

OPERATION MANUAL



YLLS Series CW Fiber Laser

Model: YLLS-3000-W, YLLS-Plus-3000-W



Document V1.3 20200624
Copyright © GW LaserTech, All Rights Reserved

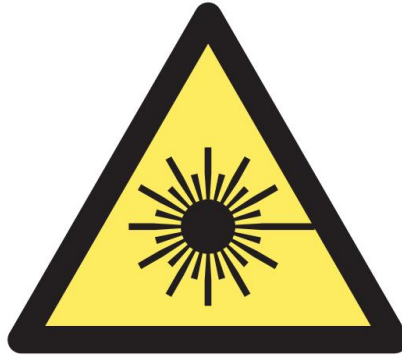
Before using this product, please read the user manual carefully and familiarize yourself with the relevant content we have compiled for you. Please keep the product manual together with the product to provide you and all other users with operational, safety, and other important information at all times.

Note

We reserve the right to change the information in this manual without prior notice. GW (Shanghai) Laser Technology Co., Ltd. believes that the information provided in this manual is accurate and reliable, but GW (Shanghai) Laser Technology Co., Ltd. does not undertake any warranties with respect to the content of this manual, including (but not limited to) the implied warranties of merchantability and applicability. In addition, GW (Shanghai) Laser Technology Co., Ltd. will not be liable for any patent infringement or other damage to the rights and interests of third parties resulting from the use of the contents of this manual. GW (Shanghai) Laser Technology Co., Ltd. will not be responsible for any wrong information in this manual. GW (Shanghai) Laser Technology Co., Ltd. (Hereinafter referred to as “GW Laser”) shall not be liable for any accidental or indirect consequences arising from the provision, implementation or use of this manual.

Direct or indirect use of the information and contents provided in this manual does not mean that GW Laser grants any patent or other intellectual property rights.

Copyright © 2015-2019 GW LaserTech, All Rights Reserved. Except as permitted by applicable copyright laws, the content of this manual may not be reproduced, transmitted, stored in retrieval system or adapted for publication in any form or by any means without prior written authorization by GW Laser.

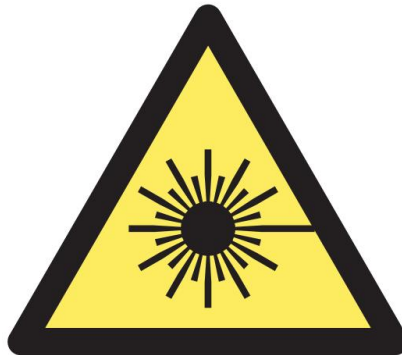


YLLS Fiber Laser is the Class 4 laser product.

This product emits an invisible laser of up to 3000W with a wavelength between 900nm and 1100nm.

Avoid eye and skin direct exposure to the output laser or scattered radiation.

Do not turn on the laser. As there is not product parts or accessories to be used by the users provided inside the laser. All maintenance and repair of the products can only be carried out by the service personnel authorized by GW Laser.



Safety Information

Safety Convention

We will use different words and characters to remind you of a variety of potential hazards and important information, including:

WARNING

Be applicable to a variety of potential personal injuries. This signal reminds you that you need to follow the specified use methods or steps to use, and if you do not follow the prompts to operate correctly, it may cause personal injury to yourself or others. If you do not fully understand and meet the required conditions, do not negotiate the WARNING symbol to continue to the next step.

CAUTION

Be applicable to potential product damage. The signal reminds you that you need to follow the specified use methods or steps. If you do not follow the prompts to operate correctly, it may cause damage to the product or parts. If you do not fully understand and meet the required conditions, do not negotiate the CAUTION symbol to continue to the next step.

IMPORTANT

Various information about the usage of this product. Please do not ignore this information.



This symbol represents laser radiation. This symbol appears on products with laser output.

Safety Guidance

In order to ensure safe operation and optimize the operational performance of this product, please strictly comply with the following WARNINGS and CAUTIONs, as well as other information contained in this manual.

WARNING: When using this product, make sure to use the appropriate ground power supply.

WARNING: Any parts inside this product are not allowed to be opened by the user for maintenance. If necessary, please contact GW Laser technicians for maintenance services. Any unauthorized alteration to this product will void the warranty.

WARNING: The output connector of this product is connected by optical fiber cable and the laser. Please use the output connector with care.

WARNING: If this product is used in a manner not specified in this document, the protection provided by the product may be impaired. This product must and should only be used under normal conditions.

CAUTION: Do keep the AC power supply off when operating the fiber output connector (e.g., installing the connector, checking the end surface of the connector with an optical instrument, etc.).

Laser Class

In accordance with 21 CFR 1040.10 and 1040.11 under IEC/EN 60825-1, this product is a high power class-4 laser. This product can output up to 3000W of non-visible infrared light. The laser of such class may cause eye or skin injury. Although the output light is invisible, it can still cause irreversible corneal damage. This product does not provide a laser safety protective goggles, but it is necessary to wear suitable protective goggles to avoid injury when using the laser.

WARNING: Never look directly at the fiber output connector, and be sure to wear proper protective goggles to avoid injury when using the laser.

CAUTION: Performing operations or adjustments outside the scope specified in this manual may result in radiation

Use environment and precautions

WARNING: When using this product, be sure to use the appropriate grounding power supply and normal voltage.

CAUTION: Before starting the laser, ensure that the ambient temperature and humidity are within the specified range.

CAUTION: Do not expose the product to excessive moisture.

CAUTION: The laser uses water cooling mode. Please ensure that the water cooling flow rate is up to standard to effectively cool the instrument.

CAUTION: Operation or adjustment beyond the scope specified in this manual may result in dangerous radiation injury.

CAUTION: Keep the output lens clean. Close the cover of the output lens after each use. Do not touch the output lens with your hands, and do not use any solvents to clean the lens. When cleaning the lens, be sure to use lens wiping paper.

Table of Content

| | |
|---|----|
| 1. Laser safety | 8 |
| 1.1 Safety regulations | 8 |
| 1.2 Safety performance | 8 |
| 1.3 Safety labels | 9 |
| 2. Description | 11 |
| 2.1 Front panel | 12 |
| 2.2 Rear panel | 13 |
| 3. Parameter | 14 |
| 3.1 Optical performance | 14 |
| 3.2 Optical output | 14 |
| 3.3 Mechanical and environmental parameters | 15 |
| 3.4 Power source requirement | 16 |
| 3.5 Control and monitor I/O interfaces | 16 |
| 3.6 RS-232 interface | 17 |
| 3.7 Product dimensions | 18 |
| 3.7.1 Laser | 18 |
| 3.7.2 Optical output connector (QBH type) | 18 |
| 4. Preparations | 19 |
| 4.1 Open the package | 19 |
| 4.2 Installation | 21 |
| 4.3 Power supply connection | 21 |
| 4.4 Water-cooled connection | 21 |
| 5. YLLS laser operation | 22 |
| 5.1 Initial operation | 22 |

| | |
|--|----|
| 5.2 Operation mode setting | 23 |
| 5.2.1 Internal control power control, "CW" output mode | 23 |
| 5.2.2 "External Control" power control, "CW" output mode | 23 |
| 5.2.3 External control mode, "pulse" working mode | 25 |
| 5.3 Red guide laser use | 26 |
| 6. YLLS laser human-machine interface | 26 |
| 6.1 Introduction to the man-machine interface | 26 |
| 6.2. RS232 serial port connection method | 30 |
| 6.3. Hotspot connection mode | 34 |
| 7. Maintenance/troubleshooting | 36 |
| 7.1 Clean QBH quartz block | 36 |
| 7.2 Error message and troubleshooting | 37 |
| 8. Warranty | 39 |
| 8.1 General warranty | 39 |
| 8.2 Service and repair | 40 |
| 8.3 Change | 40 |
| 9. System status code query form | 41 |
| 9.1 The status code corresponds to the characters displayed on the interface | 41 |
| 9.2 Fault codes correspond to characters displayed on the interface | 43 |

1. Laser safety

1.1 Safety regulations

The YLLS series CW fiber laser is an OEM laser product that can be integrated into laser systems for commercial and manufacturing applications. Therefore, this product does not fully meet the definition for complete laser processing system in 21 CFR 1040.10 and 1040.11 under IEC/EN 60825-1. GW Laser Tech is not responsible for the compliance of the laser systems that integrate this product. The end user is responsible for ensuring that the system used meets all required safety regulations and rules.

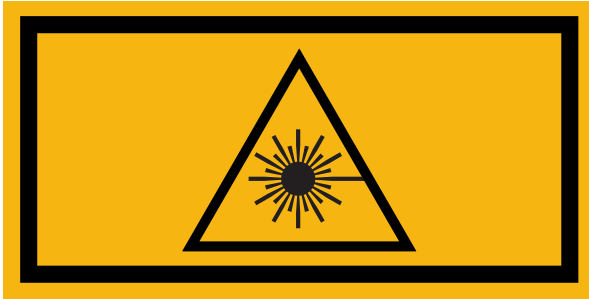
1.2 Safety performance

| Item | Description |
|---------------------------------------|---|
| Externally controlled laser interface | This interface is used for external control of the laser, providing functions such as enable, emergency stop, interlock, alarm, etc.. |
| Output power monitoring | Monitor the output power while the laser is operating. |
| Overheat protection | Monitor the internal temperature of the laser to protect the internal components from damage due to exceeding the safe operating temperature. |
| Safety/warning labels | Various labels are used to alert and warn users of possible hazards. |

1.3 Safety labels

Safety labels and label location

The following pictures show the labels and their position on the product. (Replaced with the latest label picture)



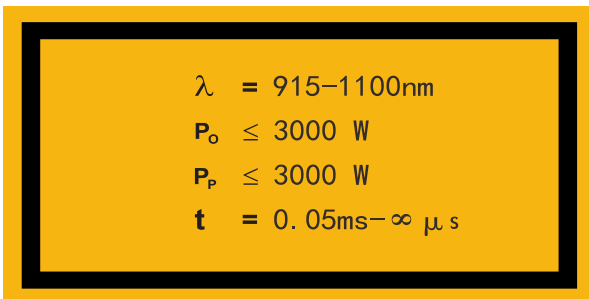
Laser outlet label

Location: Upper panel



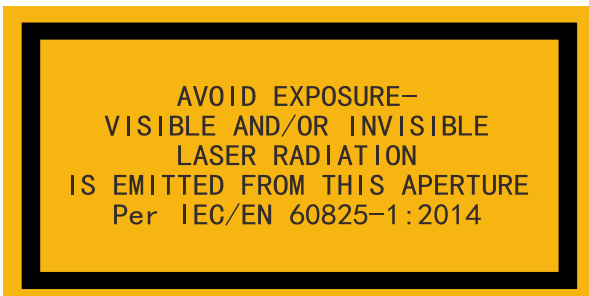
Certification label

Location: Upper panel



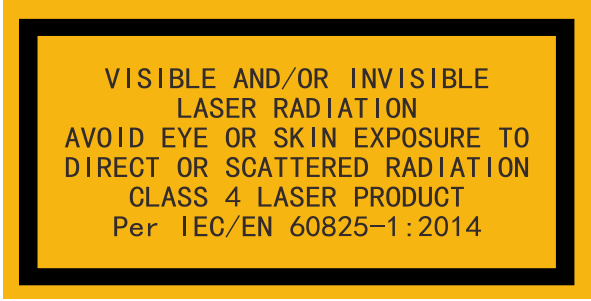
Warning label

Location: Upper panel



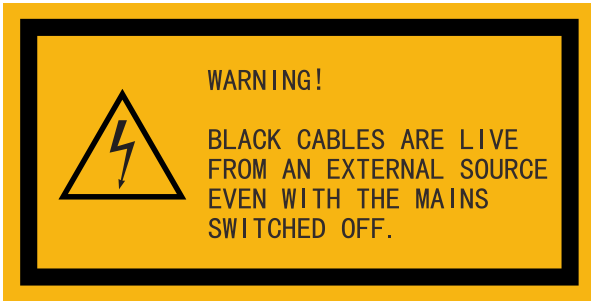
Warning label

Location: Upper panel



Certification label

Location: Upper panel



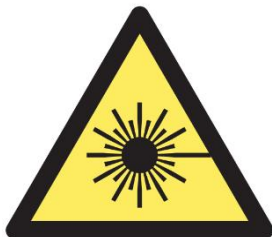
Warning label

Location: Upper panel



Product lable

Location: Front panel



Laser safety label

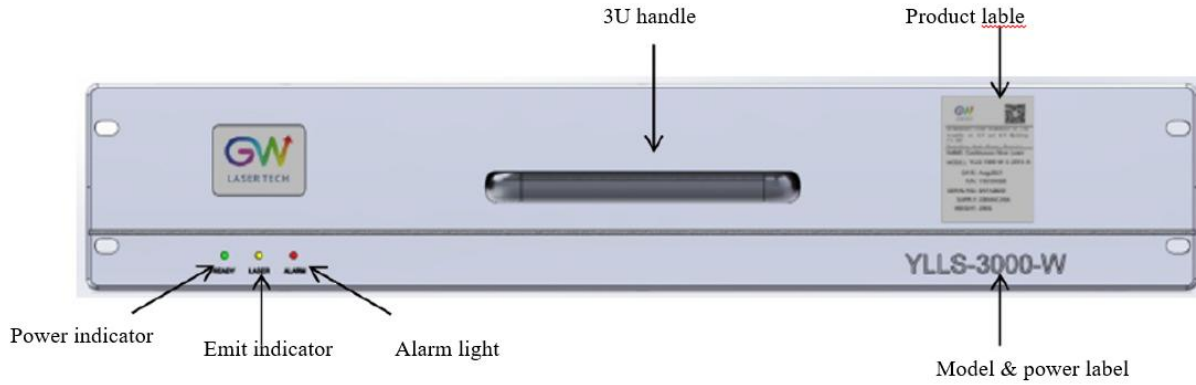
Location: Rear panel

2. Description

The YLLS series OEM fiber laser from GW Laser is designed for industrial material processing applications with reliable, efficient and proprietary ABR and SPP technologies. Key innovations in the YLLS series fiber lasers also include the proprietary thermal processing, mode-filtering technology, and a durable and novel fiber laser structure. The YLLS fiber laser includes a powerful optical engine, comprehensively controlling and monitoring the electronic equipment. The beam is transmitted and output through a metal-protected QBH optical fiber cable.

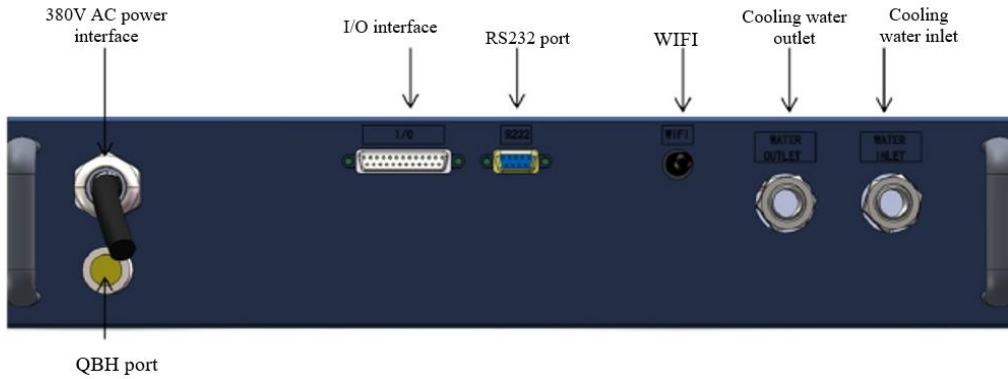
The YLLS series OEM fiber lasers from GW Laser meet your highest requirements on performance and reliability. The YLLS series lasers provide up to 3000W continuous wave (CW) single-mode output laser, with the output waveband between 1070nm and 1080nm. YLLS lasers provide high-efficiency and high-quality output laser. The beam quality M2 output from a single-mode fiber cable is less than 3 generally, or in case of high-brightness multi-mode fiber cable output, $BPP < 1.5$. Such output options with higher beam quality and multiple functions make this product ideal for handling a variety of materials, like the fine cutting, precision welding, and cutting and welding of different materials with different thicknesses.

2.1 Front panel



| Item | Description |
|------------------------|---|
| Power indicator | The green indicator is on after the power is turned on |
| Laser output indicator | The yellow indicator is on when the laser is emitted |
| Alarm indicator | In case of a warning for the laser, the red indicator will flicker; in case of any fault, the red indicator is normally on, and meanwhile, the laser will stop emitting immediately |

2.2 Rear panel



| Item | Description |
|-------------------------------|---|
| 380V AC power port | For laser power supply 380V AC power input |
| I/O interface | DB25 interface, to connect I/O signal, select laser output mode, transmit alarm signal, etc. |
| RS 232 interface | DB9 interface, used to communicate with the upper computer, and be able to control the laser in the internal control mode |
| WIFI | Laser external network communication, being able to monitor the laser operation status |
| Laser water-cooling interface | Connect 16mm PU tube |

3. Parameter

3.1 Optical performance

| Characteristics | Min. value | Typical value | Max. value | Unit |
|-------------------------------|------------|---------------|------------|------|
| Operation mode | CW/Pulse | | | |
| Polarization | Random | | | |
| Output center wavelength | | 1070±10 | | nm |
| Output power YLLS-3000-W | 2900 | 2950 | 3000 | W |
| YLLS-Plus-3000-W | 3150 | 3200 | 3300 | W |
| Output power adjustment range | 1 | | 100 | % |
| Output bandwidth | | < 3.0 | | nm |
| Modulation frequency | | | 10 | kHz |
| Turn-on time | | | 25 | μs |
| Red guide light output power | | | 1 | mW |

3.2 Optical output

| Characteristics | Min. value | Typical value | Max. value | Unit |
|---|---------------------------|---------------|------------|------|
| Fiber output connector | QBH | | | |
| Output optical fiber cable | 13 mm metal armored cable | | | |
| Beam quality, single-mode output | 1.6 | | 3 | |
| Output fiber diameter, single-mode output | 30 | | 50 | um |
| Output fiber length, single-mode output | | 15 | | m |
| Beam quality, multi-mode output | | 1.5 | | |
| Output fiber diameter, multi-mode output | | 50 | 100 | um |
| Output fiber length, multi-mode output | | 15 | | m |

3.3 Mechanical and environmental parameters

| Characteristics | Min. value | Typical value | Max. value | Unit |
|--|------------------|---------------|------------|-------|
| Operating temperature range | 5 | | 45 | °C |
| Storage temperature | -10 | | 50 | °C |
| Cooling method | Water-cooled | | | |
| Water flow | YLLS-3000-W | 25 | | L/min |
| | YLLS-Plus-3000-W | 25 | | |
| Water temperature | 24 | 25 | 26 | °C |
| Water pressure | 4 | | 5 | Bar |
| The cooling capacity of the water cooling system | | 7500 | | Watts |
| YLLS-3000-W | | 7500 | | |
| | YLLS-Plus-3000-W | 7500 | | |
| Operating humidity | 0 | | 95 | % |
| Dimensions | 648X483X89 | | | mm |

Note: The water cooling system needs to be equipped with a filter element with a aperture less than 200 μ . Cooling water is required to be of deionized water, and the ion concentration in water is less than 20 ppm. The use of unqualified cooling water may cause irreparable damage to the laser.

3.4 Power source requirement

380V interface definition:

| Characteristics | | | Parameter | |
|-----------------|----------------------|--------------|---------------|-------------------------------------|
| Connector | | | 4-Pin | |
| Pin# | Function | Wire color | Power voltage | Power current |
| 1 | AC power supply (L1) | Brown | 380V AC | 15A (YLLS-3000-W, YLLS-Plus-3000-W) |
| 2 | AC power supply (L2) | Black | 380V AC | 15A (YLLS-3000-W, YLLS-Plus-3000-W) |
| 3 | AC power supply (L3) | Grey | 380V AC | 15A (YLLS-3000-W, YLLS-Plus-3000-W) |
| 4 | Grounding | Green/yellow | N/C | N/C |

3.5 Control and monitor I/O interfaces

| X1 | Interface 1 (DB 25Pin) | | | |
|------|------------------------|-----------------|--------|--|
| Pin# | Definition | Description | IN/OUT | Notes |
| 1 | +24V-IN | IN+24V | IN | N/C |
| 14 | +24V-IN | IN+24V | IN | N/C |
| 2 | GNDD | 0V | IN | Digital signal reference potential |
| 15 | GNDD | 0V | IN | Digital signal reference potential |
| 3 | GNDD | 0V | IN | Digital signal reference potential |
| 16 | GNDD | 0V | IN | Digital signal reference potential |
| 4 | S-LAS | Laser enabled | OUT | Output laser enabled (24V) |
| 17 | 24V+ | Ext 24V | OUT | Supply 24VDC |
| 5 | S-ERR | System error | OUT | System error output (24V) |
| 18 | S-WAR | Warning | OUT | Output warning signal (24V) if it is close to 90% of the alarm threshold |
| 6 | S-RDY | System ready | OUT | The system is ready for operation |
| 19 | P-RST | Reset | IN | Reset the general error. |
| 7 | X-RED | Red guide laser | IN | Externally-controlled red guide laser activation (24V) |
| 20 | P-LPS | LPS activation | IN | Laser ready for input |

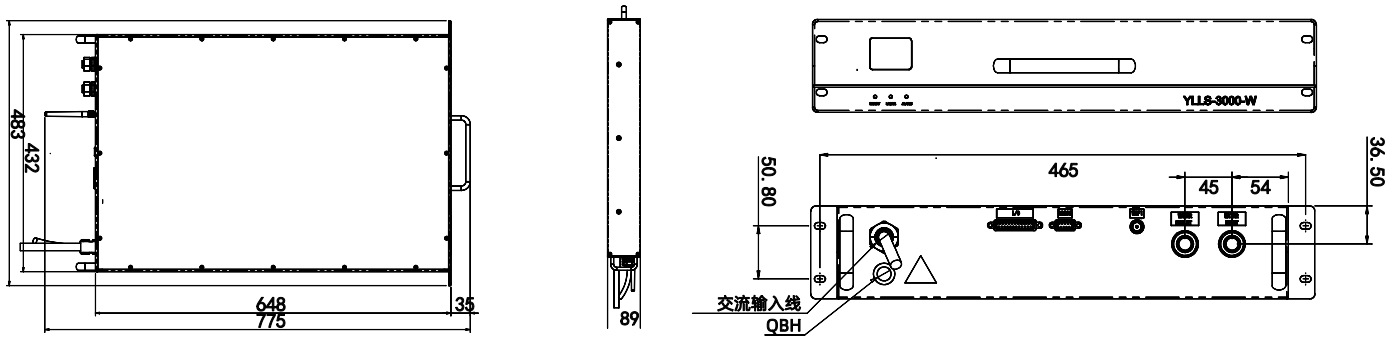
| | | | | |
|----|---------|---------------------------|-----|--|
| | | | | 24VDC input to turn on the power supply of laser |
| 8 | X-STOP | Scram | IN | Logic control signal, NC (24V) |
| 21 | X-SN | Laser on | IN | Externally-controlled laser emission activation (24V) |
| 9 | M-BIT0 | Mode select encoding BIT0 | IN | 0: Externally-controlled CW mode 1: Externally-controlled PWM modulation mode |
| 22 | X-WAT | Cold water interlock | IN | Logic control signal, NC (24V) |
| 10 | X_PULSE | 0~24V | IN | Modulation input (0~24V) |
| 23 | L-Pout | Laser power output | OUT | Laser output power monitoring 0-10VDC |
| 11 | GNDA | GND | IN | Analog signal reference potential |
| 24 | IN1 | Water flow detection | IN | Water flow analog voltage 0.5V-3.5V input |
| 12 | GNDA | GND | IN | Analog signal reference potential |
| 25 | LPIN | Laser power input | IN | Analog input, 0-10VDC |
| 13 | GNDA | GND | IN | Analog signal reference potential |

3.6 RS-232 interface

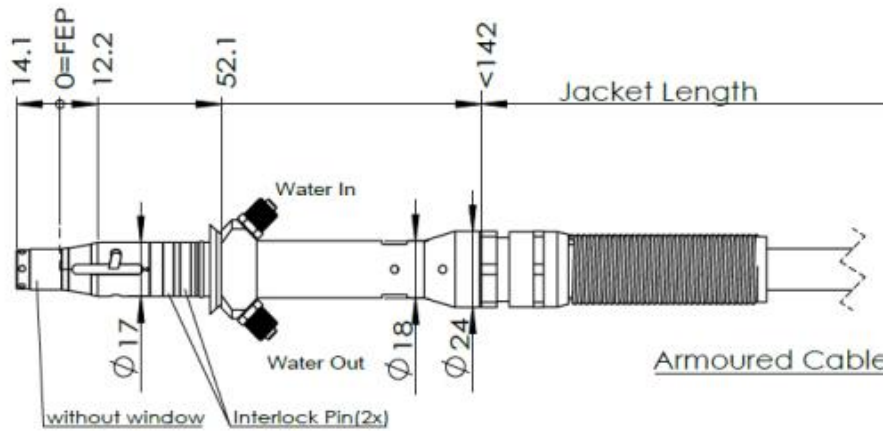
| X2 | Interface 2 (DB 9Pin) | | | |
|-------|-----------------------|-------------|--------|----------|
| Pin | Definition | Description | IN/OUT | Notes |
| 2 | Transmit Data (TXD) | Data output | | -10V~10V |
| 4,7-9 | NC | | | N/A |
| 3 | Receive Data (RXD) | Data input | | -10V~10V |
| 5 | GND | Grounding | | 0V |

3.7 Product dimensions

3.7.1 Laser



3.7.2 Optical output connector (QBH type)



FEP=Fiber End Plane(Without

QBH type optical beam transmission cable

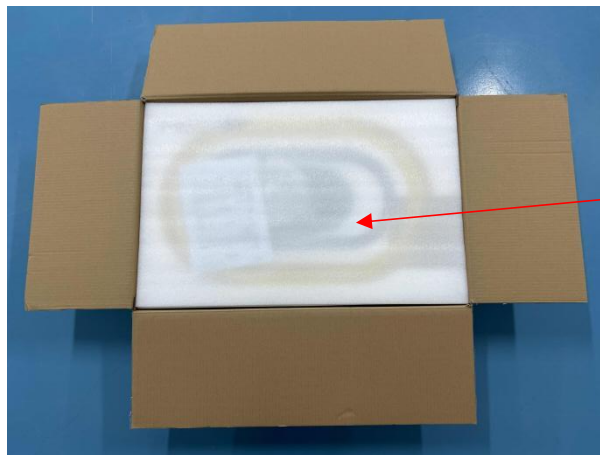
4. Preparations

4.1 Open the package

1. Check whether the container is damaged or not after receiving the product. If you find any damage caused by transport, please make a record immediately and notify the carrier and GW Laser.
2. Open the package and take out the YLLS laser as illustrated below. Pay extra attention to the optical fiber cable to avoid damage when taking out the laser.
3. Please check the laser to see if there is fiber breakage or device damage. If any, please contact GW Laser or the sales representative to send the laser back for inspection and repair. Don't try to fix it yourself. If you suspect any damage to the laser, do not attempt to install or operate the laser.
4. Please put the laser at room temperature for a few hours, and then start to operate the laser.



Step 1: Place the packed laser in the correct orientation

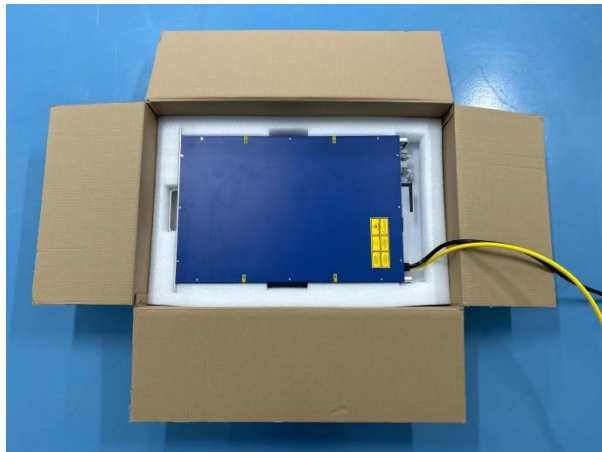


Top protective
sponge

Step 2: Open the package and remove the protective sponge at the top



Step 3: Remove the top sponge and you will see the QBH cable as shown in the Figure. If you find any cable damage, take a photo and notify GW Laser immediately.



Step 4: Please carefully take out the QBH cable from the top sponge tray and do not remove the sponge protective film of the output connector.



Step 5: Arrange two people to lift the laser out of the box together. As shown in the Figure, one person holds the handle of the front panel and the other person holds the handle of the rear panel to carefully lift the laser out in the correct direction.

4.2 Installation

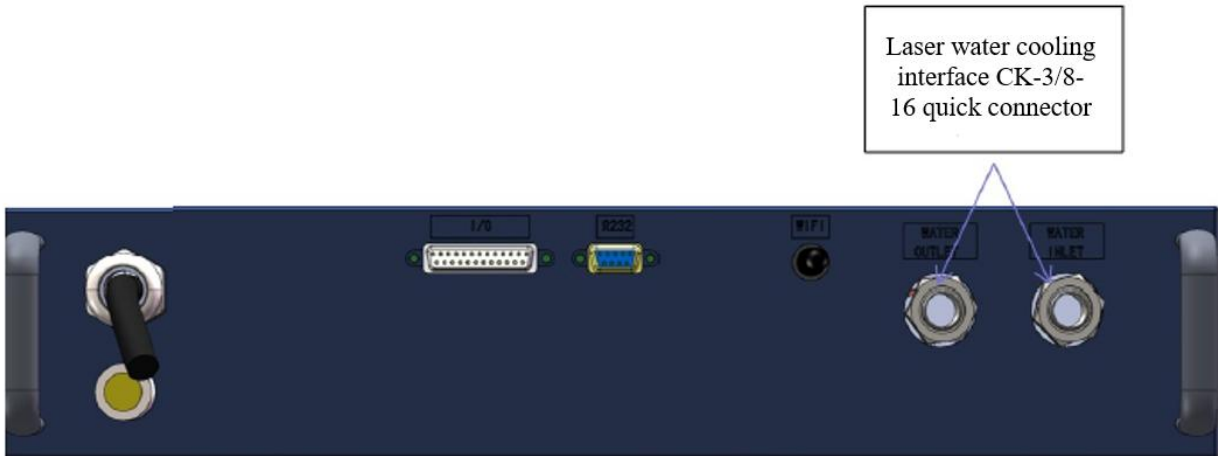
In all installations, make sure that there is enough clearance for the back of the laser to use the rear panel.

4.3 Power supply connection

The power connector of the fiber laser is on the rear panel (for details about the power supply requirements, see Section 3.4). When in use, the laser must be connected to an external power supply, and its power cable must meet the regulatory requirements of the local country.

4.4 Water-cooled connection

When in use, the laser must be kept connected to an appropriate external cooling system. Its water cooling capacity should meet the corresponding parameter requirements.



YLLS fiber laser water-cooled interface adopts CK-3/8-16 quick connector, which is matched with 16mm PU gas pipe.

5. YLLS laser operation

5.1 Initial operation

1. Remove the protective cover of the laser output connector (QBH) and check the cleanliness of the quartz glass and QBH connector.
2. Make sure you wear proper eye protection and protective clothing.
3. Turn on the AC power supply connected to the YLLS fiber laser.
4. Set the control mode and working mode of the laser.

Control method:

Internal control: Connect the laser to the computer with the DB9 serial port cable, open the GW HMI software on the computer, and control the laser through HMI.

External control: The laser is controlled by connecting the DB25 connectors on the rear panel of the laser.

Working mode:

CW mode: It is also known as continuous mode, and the output power will remain constant after this mode is selected. In the internal control mode, the constant power value is set by HMI. In the external control mode, the constant power value is controlled by the analog signal on Pin 1# of the DB25 (0.1V = 1% and 10V = 100%).

Modulation mode: When this mode is selected, the output power varies between IDLE (low modulated signal) and ON (high modulated signal) values. The ON value is determined by the set value of the selected working mode.

For more details on how controls and operating modes work, please refer to Section 5.2: Time Series.

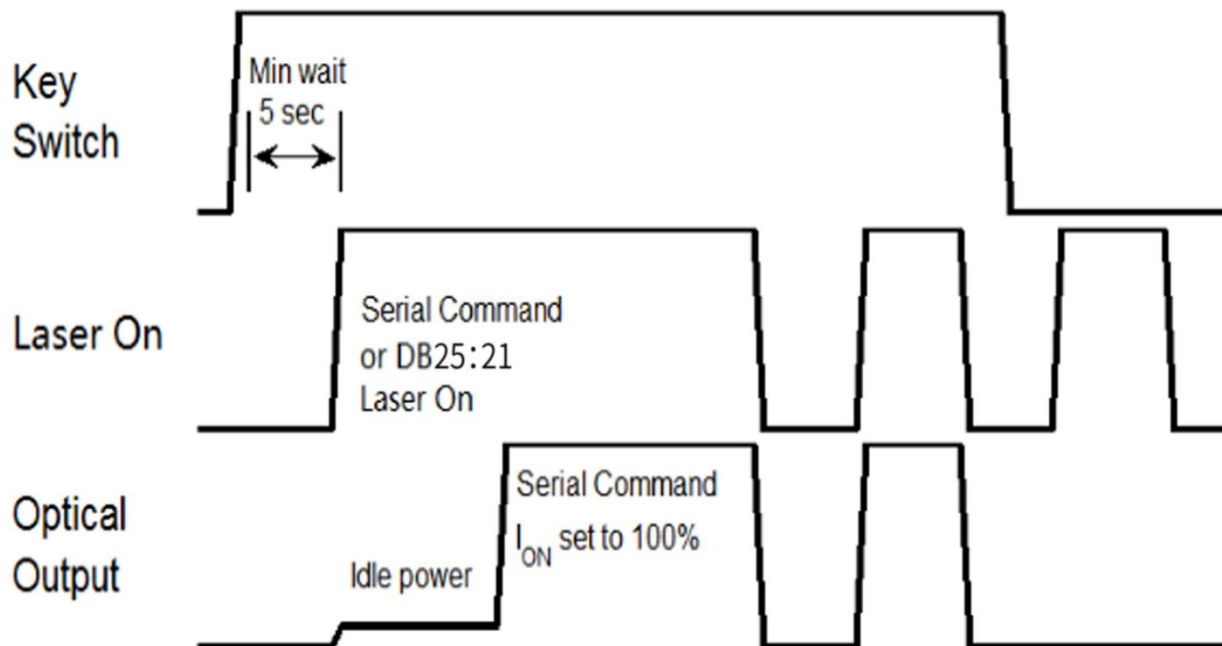
5. Make sure the Laser_On signal light is off (DB25 PIN2 input 0V)
6. The laser output is enabled by running the RS-232 command or by supplying 24V voltage to the PIN1# and PIN2# of DB25.
7. It is available to check whether the laser is started through the DB25 Pin 4#.

5.2 Operation mode setting

YLLS series lasers provide different operation modes according to the setting of power control and output mode. When the power control is selected as "External Control", the user can select a different control mode through the DB 25 pin9.

5.2.1 Internal control power control, "CW" output mode

When the power control is selected as "Internal Control" and the external control output mode is set as "CW", the external control output mode can be set through the HMI on the host computer. When Laser-ON is activated, the Laser output power is determined by the corresponding value set by the HMI on the host computer, and this output value can be changed at any time when the laser is emitted. When the laser is started, the I_{ON} value is equal to the IDLE power value.

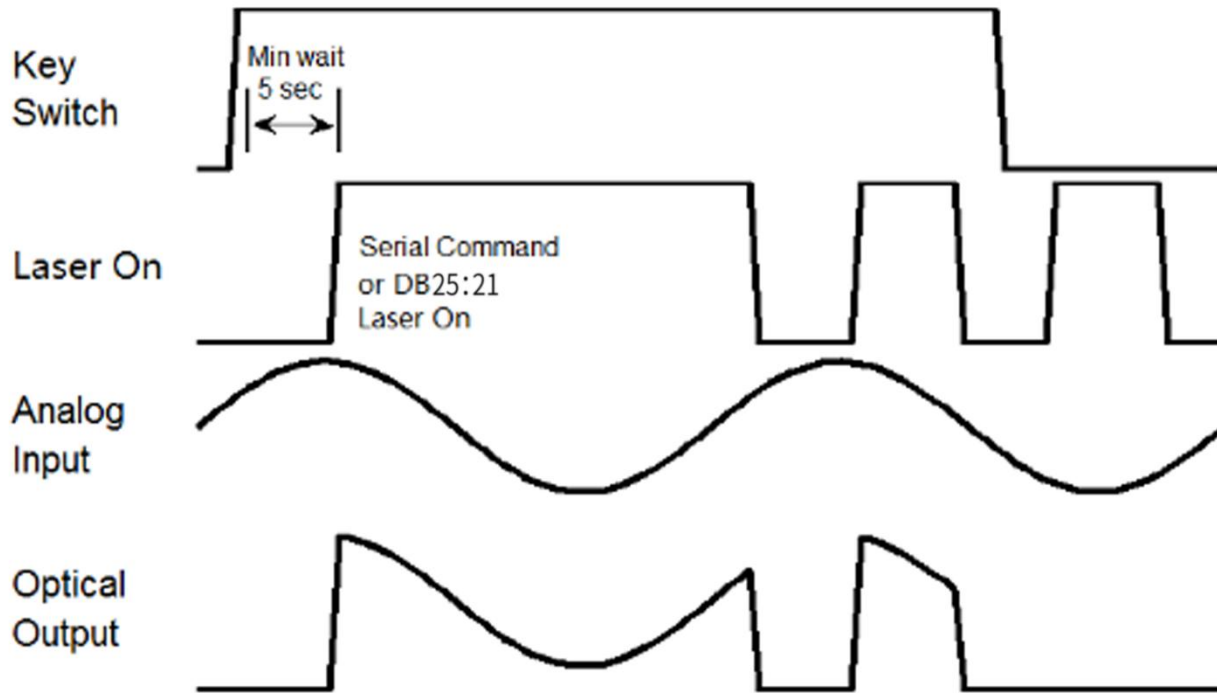


Time series of internal control power control and default "CW" mode

5.2.2 "External Control" power control, "CW" output mode

When the PIN9# of DB25 is open-circuited or grounded, the YLLS laser works in the CW mode. When the power mode is selected as "External control" and the output mode is set as "CW", it is required to delay the output of the Laser-On command (RS-232 or DB-25) for 5 seconds. When the Laser-On command is enabled, the laser output power will be determined by the analog input control voltage. If the analog input voltage falls below the programmed minimum, the YLLS

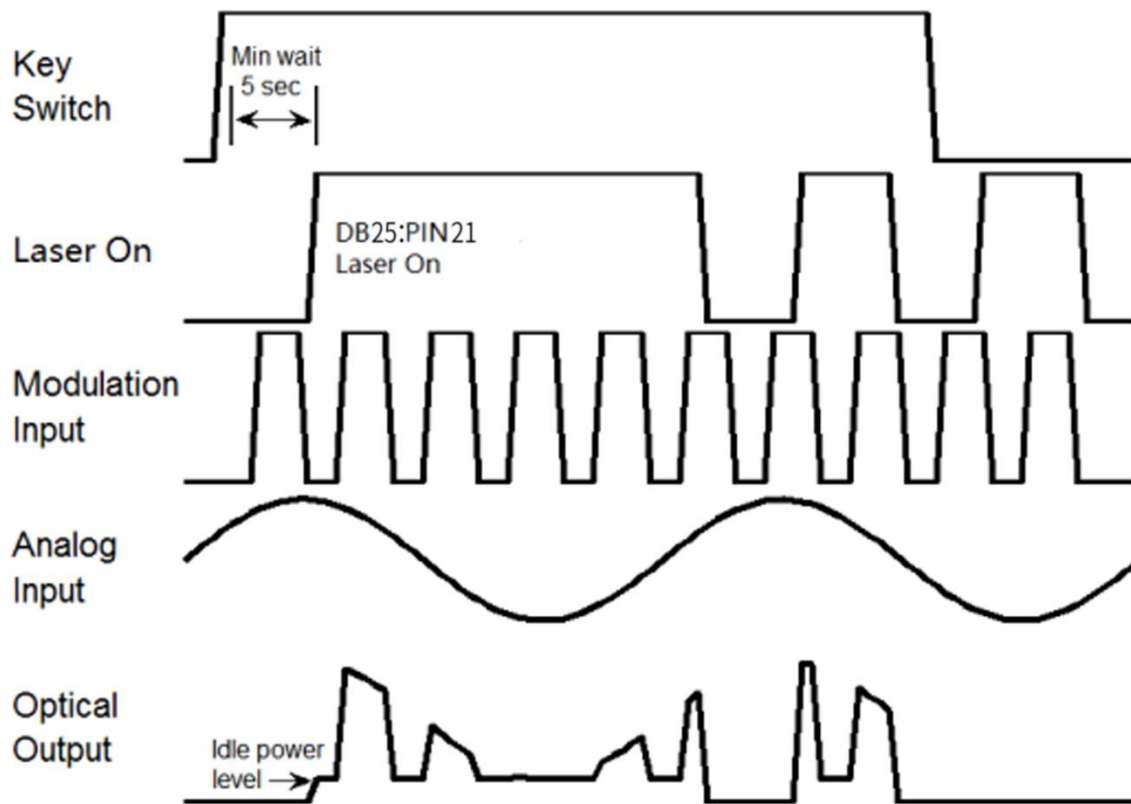
laser controller will temporarily turn off Laser-On until the analog input signal again exceeds the programmed minimum.



Time series of modulating "External Control" power control and "CW" output mode

5.2.3 External control mode, "pulse" working mode

The laser is in external control mode by default. You can also switch between internal control and external control by using the HMI. When the DB25 PIN15 is connected to 24VDC power and the DB25 PIN16 is open-circuited or grounded, the YLLS laser operates in pulse mode. When the PIN13 of DB25 is connected to 24V power, the Laser-On command is activated, and the laser output power will be determined by the synthesizing of the voltage signal of the PIN1 analog input pin of DB25 and the pulse signal of the PIN14 of DB25.



Sequence diagram of pulse working mode in external control mode

5.3 Red guide laser use

The red guide laser is used only when the Laser_On signal is turned off. **The red guide laser can be activated by connecting the Pin 7 of DB25 to the 24V** power or by transmitting the guide laser activation command via RS-232. The red guide laser status can be obtained through the HMI interface or through the RS-232 command. The red guide laser will remain on until the guide laser activation signal is turned off. If the Laser-On command is activated, the red guide laser is automatically turned off.

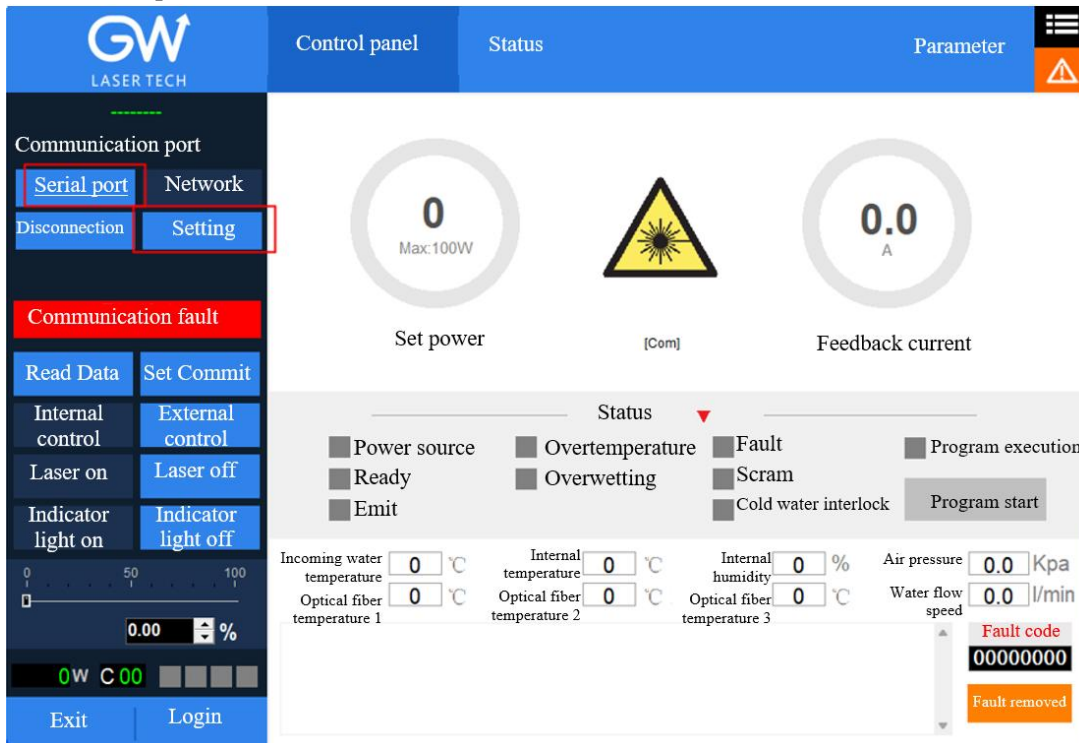
6. YLLS laser human-machine interface

6.1 Introduction to the man-machine interface

GW Laser provides the human machine interface (HMI) applications for controlling and monitoring the operation of YLLS lasers. Get the latest version of HMI program for YLLS laser control, easily install it on the computer, and then double-click "HIM_SJ_V5.8_20230505B" to start the program.





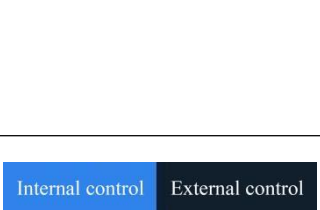
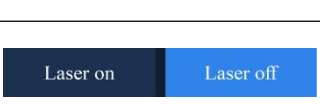







When the program is started, the user needs to select the appropriate serial port by clicking the "Settings" control button. The HMI will automatically establish communication. If the HMI cannot establish communication with the YLLS laser, the HMI will display a "Communication Fault" error and the user will not be able to operate the YLLS laser.



After the communication is established, the default interface is of "Control Panel", which will display all the information of YLLS, such as the temperature of YLLS laser at different positions and the different laser status indicators: "Power", "Ready", "Emit", "Overtemperature", "Super-wet", "Fault", "Emergency






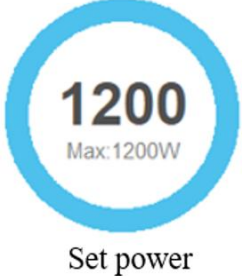


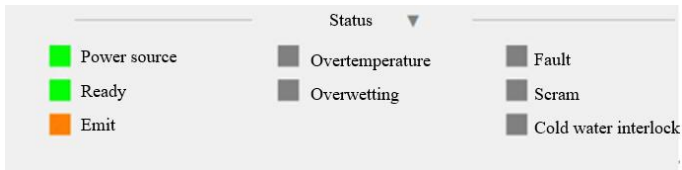
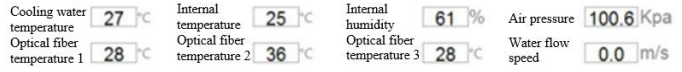
stop", and "Cold water interlock". Users can operate the laser by clicking the "Login" button at the bottom of the HMI and entering the correct user name (user) and password (000000). Different users can operate different parameters of the YLLS laser. Before activating the key switch signal, the user can click the "internal control" or "external control" button to change the operation mode.

| S/N | Button/indicator | Description |
|-----|---|--|
| 1 |  | Communication mode selection: Select the communication mode for establishing the connection with the YLLS laser. |
| 2 |  | Disconnect the communication with the YLLS laser. |
| 3 |  | Parameter setting of the communication port |
| 4 |  | In the internal control mode, "Read Data" and "Set Commit" are enabled. In the external control mode, "Read Data" and "Set Commit" are disabled. When "Read Data" is available, the button will be in blue and the HMI will start collecting the various states of the laser and display them on the HMI. Users can click the "Read Data" button to turn off the "Read data" function and stop data collection. When "Set Commit" is available, the button will be in blue and the HMI transmits the laser output power percentage value set by the user to the YLLS laser |
| 5 |  | The user can select the control mode of YLLS laser (internal control or external control) by pressing the button. When activated, the corresponding button turns blue. |
| 6 |  | In the internal control mode, the user can turn the laser on or off by clicking the "Laser On" or "Laser Off" button. When activated, the corresponding button turns blue. |
| 7 |  | In the internal control mode, the user can turn on or off the red guide light by clicking the "Indicator light on" or "Indicator light off" button. When activated, the corresponding button turns blue. |
| 8 |  | In the internal control mode, if the button is set as blue, the laser output power can be changed by entering the specified value in the power setting box or adjusting the key on the vertical slider. Users can turn this function off by clicking the "Settings" button. If the setting button is turned off, the power setting will be locked. |
| 9 |  | This label lights up when an error event occurs. |
| 10 |  | Click the login button to open the user login interface. |
| 11 |  | Click the button to exit HMI. Before exiting the application program, you must disconnect the communication connection and then press the exit button. |

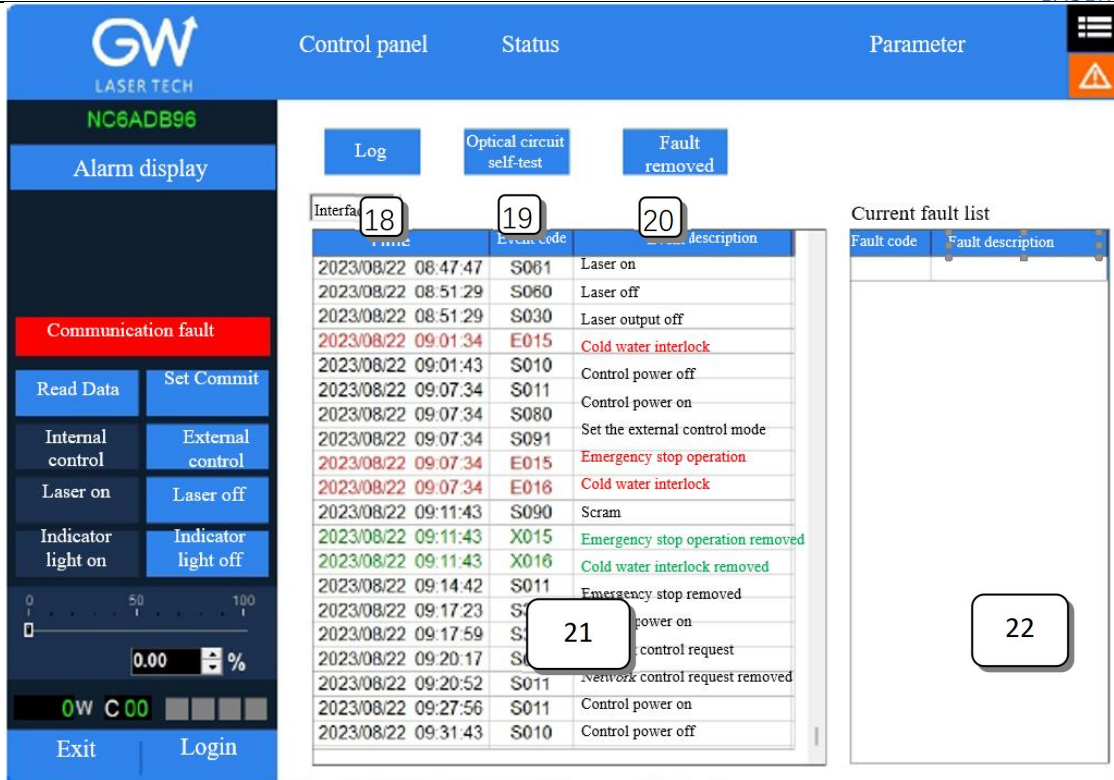
When the laser is activated, the laser indicator will light up. In the internal control mode, when the laser is running, the output energy can also be adjusted by changing the set percentage value.

The screenshot displays the HMI interface for the YLLS-3000-W Series Fiber Laser. It features a top navigation bar with tabs for 'Control panel', 'Status', 'Program', and 'Parameter'. The left sidebar contains communication and control options like 'Serial port', 'Network', 'Disconnection', 'Setting', and 'Request for equipment control'. The main area shows three large circular gauges: 'Set power' at 1200 (Max: 1200W), a laser warning icon labeled '1', and 'Feedback current' at 80.0 A. Below these are status indicators for 'Power source', 'Ready', 'Emit', 'Overtemperature', 'Overwetting', 'Fault', 'Scram', and 'Cold water interlock'. A 'Program start' button is also visible. The bottom section displays various sensor readings: Cooling water temperature (24 °C), Internal temperature (26 °C), Internal humidity (36 %), Optical fiber temperature 1 (28 °C), Optical fiber temperature 2 (40 °C), Optical fiber temperature 3 (26 °C), and Water flow speed (0.0 l/min). A log window shows system events such as 'Laser output on', 'Program start', 'Main power on, system ready', 'Program end', 'Output fiber cable protection', and 'Narrow pulse protection (<20us) removed'. A 'Fault code' display shows '00001000' and a 'Fault removed' button.

The YLLS HMI will continuously read the internally-set monitor information and display the laser information on the HMI interface in real time.

| | Indicator | Description |
|----|---|--|
| 12 |  | <p>C00 Display the current operation mode</p> <p>    Status display:</p> <p>1st: Power on 2nd: Laser ready 3rd: Laser turned on 4th: Alarm</p> |
| 13 |  | <p>Internal control mode: Read the vertical slider or manually input power values.</p> <p>External control mode: Read the analog input control voltage value of the DB25 Pin1</p> |
| 14 |  | <p>Read the internal 12 current feedback value</p> |
| 15 |  | <p>Laser labels are used to indicate whether the laser is emitting and warn the user of possible potential hazards,</p> |
| 16 |  | <p>Display the various states monitored by the YLLS laser</p> |
| 17 |  | <p>Read the current temperature and humidity monitor value</p> |

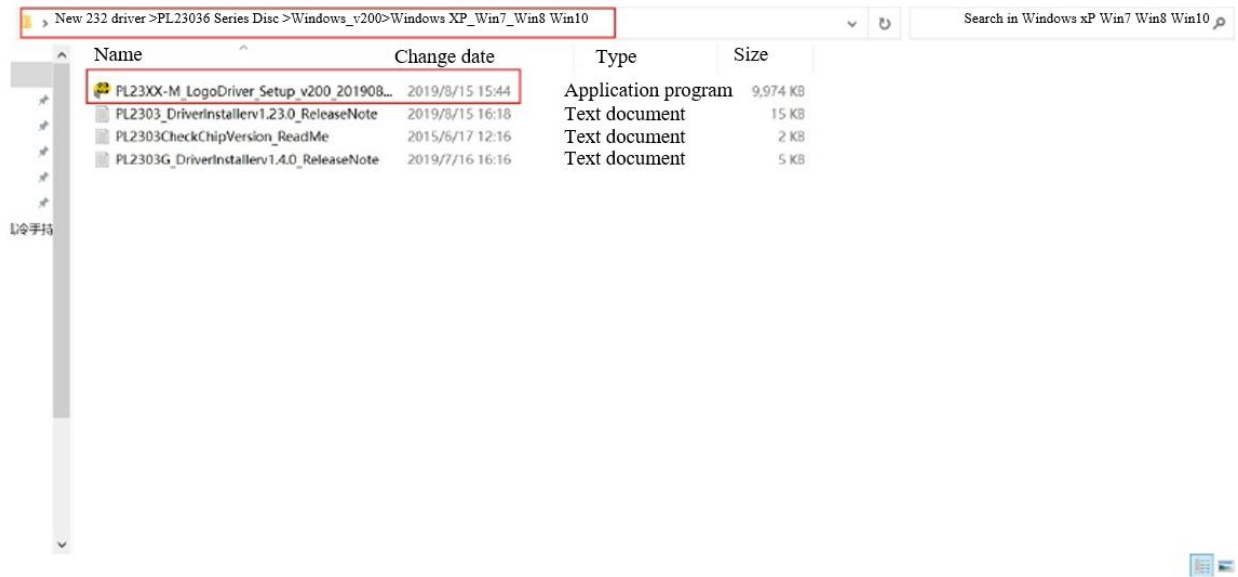
When an error event occurs, the internal control card in the YLLS laser stores the error information in memory. The YLLS laser also has the function of counting all error messages. The user can get status records. Clearing the status record does not affect the information recorded by the error counter.



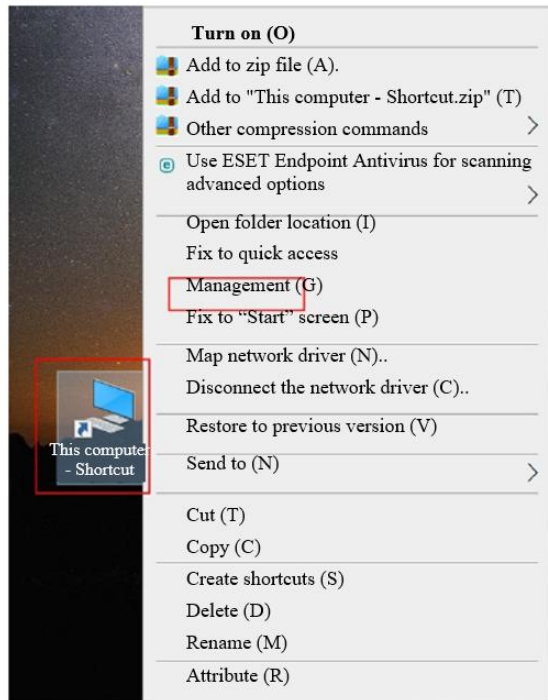
| | Button/indicator | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------|---|--|------------|-------------------|---------------------|------|------------------|---------------------|------|-----------------------------|---------------------|------|-------------------|---------------------|------|-------------------------------|---------------------|------|------|---------------------|------|-----------------------------|---------------------|------|----------------|---------------------|------|-------------------------------------|---------------------|------|-----------------------------|---------------------|------|-----------------------------|---------------------|------|---|---------------------|------|-----------------------------|---|
| 18 | | Press this button, and the HMI will download the status log. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | | In any case, the user can run the self-test program by pressing this button. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | | Press this button, and the user will reset the general error. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | <p>Log</p> <table border="1"> <thead> <tr> <th>Time</th> <th>Event code</th> <th>Event description</th> </tr> </thead> <tbody> <tr><td>2017/08/23 16:33:02</td><td>S011</td><td>Control power on</td></tr> <tr><td>2017/08/23 16:33:02</td><td>S021</td><td>Main power on, system ready</td></tr> <tr><td>2017/08/23 16:33:02</td><td>S041</td><td>Temperature alarm</td></tr> <tr><td>2017/08/23 16:33:02</td><td>S081</td><td>Set the internal control mode</td></tr> <tr><td>2017/08/23 16:33:02</td><td>S291</td><td>S291</td></tr> <tr><td>2017/08/23 16:33:02</td><td>E013</td><td>Optical fiber disconnection</td></tr> <tr><td>2017/08/23 16:33:50</td><td>S020</td><td>Main power off</td></tr> <tr><td>2017/08/23 16:33:50</td><td>E002</td><td>2# driver board communication fault</td></tr> <tr><td>2017/08/23 16:33:50</td><td>E013</td><td>Optical fiber disconnection</td></tr> <tr><td>2017/08/23 16:33:59</td><td>S021</td><td>Main power on, system ready</td></tr> <tr><td>2017/08/23 16:33:59</td><td>X002</td><td>2# driver board communication fault removed</td></tr> <tr><td>2017/08/23 16:33:59</td><td>E013</td><td>Optical fiber disconnection</td></tr> </tbody> </table> | Time | Event code | Event description | 2017/08/23 16:33:02 | S011 | Control power on | 2017/08/23 16:33:02 | S021 | Main power on, system ready | 2017/08/23 16:33:02 | S041 | Temperature alarm | 2017/08/23 16:33:02 | S081 | Set the internal control mode | 2017/08/23 16:33:02 | S291 | S291 | 2017/08/23 16:33:02 | E013 | Optical fiber disconnection | 2017/08/23 16:33:50 | S020 | Main power off | 2017/08/23 16:33:50 | E002 | 2# driver board communication fault | 2017/08/23 16:33:50 | E013 | Optical fiber disconnection | 2017/08/23 16:33:59 | S021 | Main power on, system ready | 2017/08/23 16:33:59 | X002 | 2# driver board communication fault removed | 2017/08/23 16:33:59 | E013 | Optical fiber disconnection | <p>Black: Indicate the execution status of the controller</p> <p>Red: Indicate the error status of the controller</p> <p>Green: Indicate that the error status is cleared</p> |
| Time | Event code | Event description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2017/08/23 16:33:02 | S011 | Control power on | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2017/08/23 16:33:02 | S021 | Main power on, system ready | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2017/08/23 16:33:02 | S041 | Temperature alarm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2017/08/23 16:33:02 | S081 | Set the internal control mode | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2017/08/23 16:33:02 | S291 | S291 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2017/08/23 16:33:02 | E013 | Optical fiber disconnection | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2017/08/23 16:33:50 | S020 | Main power off | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2017/08/23 16:33:50 | E002 | 2# driver board communication fault | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2017/08/23 16:33:50 | E013 | Optical fiber disconnection | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2017/08/23 16:33:59 | S021 | Main power on, system ready | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2017/08/23 16:33:59 | X002 | 2# driver board communication fault removed | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2017/08/23 16:33:59 | E013 | Optical fiber disconnection | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | | Read the current error message | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

6.2. RS232 serial port connection method

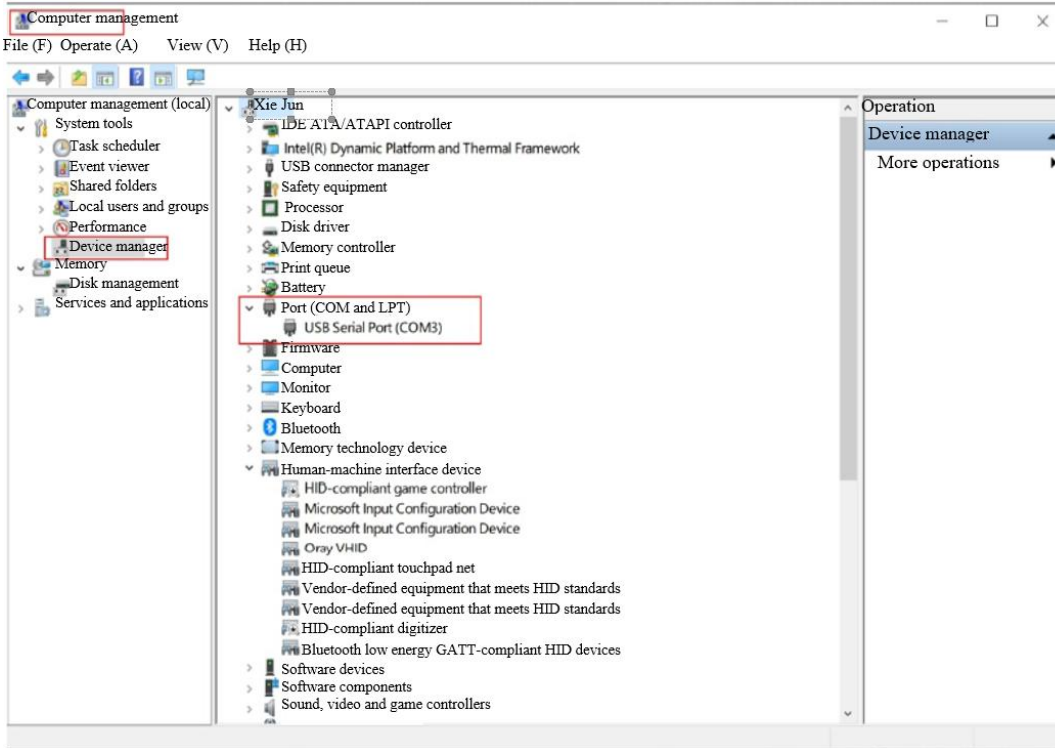
6.2.1. Obtain and install the RS232 serial port cable driver



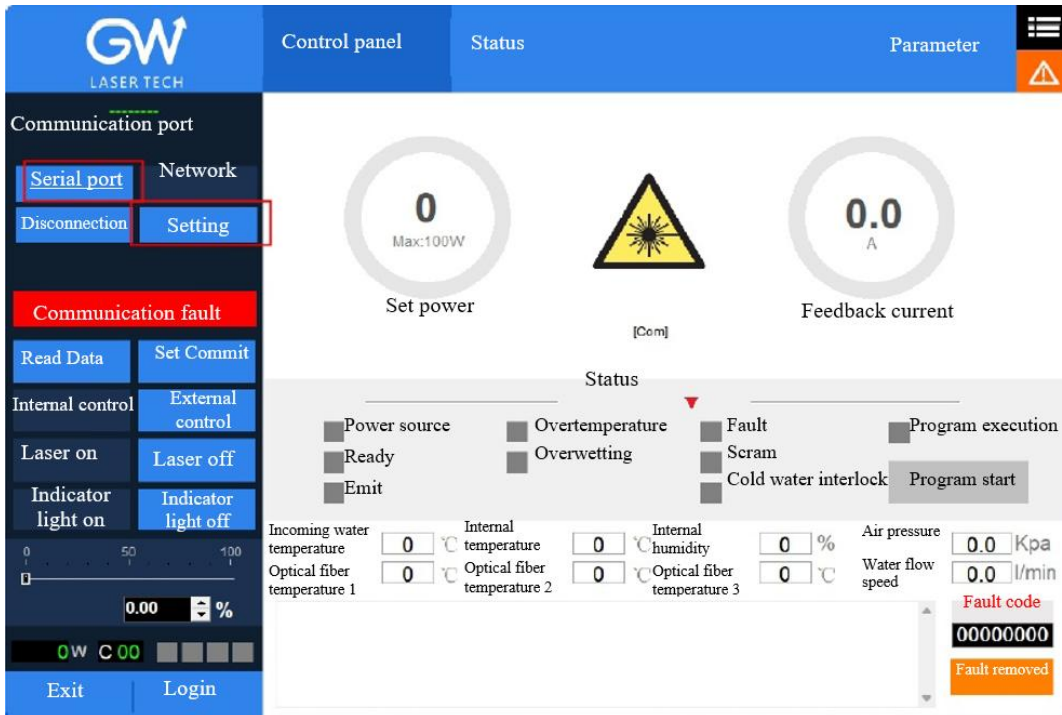
6.2.2. Query the port number of the RS232 serial port cable on the PC side: Select "This computer" and right click "Manage".



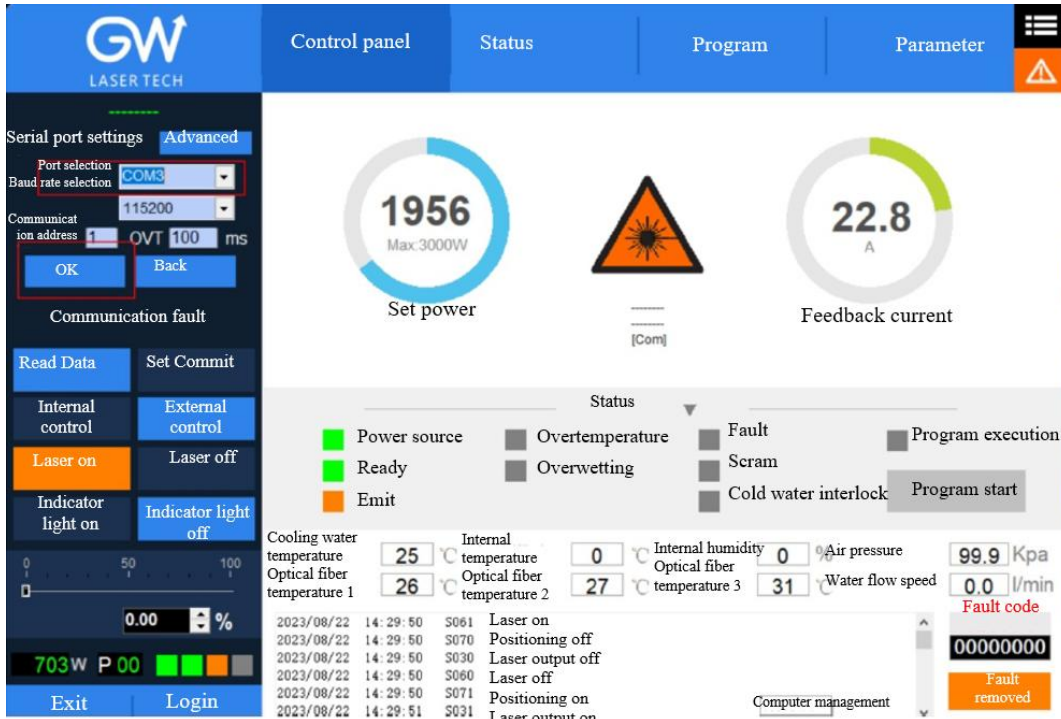
Click "Device Management" and click "Port" to confirm the RS232 port number



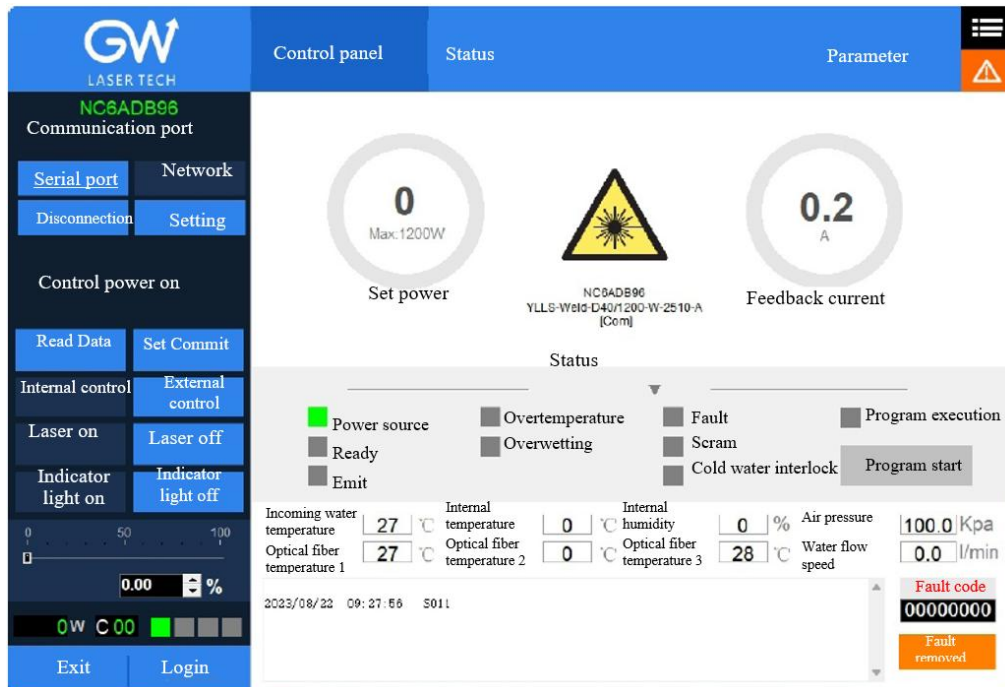
6.2.3. Double click to start HIM_SJ_V5.8_20230505B



6.2.4. Enter the inquired port number of RS232 and click "OK".



The following interface is displayed when the connection is successful:

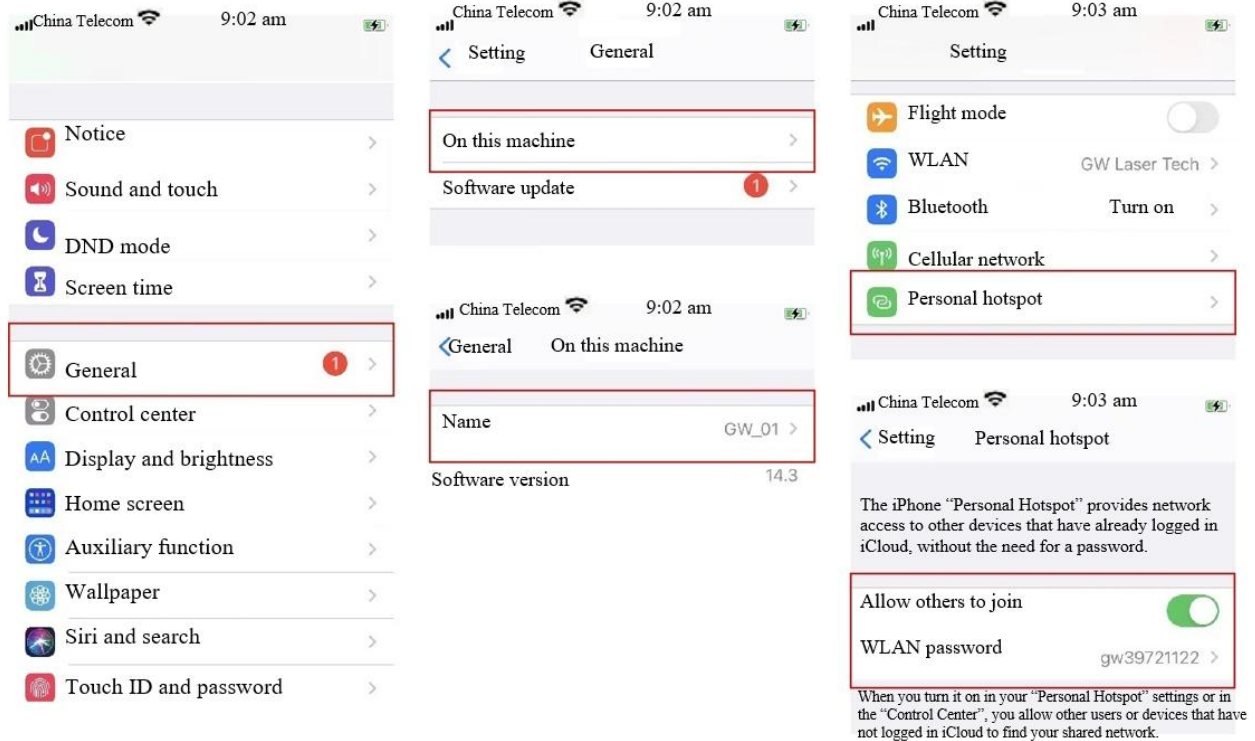


6.3. Hotspot connection mode

6.3.1. Connection mode for IOS version

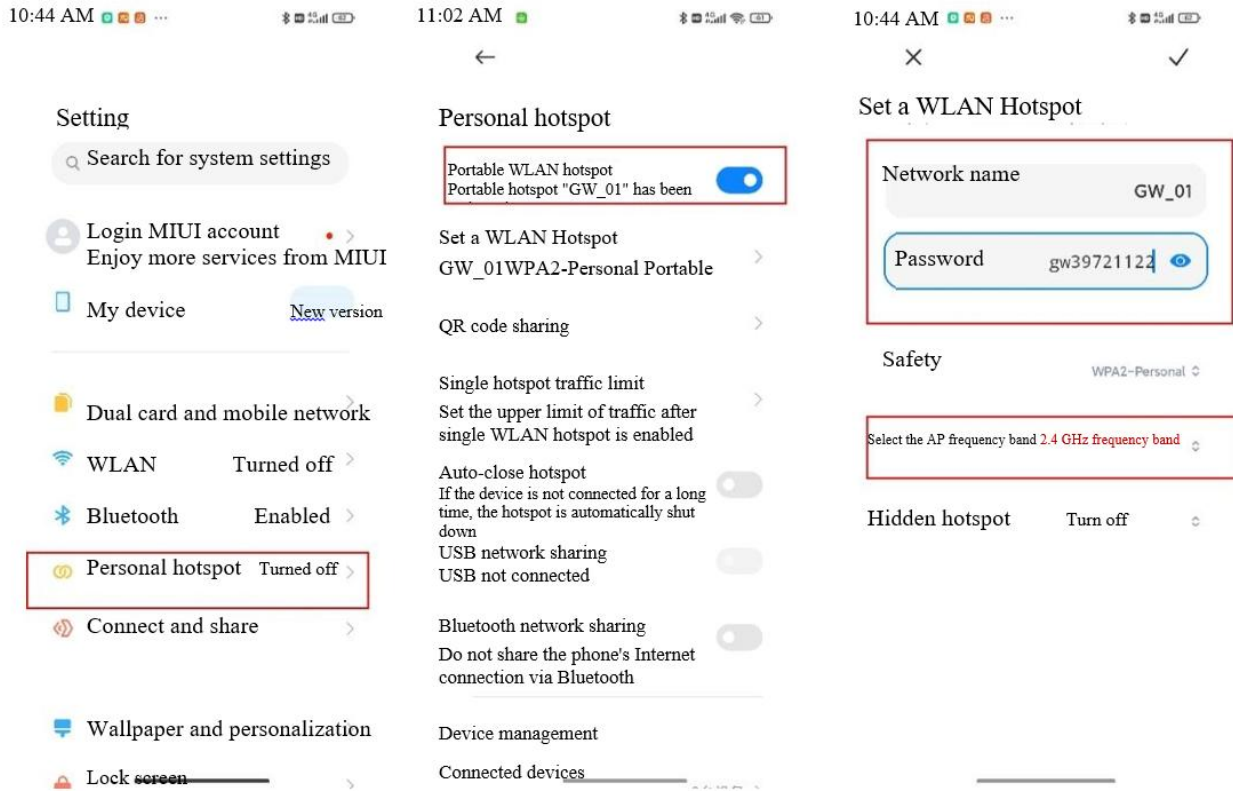
Open the phone Settings → General → About this machine → Change the name to "GW_01"

Back to Settings → Personal Hotspot → Allow others to join → WLAN password changed to "gw39721122"



6.3.2. Connection method for Android version

Open Personal Hotspot → Portable WLAN hotspot → Network name GW_01 → Password gw39721122 → AP band at 2.4GHz



7. Maintenance/troubleshooting

7.1 Clean QBH quartz block

Warning:

Before cleaning the quartz block, make sure that the emergency stop button is pressed down and all lasers are disconnected from power supplies.

1. Take off the protective cover.
2. Carefully remove protective casing.
3. Check whether the quartz block is subject to any contamination. If the quartz block is contaminated by any residual debris, it must be cleaned before operating the laser.
4. For best results, clean with a soft lens cleaning paper and isopropyl alcohol.
5. Place the lens paper on the top of the quartz block.
6. Put a drop of isopropyl alcohol on the lens paper at the top of the quartz block. Move the paper horizontally until the lens dries.
7. Check visually if the quartz block is clean. If the lens is not clean, repeat the steps to clean the lens. Make sure there are no dust or other particles or traces of isopropyl alcohol on the surface of the quartz block.
8. Reinstall the protective cover.



The protective cap of the cable connector is for protection purposes only and cannot be used as an aperture. When using the laser, the temperature of the protective cap will rise if the protective cap is not removed, which will cause damage to the laser, and result in personal safety risks as well.

7.2 Error message and troubleshooting

| Alarm information | Description | Correction method |
|---|--|---|
| 1# driver board communication error | Communication error between #1 driver board and control board | Please contact GW Laser for customer support |
| 2# driver board communication fault | Communication error between #2 driver board and control board | Please contact GW Laser for customer support |
| 3# driver board communication error | Communication error between #3 driver board and control board | Please contact GW Laser for customer support |
| #1 AD board communication error | Communication error between #1 AD board and control board | Please contact GW Laser for customer support |
| #2 AD board communication error | Communication error between #2 AD board and control board | Please contact GW Laser for customer support |
| Diode module overtemperature | Some laser diodes overheat | First check whether there is any fault in the water cooling system, and check whether the coolant pressure is normal. Then check the coolant temperature, and if the problem persists, please contact GW Laser for customer support. |
| Driver module overheat | Some MOSFETs (s) overheat | First check whether there is any fault in the water cooling system, and check whether the coolant pressure is normal. Then check the coolant temperature, and if the problem persists, please contact GW Laser for customer support. |
| Water temperature overranging | The water-cooling liquid overtemperature | First check whether there is any fault in the water cooling system, and check whether the coolant pressure is normal. Then check the coolant temperature, and if the problem persists, please contact GW Laser for customer support. |
| Optical fiber temperature exceeds the upper limit | The optical fiber tray is detected over-temperature. | First check whether there is any fault in the water cooling system, and check whether the coolant pressure is normal. Then check the coolant temperature, and if the problem persists, please contact GW Laser for customer support. |
| Laser reflection energy exceeds the upper limit | For the YLLS laser detection, the emitted laser exceeds the threshold. | First clean the collimator and cutting head, and then run a self-test program for a full YLLS laser inspection. If the problem persists, please contact GW Laser for customer support. |
| Laser output energy exceeds the lower limit | The detected laser output power is lower than the expected value. | Run the self-test program for a full YLLS laser inspection. If the problem persists, please contact GW Laser for customer support. |
| Diode short-circuit fault | Laser diode short circuit | Please contact GW Laser for customer support. |

| | | |
|---|--|--|
| Optical fiber disconnection | Fiber optic sensor detects fiber rupture | First, run the self-test program for comprehensive inspection of YLLS laser. If the problem persists, please contact GW Laser for customer support. |
| The internal humidity exceeds the upper limit | The humidity sensor detects overhigh humidity. | First check the ambient humidity, and then run the self-test program for a full YLLS laser inspection. If the problem persists, please contact GW Laser for customer support. |
| Cold water interlock | Water cooling system interlock is triggered. | If the water cooling system is interlocked and connected to the YLLS laser, check whether there is any error message for the water cooling system. If the problem persists, please contact GW Laser for customer support. |
| Scram | The emergency stop error is triggered | The emergency stop button is pressed If the problem persists after the emergency stop button is released, please contact GW Laser for customer support. |

8. Warranty

8.1 General warranty

a) GW Laser guarantees that after the product is shipped, GW Laser does not have any liens and encumbrances on the product.

b) Unless otherwise stated by GW (Shanghai) Laser Technology Co., Ltd., GW Laser provides all products with a warranty against material defects and quality problems for a period of 24 months (Counting from the date of delivery). According to the tenth paragraph of the sales terms of GW Laser, GW Laser will choose to 1) repair 2) replace or 3) refund the products that are confirmed defective and still within the warranty period. All repaired or replaced products follow the initial warranty period of the original products that are requested for repair, that is, such repaired or replaced products can enjoy the warranty for free only within the remaining warranty period of the original products that are requested for repair. The buyer must submit a written request for repair within 30 days after any quality problem is found. All requests for repair must be made directly by the buyer, and GW Laser will not accept any third party the repair requests.

c) The above requests for repair does not apply to product problems caused by: 1) Incorrect or inappropriate maintenance or calibration made by personnel not from GW Laser; 2) Usage of software, interface or power supply provided by the customer or a third party; 3) Unauthorized modification; incorrect operation out of the limit range of product parameters; 4) Abuse, negligence, accident, and loss or damage during transportation; or 5) Unauthorized maintenance or repair.

d) The above warranty regulations are unique. In addition, GW Laser will not assume any form of (whether express or implied) written or oral maintenance liability and terms set forth by the regulations or laws. GW Laser expressly waives the maintenance liability and terms of implied warranties in the laws, including (but not limited to) the implied warranties of merchantability and applicability.

e) The technical guidance and services provided by GW Laser to customers will not affect the warranty terms provided by GW Laser.

8.2 Service and repair

CAUTION: There are no built-in spare parts for user to maintain. All repairs should be carried out by the personnel from GW Laser. Therefore, the repair or replacement requests within the warranty scope must be timely notified to GW or the service representative of your region as soon as the problem is found. Approved returned products must be placed in a suitable container.

If any damage is found upon receipt of the goods, it shall be promptly informed to the carrier in writing.

IMPORTANT: Please do not return the product to GW without returning the Return Material Authorization (RMA). If the warranty period of the product has expired, or the product is no longer within the scope of warranty, the buyer will bear the cost of repair.

IMPORTANT: The user should properly save the software log file to facilitate the fault analysis of GW Laser maintenance personnel.

8.3 Change

We reserve the right to change the design and structure of the product, and we do not assume any responsibility for the modification of product of the same model already sold.

9. System status code query form

9.1 The status code corresponds to the characters displayed on the interface

| S/N | Code name | Interface character |
|-----|-----------|----------------------------------|
| 1 | S010 | Control power off |
| 2 | S011 | Control power on |
| 3 | S020 | Main power off |
| 4 | S021 | Main power on, system ready |
| 5 | S030 | Laser output off |
| 6 | S031 | Laser output on |
| 7 | S040 | Water temperature normal |
| 8 | S041 | Water temperature alarm |
| 9 | S050 | Fault removed |
| 10 | S051 | Fault indication |
| 11 | S060 | Laser off |
| 12 | S061 | Laser on |
| 13 | S070 | Positioning off |
| 14 | S071 | Positioning on |
| 15 | S080 | Set the external control mode |
| 16 | S081 | Set the internal control mode |
| 17 | S090 | Emergency stop operation removed |
| 18 | S091 | Emergency stop operation |
| 19 | S100 | Cold water interlocking normal |
| 20 | S101 | Cold water interlocking fault |
| 21 | S110 | Program end |
| 22 | S111 | Program start |

| | | |
|----|------|----------------------------------|
| 23 | S120 | Internal humidity normal |
| 24 | S121 | Internal humidity alarm |
| 25 | S130 | Clear QCW mode |
| 26 | S131 | Set QCW mode |
| 27 | S140 | Fiber temperature normal |
| 28 | S141 | Fiber temperature alarm |
| 29 | S150 | Driver module temperature normal |
| 30 | S151 | Driver module temperature alarm |
| 31 | S160 | Diode temperature normal |
| 32 | S161 | Diode temperature alarm |
| 33 | S170 | Internal temperature normal |
| 34 | S171 | Internal temperature alarm |
| 59 | S300 | Network master control removed |
| 60 | S301 | Network master control obtained |
| 61 | S310 | Network control request removed |
| 62 | S311 | Network control request |

9.2 Fault codes correspond to characters displayed on the interface

| S/N | Fault codes BIT31 to BIT0 | Status | Internal code name | Interface character |
|-----|---------------------------|--------|--------------------|--|
| 1 | BIT0 | 0 | X001 | 1# driver board communication fault removed |
| 2 | | 1 | E001 | 1# driver board communication error |
| 3 | BIT1 | 0 | X002 | 2# driver board communication fault removed |
| 4 | | 1 | E002 | 2# driver board communication fault |
| 5 | BIT2 | 0 | X003 | 3# driver board communication fault removed |
| 6 | | 1 | E003 | 3# driver board communication error |
| 7 | BIT3 | 0 | X004 | 4# driver board communication fault removed |
| 8 | | 1 | E004 | 4# driver board communication error |
| 9 | BIT4 | 0 | X005 | AD board communication fault removed |
| 10 | | 1 | E005 | AD board communication error |
| 11 | BIT5 | 0 | X006 | Diode module overtemperature |
| 12 | | 1 | E006 | Diode module overtemperature |
| 13 | BIT6 | 0 | X007 | Driver module overtemperature removed |
| 14 | | 1 | E007 | Driver module overheat |
| 15 | BIT7 | 0 | X008 | Water temperature over-limit removed |
| 16 | | 1 | E008 | Water temperature overranging |
| 17 | BIT8 | 0 | X009 | Optical fiber temperature over-upper-limit removed |
| 18 | | 1 | E009 | Optical fiber temperature exceeds the upper limit |
| 19 | BIT9 | 0 | X010 | Laser reflection energy over-upper-limit removed |

| | | | | |
|----|-------|---|------|--|
| 20 | | 1 | E010 | Laser reflection energy exceeds the upper limit |
| 21 | BIT10 | 0 | X011 | Laser output energy under-lower-limit removed |
| 22 | | 1 | E011 | Laser output energy exceeds the lower limit |
| 23 | BIT11 | 0 | X012 | Diode short-circuit fault removed |
| 24 | | 1 | E012 | Diode short-circuit error |
| 25 | BIT12 | 0 | X013 | Optical fiber disconnection removed |
| 26 | | 1 | E013 | Optical fiber disconnection |
| 27 | BIT13 | 0 | X014 | The internal humidity over-upper-limit and super-wet removed |
| 28 | | 1 | E014 | The internal humidity over-upper-limit and super-wet |
| 29 | BIT14 | 0 | X015 | Cold water interlock removed |
| 30 | | 1 | E015 | Cold water interlock |
| 31 | BIT15 | 0 | X016 | Emergency stop removed |
| 32 | | 1 | E016 | Scram |
| 33 | BIT16 | 0 | X017 | The positioning light fault removed |
| 34 | | 1 | E017 | The positioning light fault |
| 35 | BIT17 | 0 | X018 | Narrow pulse protection removed |
| 36 | | 1 | E018 | Narrow pulse protection |
| 37 | BIT18 | 0 | X019 | Overvoltage protection removed |
| 38 | | 1 | E019 | Overvoltage protection |
| 39 | BIT19 | 0 | X020 | Internal temperature protection removed |
| 40 | | 1 | E020 | Internal temperature protection |
| 41 | BIT20 | 0 | X021 | Reserved |

| | | | | |
|----|-------|---|------|----------|
| 42 | | 1 | E021 | Reserved |
| 43 | BIT21 | 0 | X022 | Reserved |
| 44 | | 1 | E022 | Reserved |
| 45 | BIT22 | 0 | X023 | Reserved |
| 46 | | 1 | E023 | Reserved |
| 47 | BIT23 | 0 | X024 | Reserved |
| 48 | | 1 | E024 | Reserved |
| 49 | BIT24 | 0 | X025 | Reserved |
| 50 | | 1 | E025 | Reserved |
| 51 | BIT25 | 0 | X026 | Reserved |
| 52 | | 1 | E026 | Reserved |
| 53 | BIT26 | 0 | X027 | Reserved |
| 54 | | 1 | E027 | Reserved |
| 55 | BIT27 | 0 | X028 | Reserved |
| 56 | | 1 | E028 | Reserved |
| 57 | BIT28 | 0 | X029 | Reserved |
| 58 | | 1 | E029 | Reserved |
| 59 | BIT29 | 0 | X030 | Reserved |
| 60 | | 1 | E030 | Reserved |
| 61 | BIT30 | 0 | X031 | Reserved |
| 62 | | 1 | E031 | Reserved |
| 63 | BIT31 | 0 | X032 | Reserved |
| 64 | | 1 | E032 | Reserved |

