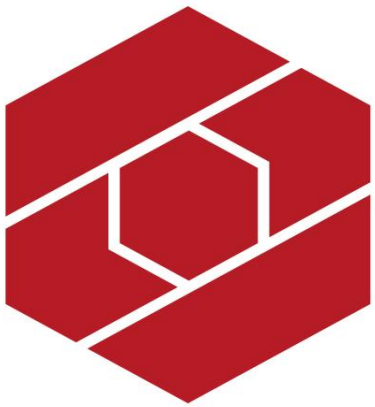
YFPN-300-GME-LR05071A

Pulsed Fiber Laser User Manual



GZTECH

Company Introduction

Wuhan Guangzhi Technology Co., Ltd. was established in May 2018 in Optics Valley of Wuhan. The Chairman, Dr. Huang Zhihua, is a graduate of Tsinghua University, and the founding team boasts profound expertise in theoretical design, technology development, and product engineering. The company specializes in the research and development, production, and sales of pulsed lasers, as well as offering laser process development and customized laser solutions. The products are primarily applied in fields such as new energy, hard and brittle material processing, surface marking, and cleaning. Based on fiber laser technology and solid-state laser technology, and integrating high-speed electronic control software and thermal control structure technology, the company has successively launched a series of industrial laser products including fiber MOPA, QCW, fiber infrared picosecond and green lasers, as well as solid-state nanosecond ultraviolet lasers. Additionally, it possesses OEM/ODM development capabilities for other special wavelength research and customization-type lasers.

GZTECH is named after a passage in *Mozi's Explanations of the Classics,* which reads, "Jing (shadow), when guang (light) arrives, jing vanishes; if guang exists, jing will never arise." The 21st century is the Photonics Century, and GZTECH is dedicated to illuminating traditional manufacturing fields by utilizing advanced laser technology, thereby creating incremental value for society.

GZTECH is headquartered in Wuhan, with sales and service centers established in Shenzhen, Suzhou, and Jinan, as well as a Foreign Trade Department responsible for overseas business. Guided by the mission of "Promoting lasers to be a fundamental productivity tool in intelligent manufacturing", GZTECH is committed to relentless technological innovation and continuous improvement of laser performance, aiming to make lasers a fundamental productivity tool in the field of future intelligent manufacturing.

GZTECH will proceed with utmost sincerity on the path to long-term success, growing and developing together with customers.

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Chapter 1 Safety Information

1. Safety warning signs and classifications

The following safety warning sign requirements must be strictly observed during the operation of lasers:

Sign type	Descriptions and requirements
	**Warning:** There is potential harm to the human body, and operations must be carried out following established procedures. Violation may result in personal injury. During operation: It is mandatory to wear qualified protective glasses at all times; direct viewing of or exposing skin to the laser beam is strictly prohibited.
	**Attention:** There is potential harm to the equipment, and operations must be carried out following established procedures. Violation may result in equipment damage. During operation: Avoid touching optical lenses or high-precision components; ensure that grounding and power supply meet specifications.
	**Caution laser:** This sign is posted at the laser output port. It indicates the presence of Class IV visible light, invisible light, and ultraviolet radiation from the laser. Direct exposure can cause permanent retinal damage.

2. Laser safety protection requirements

Laser Class: GME series lasers all belong to Class IV lasers (with power greater than 500mw). In China, they are also classified as Class 4 according to GB 7247.1-2012.

Protective equipment: Specialized protective glasses that shield against 1060nm wavelength laser must be selected and worn throughout the entire operation process.

Operation prohibitions: Direct contact with the laser output head or mirror-reflected areas is prohibited; installing cameras or optical instruments while the laser is in operation is prohibited; disassembling the enclosure or adjusting internal components without powering off is prohibited.

3. General safety regulations

Mirror reflection risk: Secondary radiation may be generated after the main laser beam is reflected by a flat surface. Although the energy is relatively low, it may still cause damage to the eyes or material surfaces. It is necessary to avoid the reflection path during operation.

Key points for optical operation: When the laser is activated, do not look directly into the laser-emitting aperture; avoid aligning optical devices with the eyes at the same horizontal level; only use specialized polished glass paper for cleaning lenses, and cover them with protective caps after operation.

Electrical safety: When wiring, strictly follow the electrical instructions. Poor grounding may lead to electric shock or equipment damage. Regularly check the electrical circuits.

4. Operating environment and maintenance

Environmental requirements: Temperature: 10°C - 35°C; Humidity: 20% - 70% (no condensation). The equipment must be placed inside a ventilated and dust-proof cabinet, away from high-temperature or humid environments. The cooling fan should be kept at a distance of 5 cm or more from obstacles to ensure unobstructed airflow.

Daily maintenance: Do not collide with the scanning table or optical components. In case of a malfunction, shut down the equipment immediately and contact professional personnel. Regularly clean the dust from the equipment surface and keep the work area clean and tidy.

5. Protection commitments and government-required safety assurances

Please read this manual thoroughly and sign the safety confirmation form before operation. Improper operation may lead to irreversible consequences! Although the laser itself is safe, necessary protective measures still need to be taken during use. Both equipment manufacturers and end-users should strictly adhere to laser safety standards, which is a fundamental prerequisite for ensuring safe production. In usage situations, it is imperative to commit to installing laser protection devices with isolation and blocking functions, even when the laser is in an activated state. Relevant safety requirements can be referred to in the national standard GB 7274.1-2012.

Chapter 2 Product Introduction

GME series products are MOPA (Master Oscillator Power Amplifier) pulsed fiber lasers, offering optional power outputs ranging from 20W to 500W. They feature adjustable pulse frequency, adjustable pulse width, high beam quality, high pulse energy, compact structure, high electro-optical efficiency, and stable and reliable performance. By optimizing cost design, these lasers achieve a higher cost-effectiveness. They can meet the conventional processing needs (such as marking and welding) of industries including 3C electronics, new energy, and lithium battery. Compliant with international certification standards such as FCC, CE, and RoHS, they are suitable for users with limited budgets but requiring stability and basic functionalities.

1. Product usage

Preparation before startup: Check whether the appearance of the laser is abnormal, whether the casing is dented, and whether the output armored cable is bent, detached, or damaged. Remove the dust cap and inspect the lens for cleanliness. If it is dirty, wipe it clean with alcohol and a clean cloth. Fix the laser on a bracket, ensuring good ventilation for the laser. Connect the power cable to a 24V or 48V DC constant voltage power supply, or to a 220V AC power source, and ensure that the power supply can provide sufficient output power. Refer to the power interface definitions, incorrect power connection methods may cause the laser to burn out. Remember that 24V, 48V, and AC voltages are not interchangeable. Connect the signal cable between the equipment and the laser, and check that it is properly locked.

2. Operating steps

Preparation before startup: Turn on the equipment power supply and the laser power supply. After the laser power supply is energized, the fan will rotate at full speed to confirm that the laser is powered normally. After approximately 10 seconds, the fan speed will adjust according to the ambient temperature and the laser’s power. After starting up the equipment, check the status of the laser.

Taking a marking machine as an example: Once the marking machine starts up normally, for the initial test of the laser, first set the marking machine power to 0%. Then, draw a simple pattern in the marking machine software, drive the laser to mark, and observe the laser output using a frequency-doubling filter. If the output is normal, stop marking, increase the marking power in the marking machine software settings, and then drive the laser to mark again. Repeat this process. When the laser is operating normally, you can observe through the frequency-doubling filter that the corresponding laser output becomes stronger, and the corresponding marking effect also improves. Otherwise, shut down the equipment for inspection and proceed with subsequent operations only after everything is confirmed to be normal.

3. Configuration list

Name	Quantity	Unit
Pulsed fiber laser	1	Set
Test report	1	Sheet
Laser user manual	1	Piece

4. Optical characteristics

No.	Characteristics	Parameter value	Unit
1	Central wavelength	1060 - 1080	nm
2	Spectral width @3dB	< 20	nm
3	Maximum pulse energy	1.5	mJ
4	Output power	300	W
5	Power adjustment range	0 - 100	%
6	Frequency adjustment range	1 - 2000	kHz
7	Laser switching ON/OFF time	< 20	μs
8	Pulse width	50 - 500	ns
9	Output power instability	< 5	%
10	Beam quality M^2	< 1.8	/
11	Polarization direction	Random	/

12	Anti-high reflection	Yes	/
13	Indicator red light	0.3 - 2	mW
14	Collimated beam diameter (4σ)	6 - 8	mm
15	Delivery cable length	5	m

5. Electrical characteristics

No.	Characteristics	Parameter value	Unit
1	Power supply voltage	48	VDC
2	Working current	< 24	A
3	Power consumption	< 1152	W
4	Recommended power supply	> 1500	W

6. Environmental requirements

No.	Characteristics	Parameter value	Unit
1	Operating temperature	0 - 40	℃
2	Storage temperature	-10 - 60	℃
3	Cooling method	Air cooling	/

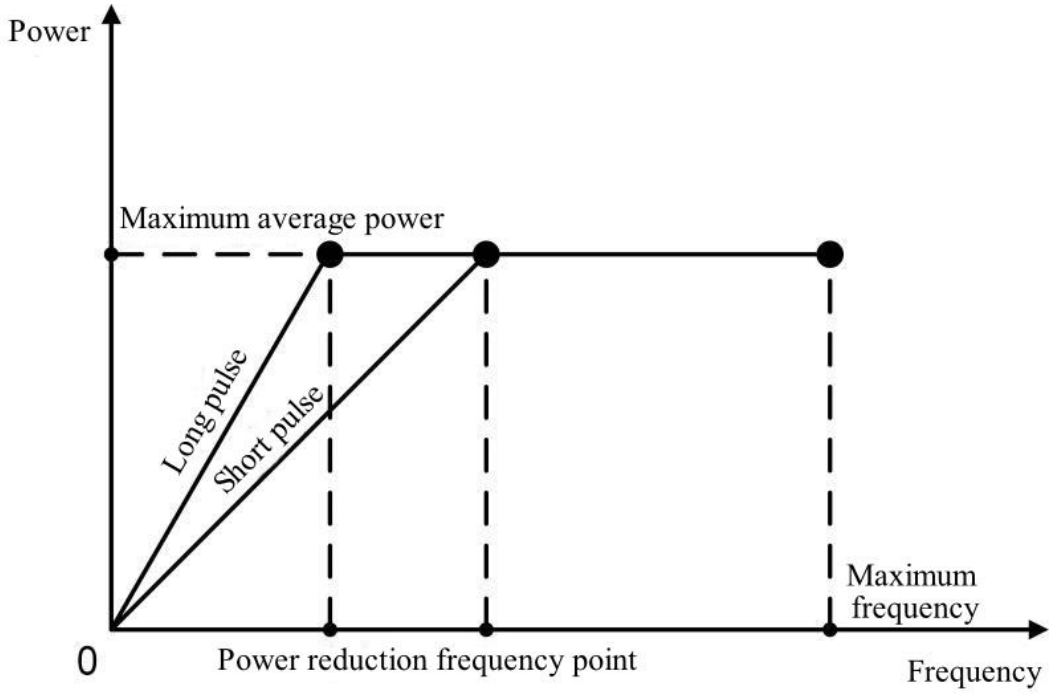
7. Structural characteristics

No.	Characteristics	Parameter value	Unit
1	Laser dimension	351*360*135	mm^3
2	Isolator dimension	255*50*50 (105*Φ35)	mm^3
3	Net weight	21.0	kg

8. The pulse width corresponds to the power reduction frequency point and the maximum single pulse energy

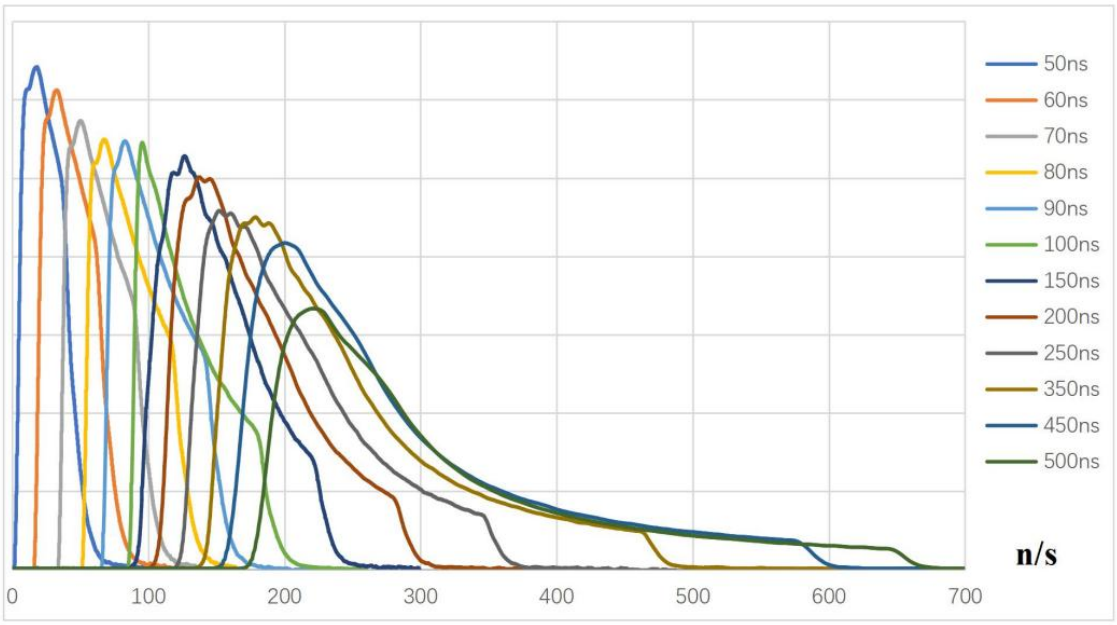
No.	Pulse width (ns)	Power reduction frequency (kHz)	Upper frequency limit (kHz)	Max single pulse energy (mJ)
1	CW	/	/	/
2	50	1070	2000	0.28
3	60	940	2000	0.32
4	70	860	2000	0.35
5	80	770	2000	0.39
6	90	650	1000	0.46
7	100	600	1000	0.50
8	150	390	1000	0.77

9	200	275	1000	1.09
10	250	230	600	1.30
11	350	200	600	1.50
12	450	200	600	1.50
13	500	200	500	1.50

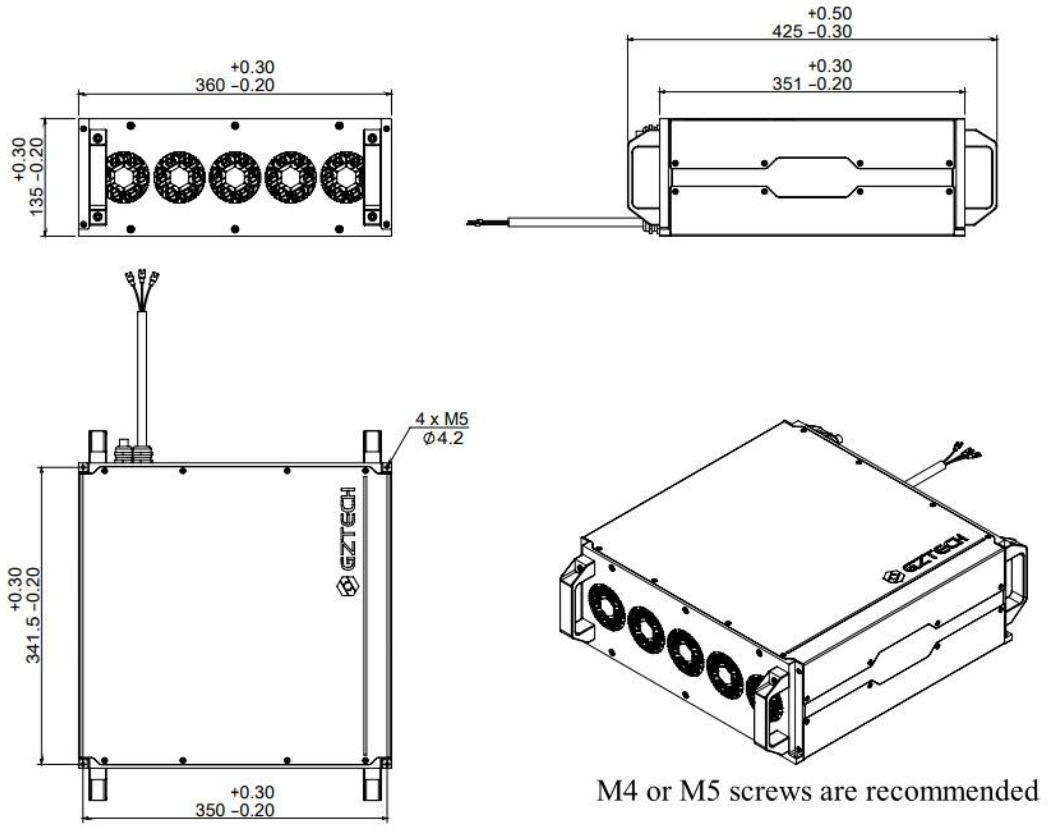


The relationship between laser output power and frequency

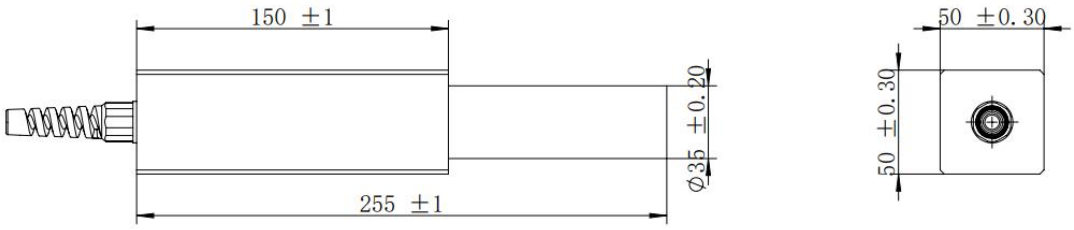
9. Pulse width waveform



10. Dimension



Laser dimension

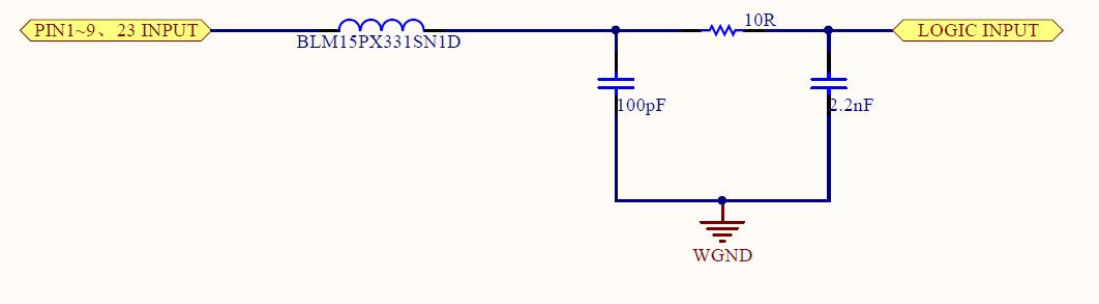


Isolator dimension

Chapter 3 Laser Interface Description

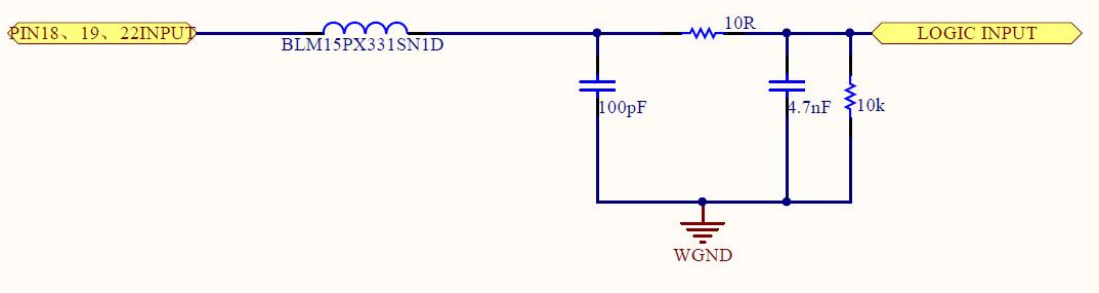
1. Electrical input-output characteristics

DB25 interface for digital signal input



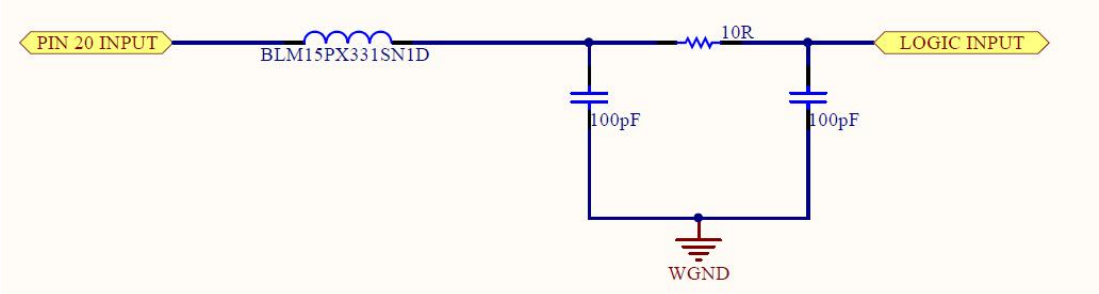
Maximum input voltage: 5.5V; Minimum operating input current: 8mA

Pin 1–9 and Pin 23 Input



Maximum input voltage: 5.5V

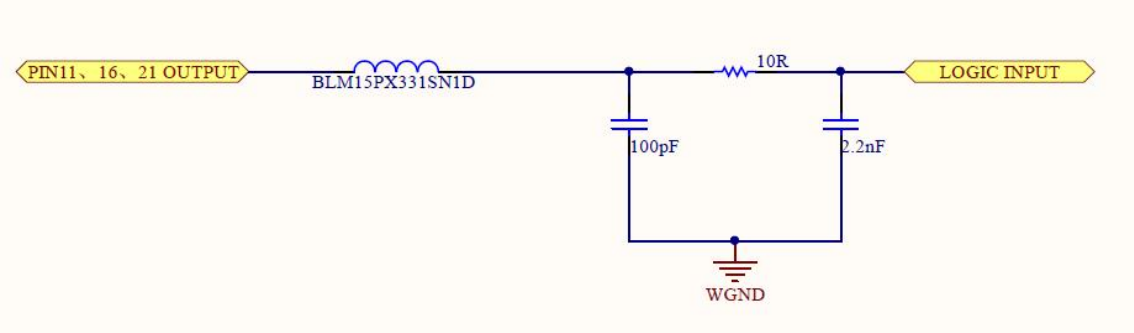
Pin 18, Pin 19, and Pin 22 Input



Maximum input voltage: 5.5V; Minimum operating input current: 8mA

Pin 20 Input

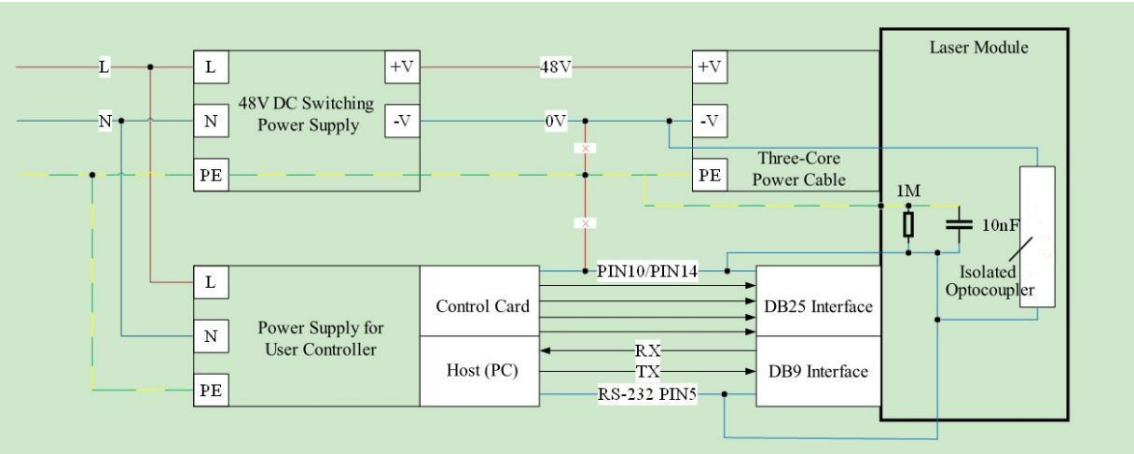
DB25 interface for digital signal output



Pin 11, Pin 16, and Pin 21 Output

Maximum output: 5V; Maximum output driving current: 10mA

2. Electrical connection diagram



3. Power interface definitions

The definitions for the laser power interface are shown in the following table:

Table 1 Power interface definitions

Line ID	Color	Definition
PE / GND	Yellow-green	Grounding
0 V	Blue	48V-, negative pole
+48 V	Brown	48V+, main power supply 48V

4. DB9 interface definitions

The definitions for the DB9 interface are shown in the following table:

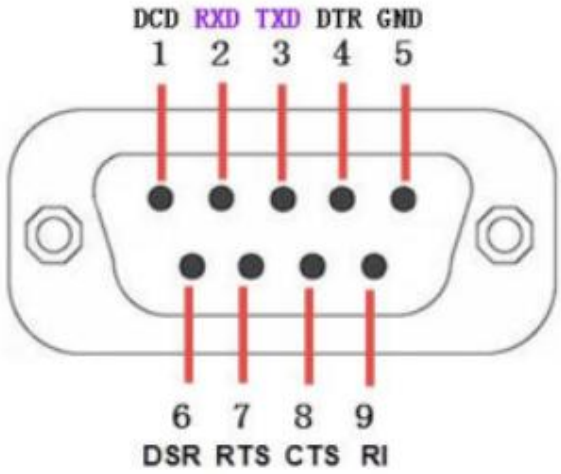


Table 2 DB9 interface definitions

Pin	Definition
1,4,6-9	No connection
2	RXD
3	TXD
5	GND

5. DB25 interface definitions

The definitions for the DB25 interface are shown as follows:

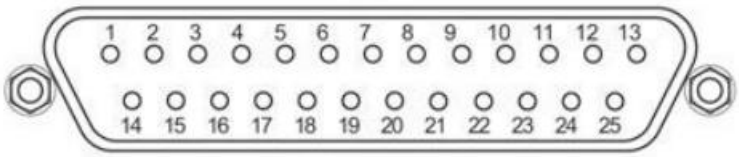


Table 3 DB25 interface definitions

Pin	Definition	Note
1-8	Power setting, 8-bit bus, with pins 1-8 corresponding to data bits D0…D7. A value ranging from 0 to 255 represents the power from minimum to maximum.	Input with isolation
9	Power latch signal, active on the rising edge.	Input with isolation

10,14	GND	
11,16,21	Alarm status	Output with isolation
18	EE signal - Pre-amplifier switch control signal, active at high level. High level is greater than 3.5V. Low level is either unconnected or less than 0.8V.	Input with isolation
19	EM signal - Optical switch control signal, active at high level. High level is greater than 3.5V. Low level is either unconnected or less than 0.8V.	Input with isolation
20	PRR synchronous pulse control signal	Input with isolation
22	Red light indication control signal	Input with isolation
23	Emergency stop control signal	Input with isolation
12,13,15, 17,24,25	Reserved	

Remarks: For DB25 signals, the high-level range is greater than 3.5V and less than 5.4V; the low-level is less than 0.8V. If DB25 control is used with standard marking software, set the laser type to “Fiber” in the parameter settings, and the Fiber type should be “IPG_YLPM (for EZCAD2)” or “GZ_YFPN (for EZCAD3)”.

The laser output control via DB25 is illustrated as shown in the following figure:

Figure 1 DB25 control timing

T1 is the pump charging time, which is greater than 8ms. Under the condition where EE is active and EM is inactive, there is laser leakage from the laser.

T2 is the delay between the EM signal and the PRR, generated by the control card.

If PRR leads the EM signal by 3 cycles, the external frequency locking mode should be selected. If PRR does not lead the EM signal by 3 cycles, the internal frequency locking mode should be selected.

T3 just needs to be greater than 0.

T4 is the delay time between the PRR frequency signal and the laser output, which ranges from 0 to 50 microseconds depending on the pulse width.

The laser output always follows the PRR signal, with a delay of T4 in between.

At the start of each laser emission (or marking process), EE becomes active first, and after a delay of approximately 8ms, the EM signal becomes active, at which point the laser outputs laser. If there is a need to turn off the laser midway (<1 ms), EM can be made inactive, at which point the laser outputs 0~100 mW (depending on power, mode, and simmer settings). After each processing is completed, the EM and EE signals can be turned off, and the laser will have no laser leakage output.

The PRR signal has a minimum frequency of 1 kHz and a maximum frequency corresponding to the maximum frequency of the pulse width. When PRR is below this frequency, the laser automatically outputs at 1 kHz. When it is above the maximum frequency of the pulse width, it automatically outputs at the maximum frequency.

In the power latch mode, when there is a change at pins 1-8 and subsequently a rising edge occurs at pin 9, the laser output power will change within 10~300 microseconds; pins 1-8 represent values from 0 to 255, corresponding to output power ranging from 0% to 100%. In the power tracking mode, when there is a change at pins 1-8 (with pin 9 being ignored), the laser output power will also change within 10~300 microseconds.

Table 4 Laser status output table

The status of Pin11, Pin16, and Pin21 is as follows:			
Pin11	Pin16	Pin21	Status description
LOW	LOW	LOW	Temperature alarm, laser temperature exceeds operating range.
HIGH	LOW	LOW	Power supply abnormality
LOW	LOW	HIGH	Normal operation
HIGH	LOW	HIGH	Laser self-checking in progress, not ready
LOW	HIGH	LOW	Anti-laser alarm
HIGH	HIGH	LOW	Reserved
LOW	HIGH	HIGH	System failure
HIGH	HIGH	HIGH	Reserved

Chapter 4 GUI Laser Control Software User Manual

1. Installation of USB serial port driver

Run PL2303_Prolific_DriverInstaller_v1.12.0.exe. Install it using the default method.

As shown in the following image(s):

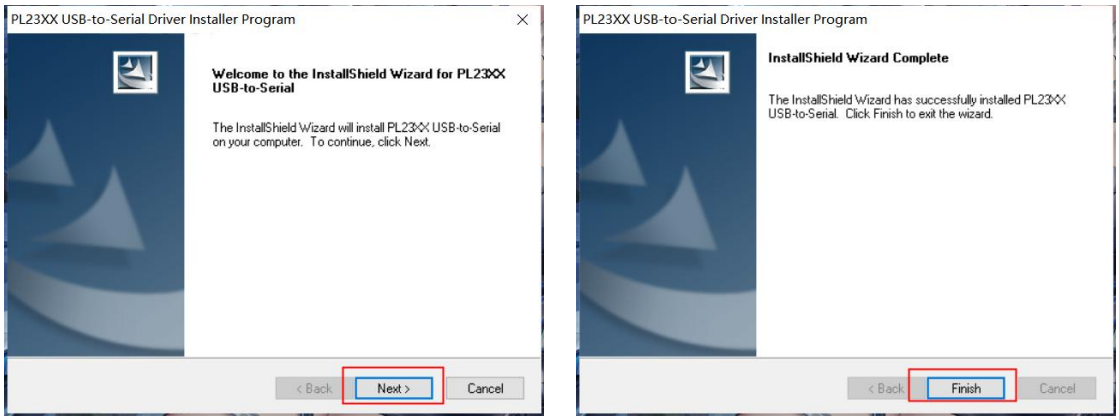


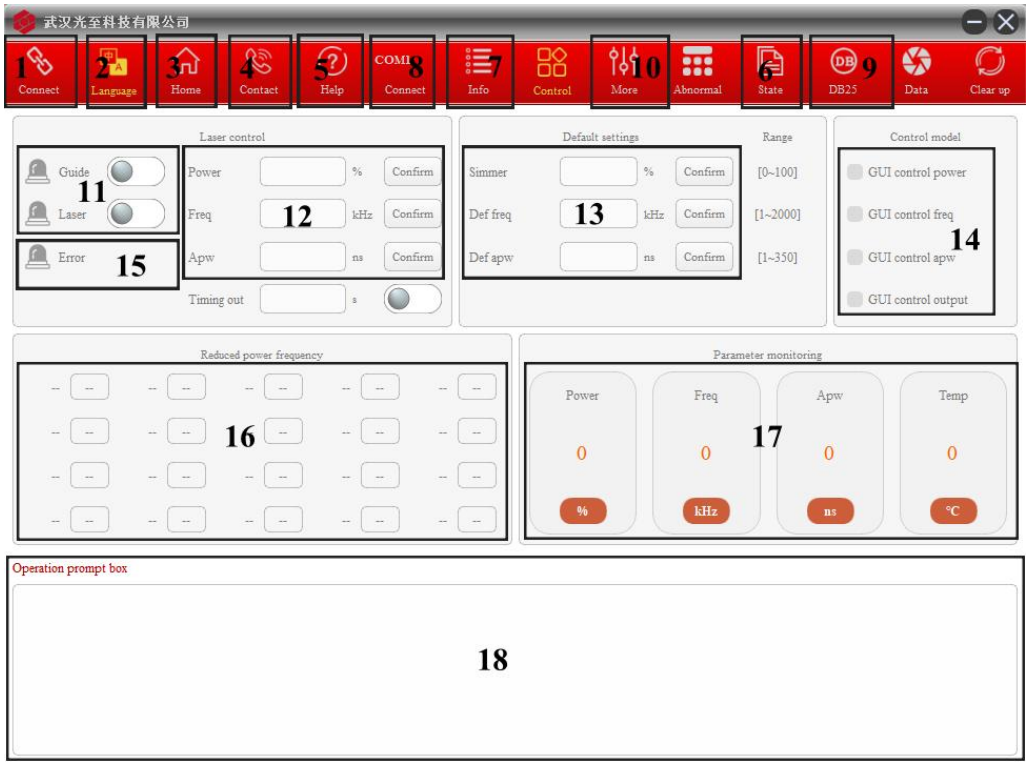
Figure 2 USB to RS232 driver installation

After the installation is completed, connect the computer and the laser using a serial cable and check the serial port number. Open Device Manager, as shown in the following image(s):

Figure 3 Serial port number inquiry

2. GUI interface description

As shown in Figure 4, it is the initial interface of the GUI.



"Auto Connect" button: No need to select a serial port. After successful connection, it displays "Disconnect". (Both icon and text are applicable)

"Home" button: Click to open the homepage of our company's official website. (Both icon and text are applicable)

"Contact" button: Click to open the "Contact Us" page of our company's official website. (Both icon and text are applicable)

Status information: After the laser alarm, this area displays the specific alarm module. (Icon only)

"Help" button: Click to open the documentation page of our company's official website. (Both icon and text are applicable)

Laser's SN (Serial Number), PN (Part Number), and program version. (Both icon and text are applicable)

"Manual Connect" button: Retains the connection method of manually selecting a serial port.

"More" modules: Newly added features.

"Red light"/"Laser" buttons.

Frequency, Power, and Pulse width inputs. (Activated by pressing the Enter key)

First pulse height (Simmer), Default frequency, and Default pulse width. (Activated by pressing the Enter key)

Control mode switch.

Error alarm light: Green indicates normal operation; if red, it indicates an error in the laser.

Power reduction frequency points: Up to 20 can be displayed; if more than 20, only the first 20 are shown.

Real-time frequency, Pulse width, Power, and Temperature.

Prompt information: Used to confirm whether the operation was successfully executed.

Version information, Laser type (regular or trial machine), and System time.

3. GUI software connection

Double-click to open “GZTECH MOPA Laser Control Software V3.0” (Software upgrades will not be notified separately; please check the company website for document downloads). Click the “Connect” button (either the automatic connection in Box 1 or the manual connection in Box 8 in Figure 4), and the laser will start connecting. A progress bar will pop up as shown in Figure 5 below. You just need to wait for the progress bar to complete. The “Operation Prompt” in Box 18 in Figure 4 will display “Connection Successful!” Once done, and the serial port drop-down menu on the manual connection button will show the currently connected serial port. The two connection buttons can be opened and closed interchangeably. The automatic connection will display a progress bar, while both successful and failed manual connections will trigger a pop-up notification.

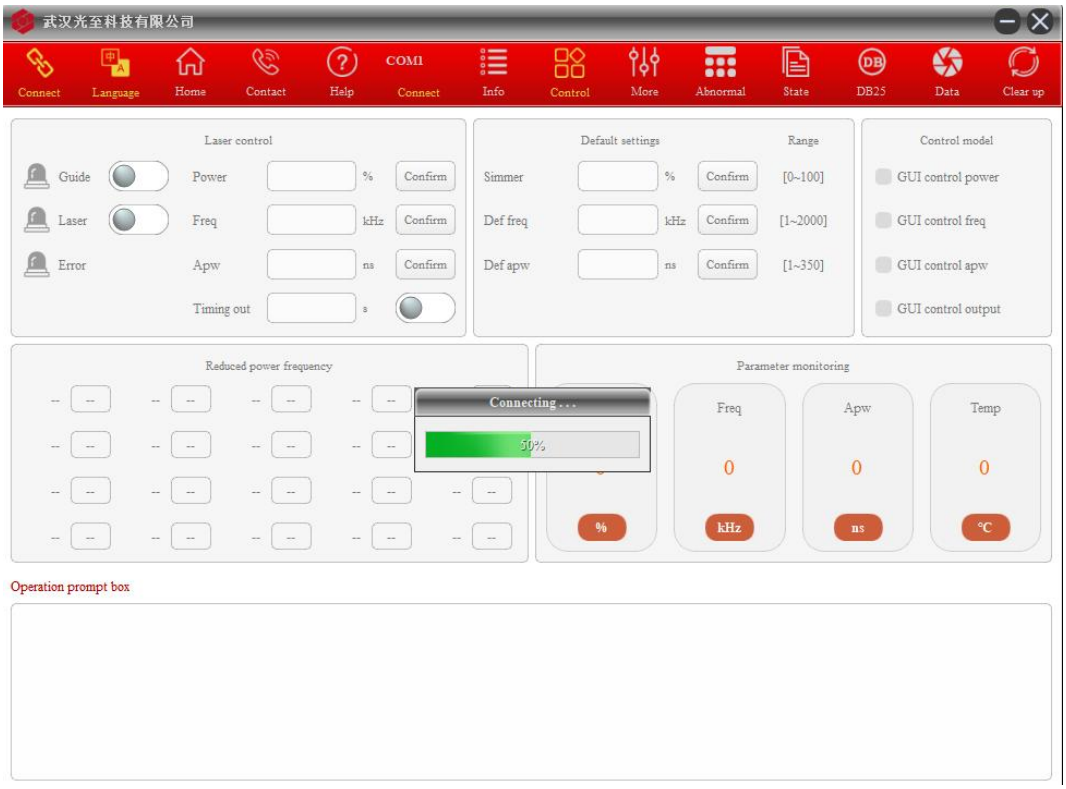


Figure 5 Laser in the process of automatic connection

4. Troubleshooting GUI connection failures

The serial port driver was not installed successfully.

The laser is not powered on.

The serial port cable is not connected to the laser.

The serial port cable is occupied by other software.

Connecting within 30 seconds after the laser is powered on may cause the connection to fail. It is recommended to wait for 30 seconds after powering on before connecting.

The serial port is unresponsive (frozen). Reinsert the serial port or restart the computer.

When connecting the computer to the serial port, there is a chance that the Device Manager will not refresh the serial port status, indicating that the serial port is unresponsive (frozen). If reinserting the cable still does not refresh the status, it is recommended to restart the computer.

5. Mode selection

The laser mode can be controlled via either DB25 or GUI (DB9). It is possible to have some parts controlled via DB9, while others are controlled via DB25. The interface is shown in Figure 6 below.

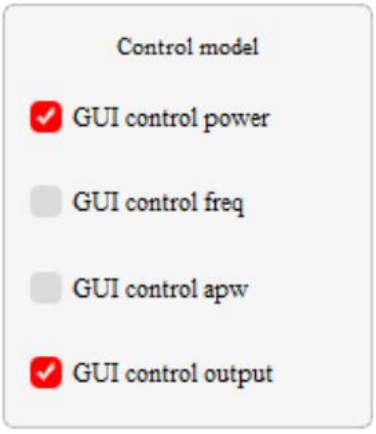


Figure 6 Control mode

Only after selecting the mode control can the GUI modify parameters such as power, frequency, pulse width, and control the laser on/off function.

The laser is factory-set to control pulse width, power, frequency, and laser on/off function via DB25, meaning none of the above options are selected by default.

The default pulse width, default frequency, and simmer settings of the laser take effect immediately after modification, regardless of the control mode.

The laser is set to DB25 control by default. Selecting the GUI option only ensures control during the current session. If GUI control of a parameter needs to be maintained after shutdown, it becomes effective after selecting “More”→ “Interface Mode Selection” → “Custom Mode”.

GUI control of pulse width refers to whether the laser pulse width setting is configured via DB25 or GUI; selecting it means GUI control, otherwise, it is DB25 control.

GUI control of power refers to whether the laser power setting is configured via DB25 or GUI; selecting it means GUI control, otherwise, it is DB25 control. Under DB25 control, the EZCAD software can optimize power linearity. Please refer to the control card manual for details.

GUI control of frequency refers to whether the laser frequency setting is configured via DB25 or GUI; selecting it means GUI control, otherwise, it is DB25 control. Under DB25 control, the EZCAD software imposes range limitations. Please refer to the control card manual for details.

GUI control of laser on/off function refers to whether the laser output setting is configured via DB25 or GUI; selecting it means GUI control, otherwise, it is DB25 control.

6. Operation and feedback

After the laser is connected and powered on, a dialog box displaying the connection progress will pop up. Once the connection is complete, all operations performed on the laser will be displayed in the “Operation Prompt” section, and the laser will provide feedback in the “Operation Prompt” to indicate whether the operation was executed correctly. Please refer to the prompt information after setting parameters to ensure that the laser executes the operations correctly!

In Figure 4, Box 11 contains the buttons for turning on/off the red light and laser. When the red light or laser is turned on, the corresponding indicator light changes from off (black) to on (green). When the red light or laser is turned off, the indicator light changes from on (green) to off (black). It should be noted that to turn on the laser using the GUI, you must first select Box 14 labeled “GUI Control Laser On/Off” in Figure 4.

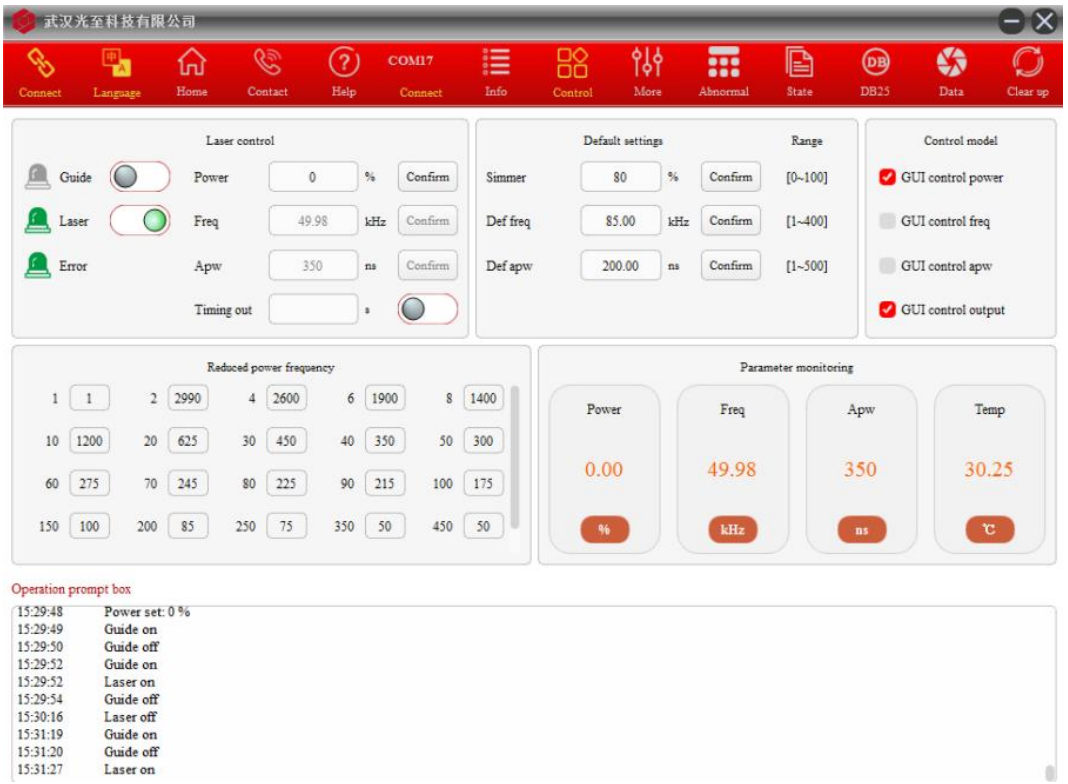


Figure 7 Example of laser on/off operation

Chapter 5 Troubleshooting Guide for Common Product Issues

1. Common product issues and solutions

Table 5 Troubleshooting table for common issues

Issue No.	Issue Description	Solutions
1	Fan not rotating after laser power-on	1) Check if the power connection is normal; 2) Replace the power supply.
2	Abnormal noise from the laser	1) Ensure that the noise is coming from the laser fan, not from other devices; 2) Check for foreign objects on the rear cover of the laser; 3) Check if the abnormal noise is due to improper installation of the laser.
3	No laser emitting	1) Ensure that the laser fan is functioning normally and that there are no obstructions in the optical path; 2) Ensure that the hardware connections are normal, including DB9 or DB25 connections; Ensure that the input voltage is normal; 3) Confirm that the software settings are correct. For marking machines, select “Fiber” and the type as “IPG_YLPM” (for EZCAD2) or “GZ-YFPN” (for EZCAD3); Check if the software is raising any alarms; 4) Connect to our company’s “GUI” software to control the laser to emit laser. If it does not emit laser, an alarm message will be displayed.

4	Low laser power	1) Check if the laser parameters are set correctly; 2) Check if the power meter is functioning properly for testing; 3) Check if the output head of the laser is contaminated; 4) Use our company's "GUI" software to control the laser to emit laser and test the power.
5	Abnormal laser spot	1) Observe if the lens on the output head of the laser is clean and undamaged while the laser is powered off; 2) Check if the lenses on the marking machine are normal.
6	Reduced marking capability	1) Determine if the laser parameters are appropriate; it is recommended to use 200ns and a power reduction frequency point; 2) Check the status of the marking machine table, adjust the lifting rod, check if the laser spot is blocked, if the output spot is circular, and if the galvanometer, field lens, and red light beam combiner mirrors are contaminated; 3) Check if the output power of the laser is normal.
7	Laser parameters not adjustable	1) Check if this model is an adjustable parameter model; 2) Use our company's GUI software for control; if it can be controlled, check if the DB25 cable is normal; Check if the DB25 cable is normal and replace it if necessary; 3) If the above methods do not resolve the issue, please contact our company's technical personnel.

8	No “Pulse width” adjustment option in the marking machine software	1) Please select the correct control method, choose “Fiber” and “IPG_YLPM” (for EZCAD2) or “GZ-YFPN” (for EZCAD3). 2) Please confirm that this model is an adjustable model.

If the above solutions do not resolve the issue, please contact our company’s after-sales personnel.

Chapter 6 Warranty Statement

Damage to personnel or equipment caused by failure to operate in accordance with this manual is not covered by the warranty;

Users are prohibited from disassembling or assembling the equipment by themselves, and repairs must be carried out by authorized technicians from GZTECH.

Do not open the laser. If you encounter any malfunctions or have questions, please contact Wuhan Guangzhi Technology Co., Ltd. If the label is torn off or damaged, the company will not provide a warranty.

Warranty Terms for Fiber Laser Products: The free warranty period for fiber lasers starts from the date of the sales contract and varies from 24 months to 36 months depending on the model, with the specific period subject to the contract agreement;

Warranty Terms for Solid-State Laser Products: The free warranty period for solid-state lasers starts from the date of the sales contract and is 18 months, with the specific period subject to the contract agreement. For wear-and-tear components exposed to the user's operating environment, including beam expanders and window mirrors, the warranty period is 6 months.

Extended Warranty Service: After the laser warranty expires, to ensure post-sales service quality, customers can purchase extended warranty services. For specific pricing, please consult the business department.

Remote Service: For laser malfunction issues, please call our after-sales service hotline tel: 400-863-9698. We promise to respond within 24 hours.

Appendix

1. Appendix 1: User manual for serial port and character stream protocol

Interface definition:

The DB9 interface definitions are as shown in the following table.

The RS232 interface type is DB9 male connector. The specific pin definitions are as listed below. When connecting to a computer, a crossover cable is required.

Table 6 DB9 interface definitions

Pin	Definition	I/O Characteristic	Electrostatic Discharge (ESD) Protection Level
1,4,6-9	No connection	--	--
2	RXD	Input	3B
3	TXD	Output	3B
5	GND	--	--

Serial Communication Settings

Baud Rate: 115200

Data Bits: 8 bits

Stop Bits: 1 bit

Parity Bits: None

Character Stream Protocol

Table 7 Protocol format

Command (in lowercase)	Space	Parameter	New line
'string'	''	'xxx'	'\n'

Example: To set the repetition rate to 100kHz; send: 'freq100\n';

The laser will return 'freq:100(kHz)\n' within 50ms;

If 'Inputinstructionerror:100\n' is received, it indicates a setting error.

Laser Parameter List

Table 8 Laser command parameter table

Command	Parameter	Remarks	Data type
freq	Sets PRR (Pulse Repetition Rate), only valid when PRR control is set to serial port.	kHz	int
apw	Sets pulse width, only valid when pulse width control is set to serial port.	ns	int
pwsw	Sets pulse width control 0 – DB25 control 1 – Serial port control	--	int

gtpsw	Sets frequency 0 – DB25 control 1 – Serial port control	--	int
pp	Sets power percentage, only valid when power control is set to serial port.	Percentage 0~100	int
out	Sets laser output, only valid when output control is set to serial port. 0 – Turn off output 1 – Turn on output	--	int
outputsw	Sets output control 0 – DB25 control 1 – Serial port control	--	int
powersw	Sets power percentage control 0 – DB25 control 1 – DB9 control	--	int
guide	Sets red light 0 – Turn off output 1 – Turn on output	--	int

cnmode	0 – Normal mode: After power-off, PRR, pulse width, power percentage, and output control modes switch to DB25 control; 1 – Custom mode: PRR, pulse width, power percentage, and output control modes can be saved.	Not lost after power-off	int
getstatus	0 – Reads current real-time frequency, pulse width, and power		int
modbus	Lost after power-off, character stream protocol; Lost after power-off, modbus protocol; 207 – Not lost after power-off, character stream protocol; 208 – Not lost after power-off, modbus protocol		

Operation Procedure:

Send pre-control commands: “print0\n”, “uartfeedback0\n”

Wait for self-check to complete; approximately 18 seconds.

Control the pulse repetition rate (PRR) via the serial port by sending the command “gtpsw1\n”, then set the PRR, for example, “freq100\n” (set PRR to 100kHz).

Control the pulse width via the serial port by sending the command “pwsw1\n”, then set the pulse width, for example, “apw100\n” (set pulse width to 100ns).

Control the power percentage via the serial port by sending the command “powersw1\n”, then set the power percentage, for example, “pp10\n” (set power to 10%).

Control the laser output via the serial port by sending the command “outputsw1\n”, then turn on the output, for example, “out1\n” (turn on laser output).

After power-off, the following four controls will automatically switch to DB25 control. (If you need to save the control state, please send the command “cnmode1\n”).

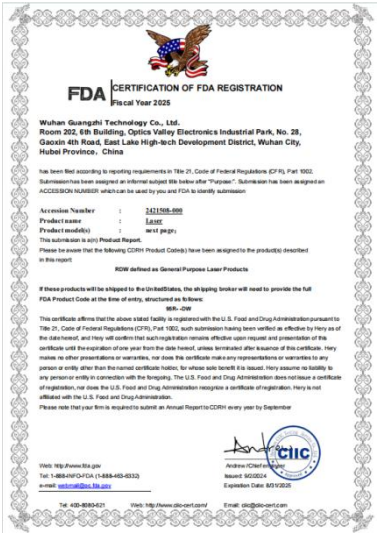
Note: We can also set the serial communication to control the laser parameters through MODBUS protocol. Please contact us if you need.

2. Appendix 2: Certificates

RoHS Certification

FCC Certification

FDA Certification



CE Certification

For more detailed certification source documents,

please visit GZTECH official website: https://en.gzlasertech.com/