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News from laboratories

News from laboratories: Anti-reflective single-mode continuous-wave fiber laser series

Chinese company CETC JR Tianjin Laser Technology Co., Ltd. the 46th Research Institute of China Electronic Technology Group Corporation, recently developed the latest generation of high power single mode Yb-doped fiber laser GL300/500/600/800/1000/1500/2000W for scientific research fields and industrial processing.

One of the tendencies in laser architecture of last decades is fiber laser [1]. Such ideology was proposed in 60–70th [2, 3] and developed later, for example [4-7]. In recent years, global fiber lasers sales showed a significantly stronger growth than those of traditional solid-state lasers. Their most important application areas are high-power laser material processing, laser marking and micro material processing.

To develop the high power single mode Yb-doped fiber laser, it was necessary to accumulate rich experience in researching and manufacturing technology of the fiber lasers and the core components, and to possess strong ability in optical, circuit and structural design.

Main features of developed fiber lasers are high light beam quality, single structure, small volume, high transform efficiency, power, stability and reliability, long life, anti-reflective light design, maintenance free operation. Parameters of developed fiber laser are collected in Table 1.

Such fiber laser can be very effective for application in the following fields:

– scientific researches;

– cutting high-reflective material such as copper and aluminum;

– precise machining, cut;

– metal and non-metal material marking;

– special material machining.

Table 1. The parameters of anti-reflective single-mode continuous-wave fiber laser.

Parameter	Specifications	Unit
Central wavelength	1080 ± 20	nm
Nominal output power	300/500/600/800/ /1000/1500/2000	W
Beam quality M^2	<1.4	
Max. modulation frequency	50	kHz
Polarization state	Random	
Power stability ($T > 24$ h)	< 2	%
Output power tenability	2…100	%
Control mode	CW/modulation	
Delivery cable length	10…15	m
Beam delivery optics	QBH	
Cooling method	Water cooling	
Power supply	200…240, 380	V_{ac}
Operating temperature	10…40	°C
Operating humidity	10…95	%
Store temperature	–10…+60	°C

Fig. 1. Anti-reflective single-mode continuous-wave fiber laser.

Typical fiber laser for scientific application is presented in Fig. 1.

Fig. 2 demonstrates medium power laser cutting machine of the sheet metal cutting industry based on seven different laser output powers (300, 500, 600, 800, 1000, 1500 and 2000 W). It can be used also as cutting equipment for high-reflective materials such as copper and aluminum.

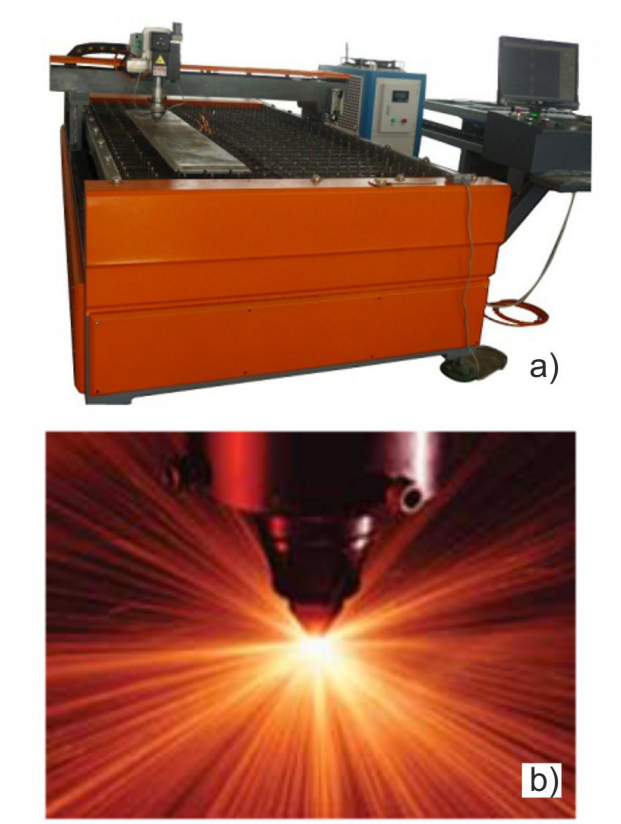

Fig. 2. 3015/4020 type optical fiber laser cutting machine (a) and its cutting head in operation mode (b).

The distinguishing features of laser cutting process are as follows:

– no deformation process, perfect edge cutting;

– high cutting speed, high production efficiency, short production cycle, fast molding and cutting;

– narrow kerf, good cutting quality, high degree of automation, simple operation, no pollution;

– improvement of the utilization rate of material;

– low production cost, good economic benefit.

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