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页数

名称 Raycus CW Fiber Laser

500-20000W Cutting Parameters

单位 Raycus

编写 laser application department

校对

审核

标审

批准

Wuhan Raycus Fiber Laser Technologies Co.,LTD.

Content

The following cutting data will fluctuate in terms of cutting speed according to actual conditions (different oxygen purity, plate quality, shielding gas, nozzle size, etc.).

一、RFL-C500 Cutting Speed

1.1 QBH single module RFL-C500 core 25μm cutting data (collimation 75mm/focus 125mm)

RFL-C500 CW Fiber Laser (25μm)								
material	thickness（mm）	speed（m/min）	power（W）	gas	Air pressure（bar）	nozzle（mm）	focus position（mm）	cutting height（mm）
carbon steel	0.8	12	500	N_2/ Air	10	1.5S	0	1
	1	10			10	1.5S	0	1
	2	3.5	500	O_2	0.6	1.2D	+3	0.8
	3	2			0.6	1.2D	+3	0.8
	4	1.5			0.6	1.5D	+3	0.8
	5	1.0			0.6	2.0D	+3	0.8
	6	0.8			0.6	2.5D	+3	0.8
stainless steel	0.5	24	500	N_2	12	1.5S	0	0.8
	1	12			12	1.5S	0	0.5
	2	2.7			12	2.0S	-1	0.5
	3	0.7			14	2.0S	-1.5	0.5

Note: The red-labeled parameters in the table are proofing parameters, which are greatly affected by various factors in actual processing, and are only suitable for small batch production. Higher power lasers are recommended for mass production processing.

二、 RFL-C1000 Cutting Speed

2.1 Single module RFL-C1000 core 25μm cutting data (collimation 100mm/focus 125mm)

RFL-C1000 CW Fiber Laser (25μm)								
material	thickness（mm）	speed（m/min）	power（W）	gas	Air pressure	nozzle（mm）	focus position	cutting height（mm）
carbon steel	0.8	18	1000	N_2/ Air	10	1.5S	0	1
	1	10			10	1.5S	0	1
	2	4	1000	O_2	2	1.2D	+3	0.8
	3	3			0.6	1.2D	+3	0.8
	4	2.3			0.6	1.2D	+3	0.8
	5	1.8			0.6	1.2D	+3	0.8
	6	1.5			0.6	1.5D	+3	0.8
	8	1.1			0.6	1.5D	+3	0.8
	10	0.8			0.6	2.5D	+3	0.8
stainless steel	0.8	20	1000	N_2	12	1.5S	0	0.8
	1	13			12	1.5S	0	0.5
	2	6			12	2.0S	-1	0.5
	3	3			12	3.0S	-1.5	0.5
	4	1			14	3.0S	-2	0.5
	5	0.6			16	3.5S	-2.5	0.5
aluminum alloy	0.8	18	1000	N_2	12	1.5S	0	0.8
	1	10			12	1.5S	0	0.5
	2	5			14	2.0S	-1	0.5
	3	1.5			16	3.0S	-1.5	0.5
brass	1	9	1000	N_2	12	2.0S	0	0.5
	2	2			14	2.0S	-1	0.5
	3	0.8			16	3.0S	-1.5	0.5

Note: The red-labeled parameters in the table are proofing parameters, which are greatly

affected by various factors in actual processing, and are only suitable for small batch production.

Higher power lasers are recommended for mass production • processing.

2.2 Single module RFL-C1000 core 25μm drilling reference

Raycus RFL-C1000 10mm carbon steel oxygen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	1000	100	100	12	1	0	100	
								50
Mediu	1000	45	100	8	0.6	-4	600	
								50
Low	1000	40	100	4	0.6	-5	2500	

Raycus RFL-C1000 5mm stainless steel nitrogen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	1000	100	1000	12	10	0	100	
								0
Mediu	1000	50	1000	10	10	-5	500	
								0
Low	1000	45	1000	4	10	-6	1000	

Drilling parameters take the limit carbon steel/stainless steel thickness that can be penetrated under current power as an example;

The drilling is sorted in order, with the high order being the first level of drilling, and so on.

三、RFL-C1500S Cutting Data

3.1 Single module RFL-C1500S core 50μm cutting data (collimation 100mm/focus 125mm)

RFL-C1500S CW Fiber Laser (50μm)								
material	thickness（mm）	speed（m/min）	power（W）	gas	Air pressure（bar）	nozzle（mm）	focus position（mm）	cutting height（mm）
carbon steel	1	20	1500	N_2/ Air	10	1.5S	0	1
	2	5	1500	O_2	2	1.2D	+3	0.8
	3	3.6			0.6	1.2D	+3	0.8
	4	2.5			0.6	1.2D	+3	0.8
	5	1.8			0.6	1.2D	+3	0.8
	6	1.4			0.6	1.5D	+3	0.8
	8	1.2			0.6	1.5D	+3	0.8
	10	1			0.6	2.0D	+2.5	0.8
	12	0.8			0.6	2.5D	+2.5	0.8
	14	0.65			0.6	3.0D	+2.5	0.8
	16	0.5			0.6	3.0D	+2.5	0.8
stainless steel	1	20	1500	N_2	10	1.5S	0	0.8
	2	7			12	2.0S	-1	0.5
	3	4.5			12	2.5S	-1.5	0.5
	5	1.5			14	3.0S	-2.5	0.5
	6	0.8			16	3.0S	-3	0.5
aluminum alloy	1	18	1500	N_2	12	1.5S	0	0.5
	2	6			14	2.0S	-1	0.5
	3	2.5			14	2.5S	-1.5	0.5
	4	0.8			16	3.0S	-2	0.5
brass	1	15	1500	N_2	12	1.5S	0	0.5
	2	5			14	2.0S	-1	0.5
	3	1.8			14	2.5S	-1.5	0.5

Note: The red-labeled parameters in the table are proofing parameters, which are greatly

affected by various factors in actual processing, and are only suitable for small batch production. Higher power lasers are recommended for mass production processing.

3.2 Single module RFL-C1500 core 50μm drilling reference

Raycus RFL-C1500 16mm carbon steel oxygen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	1000	100	100	12	1	0	100	
								50
Medium	1000	45	100	8	0.6	-4	600	
								50
Low	1000	40	100	4	0.6	-5	2500	

Raycus RFL-C1500 6mm stainless steel nitrogen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	1000	100	1000	12	10	0	100	
								0
Medium	1000	50	1000	8	10	-4	500	
								0
Low	1000	45	1000	4	10	-6	1000	

Drilling parameters take the limit carbon steel/stainless steel thickness that can be penetrated under current power as an example;

The drilling is sorted in order, with the high order being the first level of drilling, and so on.

四、RFL-C2000S Cutting Data

4.1 Single module RFL-C2000S core 50μm cutting data (collimation 100mm/focus 125mm)

RFL-C2000S CW Fiber Laser（50μm）								
material	thickness（mm）	speed（m/min）	power（W）	gas	Air pressure（bar）	nozzle（mm）	focus position（mm）	cutting height（mm）
carbon steel	1	25	2000	N_2/ Air	10	1.5S	0	1
	2	9			10	2.0S	-1	0.5
	2	5.2	2000	O_2	1.6	1.0D	+3	0.8
	3	4.2			0.6	1.0D	+3	0.8
	4	3			0.6	1.0D	+3	0.8
	5	2.2			0.6	1.2D	+3	0.8
	6	1.8			0.6	1.2D	+3	0.8
	8	1.3			0.5	2.0D	+2.5	0.8
	10	1.1			0.5	2.0D	+2.5	0.8
	12	0.9			0.5	2.5D	+2.5	0.8
	14	0.8			0.5	3.0D	+2.5	0.8
	16	0.7			0.6	3.5D	+2.5	0.8
	18	0.5			0.6	4.0D	+3	0.8
	20	0.4			0.6	4.0D	+3	0.8
stainless steel	1	28	2000	N_2	10	1.5S	0	0.8
	2	10			12	2.0S	-1	0.5
	3	5			12	2.0S	-1.5	0.5
	4	3			14	2.5S	-2	0.5
	5	2			14	3.0S	-2.5	0.5
	6	1.5			14	3.0S	-3	0.5
	8	0.6			16	3.0S	-4	0.5
aluminum alloy	1	20	2000	N_2	12	1.5S	0	0.8
	2	10			12	2.0S	-1	0.5
	3	4			14	2.0S	-1.5	0.5

	4	1.5			14	2.5S	-2	0.5
	5	0.9			16	3.0S	-2.5	0.5
	6	0.6			16	3.0S	-3	0.5
brass	1	18	2000	N_2	12	1.5S	0	0.8
	2	8			12	2.0S	-1	0.5
	3	3			14	2.5S	-1.5	0.5
	4	1.3			16	3.0S	-2	0.5
	5	0.8			16	3.0S	-2.5	0.5

Note: Air or nitrogen cutting is recommended for carbon steel 1 or 2mm. The cutting speed is faster than that with oxygen, and there will be slight dross.

Note: The red-labeled parameters in the table are proofing parameters, which are greatly affected by various factors in actual processing, and are only suitable for small batch production. Higher power lasers are recommended for mass production processing.

4.2 Single module RFL-C2000S core 50μm drilling reference

Raycus RFL-C2000S 20mm carbon steel oxygen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	2000	100	200	12	1	0	200	
								200
Medium	2000	45	150	8	0.7	-4	400	
								200
Low	2000	55	150	4	0.6	-6	3000	

Raycus RFL-C2000S 8mm stainless steel nitrogen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	2000	100	1000	12	10	0	100	
								0
Medium	2000	50	1000	8	10	-5	500	
								0
Low	2000	40	1000	4	10	-6	1000	

Drilling parameters take the limit carbon steel/stainless steel thickness that can be penetrated under current power as an example;

The drilling is sorted in order, with the high order being the first level of drilling, and so on.

五、RFL-C3000S Cutting Data

5.1 Single module RFL-C3000S core 50μm cutting data (collimation 100mm/focus 150mm)

RFL-C3000S CW Fiber Laser（50μm）								
material	thickness（mm）	speed（m/min）	power（W）	gas	Air pressure（bar）	nozzle（mm）	focus position（mm）	cutting height（mm）
carbon steel	1	35	3000	N_2/ Air	10	1.5S	0	1
	2	20			10	2.0S	0	0.5
	2	5.5	1200	O_2	1.6	1.0D	+3	0.8
	3	4	2000		0.6	1.0D	+4	0.8
	4	3.5	2400		0.6	1.0D	+4	0.8
	5	3.2	2400		0.6	1.2D	+4	0.8
	6	2.7	3000		0.6	1.2D	+4	0.8
	8	2.2	3000		0.6	1.2D	+4	0.8
	10	1.5	3000		0.6	1.2D	+4	0.8
	12	1	2400		0.6	3.0D	+4	0.8
	14	0.9	2400		0.6	3.0D	+4	0.8
	16	0.75	2400		0.6	3.5D	+4	0.8
	18	0.65	2400		0.6	4.0D	+4	0.8
	20	0.6	2400		0.6	4.0D	+4	0.8
	22	0.55	2400		0.6	4.0D	+4	0.8
stainless steel	1	45	3000	N_2	10	1.5S	0	0.8
	2	24			12	2.0S	0	0.5
	3	10			12	2.5S	-0.5	0.5
	4	6.5			14	2.5S	-1.5	0.5
	5	3.6			14	3.0S	-2.5	0.5
	6	2.7			14	3.0S	-3	0.5
	8	1.2			16	3.5S	-4.5	0.5
	10	0.8			16	4.0S	-6	0.5
aluminu	1	30	3000	N_2	12	1.5S	0	0.8

	2	18			12	2.0S	0	0.5
	3	8			14	2.0S	-1	0.5
	4	6			14	2.5S	-2	0.5
	5	3.2			16	3.0S	-3	0.5
	6	2			16	3.0S	-3.5	0.5
	8	0.9			16	3.5S	-4	0.5
brass	1	28	3000	N_2	12	1.5S	0	0.8
	2	15			12	2.0S	0	0.5
	3	6			14	2.5S	-1	0.5
	4	3			14	3.0S	-2	0.5
	5	2.2			14	3.0S	-2.5	0.5
	6	1.3			16	3.0S	-3	0.5

Note 1: Air or nitrogen cutting is recommended for carbon steel 1 or 2mm, the cutting speed is faster than that with oxygen, and there will be slight slagging.

Note 2: The power used for debugging and the speed of debugging will be different depending on the gas purity and the quality of the board.

Note: The red-labeled parameters in the table are proofing parameters, which are greatly affected by various factors in actual processing, and are only suitable for small batch production. Higher power lasers are recommended for mass production processing.

5.2 Single module RFL-C3000S core 50μm drilling reference

Raycus RFL-C3000S 22mm carbon steel oxygen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	3000	100	200	12	1	0	200	
								200
Medium	3000	45	150	8	0.7	-4	2500	
								200
Low	3000	55	150	4	0.6	-6	3000	

Raycus RFL-C3000S 10mm stainless steel nitrogen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	3000	100	1000	12	10	0	100	
								0
Medium	3000	35	1000	8	10	-5	500	
								0
Low	3000	35	1000	4	10	-6	1000	

Drilling parameters take the limit carbon steel/stainless steel thickness that can be penetrated under current power as an example;

The drilling is sorted in order, with the high order being the first level of drilling, and so on.

六、RFL-C3300 Cutting Data

6.1 Multi-module RFL-C3300S core 100μm cutting data (collimation 100mm/focus 150mm)

RFL-C3300 CW Fiber Laser（100μm）									
material	thickness（mm）	speed（m/min）	power（W）	gas	Air pressure（bar）	nozzle（mm）	focus position（mm）	cutting height（mm）	Note
carbon steel	1	30	3300	N_2/ Air	10	1.5S	0	1	1
	2	12	3300		10	2.0S	-1	0.5	
	2	5.2	1800	O_2	1.6	1.2D	+3	0.8	2
	3	4.5	1800		0.6	1.2D	+3	0.8	
	4	3.6	2400		0.6	1.2D	+3	0.8	
	5	3.2	2400		0.6	1.2D	+3	0.8	
	6	2.6	3300		0.6	1.2D	+3	0.8	
	8	2.2	3300		0.6	1.2D	+3	0.8	
	10	1.1-1.3	1800-2		0.5	3.0D	+2.5	0.8	
	12	0.9-1.1	1800-2		0.5	3.5D	+2.5	0.8	
	14	0.8-0.9	2200-3		0.5	3.5D	+2.5	0.8	
	16	0.7-0.8	2200-3		0.5	4.0D	+2.5	0.8	
	18	0.65-0.7	2200-3		0.5	4.0D	+2.5	0.8	
	20	0.55-0.65	2200-3		0.6	4.0D	+3	0.8	
	22	0.5-0.55	2200-3		0.6	4.0D	+3	0.8	
stainless steel	1	35	3300	N_2	10	1.5S	0	0.8	
	2	13			12	2.0S	-1	0.5	
	3	7			12	2.5S	-1.5	0.5	
	4	5.5			14	2.5S	-2	0.5	
	5	4			14	2.5S	-2.5	0.5	
	6	3			14	3.0S	-3	0.5	
	8	1.2			16	3.5S	-4	0.5	
	10	0.8			16	4.0S	-5	0.5	
	1	25	3300	N_2	12	1.5S	0	0.8	

	2	12			12	2.0S	-1	0.5	
	3	8			14	2.0S	-1.5	0.5	
	4	5			14	2.0S	-2	0.5	
	5	3			16	3.0S	-2.5	0.5	
	6	2			16	3.0S	-3	0.5	
	8	0.8			16	3.5S	-4	0.5	
brass	1	22	3300	N_2	12	1.5S	0	0.5	
	2	12			12	2.0S	-1	0.5	
	3	5			14	2.5S	-1.5	0.5	
	4	3			14	3.0S	-2	0.5	
	5	2			14	3.0S	-2.5	0.5	
	6	1.3			16	3.0S	-3	0.5	

Note 1: Air or nitrogen cutting is recommended for carbon steel 1 or 2mm, the cutting speed is faster than that with oxygen, and there will be slight slagging.

Note 2: The power used for debugging and the speed of debugging will be different depending on the gas purity and the quality of the board.

Note: The red-labeled parameters in the table are proofing parameters, which are greatly affected by various factors in actual processing, and are only suitable for small batch production. Higher power lasers are recommended for mass production processing.

6.2 Multi-module RFL-C3300S core 100μm drilling reference

Raycus RFL-C3300 22mm carbon steel oxygen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	3300	100	200	12	1	0	100	
								200
Mediu	3300	45	150	8	0.6	-5	200	
								200
Low	3300	50	150	4	0.6	-6	2500	

Raycus RFL-C3300 10mm stainless steel nitrogen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	3300	100	1000	12	10	0	200	
								0
Mediu	3300	50	1000	8	10	-5	500	
								0
Low	3300	40	1000	4	10	-7	1000	

七、RFL-C4000 Cutting Data

7.1 Multi-module RFL-C4000 core 100μm cutting data (collimation 100mm/focus 150mm)

RFL-C4000 CW Fiber Laser（100μm）									
material	thickness（mm）	speed（m/min）	power（W）	gas	Air pressure（bar）	nozzle（mm）	focus position（mm）	cutting height（mm）	Note
carbon steel	1	35	4000	N_2/ Air	10	1.5S	0	1	1
	2	15	4000		10	2.0S	-1	0.5	
	3	10	4000		10	2.0S	-1.5	0.5	
	3	4.5	1800	O_2	0.6	1.2D	+3	0.8	2
	4	3.5	2400		0.6	1.2D	+3	0.8	
	5	3.2	2400		0.6	1.2D	+3	0.8	
	6	2.8	3000		0.6	1.2D	+3	0.8	
	8	2.3	3600		0.6	1.2D	+3	0.8	
	10	2	4000		0.6	1.2D	+3	0.8	
	12	1.2	1800-		0.5	3.0D	+2.5	0.8	
	14	1	1800-		0.5	3.5D	+2.5	0.8	
	16	0.8	2200-		0.5	3.5D	+2.5	0.8	
	18	0.7	2200-		0.5	4.0D	+2.5	0.8	
	20	0.65	2200-		0.5	4.0D	+3	0.8	
	22	0.6	2200-		0.5	4.5D	+3	0.8	
	25	0.5	2400-		0.5	5.0D	+3	0.8	
stainless steel	1	40	4000	N_2	10	1.5S	0	0.8	
	2	20			12	2.0S	-1	0.5	
	3	12			12	2.0S	-1.5	0.5	
	4	7			12	2.5S	-2	0.5	
	5	4.5			14	2.5S	-2.5	0.5	
	6	3.5			14	3.0S	-3	0.5	
	8	1.8			14	3.0S	-4	0.5	
	10	1.2			16	4.0S	-5	0.5	
	12	0.8			16	4.0S	-6	0.5	

aluminum alloy	1	30	4000	N_2	12	1.5S	0	0.6	
	2	20			12	2.0S	-1	0.5	
	3	13			14	2.0S	-1.5	0.5	
	4	7			14	2.5S	-2	0.5	
	5	5			14	2.5S	-2.5	0.5	
	6	3			16	3.0S	-3	0.5	
	8	1.3			16	3.0S	-4	0.5	
	10	0.8			16	3.5S	-5	0.5	
brass	1	28	4000	N_2	12	1.5S	0	0.6	
	2	15			12	1.5S	-1	0.6	
	3	8			14	2.0S	-1	0.6	
	4	5			14	2.5S	-2	0.5	
	5	3			14	3.0S	-2	0.5	
	6	2.5			16	3.0S	-2.5	0.5	
	8	1			16	3.0S	-4	0.5	

Note 1: Air or nitrogen cutting is recommended for carbon steel 1 to 3mm, the cutting speed is faster than that with oxygen, and there will be slight slagging.

Note 2: The power used for debugging and the speed of debugging will be different depending on the gas purity and the quality of the board.

Note: The red-labeled parameters in the table are proofing parameters, which are greatly affected by various factors in actual processing, and are only suitable for small batch production. Higher power lasers are recommended for mass production processing.

7.2 Multi-module RFL-C4000 core 100μm drilling reference

Raycus RFL-C4000 25mm carbon steel drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	4000	100	200	12	1	0	100	
								300
Medium	4000	45	200	8	0.6	-5	200	
								300
Low	4000	50	200	4	0.6	-6	3000	

Raycus RFL-C4000 12mm stainless steel nitrogen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	4000	100	1000	12	10	0	100	
								0
Medium	4000	50	1000	8	10	-6	500	
								0
Low	4000	45	1000	4	10	-8	1500	

八、RFL-C6000 Cutting Data

8.1 Multi-module RFL-C6000 core 100μm cutting data (collimation 100mm/focus 150mm)

RFL-C6000 CW Fiber Laser（100μm）									
material	thickness（mm）	speed（m/min）	power（W）	gas	Air pressure（bar）	nozzle（mm）	focus position（mm）	cutting height（mm）	note
carbon steel	1	45	6000	N2/ Air	12	1.5S	0	1	1
	2	25			12	2.0S	-1	0.5	
	3	14			14	2.0S	-1.5	0.5	
	4	8			14	2.0S	-2	0.5	
	5	6.4			16	3.0S	-2.5	0.5	
	6	5			16	3.5S	-3	0.5	
	3	3.6-4.2	2400	O_2	0.6	1.2E	+3	0.8	2
	4	3.3-3.8	2400		0.6	1.2E	+3	0.8	
	5	3-3.6	3000		0.6	1.2E	+3	0.8	
	6	2.7-3.2	3300		0.6	1.2E	+3	0.8	
	8	2.2-2.5	4200		0.6	1.2E	+3	0.8	
	10	2.0-2.3	5500		0.6	1.2E	+4	0.8	
	12	0.9-1	2200		0.6	3.0D	+2.5	0.8	
	12	1.9-2.1	6000		0.6	1.2E	+5	0.8	
	14	0.8-9	2200		0.6	3.5D	+2.5	0.8	
	14	1.4-1.7	6000		0.6	1.4E	+5	1	
	16	0.8-0.9	2200		0.6	4.0D	+2.5	0.8	
	16	1.2-1.4	6000		0.6	1.4E	+6	1	
	18	0.65-0.75	2200		0.6	4.0D	+2.5	0.8	
	20	0.6-0.7	2400		0.6	4.0D	+3	0.8	
	22	0.55-0.65	2400		0.6	4.0D	+3	0.8	
	25	0.5	2400		0.5	5.0D	+3	1	
stainless steel	1	60	6000	N_2	10	1.5S	0	0.8	
	2	30			12	2.0S	-1	0.5	

	3	18			12	2.5S	-1.5	0.5	
	4	12			14	2.5S	-2	0.5	
	5	8			14	3.0S	-2.5	0.5	
	6	5			15	3.0S	-3	0.5	
	8	3.8			15	3.0S	-4	0.5	
	10	2			15	3.5S	-6	0.5	
	12	1.2			16	3.5S	-7.5	0.5	
	14	1			16	4.0S	-9	0.5	
	16	0.6			18	4.0S	-10.5	0.5	
	18	0.5			20	5.0S	-11	0.3	
	20	0.3			20	5.0S	-12	0.3	
aluminum alloy	1	50	6000	N_2	12	1.5S	0	1	
	2	25			12	2.0S	-1	0.5	
	3	16			14	2.5S	-1.5	0.5	
	4	10			14	2.5S	-2	0.5	
	5	6			14	3.0S	-3	0.5	
	6	4			16	3.0S	-3	0.5	
	8	2			16	3.0S	-4	0.5	
	10	1.2			18	3.5S	-4.5	0.5	
	12	0.7			18	4.0S	-5	0.5	
	14	0.5			18	4.0S	-5	0.3	
	16	0.4			20	5.0S	-8	0.3	
brass	1	40	6000	N_2	12	1.5S	0	1	
	2	20			12	2.0S	-1	0.5	
	3	14			14	2.5S	-1	0.5	
	4	9			14	3.0S	-1.5	0.5	
	5	5.5			14	3.0S	-2	0.5	
	6	3.8			16	3.0S	-2.5	0.5	
	8	1.8			16	3.5S	-3	0.5	
	10	1			16	3.5S	-3	0.5	

	12	0.7			18	4.0S	-4	0.3	

Note 1: Air or nitrogen cutting is recommended for carbon steel 1 to 6mm, the cutting speed is faster than that with oxygen, and there will be slight slagging.

Note 2: The power used for debugging and the speed of debugging will be different depending on the gas purity and the quality of the board.

Note: The red-labeled parameters in the table are proofing parameters, which are greatly affected by various factors in actual processing, and are only suitable for small batch production. Higher power lasers are recommended for mass production processing.

8.2Multi-module RFL-C6000 core 100μm drilling reference

Raycus RFL-C6000 25mm carbon steel drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	6000	50	300	18	1	0	100	
								300
Mediu	6000	45	300	12	0.8	-5	500	
								300
Low	6000	45	300	8	0.7	-6	1000	

Raycus RFL-C6000 20mm stainless steel nitrogen drilling parameters

(for reference only)）

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	6000	100	800	12	10	0	100	
								0
Mediu	6000	60	600	8	10	-6	500	
								0
Low	6000	45	600	4	10	-8	1500	

九、**RFL-C8000 Cutting Data**

9.1 Multi-module RFL-C8000 core 100μm cutting data (collimation 100mm/focus 200mm)

RFL-C8000 CW Fiber Laser（100μm）									
material	thickness（mm）	speed（m/min）	power（W）	gas	Air pressure（bar）	nozzle（mm）	focus position（mm）	cutting height（mm）	Note
carbon steel	1	40-45	8000	N_2/ Air	10	1.5S	0	1	1
	2	30-35			12	2.0S	0	0.5	
	3	20-25			13	2.0S	-1	0.5	
	4	15-18			13	2.5S	-1.5	0.5	
	5	10-12			13	2.5S	-2	0.5	
	6	8-9			13	2.5S	-2	0.5	
	8	5-5.5			13	3.0S	-3	0.5	
	8	2.3-2.5	4000	O_2	0.6	1.2E	+4	0.8	2
	10	2.3	6000		0.6	1.2E	+6	0.8	
	12	2	7500		0.6	1.2E	+7	0.8	
	14	1.8	8000		0.6	1.4E	+8	0.8	
	16	1.6			0.6	1.4E	+9	0.8	
	20	1.3			0.6	1.6E	+9	0.8	
	22	0.65			0.7	1.8E	+9	0.8	
	25	0.45			0.7	1.8E	+10	0.8	
	30	0.25			1.3	1.8E	+11	1.2	
	40	0.15			1.5	1.8E	+11.5	1.2	
stainless steel	1	60	8000	N_2	10	2.0S	0	1	
	2	35			12	2.0S	0	0.5	
	3	24			13	2.0S	0	0.5	
	4	15			12	2.0S	-1	0.5	
	5	10			15	2.5S	-1	0.5	
	6	8			8	3.5B	-2	0.5	
	8	5			7	5.0B	-2	0.5	

	10	3.5			5	5.0B	-3	0.5	
	12	2.5			6	6.0B	-4	0.5	
	14	2			6	7.0B	-6	0.3	
	16	1			6	7.0B	-8	0.3	
	18	1.5			14	5.0B	-9	0.5	
	20	0.8			6	7.0B	-11	0.3	
	25	0.4			6	7.0B	-13	0.3	
	30	0.2			10	7.0B	+8	0.3	
stainless steel air	1	60	8000	Air	10	2.0S	0	1	
	2	35			10	2.5S	0	0.5	
	3	25			10	2.5S	0	0.5	
	4	16			10	3.5B	0	0.5	
	5	10			10	3.5B	0	0.5	
	6	8			10	3.5B	0	0.5	
	8	5.5			10	3.5B	0	0.5	
	10	3.5			10	3.5B	-1	0.5	
	12	2.5			10	5.0B	-4	0.5	
	14	2			10	5.0B	-6	0.5	
	16	1			10	5.0B	-8	0.5	
	18	0.8			10	5.0B	-9	0.5	
	20	0.7			10	5.0B	-11	0.3	
	25	0.5			10	5.0B	-13	0.3	
	30	0.25			10	5.0B	+8	0.3	
aluminum alloy	1	45	8000	N_2	12	2.0S	0	0.8	
	2	30			12	2.0S	-1	0.5	
	3	25			12	2.0S	-1	0.5	
	4	15			12	2.0S	-2	0.5	
	5	10			14	2.5S	-3	0.5	
	6	7			14	2.5S	-3	0.5	
	8	4			14	2.5S	-4	0.5	

	10	2.5			14	5.0B	-5	0.5	
	12	2			16	5.0B	-5	0.5	
	14	1.2			16	5.0B	-6	0.5	
	16	1			16	5.0B	-7	0.5	
	18	0.8			16	5.0B	-8	0.5	
	20	0.6			16	7.0B	-9	0.3	
	25	0.5			16	7.0B	-10	0.3	
	30	0.2			18	7.0B	+7	0.3	
carbon steel	1	40	8000	N_2	12	2.0S	0	1	
	2	27			12	2.0S	-1	0.5	
	3	18			12	2.0S	-1	0.5	
	4	11			12	2.0S	-2	0.5	
	5	8			14	2.5S	-3	0.5	
	6	6.5			14	2.5S	-3	0.5	
	8	3			14	2.5S	-4	0.5	
	10	1.5			14	5.0B	-5	0.5	
	12	1			14	5.0B	-5	0.5	
	14	0.8			16	5.0B	-8	0.5	
	16	0.6			16	5.0B	-11	0.3	
Red copper oxygen	1	30	8000	O_2	5	2.0S	-0.5	1	3
	2	20			5	2.0S	-1	0.5	
	3	14			6	2.0S	-2	0.5	
	4	8			8	2.0S	-2	0.5	
	5	5			8	2.5S	-3	0.5	
	6	3			8	2.5S	-3	0.5	
	8	1.5			10	3.0S	-4	0.5	
	10	0.7			12	4.0S	-5	0.5	

Note 1: Air or nitrogen cutting is recommended for carbon steel 1 to 8mm, the cutting speed is faster than that with oxygen, and there will be slight slagging.

Note 2: Use high-power high-speed bright-face cutting technology and high-speed

double-layer tip nozzles for 8-15kW carbon steel oxygen cutting. The power used for debugging and the speed of debugging will be different according to the gas purity and the quality of the board.

Note 3: In the copper cutting process, oxygen must be used for cutting, and air or nitrogen cannot be used for cutting.

Note: The red-labeled parameters in the table are proofing parameters, which are greatly affected by various factors in actual processing, and are only suitable for small batch production. Higher power lasers are recommended for mass production processing.

9.2 Multi-module RFL-C8000 core 100μm drilling reference

Raycus RFL-C8000 20mm carbon steel drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	8000	45	80	16	1	-3	200	
								200
Medium	8000	35	80	12	0.9	-4	600	
								300
Low	8000	18	80	4	0.6	-4	400	

Raycus RFL-C8000 30mm carbon steel drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	8000	70	100	16	1	-5	200	
								200
Medium	8000	37	80	15	0.7	-5	2000	
								300
Low	8000	45	120	13	0.7	-5	2000	

Raycus RFL-C8000 20mm stainless steel nitrogen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	8000	24	80	20	0.8	-8	150	
								200
Medium	8000	35	100	15	6	-8	2000	
								200
Low	8000	50	80	4	6	-8	500	

Raycus RFL-C8000 30mm stainless steel oxygen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	8000	70	1000	15	1.2	3	3000	
								0
medium to high	8000	70	1000	12	1.2	3	2000	
								0
lower middle	8000	65	800	10	1	-10	1000	
								0
Low	8000	60	800	10	1	-18	800	

十、RFL-C10000 Cutting Data

10.1Multi-module RFL-C10000 core 100μm cutting data (collimation 100mm/focus 200mm)

RFL-C10000 CW Fiber Laser（100μm）									
material	thickness（mm）	speed（m/min）	power（W）	gas	Air pressure（bar）	nozzle（mm）	focus position（mm）	cutting height（mm）	Note
carbon steel	1	50-60	10000	N_2/ Air	12	1.5S	0	1	1
	2	35-40			12	2.0S	0	0.5	
	3	25-30			13	2.0S	0	0.5	
	4	18-20			13	2.5S	0	0.5	
	5	13-15			13	2.5S	0	0.5	
	6	10-12			13	2.5S	0	0.5	
	8	7-8			13	3.0S	-1	0.5	
	10	3.5-4.5			13	4.0S	-3	0.5	
	10	2.3	6000	O_2	0.6	1.2E	+6	0.8	2
	12	2	7500		0.6	1.2E	+7	0.8	
	14	1.8	8500		0.6	1.4E	+7	0.8	
	16	1.6	9500		0.6	1.4E	+8	0.8	
	20	1.4	10000		0.6	1.6E	+8	0.8	
	22	1.0			0.7	1.8E	+9	0.8	
	25	0.65			0.7	1.8E	+10	0.8	
	30	0.35			1.3	1.8E	+11	1.2	
	40	0.2			1.5	1.8E	+11.5	1.2	
stainless steel	1	50-60	10000	N_2	10	2.0S	0	1	
	2	35-40			12	2.0S	0	0.5	
	3	25-30			13	2.0S	0	0.5	
	4	18-20			12	2.0S	0	0.5	
	5	15			15	2.5S	0	0.5	
	6	9			8	3.5B	0	0.5	
	8	6			7	5.0B	0	0.5	
	10	4			5	5.0B	-1	0.5	

	12	3			6	6.0B	-4	0.5	
	14	2.4			6	7.0B	-6	0.3	
	16	2			6	7.0B	-8	0.3	
	18	1.5			14	5.0B	-9	0.5	
	20	1.2			6	7.0B	-11	0.3	
	25	0.6			6	7.0B	-13	0.3	
	30	0.25			10	7.0B	+7	0.3	
	40	0.15			15	7.0B	+9	0.3	
stainless steel air	1	50-60	10000	Air	10	2.0S	0	1	
	2	30-35			10	2.5S	0	0.5	
	3	25			10	2.5S	0	0.5	
	4	20			10	3.5B	0	0.5	
	5	17			10	3.5B	0	0.5	
	6	10			10	3.5B	0	0.5	
	8	7			10	3.5B	0	0.5	
	10	6			10	3.5B	-1	0.5	
	12	4.5			10	5.0B	-4	0.5	
	14	3			10	5.0B	-6	0.5	
	16	2			10	5.0B	-8	0.5	
	18	1.5			10	5.0B	-9	0.5	
	20	1.2			10	5.0B	-11	0.3	
	25	0.6			10	5.0B	-13	0.3	
	30	0.25			10	5.0B	+7	0.3	
aluminum alloy	1	55	10000	N_2	12	2.0S	0	0.8	
	2	30			12	2.0S	-1	0.5	
	3	25			12	2.0S	-1	0.5	
	4	20			12	2.0S	-2	0.5	
	5	16			14	2.5S	-3	0.5	
	6	9			14	2.5S	-3	0.5	
	8	6			14	2.5S	-4	0.5	

	10	4.5			14	5.0B	-5	0.5	
	12	2			16	5.0B	-5	0.5	
	14	1.5			16	5.0B	-5	0.5	
	16	1.2			16	5.0B	-5	0.5	
	18	1			16	5.0B	-5	0.5	
	20	0.8			16	7.0B	-5	0.3	
	25	0.6			16	7.0B	-5	0.3	
	30	0.25			18	7.0B	+7	0.3	
	40	0.15			18	7.0B	+8	0.3	
brass	1	40	10000	N_2	12	2.0S	0	1	
	2	27			12	2.0S	-1	0.5	
	3	20			12	2.0S	-1	0.5	
	4	15			12	2.0S	-2	0.5	
	5	11			14	2.5S	-3	0.5	
	6	7			14	2.5S	-3	0.5	
	8	5			14	2.5S	-4	0.5	
	10	4			14	5.0B	-5	0.5	
	12	2			14	5.0B	-5	0.5	
	14	1			16	5.0B	-8	0.5	
	16	0.7			16	5.0B	-11	0.3	
red copper oxygen	1	30	10000	O_2	5	2.0S	-0.5	1	3
	2	20			5	2.0S	-1	0.5	
	3	15			6	2.0S	-2	0.5	
	4	10			8	2.0S	-3	0.5	
	5	6			8	2.5S	-4.5	0.5	
	6	4			8	2.5S	-5	0.5	
	8	2			10	3.0S	-6	0.5	
	10	0.7			12	4.0S	-8	0.5	

Note 1: Air or nitrogen cutting is recommended for carbon steel 1 to 10mm, the cutting speed is faster than that with oxygen, and there will be slight slagging.

Note 2: Use high-power high-speed bright-face cutting technology and high-speed double-layer tip nozzles for 8-15kW carbon steel oxygen cutting. The power used for debugging and the speed of debugging will be different according to the gas purity and the quality of the board.

Note 3: In the copper cutting process, oxygen must be used for cutting, and air or nitrogen cannot be used for cutting.

Note: The red-labeled parameters in the table are proofing parameters, which are greatly affected by various factors in actual processing, and are only suitable for small batch production. Higher power lasers are recommended for mass production processing.

10.2 Multi-module RFL-C10000 core 100μm drilling reference

Raycus RFL-C10000 20mm carbon steel drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	10000	45	80	16	1	-3	200	
								200
Medium	10000	35	80	12	0.9	-4	600	
								300
Low	5000	10	80	4	0.6	-4	100	

Raycus RFL-C10000 30mm carbon steel drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms

High	9000	70	100	16	1	-5	200	
								200
Medium	10000	37	80	15	0.7	-5	2000	
								300
Low	10000	45	120	13	0.7	-5	1000	

Raycus RFL-C10000 20mm stainless steel nitrogen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	10000	24	80	20	0.8	-8	150	
								200
Medium	10000	35	100	15	6	-8	2000	
								200
Low	10000	50	80	4	6	-8	500	

Raycus RFL-C10000 30mm stainless steel oxygen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	10000	70	1000	15	1.2	3	3000	
								0
medium to high	10000	70	1000	12	1.2	3	2000	
								0
lower middle	10000	65	800	10	1	-10	1000	
								0
Low	8000	60	800	10	1	-18	800	

十一、RFL-C12000 Cutting Data

11.1 Multi-module RFL-C12000 core 100μm cutting data (collimation 100mm/focus 200mm)

RFL-C12000 CW Fiber Laser（100μm）									
material	thickness（mm）	speed（m/min）	power（W）	gas	Air pressure（bar）	nozzle（mm）	focus position（mm）	cutting height（mm）	Note
carbon steel	1	50-80	12000	N_2/ Air	12	1.5S	0	1	1
	2	45-48			12	2.0S	0	0.5	
	3	30-38			13	2.0S	0	0.5	
	4	20-26			13	2.5S	0	0.5	
	5	15-20			13	2.5S	0	0.5	
	6	10-13			13	2.5S	0	0.5	
	8	7-10			13	3.0S	-1.5	0.5	
	10	5-6.5			13	4.0S	-3	0.5	
	10	2.3	6000	O_2	0.6	1.2E	+6	0.8	2
	12	2	7500		0.6	1.2E	+7	0.8	
	14	1.8	8500		0.6	1.4E	+7	0.8	
	16	1.6	9500		0.6	1.4E	+8	0.8	
	20	1.4	12000		0.6	1.6E	+8	0.8	
	22	1.2			0.7	1.8E	+9	0.8	
	22	1.2			0.7	1.4SP	+11	0.5	
	25	0.85			0.7	1.8E	+11	0.8	
	25	0.95			0.7	1.5SP	+12	0.5	
	30	0.4			1.3	1.8E	+11	1.2	
	30	0.8			0.8	1.5SP	+12	0.5	
	40	0.3			1.5	1.8E	+11.5	1.2	
stainless steel	1	63	12000	N_2	10	2.0S	0	1	
	2	42			12	2.0S	0	0.5	
	3	33			13	2.0S	0	0.5	
	4	27			12	2.0S	0	0.5	

	5	18			15	2.5S	0	0.5	
	6	15			8	3.5B	0	0.5	
	8	10			7	5.0B	0	0.5	
	10	7.5			5	5.0B	-1	0.5	
	12	5.5			6	6.0B	-4	0.5	
	14	3.5			6	7.0B	-6	0.3	
	16	2.3			6	7.0B	-8	0.3	
	18	1.5			6	7.0B	-9	0.5	
	20	1.45			6	7.0B	-11	0.3	
	25	0.9			6	7.0B	-13	0.3	
	30	0.26			10	7.0B	+7	0.3	
	40	0.15			15	7.0B	+8	0.3	
stainless steel air	1	60	12000	Air	10	2.0S	0	1	
	2	38			10	2.5S	0	0.5	
	3	28			10	2.5S	0	0.5	
	4	25			10	3.5B	0	0.5	
	5	18			10	3.5B	0	0.5	
	6	15			10	3.5B	0	0.5	
	8	10			10	3.5B	0	0.5	
	10	6.5			10	3.5B	-1	0.5	
	12	4.5			10	5.0B	-4	0.5	
	14	2.6			10	5.0B	-6	0.5	
	16	2.3			10	5.0B	-8	0.5	
	18	1.9			10	5.0B	-9	0.5	
	20	1.4			10	5.0B	-11	0.3	
	25	1			10	5.0B	-13	0.3	
	30	0.28			10	5.0B	+7	0.3	
aluminum alloy	1	45	12000	N_2	12	2.0S	0	0.8	
	2	35			12	2.0S	-1	0.5	
	3	25			12	2.0S	-1	0.5	

	4	20			12	2.0S	-2	0.5	
	5	16			14	2.5S	-3	0.5	
	6	11			14	2.5S	-3	0.5	
	8	7			14	2.5S	-4	0.5	
	10	5			14	5.0B	-5	0.5	
	12	2.6			16	5.0B	-5	0.5	
	14	1.7			16	5.0B	-5	0.5	
	16	1.6			16	5.0B	-5	0.5	
	18	1.3			16	5.0B	-5	0.5	
	20	1			16	7.0B	-5	0.3	
	25	0.6			16	7.0B	-5	0.3	
	30	0.45			18	7.0B	+7	0.3	
	40	0.3			18	7.0B	+8	0.3	
brass	1	40	12000	N_2	12	2.0S	0	1	
	2	35			12	2.0S	-1	0.5	
	3	22			12	2.0S	-1	0.5	
	4	18			12	2.0S	-2	0.5	
	5	15			14	2.5S	-3	0.5	
	6	10			14	2.5S	-3	0.5	
	8	7			14	2.5S	-4	0.5	
	10	5			14	5.0B	-5	0.5	
	12	2.4			14	5.0B	-5	0.5	
	14	1.4			16	5.0B	-8	0.5	
	16	1			16	5.0B	-11	0.3	
red copper oxygen	1	35	12000	O_2	5	2.0S	-0.5	1	3
	2	25			5	2.0S	-1	0.5	
	3	18			6	2.0S	-2	0.5	
	4	12			8	2.0S	-3	0.5	
	5	8			8	2.5S	-4.5	0.5	
	6	5			8	2.5S	-5	0.5	

	8	2.5			10	3.0S	-6	0.5	
	10	1.2			12	4.0S	-8	0.5	

Note 1: Air or nitrogen cutting is recommended for carbon steel 1 to 10mm. The cutting speed is faster than that with oxygen, and there will be slight dross.

Note 2: Use high-power high-speed bright-face cutting technology and high-speed double-layer tip nozzles for 8-15kW carbon steel oxygen cutting. The power used for debugging and the speed of debugging will be different according to the gas purity and the quality of the board.

Note 3: In the copper cutting process, oxygen must be used for cutting, and air or nitrogen cannot be used for cutting.

Note: The red-labeled parameters in the table are proofing parameters, which are greatly affected by various factors in actual processing, and are only suitable for small batch production. Higher power lasers are recommended for mass production processing.

11.2Multi-module RFL-C12000 core 100μm drilling reference

Raycus RFL-C12000 20mm carbon steel drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	10000	45	80	16	1	-3	200	
								200
Medium	12000	35	80	12	0.9	-4	600	
								300
Low	5000	10	80	4	0.6	-4	100	

Raycus RFL-C12000 30mm carbon steel drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	9000	70	100	16	1	-5	200	
								200
Medium	12000	37	80	15	0.7	-5	2000	
								300
Low	12000	45	120	13	0.7	-5	1000	

Raycus RFL-C12000 20mm stainless steel nitrogen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	9000	70	100	16	1	-5	200	
								200
Medium	12000	37	80	15	0.7	-5	2000	
								300
Low	12000	45	120	13	0.7	-5	1000	

Raycus RFL-C12000 30mm stainless steel oxygen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	10000	70	1000	15	1.2	3	3000	
								0
medium to high	12000	70	1000	12	1.2	3	2000	
								0
lower middle	12000	65	800	10	1	-10	1000	
								0
Low	12000	60	800	10	1	-18	800	

十二、RFL-C15000 Cutting Data

12.1 Multi-module RFL-C15000 core 100μm cutting data (collimation 100mm/focus 200mm)

RFL-C15000 CW Fiber Laser（100μm）									
material	thickness（mm）	speed（m/min）	power（W）	gas	Air pressure（bar）	nozzle（mm）	focus position（mm）	cutting height（mm）	Note
carbon steel	1	50-80	15000	N_2/ Air	10	1.5S	0	1	1
	2	45-48			10	2.0S	0	0.5	
	3	30-38			12	2.0S	0	0.5	
	4	26-29			12	2.5S	0	0.5	
	5	20-23			12	2.5S	0	0.5	
	6	17-19			12	2.5S	0	0.5	
	8	10-12			12	3.0S	-1	0.5	
	10	7-8			13	4.0S	-1	0.5	
	12	5-6			13	4.0S	-2	0.5	
	14	4.5-5.5			13	4.0S	-6	0.5	
	16	3-3.5			13	5.0B	-8	0.5	
	10	2.3	6000	O_2	0.6	1.2E	+6	0.8	2
	12	2	7500		0.6	1.2E	+7	0.8	
	14	1.8	8500		0.6	1.4E	+7	0.8	
	16	1.7	9500		0.6	1.4E	+8	0.8	
	20	1.5	15000		0.6	1.6E	+8	0.8	
	22	1.3			0.7	1.8E	+9	0.8	
	22	1.3			0.7	1.4SP	+11	0.5	
	25	1.2			0.7	1.8E	+10	0.8	
	25	1.2			0.7	1.5SP	+12	0.5	
	30	0.8			0.8	1.8E	+11	1.2	
	30	0.85			0.8	1.5SP	+12	0.5	
	40	0.45			1.5	1.8E	+11.5	1.2	
	50	0.3			1.6	1.8E	+11.5	1.8	

	60	0.2			1.8	1.8E	+12	2	
stainless steel	1	65	15000	N_2	10	2.0S	0	1	
	2	42			12	2.0S	0	0.5	
	3	35			13	2.5S	0	0.5	
	4	29			12	2.5S	0	0.5	
	5	22			15	2.5S	0	0.5	
	6	18			8	3.5B	0	0.5	
	8	12			7	5.0B	0	0.5	
	10	9			5	5.0B	-1	0.5	
	12	7			6	6.0B	-4	0.5	
	14	4.2			6	7.0B	-6	0.3	
	16	2.8			6	7.0B	-8	0.3	
	18	2.3			6	7.0B	-9	0.5	
	20	2			6	7.0B	-11	0.3	
	25	1.1			6	7.0B	-13	0.3	
	30	0.7			10	5.0B	-15	0.3	
	40	0.4			15	7.0B	+8	0.3	
	50	0.2			15	8.0B	+9	0.3	
stainless steel air	1	65	15000	Air	10	2.0S	0	1	
	2	40			10	2.5S	0	0.5	
	3	32			10	2.5S	0	0.5	
	4	25			10	3.5B	0	0.5	
	5	20			10	3.5B	0	0.5	
	6	16			10	3.5B	0	0.5	
	8	11			10	3.5B	0	0.5	
	10	9			10	3.5B	-1	0.5	
	12	6.5			10	5.0B	-4	0.5	
	14	4			10	5.0B	-6	0.5	
	16	3.1			10	5.0B	-8	0.5	
	18	2.3			10	5.0B	-9	0.5	

	20	2			10	5.0B	-11	0.3	
	25	1.3			10	5.0B	-13	0.3	
	30	0.9			10	5.0B	-15	0.3	
	40	0.45			12	6.0B	+8	0.3	
	50	0.25			12	8.0B	+9	0.3	
aluminum alloy	1	60	15000	N_2	12	2.0S	0	0.8	
	2	50			12	2.0S	-1	0.5	
	3	40			12	2.0S	-1	0.5	
	4	35			12	2.0S	-2	0.5	
	5	26			14	2.5S	-3	0.5	
	6	16			14	2.5S	-3	0.5	
	8	10			14	2.5S	-4	0.5	
	10	5.5			14	5.0B	-5	0.5	
	12	4.5			16	5.0B	-5	0.5	
	14	3.4			16	5.0B	-5	0.5	
	16	2.1			16	5.0B	-5	0.5	
	18	1.8			16	5.0B	-5	0.5	
	20	1.4			18	7.0B	-5	0.3	
	25	0.9			18	7.0B	-5	0.3	
	30	0.7			20	7.0B	-7	0.3	
	40	0.3			20	7.0B	+8	0.3	
	50	0.2			20	8.0B	+9	0.3	
brass	1	50	15000	N_2	12	2.0S	0	1	
	2	40			12	2.0S	-1	0.5	
	3	32			12	2.0S	-1	0.5	
	4	28			12	2.0S	-2	0.5	
	5	20			14	2.5S	-3	0.5	
	6	14			14	2.5S	-3	0.5	
	8	8			14	2.5S	-4	0.5	
	10	5.5			14	5.0B	-5	0.5	

	12	3.2			14	5.0B	-5	0.5	
	14	2.7			16	5.0B	-8	0.5	
	16	1.5			18	5.0B	-11	0.5	
	18	1.1			18	5.0B	-11	0.5	
	20	0.6			18	6.0B	-12	0.3	
red copper oxygen	1	40	15000	O_2	5	2.0S	-0.5	1	3
	2	30			5	2.0S	-1	0.5	
	3	28			6	2.0S	-2	0.5	
	4	20			8	2.0S	-3	0.5	
	5	15			8	2.5S	-4.5	0.5	
	6	10			8	2.5S	-5	0.5	
	8	6			10	3.0S	-6	0.5	
	10	2			12	4.0S	-8	0.5	

Note 1: Air or nitrogen cutting is recommended for carbon steel 1to 16mm. The cutting speed is faster than that with oxygen, and there will be slight dross.

Note 2: Use high-power high-speed bright-face cutting technology and high-speed double-layer tip nozzles for 8-15kW carbon steel oxygen cutting. The power used for debugging and the speed of debugging will be different according to the gas purity and the quality of the board.

Note 3: In the copper cutting process, oxygen must be used for cutting, and air or nitrogen cannot be used for cutting.

Note: The red-labeled parameters in the table are proofing parameters, which are greatly affected by various factors in actual processing, and are only suitable for small batch production. Higher power lasers are recommended for mass production processing.

12.2 Multi-module RFL-15000 core 100μm drilling reference

Raycus RFL-C15000 20mm carbon steel drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	10000	45	80	16	1	-3	200	
								200
Medium	15000	35	80	12	0.9	-4	600	
								300
Low	8000	15	80	4	0.6	-4	100	

Raycus RFL-C15000 30mm carbon steel drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	9000	70	100	16	1	-5	200	
								200
Medium	15000	37	80	15	0.7	-5	2000	
								300
Low	15000	45	120	13	0.7	-5	1000	

Raycus RFL-C15000

20mm stainless steel nitrogen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	15000	24	80	20	0.8	-8	150	
								200
Medium	15000	35	100	15	6	-8	1200	
								200
Low	15000	50	80	4	6	-8	500	

Raycus RFL-C15000 30mm stainless steel oxygen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	10000	70	1000	15	1.2	3	3000	
								0
medium to high	15000	70	1000	12	1.2	3	2000	
								0
lower middle	15000	65	800	10	1	-10	1000	
								0
Low	12000	60	800	10	1	-18	800	

十三、RFL-C20000 Cutting Data

12.1 Multi-module RFL-C20000 core 100μm cutting data (collimation 100mm/focus 200mm)

RFL-C20000 CW Fiber Laser（100μm）									
material	thickness（mm）	speed（m/min）	power（W）	gas	Air pressure（bar）	nozzle（mm）	focus position（mm）	cutting height（mm）	Note
carbon steel	5	25-28	20000	N_2/ Air	8	3.0S	0	0.5	1
	6	21-25			8	3.0S	-0.5	0.5	
	8	13-15			8	3.0S	-1	0.5	
	10	10-13			8	3.5S	-1.5	0.5	
	12	8-9			8	3.5S	-2	0.5	
	14	6-7			8	4.0S	-3	0.5	
	16	5-6			8	5.0S	-4	0.5	
	18	3.2-4			10	6.0S	-6	0.5	
	20	2.7-3.2			10	6.0S	-8	0.5	
	10	2.3	6000	O_2	0.6	1.2E	+8	0.8	2
	12	2	7500		0.6	1.2E	+9	0.8	
	14	1.8	8500		0.6	1.4E	+10	0.8	
	16	1.7	9500		0.6	1.4E	+11	0.8	
	18	1.6	12000		0.6	1.6E	+12	0.8	
	20	1.5	12000		0.6	1.6E	+12	0.8	
	22	1.3	20000		0.7	1.8E	+12.5	0.8	
	22	1.4			0.7	1.4SP	+13	0.5	
	25	1.3			1.0	1.5SP	+13	0.4	
	30	1.2			1.2	1.5SP	+13.5	0.4	
	40	0.85			1.4	1.5SP	+14	0.4	
	50	0.4			1.6	1.8E	+13	2	
	60	0.25			1.6	1.8E	+13.5	2	
	70	0.2			1.7	1.8E	+13.5	2	
	80	0.15			1.8	1.8E	+14	2	

stainless steel	1	70	20000	N_2	8	2.0S	0	1
	2	45			8	2.0S	0	0.5
	3	38			8	2.5S	0	0.5
	4	32			8	2.5S	0	0.5
	5	25			8	3.0S	0	0.5
	6	22			8	3.5B	0	0.5
	8	17			8	5.0B	-1	0.5
	10	14			8	5.0B	-1.5	0.3
	12	11			8	6.0B	-2	0.5
	14	7			8	6.0B	-4	0.3
	16	5.8			8	6.0B	-5	0.3
	18	4			8	6.0B	-6	0.3
	20	3			12	6.0B	-7.5	0.3
	25	1.6			12	7.0B	-12	0.3
	30	1.1			12	7.0B	-16	0.3
	40	0.5			16	7.0B	-16	0.3
	50	0.2			16	8.0B	+11	0.3
	60	0.15			20	8.0B	+11	0.3
	70	0.12			20	8.0B	+11	0.3
	80	0.1			20	8.0B	+11	0.3
	90	0.08			20	8.0B	+11	0.3
	100	0.05			20	8.0B	+11	0.3
stainless steel air	1	70	20000	Air	8	2.0S	0	1
	2	45			8	2.5S	0	0.5
	3	38			8	2.5S	0	0.5
	4	35			8	3.5B	0	0.5
	5	25			8	3.5B	0	0.5
	6	22			8	3.5B	0	0.5
	8	17			10	3.5B	0	0.5

	10	13			10	3.5B	-1.5	0.3	
	12	11			10	5.0B	-4	0.3	
	14	7			10	5.0B	-6	0.3	
	16	5.8			10	5.0B	-7	0.3	
	18	4			10	5.0B	-8	0.3	
	20	3.2			10	5.0B	-9	0.3	
	25	1.7			10	5.0B	-13	0.3	
	30	1.1			10	5.0B	-17	0.3	
	40	0.5			16	7.0B	-16	0.3	
	50	0.2			16	8.0B	+11	0.3	
	60	0.15			20	8.0B	+11	0.3	
	70	0.12			20	8.0B	+11	0.3	
	1	65			8	2.0S	0	0.8	
	2	55			8	2.0S	-1	0.5	
	3	45			10	2.5S	-1	0.5	
	4	40			12	2.5S	-2	0.5	
	5	30			14	3.0S	-3	0.5	
	6	20			14	3.0S	-3	0.5	
	8	13			14	3.5S	-4	0.5	
	10	8.5			14	3.5S	-5	0.5	
aluminu	12	8	2000		16	5.0B	-6	0.3	
m alloy	14	4.5	0	N_2	16	5.0B	-7	0.3	
	16	4			16	5.0B	-7	0.3	
	18	3.5			16	5.0B	-7	0.3	
	20	2.3			18	6.0B	-7	0.3	
	25	1.5			18	6.0B	-7.5	0.3	
	30	0.8			20	7.0B	-7.5	0.3	
	40	0.6			20	7.0B	-9	0.3	
	50	0.4			20	8.0B	-9	0.3	
	60	0.2			20	8.0B	-9	0.3	

brass	1	55	20000	N_2	12	2.0S	0	1	
	2	42			12	2.0S	0	0.5	
	3	34			12	2.0S	0	0.5	
	4	30			12	2.5S	0	0.5	
	5	21			14	2.5S	0	0.5	
	6	15			14	3.0S	0	0.5	
	8	9			14	3.0S	0	0.5	
	10	6			14	5.0B	-1	0.3	
	12	4			14	5.0B	-2	0.3	
	14	3			16	5.0B	-3	0.3	
	16	2			18	5.0B	-3	0.3	
	18	1			18	5.0B	-4	0.3	
	20	0.7			18	6.0B	-5	0.3	
red copper oxygen	1	40	20000	O_2	5	2.0S	0	1	3
	2	30			5	2.0S	0	0.5	
	3	28			6	2.0S	0	0.5	
	4	20			8	2.5S	-1	0.5	
	5	15			8	2.5S	-1	0.5	
	6	10			8	3.0S	-2	0.5	
	8	6			10	3.0S	-3	0.5	
	10	3.5			12	3.5S	-4	0.5	
	12	2.5			12	3.5S	-5	0.5	

Note 1: Air or nitrogen cutting is recommended for carbon steel 1to 16mm. The cutting speed is faster than that with oxygen, and there will be slight dross.

Note 2: Use high-power high-speed bright-face cutting technology and high-speed double-layer tip nozzles for 8-20kW carbon steel oxygen cutting. The power used for debugging and the speed of debugging will be different according to the gas purity and the quality of the board.

Note 3: In the copper cutting process, oxygen must be used for cutting, and air or nitrogen cannot be used for cutting.

Note: The red-labeled parameters in the table are proofing parameters, which are greatly affected by various factors in actual processing, and are only suitable for small batch production. Higher power lasers are recommended for mass production processing.

13.2Multi-module RFL-20000 core 100μm drilling reference

Raycus RFL-C20000 30mm carbon steel drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	15000	45	150	16	1	-3	200	
								200
Medium	15000	35	80	12	0.9	-4	600	
								300
Low	20000	30	80	4	0.9	-4	200	

Raycus RFL-C20000 40mm carbon steel drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	15000	60	100	16	1	-5	200	
								200
Medium	15000	40	150	15	0.7	-5	2000	
								300
Low	20000	45	150	13	0.7	-5	1000	

Raycus RFL-C20000 30mm stainless steel nitrogen drilling parameters

(for reference only)

	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	20000	24	80	20	3	-15	150	
								200
Medium	20000	35	100	15	5	-12	1200	
								200
Low	20000	50	80	4	5	-8	500	

Raycus RFL-C20000 30mm stainless steel oxygen drilling parameters

(for reference only)

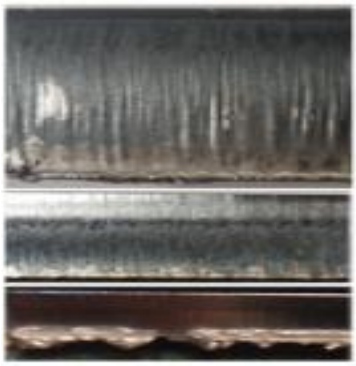
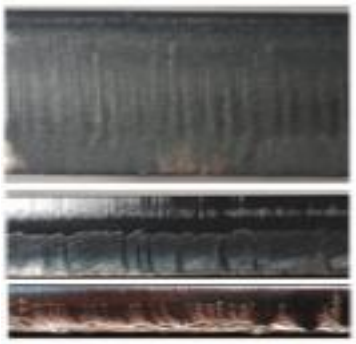
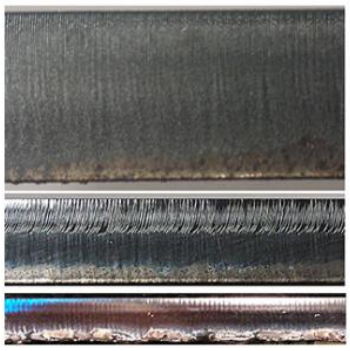
	power W	duty cycle %	frequency Hz	nozzle height mm	air pressure bar	focus mm	time ms	Blowing ms
High	15000	60	1000	15	1.2	3	200	
								200
medium to high	20000	60	1000	12	1.2	3	2000	
								200
lower middle	20000	55	800	10	1	-10	1000	
								200
Low	20000	50	800	10	1	-18	800	

十四、**Poor Cutting and Solutions**

Example	problem	Reason	Solution
	tiny regular burrs	Focus is too low; cutting speed is too high	Raise focus; reduce cutting speed
	Irregular filamentous burrs, discoloration of the surface of the board	Focus is too high; cutting speed is too low; air pressure is too low	Decrease focus; increase cutting speed; increase air pressure
	Long irregular burrs on one side	Misaligned nozzle; high focus; low air pressure; low speed	Center the nozzle; reduce the focus; increase the air pressure; increase the speed
	Plasma gas is generated on a straight section	Cutting speed is too high; power is too low; focus is too low	Press the pause button immediately to prevent molten slag from splashing on the focusing lens; reduce the cutting speed ; increase the power; raise the focus
	Material is discharged from above	Power is too low; cutting speed is too high; air pressure is too high	Press the pause button immediately to prevent molten slag splashing on the focusing lens; increase power;

			decrease cutting speed ; decrease air pressure
	The index line at the bottom is greatly offset, and the cut at the bottom is wider	Cutting speed is too high; laser power is too low; air pressure is too low; focus is too high	Reduce cutting speed; increase laser power; increase air pressure; decrease focus
	The burrs on the bottom surface are similar to slag, drip-shaped and easy to remove	Cutting speed is too high; air pressure is too low; focus is too high	Reduce cutting speed; increase air pressure; reduce focus
	Metal burrs on the bottom surface are difficult to remove	Cutting speed is too high; air pressure is too low; gas is impure; focus is too high	Reduce cutting speed; increase air pressure; use purer gas; reduce focus
	Only have burrs on one side	The nozzle is not centered; the nozzle opening is defective	Center the nozzle; replace the nozzle
	Rough cutting surface	The focus is too high; the air pressure is too high; the cutting speed is too low; the material is too hot	Reduce focus; reduce air pressure; increase cutting speed; cool material
		The air pressure is too high; the cutting	Reduce air pressure; increase cutting speed;

		speed is too low; the focus is too high; there is rust on the surface of the plate; the workpiece is overheated; the material is impure	reduce focus; use better quality materials

The cutting gap is too narrow:	Cut section	Reasons
Thin streaks on the upper layer, insufficient oxygen on the lower surface of the slit, slag		**Focus is too low**
		**Cutting speed is too fast**
		**Air pressure is too low**

		The nozzle is too small
		**Nozzle height is too low**

十五、Nozzle selection for cutting process

Nozzle name	Name symbol	Nozzle shape	Shape characteristics	usefulness
Single layer	S(Single)		The inner wall is conical, and the high-pressure gas blowing slag gas flow is large	Fusion cutting of stainless steel, aluminum plate and other materials
Double layer	D(Double)		Double layer composite adds an inner core to the single layer	Double layer size above 2.0 is used for carbon steel sand surface cutting
High speed double layer	E		The shape of the nozzle is pointed, and the three holes on the inner core edge are larger than the ordinary double layer	Mainly used for carbon steel high-power high-speed bright surface cutting
Storm nozzle	B(Boost)		Improved on the basis of single-layer nozzle, the nozzle mouth has a step	Can be used to cut stainless steel with high power nitrogen and low pressure