



RLT-150&RLT-180

射频CO<sub>2</sub>激光器使用说明书

RF CO<sub>2</sub> Laser User Manual



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## 目录 Contents

1. 激光安全 .....	1
2. 准备工作 .....	1
3. 安装与使用 .....	1
4. RLT-150&RLT-180 系列射频 CO <sub>2</sub> 激光器参数表 .....	2
5. 信号接口描述和连接器引脚 .....	3
6. RLT-150&RLT-180 尺寸图 .....	4
1.Operation Safety .....	5
2.Preparations .....	5
3.Installation and Operation .....	5
4.RLT-150&RLT-180 RF CO <sub>2</sub> lasers Specifications .....	7
5.Description of Control Signal Interface .....	8
6.RLT-150&RLT-180 Dimensional Drawing .....	8

## 1. 激光安全

### 1.1 安全标准

使用 RLT-150&RLT-180 射频 CO<sub>2</sub> 激光器 (以下简称激光器) 的设备应符合中华人民共和国 GB/T10320-2011 《激光设备和设施的电气安全》和 GB7247.1-2012 《激光产品的安全第 1 部分：设备分类、要求》国家标准。

### 1.2 危险警示

激光器输出 9.3 μm-10.6 μm 人眼不可见的远红外波长激光，其直接的或散射的激光辐射能够引起严重的角膜损伤和皮肤损伤，因此，在激光器使用过程中，必须佩戴激光防护镜等保护用品。必须绝对避免激光照射到酒精、乙醚、丙酮以及木板、棉花等可燃物上，以免发生爆炸和火灾。

此外还需注意不要将激光束照射到金属、镜子等光滑表面上，避免这些光滑表面反射激光而带来不可预知的危险。

### 1.3 特别提示

在激光器首次启动输出激光之前，必须取下前面板输出端圆孔上的防尘保护贴，否则，输出的激光束将会烧毁保护贴造成激光器输出镜的污染，严重的污染有可能使得激光器无法输出激光从而导致整机报废。

## 2. 准备工作

### 2.1 检查包装

2.1.1 检查包装箱封箱胶条是否完整。

2.1.2 检查包装箱外观是否有损坏、变形以及受潮等现象。

### 2.2 装箱清单

2.2.1 使用合适的工具打开包装箱，开箱时注意请勿伤及箱内物品。开箱后检查激光器 (包括随机配件) 及其所在的塑料泡沫包裹是否完好无损，若有意外的情况，请及时与公司销售服务部门联系进行沟通说明。

2.2.2 检查包装箱内物品：激光器 1 台，激光器检测报告 1 份，激光器使用说明书 1 份，激光器输出控制 DB25 接头 (公) 1 个。

2.2.3 可选择的配件：48V 直流电源。

## 3. 安装与使用

### 3.1 安装要求

3.1.1 激光器前后端安装有激光器谐振腔的输出镜和反射镜镜座，这是激光器的精密部分，不得与其他任何物件进行硬接触，否则会造成激光器的损坏；但可以使用软性材料与端板进行软接触，用于密封光路保护激光器的输出窗口镜。

3.1.2 安装激光器的固定底板必须具有良好的平面度和足够的刚度，确保安装后激光器不致发生形变。倘若激光器的工作环境有震动的情况，则固定底板最好施加防震措施，以免对于激光器的光路产生影响。

### 3.2 激光器前后端板说明

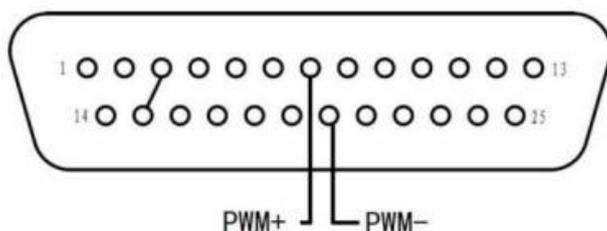
3.2.1 激光器前端板：带有圆形通孔的孔内安装有激光器的输出镜，激光从这个圆孔中输出。

3.2.2 激光器后端板：主要有激光器的供电电源接口 (48VDC+ 和一个 48VDC-)、控制信号 DB25 接口、水冷接口。

### 3.3 控制信号的连接

3.3.1 供电电源接口：用于连接激光器的48V直流电源供电。将48V直流电源正极输出的导线链接48V+，48V直流电源负极输出的导线则应该连接到后端板的GND接口（即与激光器机壳地连接）。电源和激光器之间的连接导线大于 $25\text{mm}^2$ ，正负极不得接反，否则会损坏激光器。

3.3.2 控制信号DB25接口：PWM+信号通过激光器后面板上DB25 Pin7接入，GND/PWM-信号通过激光器后面板上DB25 Pin20接入，Pin3和Pin15短接。



### 3.4 激光器控制和操作

3.4.1 激光器控制过程：RLT-150&RLT-180型激光器通过脉冲宽度调制信号(PWM)来控制激光功率输出。PWM信号的低电平电压范围应在0-0.5V(激光关);高电平电压范围应在3.5-5V(激光开),通过PWM信号占空比可对激光功率进行控制，PWM信号由外部控制卡提供，PWM信号调制频率为0-100KHz,占空比0-60%。

下图所示的波形就是一个典型的0-5V的PWM信号，占空比(或脉宽)可调，频率也可调：

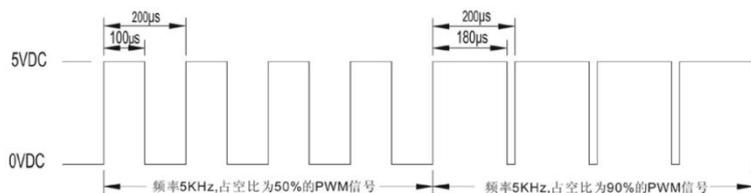


图1 . TTL 控制信号实现的PWM调制功能示意图

3.4.2 激光器开机操作：开启48V直流供电电源，激光器处于准备输出的待机状态；此时，通过DB25连接线输入TTL信号，则激光器开始输出激光。在激光器输出过程中，用户可以通过改变TTL信号参数可以改变PWM的调制功能，获得所需要的激光脉冲宽度、重复频率和平均功率等输出指标。

3.4.3 激光器关机步骤：停止TTL控制信号输入，激光输出停止；关闭48V直流供电电源。

### 4. RLT-150&RLT-180系列射频CO<sub>2</sub>激光器参数表

型号	RLT-150	RLT-180
波长	10.6 µm	
激光功率	≥150W	≥180W
功率稳定性	≤±10%	
光束质量 M <sup>2</sup>	<1.5	
光束直径 (1/ e <sup>2</sup> )	2.3±0.2mm	

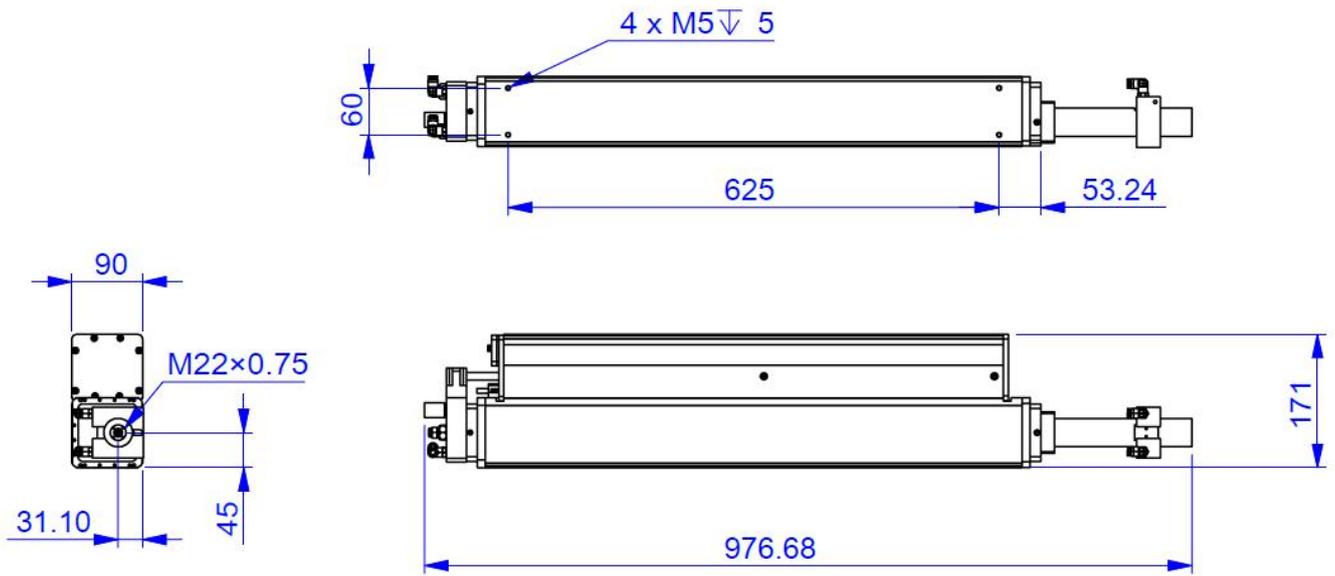
光束发散角（全角）	<8mrad
偏振性	水平线偏振， >100:1
调制频率	0-100 kHz
占空比范围	0-60%
电输入	DC 48V/62A
冷却方式	水冷
尺寸	977mm×90mm×171mm
重量	16.00kg
工作外壳温度	<50℃（122°F）
工作环境温度	<15~40℃（59~104°F）
湿度	非冷凝
运输和存储环境温度	-10~40℃（14~104°F）
<p>1) 激光功率在激光器温度 25℃ 下测得，高于 25℃ 每上升 1℃ 输出功率约降低 1%</p> <p>2) 稳定度计算公式：稳定度=±(Pmax-Pmin)/(2Pmax) 稳定度测试条件：正常运行环境下，开机预热 5 分钟，恒定控制占空比。</p>	

## 5. 信号接口描述和连接器引脚

引脚	功能	描述
pin1	正向信号检测输出	预定义，未使用
pin2	反向信号检测输出	预定义，未使用
pin3	激光器使能	激光器使能，低有效
pin4	TXD	与 pin17 作为串口内部使用
pin5	外部串口通信 RX	预定义，未使用
pin6	外部串口通信 TX	预定义，未使用
pin7	PWM 信号 (+)	TTL 信号，高电平有效
pin8	激光器激活输出	预定义，未使用
pin9	激光状态指示输出	预定义，未使用
pin10	温度状态指示输出	预定义，未使用
pin11	电压状态指示输出	预定义，未使用
pin12	激光器激活输出回路	预定义，未使用
pin13	485A	预定义，未使用
pin14	激光状态指示输出回路	预定义，未使用
pin15	使能指示输出回路	预定义，未使用
pin16	电压、温度状态指示输出回路	预定义，未使用
pin17	RXD	与 pin4 作为串口内部使用
pin18	5V 输出回路	
pin19	48V 输入回路	预定义，未使用

pin20	PWM 信号 (-)	状态指示输出回路
pin21	48V 输入	预定义 , 未使用
pin22	48V 输入	预定义 , 未使用
pin23	5V 输出	
pin24	5V 输出	
pin25	485B	状态指示输出回路

6. RLT-150&RLT-180 尺寸图



## **1.Operation Safety**

### **1.1 Safety Regulations**

The equipment utilizing RLT-150&RLT-180 RF CO<sub>2</sub> laser (hereinafter referred to as laser) shall comply with The National Standards of The People's Republic of China GB/T10320-2011 "Electrical Safety of Laser Equipment and Facilities" and GB7247.1-2012 "Safety of Laser Products -Part1: Equipment Classification and Requirements"

### **1.2 Warnings**

The laser emits invisible infrared laser beam with wavelengths of 9.3 μm /10.6 μm, direct or scattered laser radiation can cause severe corneal injury and skin damage. Therefore, during the use of the laser; it is necessary to wear protective glasses or other protective devices is essential. It is absolutely necessary to avoid laser irradiation on alcohol, ether, acetone, wood, cotton and other combustible materials to avoid explosion and fire. In addition, care should be taken not to irradiate the laser beam on smooth surfaces such as metals and mirrors, to avoid unpredictable dangers caused by the reflection of laser light on these smooth surfaces.

### **1.3 Reminder**

Before the laser starts to output the laser for the first time, the dust-proof protective sticker on the round hole at the output end of the front panel must be removed. Otherwise, the output laser beam will burn the protective sticker and cause pollution of the laser output mirror. Serious pollution may make the laser unable to output laser and cause the whole machine to be scrapped.

## **2.Preparations**

### **2.1 Check the packaging**

2.1.1 Check if the sealing tape is complete.

2.1.2 Check if the packaging is damaged or serious deformation, damp and so on.

### **2.2 Unpacking and packing list**

2.2.1 Use suitable tools to open the box, and be careful not to damage the contents when unpacking. After unpacking, check the laser (including random accessories) and the plastic foam is intact. If there is an accident, please contact the company's sales and service department for communication and explanation.

2.2.2 Check the contents of the packing box: 1 RF laser, 1 laser inspection report, 1 laser instruction, and 1 connector (male) of DB25 control.

2.2.3 Optional accessories: 48V DC power supply.

## **3.Installation and Operation**

### **3.1 Installation Requirements**

3.1.1 The precision parts of RLT-150&RLT-180 series, Output Lens and Full Reflector holders of the resonator, are mounted at

the front and rear ends of the laser. Hard Contact to these two parts are prohibited. Otherwise, it will cause a serious damage to the laser. The soft types of materials can be applied to contact the plate of output end, in order to seal the beam path so to protect the output lens.

3.1.2 The flatness and sufficient rigidity of the laser holder is essential to avoid the deformation of the laser, after installation. If the laser is to be operated under a vibrating working environment, it is better to equip the anti-vibration measures to the laser holder to avoid any negative effect on the laser beam path.

### 3.2 Front and Rear End Plates of RLT-150&RLT-180 series

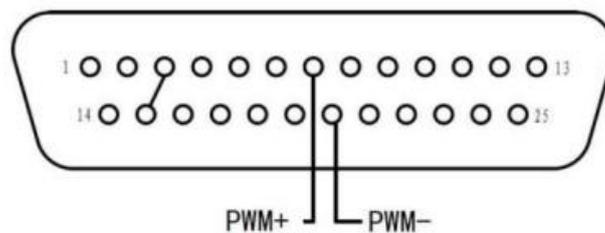
3.2.1 Laser front end plate: the hole with the circular through-hole, which contains the output mirror of the laser, from which the laser emits.

3.2.2 Laser rear end plate: There are the laser's power supply interfaces (48VDC+ and a 48VDC-), control signal DB25 interface, and water cooling interface.

### 3.3 Electrical Connection of Rear Panel

3.3.1 Power Supply Interface: Used to connect the 48V DC power supply for the laser. Connect the wire from the positive output of the 48V DC power supply to 48V+, and the wire from the negative output of the 48V DC power supply should be connected to the GND interface on the rear panel (i.e., connected to the laser chassis ground). The connecting wire between the power supply and the laser must be larger than 25mm<sup>2</sup>, and the positive and negative poles must not be reversed; otherwise, the laser will be damaged.

3.3.2 Control Signal DB25 Interface: The PWM+ signal is input through DB25 Pin7 on the rear panel of the laser, and the GND/PWM- signal is input through DB25 Pin20 on the rear panel of the laser. Pin3 and Pin15 are short-circuited.



### 3.4 Laser Control and Operation

3.4.1 Laser control process: RLT-150&RLT-180 series laser controls laser power output through pulse width modulation signal (PWM). The low-level voltage range of the PWM signal should be 0-0.5V (laser off); the high-level voltage range should be 3.5-5V (laser on). The laser power can be controlled by the PWM signal duty cycle. External control card provide the PWM signal. The PWM signal modulation frequency is 0-100KHz, and the duty cycle is 0-60%.

The Figure 1 shows a typical 0-5V PWM signal with adjustable duty cycle (or pulse width) and adjustable frequency:

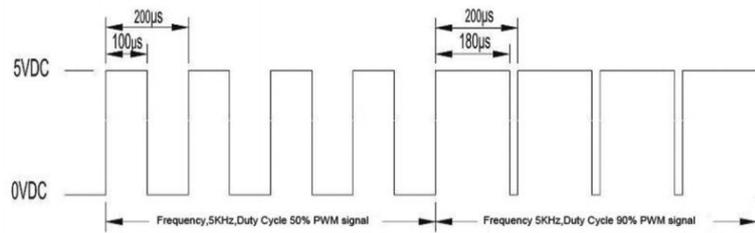


Figure 1.Schematic diagram of PWM modulation function realized by TTL control signal

3.4.2 Laser start-up operation: Turn on the 48V DC power supply, and the laser is in a standby state ready to output; at this time, input the TTL signal through the DB25 cable, and the laser starts to output laser. In the laser output process, the user can change the PWM modulation function by changing the TTL signal parameters, and obtain the required output indicators such as laser pulse width, repetition frequency and average power.

3.4.3 Laser shutdown steps: stop the TTL control signal input, the laser output stops, then turn off the 48V DC power supply.

#### 4. RLT-150&RLT-180 RF CO<sub>2</sub> lasers Specifications

Mode	RLT-150	RLT-180
Wavelength	10.6 μm	
Rated Power	≥150W	≥180W
Power Instability	≤±10%	
Beam QualityM <sup>2</sup>	<1.5	
Beam Size (1/ e <sup>2</sup> )	2.3±0.2mm	
Beam Divergence	<8mrad	
Polarization	Horizontal Linear Polarization, >100:1	
Modulation Frequency	0-100kHz	
Duty	0-60%	
Electrical Input	DC 48V/62A	
cooling method	Water Cooling	
Size(L*W*H)	977mm×90mm×171mm	
Weight	16.00kg	
Maximum Case Temperature	<50°C (122°F)	
Ambient Temperature at Work	<15~40°C (59-104°F)	
Humidity	Non-condensing	
Transportation and Storage Environments Temperature	-10~40°C (14~104°F)	

1) Output power measured at a laser temperature of 25°C.

Higher than 25°C, 1°C increase will cause output power deduction about 1%

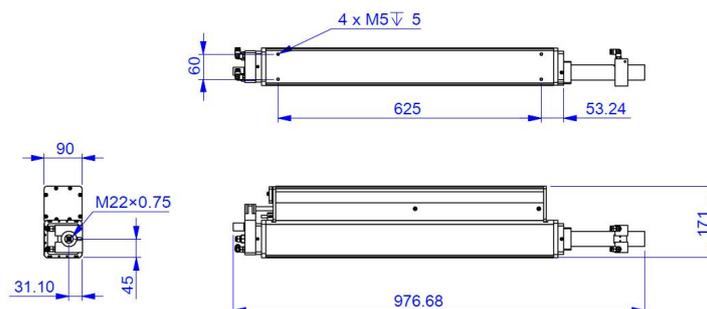
2) Stability Formular: Stability = ±(Pmax-Pmin)/(2Pmax)

Stability test conditions: In normal operating environment, preheat the laser for 5 minutes and constant control the duty cycle

## 5. Description of Control Signal Interface

Pin	Function	Description
pin1	Forward signal detection output	Predefined, unused
pin2	Reverse signal detection output	Predefined, unused
pin3	Laser enable	Laser enable, active low
pin4	TXD	Used internally with pin17 as a serial port
pin5	External serial communication RX	Predefined, unused
pin6	External serial communication TX	Predefined, unused
pin7	PWM (+)	TTL signal, active high
pin8	Laser activation output	Predefined, unused
pin9	Laser status indicator output	Predefined, unused
pin10	Temperature status indicator output	Predefined, unused
pin11	Voltage status indicator output	Predefined, unused
pin12	Laser activation output loop	Predefined, unused
pin13	485A	Predefined, unused
pin14	GND	Laser status indicator output loop
pin15	GND	Enable indicator output loop
pin16	GND	Voltage and temperature status indicator output loop
pin17	RXD	Used internally with pin4 as a serial port
pin18	GND	5V output loop
pin19	GND	Predefined, unused
pin20	PWM (-)	PWM signal (-)
pin21、22	NC	Predefined, unused
pin23、24	5V output	
pin25	485B	Status indicator output loop

## 6. RLT-150&RLT-180 Dimensional Drawing





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