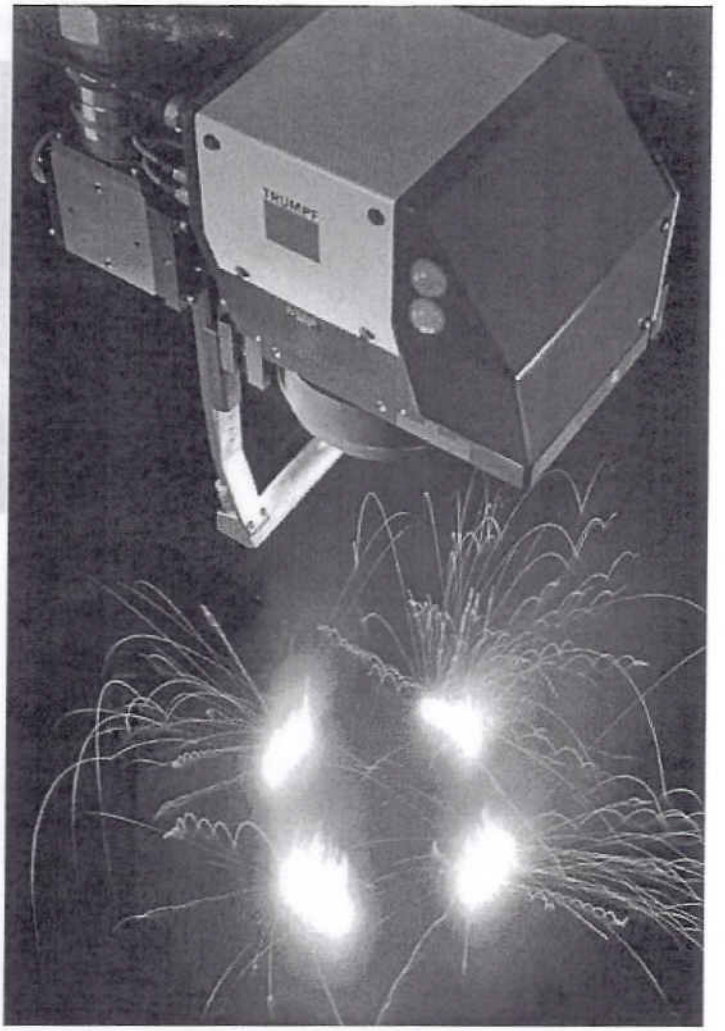
TRUMPF offers three designs of these programmable focusing optics:

The PFO 20 is largely intended for seam and spot welding within small work areas, whereas the PFO 33 and PFO 3D are best used in conjunction with a laser with a high beam quality, such as the TruDisk laser, for remote welding applications, i.e., for welding at large working distances. The PFO 3D includes an integrated z-axis with a 140 mm stroke that even allows you to perform welding tasks within a three-dimensional workspace. The PFO control unit can be combined with that of a robot, which significantly enlarges the processing area, allowing welding "on-the-fly".

Like focusing optics of the CFO series, PFOs are also integrated in our global Telepresence network.

Programmable focusing optics PFO 3D.



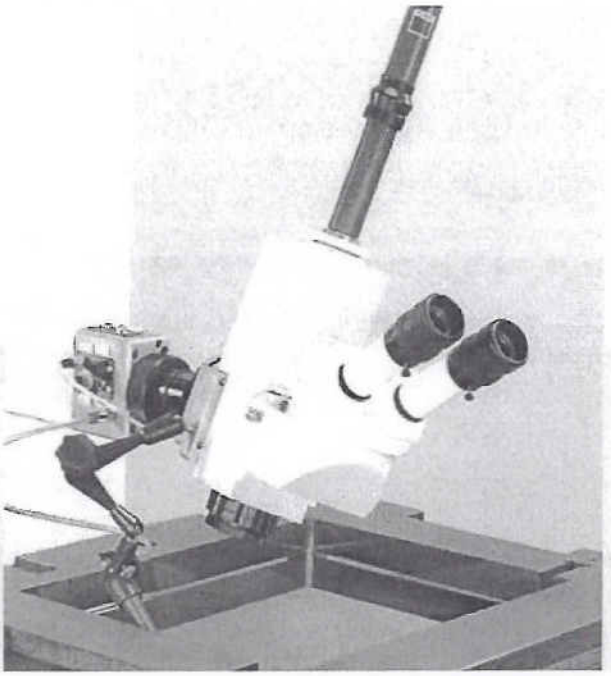


Programmable focusing optics PFO 20.

For manual applications.

We offer a focusing optics with a stereo microscope for welding by hand. Along with the integrated visor, this feature allows the operator to make first-rate process observations, and work on even the thinnest welding wires by hand. The diameter of the welding point can be adjusted to the welding task by mechanically moving the motor-driven defocusing unit.

Manual focusing optics with stereo microscope.



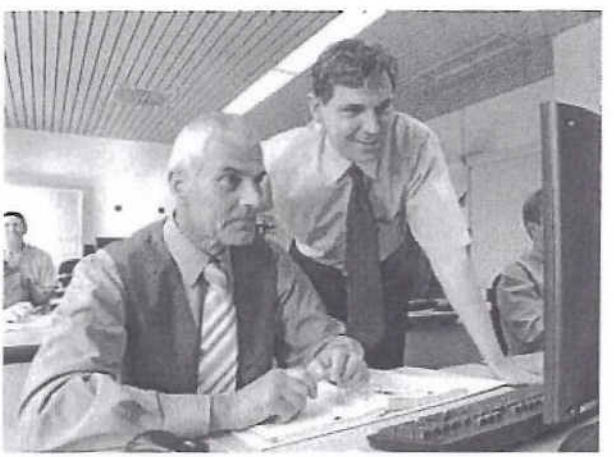
TruServices:

We are there for you.

Our service begins even before you decide to buy a laser. We provide comprehensive consulting services to help you figure out what you really need.

Let's go.

Your laser will be operational in the shortest time possible. The laser, beam guidance system, focusing optics, programming, control unit, and, where applicable, automation components were developed for one another at TRUMPF – eliminating all interface problems.



Comprehensive support.

We support you with made-to-order services that go above and beyond the entire life cycle of your facility, maintaining the machine and upgrading it with new functions upon request. We will train you and your employees so that you can take full advantage of your laser system's potential. Our service is so extensive that we will even visit your site to optimize your machine parameters, in order to help you lower your parts costs and increase both production speed and product quality. We keep downtime and service visits to a minimum, because, with your permission, our specialists can use our online Telepresence service to access your software directly and solve the problem at hand. And, should you need a spare part, we can be reached from anywhere in the world, 24/7, 365 days a year.

TRUMPF is certified according to DIN EN ISO 9001 and VDA 6.4

WENSAUER & PARTNER

ID no. 0376144-40-06-09-F – Subject to change

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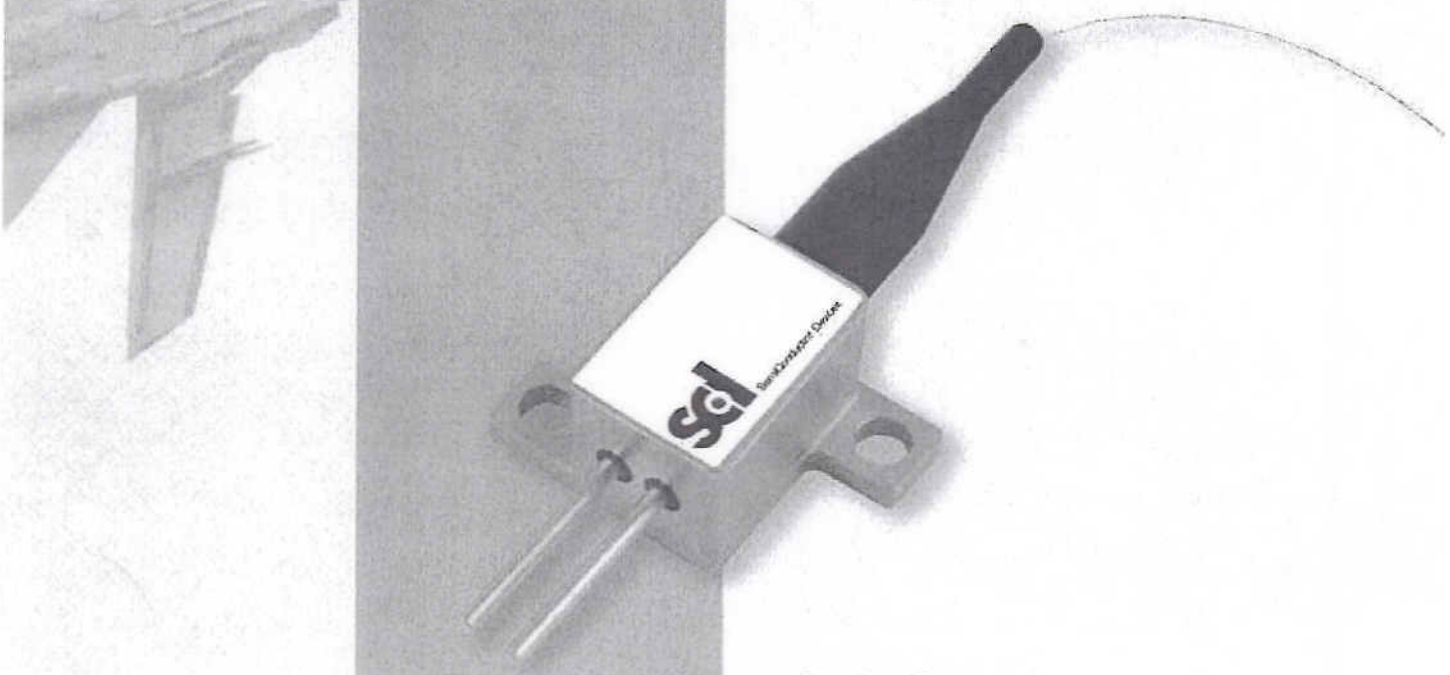
TRUMPF

HELIUM

HELIUM - FIBER COUPLED SINGLE EMITTER

Description

- Up to 9W at 9xx wavelengths
- 105 µm fiber core; 0.15=NA
- Typical 50% optical to electrical efficiency
- Designed for operation in rugged environment



Applications

- Fiber Laser Pumping
- Direct, Medical, Telecom, Space and Defense

sdi SemiConductor Devices

Helium - Fiber Coupled Single Emitter: Generic Specifications

Parameter	Typical	Typical	Typical
Laser Characteristics			
Central wavelength	915 +/-5 nm	940 +/-5 nm	975 +/-5 nm
CW output power	Up to 8 W	Up to 8 W	Up to 9 W
Spectral width (FWHM)	4 +/-1 nm	4 +/-1 nm	4 +/-1 nm
Conversion efficiency	>=45%	>=45%	>=45%
Operating Current	< 11 A	< 11 A	< 12 A
Forward Voltage	1.7 V	1.7 V	1.65 V
Characterization temperature	25C	25C	25C
Wavelength tuning vs. temperature	<0.35 nm/°C	<0.35 nm/°C	<0.35 nm/°C
Fiber Characteristics			
Fiber core dimension	105 µm	105 µm	105 µm
Fiber Numerical aperture	0.15	0.15	0.15
Fiber Cladding	125 µm	125 µm	125 µm

DANGER

INVISIBLE LASER RADIATION— AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION

EYE PROTECTION REQUIRED
CLASS 4 LASER PRODUCT

Devices are highly sensitive to ESD. Terminals must be short-cricuited unless required for operation

SCD reserves the right to change product design and specification at any time without notice.
No responsibility is assumed for the use of these products, nor for any infringement on the right of others, resulting from the use of these products.
Laser diode product components are intended for use in a user devised end system.
However, these products are capable of emitting Class IV radiation.
Extreme care must be exercised during their operation.
Only persons familiar with the appropriate safety precaution should operate a laser product.
Direct viewing of the laser beam exposure to specular reflections, must be avoided.
Serious injury may result, if any part of the body is exposed to the beam.
The eye is extremely sensitive to the infrared radiation and therefore, proper eyewear must be worn at all times.
Use of optical instruments with these products, may increase eye hazard.
Always wear proper eye protection when operating.

www.studio3.co.il

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SCD/UNC-33168-1210

laser welding

Fiber Laser Welder

LF1000A

- 1kW laser power
- Real time power feedback
- Energy and time share options
- Touch screen interface
- Optical feedback protection
- Flexible beam delivery options

Features

1kW laser power – enables both high speed and penetration welding of steels and aluminum.

Real time power feedback – laser power output is verified and maintained to ensure high weld repeatability and quality

Energy and time share options – increase efficiency by supporting more than one workstation or multiple weld heads with energy and time beam sharing options

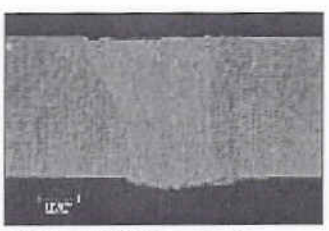
Laser tuned for weld performance – laser beam characteristics are specifically designed for both excellent weld quality and performance. Pulse shaping and modulation provide ultimate weld control

Touchscreen interface – enables quick and easy parameter programming

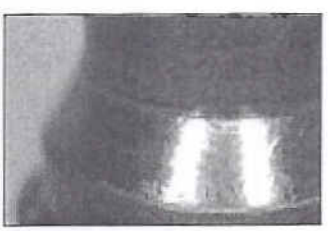
Optical feedback protection – the unique internal design of the laser provides *guaranteed protection* from optical reflection from the workpiece

Flexible Beam Delivery Options – a range of delivery fibers and focus heads are available to provide an optimized solution for process spot size and equipment integration

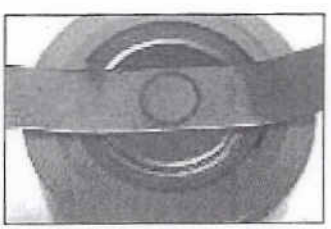
TYPICAL APPLICATIONS



Welding 0.06" thick aluminum



High speed welding of tube components



Welding battery tabs

Seam welding automotive sub assemblies

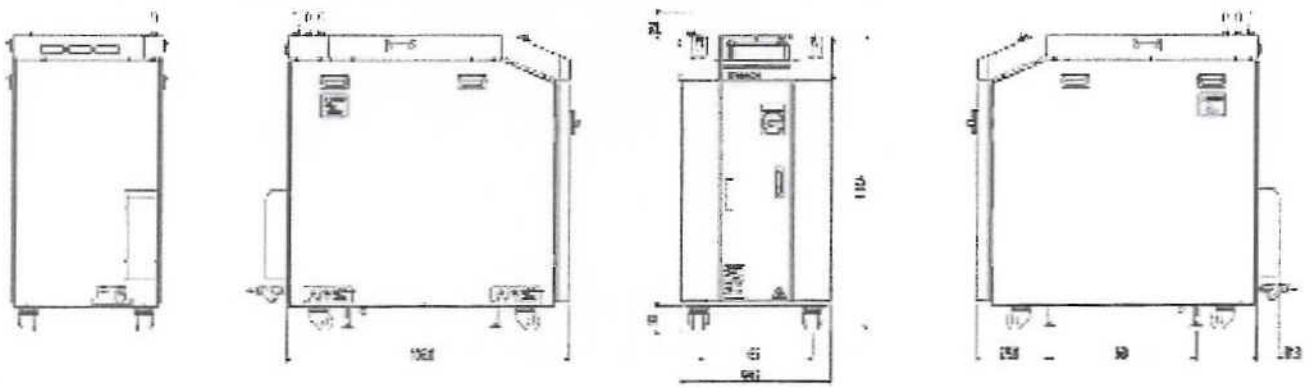
Spirit Of Innovation.

MIYACHI UNITEK™

SPECIFICATIONS

MODEL NUMBER LF1000A			
Oscillator:	*Maximum rated power*		1000W
	Maximum peak power		1000W
	Waveform	*REPEAT mode*	0.1~500.0ms (0.1ms step) / 0.05~50.00ms (0.05ms step)
	Control	*CW Mode*	0.1~100.0ms (0.1ms step) / 0.01~10.00ms (0.01ms step)
	Repetition speed		1~5000pps
	Modulation		1~5000Hz (Single, triangle, and square wave)
	Wavelength		1070~1100nm
	Safety shutter		Open-close sensor
	Guide laser		Red-colored visible laser
	Output power stability		±2% or below @ over 10W
	Optics		Optical fiber , three energy share at max.
Controller:	*Schedule set*		256
	Measuring and monitoring		Laser energy (J) and average power (W)
	Counter:		Total outputs (9 digits), good results (9 digits) LD-on time (7 digits), processing time (7 digits)
	Cable length		0.5m
Power Supply:	*AC power requirements*		Three phase, 200~400VAC +10%/-15%, 50/60Hz
	Power consumption		10.3kW max. (1.0kW @ hold time)
	External datacom		RS-485, LAN (100BASE-TX/10BASE-T)
	Cooling method		Water cooling (Temp. 5~26°C)
	Ambient operation temperature:		41-122°F (5-50°C)
	Weight lbs (kg)		838 (380)
	Dimensions H x W x D in (mm)		43.7 x 22.4 x 42.0 (1110.4 x 569.5 x 1068.8)

Specifications subject to change without notice



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laser welding

Fiber Laser Welder

LF1000A

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- Real time power feedback
- Energy and time share options
- Touch screen interface
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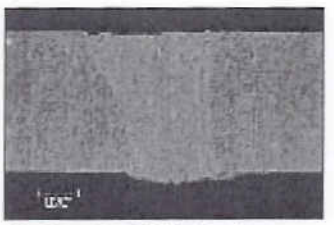
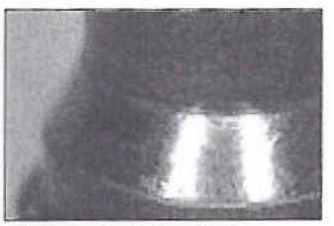
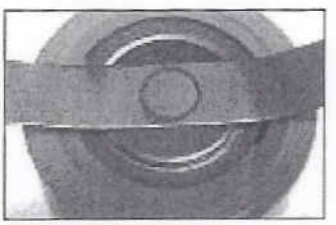
TYPICAL APPLICATIONS



Welding 0.06" thick aluminum



High speed welding of tube components



Welding battery tabs

Seam welding automotive sub assemblies

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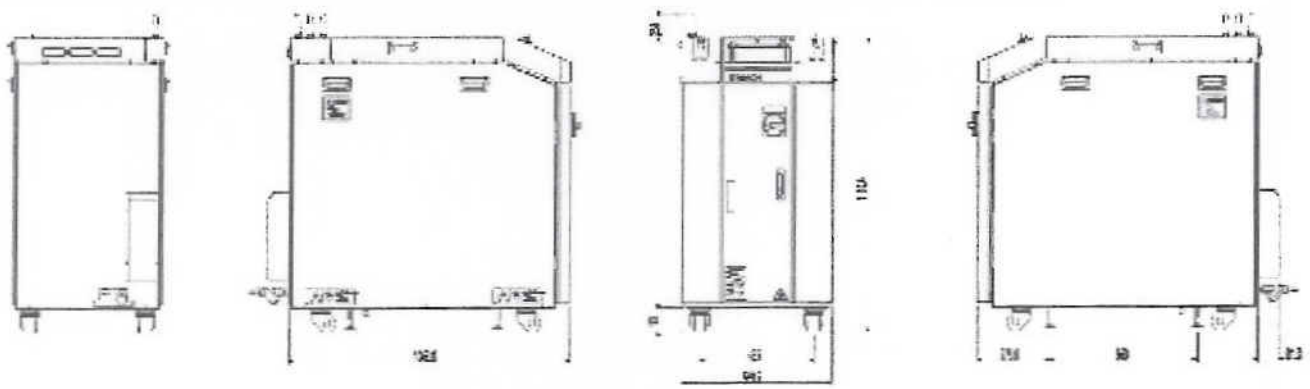
	Control	*CW Mode*	0.1~100.0ms (0.1ms step) / 0.01~10.00ms (0.01ms step)
	Repetition speed		1~5000pps
	Modulation		1~5000Hz (Single, triangle, and square wave)
	Wavelength		1070~1100nm
	Safety shutter		Open-close sensor
	Guide laser		Red-colored visible laser
	Output power stability		±2% or below @ over 10W
	Optics		Optical fiber , three energy share at max.
Controller:	*Schedule set*		256
	Measuring and monitoring		Laser energy (J) and average power (W)
	Counter:		Total outputs (9 digits), good results (9 digits) LD-on time (7 digits), processing time (7 digits)
	Cable length		0.5m
Power Supply:	*AC power requirements*		Three phase, 200~400VAC +10%/-15%, 50/60Hz
	Power consumption		10.3kW max. (1.0kW @ hold time)
	External datacom		RS-485, LAN (100BASE-TX/10BASE-T)
	Cooling method		Water cooling (Temp. 5~26°C)
	Ambient operation temperature:		41-122°F (5-50°C)
	Weight lbs (kg)		838 (380)
	Dimensions H x W x D in (mm)		43.7 x 22.4 x 42.0 (1110.4 x 569.5 x 1068.8)

Specifications subject to change without notice



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SPI Lasers | inspiring your products & manufacturing

redPOWER®

High Power Fiber Lasers R4 200-400W CW/M –"LM"

With GTWave® Technology

PRELIMINARY DATASHEET

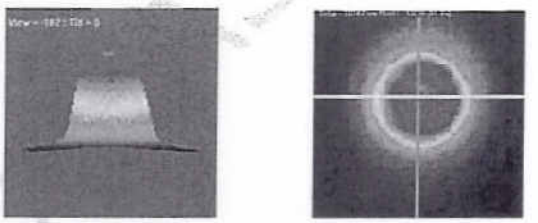
Features

- CW or Modulated to 100 kHz (modulated pulses <10µs to CW)
- Efficiency up to 10x equivalent Nd YAG lasers
- High output power stability
- Full comms / analog I-O control options
- Application optimized beam profile
- Improved process control for welding
- 2-year standard warranty (additional warranty options available)

Applications

Made For..... Materials processing

Precision welding
Cutting
Bending
Bonding
Plastics Cutting/welding
Sintering
Annealing
Surface texturing



Application Optimised Beam Profile

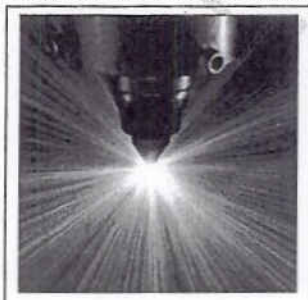
redPOWER®

The redPOWER® series of fiber lasers from SPI has been designed to meet the highest standards of reliability, repeatability and user safety.

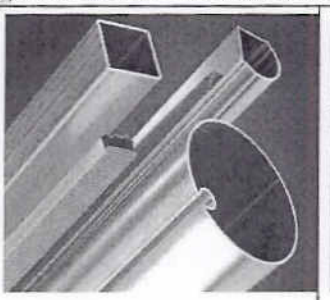
The commercial advantages of fiber lasers over alternative technologies are far reaching: improved line speeds, finer machining capabilities, reduced downtime and lower cost of ownership, giving users a leading edge advantage. With the Low Moded (LM) M^2~4 beam parameters, the laser has been optimised as a highly flexible process tool for a wide range of cutting and welding applications. SPI's R4 LM lasers are designed for applications in markets such as medical, electronics, plastics and printing.

Significant design features of the SPI unit include thermal management, low noise, output stability and system-to-system repeatability. Every care has been taken at the design stage to ensure our products offer a long and maintenance-free life.

Designed in accordance with: IEC/EN 60825 Laser safety, IEC/EN 61010 Electrical safety, IEC/EN 61000 EMC, RoHS Directive.

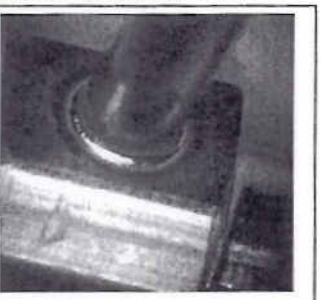


Fiber Laser Cutting



Tube Cutting

Remote Welding- Fraunhofer IWS



Seam Welding

www.spilasers.com

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SM-S00167 Issue C
PRELIMINARY

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SPI Lasers LLC, 4000 Burton Drive, Suite 1, Santa Clara, CA 95054
US office: +1 408 454 1169

nqa. ISO 9001 Registered UKAS

Optical		
Rated output power	200W "LM"	400W "LM"
Central emission wavelength	1070 ± 10nm	
Mode of operation	CW and Modulated	
Output power variation	<± 3 % [1]	
Red pilot laser	Standard	
Pulse Characteristics		
Maximum modulation rate	100kHz	
Minimum pulse width	<10 µS	
Output Beam Characteristics		
Beam diameter	3.2 ± 0.5	
Full angle divergence	<3.0	
M^2 / Beam Parameter Product (BPP)	3-5 / 1 – 1.7 mm.mrad	
Polarization	Random	
Beam delivery cable length	6m (standard) / options available	
Control		
Control interface	Analog/RS232 (standard) / options available	
Control options	Open Loop	
Electrical		
Power supply requirements	Single Phase	
Operating Voltage(Vac 50 - 60 Hz)	240	
Safety Interlock Performance Level	PL'e' [2]	
Mechanical		
Dimensions	5U (19") rack unit 507 x 483 x 221 mm	
Weight	<45kg	
Cooling	Water	
Environmental		
Operating temperature	5-40°C	
Humidity	5-85% RH (non-condensing)	
Configuration Options		
10m Beam delivery optic cable	•	•
PSE (Pulse Shape Equalization)	•	•
XPR (Extended Processing Range)	•	•

[1] 8 hrs constant temperature [2] ISO 13849-1 - Safety of Machinery

Accessories

Visit www.spilasers.com for more information on accessories and accessory datasheets.

- Extended warranty options
- Longer beam delivery optic lengths

Terms and Conditions

Some specific combinations of product specifications and optional accessory may not be available. These lasers are designed as products for incorporation or integration into other equipment. All product information is believed to be accurate and subject to change without notice. A complete product specification will be issued on request at time of order acknowledgement. The user assumes all risks and liability whatsoever in connection with the use of the product or its application.

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redPOWER®

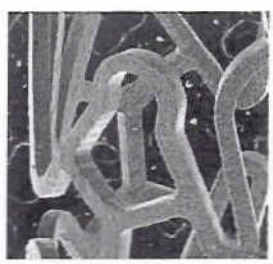
High Power Fiber Lasers R4 25-400W CW/M -"HS"
With GTWave® Technology

Features

- CW or Modulated to 100 kHz (modulated pulses <10µs to CW)
- Single mode (M^2 <1.1)
- Efficiency up to 10x equivalent Nd YAG lasers
- High stability laser (typically <±0.5% output power variation)
- Spot size to sub 10µm
- Open Loop/ Closed Loop Control Options
- XPR, PSE Extended performance control options
- Full comms/analog I-O control options
- High reliability optics, diode MTTF > 400,000 hours
- 2-year standard warranty (additional warranty options available)

Applications

- Materials processing
  - Precision welding
  - Cutting
  - Bending
  - Bonding
  - Drilling
  - Rapid prototyping
  - Sintering
  - Annealing
  - Surface texturing
- Marking and engraving
  - Graphic image processing
  - Flexo
  - Anilox
  - Gravure



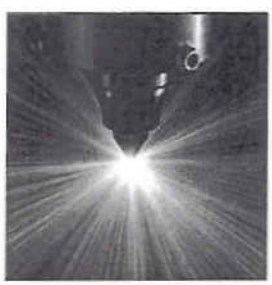


Image Courtesy of Inno-Shape and Bessy

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The commercial advantages of fiber lasers over alternative technologies are far reaching: improved line speeds, finer machining capabilities, reduced downtime and lower cost of ownership, giving users a leading edge advantage. SPI's R4 "HS" series lasers can be employed in a wide range of process requirements and have been optimized for maximum performance and operating flexibility. Extended Performance Range (XPR) and Pulse Shape Equalization (PSE) control features are available options for the most demanding applications.

Significant design features of the SPI unit include thermal management, low noise, output stability and system-to-system repeatability. Every care has been taken at the design stage to ensure our products offer a long and maintenance-free life.

Designed in accordance with: IEC/EN 60825 Laser safety, IEC/EN 61010 Electrical safety, IEC/EN 61000 EMC, RoHS Directive.

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SM-S00087 Issue F

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nqa. ISO 9001 Registered | UKAS

Rated output power	25W "HS"	50W "HS"	75W "HS"	100W "HS"	200W "HS"	300W "HS"	400W "HS"
Optical							
Central emission wavelength	1070 ± 10nm						
Mode of operation	CW and Modulated						
Output power variation	<± 0.5% (typical) [1]						
Red pilot laser	Standard						
Pulse Characteristics							
Maximum modulation rate	100kHz						
Minimum pulse width	<10 µS						
Output Beam Characteristics							
Beam diameter	5.0 ± 0.5mm				5.0 ± 0.7mm		
Full angle divergence	<0.4mrad				<0.45mrad		
M^2 / Beam parameter product (BPP)	<1.1 (nominal) <0.37 mm.mrad						
Polarization	Random						
Beam delivery cable length	6m (standard) / options available						
Control							
Control Interface	Analog/RS232 (standard) / options available						
Control Options	Closed Loop / Open Loop						
Operating Voltage(Vac 50 - 60 Hz)	100-240				240		
Electrical							
Power supply requirements	Single Phase						
Operating Voltage(Vac 50 - 60 Hz)	100-240				240		
Safety Interlock Performance Level	PL'e' [2]						
Mechanical							
Dimensions	5U (19") rack unit 507 x 483 x 221 mm						
Weight	<45kg						
Cooling	Air	Air	Air	Air	Air		
					Water	Water	Water
Environmental							
Operating temperature	5-40°C						
Humidity	5-85% RH (non-condensing)						
Configuration Options							
10m Beam delivery optic cable	•	•	•	•	•	•	• [2]
PSE (Pulse Shape Equalization)	•	•	•	•	•	•	•
XPR (Extended Processing Range)					• [3]	•	•

[1] Measured under closed loop control **[2] ISO 13849-1 Safety of Machines** **[3] Water cooled variant only**

Accessories

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SPI Lasers | inspiring your products & manufacturing

redPOWER®

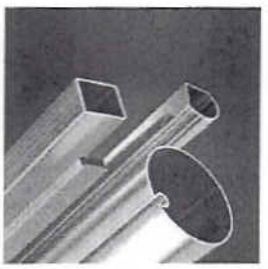
High Power Fiber Lasers R4 100-400W CW/M –"RS"
With GTWave® Technology

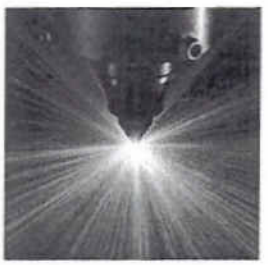
Features

- CW or Modulated to 10 kHz (modulated pulses <10µs to CW)
- Single mode (M^2 <1.1)
- Efficiency up to 10x equivalent Nd YAG lasers
- Spot size to sub 10µm
- High stability laser
- Dynamic pulse shape control
- Full comms/analog I-O control options
- High reliability optics, diode MTTF > 400,000 hours
- 2-year standard warranty (additional warranty options available)

Applications

- Materials processing
  - Precision welding
  - Cutting
  - Bending
  - Bonding
  - Drilling
  - Sintering
  - Annealing





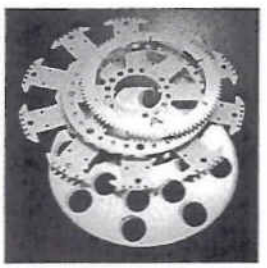


Image courtesy of Micrometric

redPOWER®

The redPOWER® series of fiber lasers from SPI has been designed to meet the highest standards of reliability, repeatability and user safety.

The commercial advantages of fiber lasers over alternative technologies are far reaching: improved line speeds, finer machining capabilities, reduced downtime and lower cost of ownership, giving users a leading edge advantage. SPI's R4 "RS" product variants can be employed in a wide range of material processing applications and have been optimized to enable maximum performance to be achieved at competitive cost.

Significant design features of the SPI unit include thermal management, low noise, output stability and system-to-system repeatability. Every care has been taken at the design stage to ensure our products offer a long and maintenance-free life.

Designed in accordance with: IEC/EN 60825 Laser safety, IEC/EN 61010 Electrical safety, IEC/EN 61000 EMC, RoHS Directive.

www.spilasers.com
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SM-S00184 Issue C

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nqa. ISO 9001 Registered | UKAS

Rated output power	50W "RS"	100W "RS"	200W "RS"	300W "RS"	400W "RS"
Central emission wavelength	1070 ± 10nm				
Mode of operation	CW and Modulated				
Output power variation	<± 3% [1]				
Red pilot laser	Standard				
Pulse Characteristics					
Maximum modulation rate	10 kHz				
Minimum pulse width	<10 µS				
Output Beam Characteristics					
Beam diameter	5.0 ± 0.5mm		5.0 ± 0.7mm		
Full angle divergence	<0.4mrad		<0.45mrad		
M^2 / Beam Parameter Product (BPP)	<1.1 (nominal) / <0.37 mm.mrad				
Polarization	Random				
Beam delivery cable length	6m (standard) / options available				
Control					
Control interface	Analog / RS232 (standard) / options available				
Control options	Open Loop				
Electrical					
Power supply requirements	Single Phase				
Operating Voltage(Vac 50 - 60 Hz)	100-240			240	
Safety Interlock Performance Level	PL'd'[2]				
Mechanical					
Dimensions	5U (19") rack unit 507 x 483 x 221 mm				
Weight	<45kg				
Cooling	Air			Water	
Environmental					
Operating temperature	5-40°C				
Humidity	5-85% RH (non-condensing)				
Configuration Options					
10m Beam delivery optic cable	•	•	•	•	•
PSE (Pulse Shape Equalization)	N/A	N/A	N/A	N/A	N/A
XPR (Extended Processing Range)	N/A	N/A	N/A	N/A	N/A

(1) 8 hours at constant temperature **(2) ISO 13849-1 Safety of Machinery**

Accessories

Visit www.spilasers.com for more information on accessories and accessory datasheets.

- Extended warranty options
- Longer beam delivery optic lengths

Terms and Conditions

Some specific combinations of product specifications and optional accessory may not be available. These lasers are designed as products for incorporation or integration into other equipment. All product information is believed to be accurate and subject to change without notice. A complete product specification will be issued on request at time of order acknowledgement. The user assumes all risks and liability whatsoever in connection with the use of the product or its application.

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LD pumped Nd: YAG LASER
SL188 series

To Customers

SL188 series has a very wide range of line-up. Adding standard model (SL188A/ SL188A2/ SL188AS/ SL188AS2) optimized for high average power, we can optimize them to variety of laser applications, like high beam quality model for and high pulse energy model etc...

Specification

LD pumped Nd: YAG laser
SL188A / SL188A2

Equipment type	SL188A	SL188A2
Laser crystal	Nd:YAG	
Laser wavelength	1.064μm	
Oscillator type	Continuous wave pumping and Q switching laser	
Output energy	>20mJ@10kHz	>20mJ@20kHz
Maximum average power	>200W@10kHz	>400W@20kHz
Cooling type	Water-cooled	Water-cooled
Utility	3phase200V 50 / 60Hz 30A	3phase200V 50 / 60Hz 60A

LD pumped Nd: YAG SHG laser
SL188AS / SL188AS2

Equipment type	SL188AS	SL188AS2
Laser crystal	Nd:YAG	
Laser wavelength	0.532μm	
Oscillator type	Continuous wave pumping and Q switching laser	
Output energy	>10mJ@10kHz	>20mJ@10kHz

Maximum average power	>100W@10kHz	>200W@10kHz
Cooling type	Water-cooled	Water-cooled
Utility	3phase200V 50 / 60Hz 30A	3phase200V 50 / 60Hz 60A

New Series !!
LD pumped Nd: YAG THG laser
SL188AT

Equipment type	SL188AT	SL188AT2 *
Laser crystal	Nd:YAG	
Laser wavelength	0.355μm	
Oscillator type	Continuous wave pumping and Q switching laser	
Output energy	>6mJ@8kHz	>10mJ@10kHz
Maximum average power	>50W@8kHz	>100W@10kHz
Cooling type	Water-cooled	Water-cooled
Utility	3phase200V 50 / 60Hz 30A	3phase200V 50 / 60Hz 60A

* : In development.

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Product Information

- Laser Processing Systems
- Lineup by Application

Pulse IR YAG Laser

Continuous Wave IR YAG Laser
Q Switched IR YAG Laser

Q Switched Green YAG Laser
Q Switched UV YAG Laser

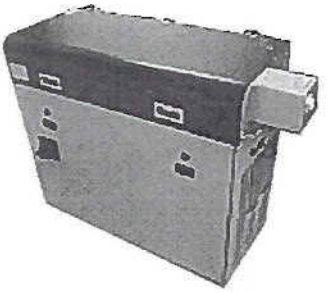
Q Switched IR YVO4 Laser
Q Switched Green YVO4 Laser
Q Switched UV YVO4 Laser

Fiber Laser

- LCD Manufacturing Equipment
- Rechargeable Battery Inspection Equipment

Product Information

Continuous Wave IR YAG Laser / Q Switched IR YAG Laser



KLY-C300a

Continuous output type "KLY-C300a" achieves 15% or more electricity-optical conversion efficiency under the condition of beam quality where transmission to optical fiber with core diameter 300μmf is possible by the optimization of YAG crystal configuration corresponding to LD pumping and development of high steady high-luminance and highly stable oscillator.

KLY-Q200a

Q-switched pulse type "KLY-Q200a" succeeds in obtaining 30nsec Q-switched pulse at the shortest by enhancing the efficiency as well as development of the super-highspeed gain switch control system of AO-Q switch elements that generate Q-switched pulse. The average output class of "KLY-Q200a" makes it possible to gain 200kW Q-switched pulse at the maximum.

KLY-SQ350a

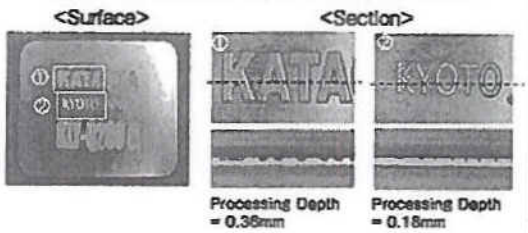
"LD pumping technology" and "Q-switched control technology" that we cultivated thorough the development of KLY-series were gathered for the development of KLY-SQ350a laser osccillator boasting of domestic top level average output and peak output in LD pumping high output Q-switched type IR lasers. In addition, new technology was adopted, as a result, we succeeded in the development of KLY-SQ350a. Both quality of beam and high output are achieved. High performance was achieved in all aspects such as "average output: 300W" and "Maximum peak output:250kW", "M2<15". In addition, due to LD pumping, high output as well as small size are also realized. The design is system consturciton friendly, therefore, for laser osccilator and power source, either separated type or integrated type can be selected in order to correpond to all applications.

Applications

Deep Engraving Marking、High-Speed Cutting、Large Area Removal Processing

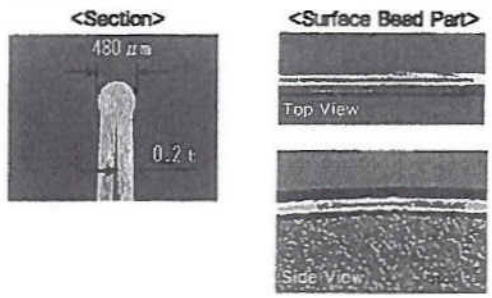
Processed Example

Aluminum Deep Engraving Processing



Oscillator Model : KLY-Q200 α
Processing Details : Deep Engraving
Material : A5000 Series
Processing Optics : Galvano Scanner

SUS Doughnut-Shape Peripheral Welding



Oscillator Model : KL Y-C300 α
Processing Details : Overlapping Outer Welding
Material : SUS304
Sheet Thickness : 0.2t
Processing Nozzle : KLP-HF80/C-T

Basic Specifications

Item	Details		
Model	KLY-C300α	KLY-Q200α	KLY-SQ350α
Wavelength	1064nm		
Pumping Source	808nm Semiconductor Laser (LD)		
Active Medium	Nd:YAG Crystal		
Configuration	Integrated Oscillator and Power Operating Voltage Part Type (Chiller Unit separate) SI Type/GI Type Type Fiber	Integrated Oscillator and Power Operating Voltage Part Type (Chiller Unit separate) Direct Ray Optics	Separate Oscillator and Power Operating Voltage Part Type Or Integrated Type (Chiller Unit separate)
Maximum Average Output Power	300W	200W@20kHz	300W10kHz
Maximum Peak Output Power	-	200kW@5kHz	250kW@10kHz
Maximum Frequency	CW,1Hz~500Hz	100Hz~50kHz	5kHz~15kHz
Pulse Width	-	<300nsec@10kHz	<150nsec@10kHz
Output Power Stability	Less than 2%rms (Cooling water stability: ±1℃.)		
Operating Voltage	AC220V±0%、50／60H z ±1Hz		

Input power Consumption	3.5kVA	6kVA
Weight	170kg	175kg
External Dimensions W×H×Dmm3	398×940×1060mm3 (Not including protrusions)	456×940×1064mm3 (Not including protrusions)

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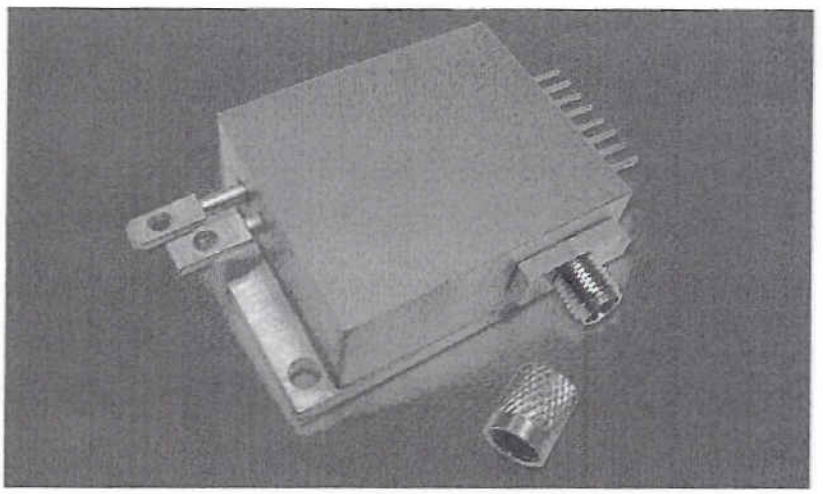
808nm High Brightness Diode Laser

K81DA4C-20.00W-FS K81DA4C-30.00W-FS



Key Features:

- 20W, 30W output power
- 200μm,400μm detechable fiber
- 0.22NA
- 808nm wavelength
- Compact package

Options:

- Integrated 650nm aiming beam
- Monitor photo diode
- Fiber detection sensor

BWT Beijing's High Power Diode Laser Modules are manufactured by adopting specialized fiber-coupling techniques, resulting in volume products with a high efficiency, stability and superior beam quality. The products are achieved by transforming the asymmetric radiation from the laser diode chip into an output fiber with small core diameter by using special micro optics. Inspecting and burn-in procedures in every aspect come to a result to guarantee each product with the reliability, stability and long lifetime.

Our research staffs are constantly improving and innovating the processing technology in the producing process, based on the professional knowledge and experience accumulated in long-terms. We are also continuously developing new products to meet customers' specific needs.

At BWT Beijing, to provide high quality products with reasonable price is our always goal.

808nm High Brightness Diode Laser

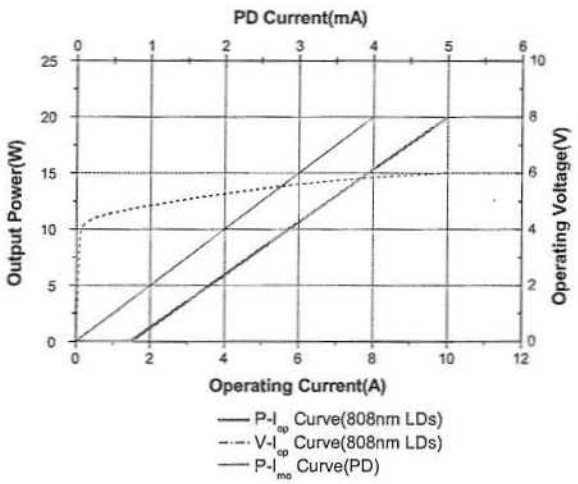
K81DA4C-20.00W-FS K81DA4C-30.00W-FS

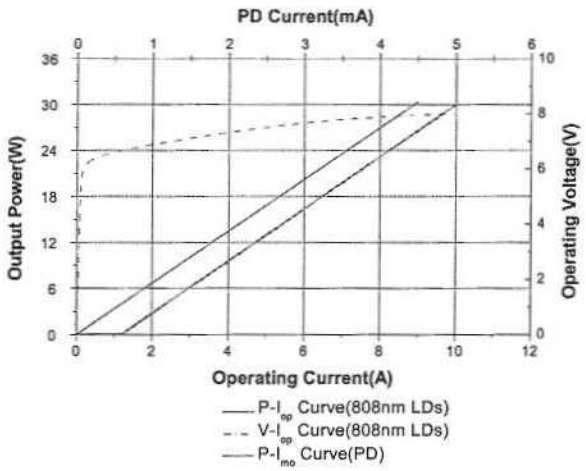
Specifications (25℃)		Symbol	Unit	K81DA4C-20.00W-FS	K81DA4C-30.00W-FS
Optical data	CW-output power	P_o	W	20	30
	Center wavelength	λ_c	nm	808	
	Tolerance of λ	-	nm	±3,±10	
	Spectral width (FWHM)	$\Delta\lambda$	nm	<3	
	Temperature drift of λ	-	nm/℃	~0.3	
Connector data	Designed for fiber core diameter	W_c	μm	200/400	
	Designed for fiber numerical aperture	NA	-	0.22	
	Fiber connector	-	-	SMA-905	
Electrical data	Operation current	I_{op}	A	10	
	Threshold current	I_{th}	A	1.5	1.2
	Conversion efficiency	η	%	40	40
	Slope efficiency	η_D	W/A	2.8	3.8
	Operation voltage	V_{op}	V	5.8	7.8
	Reverse voltage	V_{re}	V	6	8
PD data	Current	I_{mo}	mA	<0.6	<0.8
Aiming beam data	Output power	P_a	mW	>2	
	Wavelength	λ_a	nm	650±10	
	Voltage	V_a	V	2.2	
	Current	I_a	mA	<30	
Others	Operation temperature	T_{op}	℃	10~30	
	Storage temperature	T_{st}	℃	-20~+80	
	Expected lifetime	MTBF	h	>10,000	
	Dimensions (fiber and connector not included)	-	mm	52.0×35.0×20.0	
	Lead soldering temperature	T_{ls}	℃	260(10 sec.)	

808nm High Brightness Diode Laser

K81DA4C-20.00W-FS K81DA4C-30.00W-FS

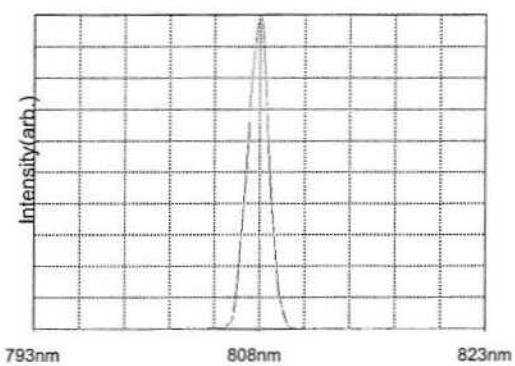
Characteristics



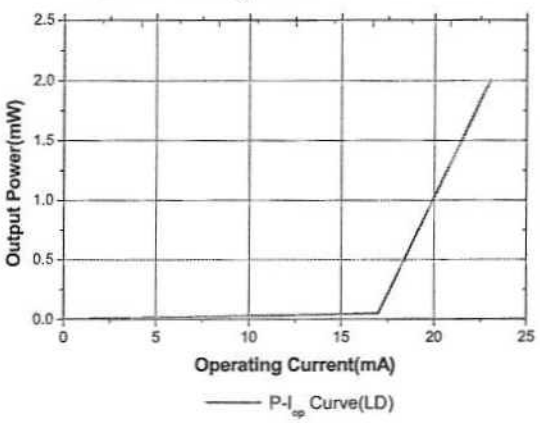


Typ. spectrum (T=25℃)

808nm diode laser modules



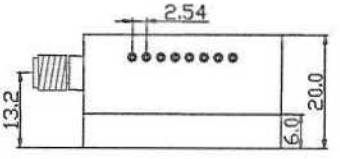
650nm Aiming Beam Characteristics

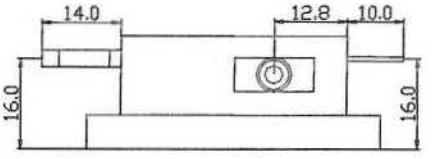


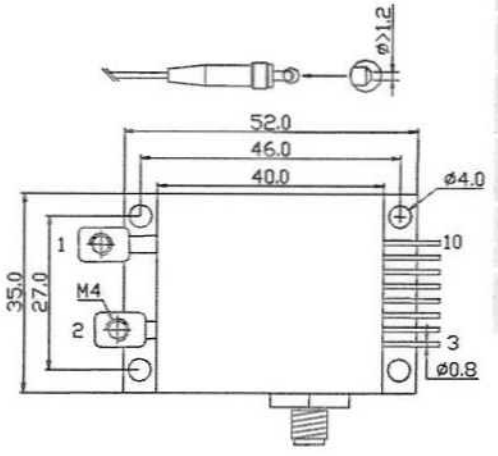
808nm High Brightness Diode Laser

K81DA4C-20.00W-FS K81DA4C-30.00W-FS

Package Dimensions (mm)







Pin	Function	Pin	Function
1	LD (-)	6	Aiming Beam LD (+2.2V) PD (N)
2	LD (+), Case	7	Aiming Beam LD (0V)
3	FCD LED (+)	8	PD (P)
4	FCD LED (-) FCD PD (P)	9	Thermistor
5	FCD PD (N)	10	Thermistor

※FCD: Fiber Connector Detector

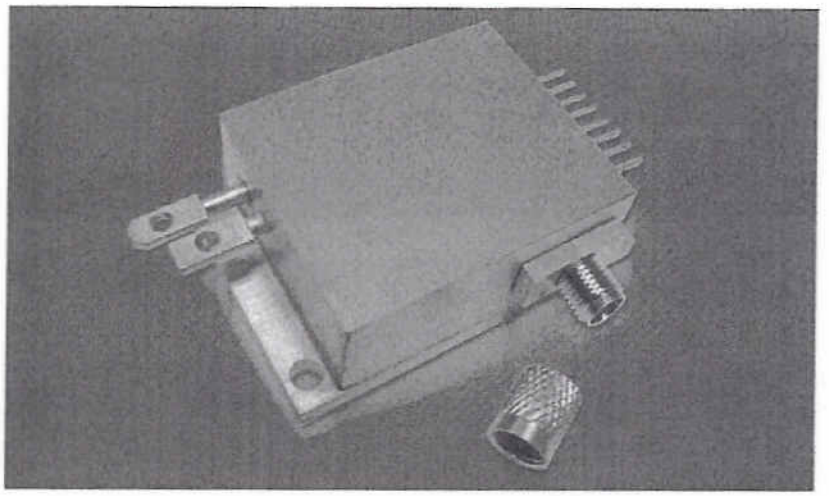
OPERATING NOTES

- Avoid eye exposure to direct or scattered radiation.
- ESD precautions must be taken.
- Please connect pins to wires by solder instead of using socket when operation current is higher than 6A. Soldering point should be close to the root of the pins. Soldering temperature should be lower than 260℃ and time shorter than 10 second.
- Use constant current power supply. Avoid surge current.
- Laser diode must be used according to the specifications.
- Laser diode must work with good cooling.
- Operation temperature is 10℃~ 30℃.
- Storage: -20℃~ +80℃, all pins short-circuit.

Information and specifications contained herein are deemed to be reliable and accurate. BWT Beijing reserves the right to change, alter or modify the design and specifications of these products at any time without notice.

976nm High Brightness Diode Laser

K98DA4C-20.00W-FS K98DA4C-30.00W-FS



Key Features:

- 20W, 30W output power
- 200μm/400um detechable fiber
- 0.22NA
- 976nm wavelength
- Compact package

Options:

- Integrated 650nm aiming beam
- Monitor photo diode
- Fiber detection sensor

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976nm High Brightness Diode Laser

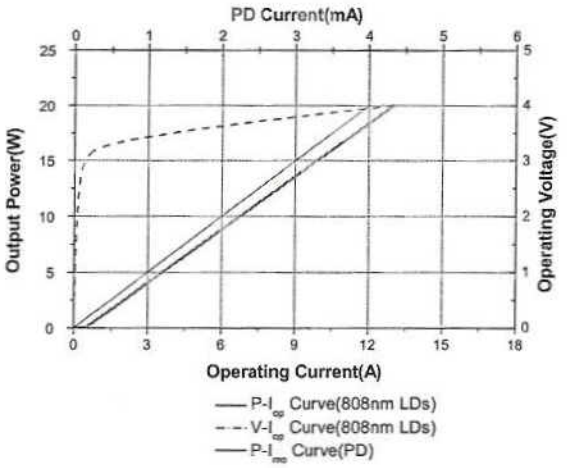
K98DA4C-20.00W-FS K98DA4C-30.00W-FS

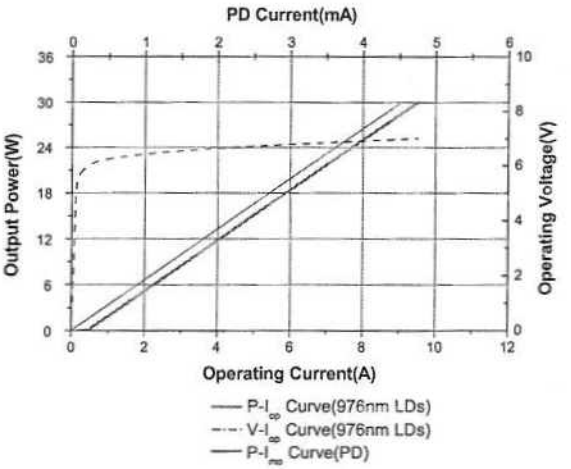
Specifications (25℃)		Symbol	Unit	K98DA4C-20.00W-FS	K98DA4C-30.00W-FS
Optical data	CW-output power	P_o	W	20	30
	Center wavelength	λ_c	nm	976	
	Tolerance of λ	-	nm	±3,±10	
	Spectral width (FWHM)	Δλ	nm	<3	
	Temperature drift of λ	-	nm/℃	~0.3	
Connector data	Designed for fiber core diameter	W_c	μm	200/400	
	Designed for fiber numerical aperture	NA	-	0.22	
	Fiber connector	-	-	SMA-905	
Electrical data	Operation current	I_{op}	A	13	9.5
	Threshold current	I_{th}	A	0.5	0.5
	Conversion efficiency	η	%	38	48
	Slope efficiency	η_D	W/A	1.6	3.5
	Operation voltage	V_{op}	V	4	7
PD data	Current	I_{mo}	mA	<6.0	<8.0
Aiming beam data	Output power	P_a	mW	>2	
	Wavelength	λ_a	nm	650±10	
	Voltage	V_a	V	2.2	
	Current	I_a	mA	<30	
Others	Operation temperature	T_{op}	℃	10~30	
	Storage temperature	T_{st}	℃	-20~+80	
	Expected lifetime	MTBF	h	>10,000	
	Dimensions (fiber and connector not included)	-	mm	52.0×35.0×20.0	
	Lead soldering temperature	T_{ls}	℃	260(10 sec.)	

976nm High Brightness Diode Laser

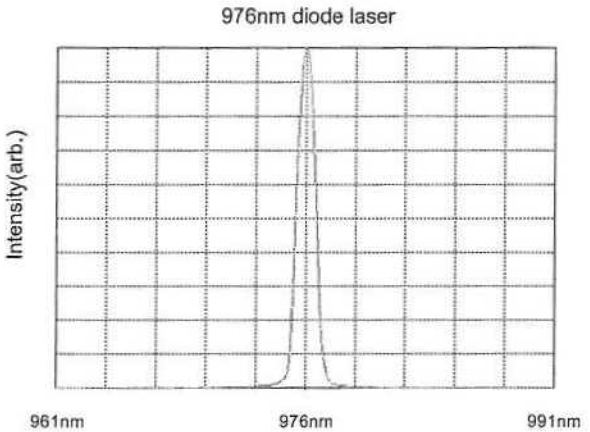
K98DA4C-20.00W-FS K98DA4C-30.00W-FS

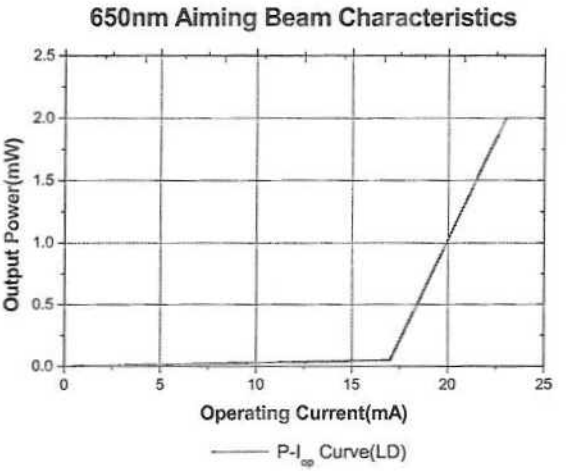
Characteristics





Typ. spectrum (T=25℃)

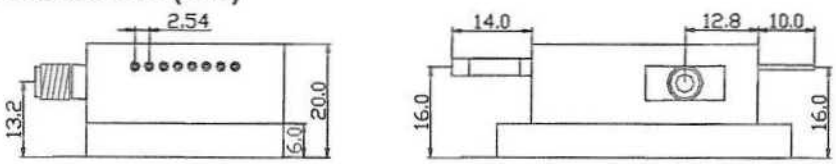


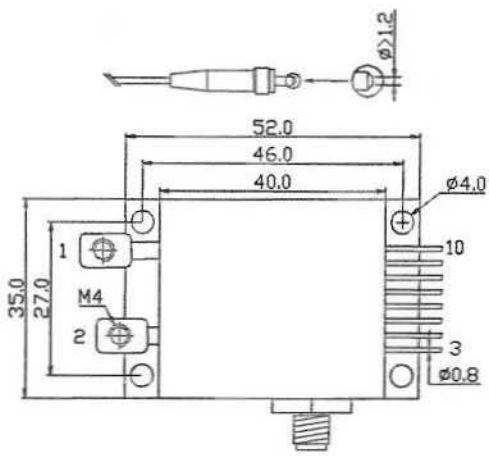


976nm High Brightness Diode Laser

K98DA4C-20.00W-FS K98DA4C-30.00W-FS

Package Dimensions (mm)





Pin	Function	Pin	Function
1	LD (-)	6	Aiming Beam LD (+2.2V) PD (N)
2	LD (+), Case	7	Aiming Beam LD (0V)
3	FCD LED (+)	8	PD (P)
4	FCD LED (-) FCD PD (P)	9	Thermistor
5	FCD PD (N)	10	Thermistor

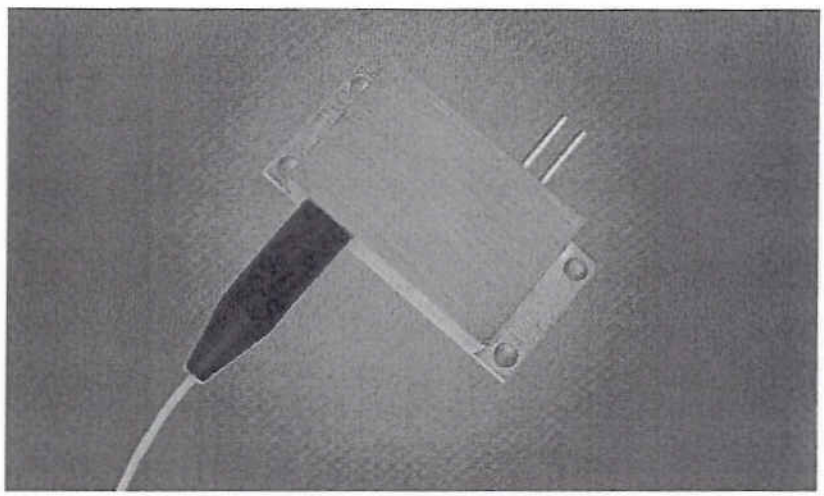
OPERATING NOTES

- Avoid eye exposure to direct or scattered radiation.
- ESD precautions must be taken.
- Please connect pins to wires by solder instead of using socket when operation current is higher than 6A. Soldering point should be close to the root of the pins. Soldering temperature should be lower than 260℃ and time shorter than 10 second.
- Use constant current power supply. Avoid surge current.
- Laser diode must be used according to the specifications.
- Laser diode must work with good cooling.
- Operation temperature is 10℃~ 30℃.
- Storage: -20℃~ +80℃, all pins short-circuit.

Information and specifications contained herein are deemed to be reliable and accurate. BWT Beijing reserves the right to change, alter or modify the design and specifications of these products at any time without notice.

Ant Series- 9××nm High Brightness Diode Laser

K91SA3F-25.00W-R K94SA3F-25.00W-R K98SA3F-25.00W-R



Key Features:

- 25W output power
- 105μm fiber core diameter
- 0.15NA/0.22NA
- 915nm, 940nm, 976nm Wavelength
- 1040nm-1100nm feedback protection

Applications:

- Pumping fiber laser
- Medical use
- Material processing

BWT Beijing's High Power Diode Laser Modules are manufactured by adopting specialized fiber-coupling techniques, resulting in volume products with a high efficiency, stability and superior beam quality. The products are achieved by transforming the asymmetric radiation from the laser diode chip into an output fiber with small core diameter by using special micro optics. Inspecting and burn-in procedures in every aspect come to a result to guarantee each product with the reliability, stability and long lifetime.

Our research staffs are constantly improving and innovating the processing technology in the producing process, based on the professional knowledge and experience accumulated in long-terms. We are also continuously developing new products to meet customers' specific needs.

At BWT Beijing, to provide high quality products with reasonable price is our always goal.

Ant Series- 9××nm High Brightness Diode Laser

K91SA3F-25.00W-R K94SA3F-25.00W-R K98SA3F-25.00W-R

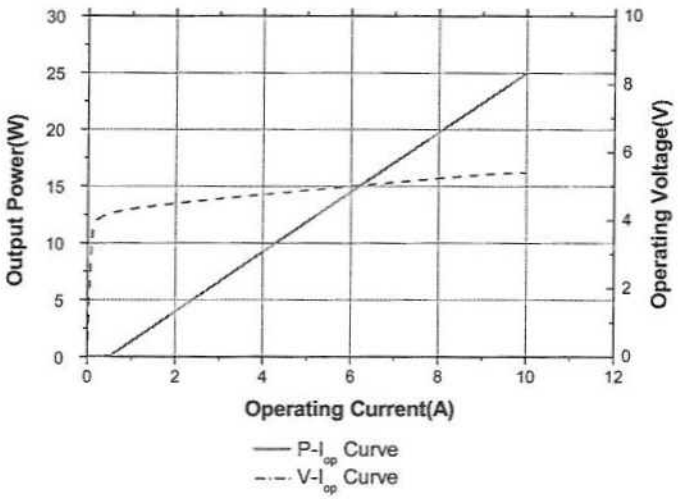
	Specifications (25℃)	Symbol	Unit	K91SA3F-25.00W-R K94SA3F-25.00W-R K98SA3F-25.00W-R
Optical data	CW-output power	P_o	W	25
	Center wavelength	λ_c	nm	915/940/976
	Tolerance of λ	-	nm	±3,±10
	Spectral width (FWHM)	Δλ	nm	<5
	Temperature drift of λ	-	nm/℃	~0.3
Fiber data (1)	Fiber core diameter	W_c	μm	105
	Numerical aperture	NA	-	0.15/0.22
	Fiber connector	-	-	FC, ST, SMA-905
Electrical data	Operation current	I_{op}	A	10
	Threshold current	I_{th}	A	0.5
	Conversion efficiency	η	%	48
	Slope efficiency	η_D	W/A	2.8
	Operation voltage	V_{op}	V	5.4
	Reverse voltage	V_{re}	V	7.5
Feedback Isolation	Wavelength range	λ	nm	1040-1100
	Isolation	-	dB	>45
Others	Operation temperature	T_{op}	℃	10~30
	Storage temperature	T_{st}	℃	-20~+80
	Expected lifetime	MTBF	h	>100,000
	Dimensions (fiber and connector not included)	-	mm	42.0 x 25.0 x 17.0
	Lead soldering temperature	T_{ls}	℃	260(10 sec.)

(1) Other fibers available.

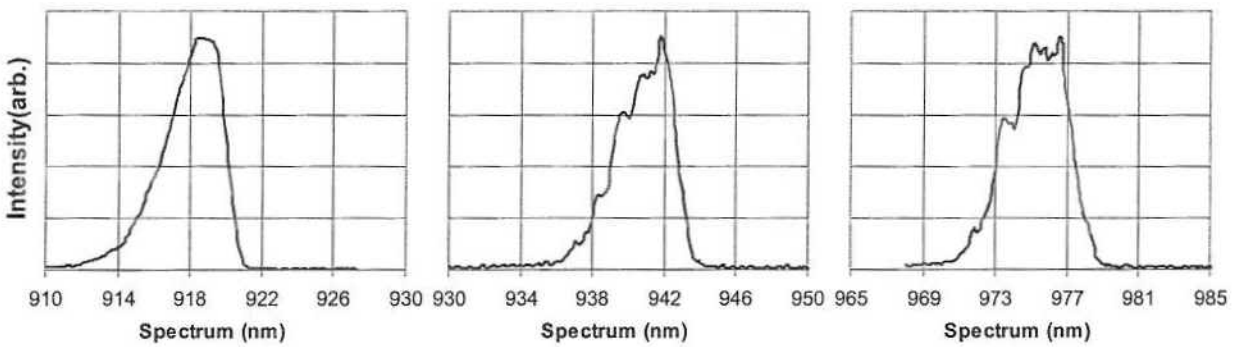
Ant Series- 9××nm High Brightness Diode Laser

K91SA3F-25.00W-R K94SA3F-25.00W-R K98SA3F-25.00W-R

Characteristics



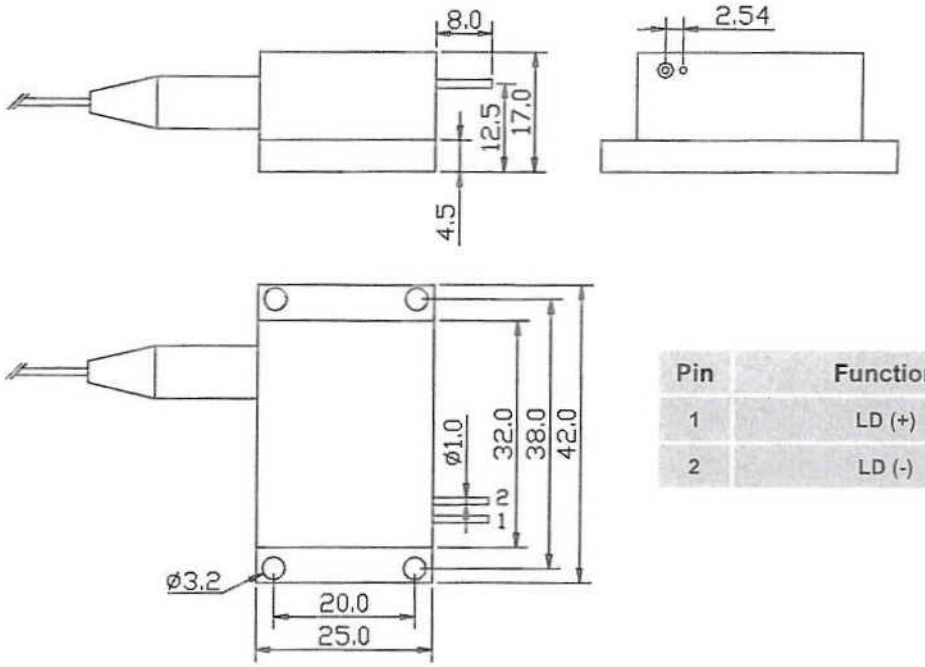
Typ. spectrum (T=25℃)



Ant Series- 9××nm High Brightness Diode Laser

K91SA3F-25.00W-R K94SA3F-25.00W-R K98SA3F-25.00W-R

Package Dimensions (mm)



Pin	Function
1	LD (+)
2	LD (-)

OPERATING NOTES

- Avoid eye exposure to direct or scattered radiation.
- ESD precautions must be taken.
- Please connect pins to wires by solder instead of using socket when operation current is higher than 6A. Soldering point should be close to the root of the pins. Soldering temperature should be lower than 260℃ and time shorter than 10 second.
- Use constant current power supply. Avoid surge current.
- Laser diode must be used according to the specifications.
- Laser diode must work with good cooling.
- A minimum bend diameter should be 300 times greater than the fiber diameter.
- Operation temperature is 10℃~ 30℃.
- Storage: -20℃~ +80℃, all pins short-circuit.

Information and specifications contained herein are deemed to be reliable and accurate. BWT Beijing reserves the right to change, alter or modify the design and specifications of these products at any time without notice.

BWT Beijing LTD is a high-tech enterprise located in Zhongguancun Science and Technology Fengtai Park, Beijing, China. BWT is a manufacturer that focuses on the packaging of pigtailed semiconductor lasers and detectors. BWT also provides customizing products and OEM services.

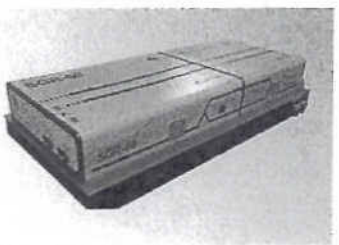
The company's products include fiber-coupled diode lasers, laser systems and the associated electronics, and diode laser arrays. It has between 50 and 100 employees including a research staff of two dozen, and approximately 2,000 square meters of manufacturing space.

PRODUCT INFO

SGR-Extra Series Q-switched Nd: YAG Solid State Laser

Products

The SGR-Extra series laser is one of Beamtech' s standard models with high energy output ranging from 6J to 25J at maximum rep rate of 10Hz. Since 2005, Beamtech has focused on Nd: YAG large energy, high peak power, solid state laser systems for science and industrial applications such as pumping Ti:sapphire ultrafast lasers and laser peening. To date, more than 10 units have been delivered to customers. The SGR-Extra series laser has been engineered and standardized to provide reliab



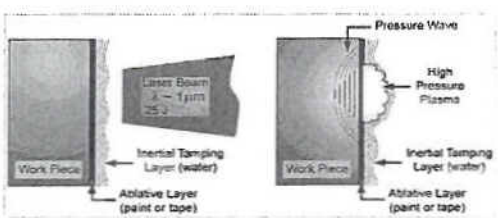
SGR-Extra Series Q-switched Nd: YAG Solid State Laser

Specifications:

	SGR-60	SGR-Extra-10	SGR-Extra-15	SGR-Extra-25
Energy(at 1Hz):	6J@1064nm 3J@532nm	10J@1064nm 5J@532nm	15J@1064nm 7J@532nm	25J@1064nm 12.5J@532nm
Energy(at 10Hz): (SGR-Extra-15,25at 5Hz)	5J@1064nm 2J@532nm	8J@1064nm 3J@532nm	10J@1064nm 7J@532nm	20J@1064nm 10J@532nm
Duration: (ns)	~10	~10	~10	~10
Divergence: (mrad)	≤2.5	≤2.5	≤2	≤2
Beam Profile: (mm)	Φ20	Φ22	Φ30	Φ35
Beam uniformity:	≥0.7	≥0.75	≥0.8	≥0.8

Applications

- Laser Ranging
- Ultrafast fs Pumping Source
- Laser driving Flyer
- Laser Peening
- Laser Excitation Plasma Source
- Laser and Material Interaction
- Nonlinear Optics
- Laser Cleaning
- Photocatalysis
- Plasma Diagnostics
- Material modified and peel



Laser peening schematic

Lasers for laser peening application

High efficiency pump cavity

Customer site of SGR-Extra-10

Features

- High beam quality, Super Gaussian uniform distribution
- 10ns pulse width, high peak power
- Larger output energy up to 25J@1064nm, 10J@532nm
- Engineering design, high reliability and stability
- High optical and mechanical stability, shakeproof
- Programmable software or remote control, easy system integrated automation work

Download Product Description

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Beamtech Optronics Co., Ltd., based in Beijing, PRC, specializes in solid-state laser design, development, manufacturing, sales and service. The company was founded in 1997, and in 2002 obtained ISO9001 certification by TÜV Rheinland (Certificate No. 01 100 064529).

Beamtech provides flashlamp-pumped Nd:YAG lasers for scientific research, medical and industrial OEM lasers and custom-built laser systems tailored to customer requirements. Beamtech lasers feature stable and reliable performance, good beam quality, ease of operation, and have been purchased by customers in China, the USA, Germany, Korea, Japan and India.

Beamtech utilizes the world most advanced technologies on laser design, development and engineering, and holds dozens of patents, including with respect to laser optical design, resonator design, laser mechanics and electrical design.

From developing its first 300J Nd:Glass high energy nanosecond laser system for Chinese Academy of Sciences in 2005 until now, Beamtech has successfully delivered more than 10 sets of high energy laser systems, which including its Melar and SGR-Extra series to customers worldwide. BeamTech recently announced its SGR-Extra-25 Q-switched Nd:YAG laser offering pulse energy of 25J at 1 Hz, with a 10ns pulse width, for laser peening, Ti:sapphire pumping and laser flyer research applications. BeamTech has delivered one of these systems to a US customer for laser peening.

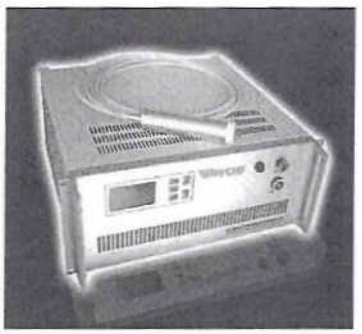
BeamTech was an exhibitor at the 2011 Photonics West trade show in San Francisco.

WUHAN RAYCUS FIBER LASER TECHNOLOGIES CO.,LTD.

200W Continuous Wave Fiber Laser

Product descriptions

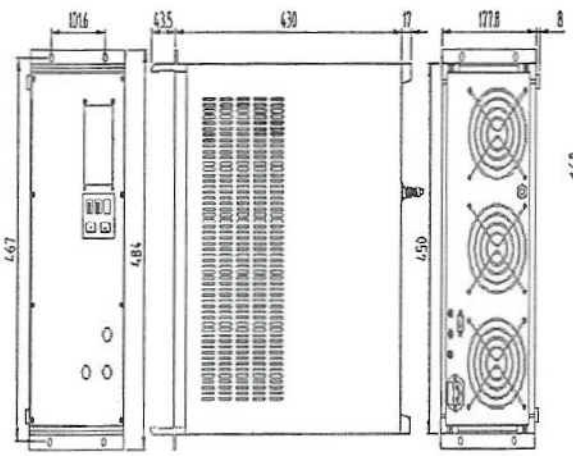
200W Continuous Wave fiber laser for marking metallic and nonmetallic materials with high beam quality and power stability. It can be used in operation environments of high-pressure and high-humidity.



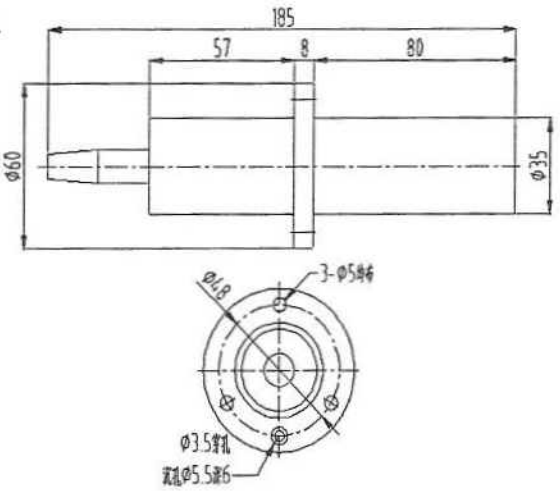
Applications

*Micromachining
*3-D deformation
*Thermal printing
*Drilling
*Cutting

Dimensions



Laser module dimension



Fiber collimator dimension

Technical parameters

Continuous wave fiber laser	200W CW
Wavelength (nm)	1064±1
Polarization	Random
Rated Output Power (W)	200
Power Adjustment Range (%)	5-100
Instability of Long-term nominal average output power (Over 5 hours) (%)	<3
Beam quality (M2)	<1.2
Output fiber length (m)	3
Working voltage (VAC)	220±10%, 50Hz
Power consumption (20℃) (W)	850
Cooling	Forced air cooled
Operating Temperature Range (℃)	0-45
Operating Humidity Range (%)	10-95
Dimension of optical module, W×D×H (mm)	484×185.8×490.5
Weight (kg)	15

ADD: HUST Industry District Innovation Base 10th Building, East Lake Hi-Tech Development Zone, China
TEL: +86-27-81338818 FAX: +86-27-81338810 P.C: 430223
HTTP://www.raycuslaser.com

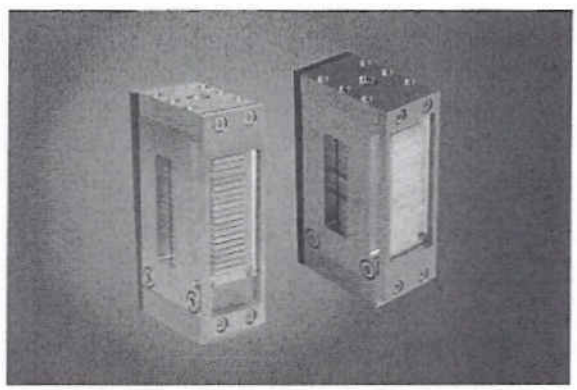
Vertical Stack Micro-channel Water Cooled Laser Diode (CW)

FEATURES

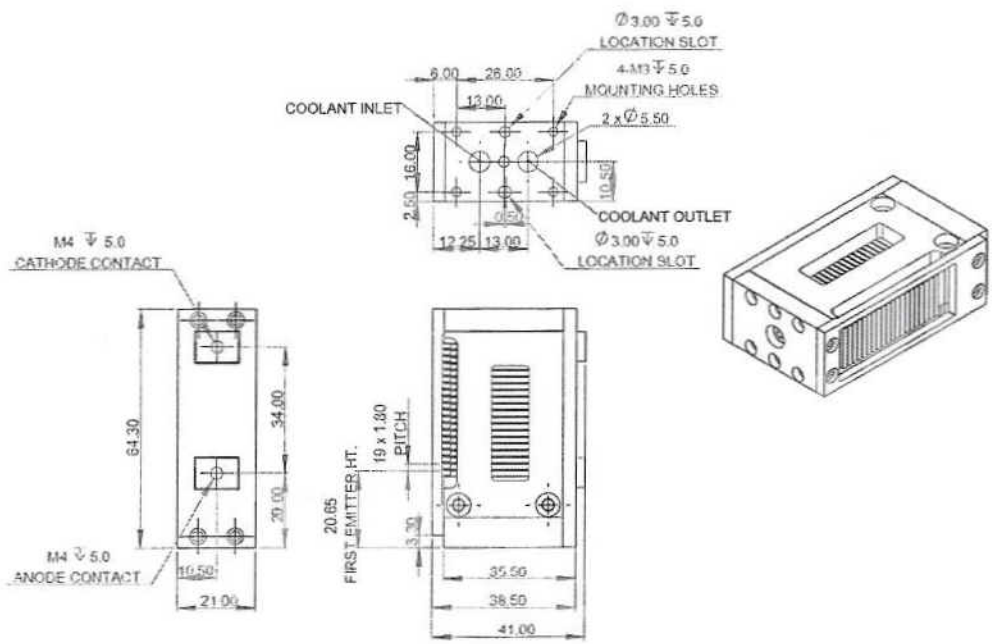
- High power
- Long lifetime
- Low Smile
- Narrow spectrum

APPLICATIONS

- Laser pumping
- Military and defense
- Industry applications
- Scientific research



Device Dimension (mm)



Remark: 5 to 20 bars are available, the above drawing is for 20 bars. Please contact FocusLight for details.

Specification

Products	FL-VS-2000-***-3	FL-VS-1000-***-3	FL-VS-500-***-3
Operating Power P_o(W)	2000	1000	500
Number of Bars	20	10	5
Center Wavelength λ(nm)	780～830	780～830	780～830
Wavelength Tolerance (nm)	±3	±3	±3
Operating Current I_o (A)	≤115	≤115	≤115
Threshold Current I_{th} (A)	≤25	≤25	≤25
Operating Voltage(V)	≤40	≤20	≤10
Slope Efficiency (W/A)	≥22.0	≥11.0	≥5.5
Power Conversion Efficiency (%)	≥50	≥50	≥50
Spectral Width FWHM (nm)	≤4	≤3.5	≤3.5
Spectral Width FW90%E(nm)	≤8	≤7	≤6
Fast Axis Divergence (90%,degree)	70	70	70
Slow Axis Divergence (90%,degree)	10	10	10
Wavelength Temp. Coefficient (nm/℃)	0.28	0.28	0.28
Operating Temperature (℃)	15～35	15～35	15～35
Storage Temperature (℃)	-40～60	-40～60	-40～60
Coolant	Deionized water		
Flow Rate (L/min/bar)	0.25-0.30		
Filter (μm)	<10		
Resistivity (MΩ/cm)	0.15-0.30		

Remarks:

- For fast axis collimation using FAC lens: Divergence <0.5°
- Data at 25°C water temperature, unless otherwise stated.
- Reduced lifetime if used above nominal operating conditions.
- A non-condensing environment is required for storage and operation below ambient dew point.

Xi'an Focuslight Technologies Co., Ltd.
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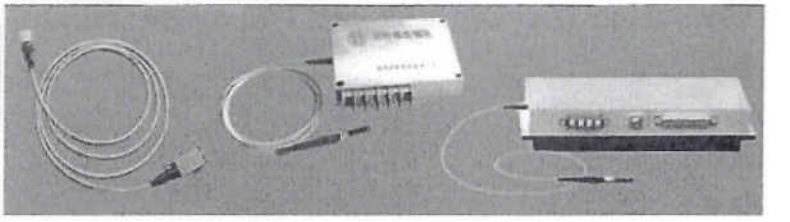
Xi'an, Shaanxi 710119,P.R.China
Tel: +86-29 8888 0786 Fax: +86-29 8888 7075
Email: sales@focuslight.com.cn
www.focuslight.com.cn

Hi-Tech Optoelectronics Co.,Ltd.

808nm Laser Module Series



Description

808nm laser module is the quantum well laser with no cooler .It can be multimode fiber coupled output at the high power and N.A. 0.12 / 0.22.The products can be used in the fields which need high power and long lifetime, like laser pumping , medical usage, printing , heat treatment of material ,marking and so on.

Features

* Kinds of output power: 600mW、750mW、 1.5W、5W、10W、14W、25W;
* Spectral Width <4nm
* 50μm、100μm、400μm、700μm Fiber Output
* High Reliability
* High Efficiency

Applications

* Laser pumping
* Medical Usage
* Printing
* Heating
* Material dealing
* Marking

Specifications（25℃）

Type	FLMM-0808-7*1-600m	FLMM-0808-7*1-750m	FLMM-0808-7*1-1.5W	FLMM-0808-8*1-005W	FLMM-0808-8*1-010W	FLMM-0808-9*1-012W	FLMM-0808-9*1-014W	FLMM-0808-9*1-025W	Unit
Optical Specification									
CW Output Power from Fiber P_f	600	750	1500	5000	10000	12000	14000	25000	mW
Center Wavelength λ_c	808	808	808	808	808	808	808	808	nm
Wavelength Tolerance	±5	±5	±5	±5	±5	±5	±5	±5	nm
Spectral Width Δλ	< 4	< 4	< 4	< 5	< 5	< 7(4)	< 7(4)	< 7(4)	nm
Wavelength Temperature Coefficient	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	nm/℃
Fiber Characteristics									
Fiber Core Size	50	100	100	400	400	700	700	700	μm
N.A.	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	
Fiber Length	1	1	1	1	1	1	1	1	m
Connecter	FC/ST/SMA-905								
Electrical Specification									
Slope Efficiency E_s	> 0.60	> 0.75	> 0.75	> 5	> 5	> 10	> 13	> 13	W/A
Threshold Current I_{th}	≤0.26	≤0.26	≤0.50	≤0.26	≤0.50	≤0.26	≤0.26	≤0.50	A
Operating Current I_o	≤1.24	≤1.24	≤2.55	≤1.24	≤2.55	≤1.24	≤1.24	≤2.55	A

Operating Voltage V_f	≤2	≤2	≤2.20	≤14	≤15.40	≤36	≤36	≤39.60	V
Series Resistance R_d	≤0.30	≤0.30	≤0.25	≤2.10	≤1.75	≤5.40	≤5.40	≤4.50	Ω
Package Style	P1-Package,HHL			P2-Package			P3- Package		
Absolute Maximum Ratings									
Reverse Voltage V_r	2	2	2.2	14	15	36	36	39	V
Operating Temperature T_o	≤25								℃
Storage Temperature T_{stg}	-10~60								℃

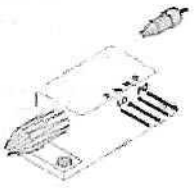
Ordering Information

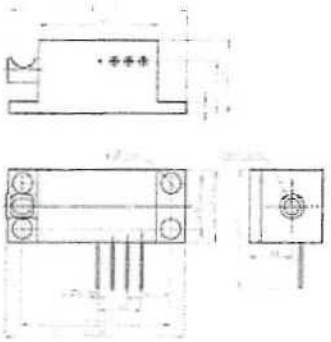
FLMS—□□□□—□□□—□□□□

- Output Power Unit:
  "m" "W" "K" means
  "mW" "W" "KW"
- Rated Output Power
  Fill with 0 if less than three numerals
- Cooling:
  1: Without cooler
- Connector:
  0: No connector
  1: FC/PC Output
  2: ST/PC Output
  6: SMA-905 Output
- Package:
  7: High power package 1
  8: High power package 2
  9: High power package 3
  A: HHL package
- Center Wavelength:
  Fill with 0 if Less than four numerals
- Multi-Mode Laser Diode Module Series Products

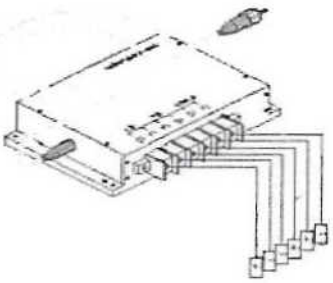
Package Dimensions

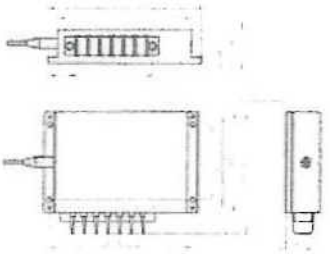
P1 Package (Clicking to magnify)



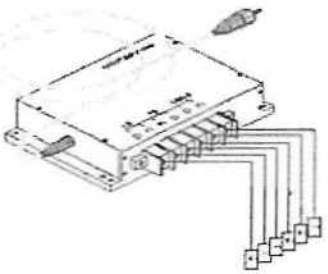


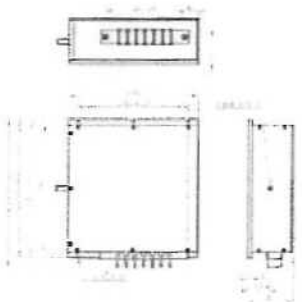
P2 Package (Clicking to magnify)



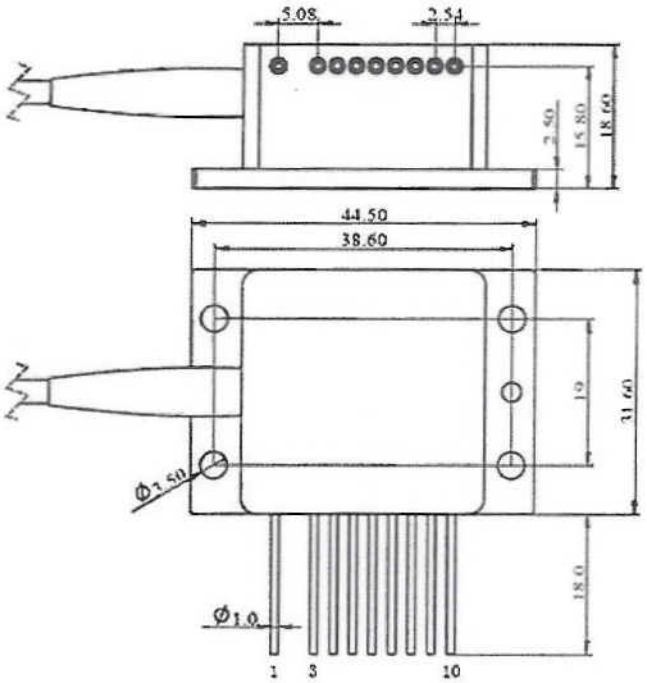


P3 Package (Clicking to magnify)





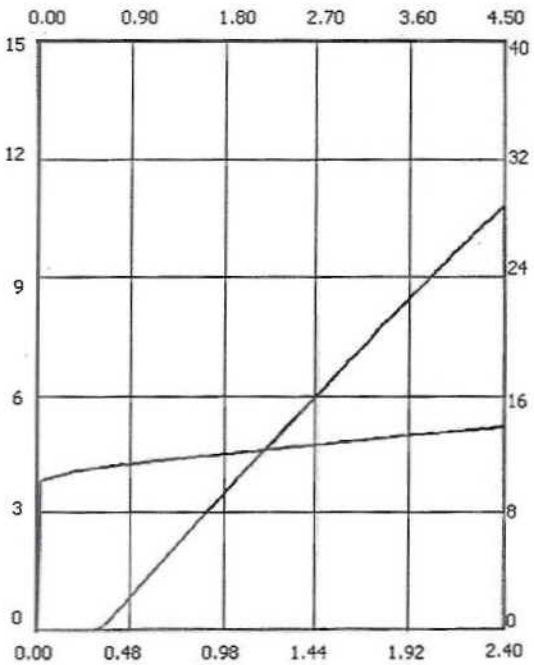
HHL Package

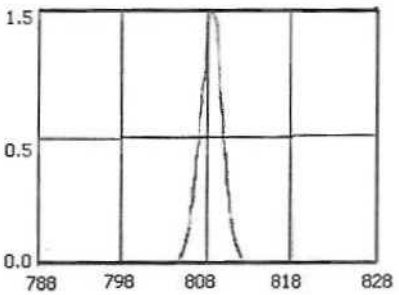


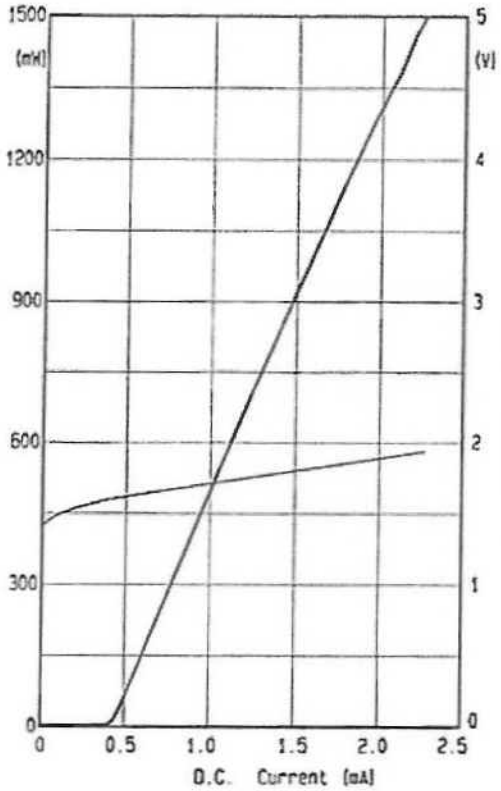
Pin Function

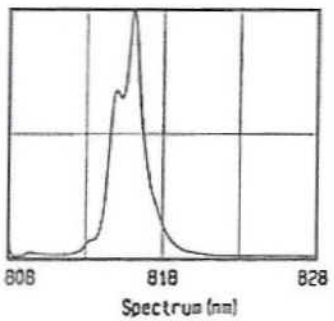
1 TEC(-)
2 -
3 case
4 LD(+)
5 Thermistor
6 Thermistor
7 LD(-)
8 PD (P)
9 PD (N)
10 TEC(+)

Typical Performance Curves









Notes

1. Laser beam is harmful especially for your eyes. Don't look at the laser beam directly.
2. Lifetime of the diode laser variated with the operating temperature inversely. We advise that the TEC cooler should be used to keep the temperature suitable.
3. For turning on the diode laser, please increase the current gradually to the specified operating value. For shutting down the diode laser, please decrease the current to zero gradually, and then turn off the power.
4. Please wear staticproof bracelet when operating.
5. Please connect the pins of the diode laser correctly as the picture showen in the manual.
6. The operating current must less than the rated current. Otherelse the diode laser should be damaged.
7. The fiber facet should be keep clean befor the diode laser is operating.
8. Please use the constant-current source to avoid the surge.
9. Diode laser should be short circuit when stop using.
10. Bend diameter of the fiber must be larger than 4cm temporarily and 8cm permanently.

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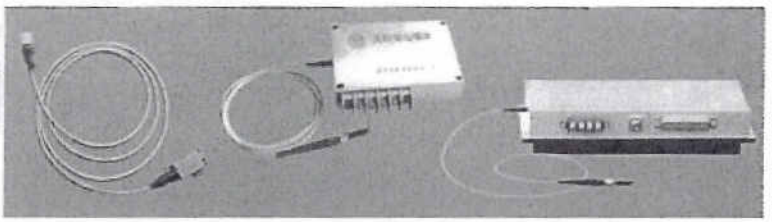
Hi-Tech Optoelectronics Co.,Ltd.

980nm Laser Module Series



Description

980 Laser Module Series are uncooled MQW Fiber-coupled Module ,operating with maximum output power CW: 25w and NA: 0.12 or 0.22 fiber-coupled output. It is mainly applied for high-luminance, long life area such as laser pumping source, medical usage, printing, heating, material processing, marking ect.

Features

* Output Power: 600mW、750mW、 1.2W、5W、10W、12W、22W
* Spectral Width <4nm
* 50μm、100μm、400μm、700μm Fiber Output
* High Reliability
* High Efficiency

Applications

* Medical Usage
* Heating
* Material Processing
* Marking

Specifications (25℃)

Type	FLMM-0980-7*1-600m	FLMM-0980-7*1-750m	FLMM-0980-7*1-1.3W	FLMM-0980-8*1-005W	FLMM-0980-8*1-010W	FLMM-0980-9*1-012W	FLMM-0980-9*1-022W	Unit
Optical Specification								
Fiber Output Power P_f	600	750	1300	5000	10000	12000	22000	mW
Center Wavelength λ_c	975	975	975	975	975	975	975	nm
Wavelength Tolerance	±15	±15	±15	±15	±15	±15	±15	nm
Spectral Width Δλ	< 4	< 4	< 4	< 5	< 5	< 7	< 7	nm
Wavelength Temperature Coefficient	0.4	0.4	0.4	0.4	0.4	0.4	0.4	nm/℃
Fiber Characteristics								
Fiber Core Size	50	100	100	400	400	700	700	μm
N.A.	0.22	0.22	0.22	0.22	0.22	0.22	0.22	
Fiber Length	1	1	1	1	1	1	1	m
Connecter	FC/ST/SMA-905							
Electrical Specification								
Slope Efficiency E_s	> 0.6	> 0.75	> 0.65	> 5	> 4.5	> 13	> 11	W/A
Threshold Current I_{th}	≤0.25	≤0.25	≤0.45	≤0.25	≤0.45	≤0.25	≤0.45	A
Operating Current I_o	≤1.25	≤1.25	≤2.45	≤1.25	≤2.45	≤1.25	≤2.45	A
Operating Voltage V_f	< 2	< 2	< 2	< 14	< 14	< 36	< 36	V
Series Resistance R_d	< 0.50	< 0.50	< 0.25	< 3.50	< 1.75	< 9	< 4.50	Ω
Package Style	P1-Package,HHL			P2-Package		P3-Package		
Absolute Maximum Ratings								
Reverse Voltage V_r	2	2	2	14	14	36	36	V
Operating Temperature								

T_o	≤25	℃
Storage Temperature T_{stg}	-10~60	℃

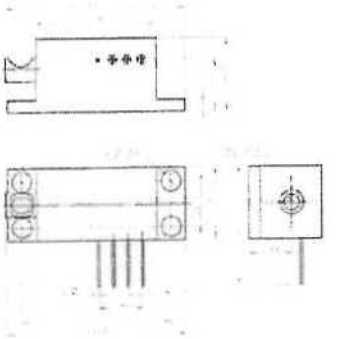
Ordering Information

FLMM-□□□□-□□□-□□□□

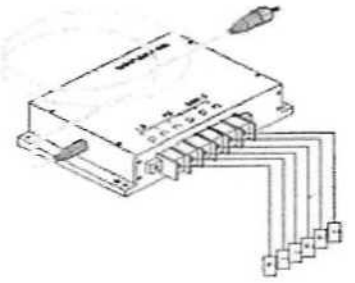
- Output Power Unit:
  "m" "W" "K" means
  "mW" "W" "KW"
- Rated Output Power
  Fill with 0 if less than three numerals
- Cooling:
  1: Without cooler
- Connector:
  0: No connector
  1: FC/PC Output
  2: ST/PC Output
  6: SMA-905 Output
- Package:
  7: High power package 1
  8: High power package 2
  9: High power package 3
- Center Wavelength:
  Fill with 0 if Less than four numerals
- Multi-Mode Laser Diode Module Series Products

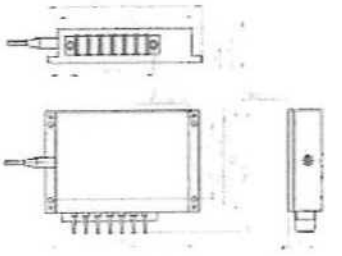
Package Dimensions

P1 Package (Clicking to magnify)

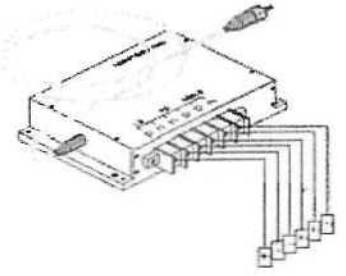


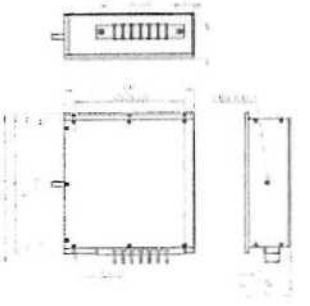
P2 Package (Clicking to magnify)



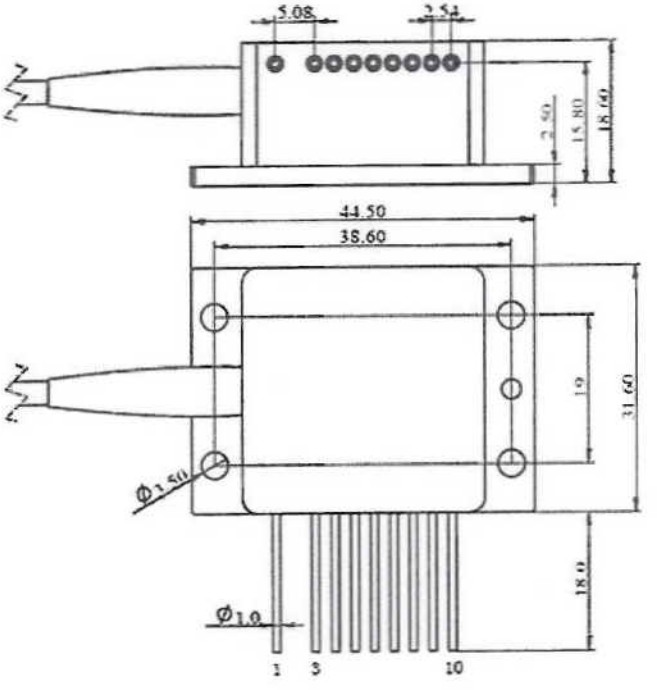


P3 Package（Clicking to magnify）





HHL Package



Pin Function

1 TEC(-)

2 -

3 case

4 LD(+)

5 Thermistor

6 Thermistor

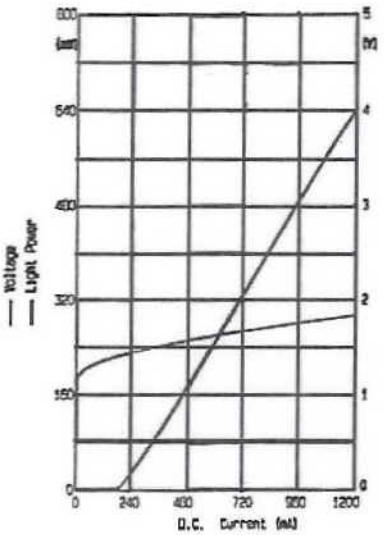
7 LD(-)

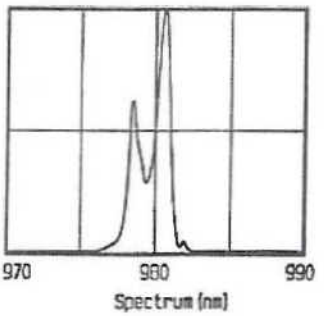
8 PD (P)

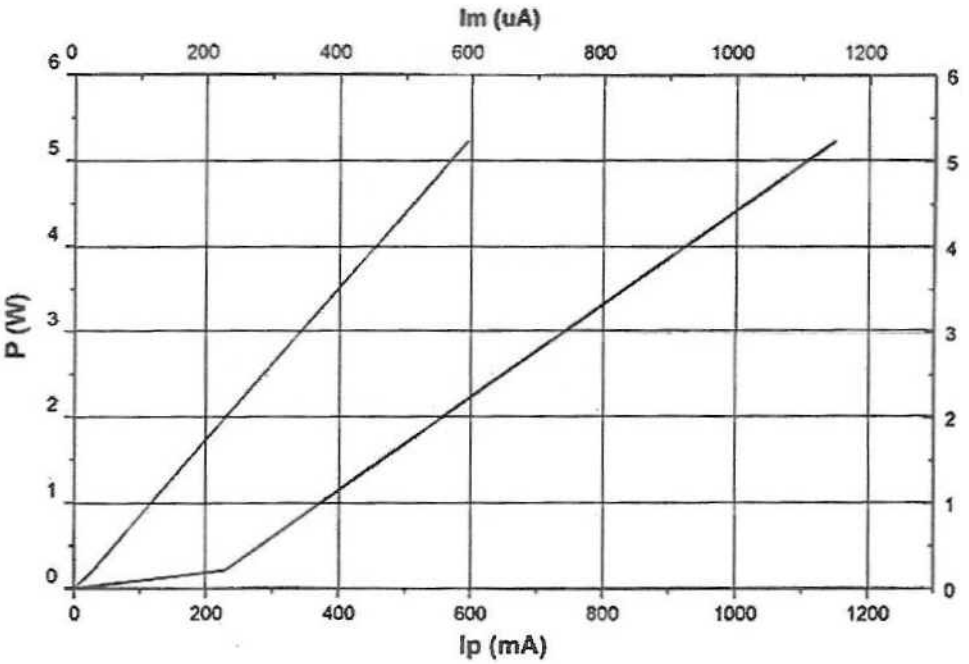
9 PD (N)

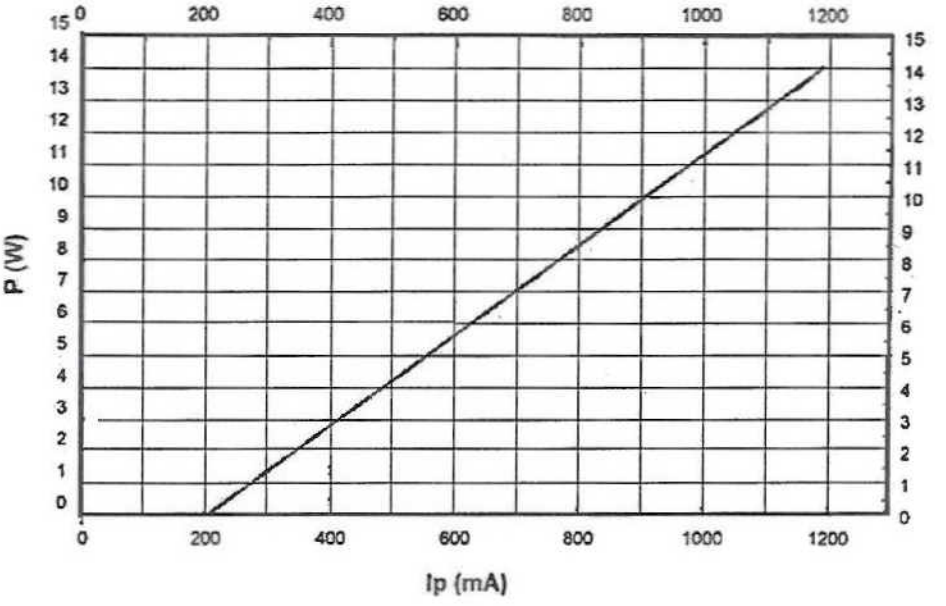
10 TEC(+)

Typical Performance Curves


Voltage
Light Power
D.C. Current (mA)


970
980
990
Spectrum (nm)


Im (uA)
P (W)
Ip (mA)



Notes

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8. Please use the constant-current source to avoid the surge.
9. Diode laser should be short circuit when stop using.
10. Bend diameter of the fiber must be larger than 4cm temporarily and 8cm permanently.

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Hi-Tech Optoelectronics Co.,Ltd.

Stacked Laser Diode Arrays

Description

HTOE Laser diode array series has been designed to provide the high output power, long lifetime and high reliability required for solid laser pumping ,medical usage and other high power laser diode applications.

Features

* Output peak power 15000W
* Spectral Width ≤4nm
* High Reliability
* High Efficiency
* CW stack arrays adopt micro-channel package
* QCW stack can be designed according to the customer of non-standard products heat sink package

Applications

* Laser Pumping
* Medical Usage
* High power laser diode applications

Specifications (20℃)

780-830nm CW Bars

Type	LDAC2-0808-040W	LDAC2-0808-060W	LDAC2-0808-100W	LDAC2-0808-200W	LDAC2-0808-320W	LDAC2-0808-480W	Unit
Optical Specification							
CW Output Power P_o	40	60	100	200	320	480	W
Output Power/bar Ps	20	20	20	40	40	40	W
Array Length L	10	10	10	10	10	10	mm
Center Wavelength λ_c	780-830	780-830	780-830	780-830	780-830	780-830	nm
Wavelength Tolerance	±5	±5	±5	±5	±5	±5	
Spectral Width Δλ	≤4	≤4	≤4	≤4	≤4	≤4	nm
Package Style			Micro Channel				
Bar length	1.6	1.6	1.6	2.4	2.4	2.4	mm
Number of Bars	2	3	5	5	8	12	
Wavelength Temperature Coefficient	0.3	0.3	0.3	0.3	0.3	0.3	nm/℃
Beam Divergence $\theta_{\parallel} \times \theta_{\perp}$	8×40	8×40	8×40	8×40	8×40	8×40	deg
Electrical Specification							
Slope Efficiency E_s(/bar)	≥1	≥1	≥1	≥1	≥1	≥1	W/A
Conversion Efficiency N_s	≥40%	≥40%	≥40%	≥40%	≥40%	≥40%	
Threshold Current I_{th}	≤5	≤5	≤5	≤12	≤12	≤12	A
Operating Current I_o	≤25	≤25	≤25	≤52	≤52	≤52	A
Operating Voltage V_f	≤4	≤6	≤10	≤10	≤16	≤24	V
Series Resistance R_d							Ω

Absolute Maximum Ratings							
Reverse Voltage V_r	2.5	2.5	2.5	2.5	2.5	2.5	V
Operating Temperature T_o	20	20	20	20	20	20	℃
Storage Temperature T_{stg}	-10~60	-10~60	-10~60	-10~60	-10~60	-10~60	℃

920-980nm CW Bars

Type	LDAC2-0980-040W	LDAC2-0980-060W	LDAC2-0980-100W	Unit
Optical Specification				
CW Output Power P_o	40	60	100	W
Output power/bar Ps	20	20	20	W
Array Length L	10	10	10	mm
Center Wavelength λ_c	920-980	920-980	920-980	nm
Wavelength Tolerance	±5	±5	±5	nm
Spectral Width $\Delta\lambda$	≤4	≤4	≤4	
Package Style		Micro Channel		
Bar Length	1.6	1.6	1.6	mm
Number of Bars	2	3	5	
Wavelength Temperature Coefficient	0.3	0.3	0.3	nm/℃
Beam Divergence $\theta_{\parallel} \times \theta_{\perp}$	8×40	8×40	8×40	
Electrical Specification				
Slope Efficiency E_s(/bar)	≥0.8	≥0.8	≥0.8	W/A
Conversion Efficiency N_s	≥30%	≥30%	≥30%	
Threshold Current I_{th}	≤10	≤10	≤10	A
Operating Current I_o	≤30	≤30	≤30	A
Operating Voltage V_f	≤4	≤6	≤10	V
Series Resistance R_d				Ω
Absolute Maximum Ratings				
Reverse Voltage V_r	2.5	2.5	2.5	V
Operating Temperature T_o	20	20	20	℃
Storage Temperature T_{stg}	-10~60	-10~60	-10~60	℃

780-830nm QCW Bars

Type	LDAQ2-0808-300W	LDAQ2-0808-600W	LDAQ2-0808-1.2K	LDAQ2-0808-003K	LDAQ2-0808-005K	LDAQ2-0808-015K	Unit
Optical Specification							
QCW Output Power P_o	300	600	1200	3000	5000	15000	W
Output power/bar Ps	60	60	60	100	100	100	W/bar
Array Length L	10	10	10	10	10	10	mm
Center Wavelength λ_c	780-830	780-830	780-830	780-830	780-830	780-830	nm
Wavelength Tolerance	±5	±5	±5	±5	±5	±5	nm
Spectral Width $\Delta\lambda$	≤4	≤4	≤4	≤4	≤4	≤4	nm
Bar Length	0.5	0.5	0.5	0.5	0.5	0.5	mm
Number of Bars	5	10	20	30	50	150	
Wavelength Temperature Coefficient	0.3	0.3	0.3	0.3	0.3	0.3	nm/℃

Beam Divergence $\theta_{\parallel} \times \theta_{\perp}$	8×40	8×40	8×40	8×40	8×40	8×40	
Electrical Specification							
Slope Efficiency E_s(/bar)	≥1	≥1	≥1	≥1	≥1	≥1	W/A
Conversion Efficiency N_s	≥40%	≥40%	≥40%	≥40%	≥40%	≥40%	
Threshold Current I_{th}	≤25	≤25	≤25	≤25	≤25	≤25	A
Operating Current I_o	≤90	≤90	≤90	≤120	≤120	≤120	A
Operating Voltage V_f	≤10	≤20	≤40	≤60	≤100	≤300	V
Series Resistance R_d							Ω
Absolute Maximum Ratings							
Reverse Voltage V_r	2.5	2.5	2.5	2.5	2.5	2.5	V
Operating Temperature T_o	20	20	20	20	20	20	℃
Storage Temperature T_{stg}	-10~60	-10~60	-10~60	-10~60	-10~60	-10~60	℃

920-980nm QCW Bars

Type	LDAQ2-0980-300W	LDAQ2-0980-600W	LDAQ2-0980-1.2K	Unit
Optical Specification				
QCW Output Power P_o	300	600	1200	W
Output power/bar Ps	60	60	60	W
Array Length L	10	10	10	mm
Center Wavelength λ_c	920-980	920-980	920-980	nm
Wavelength Tolerance	±5	±5	±5	nm
Spectral Width $\Delta\lambda$	≤4	≤4	≤4	nm
Bar Length	0.4	0.4	0.4	mm
Number of Bars	5	10	20	
Wavelength Temperature Coefficient	0.3	0.3	0.3	nm/℃
Beam Divergence $\theta_{\parallel} \times \theta_{\perp}$	8×40	8×40	8×40	
Electrical Specification				
Slope Efficiency E_s(/bar)	≥0.8	≥0.8	≥0.8	W/A
Conversion Efficiency N_s	≥30%	≥30%	≥30%	
Threshold Current I_{th}	≤15	≤15	≤15	A
Operating Current I_o	≤75	≤75	≤75	A
Operating Voltage V_f	≤10	≤20	≤40	V
Series Resistance R_d				Ω
Absolute Maximum Ratings				
Reverse Voltage V_r	2.5	2.5	2.5	V
Operating Temperature T_o	20	20	20	℃
Storage Temperature T_{stg}	-10~60	-10~60	-10~60	℃

Ordering Information

LDAC□–□□□□–□□□□

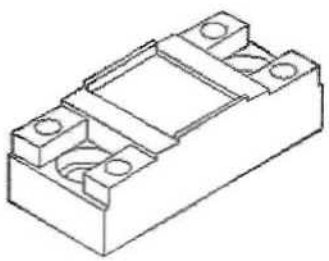
- Unit of Power:
  W: output power in W; K: output power in kW
- Output Rating:
  Actual output power in W, fill with 0 if less than three numerals
- Wavelength:
  Center Wavelength, fill with 0 if less than four numerals
- Structures:
  1: Single Bar 2: Stack Arrays 3: Linear Arrays
- Laser Diode CW Arrays Series

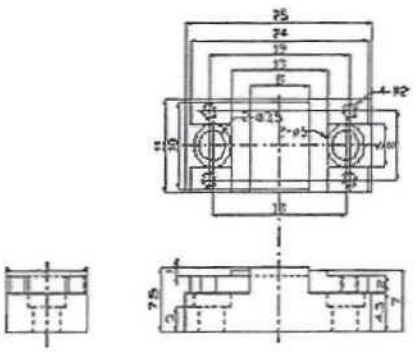
LDAQ□–□□□□–□□□□

- Unit of Power:
  W: output power in W; K: output power in kW
- Output Rating:
  Actual output power in W, fill with 0 if less than three numerals
- Wavelength:
  Center Wavelength, fill with 0 if less than four numerals
- Structures:
  1: Single Bar 2: Stack Arrays 3: Linear Arrays
- Laser Diode Quansi-CW Arrays Series

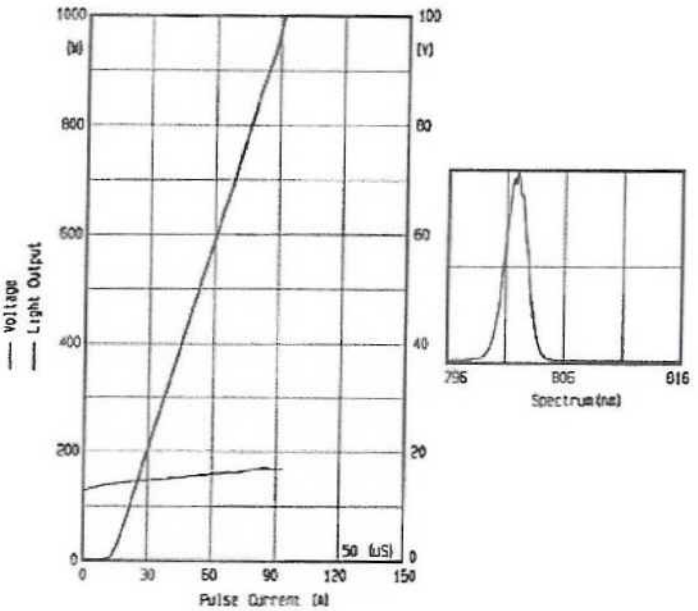
Package Dimensions

Package Dimensions (Clicking to magnify)





Typical Performance Curves



Notes

1. Caution! Don't look at the laser beam directly, because it's harmful to eyes.
2. The storage temperature is between -10 and 60 ℃.
3. Under normal circumstances, the higher the temperature is, the shorter the life of semiconductor laser will be. It is recommended to use lasers under TEC cooling or in air-conditioned room.
4. To use a laser diode in following sequences: Turn on the power supply; connect to the laser diode; and then increase the current gradually to the specified operating value. To shut down the laser diode, please decrease the current to zero gradually, and then turn off the power. Please make sure that the power supply has no current overshoot at any time. The current overshoot can damage the laser diodes permanently.
5. The high power laser diode arrays are very sensitive to electrostatic. Please wear anti-static bracelet during operating with the laser diodes (arrays).
6. Be sure that the operating current does not exceed the specified operating current. Otherwise, it will accelerate laser aging, shorten lifetime or even damage devices permanently.
7. A clean, dry and ventilated environment should be available when storing and operating laser diodes (arrays). Dust may degrade the laser diodes (arrays).
8. Constant-current power supply with voltage regulator should be used to avoid surge.

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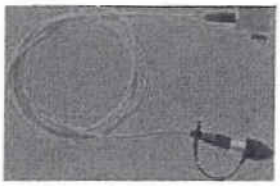
Hi-Tech Optoelectronics Co.,Ltd.

1450nm Laser Module Series



Description

1450nm diode laser module can output high power laser beam from optical fiber which NA is 0.22. This series product can used in the fields that need high brightness and long lifetime such as printing, space communication and medical.

Features

* Output Power: 400mW、3W、8W
* Spectral Width <10nm
* 100μm、430μm、600μm Fiber Output
* High Reliability
* High Efficiency

Applications

* Laser pumping
* Medical Usage
* Printing

Specifications (25℃)

Type	Symbol	Min.	Typ.	Max.	Unit
Center Wavelength	λ_c	1420	1450	1480	nm
Power	P_o	400	-	8000	mW
Threshold Current	I_{th}	500	600	700	mA
Operating Current	I_o	-	2800	3000	mA
Operating Temperature	T_o	-10	-	30	℃
Storage Temperature	T_{stg}	-40	-	70	℃

Type	FLMM-1450-7 (0、1、2、6) 1-400m	FLMM-1450-8 (0、2、6) 1-3W	FLMM-1450-9 (0、6) 1-3W
Optical Specification			
Fiber Output Power	400mW	3W	8W
Center Wavelength	1420~1480nm	1420~1480nm	1420~1480nm
Spectral Width	< 10nm	< 10nm	< 10nm
Wavelength Temperature Coefficient	0.4nm/℃	0.4nm/℃	0.4nm/℃
Fiber Specification			
Fiber Core Size	100μm	400μm	600μm
N.A.	0.22	0.22	0.22
Fiber Length	1m	1m	1m
Connecter	FC/ST/SMA-905	ST/SMA-905	SMA-905
Electrical Specification			
Slope Efficiency	>0.17W/A	>1.25W/A	>3.3W/A
Threshold Current	600mA	600mA	600mA
Operating Current	3A	3A	3A

Operating Voltage	< 2 V	< 15V	< 35V
Series Resistance	< 0.2Ω	< 1.2Ω	< 3Ω
Package Style	P1-Package	P2-Package	P3-Package

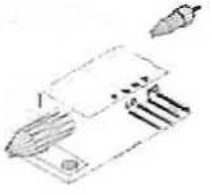
Ordering Information

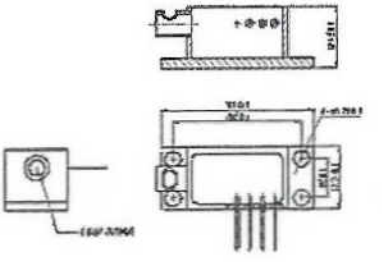
FLMS—□□□□—□□□—□□□□

- Output Power Unit:
  "m" "W" "K" means
  "mW" "W" "KW"
- Rated Output Power
  Fill with 0 if less than three numerals
- Cooling:
  1: Without cooler
- Connector:
  0: No connector
  1: FC/PC Output
  2: ST/PC Output
  6: SMA-905 Output
- Package:
  6: High power package 1
  7: High power package 2
  8: High power package 3
- Center Wavelength:
  Fill with 0 if Less than four numerals
- Multi-Mode Laser Diode Module Series Products

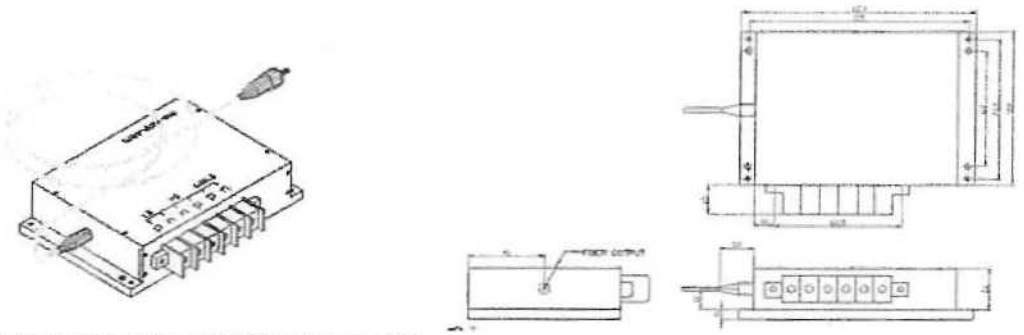
Package Dimensions

P1 Package Dimensions (Clicking to magnify)

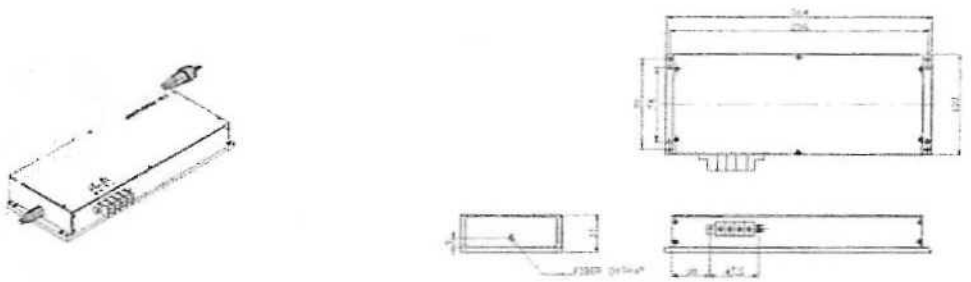




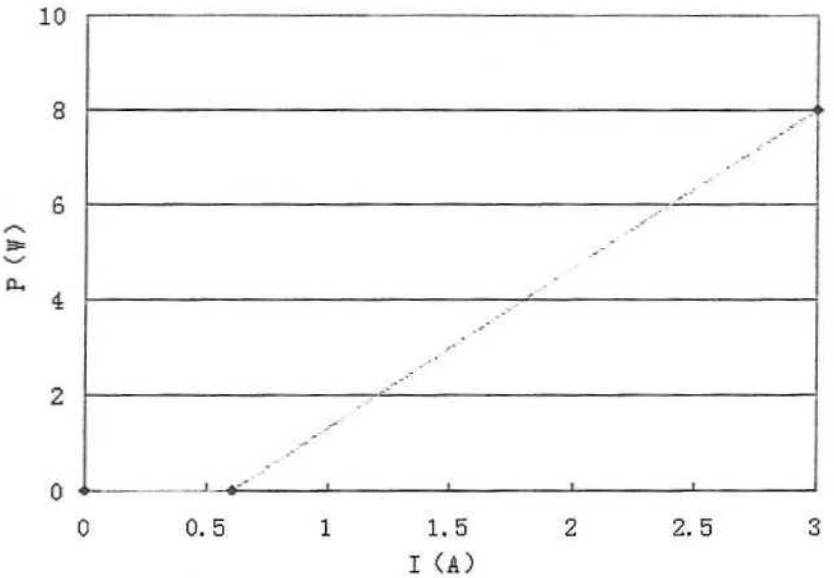
P2 Package Dimensions (Clicking to magnify)



P3 Package Dimensions (Clicking to magnify)



Typical Performance Curves



Notes

1. Laser beam is harmful especially for your eyes. Don't look at the laser beam directly.
2. Lifetime of the diode laser variated with the operating temperature inversely. We advise that the TEC cooler should be used to keep the temperature suitable.
3. For turning on the diode laser, please increase the current gradually to the specified operating value. For shutting down the diode laser, please decrease the current to zero gradually, and then turn off the power.
4. Please wear staticproof bracelet when operating.
5. Please connect the pins of the diode laser correctly as the picture showen in the manual.

6. The operating current must less than the rated current. Otherelse the diode laser should be damaged.
7. The fiber facet should be keep clean befor the diode laser is operating.
8. Please use the constant-current source to avoid the surge.
9. Diode laser should be short circuit when stop using.
10. Bend diameter of the fiber must be larger than 4cm temporarily and 8cm permanently.

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Tel: 86-10-6253-7788 Fax: 86-10-8233-5727 E-mail: info@htoe.com.cn

Optisiv Ltd. is a small, privately held manufacturer of pulsed fiber laser systems. Located in Kibbutz Einat, Israel, it was founded in 2007 by Dr. Kobi Lasri. Dr. Lasri holds a PhD in electrical engineering from Technion-Machon Technologi Le' Israel. After graduating, he worked for three years as the Technical Manager at Elbit Systems Electro-Optics Elop Ltd. in Rehovot, Israel. He subsequently served as Production Manager at Precision Photonics in Boulder, Colorado, for two-and-a-half years. He left Precision in 2007 to found Optisiv.

(a) Raycus Fiber Laser Laser Technologies Co., Ltd. designs, manufactures and sells 200W single mode (M2 < 1.2), 1064nm, CW fiber lasers from their operations in Wuhan, China. Raycus Fiber Laser Technologies Co. Ltd. founded in 2007, is the leading high power fiber laser manufacturer in China. According to its website: "with a deep understanding of laser technologies and specialty fibers, Raycus Fiber laser is the first in China to successfully produce and industrialize the high power fiber laser." According to the website, Raycus plans to introduce fiber lasers up to 1,000W soon. Home page: http://raycuslaser.com/eng/Index.aspx. History: Raycus was founded by US fiber laser industry veteran Dr. Yan Dapeng in 2007. Dr. Yan and Huagong Laser, a subsidiary of Wuhan public company Huagong Tech, each owned 50% share of the company but Dr. Yan has the key power to control the company. From Raycus's website, Yan and Huagong laser invested 30million RMB in the company each in 2007. Huagong laser was reported to sell its 32% share in Raycus for 63.36 million RMB.
From 1996 to 2007, Dr. Yan worked in several US universities and companies, including University of Illinois at Chicago, Wright State University, Zybron Company, Lasersharp Company and Nufern Company. He has 3 US patents. Before 1996, he worked at Nanjing Polytech University.

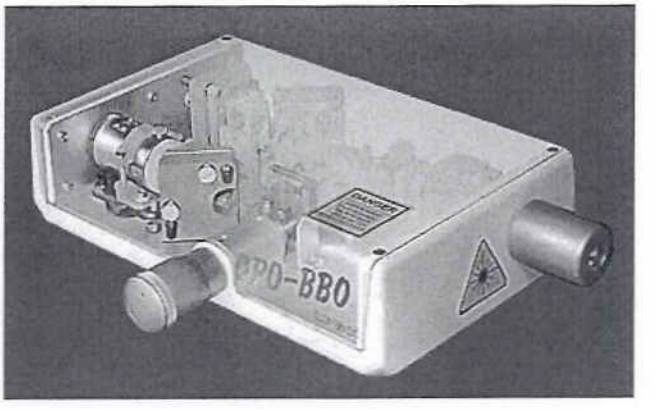
SOLAR Laser Systems is one of the oldest private high-tech companies in the former Soviet Union. Located in Minsk, Belarus, they have been working in the international photonics market for 21 years. They specialize in scientific research, development and manufacturing of solid-state lasers, laser systems and spectral equipment for industrial, medical and scientific applications.

Company website: http://www.solarlaser.com

OPO SYSTEMS

- **High efficiency**
- **UV SHG options**
- **Compatibility with MM pump lasers**
- **210...2500 nm operation range**
- **Custom solutions up to 20 µm**
- **PC control option**
- **Wavelength display option**
- **Easy to use and low maintenance**

New SOLAR LS OPO systems combine high energy output, extremely wide tuning range with exceptionally easy maintenance and increased reliability.



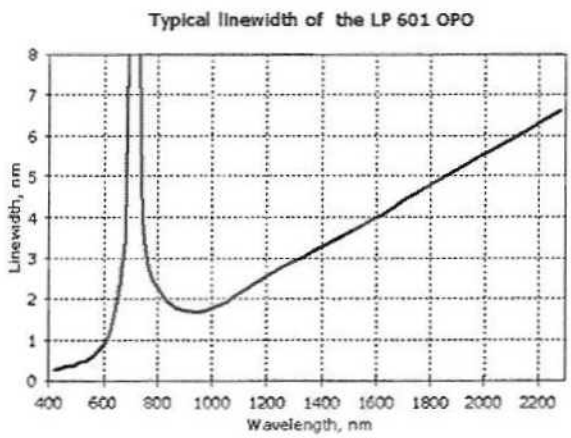
These OPO systems are developed taking into consideration the end user's demands. They are highly reliable and easy to operate unlike the similar devices already existing in the market . The main advantage of the OPO LP series is extremely low operating pump power densities. Thanks to the original optical scheme the specified parameters are obtained even at low pump intensities and as a result neither crystals nor other optics can be damaged. This feature combined with precise optics mounts and dust protective housing insures perfect reliability and long-term output stability.

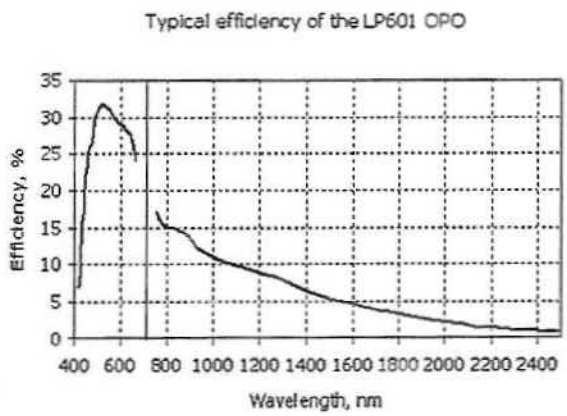
The OPO LP series optical design provides high-efficiency output even if it is pumped by standard multimode Nd:YAG lasers. The customer does not have to buy or use complex and expensive TEMoo or single-frequency pump lasers. The maintenance expenses are therefore reduced and the OPO LP series is attractive for every user. Besides the OPO supercompactness saves space at your optical table and allows to integrate it easily into any available laser system.

SPECIFICATION

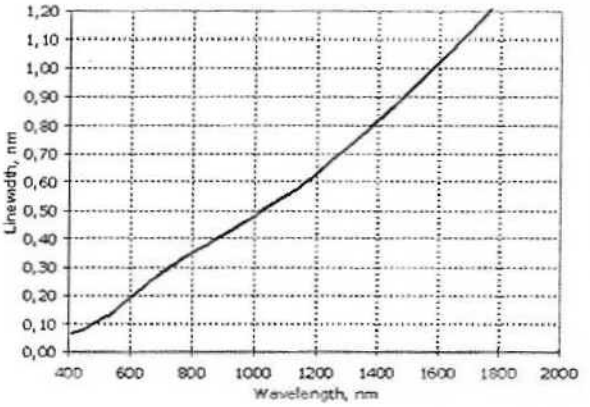
MODEL	LP601	LP603	LP604
Non-linear crystal	BBO Type I	BBO Type II	BBO Type II
Tuning range, nm signal + idler second harmonic	 410…2500 —	 410…2500 210…420	 680…2500 340...680
Max total conversion efficiency [1]	40% [2]	35% [2]	40% [3]
Linewidth [1], cm^{-1}	10…100	4…6	6…8
Dimensions, mm	255 x 220 x 70		
Pump laser requirements			
Laser type	Nd:YAG		
Wavelength, nm	355	355	532
Max pump energy, mJ	350	350	500
Operating pump intensity, MW/cm^2	60	60	80
Pulse width, ns	4…12		
Beam quality	multimode homogeneous spatial beam profile		
Beam divergence, mrad	<1.5		

* Specifications are subject to change without notice
1) Depends on output wavelength; specified for 10 ns pump pulse
2) At 500 nm
3) At 850 nm

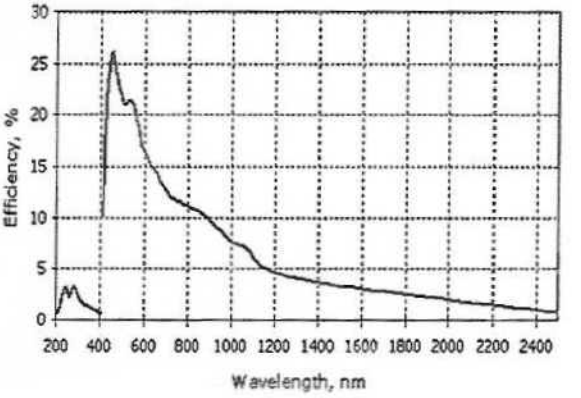




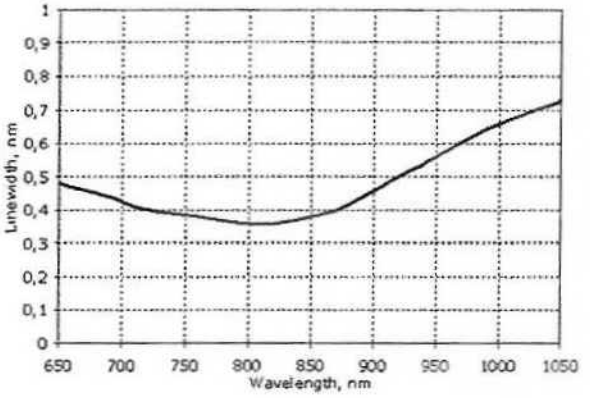
Typical linewidth of the LP 603 OPO



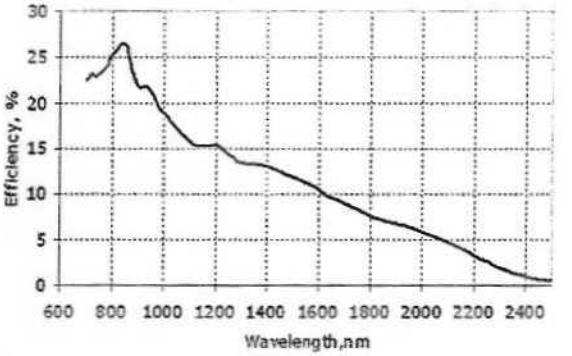
Typical efficiency of the LP603 OPO with the LG350 SHG unit



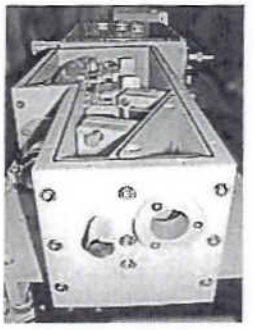
Typical linewidth of the LP 604 OPO



Typical efficiency of the LP604 OPO



CUSTOM OPO SYSTEMS



SOLAR Laser Systems has a great experience in development, manufacturing and supply of specialized custom tunable OPO systems based on OPO, SFG and DFG technologies. While developing custom systems, SOLAR LS's specialists take into consideration specific customers requirements and provide users with optimal cost and time effective solutions of the challenges they face.

The widest choice of non-linear crystals used in SOLAR LS's devises - BBO, LBO, c-LBO, KTP, KTA, $LiNbO_3$, $KNbO_3$, $AgGaSe_2$, CdSe - ensure high laser performance within the wavelength range of 190nm...20μm.

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Aurora

The new Broadband OPO from Litron

Litron Total Laser Capability

Litron Lasers

Broadband OPO Systems Tuneable sources designed for Litron's lasers

The Aurora OPO

Based around BBO, the Aurora is a broadband device pumped at 355nm. It is continuously tunable from 410nm to 680nm and the corresponding idler output to 2400nm is also available. Designed to be fully integrated with either the Nano series or the larger LPY series of systems the OPO is a modular attachment designed specifically for use with Litron's lasers. Precise stepper motor control of the crystal and accurate optical encoding of its position ensure accurate and repeatable wavelength tuning and output.

Conversion efficiencies of up to 30% are achieved allowing outputs of >50mJ in the visible from a compact laser and OPO combination making it ideal for either laboratory based or portable applications requiring a tunable source.

SPECIFICATIONS

Model	Aurora 20	Aurora 35	Aurora 50
Pump energy (mJ @355nm)	75	110	180
Max. signal output (mJ)	**20**	**35**	**50**
Linewidth (cm^{-1})	5 - 250	5 - 250	5 - 250
Repetition rate (Hz) (1)	0 - 200	0 - 200	0 - 200
Signal tuning range (nm)	410 - 680	410 - 680	410 - 680
Laser type	**Nano LG** **Nano TRL**	**Nano TRL**	**LPY700**

(1) Maximum repetition rate depends upon pump laser specification.

Aurora

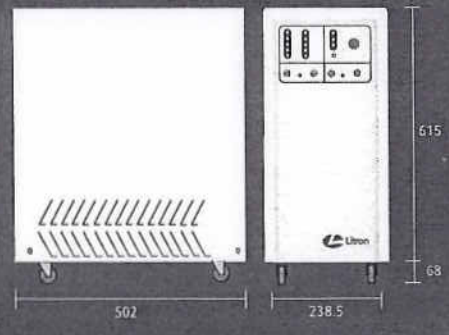
Litron Lasers

Broadband OPO Systems Tuneable sources designed for Litron's lasers

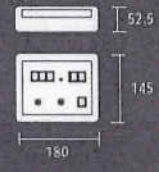
MECHANICAL DATA

Laser Head Unit & OPO

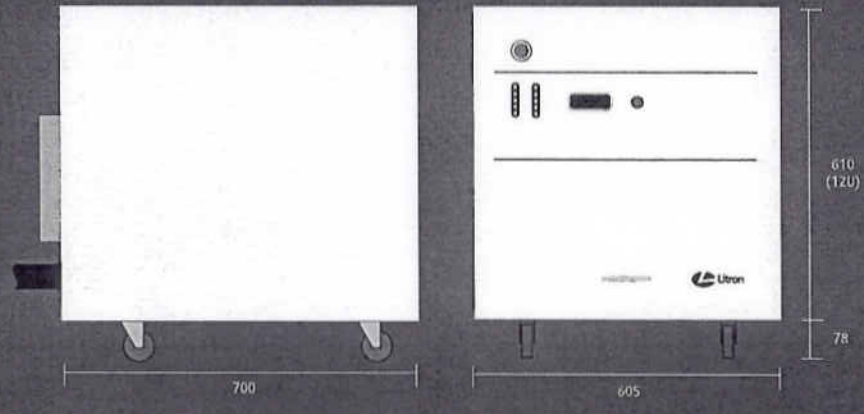
LPU1000 PSU



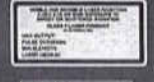
Remote Control Box



Rack-mount PSU



All dimensions shown in mm



Our policy is to improve the design and specification of our products. The details given in this document are not to be regarded as binding.

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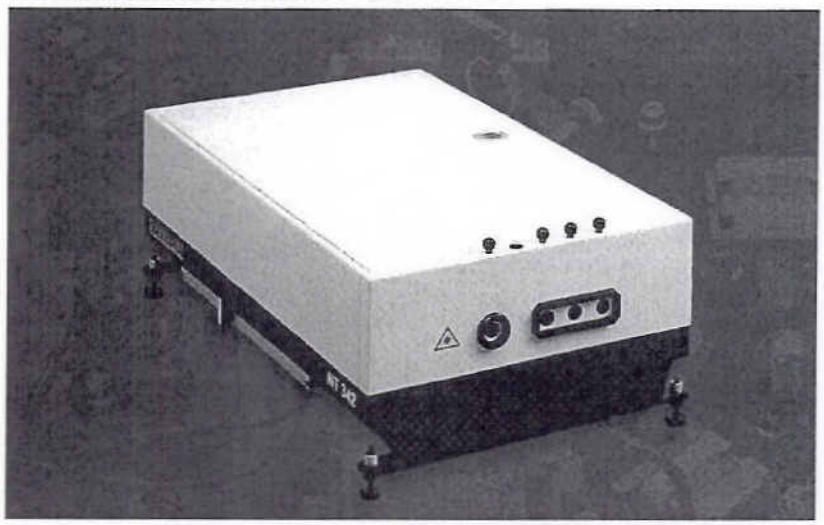
Aurora

PB 0138-1

NT340
SERIES

Tunable Wavelength Lasers



NT340 series tunable laser seamlessly integrates in a compact housing the nanosecond optical parametric oscillator and Nd:YAG Q-switched laser.

The system features high conversion efficiency, hands-free wavelength tuning from UV to IR, easy maintenance and separate output for pump laser beam.

The laser is controlled from the remote keypad or from PC through RS232 interface using LabView drivers that are supplied with the system. The remote pad features a backlit display that is easy to read even while wearing laser safety glasses.

Narrow band models features less than 5 cm^{-1} linewidth that is ideal for many spectroscopic applications.

System is designed for easy and cost-effective maintenance. Replacement of flashlamps can be done without misalignment of the laser cavity and deterioration of the laser performance. OPO pump energy monitoring system helps to increase lifetime of the optical components.

NT340 SERIES AVAILABLE MODELS

- Broad bandwidth models based on type 1 BBO OPO.
- Narrow bandwidth models based on type 2 BBO OPO. Narrow bandwidth model can be configured with SH or/and SF tuning range extension for 193-419 nm output.

To configure laser for any application, broad selection of optional items are available:

- Tuning range extension in UV range (210-419 nm);
- Tuning range extension in 300-400 nm range with high pulse energy;
- Tuning range extension in DUV range (193-210 nm);
- Fiber coupled output in 350-680 nm range;
- Pulse energy attenuator;
- Separate Nd:YAG laser harmonics output ports (1064, 532, 355 and 266 nm wavelengths) from build-in harmonics generator;
- Water-air cooled power suply.

FEATURES

- Hands-free no gap wavelength tuning from **400** to **2600 nm**
- No gap tuning from **210** to **2600 nm** with optional UV extension
- Up to **40 mJ** pulse energy in visible spectral range
- Up to **4 mJ** pulse energy in UV spectral range
- Optional sum-frequency generator extension for improved output in **300-400 nm** spectral range
- Less than **5 cm^{-1}** linewidth
- **3–5 ns** pulse duration
- **10** or **20 Hz** repetition rate
- **Remote** control pad
- PC control via RS232 and **LabView™** drivers
- Separate output port **355 nm** beam. Outputs for **1064** and **532 nm** are optional
- OPO pump energy monitoring
- Replacement of flashlamps can be done without misalignment of the laser cavity

APPLICATIONS

- Laser-induced fluorescence
- Flash Photolysis
- Photobiology
- Remote sensing
- Time-resolved spectroscopy
- Non-linear spectroscopy
- Other laser spectroscopy applications

SPECIFICATIONS [1]

MODEL	NT341A	NT341B	NT342A	NT342B
OPO				
Wavelength range [2]				
Signal	420–680 nm	420–680 nm	420–709 nm [3]	420–709 nm [3]
Idler	740–2300 nm	740–2300 nm	710–2300 nm [3]	710–2300 nm [3]
SH generator (optional)	—	—	210-419 nm	210-419 nm
SH/SF generator (optional)	—	—	225-419 nm	225-419 nm
DUV generator (optional)	—	—	—	193–210 nm
Output pulse energy				
OPO [4]	20 mJ	40 mJ	15 mJ	30 mJ
SH generator (optional) [5]	—	—	2 mJ	4 mJ
SH/SF generator (optional) [6]	—	—	3 mJ	6 mJ
DUV generator (optional) [7]	—	—	—	0.2 mJ
Linewidth [8]	10–350 cm^{-1}	10–350 cm^{-1}	< 5 cm^{-1}	< 5 cm^{-1}
Scanning step				
Signal (420-709 nm)	0.1 nm			
Idler (710-2300 nm)	1 nm			
SH range (210-419 nm)	—	—	0.05 nm	0.05 nm
Pulse duration [9]	3-5 ns			
Typical beam diameter [10]	4 mm	5 mm	4 mm	5 mm
Typical beam divergence [11]	< 6 mrad		< 2 mrad	
Polarization				
Signal beam	horizontal			
Idler beam	horizontal		vertical	
SH/SF beam	—	—	vertical	
PUMP LASER [12]				
Pump wavelength	355 nm			
Max pump pulse energy	70 mJ	135 mJ	70 mJ	135 mJ
Pulse duration	4–6 ns			
Beam quality	"Hat-top" in near field, without hot spots			
Beam divergence	< 0.5 mrad			
Pulse energy stability (StDev)	< 3.5 %			
Pulse repetition rate	10 or 20 Hz			
PHYSICAL CHARACTERISTICS				
Unit size (W×H×L) [13]	446×260×820 mm			
Power supply size (W×H×L)	330×670×520 mm			
Umbilical length, m	2.5 m			
OPERATING REQUIREMENTS				
Water consumption (max 20 °C) [14]	10 l/min			
Room temperature	15–30 °C			
Relative humidity (noncondensing)	20–80 %			
Mains voltage	208 or 240 VAC, single phase 50/60 Hz			
Power consumption	2.5 kVA			

[1] All specifications are subject to change without notice. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise all specifications are measured at 450 nm.

[2] Hands-free tuning range 210-2300 nm.

[3] Tuning range extension to 400-2600 nm is optional.

[4] Measured at 450 nm. See tuning curves for typical outputs at other wavelengths.

[5] Measured at 260 nm. See tuning curves for typical outputs at other wavelengths.

[6] Measured at 340 nm. SF generator is optimized for maximum output in 300-400 nm range. See tuning curves for typical outputs at other wavelengths.

[7] Measured at 200 nm.

[8] Linewidth is <8 cm^{-1} for 210-419 nm range.

[9] FWHM measured with photodiode featuring 500 ps rise time and 300 MHz bandwidth oscilloscope.

[10] Beam diameter is measured @ 450 nm at the $1/e^2$ point and can vary depending on the pump pulse energy.

[11] Full angle measured at the $1/e^2$ point@ 450 nm.

[12] Separate output port for the 355 nm beam is standard. Outputs for 1064 nm and 532 nm beams are optional. Laser output will be optimised for OPO operation and specification may vary with each unit we manufacture.

[13] Version with DUV generator has dimensions of 446×260×1020 mm (W×H×L).

[14] Air cooled power supply is optional.

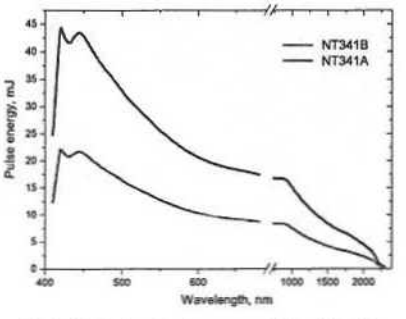


Fig 1. Typical output energy of the NT341 series tunable wavelength systems

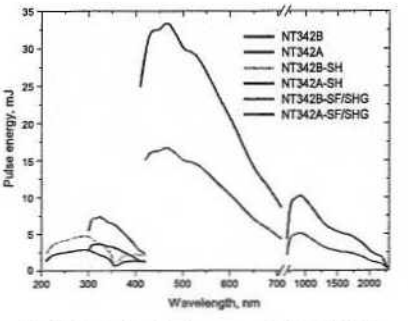


Fig 2. Typical output energy of the NT342 series tunable wavelength systems

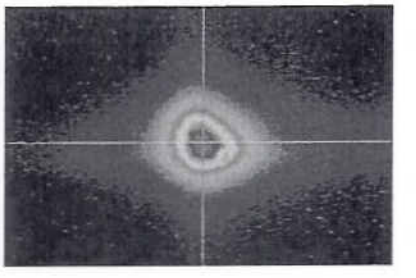


Fig 3. Typical far field beam profile of NT342 laser

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www.ekspla.com

DANGER

ISO 9001
CERTIFIED

Revision number – 110110

!!

FINE ADJUSTMENT
a product of
ERÖ Kunststofftechnik GmbH

Dahlienstraße 21
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E-Mail: info@fine-adjustment.com
Internet: www.fine-adjustment.com

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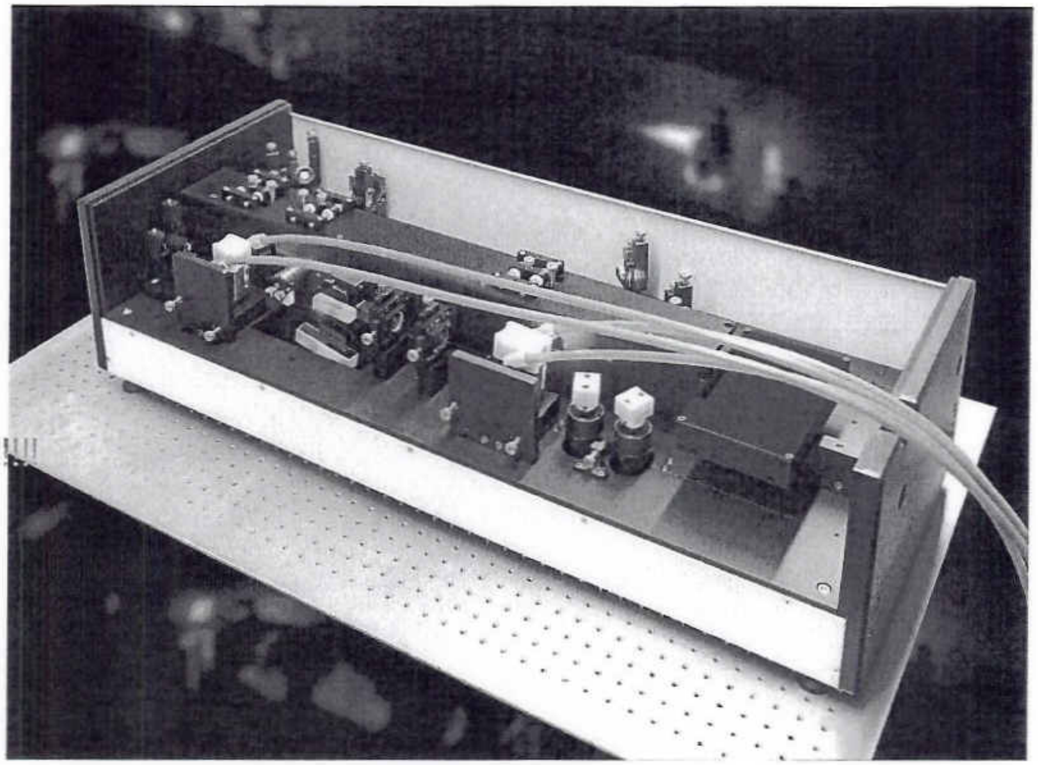

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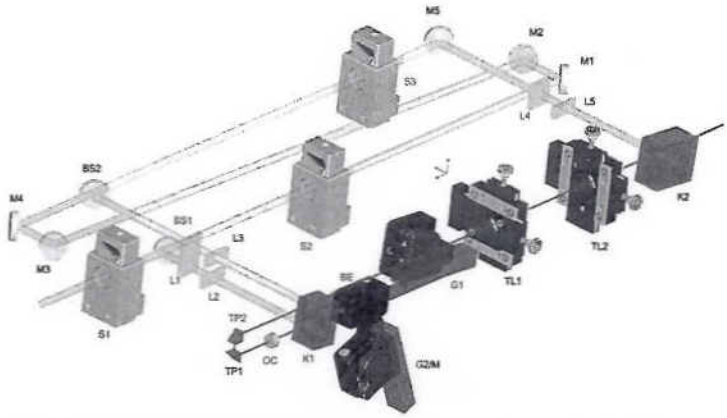

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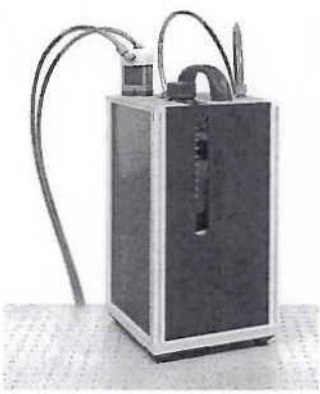

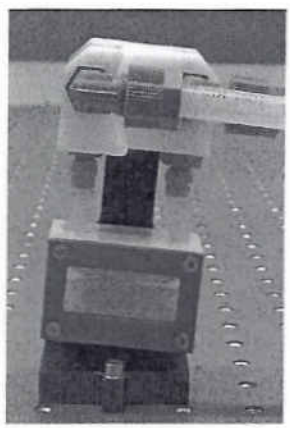

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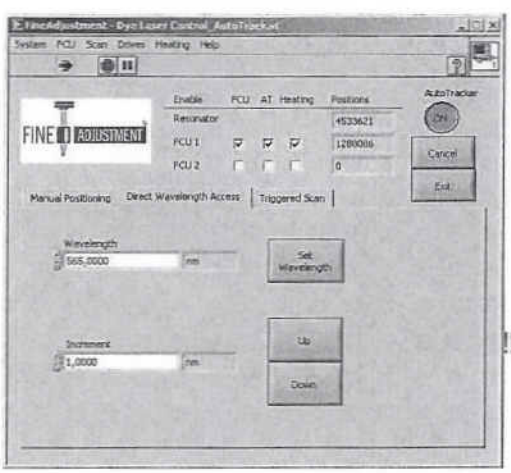

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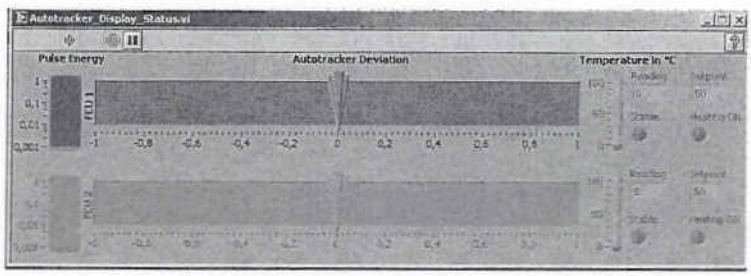

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Si pebn jof !7H!	391!on !	511!n K!A !643!on !	Qvrhbsf !Fydf rhou!	?!36!n K!
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FINE ADJUSTMENT
a product of
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Telefon: +49(0)2195-9111-15 / 18
Telefax: +49(0)2195-9111-34
E-Mail: info@fine-adjustment.com
Internet: www.fine-adjustment.com !!
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Mjof x jeui !Tqf djgdbujpot !!!Qvmtbsf !0Qvmtbsf .T

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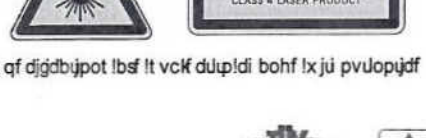

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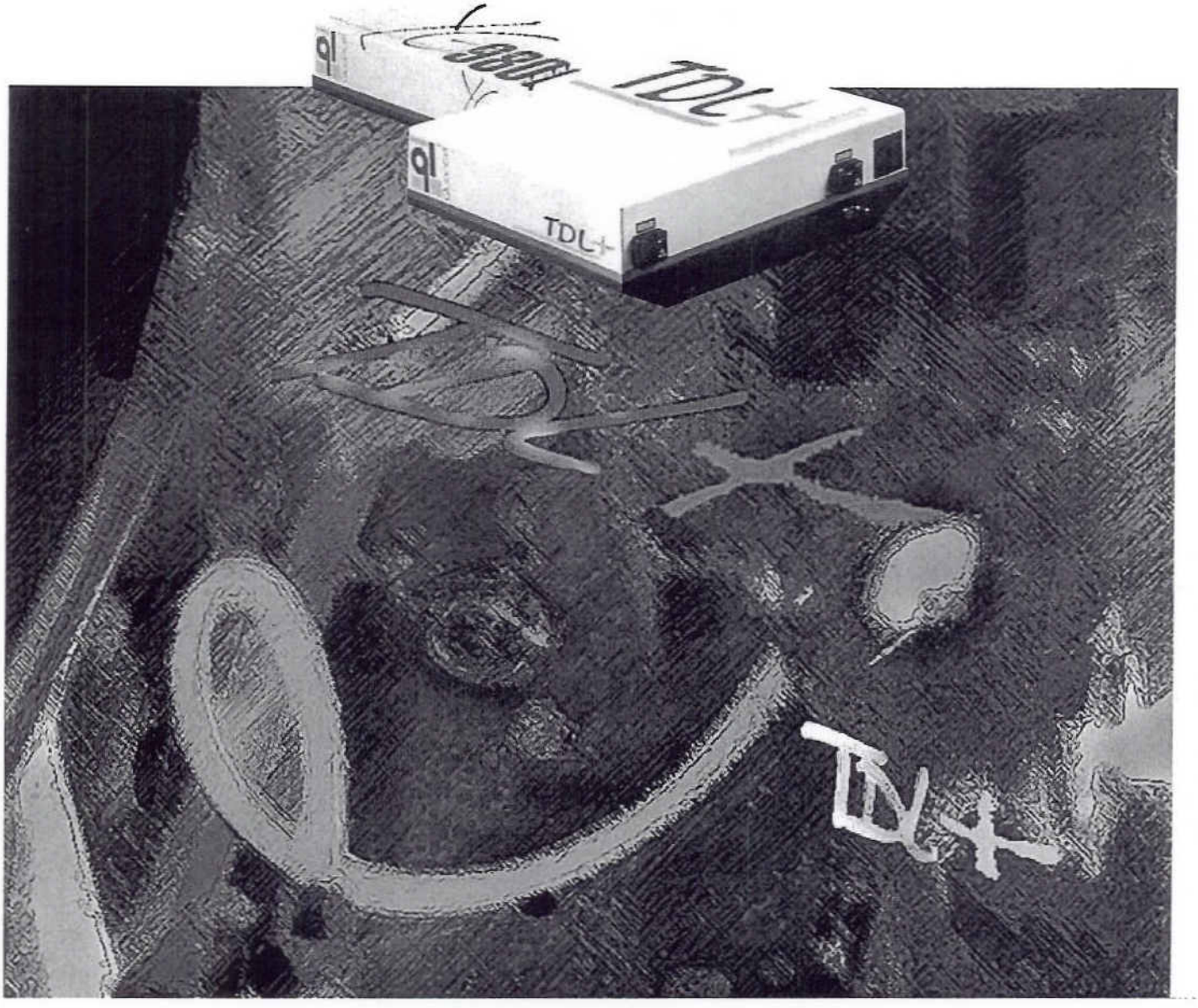
Quantel

TDL+

User-friendly Tunable Dye Laser



TDL+ ADVANTAGES

Wide tunability:
Two gratings allow for coverage of the 200- 4500nm range without realignment of the cavity. Unique dual grating option enables configuration without direct handling of the grating assemblies.

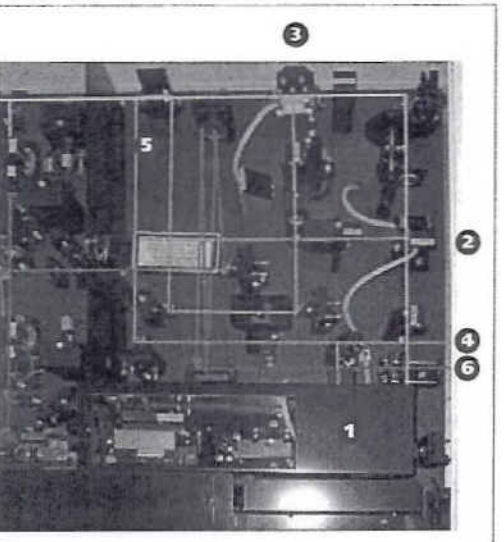
Spectral access - UV and IR generations:
Nonlinear crystals provide options for motorized or automatic phase-matching and beam compensation.

Excellent passive and active stability:
Passive stability is achieved through integrated design on option benches - Active stability is achieved by closed loop temperature control of both the oscillator spectral cavity and nonlinear crystals.

Easy dye exchange:
Dye exchange without removing dye cells prevents misalignment.

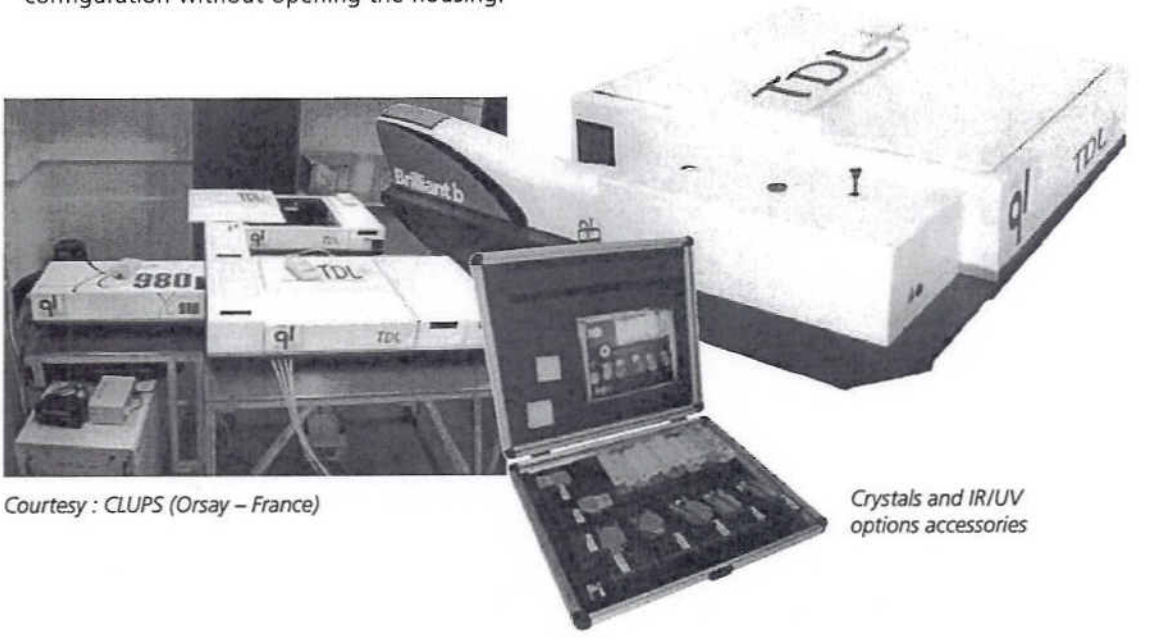
Quantel support and service:
Quantel's long history in design and manufacture of TDL tunable solutions means your productivity is backed by industry experts in installation, integration, support, and field service.

Simplicity and user safety:
- Automatic recognition of the frequency conversion crystals in IR and UV.
- Phase-matching tracking easy to use
- Dedicated software controls both pumping and dye lasers.
- Optimization and dye exchange in user operation configuration without opening the housing.



❶ Oscillator
❷ Pre amplifier
❸ Amplifier
❹ Pumping beam
❺ Fundamental beam
❻ 1064nm beam for UV mixing

TDL+ remote module



Courtesy : CLUPS (Orsay – France)

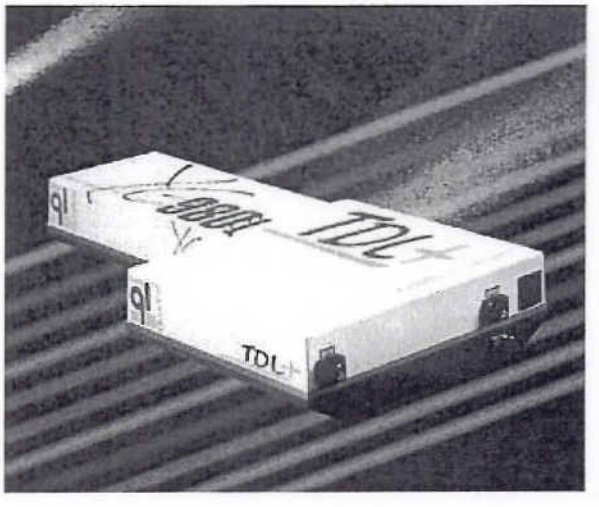
Crystals and IR/UV options accessories

TDL+: PERFORMANCE, RELIABILITY, FLEXIBILITY AND USER-FRIENDLY PULSED, TUNABLE DYE LASER SOLUTION

Tunable YAG/DYE system:

Compact, with new options, the TDL+ provides all the advantages of a tunable dye laser system. High optical efficiency, narrow spectral bandwidth, large tunability range, extremely low amplified spontaneous emission: TDL+ is the perfect tool for any application such as spectroscopy, Laser Induced Fluorescence, LIDAR, CARS, LIBS, ablation, and many more. Quantel Brilliant or YG980 lasers are mechanically and optically optimized to pump TDL+ for excellent overall stability.
The TDL+ can be purchased with a variety of Quantel pump lasers or qualified with an existing pump laser.

The TDL+ is the latest development in Quantel's long history in tunable dye lasers, with a continued focus on performances, safety, and ease of use.

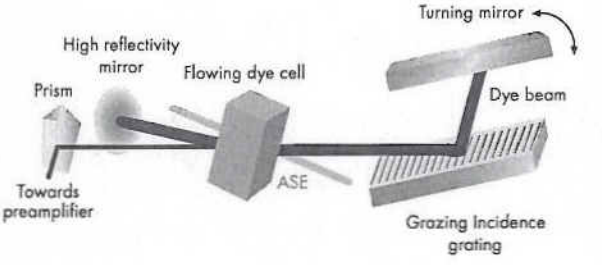


Wide tunability: 200nm to 4,5µm

Wavelength tuning is achieved with a mirror rotating in front of a grazing incidence grating. The use of a 2400l/mm grating provides tunability from 420nm to 750nm, particularly adapted to UV conversion (200nm to 420nm) through non linear crystals. An 1800 l/mm grating covers the 500-900nm range providing IR tunability from 1200nm to 4500nm by frequency subtraction. A typical laser dye supports lasing over 40nm in the fundamental wavelength.

Low ASE oscillator, temperature stabilized:

The spectral quality of Quantel systems is the result of its patented oscillator configuration. Its geometry creates an angle between the parasitic emission axis (ASE: Amplified Spontaneous Emission) and the axis of propagation of the beam. This prevents ASE from being amplified. The output ASE is reduced to the lowest level possible (<0,2% in the center of the peak of Rh 590 dye).

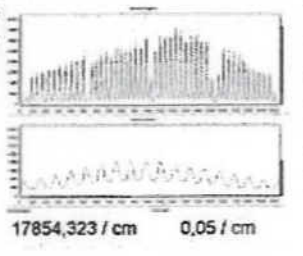


TDL+ oscillator

In standard, all mechanical and optical components of the oscillator are temperature stabilized, which leads to a high quality long term spectral stability for the system (0,05cm^{-1}/5°C/hour). This thermal regulation is particularly adapted for experiments in highly unstable temperature environments (e.g. combustion).

Narrow bandwidth

The TDL+ platform can be configured with a number of linewidth options suitable for a full range of spectroscopic applications from broadband zero-order output for multiplex CARS, moderate linewidth for survey spectroscopic scanning, and, with the Narrow Bandwidth Package, linewidth performance of <0,05cm^{-1}. The NBP package consists of 4 prisms, mounted in a convenient modular assembly, that expand the beam size in the oscillator cavity and enhance the selectivity of the grating.



Spectral measurement @560nm with HighFinesse wavemeter

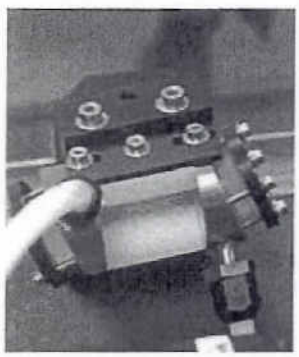
Amplification and optimized beam quality:

Amplification results from the passage of the laser beam through 2 amplifier stages, both optimized for high gain and low ASE.

The saturation of the gain insures a perfect circular output beam profile and excellent spatial uniformity. These beam characteristics allow for high nonlinear frequency conversion efficiencies. Both amplifier cells are fed by independent dye circuits in order to optimize concentration for each stage.

Modularity and flexibility:

All optical components are treated with non reflective coatings @532nm and @355nm allowing change in the pump wavelength without realignment.



Capillary cell for excellent circular output beam profile

The 2 wavelengths' axes of propagation are collinear for any Quantel Nd: YAG pumping laser. Depending on the output energy required, TDL+ can be pumped with Quantel Brilliant or YG980 systems. Quantel lasers are designed for adaptability and stability, making this combination ideal. The TDL+ can be pumped by other pulsed Nd:YAG laser, although specifications are dependant on the pumping beam quality.

Simple and quick dye exchange without any realignment:

In order to prevent any unlikely misalignment or pollution of the optical components during the dye exchange process, the TDL+ uses an external dye flowing system.

Every pump/tank assembly is connected to the system by use of quick connectors: one is dedicated to the oscillator and preamplifier and the other one to the amplifier. The design allows for efficient rinsing of the flowing circuit.

Ultraviolet and Infrared: extension of the tunability range

To generate UV or IR wavelengths, a system of nonlinear crystals configured for doubling, tripling, mixing or subtracting frequencies is used.

Performances, user safety and simplicity are all design priorities, so all optimizations of energy output within UV and IR range are carried out with the housing closed.

The generation of UV typically requires a 2400l/mm grating and generation of IR is generally more efficient with an 1800l/mm grating.

EWT option: unique combination of 2 gratings

With the EWT option (Enhanced Wavelength Tunability), the TDL+ provides the fundamental range of wavelengths from 420nm to 900nm without realignment or manipulation of gratings. Two 1800l/mm and 2400l/mm gratings are set in the oscillator side-by-side.

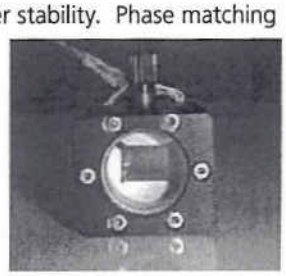
An assembly of mirrors allows the user to switch from the 420-750nm range (2400l/mm) to the 500-900nm range (1800l/mm) and to combine UV and IR experiments easily.

Double grating

Ultraviolet generation

The UV range (200-420nm) is obtained by using nonlinear crystals; a first stage provides doubling, a second provides mixing after frequency doubling and tripling, depending on the chosen crystals.

The wavelength ranges in conjunction with the type of nonlinear crystal used (KDP/BBO) have been optimized in regard to conversion efficiency, simplicity and lifetime of the dye. Each stage includes positioning mounts, beam steering compensators, delay line and nonlinear crystal. The mechanical mounts allow for precise and quick crystal exchange. Crystals are thermally regulated within a sealed oven, providing excellent power stability. Phase matching occurs through angle tuning, and the compensator is automatically rotated to preserve the propagation axis.



Temperature stabilized crystal

This option is integrated on the TDL+ bench to obtain better mechanical stability and compactness.
A Pellin-Broca prism installed after the UV output allows for wavelength separation. To compensate the deviation generated by the wavelength shift, the prism is mounted on a motorized assembly.

UVT option: automatic phase-matching

To optimize wavelength tuning, the phase matching of the nonlinear crystals is computer-controlled.

The controlling system uses two methods which can be combined, using a lookup table and/or real time closed-loop control.

These two methods provide a quick scan of the wavelengths and an optimization of the conversion efficiency for any level of output energy.

Automatic recognition of the type of crystal installed allows for look up of its settings and positioning quickly.

The furnished software gives access to different parameters: user mode (look-up tables, closed-loop and combination of both), type, temperature and position of the recognized crystal.

The compensation of the angle generated during the scanning of UV wavelength is automatic: the position of the Pellin-Broca prism is directly associated to the output wavelengths.

UV option: motorized phase-matching

For a defined UV wavelength, Quantel also provides a more simple system than the UVT.
Phase matching of the nonlinear crystals is still motorized, but the commands of the motor and the positioning of the crystal are controlled by the user through a dedicated module installed under the TDL+ bench; this option does not require a computer.
To compensate the deviation of the UV beam, the user can optimize the orientation of the Pellin-Broca prism.

UV SOC option: UV drift compensation and residual beams dumping

UV SOC option (Separated Output Compensator) corrects both the angular deviation and the translation of the beam axis during the wavelength scanning.
4 Pellin-Broca prisms are installed on an additional bench attached to the main TDL+ bench. The distance between these 4 prisms allows for dumping of the residual beams.

Infrared generation:

The IR extension principle relies on frequency subtraction between the fundamental wavelength of the dye and the residual 1064nm wavelength of the pumping laser. This option is installed on a separated bench attached to the TDL+. An 1800l/mm grating is typically used in the oscillator.

IR option: motorized phase-matching

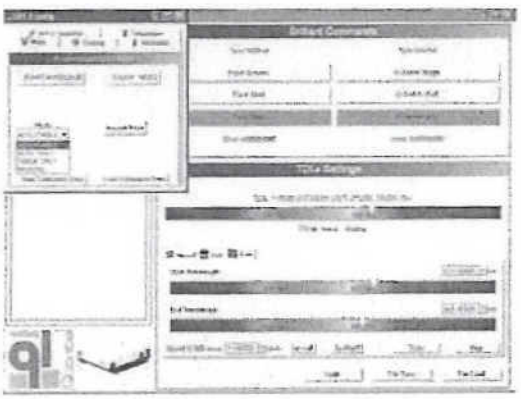
Four crystals (KTP/KTA) are used to generate the wavelength range from 1,2µm to 4,5µm. They are installed in a sealed oven and temperature stabilized. Using a KTA type crystal allows operation around 2800nm which is the spectral range of water vapour absorption. The output energy slightly decreases in the area of this absorption peak. The angle phase-matching of the crystals is computer-controlled just as for the UVT option. The software can use the memorized lookup tables or close-loop control.

IR SOC option: IR drift compensation and residual beams dumping

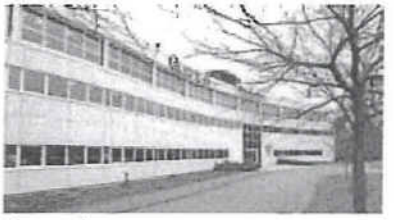
To compensate for the deviation of the IR beams during a wavelength scanning, high IR reflectivity motorized coated mirrors are used. The residual wavelengths are dumped.

Versatility of the control software

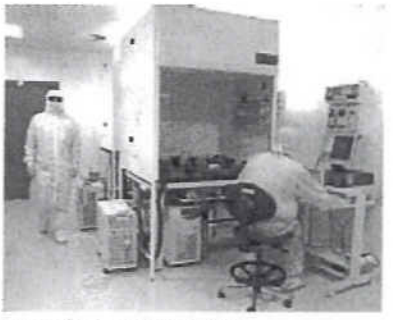
In addition to the adaptability and stability of the assembly, software is provided to control the entire system, pumping laser and dye laser. Users have access to all parameters of the different lasers: frequency, wavelength, type of crystals, temperature and user mode (auto, table, auto/table), etc.



Control software



Quantel



Manufacturing facilities

Quantel USA

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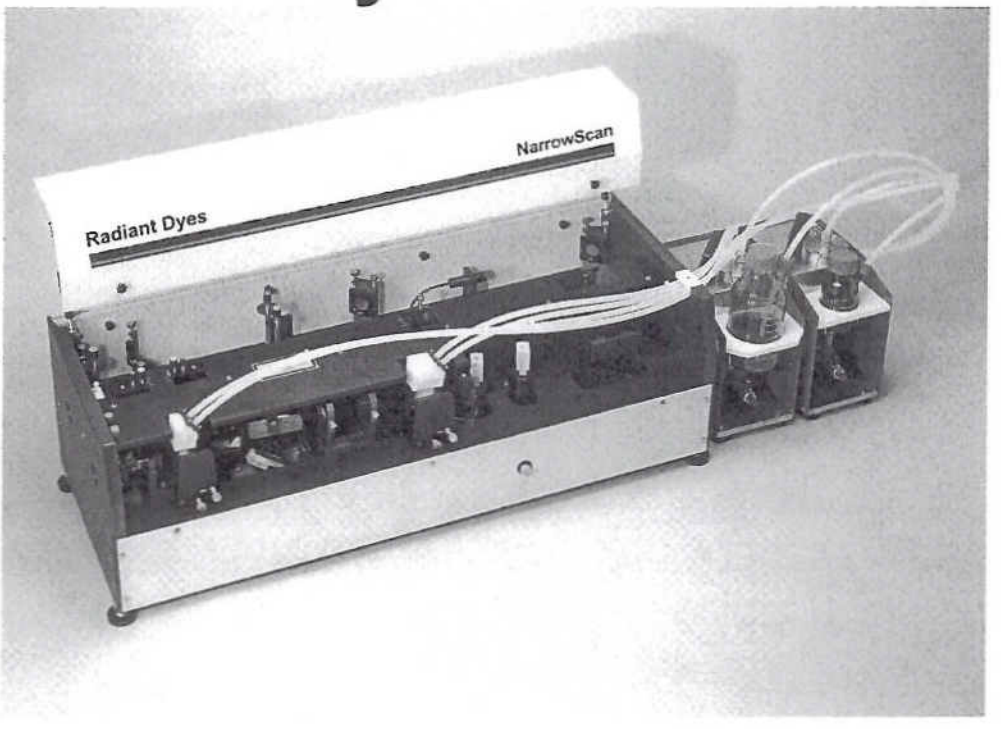
Radiant Dyes Laser Accessories GmbH

Dye Laser



New NarrowScan

New Resonator Design
4 analog / 4 digital inputs
Autotracking Frequency doubling, tripling and mixing
Wavelength Separation Unit
Frequency Stabilization
Temperature Stabilization
Wavelength Calibration
Online Bandwidth Control
Bethune Cell (up to 1 Joule pump energy)
Optional: Integrated Nd:YAG Laser

SbejbouEzft!Mbtfs!Bdd/!Hn cI -!Gsjfesjdi tus/!69-!Hfsn boz.53: 3: !X fsn frtl jsdi fo
☎!, , 5: !)1*32: 7.92172!, !: 3796-!Gby!, , 5: !)1*32: 7.4533
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Optical feedback

The new active feedback allows moreover a fully automatic wavelength calibration and an almost linear scanning. Active temperature contro, online energy control and wavelength stabilisation, as well as linewidth control are further advantages of the new optical feedback. Together with the new motor drive and a new software, we achieved a precision with reproducibility of the laser-line, linear scan and wavelength control, which is, to our knowledge, not reached by any other laser worldwide.

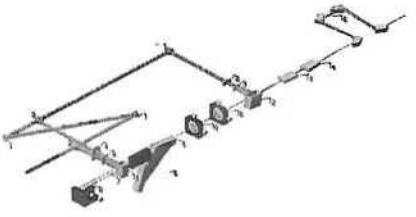
Additional options

When designing the new series of NarrowScan dye lasers we paid utmost attention to a flexible layout, meeting a variety of applications with a single dye laser. The following options can be easily integrated into the housing of the NarrowScan laser to guarantee a rigid and compact structure.

a) Frequency conversion

The excellent spectral and spatial quality of the NarrowScan-series predestinate this laser for the use in nonlinear processes. By means of our very precise positioning devices, all common crystals for frequency doubling, tripling and difference frequency mixing or mixing after doubling can be installed in the housing of the NarrowScan-laser. By installing the positioning stage directly inside the laser housing, a high stability and reproducibility is achieved. For difference frequency mixing (up to 4.5 µm) the dye laser wavelength is mixed with the fundamental of the Nd:YAG-laser. The necessary opto-mechanical components for the pump laser beam are also located inside the laser housing. All frequency units can be used independend, in LookUpTable or in autotracker mode.

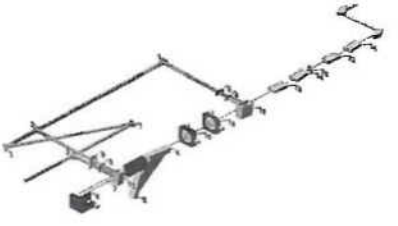
Frequency doubling



Doubling Unit & Pellin Broka Separation Box

Difference frequency mixing

Frequency tripling



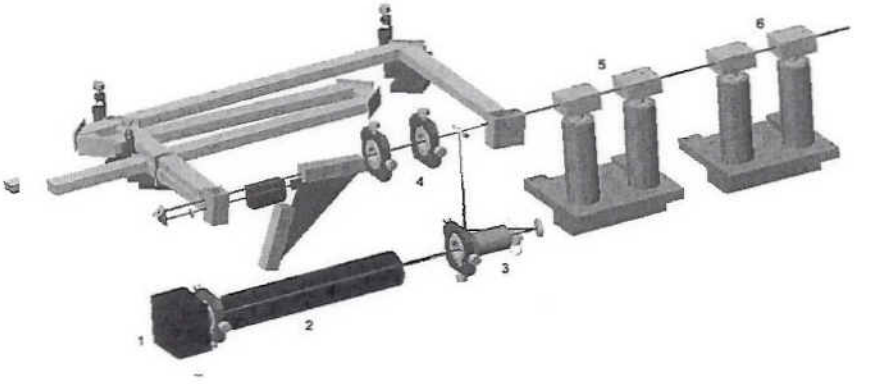
(13) compensators; (14) mixing-crystal; (15) separator (Pellin-Broka prism); (16) λ/2-plate

b) Temperature Stabilization

Our new NarrowScans are provided with an active temperature stabilization to prevent instabilities of the cavity because of changing environmental temperatures.

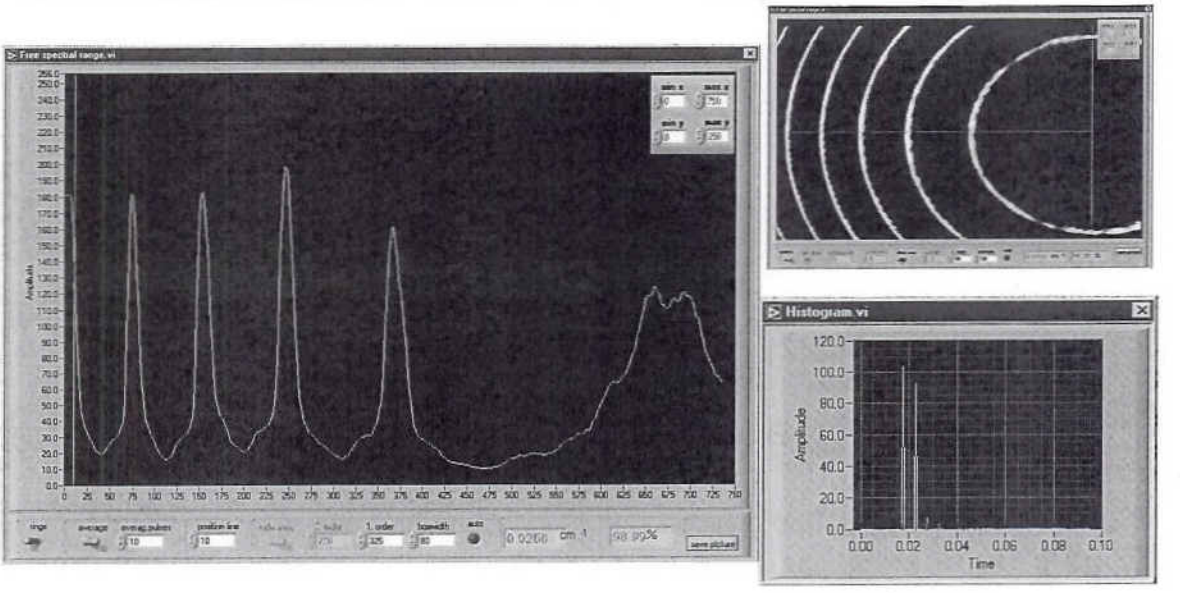
c) Opto-Galvanic Wavelength Calibration

A software controlled opto-galvanic (2) calibration device measures the absolute wavelength of atomic transitions, which are compared the actual grating position. The user can use the data to recalibrate his laser.



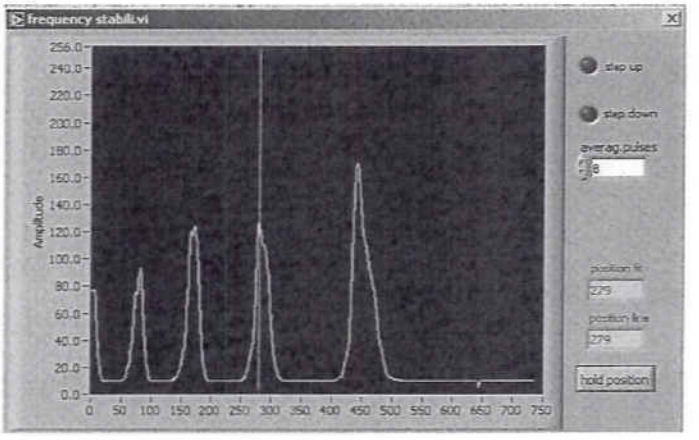
d) Bandwidth Monitor

An Etalon (3) is used to generate interference rings, which are monitored by a CCD-camera (1) and displayed on the PC. The software calculates the laser bandwidth by fitting the interference maxima, allowing an online control of the laser bandwidth during the measurements.



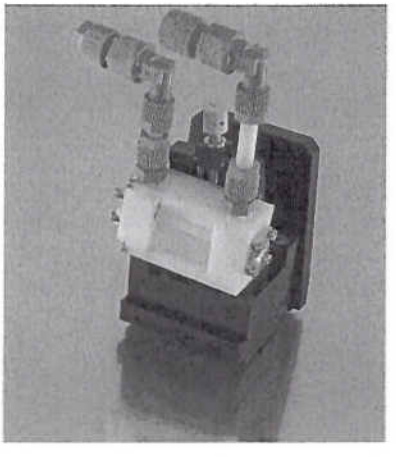
e) Wavelength / Frequency Stabilization

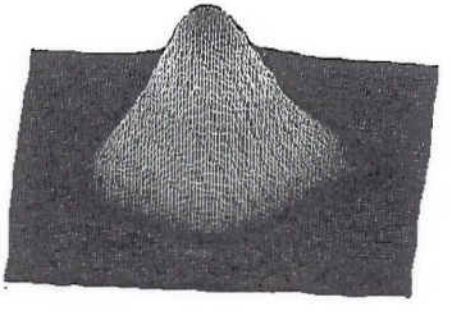
The active frequency stabilization uses the same Etalon as for the bandwidth measurement. In order to stabilize the laser frequency, one of the interference maxima is observed and kept at the same spatial position. Any frequency drift of the dye laser results in a spatial drift of the interference rings, which is compensated for slightly adjusting the resonator.



f) Prismatic cell for high power output and improved beam profile

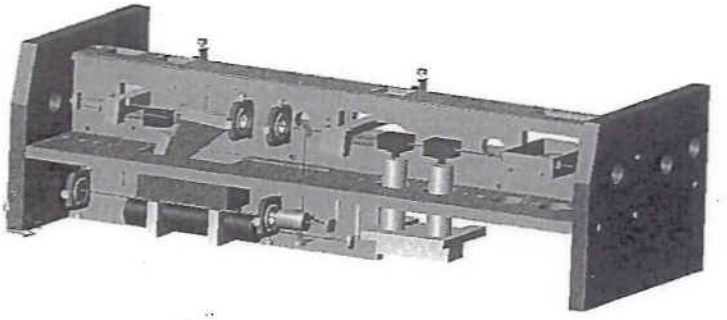
Our new prismatic cell can be used with pump powers up to 1Joule and garantees a high power output with an excellent beam profile. The inner tube can be ordered from 1.6 up to 6mm diameter, depending on the power of the pumplaser.

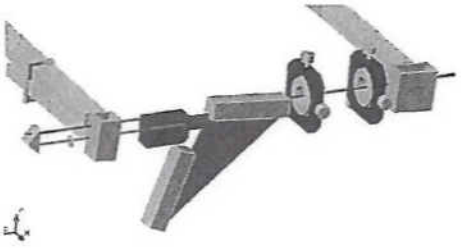




NarrowScan

The NarrowScan pulsed dye laser series is based on a new resonator-design with a very narrow linewidth (<0.04 cm^{-1}) that has been optimized in design and specifications by laser experts over many years and can now be used with pump laser pulses as short as 4 ns. The laser has very rigid and massive middle and side plates, ensuring a very high stability in the oscillator and pre-amplifier. The dimensions of the laser housing are much smaller than before, making the laser as compact as possible, while still allowing space for two frequency conversion units inside the laser.





Improved Resonator Design

- **vertical grazing incidence resonator**
- **larger tuning range**
- **lower bandwidth**
- **improved pulse to pulse energy stability**

New NarrowScan laser with the following options:

- Gratings: 1800, 2400, 3000, 3600 lines / mm
- Double-grating (bandwidth < 0.04 cm^{-1})
- Prismatic cell for high power output
- Frequency conversion units for doubling, trippling or mixing from 190nm up to 4.5µm
- "Look up" table and/or autotracking for both conversion units
- Wavelength separation with two or four Pellin-Broka-Prism
- Temperature stabilization of the crystal-housing
- Frequency stabilization
- Optogalvanic cell for laser calibration
- C++ or LabView software
- 4 digital and 4 analog inputs
- Online power monitoring of fundamental, doubled and tripled laser light
- Online bandwidth monitoring with CCD-camera
- Reversed laser design
- Integrated pump laser (dye and pump laser in a single housing)

Specifications for all NarrowScan Models:

Conversion efficiency: Nd:YAG pumped 532 nm	25 % DCM 28 % Rhodamine 6G
Conversion efficiency: Excimer pumped 308 nm	12 % Rhodamine 6G 15 % Coumarin 102
Wavelength reproducibility (580 nm)	< 0,0025 nm (typically < 0,0009 nm), temperature stabilized
Absolute accuracy of the wavelength (580 nm)	< 0,02 nm (typically < 0,01 nm), temperature stabilized
Wavelength stability	< 0,001 nm/°C
Divergence	0,5 mrad
Polarization	> 98 %
ASE-background	< 0.5 %
Dimensions	660 mm x 420 mm x 360 mm

Configurations:

Laser	Grazing Grating	Tuning Element	Tuning Range	Bandwidth [cm^{-1}]
NarrowScan Double Grating	3600 l/mm (90 mm)	3600 l/mm	330 nm – 480 nm	≤ 0,04 @ 460 nm
NarrowScan Double Grating	3000 l/mm (90 mm)	3000 l/mm	330 nm – 580 nm	≤ 0,03 @ 570 nm
NarrowScan Double Grating	2400 l/mm (90 mm)	2400 l/mm	330 nm – 710 nm	≤ 0,04 @ 580 nm
NarrowScan Double Grating	1800 l/mm (90 mm)	1800 l/mm	350 nm – 850 nm	≤ 0,05 @ 625 nm
NarrowScan Single Grating	3000 l/mm (90 mm)	Mirror	330 nm – 610 nm	≤ 0,05 @ 580 nm
NarrowScan Single Grating	2400 l/mm (90 mm)	Mirror	330 nm – 740 nm	≤ 0,06 @ 580 nm
NarrowScan Single Grating	1800 l/mm (90 mm)	Mirror	350 nm – 900 nm	≤ 0,07 @ 580 nm
NarrowScan Small Grating	2400 l/mm (60 mm)	Mirror	330 nm – 740 nm	≤ 0,08 @ 625 nm
NarrowScan Small Grating	1800 l/mm (60 mm)	Mirror	350 nm – 900 nm	≤ 0,1 @ 625 nm

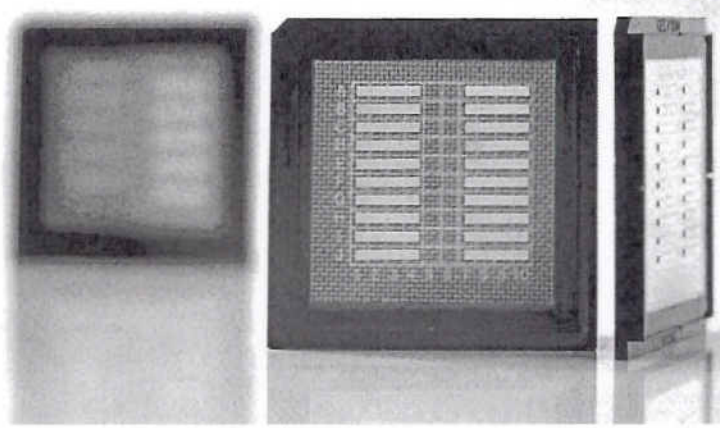
Requirements:

Pump Laser Power	20mJ – 1000mJ (one main Amplifier)
Voltage	110V 6A/ 220V 3A, 50/60Hz, single phase
Computer (not included)	Windows, Linux or Mac, one free serial or USB Port for communication

All NarrowScan dye lasers are equipped with ready-to-use Radiant Dyes dye circulators (standard models for up to 50 Hz repetition rate of the pump laser). The pump optics can be chosen by the customer, according to the wavelength and the beam profile of the pump laser. The laser can either be controlled by a PC via the RS232 interface or an independend control box with a fully functional keyboard.

JENOPTIK

High Power Diode Laser Bars
940 nm, 120 W cw



JDL-BAB-50-47-940-TE-120-2.0

Features:
- High laser power
- High efficiency
- Long lifetime, high reliability
- Excellent beam characteristics

Applications:
- Pumping of solid-state lasers and fiber lasers
- Industrial, scientific and medical systems
- Applications in the printing industry
- Defense and security

High Power Diode Laser Bars
940 nm, 120 W cw

Specifications

Product	JDL-BAB-50-47-940-TE-120-2.0				
	Symbol	Min	**Nom**	Max	Unit
Operation*					
Wavelength (cw)	λ	935	**938**	941	nm
Optical Output Power	P_{opt}		**120**		W
Operation Mode			**cw, switched**		
Power Modulation			**100**		%
Geometrical					
Number of Emitters			**47**		
Emitter Width	W	95	**100**	105	µm
Emitter Pitch	P		**200**		µm
Filling Factor	F		**50**		%
Bar Width	B	9600	**9800**	10000	µm
Cavity Length	L	1980	**2000**	2020	µm
Thickness	D	115	**120**	125	µm
Electro Optical Data*					
Fast Axis Divergence (FWHM)	$\theta_{\parallel}$		**27**	30	°
Fast Axis Divergence**	$\theta_{\parallel}$		**47**	51	°
Slow Axis Divergence at 120 W (FWHM)	$\theta_{\perp}$		**5**	7	°
Slow Axis Divergence at 120 W**	$\theta_{\perp}$		**7**	9	°
Pulse Wavelength	λ	929	**932**	935	nm
Spectral Bandwidth (FWHM)	$\Delta\lambda$		**3**	4	nm
Slope Efficiency***	η	1.0	**1.1**		W/A
Threshold Current	I_{th}		**14**	17	A
Operating Current	I_{op}		**123**	136	A
Operating Voltage	V_{op}		**1.7**	1.9	V
Series Resistance	R_s		**2**	4	mΩ
Degree of TE Polarization	α	98			%
EO Conversion Efficiency***	η_{tot}	57	**62**		%

* Mounted on a heat sink with Rth = 0.5 K/W, coolant temperature 25 °C, operating at nominal power

** Full width at 95 % power content

*** Item may change upon notice and acceptance by JENOPTIK Diode Lab GmbH, due to future improvements of technology or processing

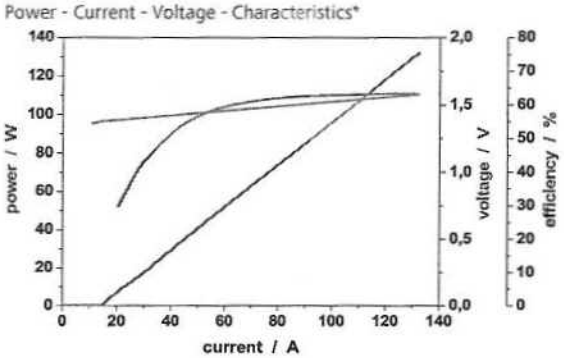
Note: Nominal data represents typical values.

Safety Advices: Laser bars are the active components in high-power diode lasers in accordance to IEC standard class 4 laser products. As delivered, laser bars cannot emit any laser beam. The laser beam can only be released if the bars are connected to a source of electrical energy. In this case, IEC-Standard 60825-1 describes the safety regulations to be taken to avoid personal injury.

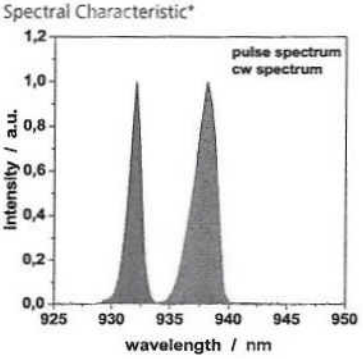
Specifications may change in compliance with our quality management system.

10/2010

Power - Current - Voltage - Characteristics*

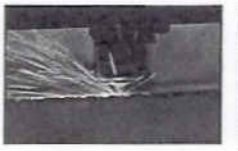
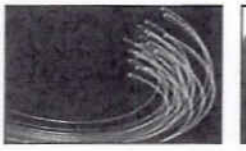


Spectral Characteristic*



JENOPTIK I Lasers & Material Processing
JENOPTIK Diode Lab GmbH
Max-Planck-Strasse 2 I 12489 Berlin I Germany
Sales contact: JENOPTIK Laser GmbH I Phone: +49 3641 65-3053 I Fax: -4011
E-mail: sales-laser.lm@jenoptik.com I www.jenoptik.com/diodelasers

Lumics

LU09xxFyyy

9xxnm Laser Diode on F-Mount

Up to 16W c.w. and 30W in pulsed mode

Description:

The LU09xxFyyy series laser diodes contains a highly optimized GaInAs/GaAs quantum well laser structure on GaAs substrate. Long lifetime is achieved through the Lumics proprietary laser diode facet passivation technology. The process inludes careful design, precisely defined manufacturing and extensive burn-in testing of each individual emitter. The device qualification includes life time testing and a set of thermal and mechanical tests.

Each laser diode chip is individulally serialized for traceability, and is shipped with a specified set of test data. Applications are mainly in solid state laser pumping, illumination, printing or medical treatment.

Features & Functions:

- Wavelength 915, 940 or 975nm
- Up to 16W c.w. operation
- Up to 30W pulsed peak power
- 94µm or 190µm emitter width
- Burn-in tested single emitter
- 2.2mm mounting holes
- Copper base
- Electrically isolated
- Option: FAC lense

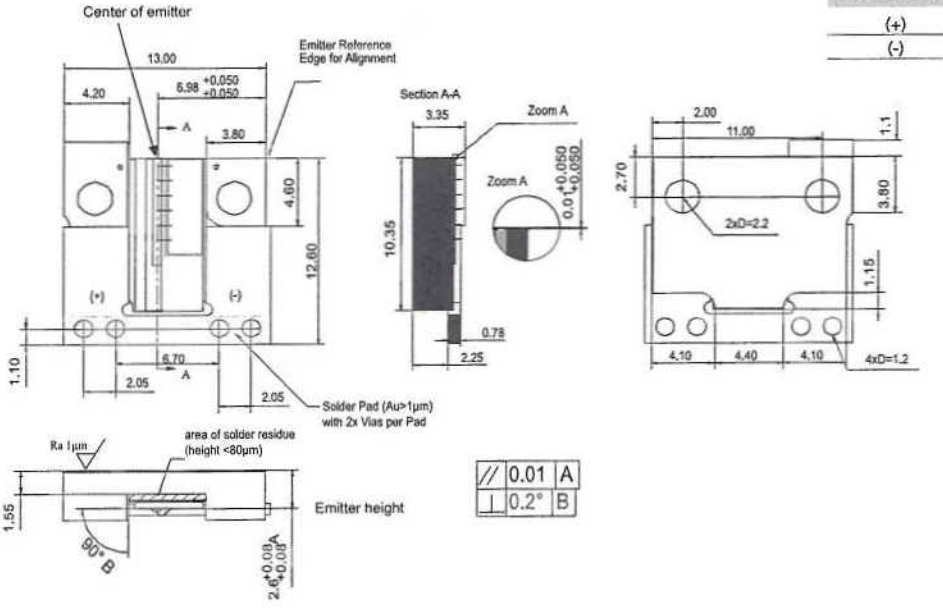
Benefits:

- Small footprint
- Efficient heat sink
- High reliability
- OEM quantities

Applications:

- Pumping (SSL)
- Plastic welding
- Marking
- Illumination
- Medical treatment

Drawing (dimensions in mm)



Connections

Contact Pad	Function
(+)	LD Anode (+)
(-)	LD Cathode (-)

Your ideas are welcome.

Data Sheet LU09xxFyyy Copyright Lumics GmbH - All rights reserved

Typical Electrical and Optical Characteristics

Parameter	Symbol	LU09xxF120	LU09xxF160	Unit
Emitter Width	W	94	190	µm
c.w. Operating Power	$P_{op\ (c.w.)}$	12	16	W
c.w. Operating Current	$I_{op\ (c.w.)}$	13	17.7	A
Pulsed (1) Operating Power	P_{op} (< 30µsec pulse / < 30% d.c.)	15	30	W
Pulsed (1) Operating Current	I_{op} (< 30µsec pulse / < 30% d.c.)	16.8	32.5	A
Threshold Current	I_{th}	500	980	mA
Forward Voltage	V_{op}	2	2	V
Slope Efficiency	λ_{diff}	0.95	0.95	W / A
Peak Wavelength	LU0915Fyyy: λ_{peak}	915+/-10	915+/-10	nm
	LU0940Fyyy: λ_{peak}	940+/-10	940+/-10	nm
	LU0975Fyyy: λ_{peak}	975+/-10	975+/-10	nm
Spectral Width (FWHM)	λ_{rms}	4	4	nm
Beam Divergence (horizontal)(2)	slow axis	7	7	deg
Beam Divergence (vertical)(2)	fast axis	27	27	deg
AR Reflectivity(3)	r_f	2	2	%
HR Reflectivity	r_r	95	95	%
Spectral Shift with Temp.	λ_{T_Shift}	0.3	0.3	nm / K
Spectral Shift with Current	λ_{P_Shift}	0.5	0.5	nm / A
Operating Temp.	T_{op}	20 - 30	20-30	°C
Option: FAC lense				
Fast axis (vertical) divergence	NA	< 3	< 3	mrad
Vertical width of the beam		< 0.8	< 0.8	mm

Important Notes:
(1) Typical pulse condition: pulse <10µsec / d.c. 1%
(2) FWHM at Pop
(3) Other coatings are offered on request

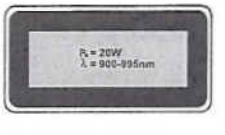
Absolute Maximum Ratings

Parameter	Symbol	LU09xxF120	LU09xxF160	Unit
LD c.w. Forward Current	$I_{op,\ (c.w.)\ max}$	15	20	A
LD pulsed (<30µsec) Forward Current	$I_{op,\ (pulsed)\ max}$	18	34	A
LD Reverse Voltage	$V_{R,\ max}$	2	2	V
Maximum Processing Temperatures:				
Solder pads for LD contacts / max 5sec.	$T_{Op\ max,\ solder\ pad}$	250	250	°C
Soldering of Cu base block / max 5sec.	$T_{Op\ max,\ Cu\ base}$	150	150	°C

Notes:
Absolute Maximum Ratings may be applied to the laser module for short periode of time only. Exposure to maximum ratings for extended period of time or exposure above one or more max ratings may cause damage or affect the reliability of the device.

Operating Temperature and Rel. Humidity must be choosen such that the dewpoint of humid air around the laser diode is below the operating heat sink temperature to avoid condensing of water on the laser diode facet.

User Safety



Your ideas are welcome.

Preliminary
200W 9xxnm High Power Laser Diode Bar on Microchannel Cooler

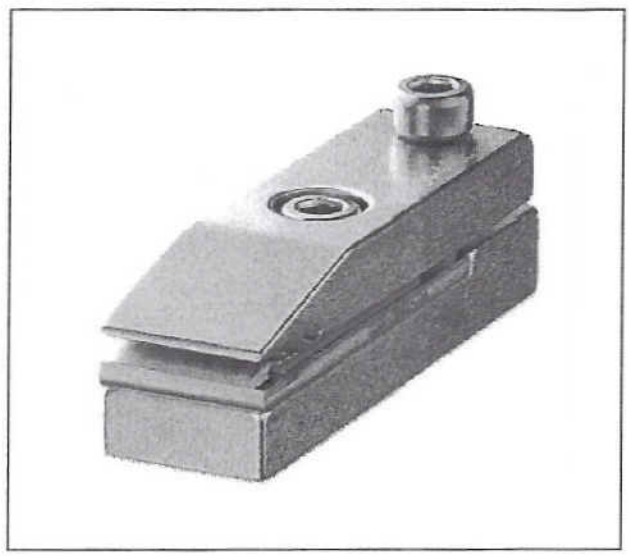
BAC200C-9xx-05/06 & BAC200C-10xx-05/06

Features:

- Mounted 10mm laser diode bar
- Active microchannel cooler (water-cooled)
- 200W operating power
- Highly reliable single quantum well MBE structure
- Telecom grade AuSN mounting technology
- Assembly option with Cu base and cover
- Standard wavelength at 915nm, 950nm, 980nm and 1030nm (others available on request)
- RoHS compliant

Applications:

- Solid state disk and fiber laser pumping
- Direct applications such as material processing
- Printing
- Medical



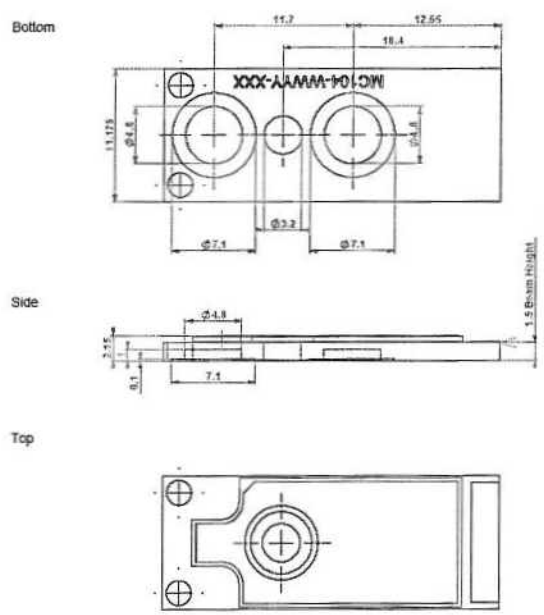
The Oclaro BAC200C-9xx-05/06 & BAC200C-10xx-05/06 laser diode bar on microchannel cooler series has been designed to provide the increased brightness and reliability required for pumping next generation solid state disk and fiber lasers, and for direct applications. The proprietary E2 front mirror passivation process, developed at our Zurich site, prevents Catastrophic Optical Damage (COD) to the laser diode facet even at extremely high output powers. The laser diode bars are mounted on a water cooled microchannel package using hard solder; providing very high reliability in CW and pulsed (1-Hz type) applications.

Characteristics

Parameter	Symbol	Typ	Unit
CW output power	P_{op}	200	W
Central wavelength [1] BAC200C-915-05/06 BAC200C-940-05/06 BAC200C-980-05/06 BAC200C-1030-05/06	 λ_{c915} λ_{c940} λ_{c980} λ_{c1030}	 915 ± 10 940 ± 10 980 ± 10 1030 ± 10	nm
Spectral width (FWHM)	$\Delta\lambda$	3.5	nm
Wavelength shift with temperature	$d\lambda_c/dT_{op}$	0.3	nm/°C
Beam divergence Parallel to Junction (90% of Power) Perpendicular to Junction (FWHM)	 $\theta_{//}$ $\theta\perp$	 8 30	deg
Polarization	–	TE	–
Threshold current	I_{th}	22	A
Slope efficiency	$\eta_D = P_{op}/(I_{op}-I_{th})$	1	W/A
Conversion efficiency	$H= P_{op}/(V_{op}xI_{op})$	65	%
Operating current	I_{op}	220	A
Operating voltage	V_{op}	1.5	V
Operating temperature	T_{op}	25 ± 5	°C
Water cooler flow	Q_w	18 ± 2	l/hrs
Microchannel Cooler differential pressure	P_w	0.1 - 0.2	MPa
Water conductivity	σ	<10	µS/cm
pH value		~8	
Particle filter (inlet)		<20	µm
Bar width	b	10	mm

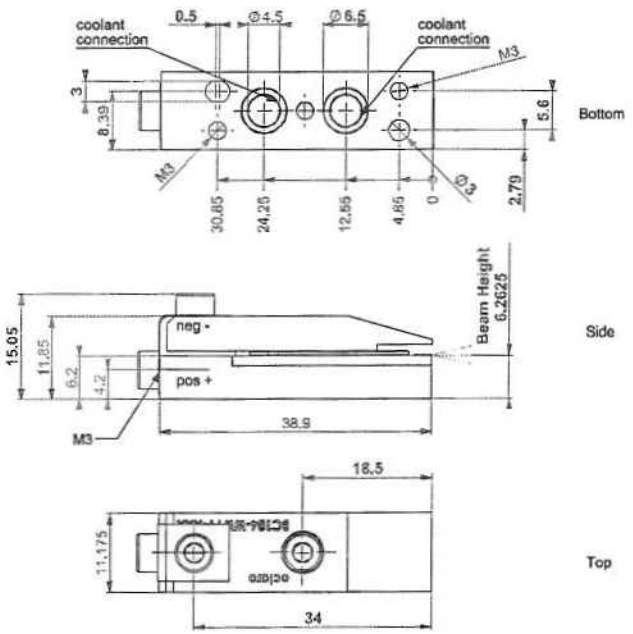
[1] Reduced wavelength window / extended range available on request (910-1070nm)

Microchannel cooler dimensions (mm)



BAC200C-9xx-05 & BAC200C-10xx-05

Microchannel cooler with base and cover dimensions (mm)



BAC200C-9xx-06 & BAC200C-10xx-06

RoHS Compliance

Oclaro is fully committed to environment protection and sustainable development and has set in place a comprehensive program for removing polluting and hazardous substances from all of its products. The relevant evidence of RoHS compliance is held as part of our controlled documentation for each of our compliant products. RoHS compliance parts are available to order, please refer to the ordering information section for further details.

Ordering Information

BAC200C-915-05	200W 915nm Laser Diode Bar on Microchannel cooler
BAC200C-940-05	200W 940nm Laser Diode Bar on Microchannel cooler
BAC200C-980-05	200W 980nm Laser Diode Bar on Microchannel cooler
BAC200C-1030-05	200W 1030nm Laser Diode Bar on Microchannel cooler
BAC200C-915-06	200W 915nm Laser Diode Bar on Microchannel cooler with base and cover
BAC200C-940-06	200W 940nm Laser Diode Bar on Microchannel cooler with base and cover
BAC200C-980-06	200W 980nm Laser Diode Bar on Microchannel cooler with base and cover
BAC200C-1030-06	200W 1030nm Laser Diode Bar on Microchannel cooler with base and cover

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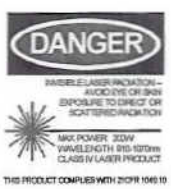

ISO 9001:2000 Certified
FM 68158

BAC200C-9xx_10xx Rev 1.1 July 2009
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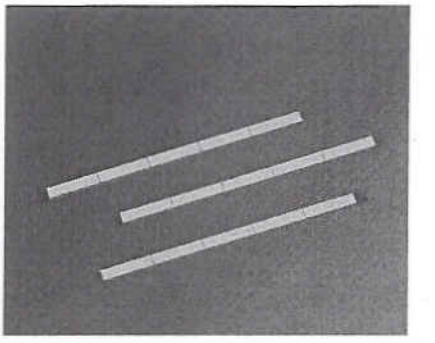

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Bmhdi bsbduf sjt ujdt !boe!rjm jubujpot !sf gf slup!qvrhf e!n f bt vsf n f out !)2!µt !qvrhf !x jeú !bul5!l l {!sf qf ujujpo!X bwf *!jn qrjft ! b!t vjubcrh!n pvoujoh!uf di oprphz!x jú !b!ú f sn brhsf t jt ubodf !pg$S_ú$ =!1/6!LOX /!Ui f !pqf sbujoh!qf bl !f n jt t jpo!x bwf rhohú ! ef qf oet !po!ú f !pqf sbujoh!n pef -!bn cjf oul uf n qf sbuvsf !boe!ú f sn brhsf t jt ubodf !$S_ú$ /!Ui f !pqf sbujoh!qf bl !f n jt t jpo! x bwf rhohú !jo!hf of sbrjt !i jhi f slú bo!ú f !t qf djgjf e!qvrhf e!qf bl !x bwf rhohú !λ_{qvrhf})2 µt !qvrhf !x jeú !bul5!l l {!sf qf ujujpo! sbuf */!Bmhdi bsbduf sjt ujdt !pcubjof e!jo!ú f !pqf sbujoh!n pef !n bz!ejgjf slgspn !ú f !di bsbduf sjt ujdt !t qf djgjf e!i f sf jo/

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EU RoHS and China RoHS compliant product

此产品符合欧盟 RoHS 指令的要求；

按照中国的相关法规和标准，不含有毒有害物质或元素。

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Uf sn t !pg ef jnwf sz! boe! sjhi ut ! up! di bohf ! ef t jho! sf t f swf e/! Evf ! up! uf di ojdbmsf r vjsf n f out ! dpn qpof out ! n bz! dpoubjo! ebohf spvt !t vct ubodf t /!Gpsljogpsn bujpo!po!ui f !uzqf t !jo!r vf t ujpo!qmbt f !dpoubdulpvs!Tbmmt !P shboj{ bujpo/

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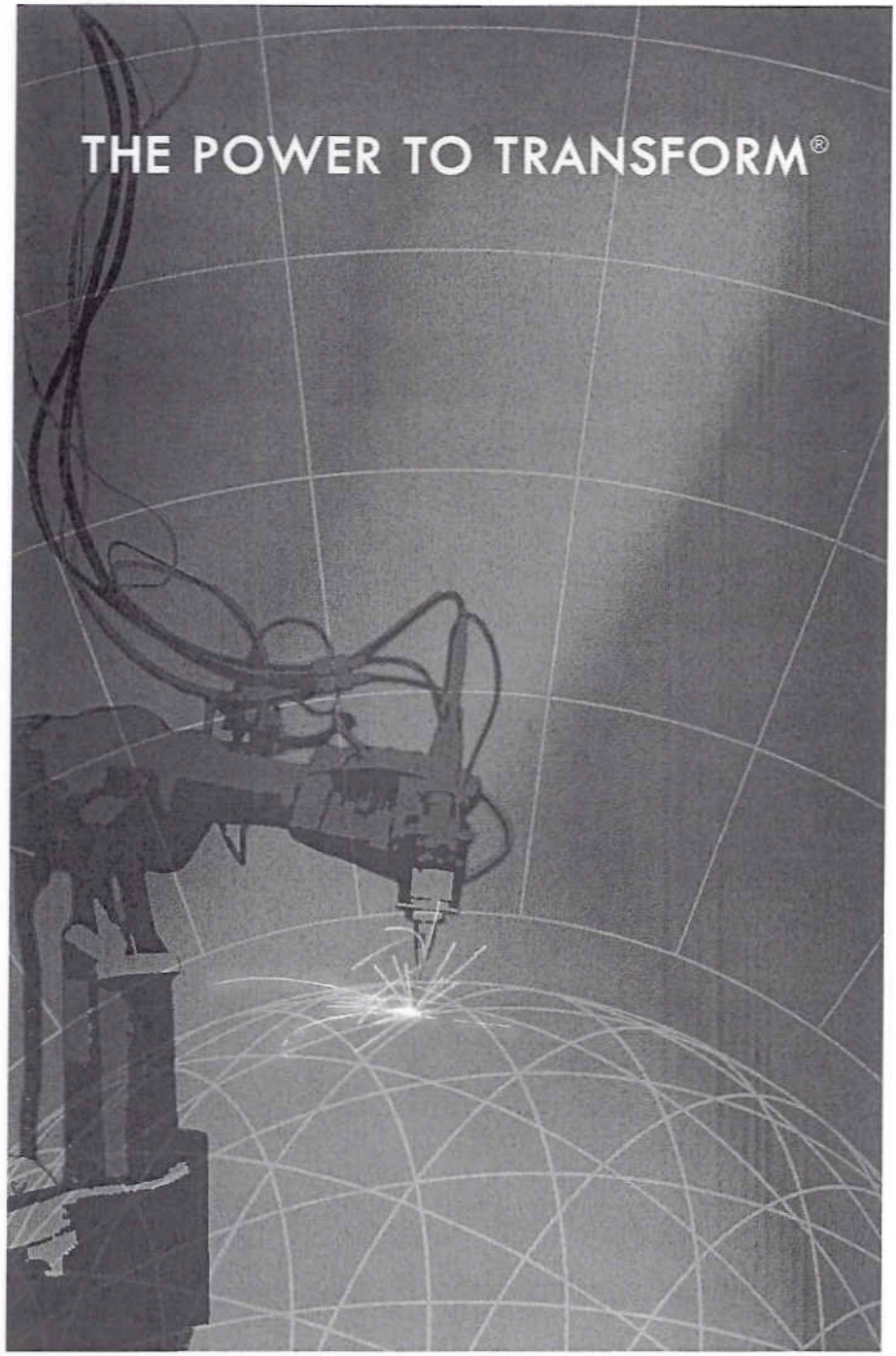
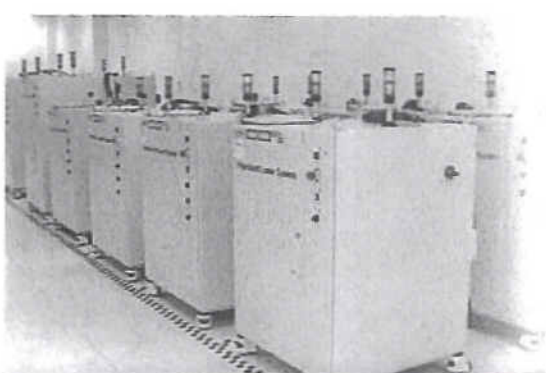
IPG PHOTONICS®





HIGH POWER FIBER LASERS
FOR INDUSTRIAL APPLICATIONS

LEADER IN INNOVATION

IPG Photonics World Headquarters, Oxford MA, USA

IPG Photonics Corporation is the world leader in high power fiber lasers and amplifiers. Founded in 1990, IPG pioneered the development and commercialization of optical fiber-based lasers for use in a wide range of venues such as materials processing, telecommunications, medical, scientific and other advanced applications. Fiber lasers have revolutionized the industry by delivering superior performance, reliability and usability at a lower total cost of ownership compared with conventional lasers, allowing end users to increase productivity and decrease operating costs. IPG is headquartered in Oxford, Massachusetts with additional manufacturing plants, sales and service offices throughout the world.

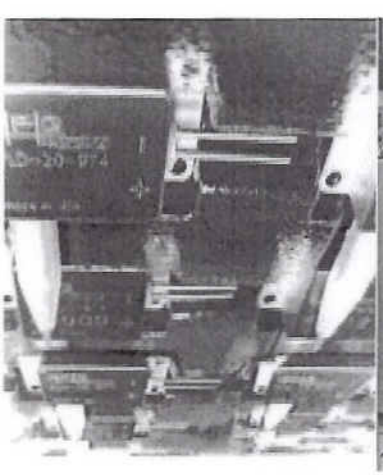
We are the only company that controls the performance, cost and yield of both active fibers and semiconductor pump diodes - the core technology of our fiber laser and amplifier products. Additionally, we developed and manufacture our own process fibers, beam couplers & switches, collimators and chillers. This innovation coupled with our extensive manufacturing capabilities place IPG in the rare position of being in full control of every step needed to achieve this mission: *to deliver innovative, reliable, high quality and high performance fiber lasers at a cost-effective price.*

HIGH POWER FIBER LASERS

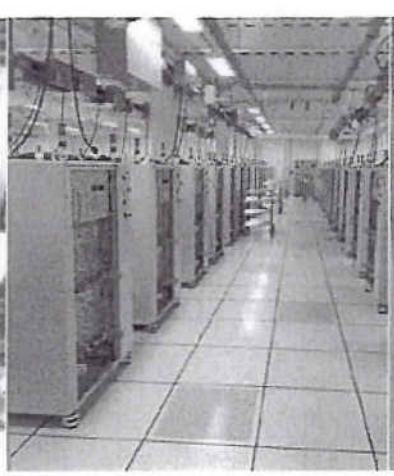
A Unique Combination of the Most Advanced Technologies

High power fiber lasers are created from active optical fibers and semiconductor diodes, a merger between two of the most innovative and advanced laser technologies. Fiber lasers use single emitter semiconductor diodes as the light source to pump the active fibers. The laser beam emitted is contained within optical fibers and delivered through an armored flexible cable. Active fibers, special optical fibers doped with rare earth ions, allow for an extremely bright light from a very small core, thus making possible the production of kilowatt class output with excellent beam quality. IPG uses many proprietary technologies to create the undisputed best beam quality kilowatt class lasers available in the market today.

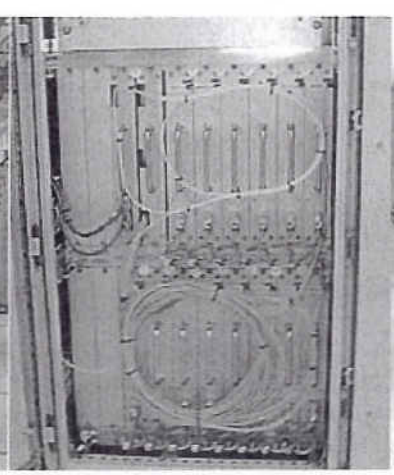
The combination of technologies results in a unique, highly reliable and superior performing laser system with parameters exceeding any traditional laser technology, including disc, rod, YAG or CO_2 lasers. Our robust fiber lasers share common attributes of compact size, long diode life, low maintenance operation, high wall plug efficiency and completely consistent beam divergence and beam profile at all power levels.



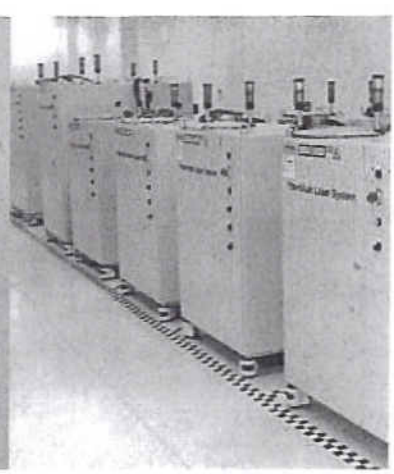
IPG's own high-power semiconductor Diodes



Diode burn-in



Open laser chassis displaying the modular design of high power fiber lasers



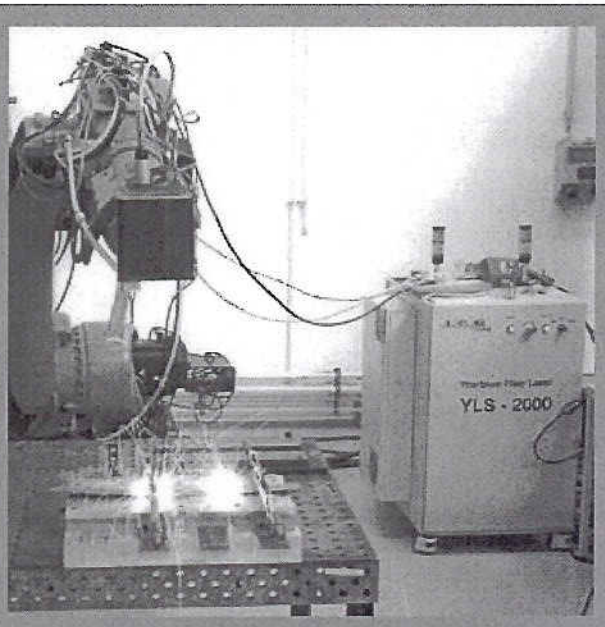
Post-production fiber lasers

FIBER LASER ADVANTAGES

What You Can Expect from an IPG Laser

Our low-order-mode kilowatt class fiber lasers range in power from 500 W to 50 kW, operating in CW or modulated modes up to 20 kHz with wall-plug efficiencies greater than 30%. The dynamic operating range of these devices is available from 10% to full power with no change in beam divergence or beam profile throughout the entire range. This allows a single laser to be utilized for both high and low-power applications such as welding, drilling and precision cutting, a previously unheard of capability.

IPG lasers' divergence specifications are far superior than other lasers and allow the use of long focal length processing lenses for vastly improved depth of field, less damage to optical components and are ideal for remote welding applications. The units can be supplied with fiber lengths to 100 meters, different fiber diameters and variety of multi-port beam switches, beam couplers, termination optics and scanners.



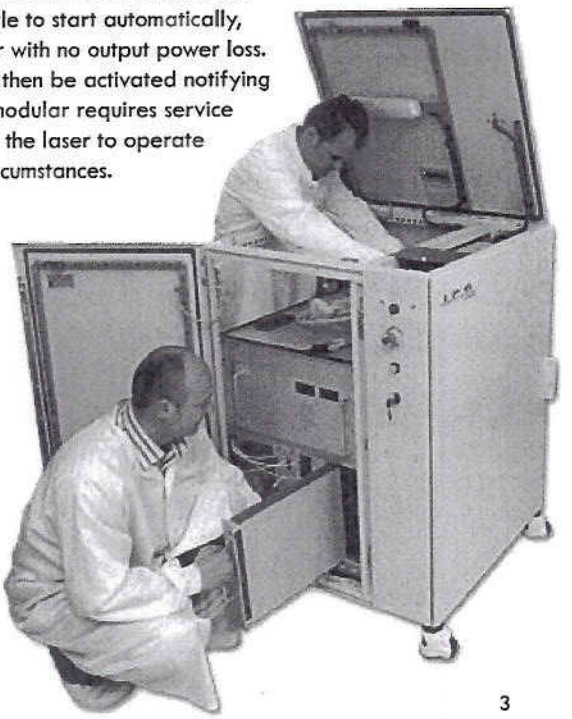
MAIN FEATURES

- Excellent Beam Parameter Product (BPP)
- Constant BPP Over Entire Power Range
- Small Focus over Large Working Distance
- Over 30% Wall-Plug Efficiency
- Maintenance Free Operation
- Modular 'Plug & Play' Design
- Compact, Rugged & Easy to Install
- Estimated Diode Lifetime > 100,000 hours
- Integrated Coupler or Beam Switch

Fiber lasers deliver their energy through an integrated flexible optical fiber. Fiber lasers have a monolithic, entirely solid state, fiber-to-fiber design that does not require mirrors or optics to align or adjust. These features make fiber lasers easier to integrate and operate in production, medical and other laser-based systems.

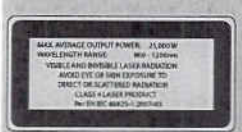
Fiber lasers are typically smaller and lighter in weight than traditional lasers, saving valuable floor space. While conventional lasers can be delicate due to the precise alignment of mirrors, fiber lasers are more rugged and able to perform in variable working environments. These qualities permit fiber laser systems to be transported easily.

The fiber laser is modular, built from multiple laser units, each one generating hundreds of watts of output power. This also allows the laser system to incorporate reserve modules and power margins. Available in the YLS series of high power laser is the redundant module feature. If something should happen with a regular fiber laser module it will shut off and allow the redundant module to start automatically, leaving the laser with no output power loss. An alarm would then be activated notifying the user that a modular requires service but still allowing the laser to operate under normal circumstances.



Each classification of high power fiber laser serves a targeted application demographic. With the most compact design, the YLR laser is offered as a cost-effective, adaptable solution for a clean room system or for integration into a production line. Directly terminated to a QBH-type connector with numerous feed fiber lengths and diameters available, the rackmount configuration is ideal for a multitude of applications from cutting, welding and drilling to medical device manufacturing.

With a larger feed fiber core and simple design, the cladding laser (CL) is aptly named. Also utilized for micro and macro welding, brazing, annealing and heat treating applications, the YLS-CL is considered a direct competitor to direct diode systems. With its maintenance-free, robust package the YLS-CL allows for plug and play fiber delivery with interchangeable process fibers available in either square or round diameters up to 1mm.



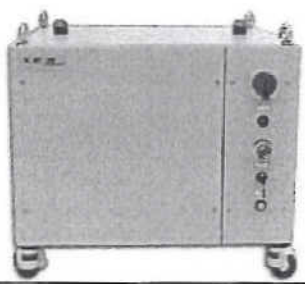
	YLR Series	YLS-CL Series
Product Designation*	YLR-XXXX	YLS-XXXX-CL
Description	Rackmount Ytterbium Fiber Laser Module	Cladding Ytterbium Fiber Laser System
Available Operating Modes	CW, QCW, SM	CW, QCW
Polarization	Random	Random
Available Output Power	10 Watts - 1 kW	500 Watts - 2 kW
Emission Wavelength	1070-1080 nm	1070-1080 nm
Feed Fiber Diameter*	Available in single mode, 50,100,200 or 300 µm diameter	300 µm diameter
Wall Plug Efficiency	>30%	>30%
Output Termination Options	QBH-Type (HLC-8). LCA, QD compatible	QBH-Type (HLC-8). LCA, QD compatible
Ancillary Options	Direct feed to termination only	Internal coupler standard, option to upgrade to 1x2 switch
Air Conditioner	Not Available	Available Option
Interface	RS-232, Digital I/O, Analog Control	LaserNet, Analog & Digital I/O interfaces
Cabinet Style/ Dimensions	6U Rackmount Enclosure[1] (HxWxD, mm) 266x448x650	25U Standalone NEMA 12 Enclosure (HxWxD, mm) 1106x856x806
Upgradable	No	No
Redundant Module	Not Available	Not Available

[1] 6U rackmount chassis based on 500 - 1 kW power. <500 Watts housed in either 3U or 4U rackmount design.

HIGH POWER LASER CONFIGURATIONS

The most versatile and customizable option within the product line is the YLS series fiber laser. Developed as a complete system, this design features the widest range of fiber diameters, the option to terminate to up to 6 ports from one power source, and the ability to upgrade. Housed in a NEMA 12, air conditioned sealed cabinet, these systems are designed to operate in industrial manufacturing environments. They have garnered wide acceptance in the very demanding automotive, aerospace and oil and gas industries, many requiring multiple shifts operating.

YLS Series

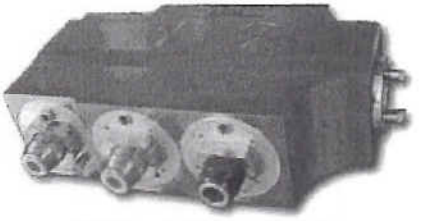


YLS-XXXX	YLS-XXXX	YLS-XXXX
Basic kW Ytterbium Fiber Laser System	kW Class Ytterbium Fiber Laser System	kW Class Ytterbium Fiber Laser System
CW, QCW, SM	CW, QCW, SM	CW, QCW, SM
Random	Random	Random
500 Watts - 2 kW	500 Watts - 4 kW	3kW - 10kW
1070-1080 nm	1070-1080 nm	1070-1080 nm
Available in single mode, 50, 100, 200 or 300 µm diameter	Available in single mode, 50, 100, 200 or 300 µm diameter	Available in 100, 200 or 300 µm diameter
>30%	>30%	>30%
QBH-Type (HLC-8). LCA, QD compatible	QBH-Type (HLC-8). LCA, QD compatible	QBH-Type (HLC-8). LCA, QD compatible
Options Available: External coupler, External 1x2, 1x4 or 1x6 beam switch, or External 50:50 beam splitter.	Options Available: Internal coupler, Internal 1x2 beam switch, Internal 50:50 beam splitter, External 1x4 or 1x6 beam switch.	Options Available: Internal coupler, Internal 1x2 beam switch, Internal 50:50 beam splitter, External 1x4 or 1x6 beam switch.
Standard	Standard	Standard
Standard: LaserNet, Digital I/O, Analog Control Additional Options: DeviceNet or Profibus	Standard: LaserNet, Digital I/O, Analog Control Additional Options: DeviceNet or Profibus	Standard: LaserNet, Digital I/O, Analog Control Additional Options: DeviceNet or Profibus
12U Standalone NEMA 12 Enclosure (HxWxD, mm) 558x790x815	25U Standalone NEMA 12 Enclosure (HxWxD, mm) 1106x856x806	31U Standalone NEMA 12 Enclosure (HxWxD, mm) 1400x856x806
Yes, Maximum 2 kW Upgrade	Yes, Maximum 4 kW Upgrade	Yes, Maximum 10 kW Upgrade
Not Available	Available option <3 kW, Standard on 3 kW+	Standard

*Product designation is relative based on desired wattage and configuration. If a 3 kW system with an internal coupler is desired, the part # designation will be "YLS-3000-CT". Likewise the addition of an internal 1x2 switch will have the "-S2T" or "-S2" notation depending on the location of the switch on the cabinet.
- Please consult IPG Sales for information regarding >10 kW lasers.

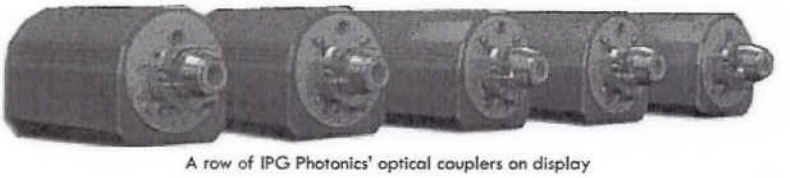
Optical Coupling, Switching & Sharing

Maximizing Your Fiber Laser's Capabilities



IPG Photonics' 2 way beam switch

The ability to couple light from one fiber to another greatly expands upon IPG's fiber laser functionality. A single laser can be used as a power source for multiple work cells thus reducing the total cost of capital equipment. A multi-port unit offers the option of attaching varied process fibers where each work cell could be operating on a different application; for instance one port could weld with a 300 µm diameter fiber in one cell while another port operates with a 100 µm fiber thus providing power to two workstations from a single laser. In addition to greater functionality, optical coupling also provides for ease of replacement of the process fiber, be it for altering the parameters for an application or in an instance of accidental damage to the fiber. If damage does occur, the main power source stays intact and operational for other channels, thus providing greater protection to the power source.



A row of IPG Photonics' optical couplers on display

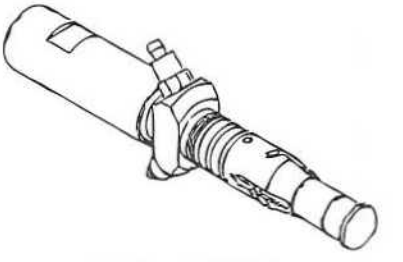
Available options include either a single port coupler, a multi port beam switch offered in either 2, 3, 4, 5 or 6 channels, or a 2 port beam sharing function with the additional option of 100% full power in one port. Each component is available in a multitude of configurations depending on the chosen power source, series and the size of the component. Up to 2 ports can be integrated internally in the YLS series with either top or side mount depending on the desired end use. External optical ports have the added option of a long stand-off distance for remote installation on the work floor for greater flexibility and convenience. Though the beam sharing function is only available as a 2 port system it can also be combined with the multi-port beam switch for even greater capabilities.

Depending on the power level, feeding fibers are available in either a 50, 100, 200 or 300 µm diameter featuring unbeatable beam quality in comparison with solid-state lasers. The beam can be switched to any channel from any position within 50ms. A state of the art safety system constantly monitors the position of mirrors, fiber interlocks, scattered light inside beam switch cavities, water flow for optical connectors and other important parameters. We manufacture all of our optical couplers, beam switches and beam splitters as well as process fibers. Process fibers are available in 100, 150, 200, 300, 400, 600, 800 or 1,000 µm diameter with lengths up to 100 meters.

IPG HP Collimators

IPG's line of collimators are available in both D25 and D50 from 60 to 200mm in focal length. The collimators feature water cooled optics, an adjustable focus and are QBH-type HLC-8 adapted for easy connection to any of our feed or process fibers. Available collimators: D25-F60, D25-F85, D50-F100, D50-F120, D50-F160 & D50-F200.

IPG Photonics' D25-F60 & D-50-F160 Collimators



IPG Photonics' HLC-8 Connector

Laser Control Software

Interface Options and Abilities

IPG fiber lasers feature the most up to date control functions requested by the industry. Interfaces such as Profibus, DeviceNet, Industrial Ethernet or simple digital I/O make integration with complex equipment straightforward and easy to use. All laser parameters and available peripherals such as a multi-channel beam switch, chiller, guide laser, power supply, etc. are constantly monitored and controlled by an internal computer and can be remotely accessed at any time. A convenient graphical user interface can be installed on any customer PC. In addition, IPG's fiber lasers have conventional interfaces such as analog control and direct modulation. Response time to these signals is less than 50 microseconds which is crucial for applications with on-the-fly adjustments. Moreover, the laser can store up to 50 different programs with 100 commands each which can be called out with the simple push of a button or via external digital signal.

Customer Care

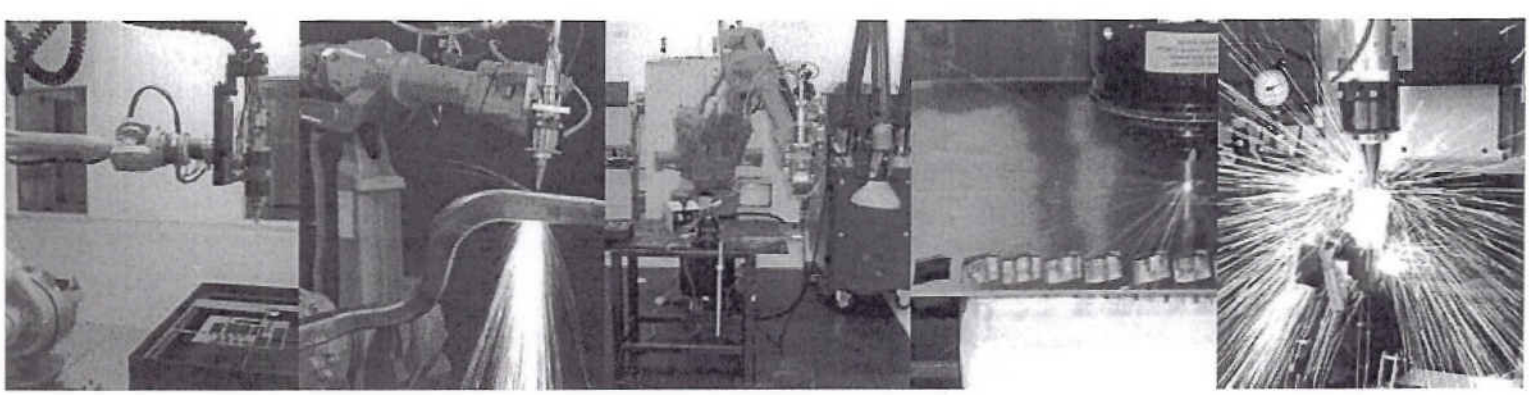
Fast and Professional

Unlike conventional laser technologies, IPG fiber lasers require no preventive maintenance. As long as output optics and coolant are properly maintained by the customer, the laser will perform consistently without adjustment or intervention by the customer or IPG. This greatly reduces downtime and maintenance cost to the customer. We have a team of dedicated service professionals and technical support specialists worldwide to provide personal and effective customer support.

Applications Processing Centers

Developing Your Laser Solution

IPG Photonics offers free applications development through any of our six Materials Processing Centers worldwide. With three US locations: Santa Clara CA, Novi MI, and Oxford MA, as well as 3 international locals: Burbach Germany, Moscow Russia and Beijing China, our applications developers are there to provide customers with an opportunity to evaluate fiber laser technology for materials processing. We offer prototyping and feasibility studies to our prospective customers to evaluate fiber lasers for their unique applications. Our knowledge of fiber laser applications can accelerate and improve your application development, from macro machining to micro machining and marking of various materials. Each of our applications labs offers our customers proof of concept, process development, recommendations, consultations, optical metrology, metallurgy, sample processing and an accompanying full results report.



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  - Rod lasers
  - Pulsed lasers
  - Short pulsed lasers
  - Beam guidance
  - Software TruControl
- Marking lasers
- Laser systems

TruFiber lasers

TruFiber 400.

Zoom Pictures

The TruFiber is attractive due to its high process speed, narrow weld seams and small cutting kerfs.

Its 200, 300 or 400 watts of laser power make it ideal for precision processing.

With proven TRUMPF quality, the TruFiber performs reliably. The fact that it is maintenance -free, with long diode life time, means its total cost of ownership is very low.

- Best beam quality $M^2 < 1.1$
- Comfortable operation with the integrated PC and touchscreen panel
- Built-in frequency generator
- Power measurement and control in real-time
- Robust laser light cable
- High safety standard
- Two product versions available: Version Stand-alone with integrated water-air chiller and version 19" for integration

Overview | Technical Data | **System Solutions** | Applications

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We offer you a broad portfolio of optics for your needs.

Applications

Deep penetration welding
Narrow seams with high strength.

Powder deposition welding
The answer to wear and modification requirements.

Heat conduction welding
Easy and fast welding of thin-walled parts and

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	TruFiber 200 / 300 / 400, Version 19"
Laser power	200 | 300 | 400 W
Operation mode	cw / modulated
Max. Modulation frequency	50 kHz
Performance range	3 % - 100 %
Wavelength	1070 +/- 10 nm
Polarization	Random
Connection and Consumption	
■ Electrical connection (voltage)	230 V
■ Electrical connection (frequency)	50-60 Hz
■ Nominal power consumption	1.1 | 1.3 | 1.95 kW
Ambient temperature	5 °C - 40 °C
Dimensions and weight supply unit	
■ Width	483 mm
■ Height	495 mm
■ Depth	513 mm

visible edges.

Brochures

Lasers for medical technology
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Laser precision cutting
New shapes faster
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Excellence in fine dimensions.
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Industry solutions

Laser cutting in medical technology
Quality for every cut.

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https://www.trumpf-laser.com/en/products/solid-state-lasers/disk-lasers/trudisk.html

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  - Rod lasers
  - Pulsed lasers
  - Short pulsed lasers
  - Beam guidance
  - Software TruControl
- Marking lasers
- Laser systems

TruDisk lasers

TruDisk 4002

Zoom | Pictures

The TruDisk disk laser combines the advantages of a solid-state laser with those of a diode laser. The diode laser, as the pump source, provides the excitation energy and ensures high efficiency. The disk, as a solid-state laser, ensures high beam quality.

- High, power-independent beam quality
- Highest availability possible
- Powers from 1 to 16 kilowatts
- Compact design
- Simpler, quicker replacement of individual components
- Plug and play with all fiber diameters
- Beam quality from 2 to 8 mm*mrad

Overview | **Technical Data** | System Solutions | Applications

1 2 3 4

	TruDisk 3302	TruDisk 4002	TruDisk 5302	TruDisk 6602
Laser power	3300 W	4000 W	5300 W	6600 W

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Solve every task perfectly.
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TruDisk applications

Deposition welding

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Overview | **Technical Data** | System Solutions | Applications

1 2 3 4

	TruDisk 3302	TruDisk 4002	TruDisk 5302	TruDisk 6602
Laser power	3300 W	4000 W	5300 W	6600 W
Laser power (with upgrade)	4000 W	4000 W	8000 W	8000 W
Beam quality	8 mm•mrad	8 mm•mrad	8 mm•mrad	8 mm•mrad
Min. diamter laser light cable	200 µm	200 µm	200 µm	200 µm
Nominal power consumption	16 kW	19 kW	26 kW	33 kW
Max. cooling water consumption at 15 degrees	1.6 m^3/h	2.2 m^3/h	2.8 m^3/h	3,3 m^3/h
Cooling water temperature range	5 °C - 20 °C	5 °C - 20 °C	5 °C - 20 °C	5 °C - 20 °C
Dimensions				
■ Width	1600 mm	1600 mm	1990 mm	1990 mm
■ Height	1550 mm	1550 mm	1550 mm	1620 mm 1550 mm
■ Depth	950 mm	950 mm	1200 mm	1200 mm

Lasers
Solve every task perfectly.
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TruDisk applications

Deposition welding
Modify and repair tools and molds.

Heat conduction welding
Easy and fast welding of thin-walled parts and visible edges.

Scanner welding
Processing without downtime.

TruDisk industry solutions

Laser cutting in medical technology
Quality for every cut.

TruDisk - TRUMPF Laser Technology - Windows Internet Explorer

Overview | **Technical Data** | System Solutions | Applications

1 2 3 4

	TruDisk 8002	TruDisk 10002	TruDisk 12002	TruDisk 12003
Laser power	8000 W	10000 W	12000 W	12000 W
Laser power (with upgrade)		12000 W		
Beam quality	8 mm•mrad	8 mm•mrad	8 mm•mrad	12 mm•mrad
Min. diamter laser light cable	200 µm	200 µm	200 µm	300 µm
Nominal power consumption	39 kW	49 kW	60 kW	60 kW
Cooling water temperature range	5 °C - 20 °C	5 °C - 20 °C	5 °C - 20 °C	5 °C - 20 °C
Dimensions				
▪ Width	1990 mm	2880 mm	2800 mm	2800 mm
▪ Height	1550 mm	1600 mm	1600 mm	1600 mm
▪ Depth	1200 mm	1400 mm	1400 mm	1400 mm

1 2 3 4

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Solve every task perfectly.
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TruDisk applications

Deposition welding
Modify and repair tools and molds.

Heat conduction welding
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Scanner welding
Processing without downtime.

TruDisk industry solutions

Laser cutting in medical technology
Quality for every cut.

HL cw - TRUMPF Laser Technology - Windows Internet Explorer

http://www.trumpf-laser.com/en/products/solid-state-lasers/rod-lasers/hl-cw.html

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  - Diode lasers
  - Rod lasers
    - HL cw
  - Pulsed lasers
  - Short pulsed lasers
  - Beam guidance
  - Software TruControl
- Marking lasers
- Laser systems

HL cw lasers

HL 3306 D

Zoom | Pictures

Lamp-pumped HL high-power lasers are continuous emission cw solid-state lasers. Laser powers are graded so that the right laser is available for every application. Laser power regulation provides constant, regulated power at the workpiece over the entire range from 380 watts to 4.4 kilowatts.

- Highest availability possible
- Regulated laser power
- Power-independent beam quality
- Design proven a thousand times over

Overview | **Technical Data** | System Solutions | Applications

	HL 383 D	HL 556 D	HL 703 D
Laser power	380 W	550 W	700 W
Beam quality	12 mm•mrad	25 mm•mrad	12 mm•mrad
Min. diameter laser light cable	300 µm	600 µm	300 µm
Nominal power consumption	14 kW	14 kW	32 kW

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CT 06032
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- Ultrashort Pulse Laser
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- Manual Welding Lasers
- Systems & Solutions

ROFIN FL Series

High Brightness Fiber Lasers for Every Application

The high brightness fiber lasers of the ROFIN FL Series are the ideal addition to compliment the range of lasers currently offered by ROFIN. With their high performance, they are suitable for classical laser cutting and laser welding applications as well as for new applications such as the Remote Cutting. The emitted wavelength in the range of 1 µm achieves high absorption in many materials. All common solid-state laser applications can be performed using the FL Series laser. With the multi-mode version of the FL laser, fiber optics of 50 to 600 µm can be used. The single-mode version produces exceptionally good beam quality, typically in the range of ≤ 0.4 mm x mrad. The excellent beam quality also allows the

Contact

Please select a country

Please select a category

Please select a product

ROFIN Worldwide

>> World map

21.01. - 25.01.2011

FABTEC

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emitted wavelength in the range of 1 µm achieves high absorption in many materials. All common solid-state laser applications can be performed using the FL Series laser. With the multi-mode version of the FL laser, fiber optics of 50 to 600 µm can be used. The single-mode version produces exceptionally good beam quality, typically in the range of ≤ 0.4 mm x mrad. The excellent beam quality also allows the efficient use of "dynamic beam" scanner systems for high-speed positioning as well as the fast and precise application of small geometries at workpieces. This reduces cycle times and increases productivity.

For easy integration into existing machining concepts, the compact version of the fiber laser is available as an alternative system solution. The compact Version is provided as single-mode laser with fiber optics of 20 µm or as multi-mode laser with fiber optics of 50 µm.

Beam switches and energy sharing modules are available as an option allowing up to four work cells to be operated with only one laser. Non-productive times are reduced and the utilization of the laser is increased.

21.01. - 25.01.2011
FABTEC
Coimbatore, India
Hall A, Booth 45

26.01. - 28.01.2011
SEMICON Korea
Seoul, Korea
Booth 2602

>> Trade fair calendar

Technical Data

	ROFIN FL 020	ROFIN FL 030	ROFIN FL 040
Excitation	Laser diodes	Laser diodes	Laser diodes
Output power	2000 W	3000 W	4000 W
Beam parameter product (using a 50 µm fiber)	≤ 2,5 mm x mrad	≤ 2,5 mm x mrad	≤ 2,5 mm x mrad
Fiber optic	50 to 600 µm	50 to 600 µm	50 to 600 µm

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rofin http://www.rofin.com/index.php?id=36052,,=1

raycus fiber laser

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	ROFIN FL x50	ROFIN FL x75	ROFIN FL 010
Excitation	Laser diodes	Laser diodes	Laser diodes
Output power	500 W	750 W	1000 W
Beam parameter product (using a 50 µm fiber)	≤ 2,5 mm x mrad	≤ 2,5 mm x mrad	≤ 2,5 mm x mrad
Fiber optic	50 to 600 µm	50 to 600 µm	50 to 600 µm

	ROFIN FL x50 S	ROFIN FL x75 S	ROFIN FL 010 S
Excitation	Laser diodes	Laser diodes	Laser diodes
Output power	500 W	750 W	1000 W
Beam parameter product (using a 20 µm fiber)	≤ 0,4 mm x mrad (single-mode)	≤ 0,4 mm x mrad (single-mode)	≤ 0,4 mm x mrad (single-mode)
Fiber optic	20 µm	20 µm	20 µm

Compact Versions:

	ROFIN FL x50 C	ROFIN FL x75 C	ROFIN FL 010 C
Excitation	Laser diodes	Laser diodes	Laser diodes
Output power	500 W	750 W	1000 W
Beam parameter product	0.4 mm x mrad	0.4 mm x mrad	0.4 mm x mrad

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Excitation	Laser diodes	Laser diodes	Laser diodes
Output power	500 W	750 W	1000 W
Beam parameter product (using a 50 µm fiber)	≤ 2,5 mm x mrad	≤ 2,5 mm x mrad	≤ 2,5 mm x mrad
Fiber optic	50 to 600 µm	50 to 600 µm	50 to 600 µm

	ROFIN FL x50 S	ROFIN FL x75 S	ROFIN FL 010 S
Excitation	Laser diodes	Laser diodes	Laser diodes
Output power	500 W	750 W	1000 W
Beam parameter product (using a 20 µm fiber)	≤ 0,4 mm x mrad (single-mode)	≤ 0,4 mm x mrad (single-mode)	≤ 0,4 mm x mrad (single-mode)
Fiber optic	20 µm	20 µm	20 µm

Compact Versions:

	ROFIN FL x50 C	ROFIN FL x75 C	ROFIN FL 010 C
Excitation	Laser diodes	Laser diodes	Laser diodes
Output power	500 W	750 W	1000 W
Beam parameter product (using a 20 µm fiber)	0.4 mm x mrad	0.4 mm x mrad	0.4 mm x mrad
Fiber optic	20 or 50 µm	20 or 50 µm	20 or 50 µm

DS Series - www.rofin.com - Industry leader for laser cutting, laser welding and laser marking - Windows Internet Explorer

rofin http://raycuslaser.com/

raycus fiber laser

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Pulsed Rod Lasers

Disc Lasers

> DS Series

StarDisc

Fiber Lasers

Diode Lasers

Ultrashort Pulse Laser

Lasers for Marking

Manual Welding Lasers

ROFIN DS Series

High Reliability Thanks to Modern Stack Management

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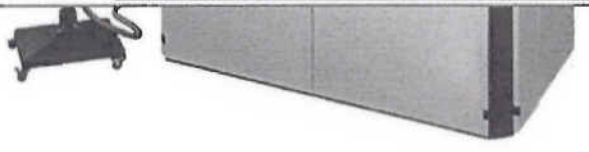
- Ultrashort Pulse Laser
- Lasers for Marking
- Manual Welding Lasers
- Systems & Solutions



The DS Series is the new generation of diode-pumped disc lasers offered by ROFIN.With a beam quality of 7 or 8 mm*mrad, the DS laser can produce very small spot sizes with long focal lengths. These features, combined with output powers ranging from 750 to 1,500 Watts, allow for an extensive range of industrial application processing like cutting of glass or welding of automotive parts. Flexibility in system integration is enhanced with the availability of optional beam switching, energy sharing, and fiber lengths of up to 100 meters and diameters of 150, 200, and 300 µm. The diode stack management increases laser uptime and minimizes laser diode replacement cost resulting in long lifetime and reliability.

	ROFIN DS 015 HQ
Excitation	Laser diodes
Output power	1500 W
Beam parameter product	≤ 8 mm x mrad
Number of discs	1
Fiber optic	150 µm

Other lasers of the Rofin DS Series: ROFIN DS x75 HQ; ROFIN DS 010 HQ; ROFIN DS 010 HX

ROFIN Worldwide

>> World map

21.01. - 25.01.2011
FABTEC
Coimbatore, India
Hall A, Booth 45

26.01. - 28.01.2011
SEMICON Korea
Seoul, Korea
Booth 2602

>> Trade fair calendar

http://www.rofin.com/info_center/newsletter/

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Xi'an Institute of Optics and Fine Mechanics

Output power of all-fiber laser in XIOPM breaks through 1000w--XIOPM - Windows Internet Explorer

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Output power of all-fiber laser in XIOPM breaks throu...

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- Upcoming Events

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state key laboratory of transient optics and photonics

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XIOPM Library http://lib.opt.ac.cn/

27th International Congress on High-Speed Photography and Photonics

中科芙特 ZKMT

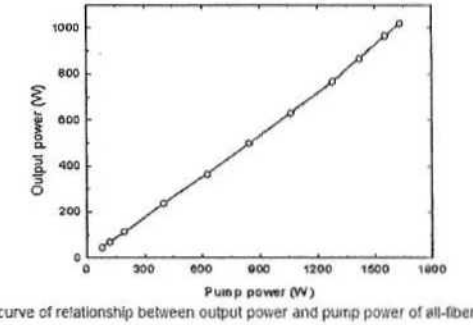
Femto Technology

Article search of XIOPM 本所论文检索

Output power of all-fiber laser in XIOPM breaks through 1000w

Author: | Time:2009-10-26 | Print | Close | Text Size: A A A

The high-power fiber laser research team in State Key Laboratory of Transient Optics and Photonics, XIOPM has made important progresses in all-fiber laser technical research: output power is greater than 1000w; light-light conversion efficiency is 62%, which is the highest level in domestic research on all-fiber laser by now.



The curve of relationship between output power and pump power of all-fiber laser

All-fiber laser technology is currently one of the most talked about research focus. Because of the advantages of high efficiency, beam quality, high stability and maintenance-free, the high-power fiber laser has been more and more widely used in industrial processing, national defense and other fields. Foreign and domestic laser companies and research institutes are competing to carry out research in this area.

In recent years, XIOPM has achieved rapid development in high-power fiber laser and power combiner. At present, this result has laid the necessary technical foundation for our development of more high-power fiber laser.

Internet | 100%

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XIOPM Launched 400W Industrial Fiber Laser Successfully--XIOPM - Windows Internet Explorer

- National news
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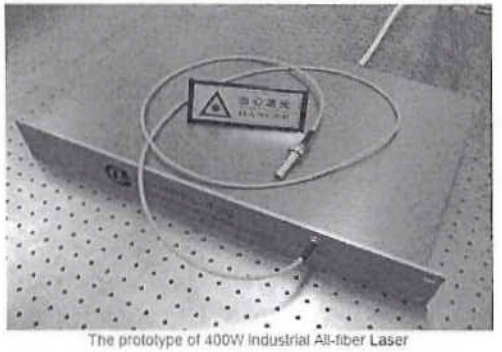
Article search of XIOPM 本所论文检索

XIOPM Launched 400W Industrial Fiber Laser Successfully

Author: | Time:2010-11-19 | Print | Close | Text Size: A A A

High-power fiber laser research team at State Key Laboratory of Transient Optics and Photonics struggled h ard and solved a series of key technologies in All-fiber Laser System Integration at the Institute's strong sup port. In 2009, the output power of All-fiber Laser broke 1000W. Recently significant progress has been mad e, and 400W Industrial Fiber Laser is launched successfully.



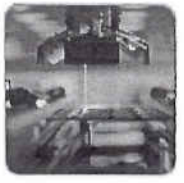
The prototype of 400W Industrial All-fiber Laser

Fiber laser is widely used in scientific research, medical engineering, industrial processing and other fields b ecause of high quality beam, high efficient lightning, long life, small size, flexible output laser, easy to use an d many other advantages.

The successful development of 400W Industrial Fiber Laser marks XIOPM has the based industrial technolo gy in high-power all-fiber laser, which will play a positive role in the development of Chinese high-power fibe r laser and related industries.

Saga

FLASHLAMP-PUMPED YAG SERIES



FEATURES

- UP TO 2.5 J @ 532 NM
- ULTRASTABLE ENERGY OUTPUT
- PASSIVE BEAM POINTING STABILIZATION
- EXCELLENT BEAM PROFILE
- COMPUTER CONTROL

APPLICATIONS

- MATERIAL PROCESSING
- INSTRUMENTATION
- SCIENTIFIC
- COMPANION PUMP LASER FOR ULTRAFAST TW SYSTEMS
- IDEAL PUMP FOR OPO AND DYE LASERS

High Energy Solid-State Pulsed Laser

Saga is the most efficient and compact flashlamp pumped solid-state laser on the market, producing up to 2.5 J per pulse @ 532 nm.

Its original optical cavity design based on an unstable resonator and a gaussian end cavity mirror enhances energy extraction. The beam exhibits a Super-Gaussian profile in the near field.

Saga is the limited footprint solution for matching high energy requirements and for pumping ultrafast TW lasers.

Saga operates at 1064, 532, 355 or 266 nm and offers various options to ease day-to-day operations such as :

- Easy optical set up alignment thanks to the diode laser pointing in the direction of the Saga output.
- Thermoregulated structure to offer outstanding beam-pointing stability and cut down harmonic generation warming-up time.
- Through RS232 interface, Saga supervision offers remote control of the laser emission, repetition rate and output energy variation, while ensuring safe and optimum operation.

THALES
LASER

Output Specifications

Model	220/10	230/10	HP	330/10
Repetition rate (Hz)	10	10	10	10
Energy per pulse (mJ)				
at 1,064 nm	1,500	2,300	-	[3]
at 532 nm	800	1,250	1,600	2,500
at 355 nm	420	600	-	-
at 266 nm	150	170	-	-
Pulse to pulse energy stability (% rms)	1.2	1.2	1.2	1.2
Pulse duration (ns)	4 - 8	4 - 8	4 - 8	4 - 8
Time jitter rms (ns)	0.5	0.5	0.5	0.5
Spectral width (cm-1)	1	1	1	1
Beam diameter (mm)	9.0	12	14	18
Divergence (mrad)	0.5	0.5	0.5	0.5
Beam pointing stability (µrad)	± 50	± 50	± 50	± 50
Beam spatial profile				
Near field	Top Hat [1]	Top Hat [1]	Top Hat [1]	Top Hat [1]
Far field	Gaussian [2]	Gaussian [2]	Gaussian[2]	Gaussian [2]

(1) Fit to supergaussian order 10 > 90 % - (2) Fit to Gaussian > 95 % - (3) IR version available on request

Utilities

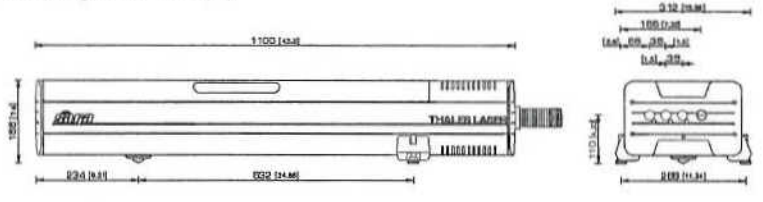
Power requirements	Voltage	208 VAC ± 5 %	230 VAC ± 5 %
	Current	25 A	20 A
	Frequency	60 Hz	50 Hz
Water requirements*	Flow	2,7 gal/mn	10 l/mn
	Static pressure	30 - 90 psi	2 - 6 bars
	Temperature	10 - 25°C	
Software	Windows 95, 98, 2000, NT, XP		

** Water to air cooling unit available on request*

Physical characteristics

Power supply	Size (H x W x L)	20.9 x 22 x 31.1 in	53 x 56 x 79 cm
Cooling Unit	Size (H x W x L)	19.1 x 8.3 x 30.3 in	48.5 x 21 x 77 cm

Dimensions are given in mm (in)



Due to Thales Laser continuous product improvement policy, specifications are subject to change without notice - Last Update: December 2007

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www.thales-laser.com

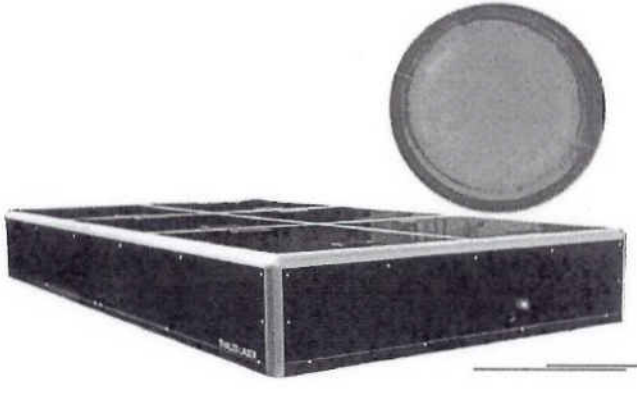
THALES LASER

Atlas+

FLASHLAMP-PUMPED GLASS SERIES

FEATURES
- 25 J ENERGY PER PULSE @ 527 NM
- 0.1Hz REPETITION RATE
- UNMATCHED BEAM PROFILE
- PULSE DURATION ~13NS (+/-3NS) or 2x 13NS (+/-3NS)
- 1 or 2 BEAMS
- SUPERVISION SOFTWARE
- INTEGRATED ISEO TIMING GENERATOR
- SINGLE BOX COMPACT DESIGN 1 X 2.5 M² FOOTPRINT

APPLICATIONS
- IDEAL PUMP FOR PETAWATT Ti:Sa LASERS
- LASER SHOT PEENING



25J @ 0.1 Hz @ 527 nm
Top Hat smooth profile !

Atlas+ breaks through the beam profile issue of conventional glass phosphate lasers to stand out as the reference pump laser for the emergent PW Ti:Sa femtosecond lasers.

Indeed, Atlas+ concentrates the solutions to offer the best spatial beam profile: long pulse duration for a limited B-integral, birefringence compensation and top-hat beam profile multimode oscillator which also improves the energy extraction efficiency.

With only 2 oscillators and 4 amplifiers to reach 25 J @ 0.1 Hz in the green, Atlas+ is the most efficient and compact pump laser for PW systems.

This optimized number of amplifiers design has many advantages: besides being compact and extremely reliable, Atlas+ demonstrates very limited beam distortion and reduced maintenance.

Full supervision by software offers remote control of the laser emission, output energy.

ISEO technology is also accessible through the supervision software for synchronization and laser safety controls.

THALES

Output Specifications

	1 beam	2 beams
Wavelength (nm)	527	527
Repetition rate (Hz)	0.1	0.1
Energy per pulse (J)	25	2 x 12.5
Pulse duration (ns)	double pulse 13 ns ±3ns	single pulse 13 ns ±3ns
Pulse to pulse ernergy stability (% rms)	< 1.5	< 1.5
Polarization	Vertical	Vertical
Beam diameter (mm)	≤ 40	≤ 30 for 2 beams
Beam profile	Supergaussian (smooth profile)	Supergaussian (smooth profile)
Divergence (mrad)	< 2	< 2
Pointing stability (µrad)	< 100	< 100
Jitter (ns)	< ±1	< ±1

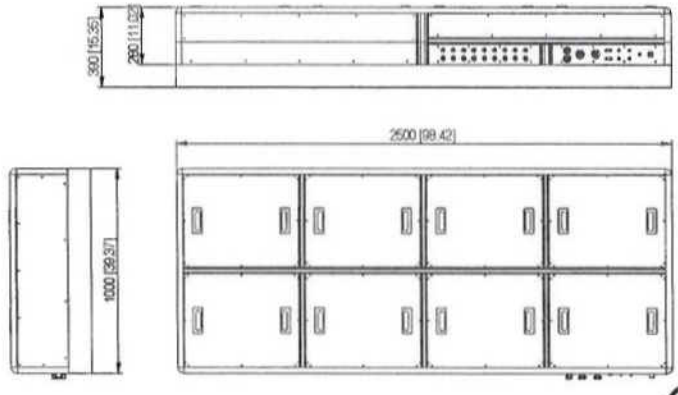
Utilities

Power requirements	Voltage	230 VAC ± 5%	208 VAC ± 5%
	Current	4 x 16 A plugs single phase	4 x 16 A plugs single phase
	Frequency	50 Hz	60 Hz
Water requirements	Flow	4 gal/min	15 l/min
	Static pressure	43.5 - 72 psi	3 - 5 barss
	Temperature	10 - 17 °C	
Software	Windows 95, 98, 2000, NT, XP		

Physical Characteristics

Power Supply (2 units)	Size (H x W x L)	64.6 x 22.0 x 30.7 in	164 x 56 x 78 cm
Cooling unit	Size (H x W x L)	14.6 x 17.5 x 28.7 in	37 x 44,5 x 73 cm

Dimensions are given in mm (in)



Specifications are subject to change without notice - Last Update: August 2009

FRANCE & EUROPE

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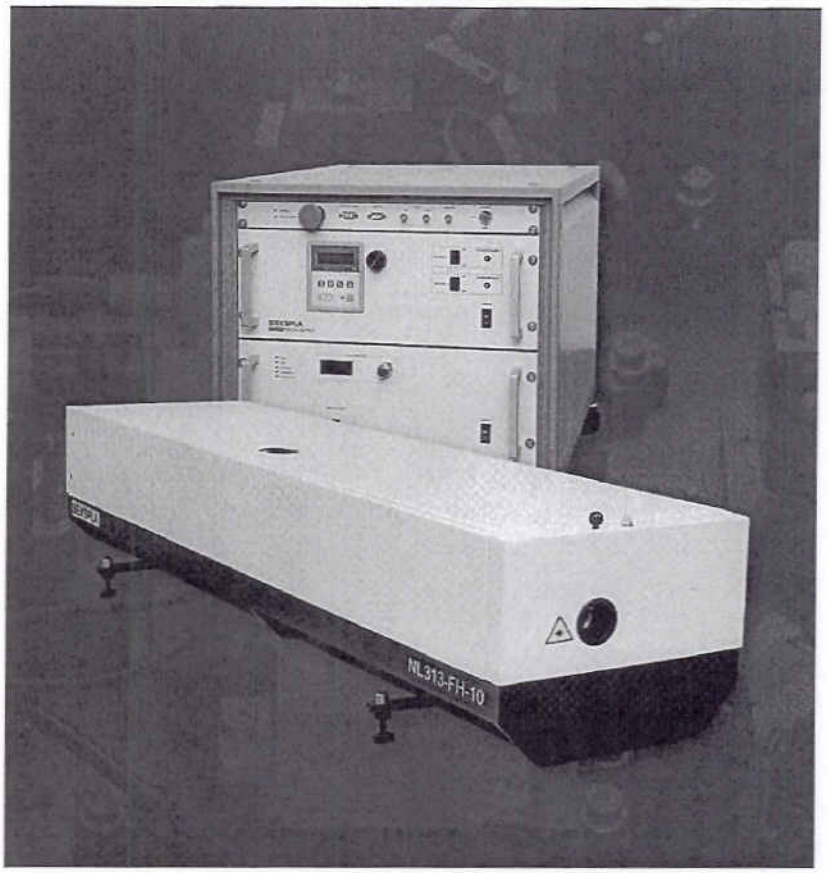
THALES

NL310
SERIES

High Energy Nanosecond Q-switched Nd:YAG Lasers



FEATURES

- Up to **1.6 J** output energy
- **Excellent** pulse energy **stability**
- **10** or **20 Hz** repetition rate
- Thermo stabilized **harmonics generator** as standard option
- **Remote** control via keypad
- **PC control** via RS232 port and LabView™ drivers
- **Low jitter** internal/external synchronization
- **Robust** and **stable** laser head

High energy nanosecond pulses, excellent beam quality and 1% pulse energy stability makes these nanosecond q-switched Nd:YAG lasers an excellent choice for pumping dye, Ti:Sapphire lasers and OPOs. In addition, extremely low jitter of the optical pulse with respect to the sync pulse allows reliable synchronization of the laser with external equipment.

For customer convenience the NL310 series nanosecond Q-switched laser is controlled either through its RS232 type PC interface with LabView™ drivers (included) or through a user-friendly remote control pad. Both options allow easy control of laser settings.

Compact size enables the system to fit into tight spaces freeing the experiment area for other instruments. The power supply and cooling unit easily fits under optical tables. The optional second (SH) (for 532 nm), third (TH) (for 355 nm) and fourth (FH) (for 266 nm) harmonic generator modules are designed for easy insertion and removal.

Simple and proven design ensures easy maintenance and long-term stability of laser operation.

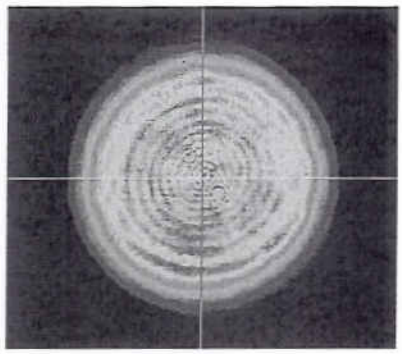
APPLICATIONS

- OPO, Ti:Sapphire, dye laser pumping
- Material processing
- Plasma studies
- Laser spectroscopy
- Remote sensing
- Your application is welcome...

SPECIFICATIONS [1]

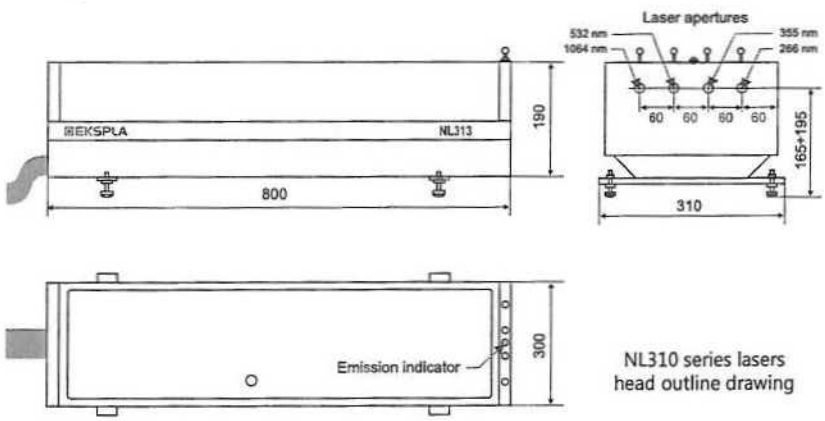
MODEL	NL311	NL313
Max. pulse energy:		
at 1064 nm	1300/1000 mJ [2]	1600 mJ
at 532 nm	600/440 mJ [2]	800 mJ
at 355 nm	350/290 mJ [2]	450 mJ
at 266 nm	130/90 mJ [2]	150 mJ
Pulse energy stability [3]	1.0 %	
Power drift [4]	3 %	
Pulse duration [5]	4–6 ns	
Max. repetition rate	10/20 Hz	10 Hz
Polarization at 1064 nm	linear, >85/80 % [2]	linear, >85 %
Optical pulse jitter [6]	0.5 ns	
Linewidth at 1064 nm	< 1 cm^{-1}	
Beam profile		
Near field	"Hat-Top"	
Far field	near Gaussian	
Beam diameter	10 mm	12 mm
Beam divergence [7]	< 0.5 mrad	
Beam pointing stability at 1064 nm	± 50 µrad	
Beam height	165–195 mm	
PHYSICAL CHARACTERISTICS		
Laser head size (W×H×L)	310×230×800 mm	
Powering/cooling cabinet size (W×H×L)	550×550×600 mm	
Umbilical length	2.5 m	
OPERATING REQUIREMENTS		
Water consumption (max 20 °C)	< 10 l/min	
Room temperature	15–30 °C	
Relative humidity (noncondensing)	20–80 %	
Mains voltage [8]	208 or 240 VAC, single phase 50/60 Hz	
Power consumption	< 3.5 kVA	

[1] All specifications subject to change without notice. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise all specifications are measured at 1064 nm.
[2] 20 Hz versions.
[3] Averaged from 300 shots, Std. Dev, after 5 minutes of warm-up.
[4] Within 8 hours after 20 minutes of warm-up.
[5] FWHM.
[6] In respect to Q-switch triggering pulse, Std. Dev.
[7] Full angle at $1/e^2$.
[8] 20 Hz version of NL311 requires 3 phase mains.



Near field

Typical beam profile of the NL310 series lasers



NL310 series lasers head outline drawing

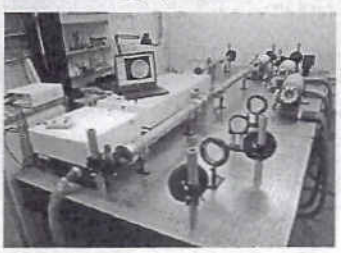
RELATED PRODUCTS

NL300 SERIES Q-SWITCHED NANOSECOND Nd:YAG LASERS

- Up to 800 mJ pulse energy
- 10 or 20 Hz repetition rate
- Compact size

HIGH ENERGY CUSTOM SYSTEMS

- Pulse energy up to 160 J



NL313-10-SH/TH/FH-AW

Model

Pulse repetition rate in Hz

Harmonics generator options:
SH – Second Harmonic
TH – Third Harmonic
FH – Fourth Harmonic
FiH – Fifth Harmonic

Other options:
AW – water-air heat exchanger option

Requests for custom made products are welcome !

EKSPLA

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Fax: +370 5 2641809
sales@ekspla.com
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Find local distributor at
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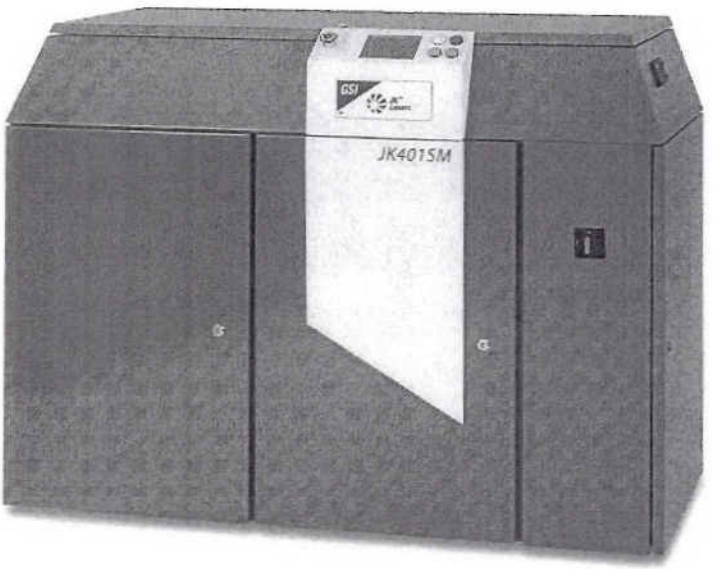
DANGER

ISO 9001
CERTIFIED

Revision number – 110110

JK401SM and JK501SM

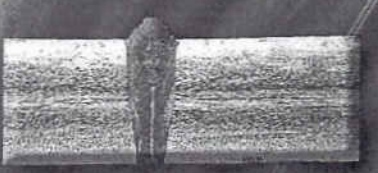
CW Nd:YAG lasers with Supermodulation ™



Better than just CW: SuperModulation enables deeper welds and cleaner cuts with high reliability, flexibility, and low process cost.

- Unique SuperModulation provides greater flexibility for a broader range of processing, enabling you to more easily optimize your production process
- SuperModulation increases the laser's maximum peak power to at least twice its normal average power rating
- Patented Luminator™ fiber-optic beam delivery system with built-in back reflection damage protection
- LaserView™ control technology allows complete process cycle programming with a single command
- Precise control of all parameters enabled by patented power supply technology
- Fully-integrated time and energy shares for faster switching

Without SuperModulation



With SuperModulation

GSI JK™ Lasers

Deeper Welds and Cleaner Cuts

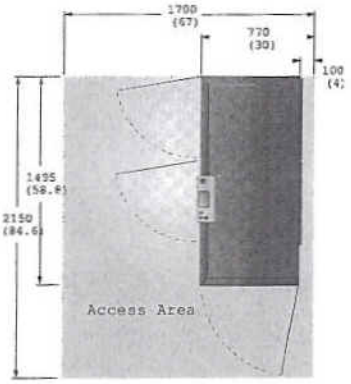
With the JK401SM and JK501SM, GSI Group introduces a new line of JK™ Lasers featuring our successful SuperModulation™ technique. With SuperModulation, some energy is stored in the laser's power supply during the laser's off-time or during a low average power cycle, and is delivered to the lasing medium during a later on-time or high average power cycle to produce a momentary 2X power output. This extra output provides processing capability not typically found in lasers with similar power ratings.

Laser Specifications

Model	JK401SM	JK501SM
Average Power (W)	400	500
Max. Modulated Peak Power (W)	800	1000
Number of Lamps	2	2
Beam Quality 1/2 Angle radium (mm. mrad)	16	24
Laser Response Time (ms)	1.5	
Modulation Frequency (Hz)	100 - 100	
Output Mode	CW, Sine or Square	

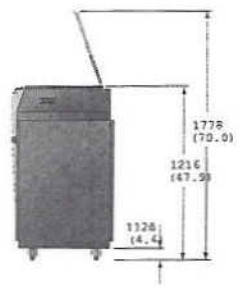
Fiber-Optic Beam Delivery

Fiber Core Diameter (µm)	400	600
Standard Spot Size (nominal) (mm)	0.16 - 0.60	0.30 - 0.90
Standard Fiber Lengths (m)	5, 10, 15, 30, 50	
Max. Fiber Length (m)	50	
Beam Delivery Options	Up to 4T or 3E or 2Tx2E combination	
Timeshare Switching Time (ms)	<50	
Focus Head Options	Straight or Right Angle	
Process Tool Options	CCTV viewing, welding nozzles, autofocus cutting modules	



Facility Requirements

Cooling Water Temperature and Flowrate	25 l/min @15°C, 5.3 US gal/min feed input
Max. Pressure Drop at 18°C	2.5 bar
Max. Inlet Pressure	7.5 bar
Cooling Capacity (kW)	19
Electrical Requirements	380 - 415V +/- 10% @ 50/60Hz
Supply Rating (kVA)	20
Max. Power Consumption (kW)	19
Ambient Temperature (°C)	5 - 40
Max. Humidity	95% RH @ 20°C, 50 RH @ 40°C
W x H x D (mm / inches)	1495 x 1216 x 770 / 58.8 x 47.9 x 30
Weight (kg)	444



Dimensions in mm (inches)

Product Code Selection Guide

		1	2	3	4	5	6	7	8	9
JK	125PS	5	S	E	3WES	D	P	A	20	15

1 Laser Power Frequency	5	50 Hz
	6	60 Hz
2 Laser Fiber Output Launch Type	S	Single fiber output
	T	Twin fiber output
	M	More than two fiber outputs
3 Language	E	English
	F	French
	G	German
	C	Chinese
4 Fiber Launch Options	2WTS	2 way time share
	3WTS	3 way time share
	4WTS	4 way time share
	2WES	2 way energy share
	3WES	3 way energy share
	4WES	4 way energy share
	2T1F	2 way time share between one 2 way energy share and one fiber
	2T2F	2 way time share between one 2 way energy share and 2 fibers
	2T2E	2 way time share between two 2 Way Energy Shares
5 Pointing Diode Option	D	Pointing Diode
6 Interface Options	P	PC interface
7 Interface Options	A	Advanced Interface
8 Cable	10	10 m interface cable
	20	20 m interface cable
	30	30 m interface cable
	50	50 m interface cable
	LV	LaserView SE
9 Luminator Fiber Selection	5	5m x 150µm
	10	10m x 150µm
	15	15m x 150µm

GSI JK™ Lasers ™

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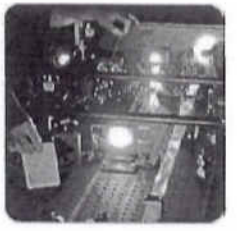
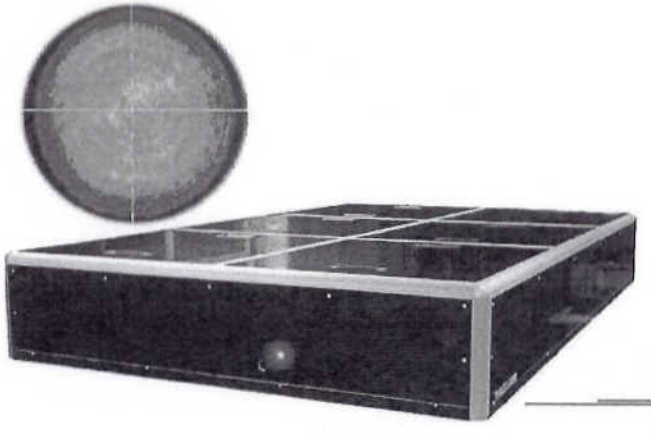
Gaïa-R

FLASHLAMP-PUMPED ND:YAG SERIES



FEATURES
- 14 J @ 532 NM (HP VERSION)
- 24 J @ 1064 NM (HP VERSION)
- UP TO 5 Hz REPETITION RATE
- UNMATCHED BEAM PROFILE
- PULSE DURATION 8 NS - 1 or 2 BEAMS
- SUPERVISION SOFTWARE
- INTEGRATED ISEO TIMING GENERATOR
- SINGLE BOX COMPACT DESIGN
  1 X 2.5 M² FOOTPRINT

APPLICATIONS
- IDEAL PUMP FOR HIGH REPETITION RATE PETAWATT Ti:Sa LASERS
- LASER SHOT PEENING



14J @ 1 Hz @ 532 nm
Top Hat smooth profile !

GAÏA-R is the new laser from THALES which pushes forward the limits of output energy reachable at high repetition rates. This Nd:YAG laser delivers indeed more than 24 J at 1064 nm and 14 J at 532 nm with repetition rate up to 5 Hz.

GAÏA-R combines the best characteristics for laser shot peening: short pulse duration and high energy to offer high intensity pulses, very low modulations to have an uniform stress and a high repetition rate for a faster process. As an option, an isolator can be implemented in the 1064 nm version in order to protect the oscillator from damage risks.

GAÏA-R was also specially designed for high energy Ti:Sa amplifiers pumping and offers a unique solution for high repetition rate Petawatt systems.

It demonstrates a top-hat beam profile with very low peak-to-valley spatial modulations, reproducible beam profile, a very limited beam distortion along propagation and a short pulse duration to avoid prelasing in the Ti:Sa amplifiers and to limit ASE.

GAÏA-R can also be used for other applications like high power LIDAR or large area ablation.

Full supervision by software offers remote control of the laser emission, output energy. ISEO technology is also accessible through the supervision software for synchronization and laser safety controls.

THALES

Output Specifications

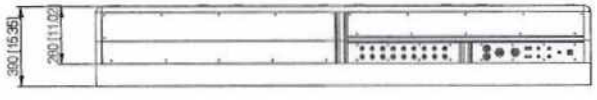
	Gaïa-R			Gaïa-R HP	
Wavelength (nm)	1064	532	355	1064	532
Repetition rate (Hz)	1Hz / 5Hz	1Hz / 5Hz	1Hz	1Hz / 5Hz	1Hz / 5Hz
Energy per pulse (J) (1)	12J / 11J	7J / 6J	3J	24J / 22J	14J / 12J
Pulse duration (ns)	8-10	8	6	1 pulse @ 8-10ns 2 pulses of 8-10ns each with adjustable delay	2 pulses of 8-10ns each with adjustable delay (delay min ~12ns)
Pulse to pulse ernergy stability (% rms)	< 1.0	< 1.2	< 2.5	<0.7	< 0.9
Polarization	Horizontal	Vertical	Vertical	50% Vertical and 50% Horizontal	Vertical
Typical Beam diameter (mm)	23	23	23	23	23
Beam profile	Top Hat	Top Hat	Top Hat	Top Hat	Top Hat
Divergence Low M²/High M²	<150µrad / <3.5mrad	<150µrad / <3.5mrad	<150µrad / <3.5mrad	<150µrad / <3.5mrad	<150µrad / <3.5mrad
Peak to peak Pointing stability (µrad)	< 60	< 60	< 60	< 60	< 60
Jitter (ns)	< ±1	< ±1	< ±1	< ±1	< ±1

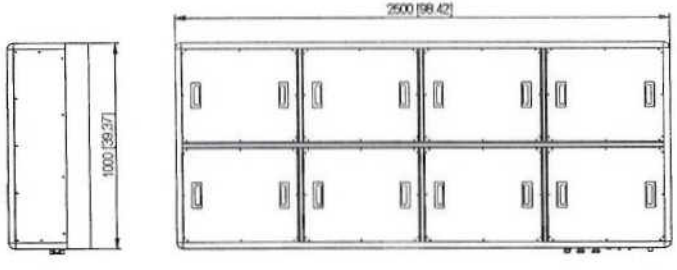
(1) Seeded option available on request

Physical Characteristics

Power Supply (2 units)	Size (H x W x L)	64.6 x 22.0 x 30.7 in	164 x 56 x 78 cm
Cooling unit	Size (H x W x L)	14.6 x 17.5 x 28.7 in	37 x 44,5 x 73 cm

Dimensions are given in mm (in)





Utilities

Power requirements	Voltage	230 VAC ± 5%	208 VAC ± 5%
	Current	single phase	single phase
	Gaïa-R 1Hz	5 x 16A plugs	5 x 16A plugs
	Gaïa-R 5Hz	7 x 16A plugs	7 x 16A plugs
	Gaïa-R HP 1Hz	7 x 16A plugs	5 x 16A plugs
	Gaïa-R HP 5Hz	11 x 16A plugs	5 x 16A plugs
	Frequency	50 Hz	60 Hz
Water requirements	Flow	4 gal/min	15 l/min
	Static pressure	43.5 - 72 psi	3 - 5 bars
	Temperature	10 - 17 °C	
Software	Windows 95, 98, 2000, NT, XP		

Specifications are subject to change without notice - Last Update: August 2009

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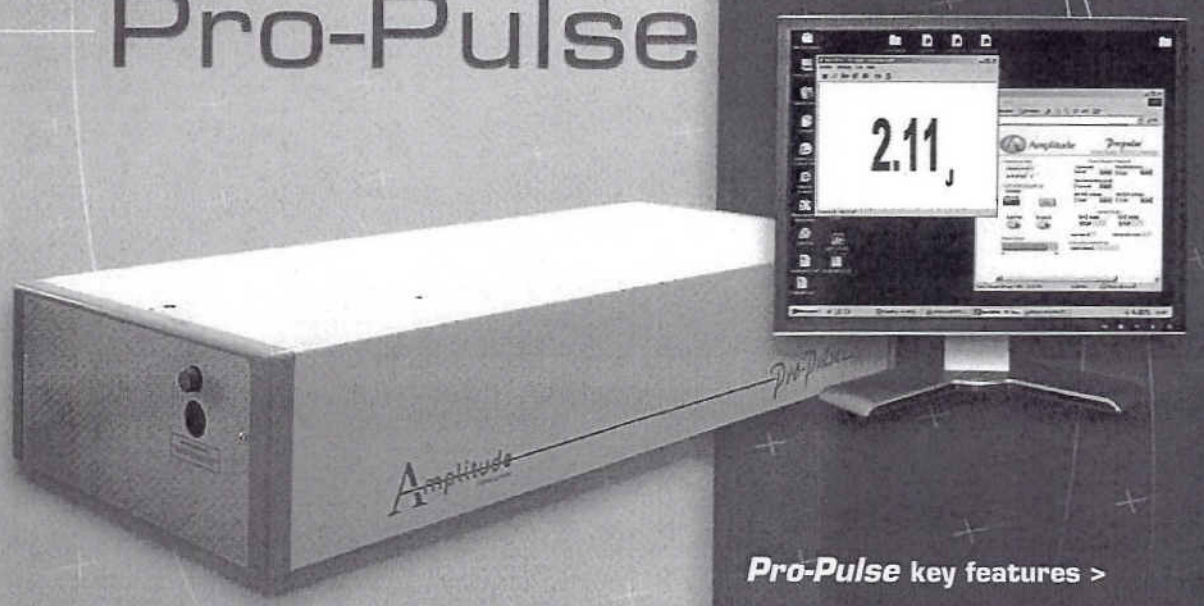
www.thales-laser.com

THALES

Amplitude
TECHNOLOGIES

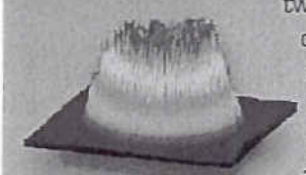
Pro-Pulse



High Energy Nd:YAG Laser

Amplitude Technologies is very well known for developing high energy femtosecond laser chains and high repetition rate ones.

Compact design. We design and build our own pump laser at 532 nm dedicated to high energy Terra-watts lasers. This laser is called Pro-Pulse. It comprises two parts: the laser head and the electronic cabinet. All optical components are included in the laser head. The electronic cabinet is composed of the power supply and the cooling unit. Pro-Pulse and Pro-Pulse+ have also built-in safety interlocks to protect users as well as the laser system itself. This laser can be totally controlled by computer (by RS232 and CAN Bus control).



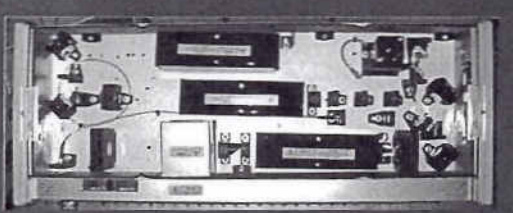
Excellence in quality. These lasers have excellent performances at 532 nm. We can provide a 1.2 J pulse energy (Pro-Pulse) and a 2 J pulse energy (Pro-Pulse+) at a repetition rate of 10 Hz. We also offer repetition rates going from 1 Hz to 20 Hz. The profile of this laser is top-hat which provides a uniform Ti:Sa pumping.

Pro-Pulse key features >

- Pulse energy: ***up to 2 J*** *(@ 532 nm)*
  up to 4 J *(@ 1064 nm)*
- Repetition rate: ***10 Hz***
- High beam quality: ***Top-hat***
- ***User friendly operation***
- ***Small footprint***

Pro-Pulse applications >

- Pump laser for ultrafast Ti:Sa lasers
- OPO pumping



www.amplitude-technologies.com

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Tel. +33 (0)1 69 11 27 90
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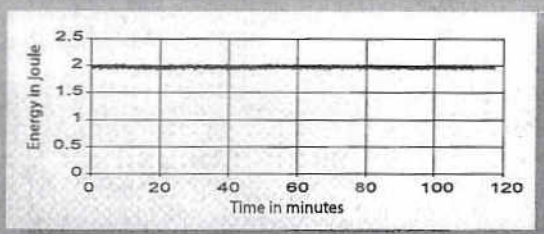
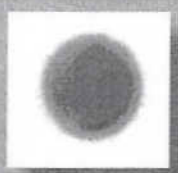
Pro-Pulse

High Energy Nd:YAG Laser

Pro-Pulse performances

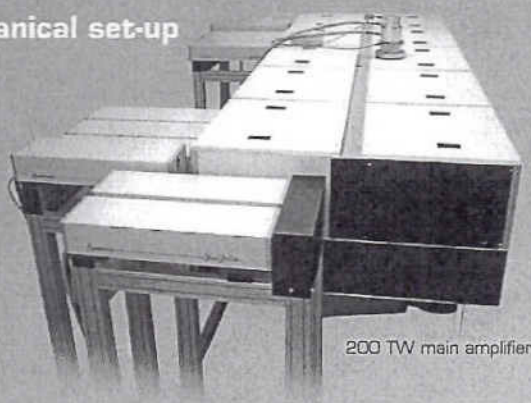
	Pro-Pulse	Pro-Pulse+
Repetition rate	10 Hz	10 Hz
Energy @ 532 nm	1.2 J	2 J
Energy @ 1064 nm	2.2 J	4 J
Flashlamp lifetime	25-30 million shots	25-30 million shots
Polarisation @ 532 nm	Vertical (S polarisation)	Vertical (S polarisation)
Pulse duration @ 532 nm	6.8 ns	6.8 ns
Divergence	< 0.3 mrad	< 0.3 mrad
Warm up time	about 20 mn	about 20 mn
Shot to shot stability	< 1%	< 1%
RMS stability @ 532 nm	< 1.2%	< 1.2%





2J beam profile

Pro-Pulse mechanical set-up

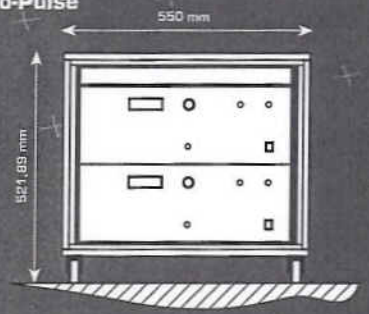


200 TW main amplifier

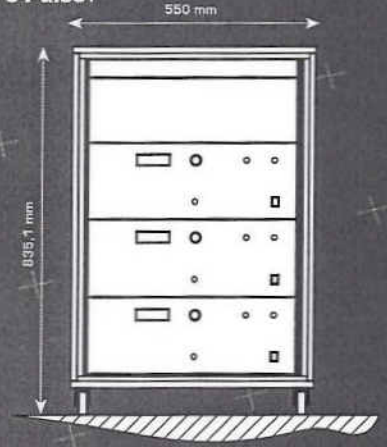
Electronic cabinet >

- power supply and cooling unit

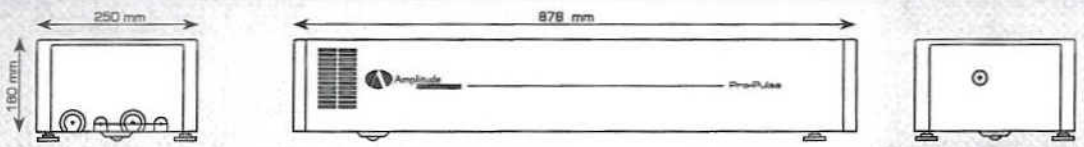
> Pro-Pulse



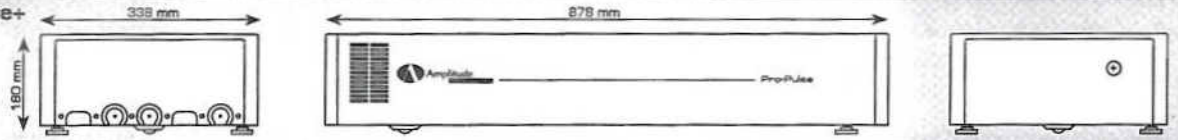
> Pro-Pulse+



Pro-Pulse



Pro-Pulse+



AMPLITUDE TECHNOLOGIES

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Amplitude TECHNOLOGIES

www.amplitude-technologies.com

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LD pumped Nd: YAG LASER
SL188 series

To Customers

SL188 series has a very wide range of line-up. Adding standard model (SL188A/ SL188A2/ SL188AS/ SL188AS2) optimized for high average power, we can optimize them to variety of laser applications, like high beam quality model for and high pulse energy model etc..

Specification

LD pumped Nd: YAG laser
SL188A / SL188A2

Equipment type	SL188A	SL188A2
Laser crystal	Nd:YAG	
Laser wavelength	1.064μm	
Oscillator type	Continuous wave pumping and Q switching laser	
Output energy	>20mJ@10kHz	>20mJ@20kHz
Maximum average power	>200W@10kHz	>400W@20kHz
Cooling type	Water-cooled	Water-cooled
Utility	3phase200V 50 / 60Hz 30A	3phase200V 50 / 60Hz 60A

LD pumped Nd: YAG SHG laser
SL188AS / SL188AS2

Equipment type	SL188AS	SL188AS2
Laser crystal	Nd:YAG	
Laser wavelength	0.532μm	
Oscillator type	Continuous wave pumping and Q switching laser	
Output energy	>10mJ@10kHz	>20mJ@10kHz

Maximum average power	>100W@10kHz	>200W@10kHz
Cooling type	Water-cooled	Water-cooled
Utility	3phase200V 50 / 60Hz 30A	3phase200V 50 / 60Hz 60A

New Series !!
LD pumped Nd: YAG THG laser
SL188AT

Equipment type	SL188AT	SL188AT2 *
Laser crystal	Nd:YAG	
Laser wavelength	0.355μm	
Oscillator type	Continuous wave pumping and Q switching laser	
Output energy	>6mJ@8kHz	>10mJ@10kHz
Maximum average power	>50W@8kHz	>100W@10kHz
Cooling type	Water-cooled	Water-cooled
Utility	3phase200V 50 / 60Hz 30A	3phase200V 50 / 60Hz 60A

* : In development.

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Product Information

- Laser Processing Systems
- Lineup by Application

Pulse IR YAG Laser

Continuous Wave IR YAG Laser
Q Switched IR YAG Laser

Q Switched Green YAG Laser
Q Switched UV YAG Laser

Q Switched IR YVO_4 Laser
Q Switched Green YVO_4 Laser
Q Switched UV YVO_4 Laser

Fiber Laser

- LCD Manufacturing Equipment
- Rechargeable Battery Inspection Equipment

Continuous Wave IR YAG Laser / Q Switched IR YAG Laser

KLY-C300a

Continuous output type "KLY-C300a" achieves 15% or more electricity-optical conversion efficiency under the condition of beam quality where transmission to optical fiber with core diameter 300μmf is possible by the optimization of YAG crystal configuration corresponding to LD pumping and development of high steady high-luminance and highly stable oscillator.

KLY-Q200a

Q-switched pulse type "KLY-Q200a" succeeds in obtaining 30nsec Q-switched pulse at the shortest by enhancing the efficiency as well as development of the super-highspeed gain switch control system of AO-Q switch elements that generate Q-switched pulse. The average output class of "KLY-Q200a" makes it possible to gain 200kW Q-switched pulse at the maximum.

KLY-SQ350a

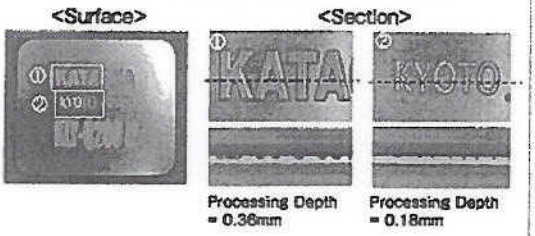
"LD pumping technology" and "Q-switched control technology" that we cultivated thorough the development of KLY-series were gathered for the development of KLY-SQ350a laser osccillator boasting of domestic top level average output and peak output in LD pumping high output Q-switched type IR lasers. In addition, new technology was adopted, as a result, we succeeded in the development of KLY-SQ350a. Both quality of beam and high output are achieved. High performance was achieved in all aspects such as "average output: 300W" and "Maximum peak output:250kW", "M2<15". In addition, due to LD pumping, high output as well as small size are also realized. The design is system consturciton friendly, therefore, for laser osccilator and power source, either separated type or integrated type can be selected in order to correpond to all applications.

Applications

Deep Engraving Marking、High-Speed Cutting、Large Area Removal Processing

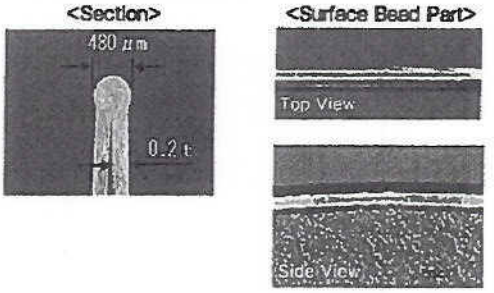
Processed Example

Aluminum Deep Engraving Processing



Oscillator Model : KLY-Q200α
Processing Details : Deep Engraving
Material : A5000 Series
Processing Optics : Galvano Scanner

SUS Doughnut-Shape Peripheral Welding



Oscillator Model : KL Y-C300α
Processing Details : Overlapping Outer Welding
Material : SUS304
Sheet Thickness : 0.2t
Processing Nozzle : KLP-HF80/C-T

Basic Specifications

Item	Details		
Model	KLY-C300α	KLY-Q200α	KLY-SQ350α
Wavelength	1064nm		
Pumping Source	808nm Semiconductor Laser (LD)		
Active Medium	Nd:YAG Crystal		
Configuration	Integrated Oscillator and Power Operating Voltage Part Type (Chiller Unit separate) SI Type/GI Type Type Fiber	Integrated Oscillator and Power Operating Voltage Part Type (Chiller Unit separate) Direct Ray Optics	Separate Oscillator and Power Operating Voltage Part Type Or Integrated Type (Chiller Unit separate)
Maximum Average Output Power	300W	200W@20kHz	300W10kHz
Maximum Peak Output Power	-	200kW@5kHz	250kW@10kHz
Maximum Frequency	CW,1Hz~500Hz	100Hz~50kHz	5kHz~15kHz
Pulse Width	-	<300nsec@10kHz	<150nsec@10kHz
Output Power Stability	Less than 2%rms (Cooling water stability: ±1℃.)		
Operating Voltage	AC220V±0%、50／60H z ±1Hz		

Input power Consumption	3.5kVA	6kVA
Weight	170kg	175kg
External Dimensions W×H×Dmm3	398×940×1060mm3 (Not including protrusions)	456×940×1064mm3 (Not including protrusions)

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Product Information

- Laser Processing Systems
- Lineup by Application

Pulse IR YAG Laser

Continuous Wave IR YAG Laser
Q Switched IR YAG Laser

Q Switched Green YAG Laser
Q Switched UV YAG Laser

Q Switched IR YVO_4 Laser
Q Switched Green YVO_4 Laser
Q Switched UV YVO_4 Laser

Fiber Laser

- LCD Manufacturing Equipment
- Rechargeable Battery Inspection Equipment

Product Information

Q Switched Green YAG Laser / Q Switched UV YAG Laser

Beam quality improvement and increase in life of excitation light source were endeavored by adopting semiconductor laser for the excitation light source instead of conventional lamp. Moreover, adoption of a highly durable optical wavelength conversion device and a wavelength conversion module with a highly accurate temperature control function were developed.

KLY-QG10α/QG30α/KLY-QG70α

Domestically largest output "QG30α/QG70α" installed acousto-optic method switch element that generates the short pulse of least 50nsec width, and enabled the oscillation of a high peak and the short pulse.

KLY-QV5α/QV10α

High output type "QV10α" installed Acousto-optic method switch element that generates the short pulse of the least 20nsec width, as a result, the oscillation of a high peak and the short pulse became possible.Although the output is over 10W, the life of elements which is two times as long as conventional elements and stablization of the conversion efficiency were achieved.

Applications

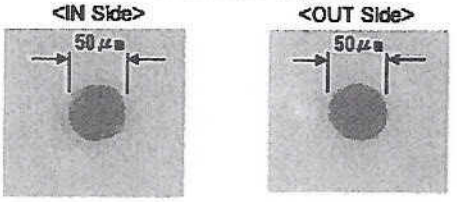
Ultrafine scribing, cutting, and drilling of difficult processing materials such as metal, semiconductors, and ceramic

Processed Examples

Processed Examples:2 Processed Examples:3 Processed Examples:4

Minute Hole Processing

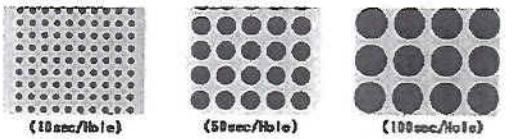
<IN Side> <OUT Side>



Oscillator Model : KLY-QV10α
Processing Details : Minute Hole Processing (Straight)
Material : Alumina Ceramics
Sheet Thickness : 0.4t
Processing Time : 6 sec/Hole
Processing Related Unit : Beam Rotator

Hole Processing (Alumina Ceramics)

<φ100μm> <φ300μm> <φ500μm>

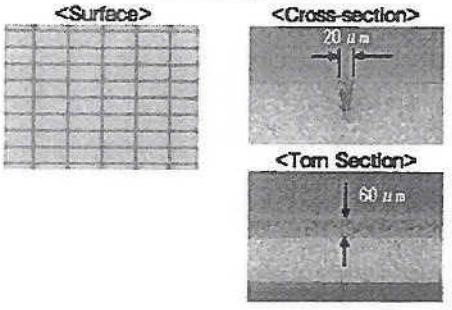


(10sec/Hole) (50sec/Hole) (100sec/Hole)

Oscillator Model : KLY-QV10α
Processing Details : Hole Processing (Straight)
Material : Alumina Ceramics
Sheet Thickness : 0.4t
Processing Related Unit : Beam Rotator

Alumina Scribing

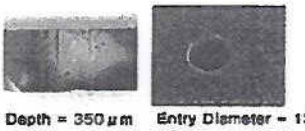
<Surface> <Cross-section>



<Torn Section>

Oscillator Model : KLY-QG30α
Processing Details : Scribing
Material : Alumina Ceramics
Sheet Thickness : 0.18t, 0.64t
Processing Speed : 50mm/sec
Processing Nozzle : Direct 33mm

Hole Processing (Alumina Ceramics)



Process No.1 Depth = 350μm Entry Diameter = 13μm

Process No.2 Depth = 270μm Entry Diameter = 9μm

Oscillator Model : KLY-QV10α
Processing Details : Drilling
Material : Diamond
Sheet Thickness : 0.5t
Processing Related Unit : Direct
Processing Time : 1sec/Hole

Basic Specifications

Item	Details				
Model	KLY-QG10α	KLY-QG30α	KLY-QG70α	KLY-QV5α	KLY-QV10α
Wavelength	532nm			355nm	
Pumping Source	808nm Semiconductor Laser (LD)				
Active Medium	Nd:YAG Crystal				
Configuration	Separate Oscillator and Power Supply Part Type(Chiller Unit separate) Direct Ray Optics				
Maximum Average Output Power	10W@10kHz	30W@10kHz	70W@10kHz	5W@10kHz	10W@10kHz

Maximum Peak Output Power	10kW@ 10kHz	30kW@ 10kHz	40kW@ 10kHz	5kW@ 10kHz	12kW@ 10kHz
Beam Quality(M2)	<4	<8	<20	<1.5	<2
Frequency	1kHz～50kHz				
Pulse Width	<100nsec@10kHz		<200nsec@10kHz	<50nsec@10kHz	
Output Power Stability	Less than 2%rms (Cooling water stability: ±1℃)				
Polarization	Circular Polarization or Linear Polarization				
Operating Voltage	AC220V±10%、50／60H z ±1Hz				
Input power Consumption	1.0kVA	2.0kVA	4.0kVA	2.0kVA	
Weight	Laser Head : Approximately 40kg Operating Voltage : Approximately 90kg		Laser Head : Approximately 50kg Operating Voltage : Approximately 100kg	Laser Head : Approximately 40kg Operating Voltage : Approximately 90kg	
External Dimensions W×H×Dmm3	Laser Head/358×182×660mm3 Operating Voltage/572×951×668mm3		Laser Head/408×175×770mm3 Operating Voltage/572×951×668mm3		

page top

Revolution of Laser Technology — KATAOKA

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SpitLight
Scientific Lasers

SpitLight High Power

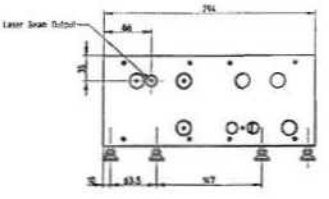
Features

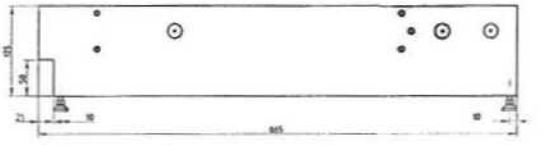
- Compact laser head and power supply with small footprint
- Robust and stable resonator structure
- Quick and easy change of flashlamps
- Maintenance-free pumping chamber with ceramic reflector
- Excellent beam quality and pointing stability
- Long flashlamp lifetime
- Double pulse option available
- System can be injection seeded (SLM-Option)

SpitLight
Scientific Lasers

SpitLight High Power

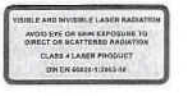
Model		SpitLight 1200	SpitLight 1500	SpitLight 2000
Laser Parameters	Repetition Rate	Product available from 1 to 100 Hz (Following specifications are for **10 Hz**)		
Energy	Pulse Energy at 1,064 nm	> 1,250 mJ	> 1,500 mJ	> 2,000 mJ
	Pulse Energy at 532 nm	> 600 mJ	> 700 mJ	> 1,000 mJ
	Pulse Energy at 355 nm	> 320 mJ	> 420 mJ	> 540 mJ
	Pulse Energy at 266 nm	> 100 mJ	> 130 mJ	> 130 mJ
	Pulse Energy at 213 nm	> 18 mJ	> 23 mJ	> 40 mJ
	Energy Stability at 1,064 nm (RMS)	< 0.8%	< 1.0%	< 1.0%
	Energy Stability at 532 nm (RMS)	< 1.3%	< 1.5%	< 1.5%
	Energy Stability at 355 nm (RMS)	< 2.0%	< 2.2%	< 2.2%
Beam Parameters	Pulse Width at 1,064 nm	6-7 ns	6-7 ns	6-8 ns
	Divergence	< 0.5 mrad	< 0.5 mrad	< 0.5 mrad
	Pointing Stability	< ± 50 µrad	< ± 50 µrad	< ± 50 µrad
	Beam Diameter	8 mm	8 mm	10 mm
	Temporal Jitter	< ± 1 ns	< ± 1 ns	< ± 1 ns
Operating Parameters	Lamp Life Time	> 20,000,000 shots	> 20,000,000 shots	> 20,000,000 shots
	Electrical Supply	230 VAC, 50 Hz, 2.5 Kw	230 VAC, 50 Hz, 2.5 Kw	380 VAC, 50 Hz, 5.0 Kw
	Cooling Water	8 l/min, 2-6 bar, < 15 °C	8 l/min, 2-6 bar, < 15 °C	8 l/min, 2-6 bar, < 15 °C
Weights	Laser Head	30 kg	30 kg	30 kg
	Power Supply	50 kg	50 kg	50 kg
Dimensions	Laser Head (in infrared) (L x W x H)	665 x 294 x 125 mm	665 x 294 x 125 mm	665 x 294 x 125 mm
	Power Supply (L x W x H)	560 x 400 x 425 mm	560 x 400 x 425 mm	560 x 400 x 425 mm





InnoLas follows a policy of continuous product improvement. All specifications are subject to change without notice. All specifications at 1,064 nm unless otherwise noted.

InnoLas Laser GmbH is DIN EN ISO 9001 certified.



CE

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INNOLAS LASER

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SpitLight
Scientific Lasers

SpitLight High Power

Features

* Compact laser head and power supply with small footprint
* Robust and stable resonator structure
* Quick and easy change of flashlamps
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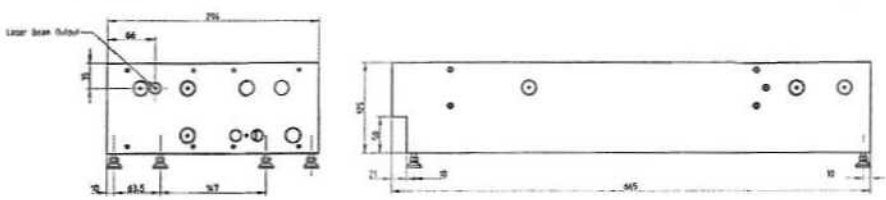
	Pulse Energy at 213 nm	> 18 mJ	> 23 mJ	> 40 mJ
	Energy Stability at 1,064 nm (RMS)	< 0.8%	< 1.0%	< 1.0%
	Energy Stability at 532 nm (RMS)	< 1.3%	< 1.5%	< 1.5%
	Energy Stability at 355 nm (RMS)	< 2.0%	< 2.2%	< 2.2%
Beam Parameters	Pulse Width at 1,064 nm	6-7 ns	6-7 ns	6-8 ns
	Divergence	< 0.5 mrad	< 0.5 mrad	< 0.5 mrad
	Pointing Stability	< ± 50 µrad	< ± 50 µrad	< ± 50 µrad
	Beam Diameter	8 mm	8 mm	10 mm
	Temporal Jitter	< ± 1 ns	< ± 1 ns	< ± 1 ns
Operating Parameters	Lamp Life Time	> 20,000,000 shots	> 20,000,000 shots	> 20,000,000 shots
	Electrical Supply	230 VAC, 50 Hz, 2.5 Kw	230 VAC, 50 Hz, 2.5 Kw	380 VAC, 50 Hz, 5.0 Kw
	Cooling Water	8 l/min, 2-6 bar, < 15 °C	8 l/min, 2-6 bar, < 15 °C	8 l/min, 2-6 bar, < 15 °C
Weights	Laser Head	30 kg	30 kg	30 kg
	Power Supply	50 kg	50 kg	50 kg
Dimensions	Laser Head (in infrared) (L x W x H)	665 x 294 x 125 mm	665 x 294 x 125 mm	665 x 294 x 125 mm
	Power Supply (L x W x H)	560 x 400 x 425 mm	560 x 400 x 425 mm	560 x 400 x 425 mm



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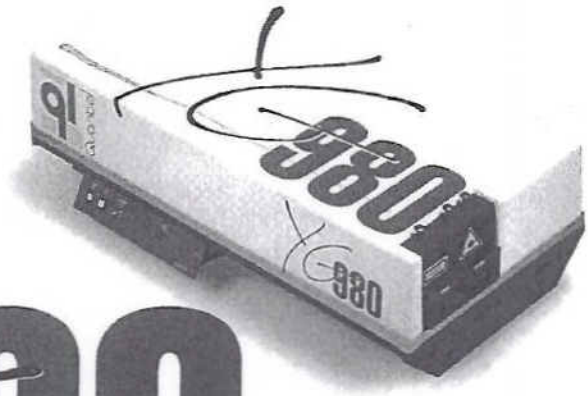
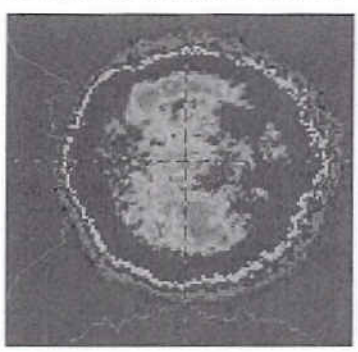


YG980 Series

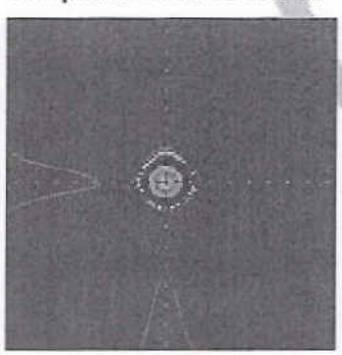
Modular Q-Switched Nd:YAG laser series with superb beam quality, excellent stability and high brightness.

- Ø 6 mm or Ø 9.5 mm.
- 1 or 2 amplifiers.
- Birefringence compensation.
- Line narrowing options (injection seeder or etalon).
- Full control of the laser through the remote control terminal or the software.
- Temperature stabilized optical bench.

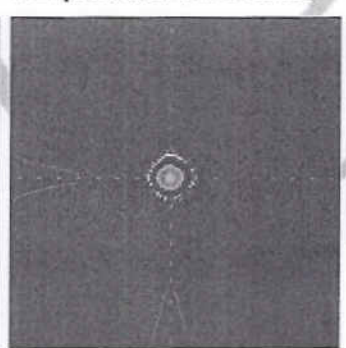
Beam profile in near field @ 1064 nm



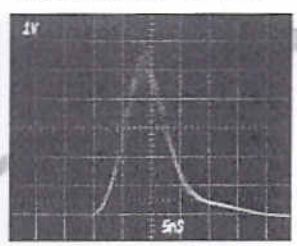
Beam profile in far field @ 1064 nm



Beam profile in far field @ 532 nm

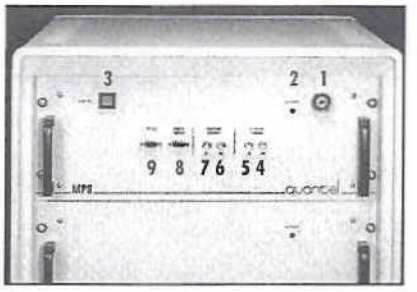


Temporal profile @ 1064 nm



YG981E-10 (1,6J @ 1064 nm, 10 Hz)

External synchronization flexibility:



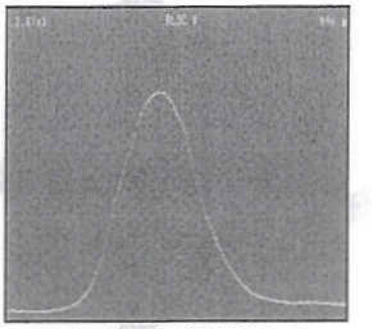
INPUT/OUTPUT:

1- Turn-on key with stand-by position
2- AC power indicator
3- Laser ON warning
4- Output Q-Switch synchronization TTL signal, adjustable from the remote control terminal by ± 500 ns
5- Input Q-Switch synchronization TTL signal
6- Output flashlamp synchronization TTL signal
7- Input flashlamp synchronization TTL signal
8- Remote control terminal connector
9- Computer serial port interface (RS232)

Flashlamps and Q-Switch can be fully controlled through TTL signal, RS232 interface or remote terminal (3 meter long cable).
A fast photodiode located after the oscillator gives an output signal displaying the optical pulse shape.
User-friendly software is also available for control by computer (see the control panel on the main brochure).

SLM (Single Longitudinal Mode) option:

The complete option consists of a SLM CW fiber laser with Faraday isolator, power supply, a set of mirrors and an electronic feedback loop with piezoelectric ceramic mounted mirror.
The temporal beam profile is free of modulation with a very high reproducibility.



Temporal profile of a YG980 SLM pulse obtained with a 6 GHz scope and a 50 ps risetime phototube.

Remote control terminal:

This user-friendly terminal can be connected either to the laser housing or to the front of panel of the electronic cabinet by a 3 meter long flexible cable. It provides the following functions:

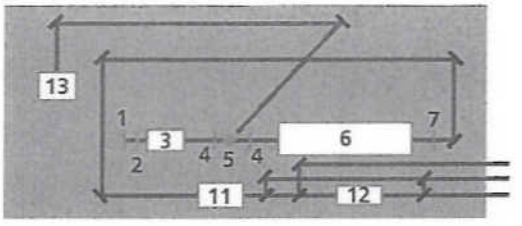
• flashlamps:
- flashlamp firing in single shot or automatic
- choice between internal or external synchronization
- readout and adjustment of voltages
- oscillator/amplifier flashlamp delay readout and adjustment
- shot counter

• Q-Switch:
- choice between internal or external synchronization
- setting of the Q-Switch in single shot, automatic or burst mode
- adjustable delay of the output synchronization signal with respect to opening of the Q-Switch
- readout and adjustment of delay between flashlamp and Q-Switch firing for energy adjustment

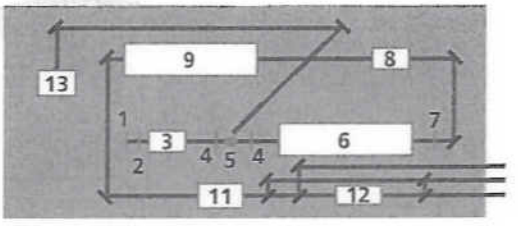
• others:
- emergency stop
- opening/closing intra-cavity shutter
- control of harmonic generators phase-matching
- wavelength separation platform rotation
- report of security defaults

Optical layout:

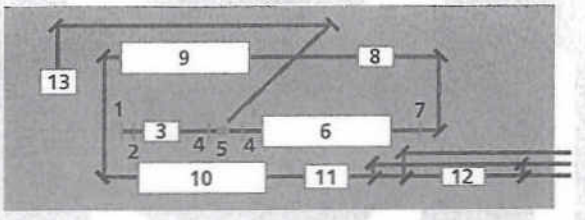
Configuration/Model	YG980	YG980E	YG981	YG981C	YG981E	YG982C	YG982E
Oscillator	ø 6 mm	ø 9.5 mm	ø 6 mm	ø 6 mm	ø 9.5 mm	ø 6 mm	ø 9.5 mm
Amplifier 1			ø 6 mm	ø 9.5 mm	ø 9.5 mm	ø 9.5 mm	ø 9.5 mm
Amplifier 2						ø 9.5 mm	ø 12 mm



YG980 & YG980E models



YG981, YG981C & YG981E models

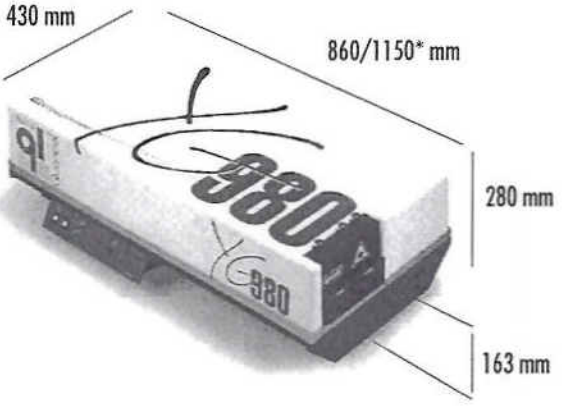


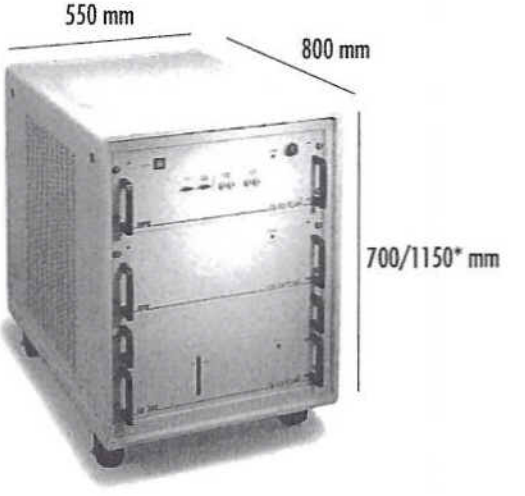
YG982 models

1- Back mirror
2- Shutter
3- Pockels cell
4- Quarter-wave plate
5- Glan polarizer
6- Oscillator laser head
7- Gaussian output coupler
8- Birefringence compensation (depends on the model)
9- First amplifier laser head
10- Second amplifier laser head
11- Second harmonic generator
12- Third or fourth harmonic generator
13- Injection seeder

Service requirements:

240 V - 16 to 20 A - 50/60 Hz
Water: 12.5 l/mn, 5°C-20°C
Pressure IN ≤ 6 bars (88PSI)
Pressure OUT ≤ 3 bars (44PSI)
Differential pressure IN-OUT ≥ 3 bars (44PSI)





** YG982*

Model		YG980	YG980E		YG981			YG981C			YG981E			YG982C	YG982E
Repetition rate (Hz)		10	10	20	10	20	50	10	20	30	10	20	30	30	10
Energy (mJ)															
	1064 nm	420	850	700	650	630	500	1200	1050	900	1600	1600	1200	1500	2500
	532 nm	190	400	300	320	290	170	600	520	350	820	780	550	700	1250
	355 nm	85	165/200*	140/160*	140	125	85	280	240	200	490	420	280/340*	350/420*	850
	266 nm	40	90	60	60	45	30	130	90	60	150	120	85	105	230
Pulse duration (ns)	1064 nm	6-8	6-8		6-8		8-11	6-8			8-11			8-11	9-12
Beam diameter (mm)	1064 nm	≤6	≤10		≤6			≤10			≤10			≤10	≤13
Divergence (mrad)	1064 nm	≤0.5	≤0.5		≤0.5			≤0.45		≤0.5	≤0.5			≤0.5	≤0.5
Polarization ratio (%)	1064 nm	≥90	≥80	≥70	≥90			≥80	≥75	≥70	≥95	≥90	≥90	≥90	≥90
Spatial profile															
Near field (fit to Gaussian)		≥0.7	≥0.7		≥0.7			≥0.7			≥0.7			≥0.7	≥0.7
Far field (fit to Gaussian)		≥0.95	≥0.9		≥0.9			≥0.9			≥0.95		≥0.9	≥0.9	≥0.9

Repetition rate (Hz): other values available on request
* **HE355:** High Energy U.V. option
Pulse duration: at FWHM measured with fast photodiode and 1 GHz scope - **Divergence:** full angle at $1/e^2$ of the peak
Polarization: horizontal @ 1064 nm - vertical @ 532 nm - horizontal @ 355 nm and @ 266 nm - **Near field spatial profile:** at 1 m from laser output
Far field spatial profile: at focal plane of a 2 m focus lens, least square fit to Gaussian (perfect fit = 1).

Power drift (%)	1064 nm	± 2
	532 nm	± 4
	355 nm	± 5
	266 nm	± 10
Energy stability (%)	1064 nm	± 2
	532 nm	± 4
	355 nm	± 6
	266 nm	± 8
Pointing stability (µrad)	1064 nm	< 50
	532 nm	< 50
	355 nm	< 50
	266 nm	< 50

Power drift: over 8 hours for $\Delta T° \leq \pm 3°C$.
Energy stability: peak-to-peak, 100% of the shots.
Pointing stability: measured by Spiricon LBA-100, rms, on 200 pulses at the focal plane of a 1 m focus lens.

Jitter (ns)	Standard		± 0.5
	SLM option		± 1
Focusability (times diffraction limit), M^2			
	10-20 Hz		≤ 2
	30-50 Hz		≤ 3
Linewidth (cm^{-1})	Standard		≤ 0.7
	LNE intracavity etalon		≤ 0.1
	SLM injection seeding	11 ns	≤ 0.003
		6 ns	≤ 0.005

Jitter: with respect to Q-Switch trigger, at half-width of 500 accumulated shots.
Linewidth:
Standard: FWHM, measured by a grating spectrometer with 0.045 cm^{-1} resolution.
LNE: FWHM, measured by a grating spectrometer with 0.045 cm^{-1} resolution, ≤ 15% energy reduction @ 1064 nm.
SLM: measured with a slow scan Fabry-Perot Etalon, ≤ 10% energy reduction @ 1064 nm and @ 532 nm, higher energy @ 355 nm.

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Ph.: +1 406 586 0131 - +1 811 QUANTEL - Fax: +1 406 586 2924

e.mail: quantel@quantel.fr - www.quantel-laser.com

RoHS

VISIBLE AND INVISIBLE LASER RADIATION
AVOID EYE OR SKIN TO DIRECT
OR SCATTERED RADIATION.
CLASS 4 LASER RADIATION PRODUCT

Max Average Power	: 30 W
Max Energy/pulse	: 2.5J
Pulse duration	: <20ns
Emitted Wavelength	: 190/4000nm

Class 4 laser product complies with FDA performance standards for laser products except for deviations pursuant to laser notice NO.50 dated june 24, 2007/IEC 60825-1

CE

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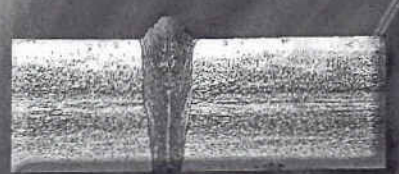
JK802SM and JK1002SM

CW Nd:YAG lasers with SuperModulation ™

The JK802SM and JK1002SM are the latest addition to the already successful range of CW Nd:YAG lasers, providing a significantly higher level of performance, enabling deeper weld penetration, faster cleaner material cutting, with high reliability, flexibililty and lower process costs.

Without SuperModulation



With SuperModulation

- Laser SuperModulation™ as a standard patented process
- SuperModulation™ increases the laser's maximum peak power to twice it's normal average power rating
- Supermodulation™ provides:
  - Welds to more than 5mm
  - Greater depth of focus
  - Reduced porosity
  - Longer Lamp life
  - Up to 40% speed increase
  - Less distortion
- Patented Luminator™ fiber beam delivery system with built in back reflection protection. "The most robust fiber delivery system in the world"
- LaserView SE™ control software provides full access to all laser funtions and diagnostics and with process cycles offers the funtionality of a "PLC within the laser"

GSI™ JK™ Lasers

Deeper Welds and Cleaner Cuts

The JK802 and JK1002 from GSI Group feature our successful SuperModulation™ technique. With SuperModulation, some energy is stored in the laser's power supply during the laser's off-time or during a low average power cycle, and is delivered to the lasing medium during a later on-time or high average power cycle to produce a momentary 2X power output. This extra output provides processing capability not typically found in lasers with similar power ratings.

Laser Specifications

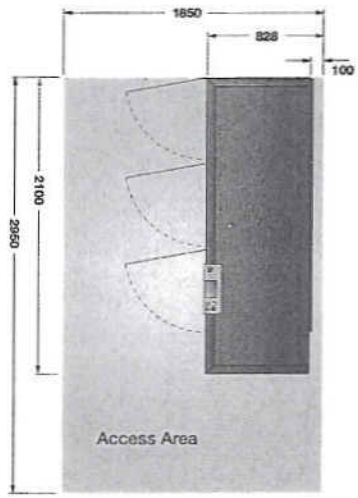
Model	JK802SM	JK1002SM
Average Power (W)	800	1000
Max. Modulated Peak Power (W)	1600	2000
Number of Lamps	4	4
Beam Quality	16	24
Laser Response Time	2	
Modulation Frequency (Hz)	100 - 1000	
Output Mode	CW, Sine or Square	

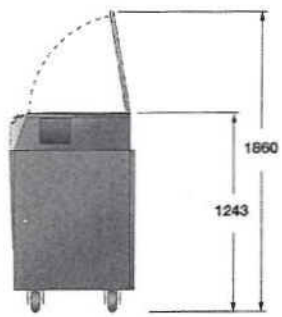
Fiber-Optic Beam Delivery

Fiber Core Diameter (µm)	400	600
Standard Spot Size (nominal) (mm)	0.16 - 0.60	0.30 - 0.90
Standard Fiber Lengths (m)	5, 10, 15, 30, 50	
Max. Fiber Length (m)	50	
Beam Delivery Options	Up to 4T or 2Tx2E combination	
Timeshare Switching Time (ms)	<50	
Focus Head Options	Straight or Right Angle	
Process Tool Options	CCTV viewing, welding nozzles, autofocus cutting modules	

Facility Requirements

Cooling Water Requirements	60 l/min, 15.8 US gal/min @15°C
Max. Pressure Drop at 18°C (bar)	2.5
Max. Inlet Pressure (bar)	7.5
Cooling Capacity (kW)	40
Electrical Requirements	380 - 415V ± 10% @ 50Hz, 440 - 480± 10% @ 60Hz
Supply Rating (kVA)	43
Max. Power Consumption (kW)	40
Ambient Temperature (°C)	5 - 40
Max. Humidity	95% RH @20°C, 50 RH @ 40°C
W x H x D	2100 x 1243 x 756 (82 x 49 x 29)
Weight (kg)	500





Dimensions in mm

Product Code Selection Guide

JK	802SM	1 S	2 N/A	3 E	4 3WES	5 D	6 P	7 A	8 20	9 15

1 Laser Power Frequency: 5 50 Hz; 6 60 Hz
2 Laser Fiber Output Launch Type: N/A
3 Language: E English; F French; G German; C Chinese
4 Fiber Launch Options: 2WTS 2 way time share; 3WTS 3 way time share; 4WTS 4 way time share; 2WES 2 way energy share; 3WES 3 way energy share; 4WES 4 way energy share; 2T1F 2 way time share between one 2 way energy share and one fiber; 2T2F 2 way time share between one 2 way energy share and 2 fibers; 2T2E 2 way time share between two 2 Way Energy Shares
5 Pointing Diode Option: D Pointing Diode
6 Interface Options: P PC interface
7 Interface Options: A Advanced Interface
8 Cable: 10 10 m interface cable; 20 20 m interface cable; 30 30 m interface cable; 50 50 m interface cable; LV LaserView SE
9 Luminator Fiber Selection: 5 5m x 150µm; 10 10m x 150µm; 15 15m x 150µm

GSI JK™ Lasers TM

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JK802SM and JK1002SM

CW Nd:YAG lasers with SuperModulation ™

The JK802SM and JK1002SM are the latest addition to the already successful range of CW Nd:YAG lasers, providing a significantly higher level of performance, enabling deeper weld penetration, faster cleaner material cutting, with high reliability, flexibililty and lower process costs.

Without SuperModulation

With SuperModulation

- ❑ Laser SuperModulation™ as a standard patented process
- ❑ SuperModulation™ increases the laser's maximum peak power to twice it's normal average power rating
- ❑ Supermodulation™ provides:
  - ❑ Welds to more than 5mm
  - ❑ Greater depth of focus
  - ❑ Reduced porosity
  - ❑ Longer Lamp life
  - ❑ Up to 40% speed increase
  - ❑ Less distortion
- ❑ Patented Luminator™ fiber beam delivery system with built in back reflection protection. "The most robust fiber delivery system in the world"
- ❑ LaserView SE™ control software provides full access to all laser funtions and diagnostics and with process cycles offers the funtionality of a "PLC within the laser"

GSI JK™ Lasers

Deeper Welds and Cleaner Cuts

The JK802 and JK1002 from GSI Group feature our successful SuperModulation™ technique. With SuperModulation, some energy is stored in the laser's power supply during the laser's off-time or during a low average power cycle, and is delivered to the lasing medium during a later on-time or high average power cycle to produce a momentary 2X power output. This extra output provides processing capability not typically found in lasers with similar power ratings.

Laser Specifications

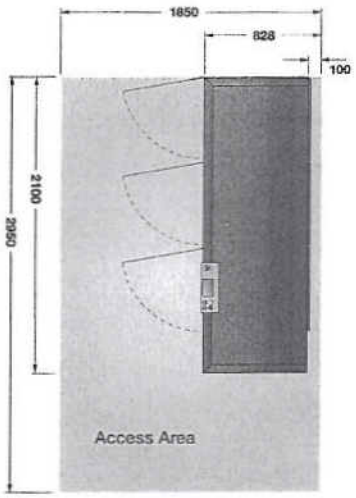
Model	JK802SM	JK1002SM
Average Power (W)	800	1000
Max. Modulated Peak Power (W)	1600	2000
Number of Lamps	4	4
Beam Quality	16	24
Laser Response Time	2	
Modulation Frequency (Hz)	100 - 1000	
Output Mode	CW, Sine or Square	

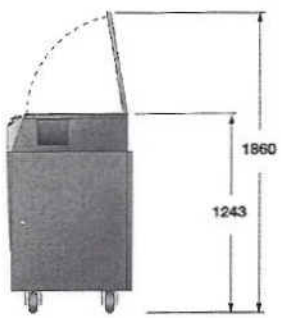
Fiber-Optic Beam Delivery

Fiber Core Diameter (µm)	400	600
Standard Spot Size (nominal) (mm)	0.16 - 0.60	0.30 - 0.90
Standard Fiber Lengths (m)	5, 10, 15, 30, 50	
Max. Fiber Length (m)	50	
Beam Delivery Options	Up to 4T or 2Tx2E combination	
Timeshare Switching Time (ms)	<50	
Focus Head Options	Straight or Right Angle	
Process Tool Options	CCTV viewing, welding nozzles, autofocus cutting modules	

Facility Requirements

Cooling Water Requirements	60 l/min, 15.8 US gal/min @15°C
Max. Pressure Drop at 18°C (bar)	2.5
Max. Inlet Pressure (bar)	7.5
Cooling Capacity (kW)	40
Electrical Requirements	380 - 415V ± 10% @ 50Hz, 440 - 480± 10% @ 60Hz
Supply Rating (kVA)	43
Max. Power Consumption (kW)	40
Ambient Temperature (°C)	5 - 40
Max. Humidity	95% RH @20°C, 50 RH @ 40°C
W x H x D	2100 x 1243 x 756 (82 x 49 x 29)
Weight (kg)	500





Dimensions in mm

Product Code Selection Guide

JK	802SM	1: S	2: N/A	3: E	4: 3WES	5: D	6: P	7: A	8: 20	9: 15

1 Laser Power Frequency
- S 50 Hz
- 6 60 Hz

2 Laser Fiber Output Launch Type N/A

3 Language
- E English
- F French
- G German
- C Chinese

4 Fiber Launch Options
- 2WTS 2 way time share
- 3WTS 3 way time share
- 4WTS 4 way time share
- 2WES 2 way energy share
- 3WES 3 way energy share
- 4WES 4 way energy share
- 2T1F 2 way time share between one 2 way energy share and one fiber
- 2T2F 2 way time share between one 2 way energy share and 2 fibers
- 2T2E 2 way time share between two 2 Way Energy Shares

5 Pointing Diode Option
- D Pointing Diode

6 Interface Options
- P PC interface

7 Interface Options
- A Advanced Interface

8 Cable
- 10 10 m interface cable
- 20 20 m interface cable
- 30 30 m interface cable
- 50 50 m interface cable
- LV LaserView SE

9 Luminator Fiber Selection
- 5 5m x 150µm
- 10 10m x 150µm
- 15 15m x 150µm

www.gsiglasers.com

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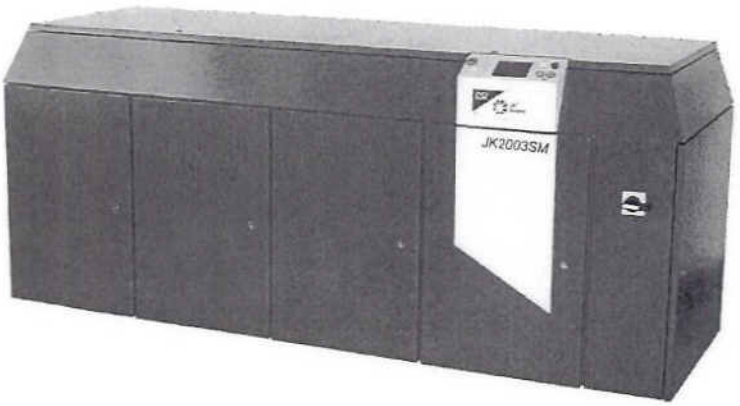
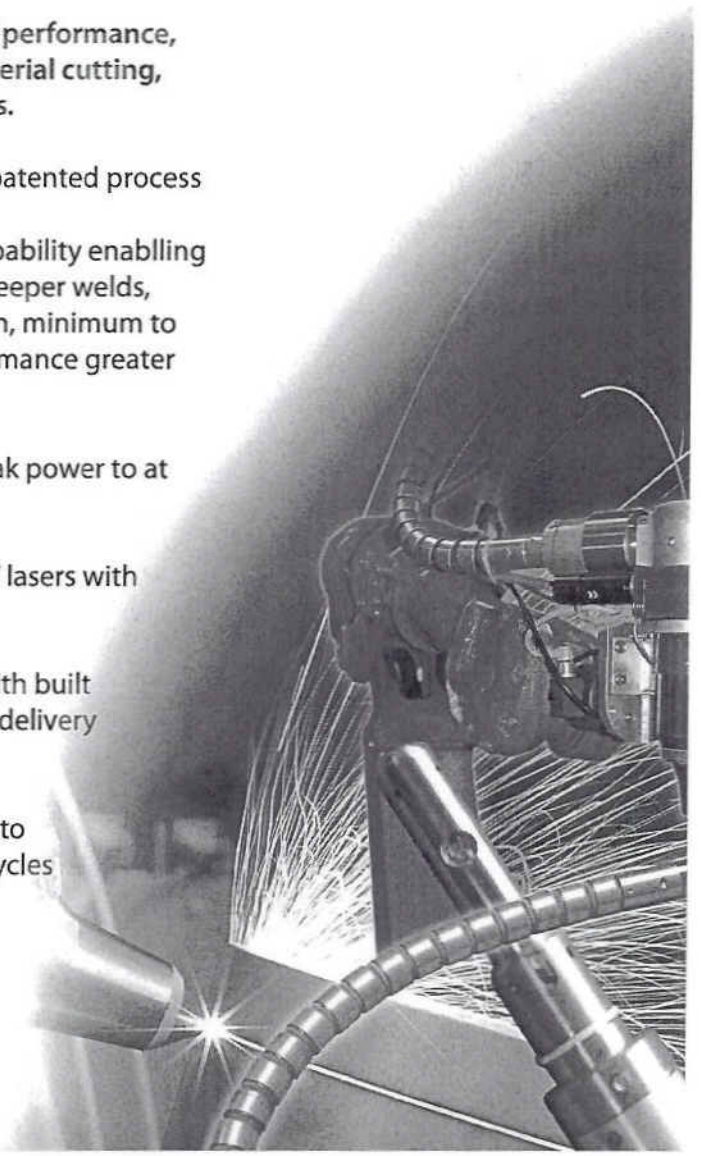
JK2003SM

The next generation CW Nd:YAG laser with SuperModulation ™



The JK2003SM provides a significantly higher level of performance, enabling deeper weld penetration, faster cleaner material cutting, with high reliability, flexibility and lower process costs.

- ❑ The only laser with SuperModulation as a standard patented process
- ❑ SuperModulation provides an enhanced process capability enablling welds in >10mm material, up to 40% faster and or deeper welds, greater depth of focus, less heat input, less distortion, minimum to zero weld porosity, SuperModulated welding performance greater than an equivalent 3kW CW laser.
- ❑ SuperModulation increases the laser's maximum peak power to at least twice it's normal average power rating.
- ❑ Redefining the price performance of high power CW lasers with Dual Cavity technology.
- ❑ Patented Luminator ™ fiber beam delivery system with built in back reflection protection. "The most robust fiber delivery system in the world"
- ❑ LaserView SE ™ control software provides full access to all laser functions and diagnostics and with profile cycles offers the functionality of a "PLC within the laser"



GSI JK™ Lasers

High Reliabilty and Flexibility

JK2003SM marks the introduction of the JK flagship CW product, featuring our patented SuperModulation ™ process capability giving this laser the widest operating range in it's class.

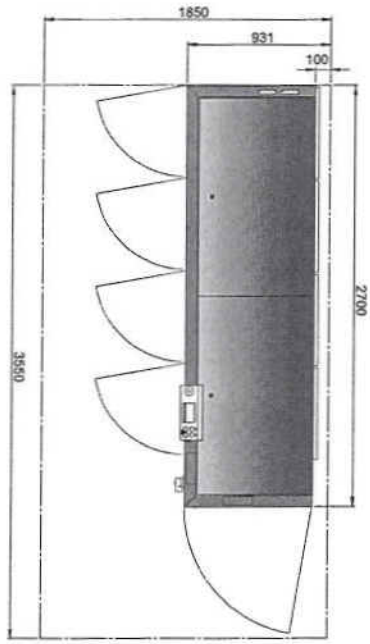
With SuperModulation ™, some energy is stored in the laser's power supply during the laser's off-time or during a low average power cycle and is delivered to the lasing medium during a later on-time or high average power cycle to produce a momentary x2 power output. This extra output provides processing capability not typically found in lasers with similar power ratings.

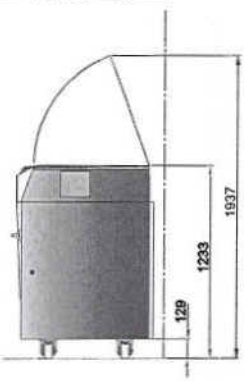
Laser Specifications

Model	JK2003SM
Max. Average Power [1] (W)	2000
Max. Modulated Peak Power (W)	4000
Beam Quality [2] (mm.mrad)	24
Fiber Diameter (µm)	600
Output Modes	CW, Sine, Square wave
Modulation Frequency (Hz)	100 - 1000
Fibre Beam Delivery Options	
Delivery Options	Up to 4 way time share
Timeshare Switching Time (ms)	<50
Standard Fiber lengths - Optional Bendlock for dynamic applications (m)	5, 10, 15, 30 and 50
Process Tools Options	Straight or right angle process tools. Right angle heads available with co-axial CCTV
Standard Range of Spot Sizes (mm)	0.3 - 0.9 plus others on request

Facility Requirements

Cooling Water Requirments	107 l/min, 28.2 US gal/min at 13°C
Max. Inlet Pressure (bar)	7.5
Max. Pressure Drop (bar)	3
Cooling Requirements (kW)	70
Supply Voltage and Frequencies	380 - 415V ± 10% @ 50Hz 440 - 480V ± 10% @ 60Hz
Supply Rating (kVA)	76
Ambient Temperature (°C)	5 - 40
Max. Humidity	95% RH @ 20°C, 50% RH @ 40°C
W x H x D (mm/inches)	2700 x 1233 x 931 / 106 x 48.5 x 36.6
Weight (kg)	800





Product Code Selection Guide

		1	2	3	4	5	6	7	8	9
JK	2003SM	S	N/A	E	3WES	D	P	A	20	15

1	Laser Power Frequency	5	50 Hz
		6	60 Hz
2	Laser Fiber Output Launch Type	N/A	
3	Language	E	English
		F	French
		G	German
		C	Chinese
4	Fiber Launch Options	2WTS	2 way time share
		3WTS	3 way time share
		4WTS	4 way time share
		2WES	2 way energy share
		3WES	3 way energy share
		4WES	4 way energy share
		2T1F	2 way time share between one 2 way energy share and one fiber
		2T2F	2 way time share between one 2 way energy share and 2 fibers
		2T2E	2 way time share between two 2 Way Energy Shares
5	Pointing Diode Option	D	Pointing Diode
6	Interface Options	P	PC Interface
7	Interface Options	A	Advanced Interface
8	Cable	10	10 m interface cable
		20	20 m interface cable
		30	30 m interface cable
		50	50 m interface cable
		LV	LaserView SE
9	Luminator Fiber Selection	5	5m x 150µm
		10	10m x 150µm
		15	15m x 150µm

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Machine Tools/Power Tools
Laser Technology/Electronics
Medical Technology

TRUMPF

State-of-the-art laser technology.

The TRUMPF Group ranks among the world's leading manufacturers of laser and production technology. Our innovations set the standard in the development of laser technology, machine tools and power tools for sheet metal fabrication, and medical technology. Our customers have relied on the superior quality of our technical solutions since 1923. Today's TRUMPF Laser GmbH + Co. KG began in 1971 in Schramberg, Germany, with the development of a solid-state laser. This was followed in 1985 by TRUMPF's first CO_2 laser with a power of 1 kW. Today, we are the technology and world market leader in industrial lasers and laser systems. We continually develop new processes and increasingly powerful laser sources and systems, and consistently apply these developments to innovations targeting our cus-

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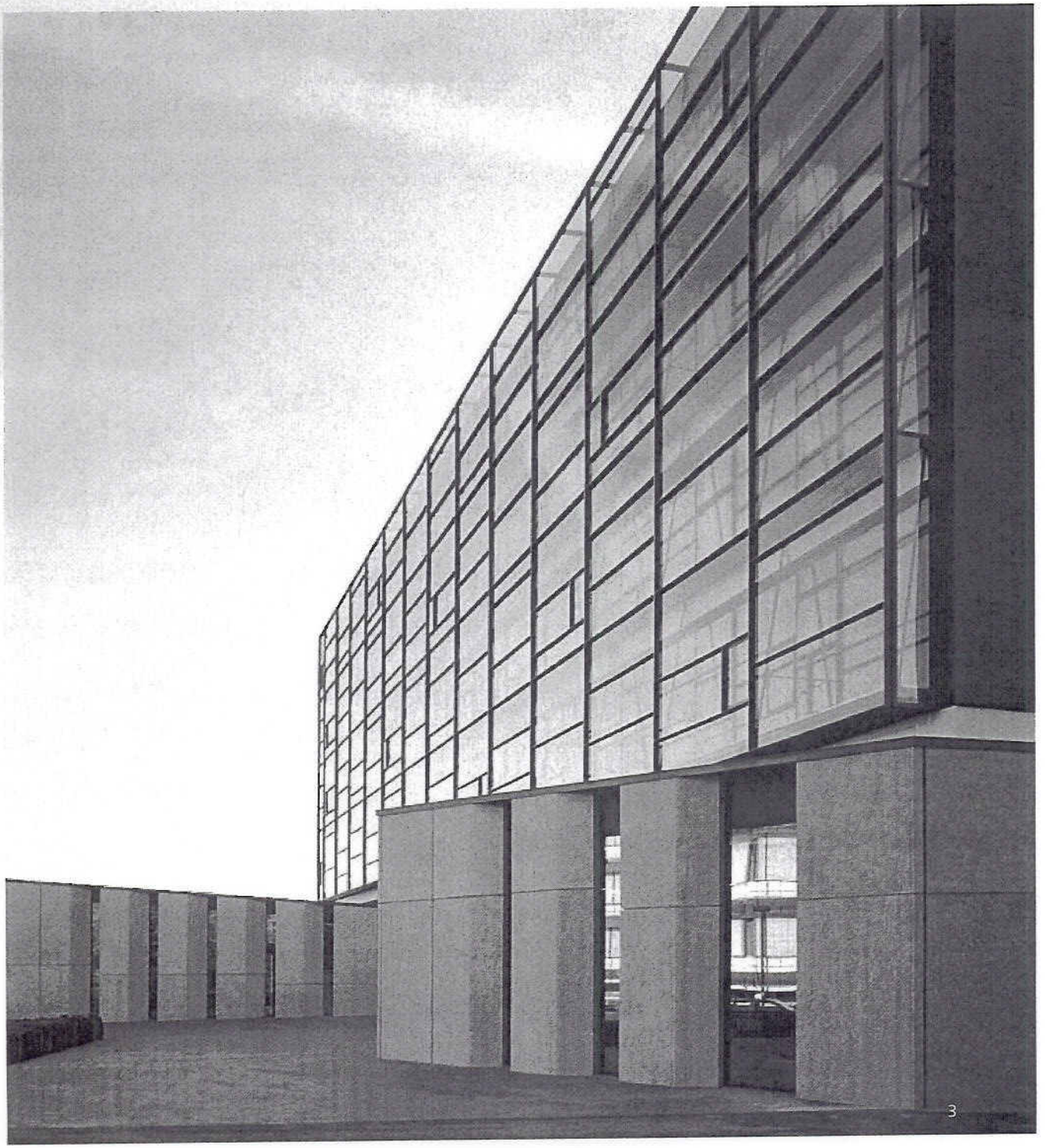
Page 38 TruServices: We are there for you.

tomers' requirements. You can count on us for all of your projects. Our comprehensive services include feasibility studies performed in our application laboratories, laser processing and design consultation, and formulating a start-to-finish concept for your plant. Even if you just want information about a new focusing optics – we speak your language.



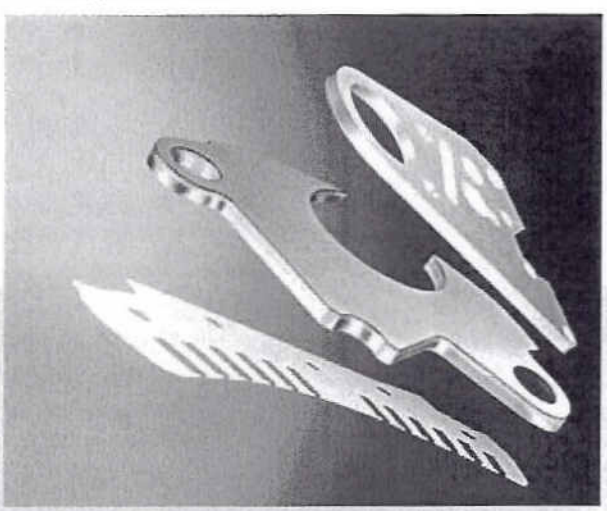
The all-rounder.

The laser is the most universal tool available for cutting, welding, marking, drilling, coating, hardening, and performing structural processing work on surfaces. A laser operates without contact, and with no wear and tear. Therefore, the heat-affected zone and component distortion produced by lasers is extraordinarily small. Refinishing work is usually unnecessary.

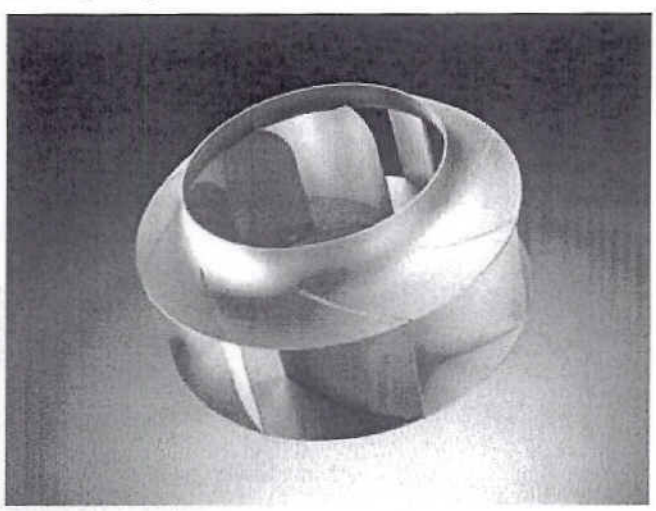
TRUMPF lasers have the flexibility to be used in a variety of applications, allowing for short processing times with optimum processing quality. Precision and a high level of automation go hand in hand when using amplified light.

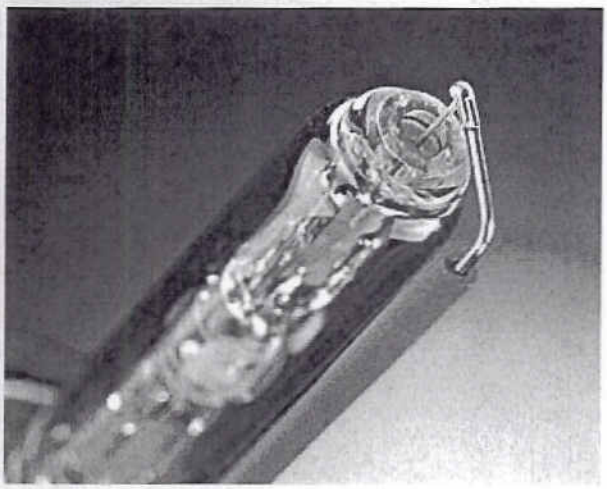
TRUMPF lasers have proven themselves ten thousand times under today's toughest manufacturing conditions and in a wide range of industries, including automotive manufacturing, automotive supply, aerospace, electronic entertainment media, precision mechanics, and medical technology. Lasers are used for processing a wide variety of products, including car bodies, transmission, exhaust and control system components, sensors, tubes and profiles, electronic components, and solar cells. Our lasers repair and coat tools and molds, and can mark anything from pacemakers to apples.

Laser cutting, from thin to thick.

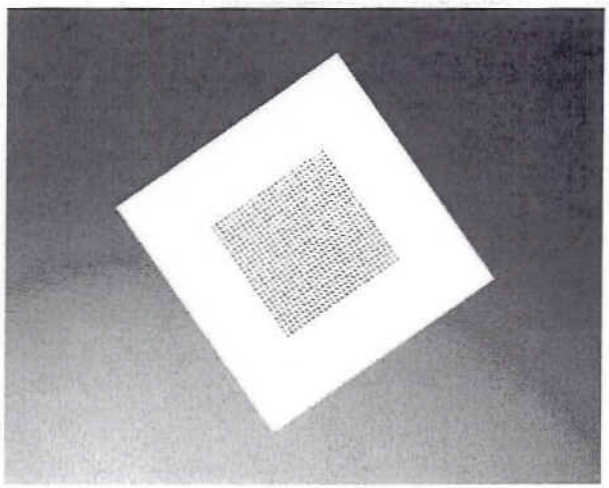


Narrow, high-strength laser weld seams.





Filigree spot welds.



Creating the smallest of holes with the highest precision.

Everything from a single source.

When you use TRUMPF lasers, you benefit from our decades of practical experience in all laser-related fields. With TRUMPF, after all, you get it all from a single source – everything from laser units, beam guidance components, and focusing optics, to software and complete systems. Our components can also be adapted to every job and easily integrated into your plant setup.

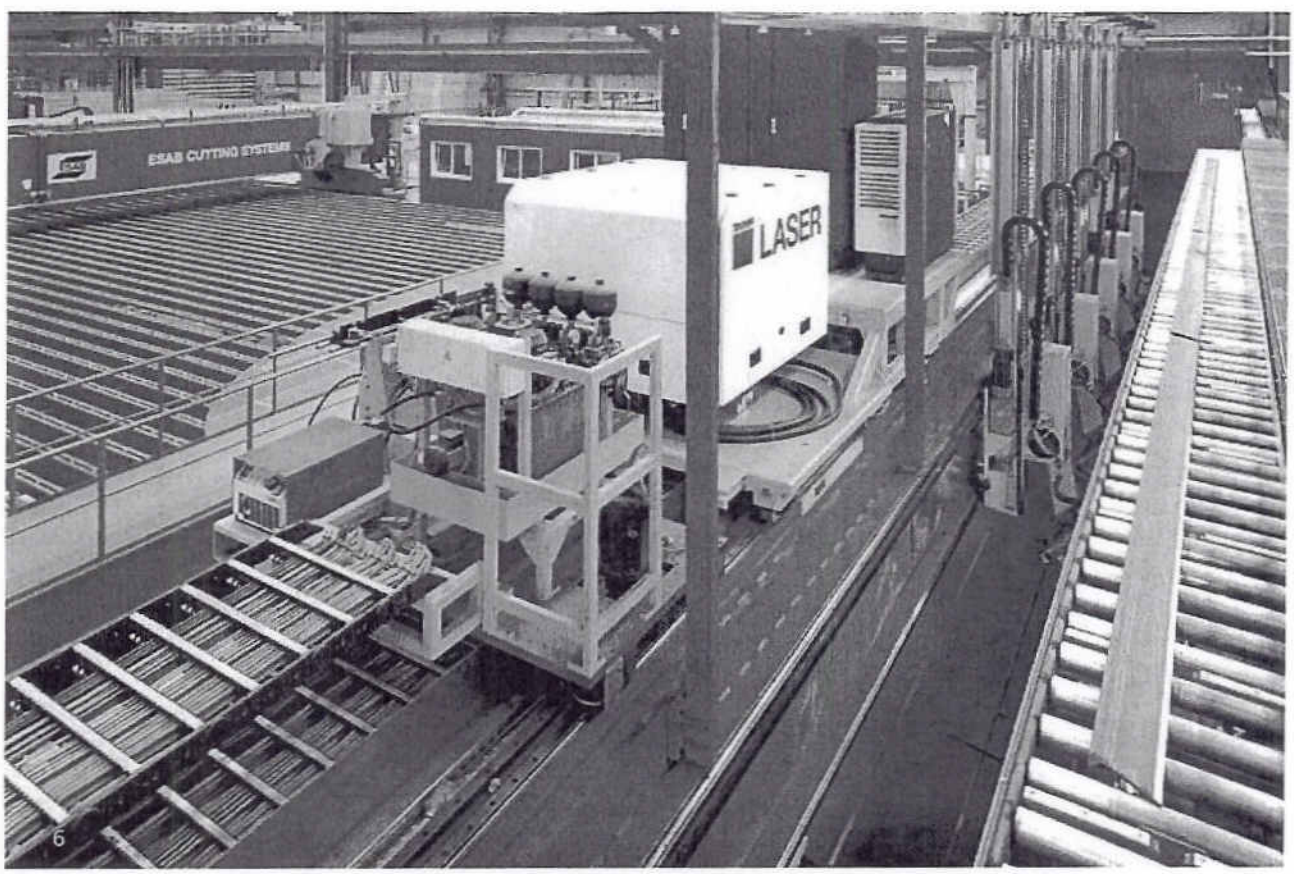
Service right from the start.

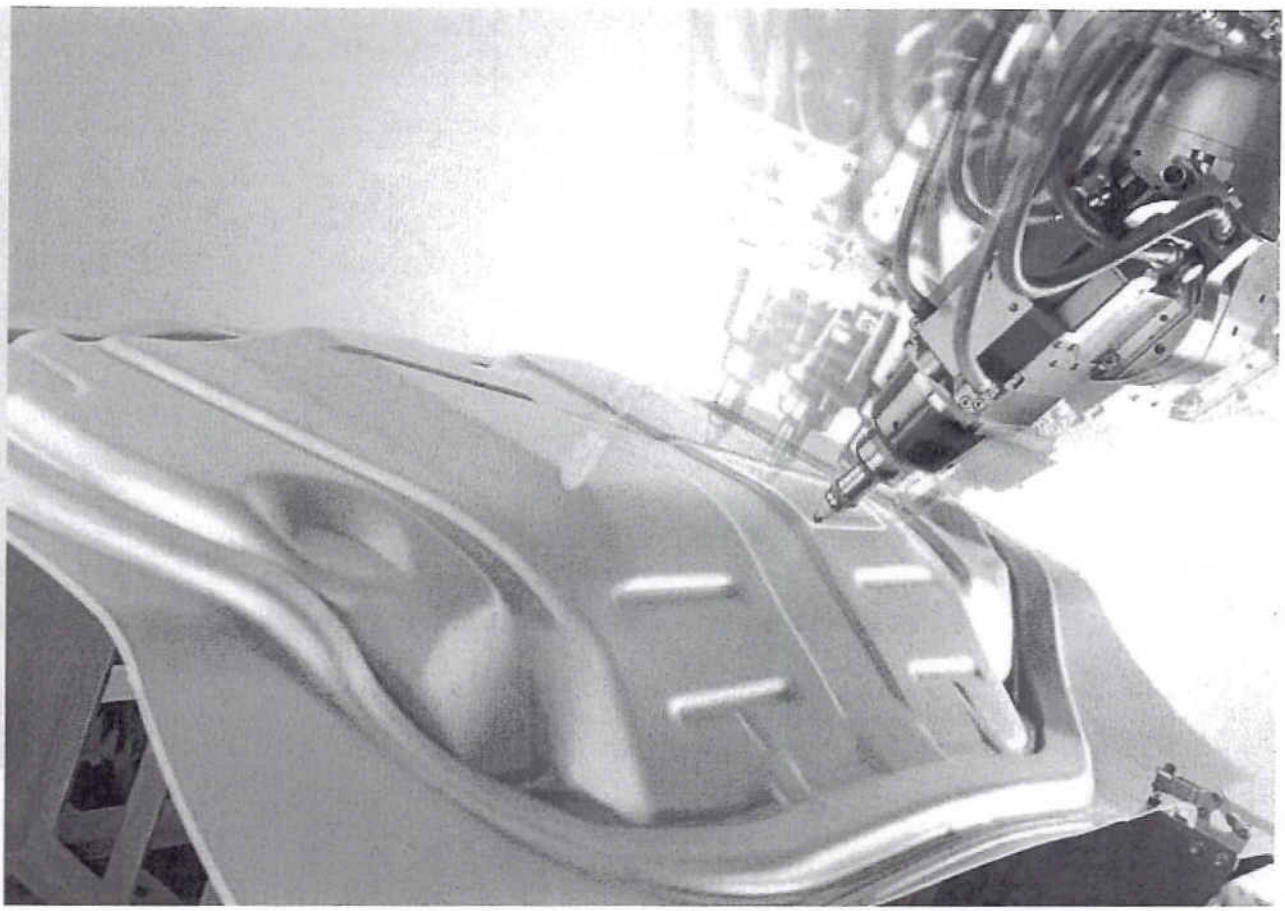
Our service begins even before you decide to buy a laser or laser system. We maintain application laboratories worldwide, where we can determine the feasibility of your desired application and show you what laser technology can do for your production processes. It goes without saying that – even after you purchase a TRUMPF laser – our application specialists will continue to assist you with application technology, incorporating lasers into component design and optimizing your production sequences.

TRUMPF CO_2 lasers:

Efficient and economical.

CO_2 lasers have been used for decades as the standard tool for processing an enormous variety of materials efficiently and economically. Worldwide, over 16,000 of our beam sources are used day in and day out, providing reliable service for cutting, welding, or surface treatment of two and three-dimensional workpieces.





Easy integration.

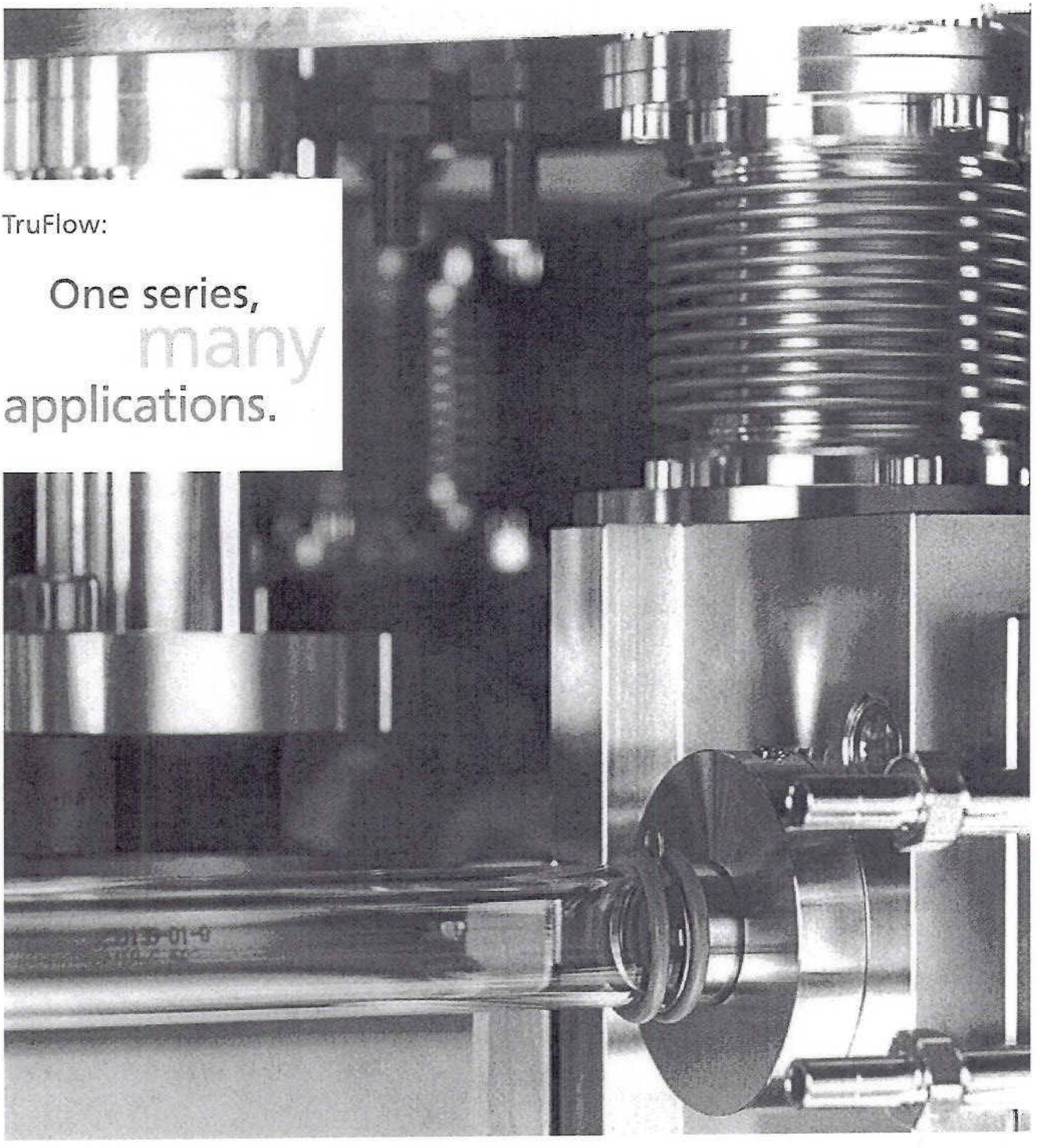
Their compact, sturdy design and open interface architecture make it easy to integrate TRUMPF CO_2 lasers into production systems. They can even be used on moving machine assemblies. Our lasers deliver top-notch quality and a high level of productivity.

Versatility.

The TRUMPF portfolio consists of TruFlow fast axial-flow lasers and TruCoax diffusion-cooled lasers. Their broad range of output options and outstanding beam characteristics make it easier to optimize the beam source with respect to your production process.

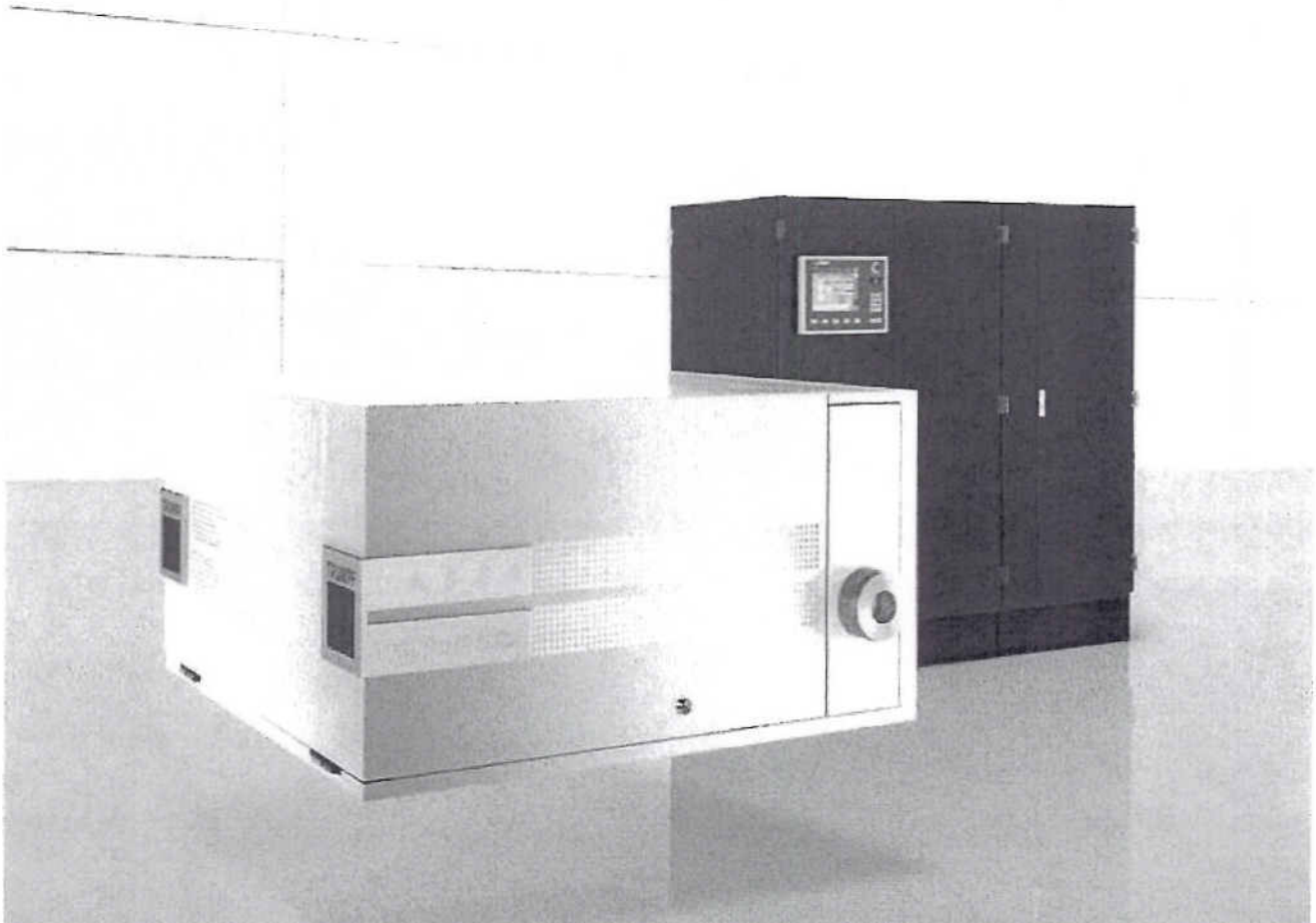
Lasers in the lower output range provide an economical means of cutting thin sheet metal and non-metal materials such as wood, paper, or plastics, and are also suitable for melting glass or perforating ceramic substrates. CO_2 lasers with output greater than 2 kW may be used to cut 2-D or 3-D sheet metal components and for welding tubes, profiles, and components of transmissions or exhaust systems. Lasers in this performance class are also the preferred choice for applying or melting down anti-abrasion layers.

TruFlow lasers in the highest output range, from 12 to 20 kW, may be used for reliable welding of thick sheet metal in applications such as shipbuilding, construction machinery, or the production of transmission components for commercial vehicles.



TruFlow:

One series, many applications.



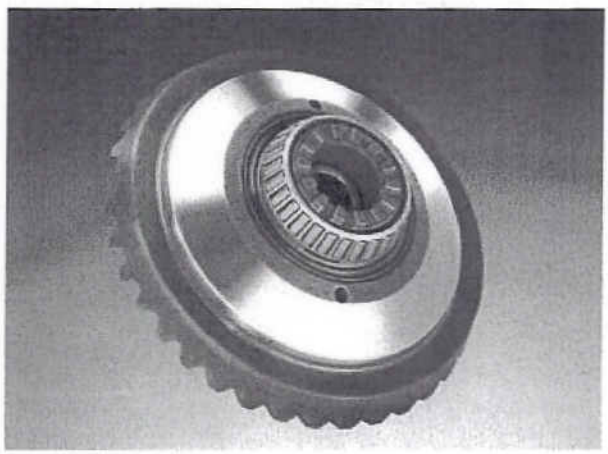
	TruFlow 700	TruFlow 1200	TruFlow 1500	TruFlow 2000	TruFlow 2700	TruFlow 3200	TruFlow 3600	TruFlow 4000
Laser power	700 W	1,200 W	1,500 W	2,000 W	2,700 W	3,200 W	3,600 W	4,000 W
Beam quality K (M^2)	0.6 (1.67)[1]	0.6 (1.67)[1]	0.6 (1.67)[1]	0.6 (1.67)[1]	0.6 (1.67)[1]	0.6 (1.67)[1]	0.6 (1.67)[1]	0.5 (2.0)[1]
Nominal power consumption[2]	23 kW	23 kW	23 kW	27 kW	34 kW	36 kW	42 kW	44 kW
Dimensions beam source								
Length	1,185 mm	1,185 mm	1,185 mm	1,185 mm	1,185 mm	1,185 mm	1,185 mm	1,185 mm
Width	1,150 mm	1,150 mm	1,150 mm	1,150 mm	1,150 mm	1,150 mm	1,150 mm	1,150 mm
Height	650 mm	650 mm	650 mm	650 mm	650 mm	650 mm	650 mm	650 mm

	TruFlow 5000	TruFlow 6000	TruFlow 7000	TruFlow 8000	TruFlow 12000	TruFlow 15000	TruFlow 20000
Laser power	5,000 W	6,000 W	7,000 W	8,000 W	12,000 W	15,000 W	20,000 W
Beam quality K (M^2)	0.55 (1.82)[1]	0.55 (1.82)	0.55 (1.82)[1]	0.52 (1.9)	0.26 (3.8)	0.24 (4.2)	0.22 (4.5)
Nominal power consumption[2]	56 kW	68 kW	80 kW	105 kW	120 kW	155 kW	200 kW
Dimensions beam source							
Length	1,185 mm	1,185 mm	1,185 mm	1,185 mm	1,665 mm	1,665 mm	1,665 mm
Width	1,150 mm	1,150 mm	1,150 mm	1,150 mm	1,524 mm	1,524 mm	1,524 mm
Height	650 mm	650 mm	650 mm	650 mm	1,100 mm	1,100 mm	1,100 mm

Valid for all laser types above:

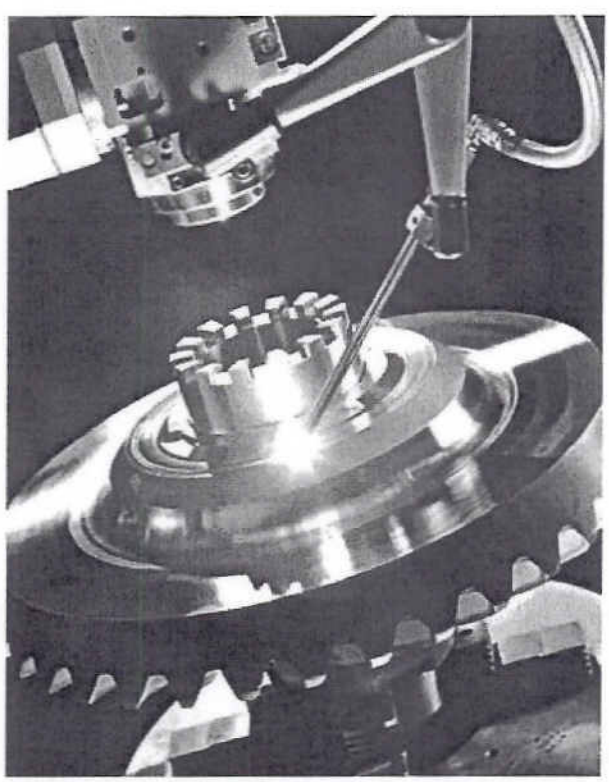
Wavelength	10.6 µm (further more on demand)
Output stability, according to the nominal power:	± 2 %

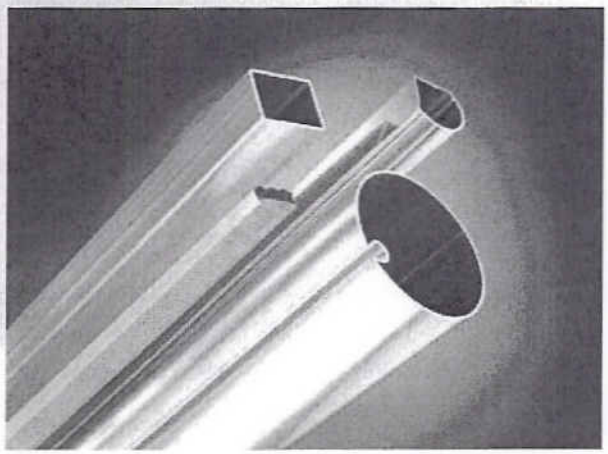
[1] The HQ lasers have a beam quality of K = 0.9 resp. M^2 = 1.1. Their laser power is approx. 10 % lower than the stated values.
[2] Laser without cooling system.



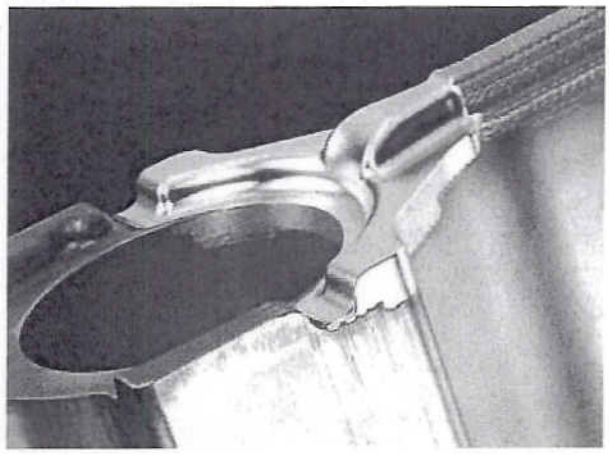
Laser welded transmission component.

TruFlow Series lasers offer you the highest level of availability and productivity – qualities that remain reliable even under the toughest production conditions. Output is available between 700 and 20,000 W, a range covering an immense array of applications. TruFlow lasers generate smooth cutting edges at high advance speeds and narrow cutting kerfs. They can also be used to create narrow welded seams with a small heat-affected zone, thereby maintaining a very low thermal load on the component.





Welding and cutting of tubes and profiles.



Powder coating of a die-forging tool.

Universal and specialized.

The modular construction of the entire series lets you tailor your TruFlow laser specifically to your application. Its wide range of output options allows you to select the beam parameters required for a given application. In addition to its standard lasers for cutting and welding, TRUMPF also offers solutions tailored to specific tasks within an application, such as lasers with especially high focusability, or beam sources that can be optimized for specific surface applications.

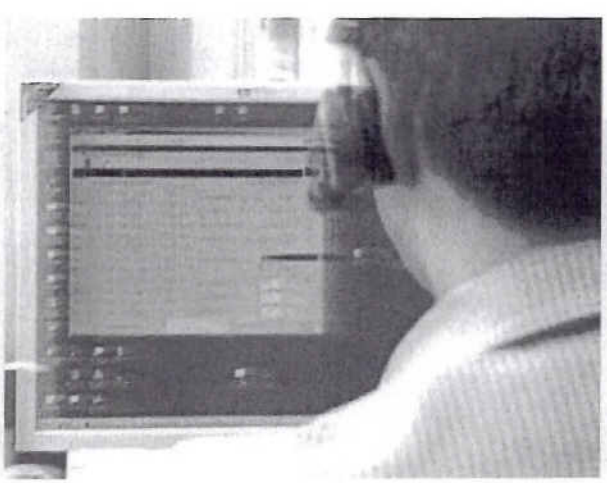
Compact, reliable, robust.

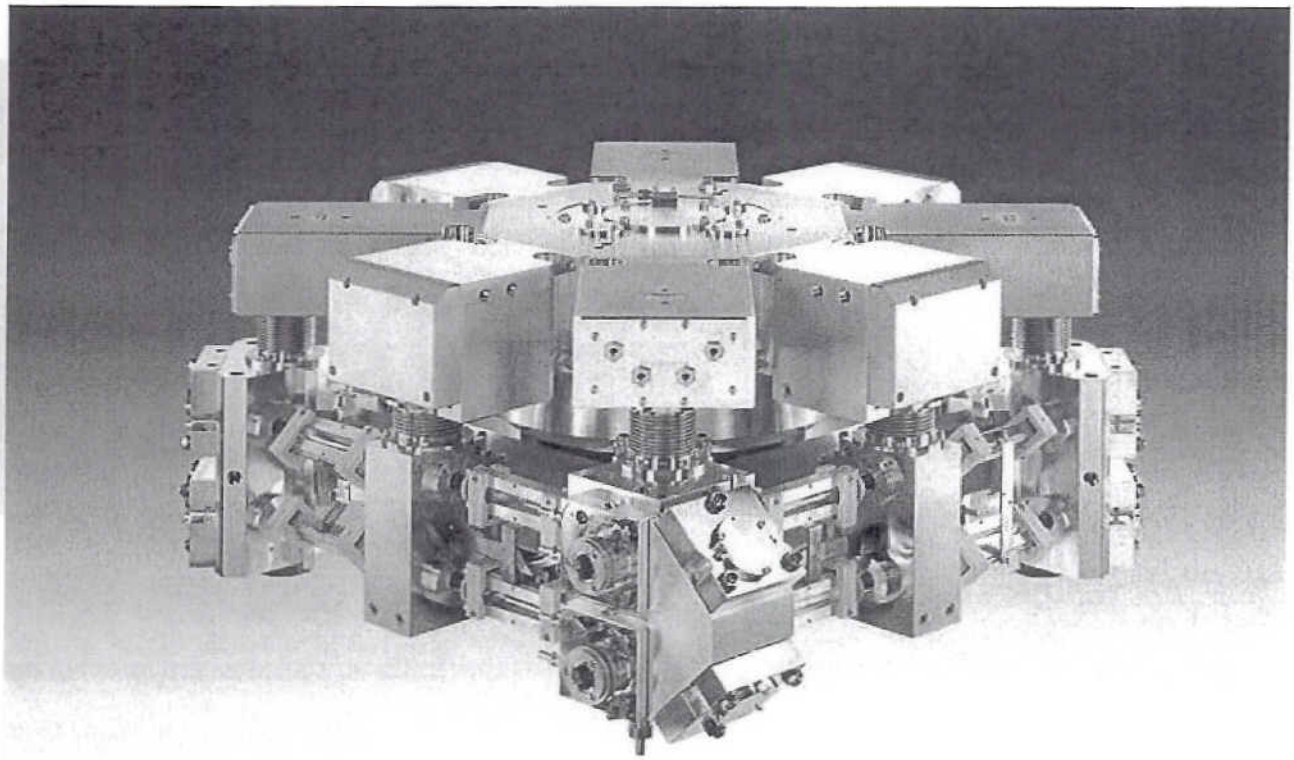
The compact, square design of the TruFlow laser resonator maximizes resonator length, allowing you to optimize beam characteristics, while minimizing overall dimensions. All major resonator components are water-cooled and offer a high level of thermo-dynamic stability, ensuring that TruFlow lasers are up to the challenge of the tough conditions of day-to-day industrial operations. TruFlow lasers are extraordinarily reliable, even on moving machine assemblies.

Efficient.

TruFlow lasers utilize only capacitive high-frequency excitation. It is the cleanest and most reliable form of laser excitation, providing high efficiency, constant beam parameters, and excellent laser output control.

Since it is magnetically suspended, the turbo radial blower is not subject to wear and tear, and is virtually maintenance-free. By continuously recirculating the laser gas, the blower provides high efficiency cooling and a high level of overall laser value.





Readily mixed.

Instead of using individual gas bottles, you can also use a premix gas bottle.

Easy operation.

All TruFlow lasers are run from the same control unit, and can be operated using an intuitive user interface. For integration into a higher-level production system control, the laser control unit is available with Profibus interface, or with analog interfaces for laser power and pulse frequency. For the ease of operation, the control reminds you of any maintenance interval that might come up.

TruCoax:

High performance in a little package.

	TruCoax 1000	TruCoax 2000
Laser power	1,000 W	2,000 W
Beam quality K (M^2)	0.9 (1.1)	0.9 (1.1)
Nominal power consumption[1]	20 kW	33 kW
Dimensions beam source		
Length	1,300 mm	1,840 mm
Width	430 mm	500 mm
Height	320 mm	540 mm

Valid for all laser types above:

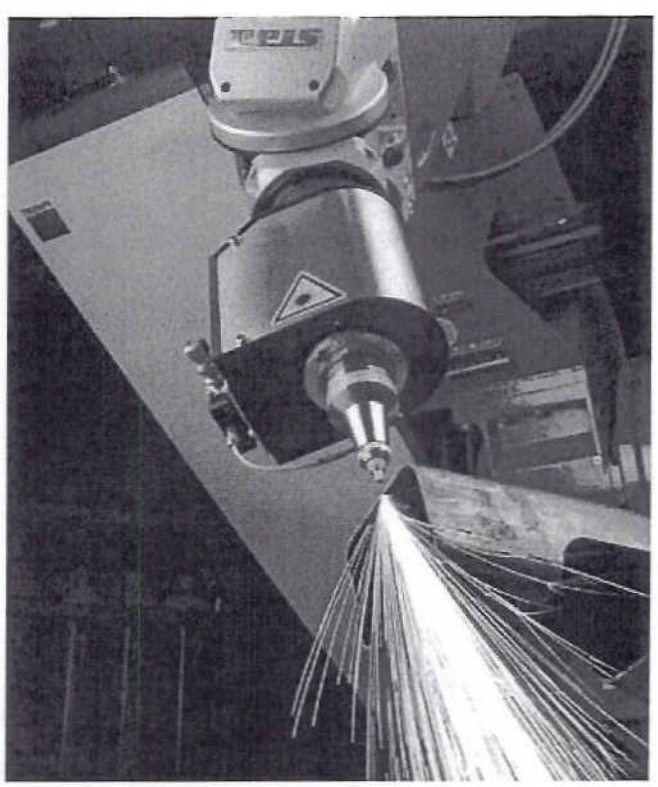
Wavelength	10.6 µm
Output stability, according to the nominal power	± 2 %

[1] Laser without cooling system.

Our TruCoax CO_2 laser is diffusion-cooled and provides a high level of beam quality at a laser power of up to 2,000 W.

TruCoax lasers are so compact that they can easily fit on the frame of a machine, and can even be combined with robotic systems. Part of what makes this possible is the design of the resonator. Its walls release the heat that is generated, and two coaxial, nested metal tubes act as high-frequency electrodes and as cooling elements.

Yet another advantage of the TruCoax laser is that the gas which is premixed in a small bottle is stored in the resonator. Plus, the TruCoax uses so little gas that you only need to replace the bottle every 1.5 to 2 years. It's hard to imagine how laser processing could be more user-friendly, or involve less maintenance.



TRUMPF solid-state lasers:

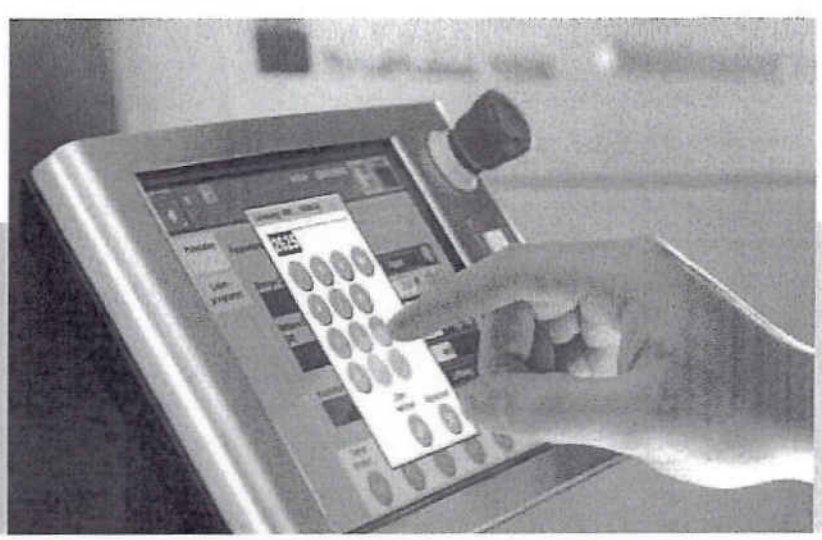
Versatility through diversity.

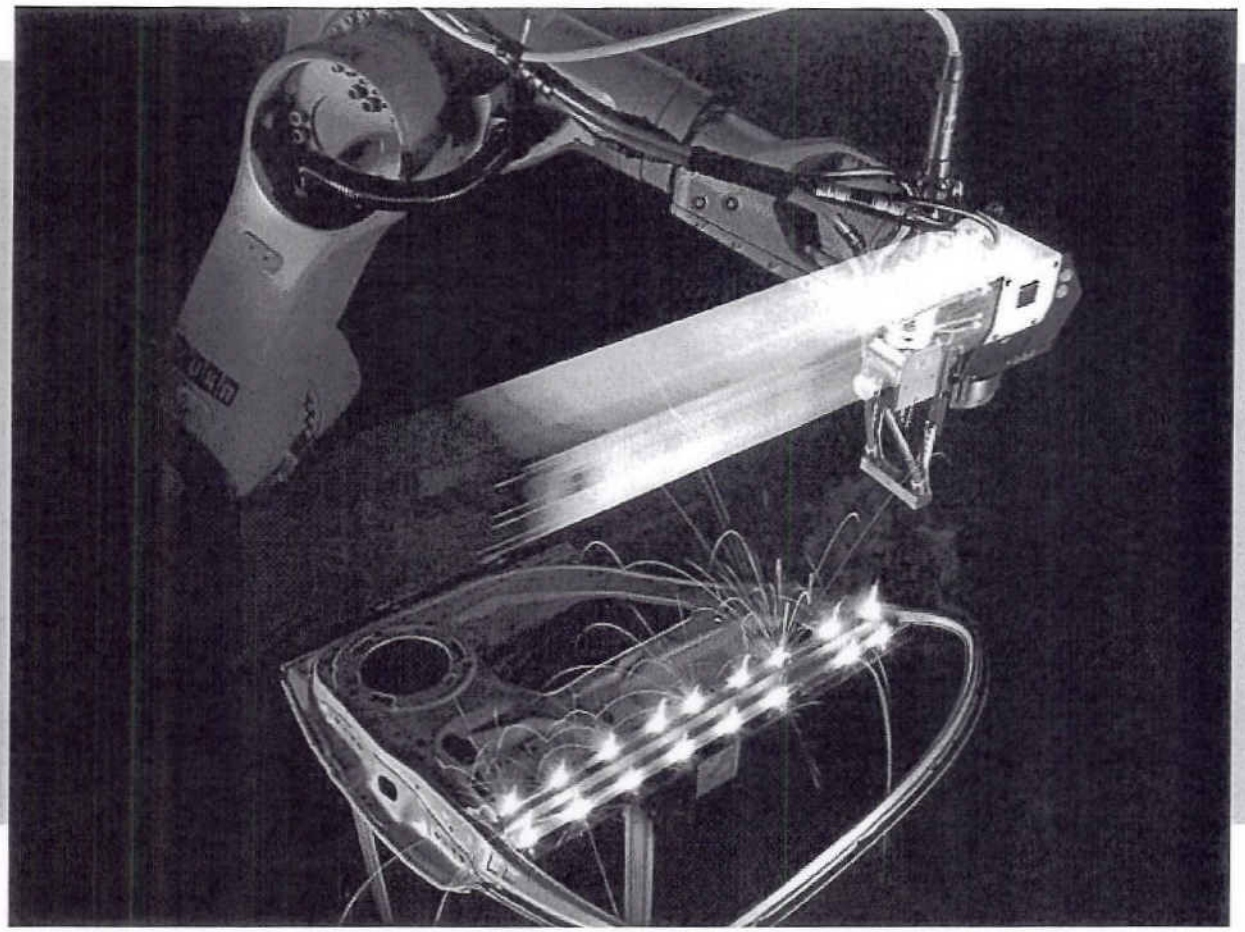
The power of TRUMPF solid-state lasers ranges from 20 to 16,000 W. Depending on the model, our solid-state lasers function according to either continuous wave or pulse operation. For pulse operation, the duration of the pulse can be in milliseconds, microseconds, nanoseconds, or even picoseconds, making these models suitable for an enormous variety of applications.

For welding or cutting, in the automotive industry, for aerospace applications, or even in heavy manufacturing: TruDisk lasers are the right choice for high-quality processing of metals and high laser power with extremely good beam quality.

The primary application for TruPulse lasers is spot and seam welding. "Cold" welding with TruPulse lasers is especially practical for components that tolerate only very low heat input and distortion. Materials with high melting points can be welded as easily as those with higher thermal conductivity. TruPulse lasers can also be used for cutting extremely fine contours in both metals and non-metals alike.

Our TruMicro lasers are suitable any time you need a controlled, highly precise, and reproducible means of removing material with a laser. For remote cutting, structuring, and drilling metals, semiconductors, and ceramics, our diode-pumped TruMicro lasers are specifically developed to meet the needs of microproduction technology.





Flexible.

The major advantage of solid-state laser technology is that the laser beam can be coupled with fiber-optic cables. Flexible laser light cables conduct the beam from its source to the processing site. Integrating lasers into production facilities or robotic equipment also showcases the advantages of laser light cable technology.

Intelligent design.

Our solid-state lasers give you fast, dynamic control, allowing laser power to be digitally controlled in real time, to achieve reproducible results from the very first second. All of the interfaces typically needed for communicating with external control units are at your disposal.

Intuitive.

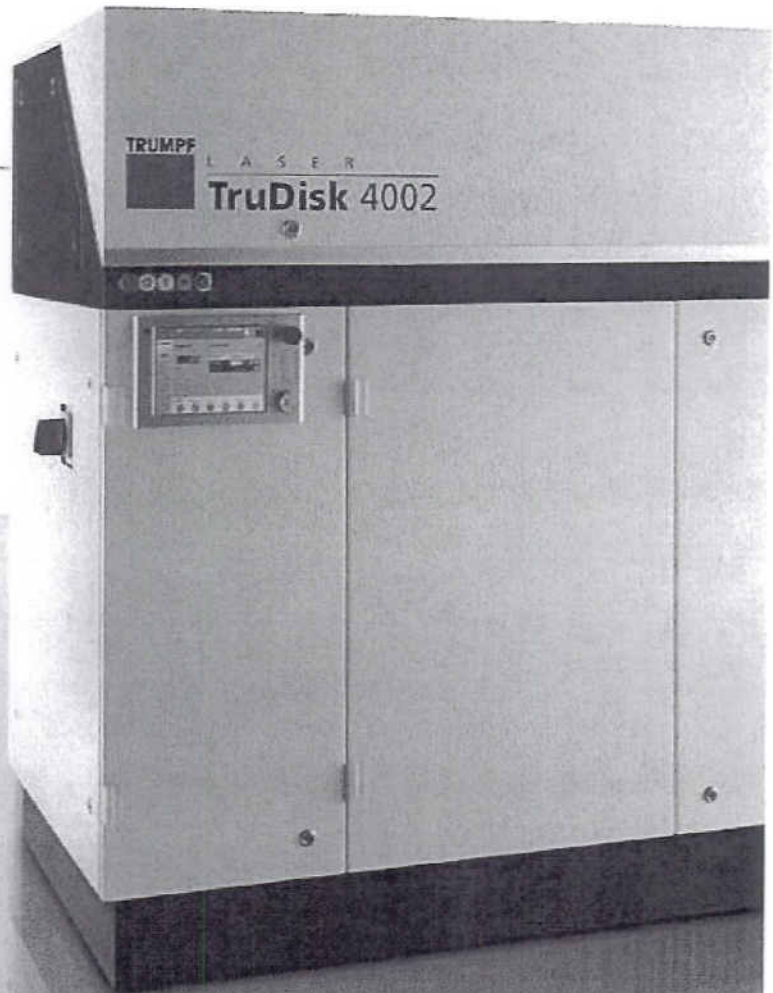
A touch screen and turn-push button are used to operate lasers through a user interface that is clearly structured and self-explanatory. The convenient operating panel can be separated from the laser, so that you can take it directly to the processing site and control all laser functions from there. Operating software allows you to store up to 200 programs, edit and scale pulse shapes, and use a single command to initiate ramping.

Secure data transmission.

Thanks to its Telepresence Portal, TRUMPF offers you unique solid-state laser services throughout the world, with over hundreds of continuously measured values available through secure remote access. As a result, our service experts can quickly troubleshoot and assess any error, often eliminating the problem immediately.

TruDisk:

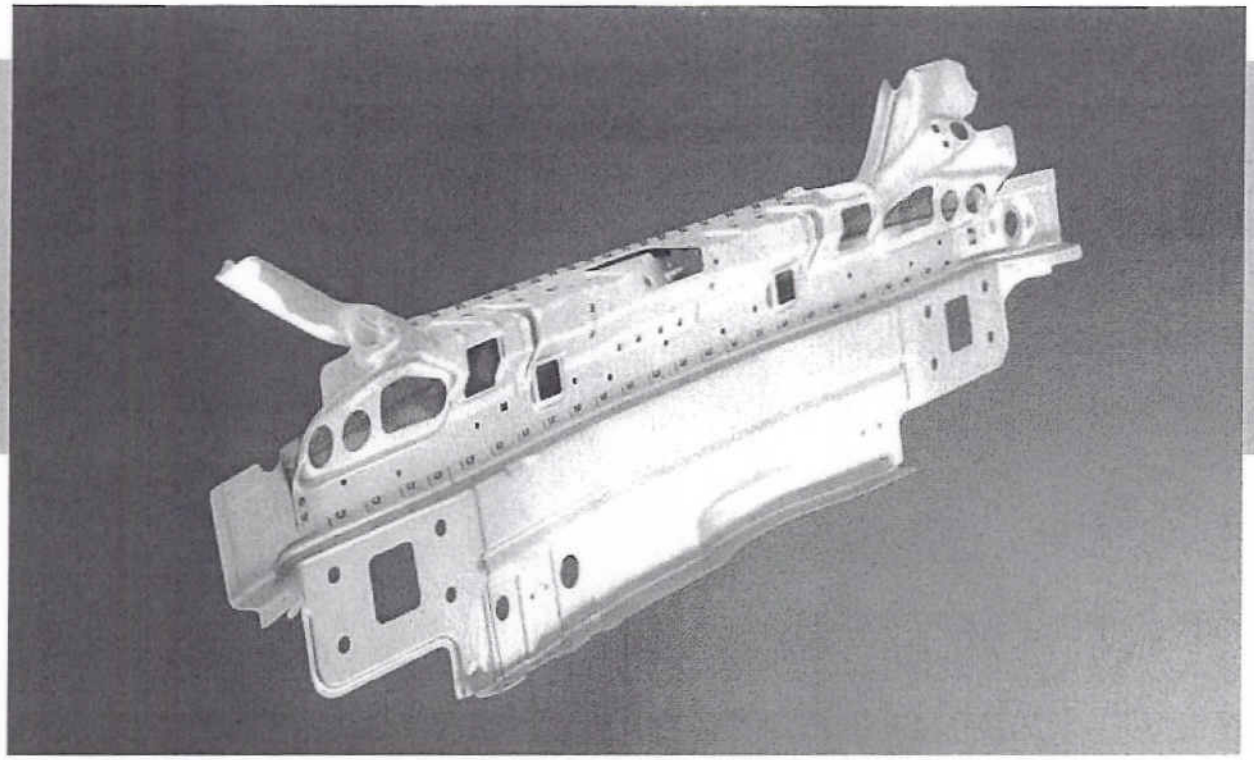
High-performance with a disk.



	TruDisk 1000	TruDisk 2002	TruDisk 2602	TruDisk 3302	TruDisk 4002	TruDisk 5302
Laser device						
Laser power	1,000 W	2,000 W[1]	2,600 W[1]	3,300 W[1]	4,000 W	5,300 W[2]
Beam quality[4]	2 mm · mrad	8 mm · mrad	8 mm · mrad	8 mm · mrad	8 mm · mrad	8 mm · mrad
Min ø laser light cable	50 µm	200 µm	200 µm	200 µm	200 µm	200 µm
Consumption						
Nominal power consumption	5 kW	10 kW	13 kW	16 kW	19 kW	26 kW
Cooling water temperature range	5 – 20 °C	5 – 20 °C	5 – 20 °C	5 – 20 °C	5 – 20 °C	5 – 20 °C
Dimensions						
Width	1,460 mm	1,600 mm	1,600 mm	1,600 mm	1,600 mm	1,990 mm
Height	1,350 mm	1,550 mm	1,550 mm	1,550 mm	1,550 mm	1,550 mm
Depth	730 mm	950 mm	950 mm	950 mm	950 mm	1,200 mm

[1] optionally upgradable on up to 4,000 W
[2] optionally upgradable on up to 8,000 W
[3] optionally upgradable on 12,000 W
[4] optional beam quality of 4 mm · mrad at laser powers from 2,000 W to 6,000 W; from 12,000 W optional beam quality of 8 mm · mrad possible

	TruDisk 6602	TruDisk 8002	TruDisk 10002	TruDisk 12003	TruDisk 16003
Laser device					
Laser power	6,600 W[2]	8,000 W	10,000 W[3]	12,000 W	16,000 W
Beam quality[4]	8 mm · mrad	8 mm · mrad	8 mm · mrad	12 mm · mrad	12 mm · mrad
Min.ø laser light cable	200 µm	200 µm	200 µm	300 µm	300 µm
Consumption					
Nominal power consumption	33 kW	39 kW	49 kW	60 kW	80 kW
Cooling water temperature range	5 – 20 °C	5 – 20 °C	5 – 20 °C	5 – 20 °C	5 – 20 °C
Dimensions					
Width	1,990 mm	1,990 mm	2,800 mm	2,800 mm	2,800 mm
Height	1,550 mm	1,550 mm	1,600 mm	1,600 mm	1,600 mm
Depth	1,200 mm	1,200 mm	1,400 mm	1,400 mm	1,400 mm



Scanner welded car body part.

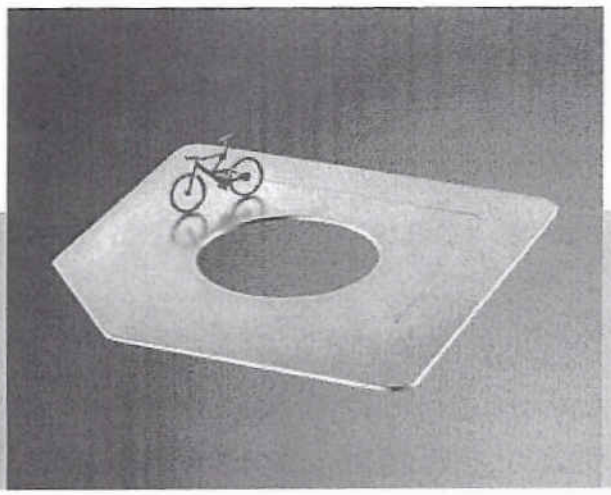
Powerful and efficient.

The new TruDisk generation of disk lasers is even more powerful, cost-effective and compact than before, and offers you numerous advantages for the efficient part production. Laser powers range from one to 16 kW and, because of their disk geometry, TruDisk lasers have best beam quality in the high multi-kilowatt range. With most of the units you can choose between two beam qualities, so you always have the laser best suited to your individual production task. The excitation of the new TruDisk lasers is provided by extremely long-lasting laser diodes made by TRUMPF. This enables a high degree of laser efficiency and minimizes operating costs.

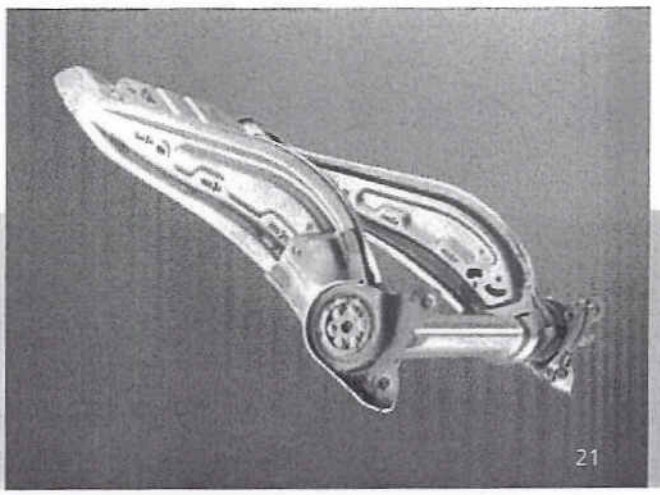
Modular and compact.

Beam generation, beam guidance, power supply, cooling and control of the TruDisk lasers are all modular in design and are located inside a compact housing. Everything is thought through and coordinated down to the smallest detail – for maximum availability and easy maintenance.

Precision cutting with TruDisk.



Laser welded seat structure.

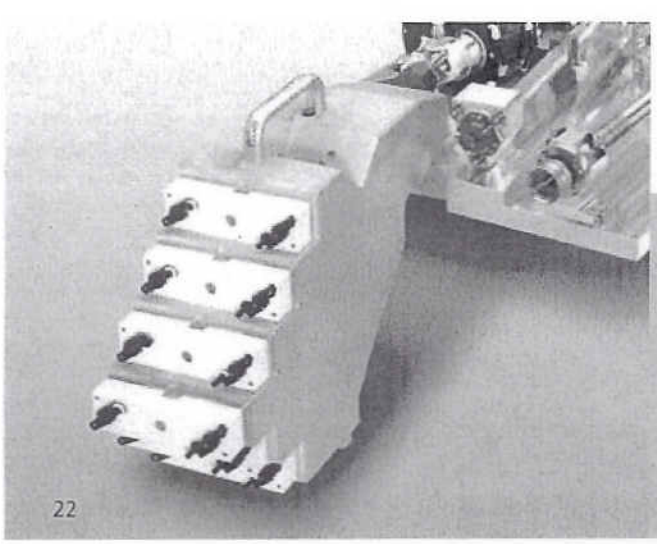


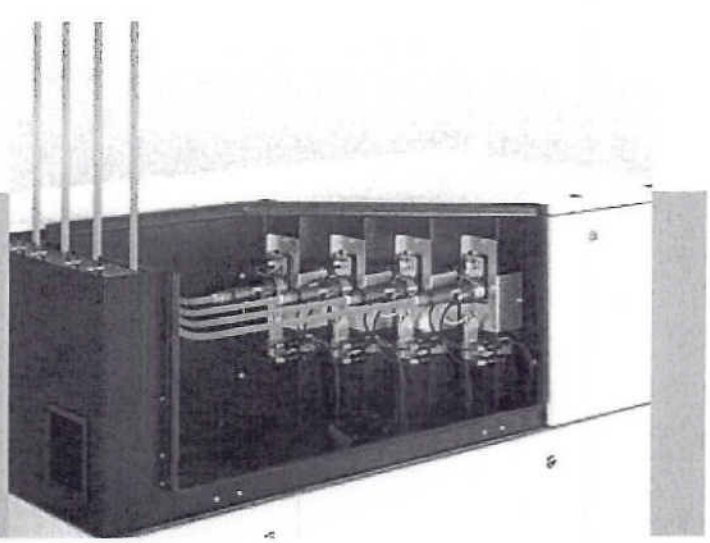
Reliable processing.

When scaling the laser power, the internal laser power density of the TruDisk lasers always lies within a secure range.
Its patented resonator design makes the TruDisk laser resistant to back reflections on all optic components, so they remain extremely stable during the production process. Thanks to the absolute laser power control, you get reproducible production results at all times.

Customizable and upgradable.

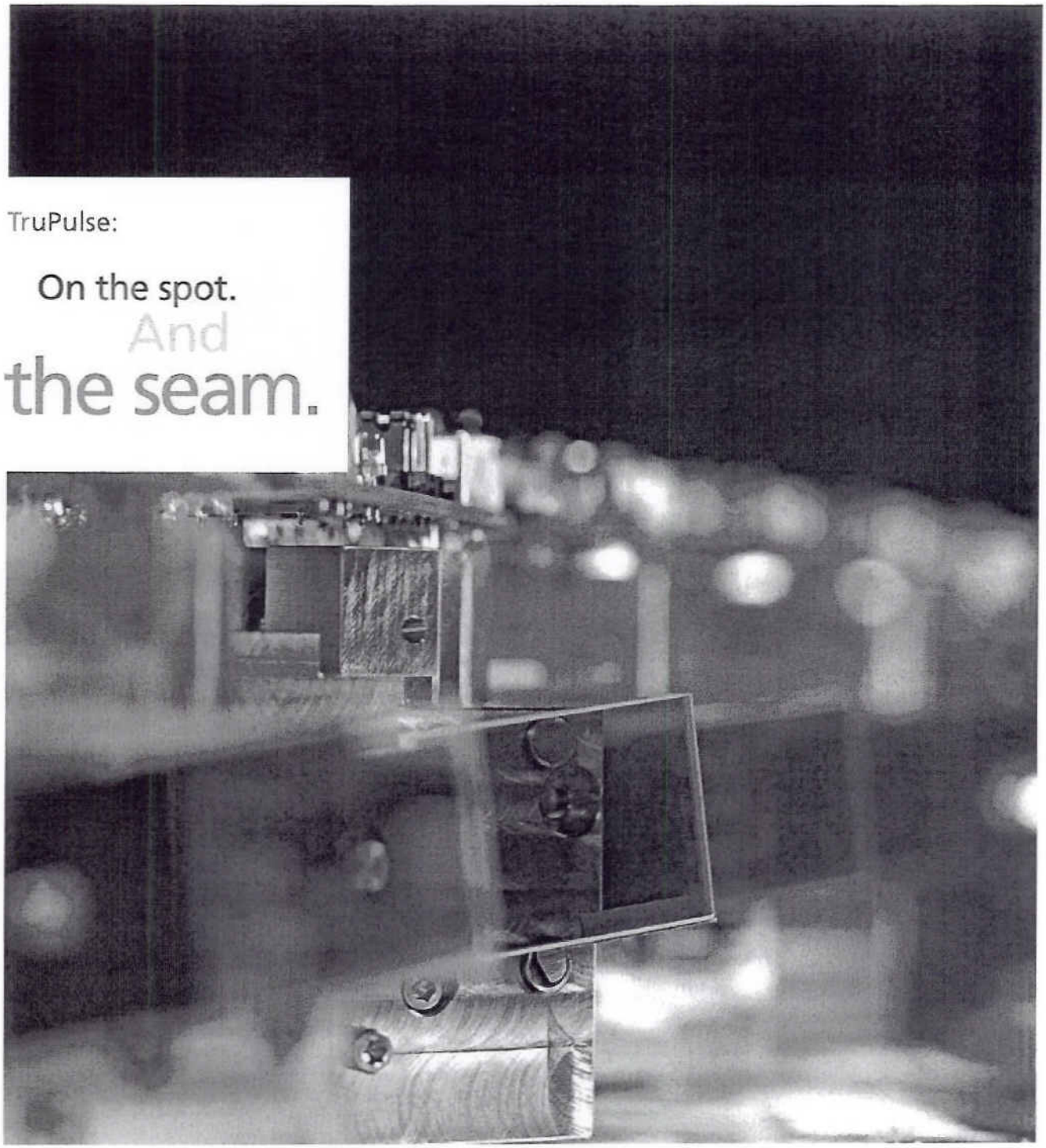
The integrated beam guidance design can be customized, both in regards to the number of outputs as well as to „energy and time sharing" options. Up to six laser light cables can be connected to a TruDisk – and they can also be easily reconnected even if you are working at the other outputs. The laser power of the disk lasers can also be individually configured – and the modular design means they can easily be upgraded later, on-site – in only a few hours.





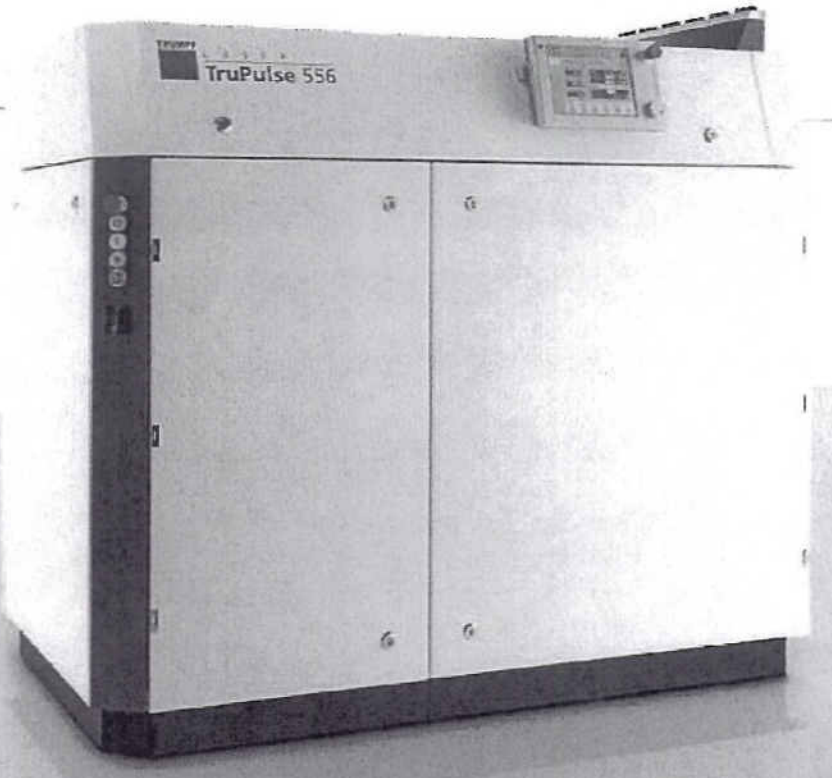
Always ready.

The new passively cooled pump modules of the TruDisk laser are ultra-long-lasting. This means they are no longer considered consumables, and operating costs can therefore be kept to a minimum. In the unlikely event that a module fails, the pump diodes instantly cover for each other: the power of the remaining modules is automatically increased so that there is no loss of power at the workpiece. You can then replace the failed pump module in an orderly manner without interrupting production – in a matter of minutes, and in just a few steps.



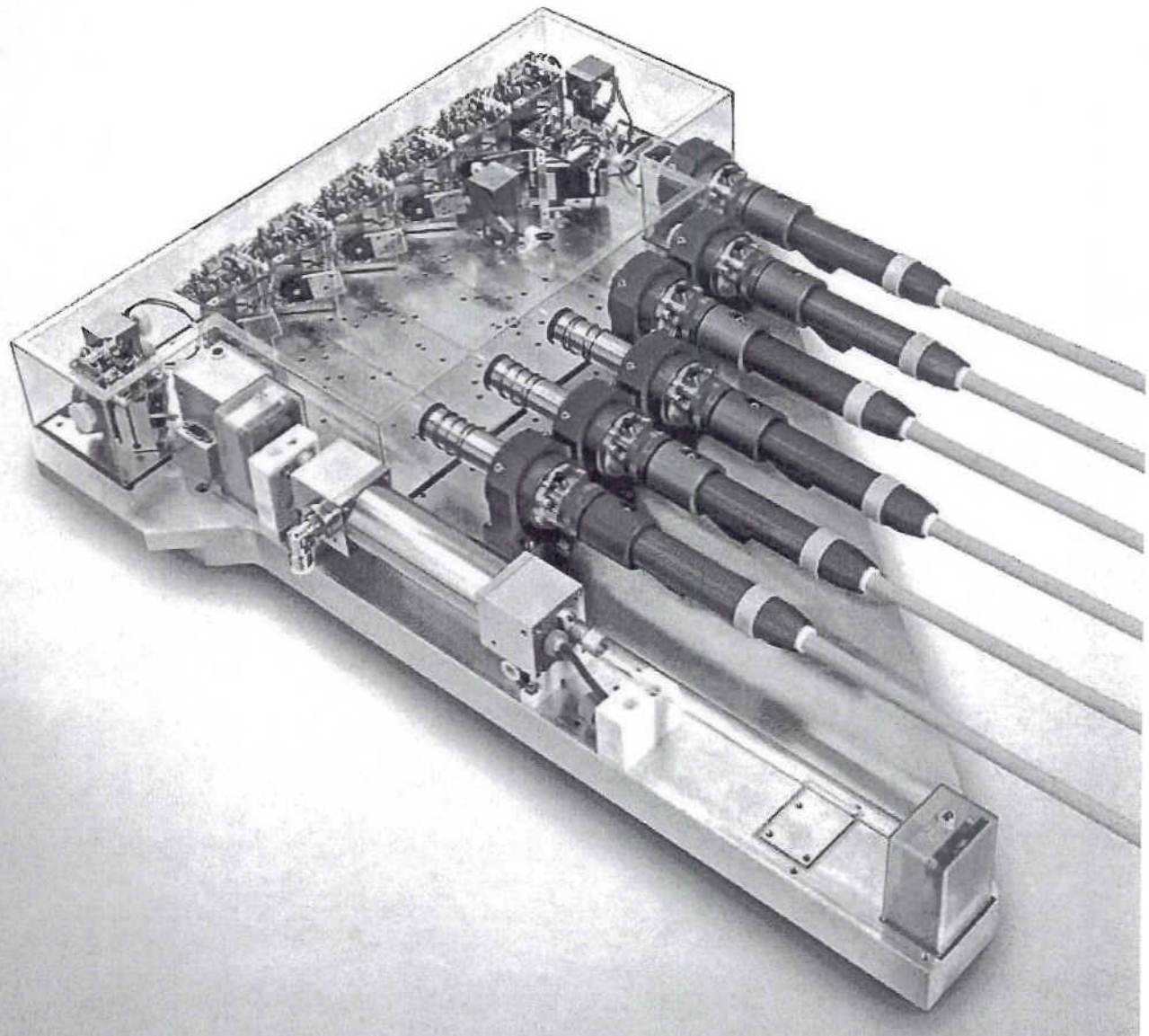
TruPulse:

On the spot.
And
the seam.



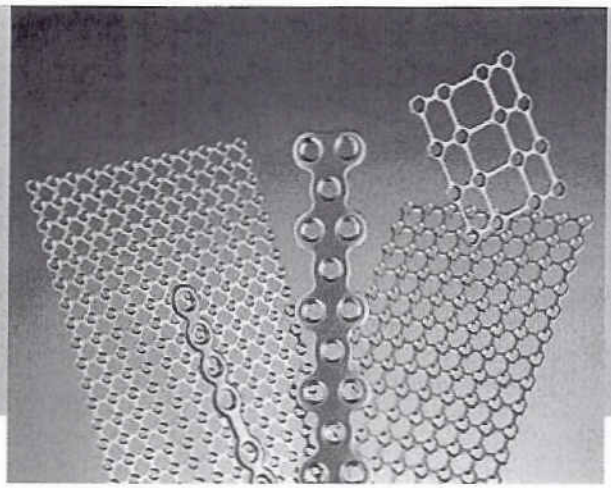
	TruPulse 21	TruPulse 33	TruPulse 44	TruPulse 62	TruPulse 74	TruPulse 103
Laser device						
Average power[1]	20 W	30 W	40 W	60 | 65 W	70 | 70 W	95 | 95 | 90 W
Max. pulse power	1,5 kW	3 kW	3 kW	3 | 5 kW	4 | 6 kW	5 | 6 | 8 kW
Max. pulse energy	15 J	30 J	30 J	20 | 50 J	30 | 60 J	30 | 60 | 90 J
Pulse duration	0.2 – 50 ms	0.2 – 50 ms	0.2 – 50 ms	0.2 – 50 ms	0.3 – 50 ms	0.3 – 50 ms
Beam quality	4 mm · mrad	12 mm · mrad	16 mm · mrad	8 mm · mrad	16 mm · mrad	12 mm · mrad
Min. ø laser light cable	100 µm	300 µm	400 µm	200 µm	400 µm	300 µm
Consumption						
Nominal power consumption A | W[2]	1.7 | 1.6 kW	1.6 | 1.5 kW	1.9 | 1.7 kW	3.0 | 2.8 kW	2.7 | 2.6 kW	4.0 | 3.8 kW
Max. cooling water consumption at 15 °C	0.2 m³/h	0.2 m³/h	0.2 m³/h	0.2 m³/h	0.2 m³/h	0.2 m³/h
Cooling water temperature range	6 – 30 °C	6 – 30 °C	6 – 30 °C	6 – 28 °C	6 – 28 °C	6 – 28 °C
Installation						
Cabinet	A	A	A	B | B/C	B | B/C	B | B/C | C

[1] At workpiece, controlled over entire life of lamps, depending on pulse duration and pulse power setting.
[2] A = air cooled | W = water cooled.

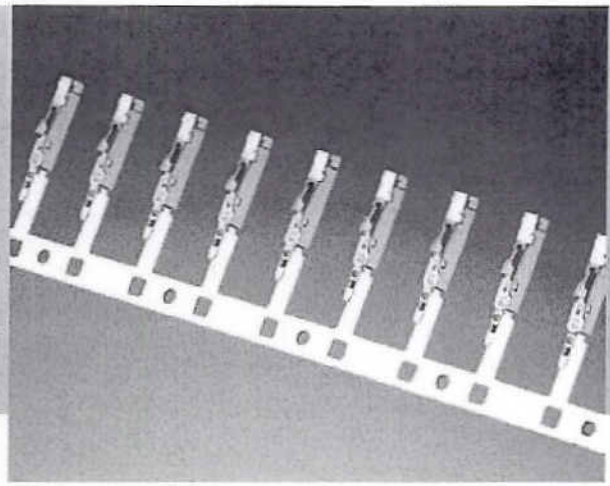


	TruPulse 106	TruPulse 124	TruPulse 156	TruPulse 203	TruPulse 304	TruPulse 556
Laser device						
Average power[1]	110 W	140 | 125 | 110 W	150 | 160 | 140 W	200 W	300 W	530 W
Max. pulse power	4 kW	6 | 6 | 9 kW	6 | 6 | 10 kW	6 | 8 kW	10 | 10 kW	10 | 10 kW
Max. pulse energy	30 J	30 | 70 | 90 J	30 | 80 | 120 J	55 | 90 J	60 | 90 J	60 | 100 J
Pulse duration	0.3 – 50 ms	0.3 – 50 ms	0.3 – 50 ms	0.3 – 50 ms	0.3 – 50 ms	0.3 – 50 ms
Beam quality	25 mm · mrad	16 mm · mrad	25 mm · mrad	12 mm · mrad	16 mm · mrad	25 mm · mrad
Min. ø laser light cable	600 µm	400 µm	600 µm	300 µm	400 µm	600 µm
Consumption						
Nominal power consumption A | W[2]	3.9 | 3.8 kW	3.9 | 3.8 kW	4.8 | 4.7 kW	7.8 kW	10.1 kW	16.7 kW
Max. cooling water consumption at 15 °C	0.2 m³/h	0.2 m³/h	0.2 m³/h	0.4 m³/h	0.5 m³/h	0.7 m³/h
Cooling water temperature range	6 – 28 °C	6 – 28 °C	6 – 28 °C	6 – 28 °C	6 – 28 °C	6 – 28 °C
Installation						
Cabinet	B	B | B/C | C	B | B/C | C	D	D/D+	D/D+

[1] At workpiece, controlled over entire life of lamps, depending on pulse duration and pulse power setting.
[2] A = air cooled | W = water cooled.



Cutting of the finest contours on titanium implants.



Laser welded connectors.

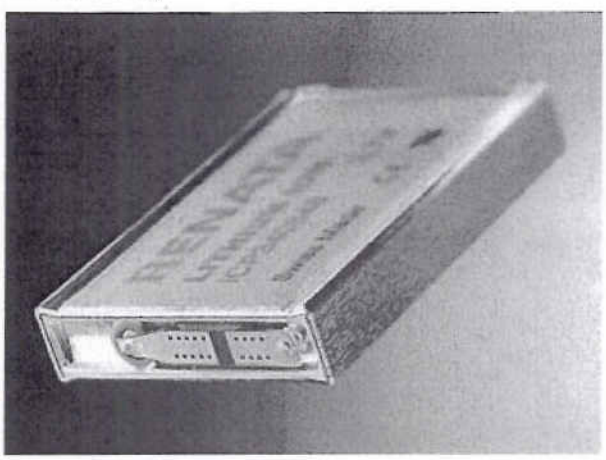
Finely tuned.

Several kilowatts of pulse power for a few milliseconds let you weld and cut in situations where other processes fail. Whether in terms of power, energy, or focusability, the TruPulse Series covers the entire parameter range for welding and cutting. With pulse powers as high as 10 kW, pulse duration between 0.2 and 50 ms, and pulse energy running up to a maximum of 120 J, these lasers are universal tools for use in both manual and automated applications.

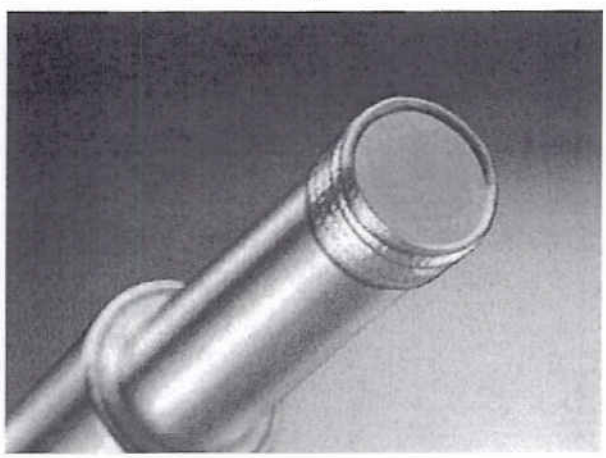
Modular.

Beam generation, beam guidance, power supply, cooling, and control units are all set up as modules in a system that has been thought out and tested in great detail. One laser can service up to six processing stations, either in parallel or in sequence. For TruPulse lasers with powers of up to 150 W, you decide whether to use air or water cooling for your laser unit.

Laser welded battery.



Laser deposition welding on beryllium-copper.



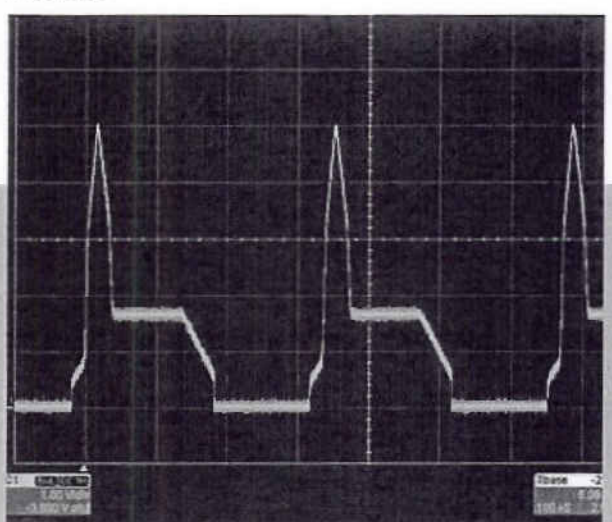
Cabinet	A	B	C	D	D+
Dimensions					
Width	485 mm	980 mm	980 mm	1,500 mm	1,500 mm
Height	700 mm	1,220 mm	1,220 mm	1,370 mm	1,370 mm
Depth	800 mm	505 mm	715 mm	730 mm	990 mm

Best results.

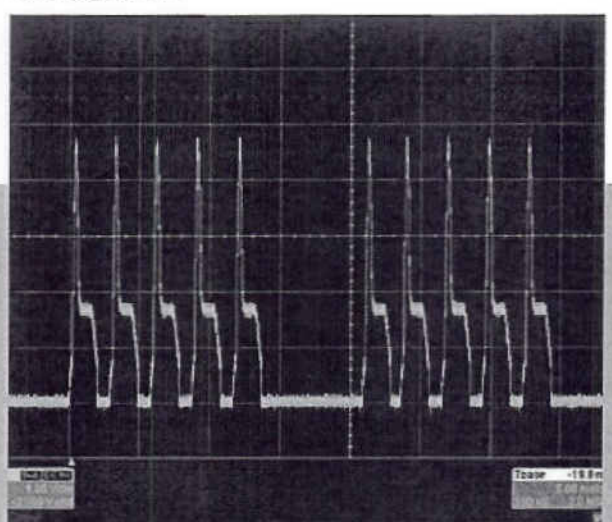
The power supply is highly dynamic, enabling ultra-short pulse rise times, and in conjunction with fast, real-time power control, provides high pulse-to-pulse stability – keeping your processing results constant at all times.

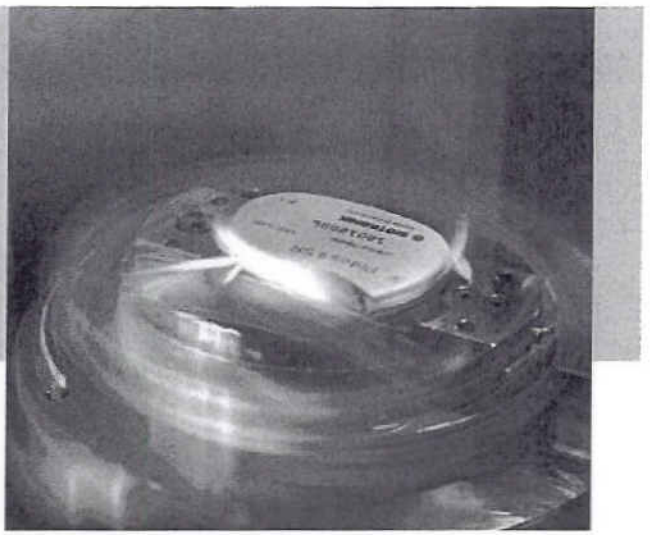
Laser pulse frequency is typically limited by pulse energy and average power. The Power Regulated Burst, however, lets you considerably exceed the average power for a short time and keep the welding time within a processing cycle to a minimum. Long Pulse Welding also opens up new possibilities, allowing you to generate a welding seam within a single laser pulse by quickly moving either the workpiece or laser beam.

Pulse shapes.



Power Regulated Burst.

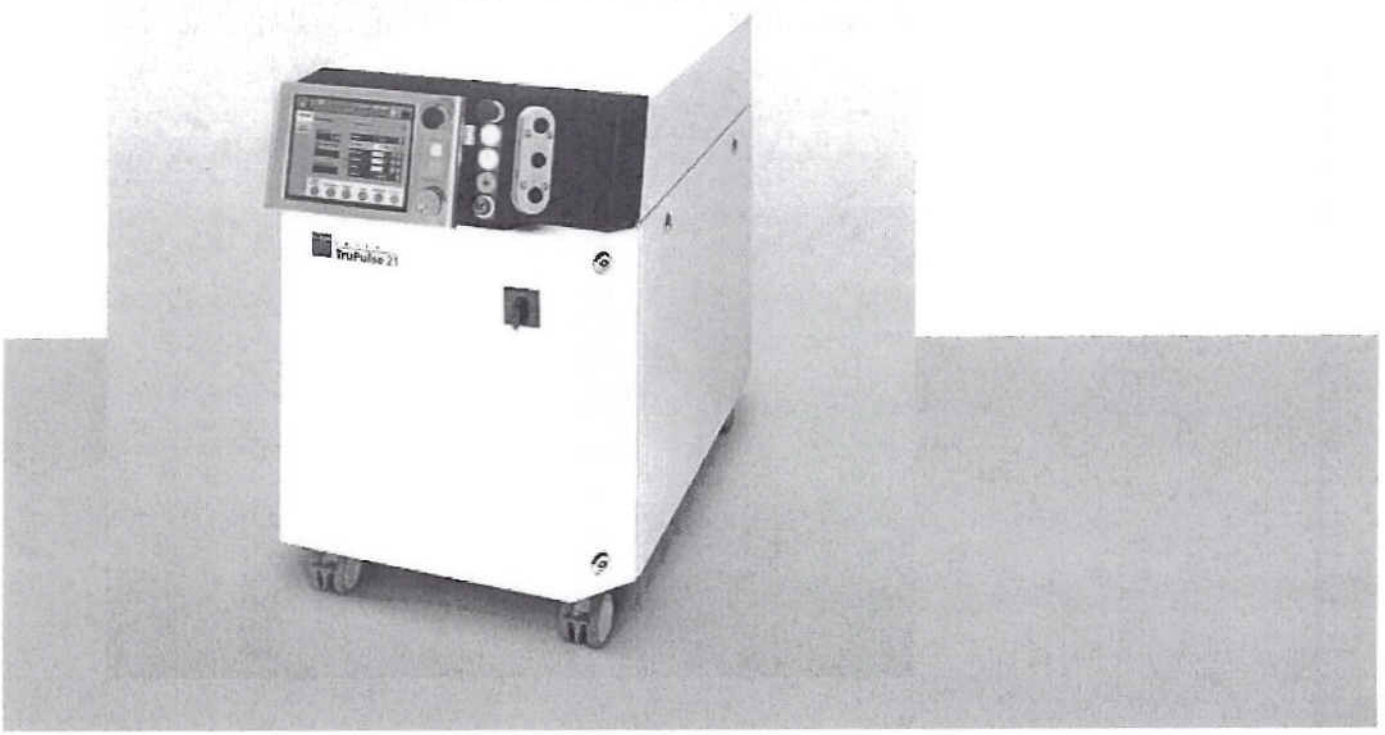


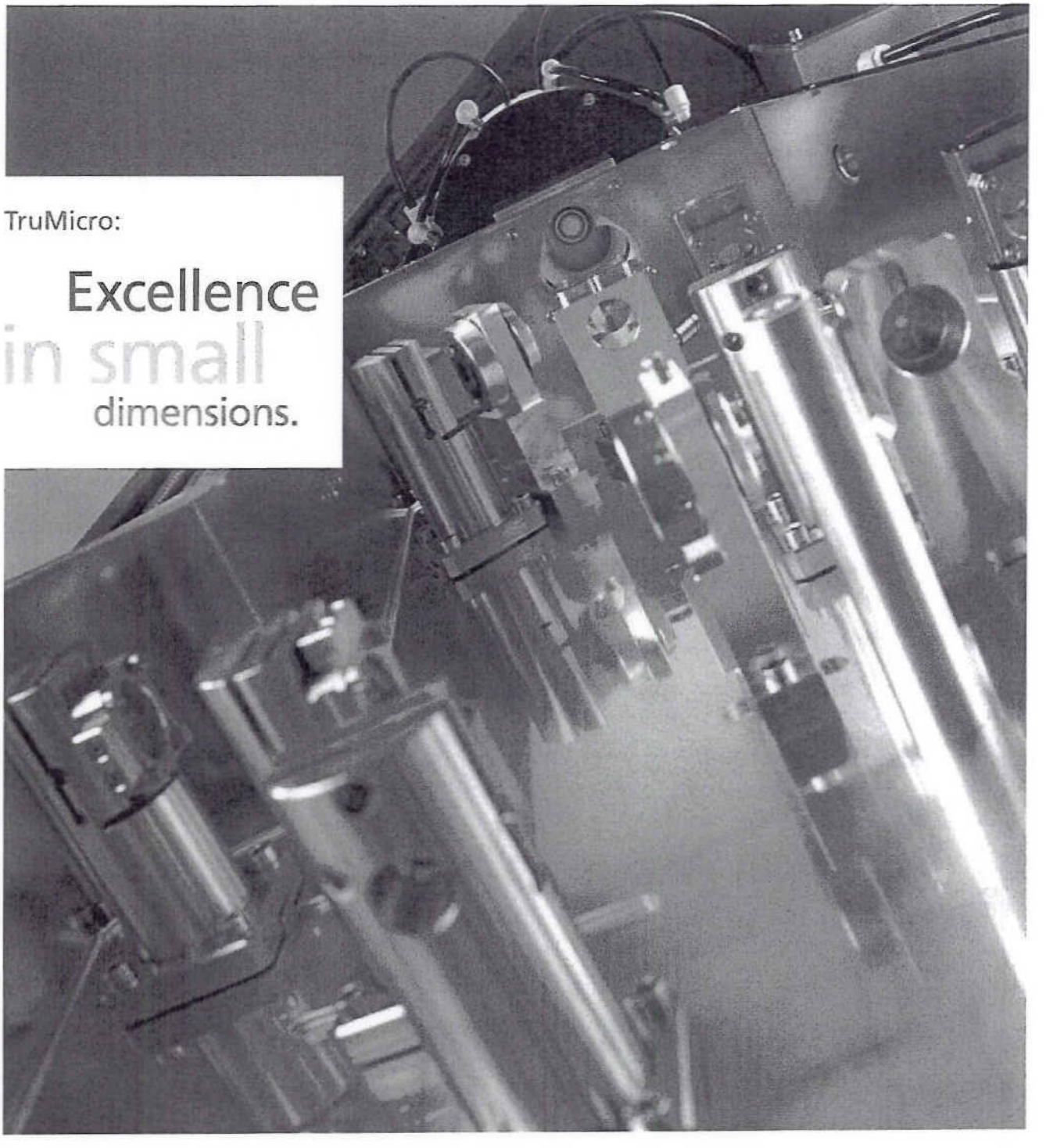


Helpful.

The application wizard „Weldassist" will help you optimize your welding parameters. If this is not sufficient, TRUMPF application specialists will be there for you with help and advice.

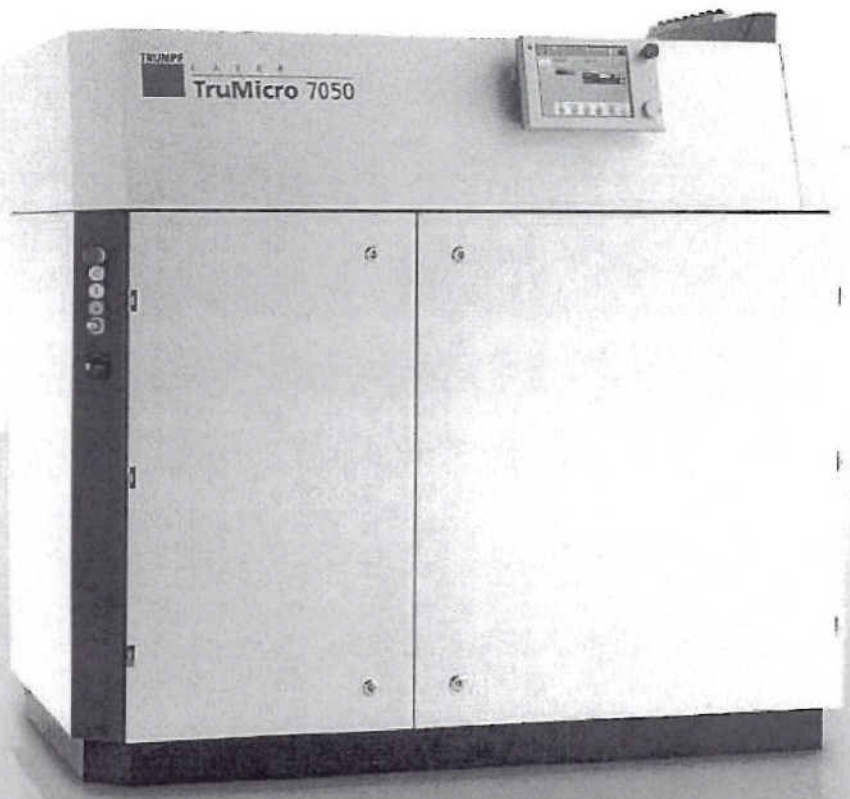
If the components you are processing with your laser must meet strict standards, our software module „Datastore" will help you record and evaluate your quality-related laser parameters.





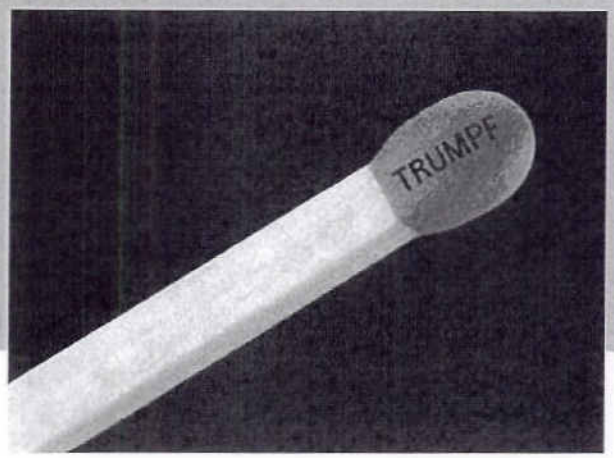
TruMicro:

Excellence in small dimensions.

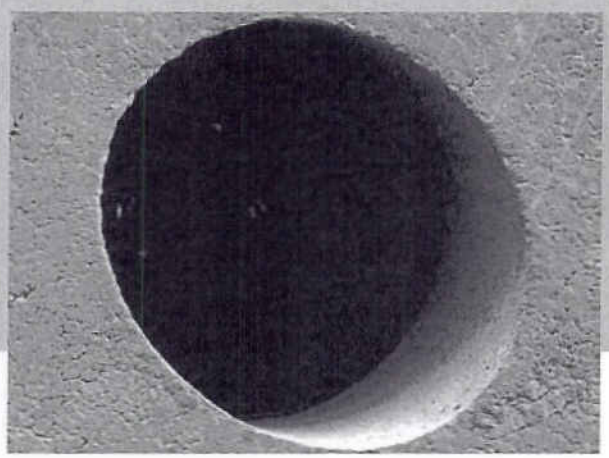


	TruMicro 5050	TruMicro 5250	TruMicro 5350	TruMicro 7050	TruMicro 7250
Laser device					
Wavelenght	1030 nm	515 nm	343 nm	1030 nm	515 nm
Max. average power	50 W	25 W	15 W	750 W	400 W
Beam quality	$M^2 < 1,3$	$M^2 < 1,3$	$M^2 < 1,3$	$M^2 < 13$ (LLK 01[1])	$M^2 < 13$ (LLK 01[1])
Polarisation ratio	Linear > 500:1	Linear > 500:1	Linear > 500:1		
Pulse duration	< 10 ps	< 10 ps	< 10 ps	30 – 700 ns[2]	300 – 1500 ns[2]
Max. pulse energy	250 µJ	125 µJ	75 µJ	50 mJ	10 mJ
Repetition rate	max. 400 kHz	max. 400 kHz	max. 400 kHz	5 – 50 kHz	5 – 100 kHz
Consumption					
Nominal power consumption	2.3 kW	2.3 kW	2.3 kW	5 kW	5 kW
Max. cooling water consumption at 18 °C	0.3 m³/h	0.3 m³/h	0.3 m³/h	0.9 m³/h	0.9 m³/h
Cooling water temperature range	6 – 18 °C	6 – 18 °C	6 – 18 °C	5 – 20 °C	5 – 20 °C
Dimensions					
Laser head	upon request	upon request	upon request		
Supply unit					
Width	650 mm	650 mm	650 mm	1,460 mm	1,460 mm
Height	1,150 mm	1,150 mm	1,150 mm	1,350 mm	1,350 mm
Depth	1,210 mm	1,210 mm	1,210 mm	730 mm	730 mm

[1] The minimum fiber diameter depends on the pulse duration.
[2] Definite pulse duration on delivery.



Cold processing with picosecond pulses on a match-head.



Drill-hole in stainless steel using TruMicro 5050.

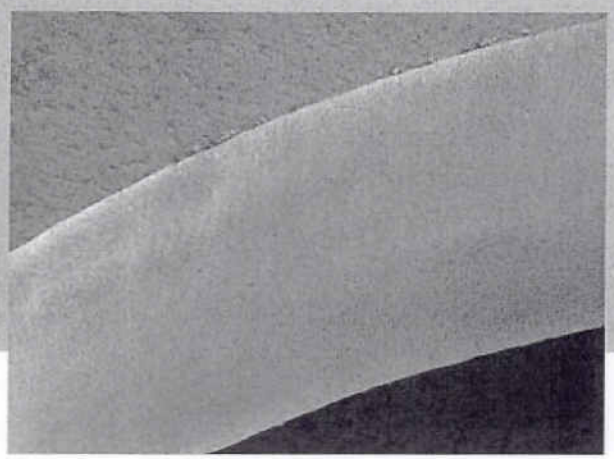
TruMicro Series 5000: Shorter than short.

The TruMicro Series 5000 is used for material ablation wherever mechanical or thermal influences, such as micro-cracks, burrs or deposits, are unacceptable or refinishing work must be avoided. These lasers enable micro processing with an ideal combination of quality, productivity and profitability.

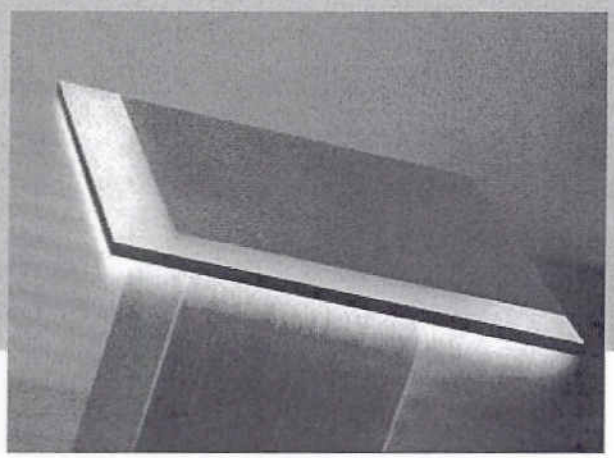
The decisive benefits of the TruMicro Series 5000 are short pulse durations which are smaller than 10 ps and their easy average power scaling, at pulse energies of up to 250 µJ. It is the unique combination of fiber and disk laser technology that enables penetration into these performance classes. Intensification of the picosecond pulses of a fiber laser with a disk laser is superior to other technologies in terms of laser power and pulse energy, while simultaneously retaining excellent beam quality.

The high peak pulse power of the TruMicro 5050 of 50 W with an infrared wavelength translates to high throughput times. With the TruMicro 5250 and 5350 you have two variants at your disposal, with outputs of 25 W in the green spectral range and 15 W in the ultraviolet spectral range. As a result, semiconductor materials, die-electrics and plastics are processed with outstanding quality and high throughput. In addition, a laser can operate several workstations simultaneously. And the overall cost of disk lasers from the TruMicro Series 5000 remains incredibly low throughout their entire service life.

Scale: ——— 50 µm



Cutting edge of a silicon wafer processed with TruMicro 5250.



Border deletion on a thin-film solar cell with TruMicro 7050.

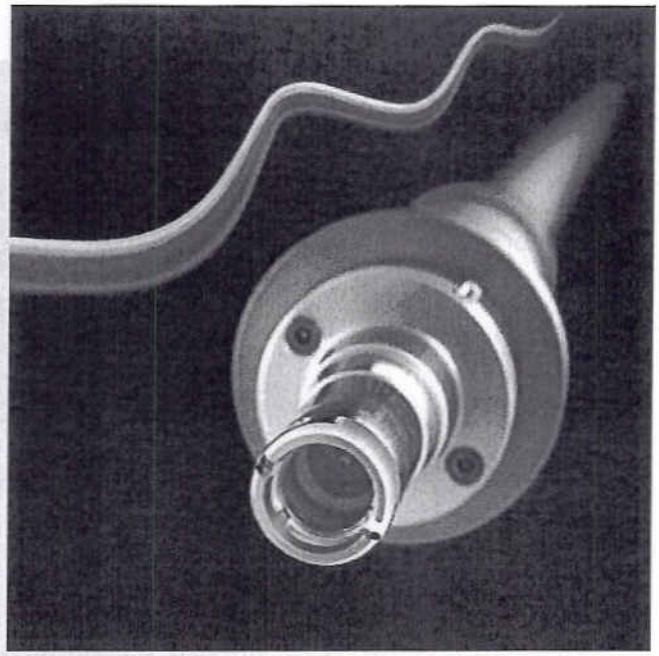
TruMicro Series 7000: Short and productive.

The lasers in the TruMicro Series 7000 combine short pulses with high peak pulse powers. With these outputs – which are especially high for short pulsed lasers – you can quickly ablate large surface layers, create micro-drilled holes or even cut with the highest throughput.

With pulse durations ranging from several tens to several hundreds of nanoseconds, the TruMicro Series 7000 achieves laser powers of up to 750 W. The disk laser technology used here features a combination of short pulses and high pulse energies together with excellent beam quality. This enables remote processing, i.e. fast positioning of the laser beam with the aid of a scanner, for precision processes such as fine cutting or drilling the tiniest of holes.

The TruMicro Series 7000 is ideal for integration into production plants. The laser and supply unit form a compact device, and beam delivery to the focussing optics takes place via our flexible laser light cable. Beam switches and splitters are integrated into the laser unit, enabling laser power to be optimized during processing as well as between workstations.

Beam guidance and optics for solid-state lasers.

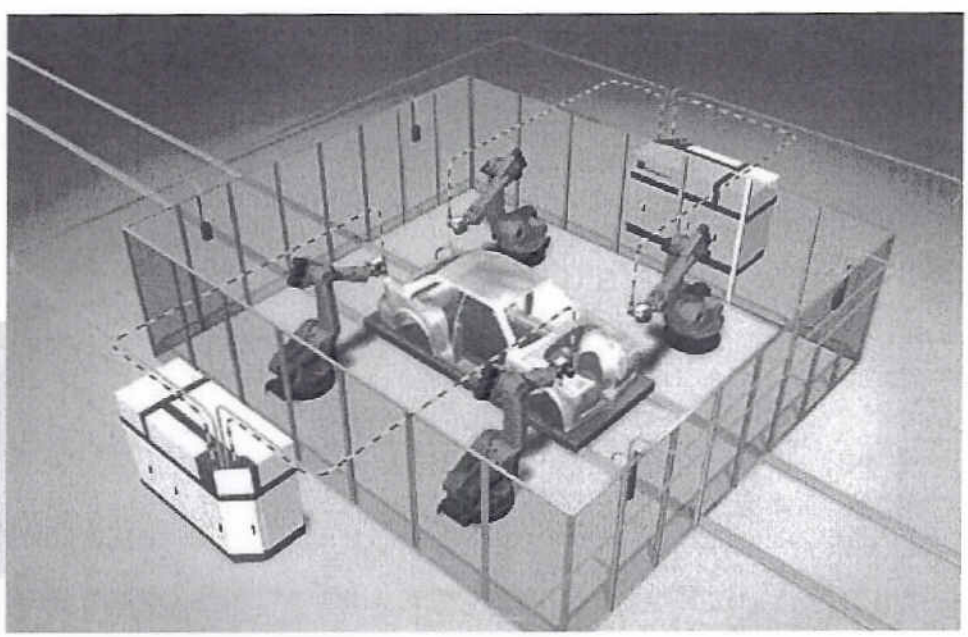


Flexible light transportation: The laser light cable.

Feeding the beam through a laser light cable makes it possible for the solid-state laser to be located away from the processing station. All that is required at the actual processing site are optics that focus the laser light on the workpiece and that can be easily integrated. The beam can be switched at the laser unit to a different output, or split into as many as six outputs, making it possible to supply up to six processing stations at once. The laser light cable can be easily connected by yourself, plug & play.

The TRUMPF LaserNetwork.

Link and distribute intelligently – the TRUMPF LaserNetwork gives you the flexibility you need to effectively use the energy available from one or more lasers at several processing stations. This allows you to make better use of individual laser capacity, increasing facility availability. The laser light cable transmits the necessary information about the laser unit and guidance system, even when you switch the cable from one outlet to another. The entire security circuit is monitored continuously, guaranteeing laser safety.



Focusing optics BEO D25.

Focusing optics BEO with D35 with camera.

The right optics for every job.

We offer an extensive line of focusing optics, for anything from welding and cutting to drilling and ablating applications. A variety of options are available for adapting all TRUMPF optics to any need.

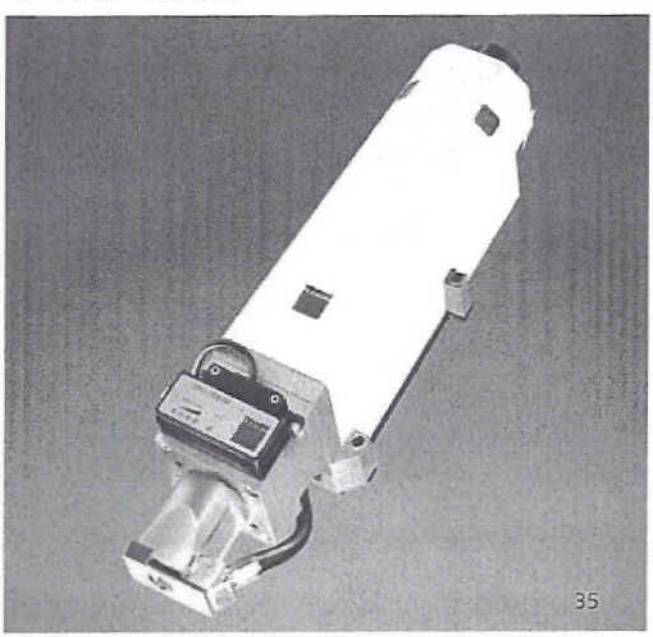
Robust and proven.

The series of BEO focusing optics consists of three basic models that differ in terms of their size and collimation focal length. Dependent on the laser you use, you will achieve a focal diameter between 10 µm and 1 mm. The BEO D25, the most compact focusing optics of the series, is used in welding applications with pulsed lasers, with outputs of up to 200 W. It is especially suited for integration into automated assembly systems. The BEO D35 can be used for welding, cutting, or drilling, in combination with pulsed or cw solid-state lasers that have powers in the kilowatt range. The BEO D70 focusing optics shows its strengths at large operating distances, when the focal diameter is small.

Monitored.

The optical construction of the controlled focusing optics of the CFO Series is similar to that of the BEO Series, but with the addition of sensors that monitor the functions of the optics. These sensors monitor the degree of contamination of the cover slide, the temperature and flow of cooling water and inert gas, as well as cross-jet pressure. TRUMPF service specialists can use our Telepresence service to call up monitoring data upon request, allowing them to troubleshoot, assess, and eliminate errors occurring anywhere along the beam path.

Controlled focusing optics CFO.



Programmable.

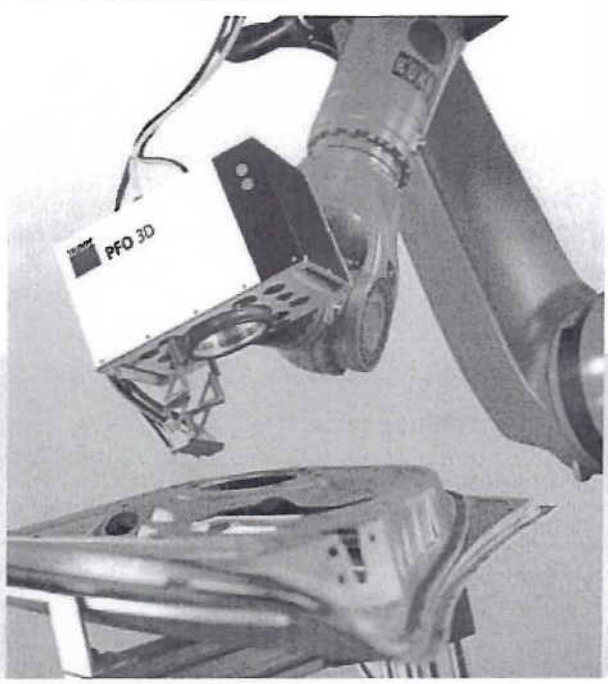
Programmable focusing optics of the PFO Series are scanner optics used for welding. Two mirrors are used to position the laser beam within the operating field. The mirror angles can be changed through a highly precise and dynamic process. In conjunction with pulsed or cw solid-state lasers, this system can be used for spot and seam welding, without having to move the workpiece or the focusing optics. The F-theta lens makes it possible to obtain constant focal conditions – and thus identical processing quality – for every point within the processing field.

TRUMPF offers three designs of these programmable focusing optics:

The PFO 20 is largely intended for seam and spot welding within small work areas, whereas the PFO 33 and PFO 3D are best used in conjunction with a laser with a high beam quality, such as the TruDisk laser, for remote welding applications, i.e., for welding at large working distances. The PFO 3D includes an integrated z-axis with a 140 mm stroke that even allows you to perform welding tasks within a three-dimensional workspace. The PFO control unit can be combined with that of a robot, which significantly enlarges the processing area, allowing welding "on-the-fly".

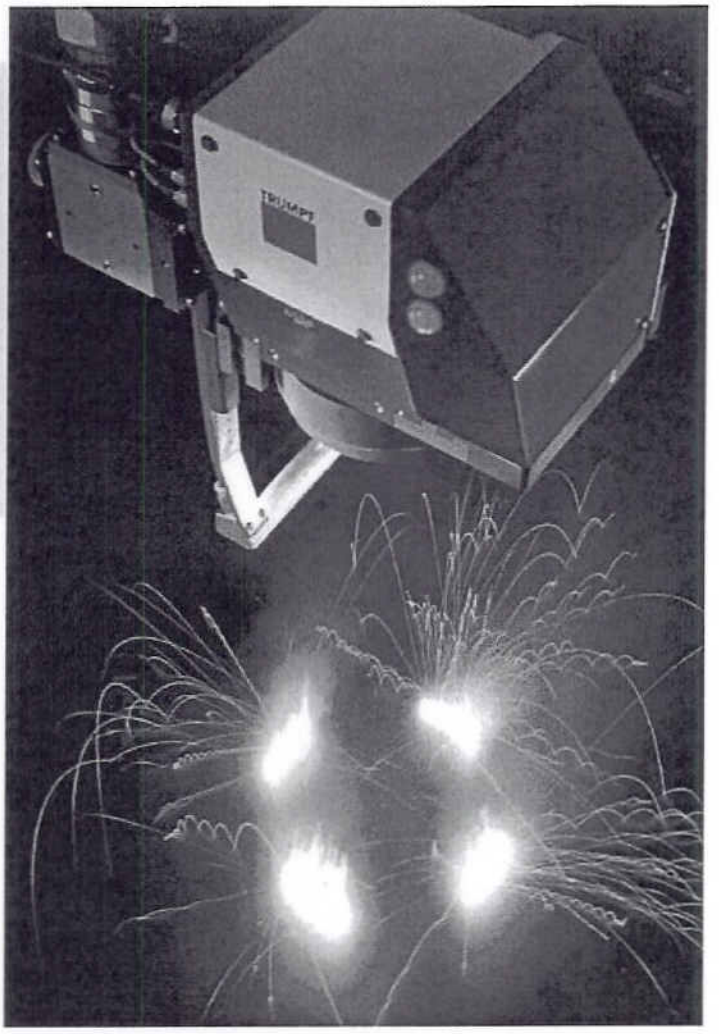
Like focusing optics of the CFO series, PFOs are also integrated in our global Telepresence network.

Programmable focusing optics PFO 3D.



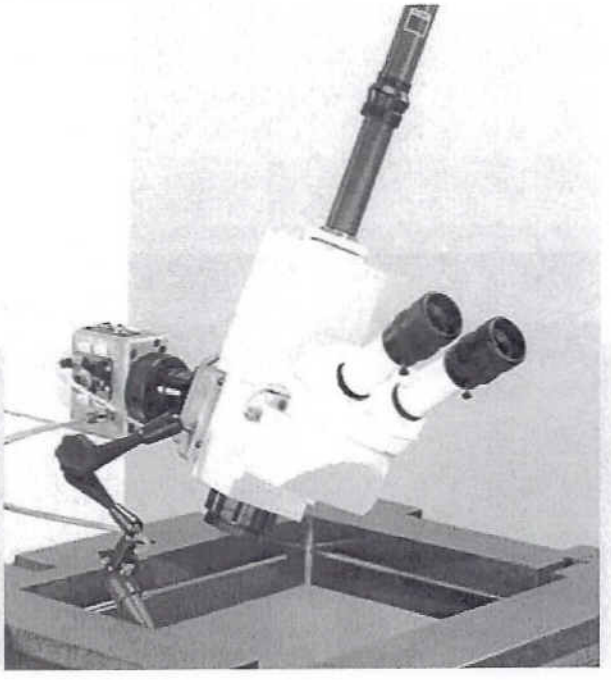
For manual applications.

We offer a focusing optics with a stereo microscope for welding by hand. Along with the integrated visor, this feature allows the operator to make first-rate process observations, and work on even the thinnest welding wires by hand. The diameter of the welding point can be adjusted to the welding task by mechanically moving the motor-driven defocusing unit.



Programmable focusing optics PFO 20.

Manual focusing optics with stereo microscope.



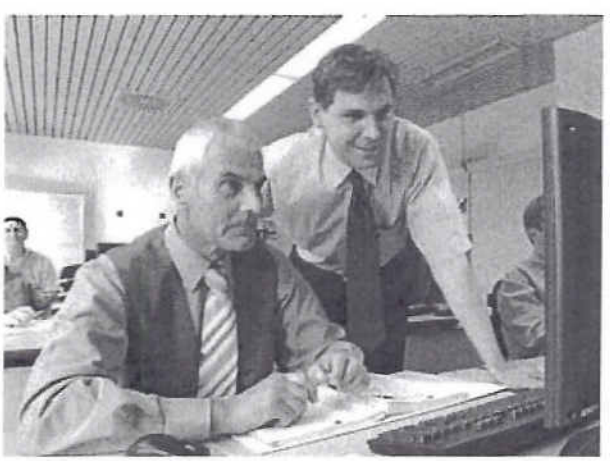
TruServices:

We are there for you.

Our service begins even before you decide to buy a laser. We provide comprehensive consulting services to help you figure out what you really need.

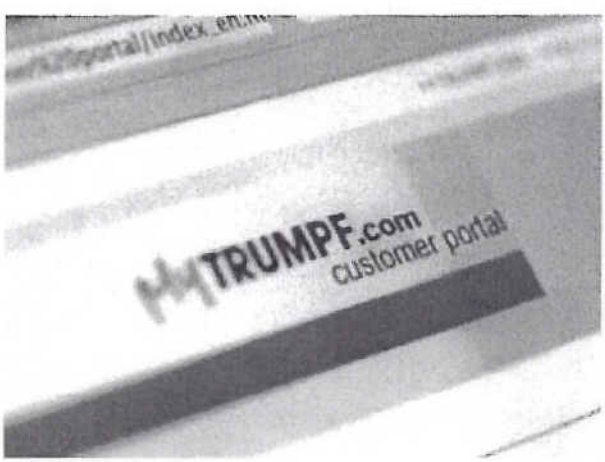
Let's go.

Your laser will be operational in the shortest time possible. The laser, beam guidance system, focusing optics, programming, control unit, and, where applicable, automation components were developed for one another at TRUMPF – eliminating all interface problems.



Comprehensive support.

We support you with made-to-order services that go above and beyond the entire life cycle of your facility, maintaining the machine and upgrading it with new functions upon request. We will train you and your employees so that you can take full advantage of your laser system's potential. Our service is so extensive that we will even visit your site to optimize your machine parameters, in order to help you lower your parts costs and increase both production speed and product quality. We keep downtime and service visits to a minimum, because, with your permission, our specialists can use our online Telepresence service to access your software directly and solve the problem at hand. And, should you need a spare part, we can be reached from anywhere in the world, 24/7, 365 days a year.



TRUMPF is certified according to DIN EN ISO 9001 and VDA 6.4

WENSAUER & PARTNER

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