

**BATTLE CARD**

**AC-DC POWER SUPPLIES FOR LASER SOURCES AND SOLUTIONS**

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## SOLUTION OVERVIEW

Laser sources are used in numerous applications to convert electrical energy. In materials processing, lasers heat up, melt, or vaporize materials for cutting, drilling, welding, marking, engraving, cleaning, or drying.

Most of those lasers in industrial use are fiber lasers. Here, multiple lower-power laser diodes “fire” sequentially into a fiber optic that is doped with rare earth elements and amplifies the light. The diodes are supplied with DC power by laser drivers. Those are low-noise current regulators

considering current/voltage characteristics of a given diode type.

While this concept has good power scalability, it may face limitations for the energy efficient processing of certain materials. Material properties like absorptivity, thermal conductivity, and thickness may require laser light based on gas lasers or solid-state lasers, which come with different excitation mechanisms and thus different requirements for supply power.

### Target Markets/Customers

Targets are OEMs of laser sources and solutions for processing glass, metals, polymers, and other materials.

Prominent examples are:

- Coherent & IPG Laser (USA)
- Trumpf & Jenoptik (Germany)
- Raycus & Han’s Laser (China)

These companies offer modular laser solutions for integration by third parties, or complete laser processing stations and systems.

### Audience: Whom to Engage and When

- Development engineers responsible for fulfilling product requirement specifications
- Procurement managers that handle the purchase of components as specified by R&D

### Business Benefits

- Laser sources for materials processing may come with optical output power ranging from watts to kilowatts. Our broad product portfolio allows customers to source power supplies with different form factors and power ratings from a single supplier, which simplifies the procurement processes.

### What should be taken into account

- The power supplies were not developed to drive lasers directly, i.e. without a dedicated laser driver.
- When it comes to output stability in pulsed lasers, the viability must be determined by the customer.

#### Configurable AC-DC



**uMP**  
400 to 1800 W



**iMP/iVS**  
1.5 kW to 5 kW



**NeoPower**  
2.4 to 5 kW



**iHP**  
12 to 24 kW

#### Bulk AC-DC



**LCC, LCM**  
250 to 3000 W



**FCM**  
10 kW

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## Qualifying Questions

- What is the input voltage requirement?
- What is the output voltage and the current requirement at that voltage?
- What is the available space (length, width, height) for the power supply?
- What is the operating temperature range, and are there specific airflow conditions to consider? (This is especially important with higher-power liquid-cooled lasers, where the system design may not allow for sufficient air flow.)
- Do you have specific safety requirements, or do you need country certifications?
- Do you have additional comments or are there any other challenges to be aware of?

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## Customer Challenges

1. Broad product scope: Laser applications require solutions with distinct specifications in terms of wavelength, power output, pulse duration, or beam quality. This diversity can make a wide range of products necessary, and increases design and manufacturing complexities.
2. Highly customized products with low quantities: Customers within an application space can additionally require modified solutions that fit their exact operational conditions, which dictates flexibility in product design.
3. Pricing pressure: Cost-effectiveness is becoming increasingly important and leads to search for optimization opportunities in the supply chains.



## Key Features and Specs (High-Level Differentiators)

1. AC-DC Configurable: 400 W to 24 kW+, Air and Liquid Cooled
2. AC-DC Bulk Power: 300 W to 10 kW+
3. AC-DC Conduction Cooled, Fanless, Fan-Cooled Medium Power: 250 W to 1.2 kW

# AC-DC POWER SUPPLIES FOR LASER SOURCES AND SOLUTIONS

## COMPETITIVE ANALYSIS

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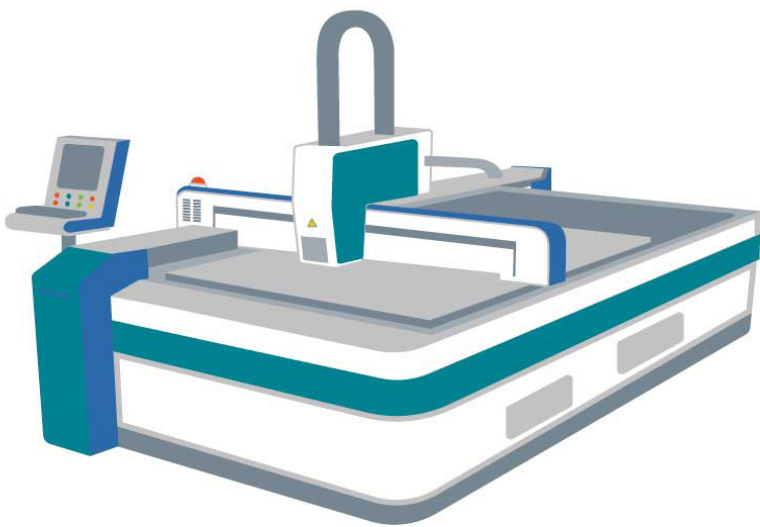
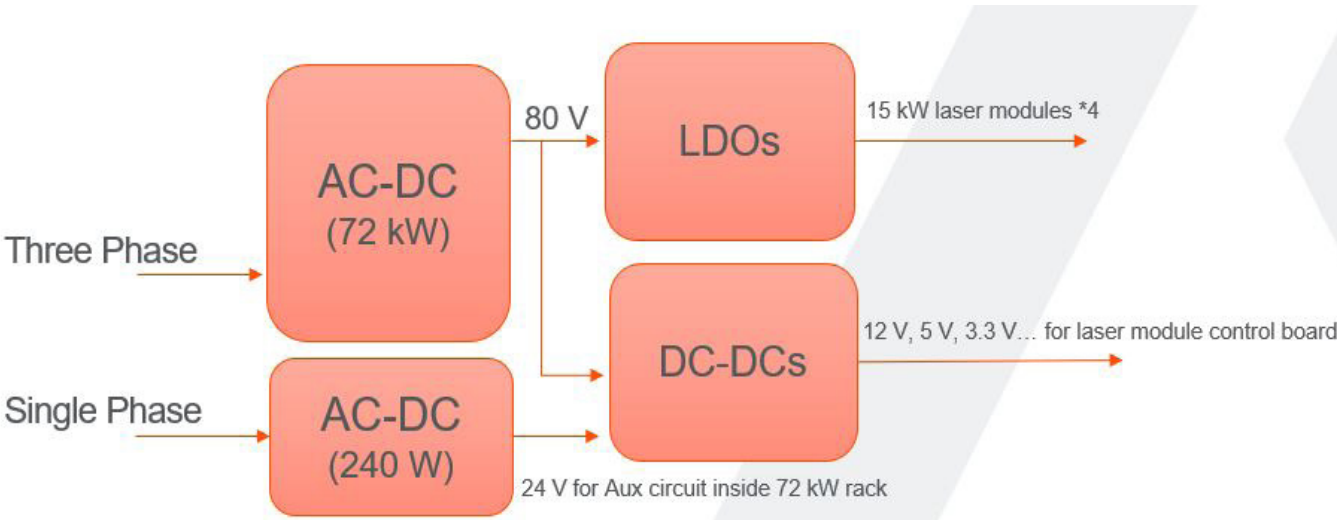
Competitor	Their Positioning & Selling Points	Our Differentiation	Comparative Positioning
TDK-Lambda (Japan)	<ul style="list-style-type: none"><li>Robust and quality products</li><li>High power density</li></ul>	<ul style="list-style-type: none"><li># 1 Configurable 750 to 24 kW<ul style="list-style-type: none"><li>4 case sizes with 1-phase and 3-phase input</li><li>5 / 8 / 10 / 16 slot cases</li><li>11+ module options supporting up to 1000 VDC</li><li>Voltage source and current source operational modes</li><li>Certified Medical, BF, and Semi F47</li><li>Low common mode and differential noise</li><li>User-configurable, slide in modules</li></ul></li><li>Architected for quick mods</li><li>Value adds</li></ul>	<ul style="list-style-type: none"><li>We are the #1 supplier of configurable power solutions with a range up to 24 kW. This means compared to competitors like TDK-Lambda or XP Power, our ability to combine flexibility and scalability sets us apart as a leader for higher-power laser applications.</li><li>Our architecture for quick mods enables us to do rapid adjustments (for example electrical modifications through firmware changes or modifications to connectors etc.) to standard products/customer needs. In contrast, competitors like Meanwell have a limited ability to offer flexible solutions (bad luck for the customer if the standard doesn't fit).</li><li>Value-add means that we leverage our standard portfolio for fully customized products, enabling the customer a faster time to market and minimal NRE (non-recurring engineering) investments.</li></ul>
XP Power (Singapore)	<ul style="list-style-type: none"><li>Strong value-add capabilities</li></ul>		
Meanwell (Taiwan)	<ul style="list-style-type: none"><li>Low cost</li><li>Broad standard product portfolio</li></ul>		
Delta (Taiwan)	<ul style="list-style-type: none"><li>Heavy investments in R&amp;D</li><li>Low cost</li></ul>		
Cosel (Japan)	<ul style="list-style-type: none"><li>Diverse AC-DC and DC-DC</li></ul>		



# AC-DC POWER SUPPLIES FOR LASER SOURCES AND SOLUTIONS

## ADDITIONAL INFORMATION

- Block diagram example: laser metal cutting machine with a combination of in-house power design and demand for third-party power conversion products



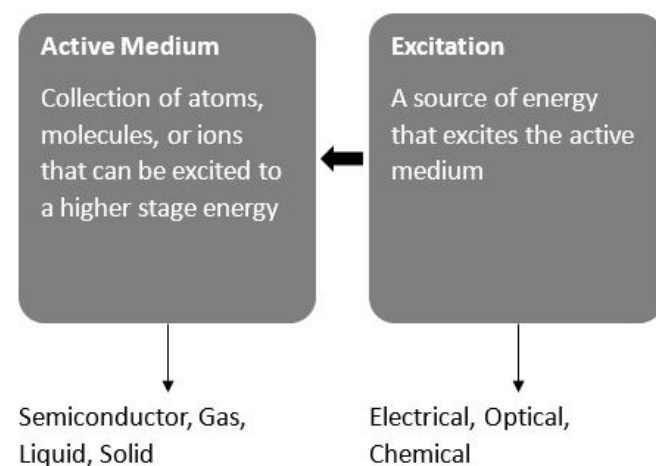
Laser CNC Machine

	Application	AE Products to be Offered
1.	AC-DC system main power	3xiHP24S-S8(8) *3
2.	LDO for CC laser driver	In-house design
3.	DC-DCs for others	ERM150, LGA
4.	Aux power for 72 kW rack control	LCC600-28H-9P

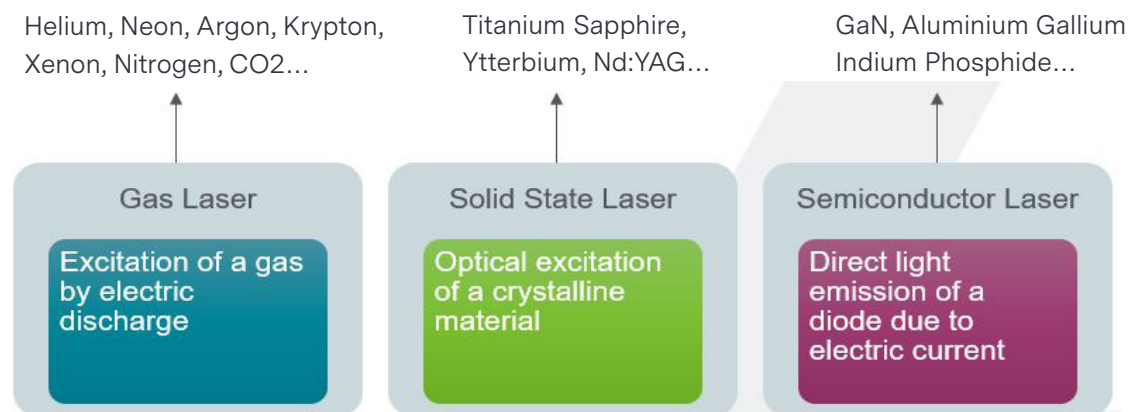
## AC-DC POWER SUPPLIES FOR LASER SOURCES AND SOLUTIONS

### ADDITIONAL INFORMATION

- Lasers emit light based on stimulated emission of electromagnetic radiation. The process requires an active medium and any means of excitation:



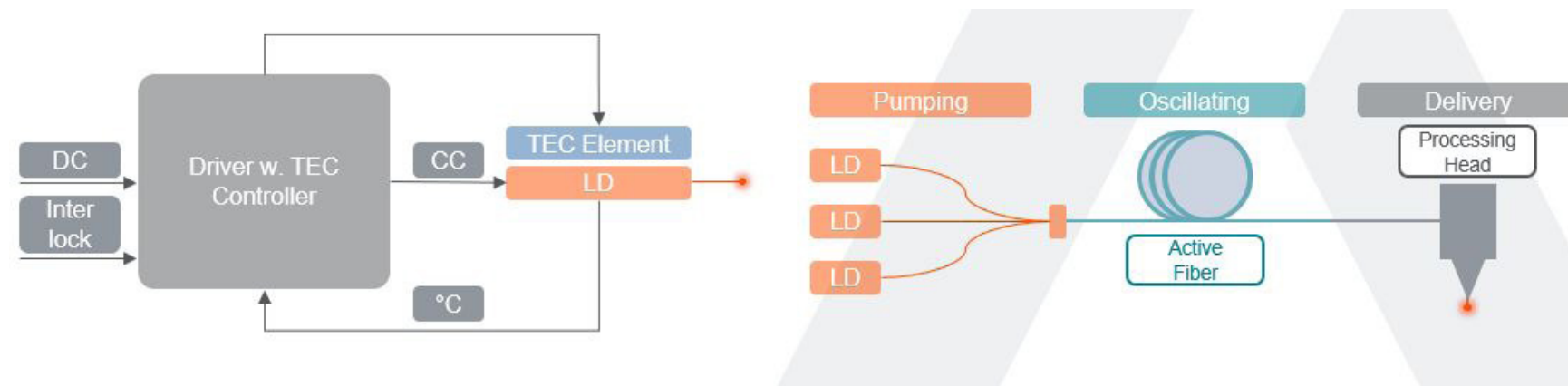
- Laser types can be categorized according to their active medium or according to their mode of operation, e.g., continuous wave.



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## ADDITIONAL INFORMATION

- Today, direct diode lasers and diode pumped fiber lasers have the largest market share in industrial applications and should be the focus of our engagement.



- When a threshold current is reached, the laser diode (LD) will shift from generating light (like a LED) to generating coherent laser emission.
- LDs have a negative temperature coefficient; to prevent a considerable shift in wavelength and protect the diode from overheating, thermoelectric elements can be used for cooling. Higher power lasers are usually liquid cooled with an external thermochiller.

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## ADDITIONAL INFORMATION

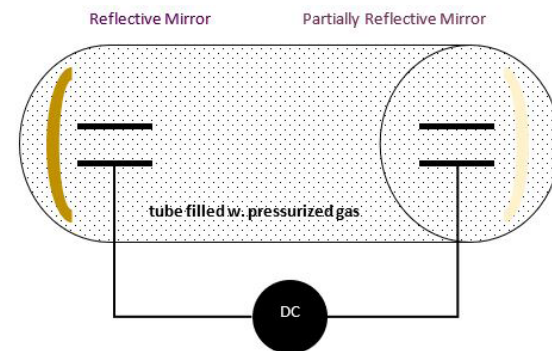
- Driving gas lasers requires DC power, with specifications determined by the breakdown voltage of a given gas, considering gas pressure and distance between electrodes.

### Argon Ion Laser (Gas Laser)

Requires current control, for example ~70 to 150 V tube voltage and ~10 A discharge current

### Helium Neon Laser (Gas Laser)

Requires high voltage, for example ~1 to 4 kV tube voltage and ~4 to 7 mA discharge current



- The requirements for supply power of solid-state lasers are determined by the excitation mechanism, for example flash lamp for optical pumping.

