Manual of SUP25A (version V1.2)

Wuxi Super Laser Technology Co.Ltd

CONTENTS

Copyright Statement

Update Record

Releases	Updates	time	codifiers
V1.0	first edition	23.10.06	Liu Chen
V1.1	Adjustment of wire break detection, adjustment of reserved port function, adjustment of CCD configuration	24.04.22	Liu Chen
V1.11	Wire feeder communication wiring	24.06.08	Liu Chen
V1.2	Addition of a rotary wire feed mechanism	25.04.03	Liu Chen

I. Precautions

This product belongs to laser welding equipment, involving the assembly and use of laser products, and applies to the basic safety standards for all types of hand-held, removable and fixed electrical equipment for indoor and outdoor use with rated AC voltage of 110V~220V. In order to ensure safe production and normal operation of the equipment, it is recommended that the user post the following safety signs on the entire machine and equipment, informing all personnel using, maintaining and approaching the equipment to pay attention to the following safety matters.

1.1 Welding safety

This product is the laser welding equipment, and should also comply with the safety and protection standards for welding equipment.

① Specialized fire zones should be designated.

② Equipment should be prohibited around the placement of flammable and explosive substances to avoid safety hazards.

③ Operators should take care to avoid high-temperature injuries caused by welding.

Logo	Name
	flammable area
	Stay safe.
	Beware of hot surfaces
	Chemical fiber clothing is prohibited

	Prohibition of protection against flammable substances

1.2 Laser safety

① The laser paired with this product emits laser radiation with a wavelength of 1080nm or near 1080nm during operation, which is invisible, and the classification of the laser is subject to the laser manufacturer.

② high-power laser can not be treated as a common light source, should avoid laser welding head out of the mouth of the light directly to people or flammable and explosive substances.

③ Direct or indirect exposure to such light intensity can cause damage to the eyes and skin. Although the beam is not visible, it can cause irreversible damage to the retina or cornea. Personnel should wear standardized protective goggles for the corresponding wavelength of the laser when the laser is in operation.

④ High-power lasers can electrolyze gases and produce ionizing radiation, and relevant personnel should pay attention to protection.

Logo	Name
	Laser radiation Avoid direct or diffuse exposure of eyes and skin Class 4 laser products
	laser window Avoid exposure to laser radiation emanating from the window.
	Shade goggles must be worn
	Beware of lasers.

	Beware of ionizing radiation

1.3 Electrical Safety

① This equipment adopts 110V~220V AC power supply, users should pay attention to the safety of electricity, to avoid the potential danger of electric shock.

② In order to ensure the normal operation of the equipment, to avoid static damage and equipment leakage, the equipment should use safety grounding measures, i.e., connect the easily conductive parts to the protective (grounding) conductor in the fixed wiring of the product, so that the easily accessible conductive parts will not become electrically charged even when the basic insulation fails. Additional safety measures (e.g. double insulation or reinforced insulation) may be applied as appropriate.

③ The control box of this product does not contain accessories that need to be operated by the user, and any installation, maintenance, and disassembly of this product should be carried out under the condition of open gate and power failure.

Logo	Name
	Beware of electrocution.
	Must be grounded
	Must be unplugged

	No Closing

II. Product overview

This manual includes a general description of the basic functions, installation, operation, use and maintenance of the SUP25A series of double-pendulum welding heads.

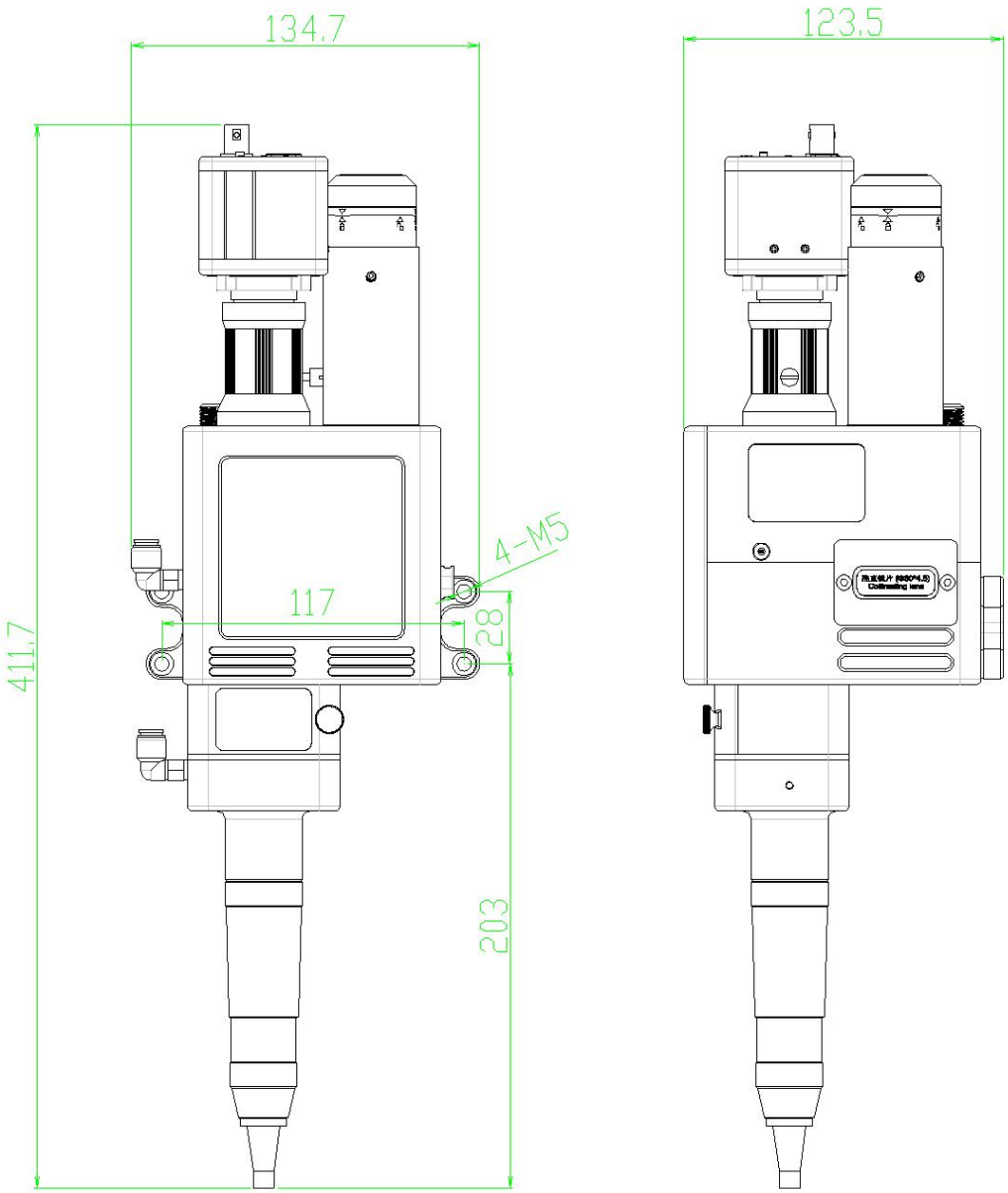


Figure 2.1 Dimensional drawing

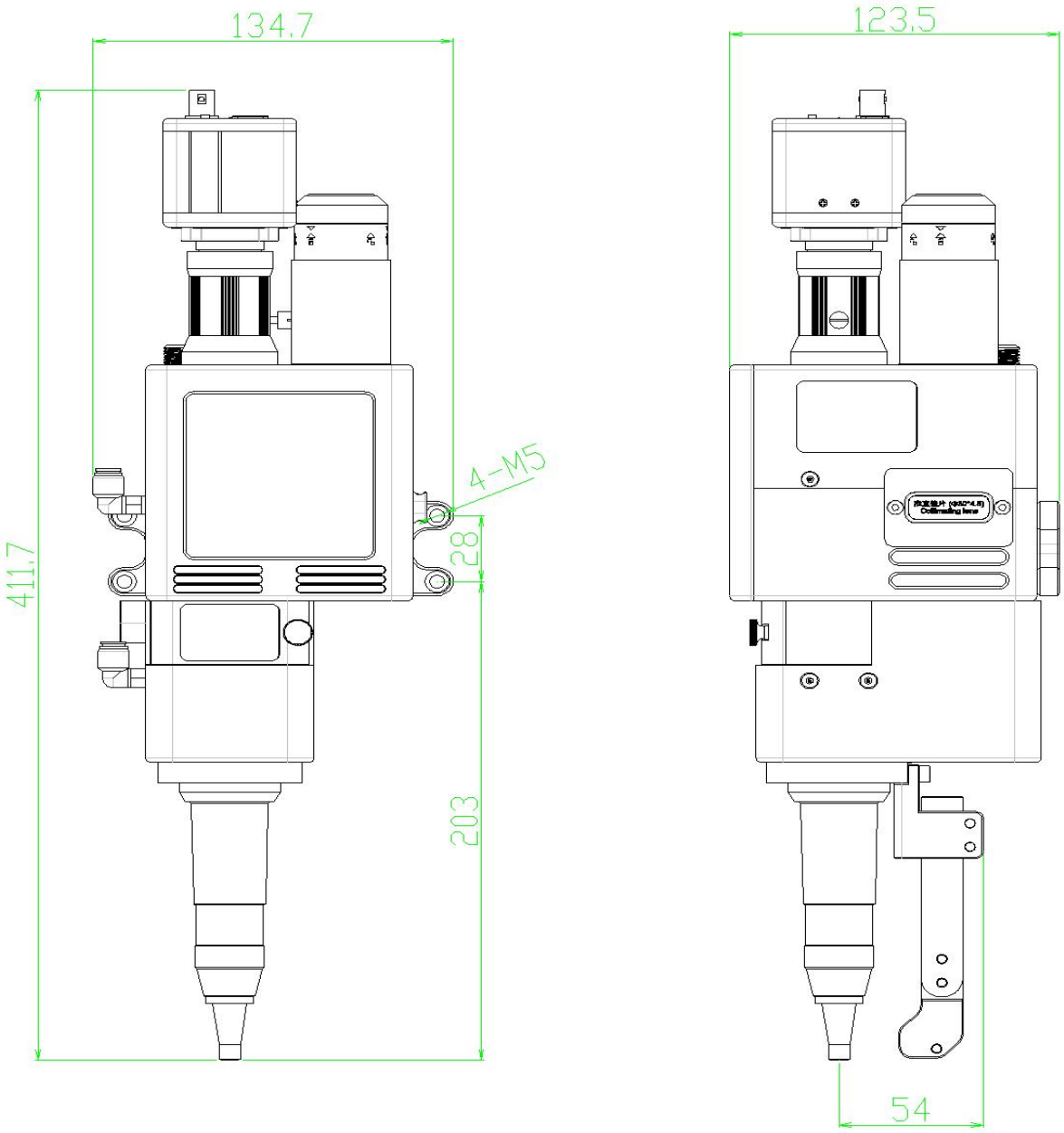


Figure 2.2 Dimensional Drawing - Rotary Wire Feed

The welding torch is fixed with M5*10L hexagonal screws 117 * 28mm rectangular distribution. The [wire feed tube] is an accessory for the wire feeder, and its angle is adjustable, so the dimensions are not shown here.

2.1 Product Features

- Basic functions:

① QBH locking structure;

② Support for CCD systems;

③ Water-cooled structure;

④ Supports up to 3000W power welding;

⑤ 6 craft patterns are available.

- Advanced features:

① Support gun body screen adjustment parameters;

② Support the synchronization of parameters of gun body screen, control box screen and wire feeder screen;

③ Open communication protocols enable complex process adjustments including rotating the spot angle;

④ Open wire breakage status detection signal prevents pulling of the workpiece due to failure of wire breakage;

⑤ Support 360°rotary wire feeding, which can realize wire filling welding of complex workpieces.

2.2 Product operating environment and basic parameters

As shown in Table 2.1 the operating environmental requirements and main parameters of the double pendulum welding head:

Table 2.1 Operating environment requirements and basic parameters

Supply voltage (V)	220V±10% AC 50/60Hz
environment in which sth. is placed	Vibration and shock free
Operating ambient temperature (℃)	-10 to 50° C
Working environment humidity (%)	<70
Cooling method	water cooling
Applicable wavelength	1080nm (±10nm)
Applicable power	≤3000W
collimating lens	D30*4.5 F75
focusing lens	D30*4 F200
protective mirror	D30*3
Recommended air flow	10~15L/min (20℃ 0.15MPa)
Focus vertical adjustment range	±15mm
weights	2.2kg (main body + CCD) / 3.7kg (main body + rotary feeder + CCD)

III. Product Installation

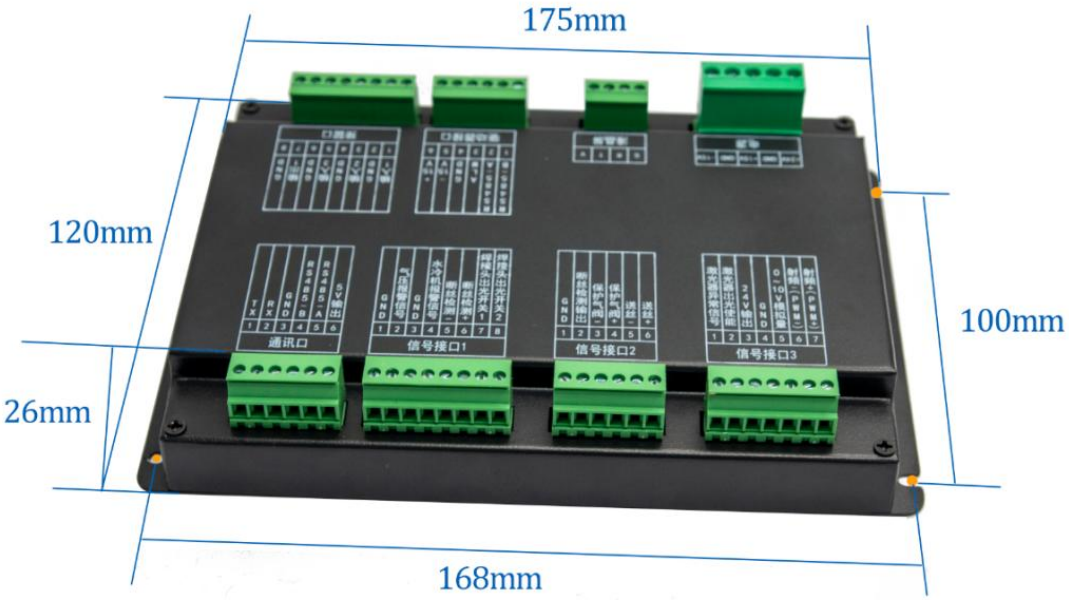


Figure 3.1 Dimensional drawing of controller

3.1 Controller

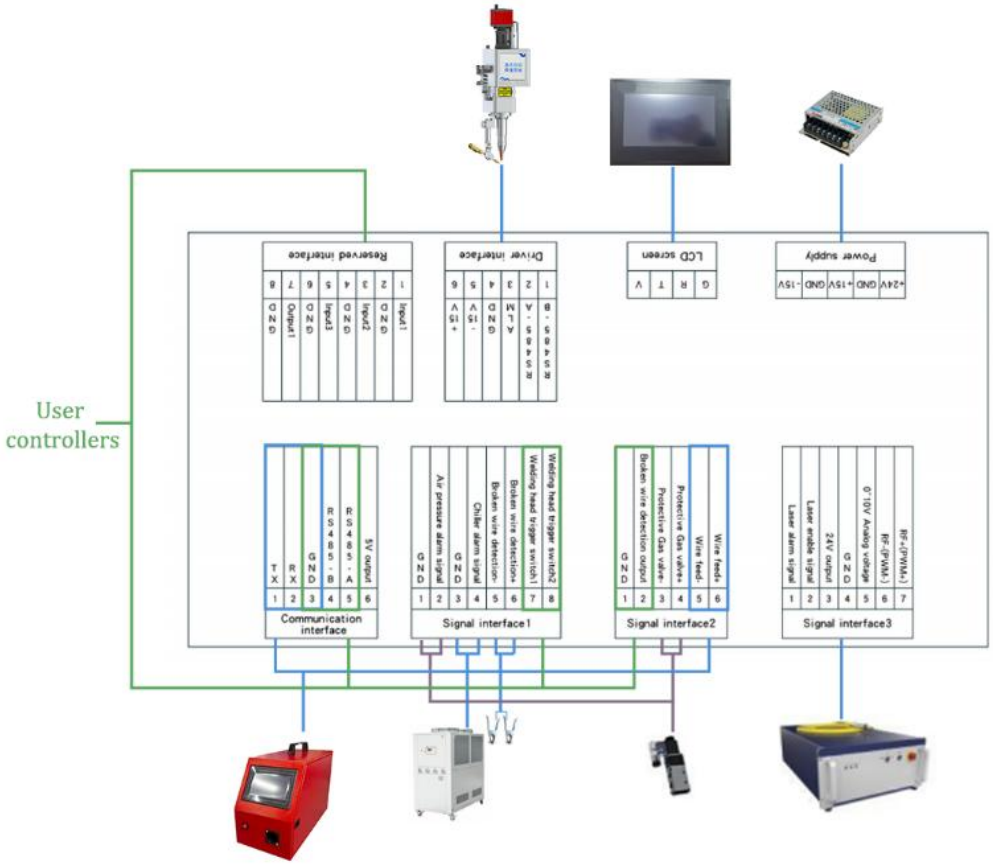


Figure 3.2 Wiring Schematic

① [Broken Wire Detection-] and [Broken Wire Detection+] should be connected to the lower end of the gun head and the workpiece separately and independently. The wire is considered unbroken when both ends are connected.

② When wiring the host computer, keep the [welding head out of the light switch 1] [welding head out of the light switch 2] and [RS485-A] [RS485-B] [GND] connection can control the equipment welding. The [reserved port] and [broken wire detection output] are extended functions, whether they are connected or not does not affect the welding function of the equipment. Please selective wiring according to the use of demand and the actual interface of the host computer.

③ To avoid abnormalities in the power used by the equipment, the ground wire of the switching power supply must be effectively grounded! The switching power supply case must be grounded!

④ The icons used in Figure 3.1 refer only to a certain type of equipment and do not specifically refer to the corresponding product.

3.1.1 Controller - power supply

The power supply side uses the 5P connector (supplied with the unit) and is powered by the supplied 24V switching power supply and ±15V switching power supply.

When installing, please note that the 15V switching power supply distinguishes between positive and negative poles, V1 connects to +15V, V2 connects to -15V, and any COM on the 15V switching power supply connects to pin 2 GND!

The switching power supply must be grounded!

3.1.2 Controller - LCD screen

The LCD wiring comes with it, just plug it directly into the corresponding interface.

3.1.3 Controller - signal interface 1

Table 3.1 Functional description of signaling interface 1

Signal Interface 1		
Pin Number	Signal Definition	Functional Description
1	GND	For the air pressure alarm signal input port, set the "Air Pressure Alarm Level" on the setting page of the display to the same level as the actual valve alarm level.
2	Air pressure alarm signal	
3	GND	For the water cooler alarm signal input port, please set the"Water Cooler Alarm Level" on the setting page of the display to the same level as the actual water cooler alarm level.
4	Water cooler alarm signal	
5	Wire Break Detection -	The wire end of the metal clip wire is connected to the [control box] and the metal clip is clamped on the [table]. When [Wire Break Detection -] [Wire Break Detection] is on, the [Wire Break Detection Output] signal outputs 24V. Option
6	Wire break detection+	The wire end of the metal clip wire is connected to the [control box], and the metal clip is clamped on the [welding torch] and conducts with the welding wire. When [wire break detection -] [wire break detection] is on, the [wire break detection output] signal outputs 24V. Option
7	Welding head light switch 1	External switch, normally disconnected. pins 7 and 8 conductive indicates that the light switch is on.
8	Welding head light switch 2	
Note: Normal output signals from the subsequent output ports are only available when there are no alarms and the switch signal is displayed in green.		

3.1.4 Controller - signal interface 2

Table 3.2 Signaling Interface 2 Functional Description

Signal Interface 2		
Pin Number	Signal Definition	Functional Description
1	GND	When the two pins of "wire breakage detection±" are on, the

2	Broken wire monitoring output	wire is not broken, 24V is output from pin 2, and pin 1 is zero.
3	Protective gas valves -	Valve open: Protected valve + Output 24V; Valve closed: protection valve + No output.
4	Protective gas valves+	
5	Wire feed-	For the wire feeder feed switch signal, connect the signal wire corresponding to the wire label. Note the distinction between positive and negative.
6	Send silk+	

3.1.5 Controller - signal interface 3

Table 3.3 Functional description of signaling interface 3

Signal Interface 3		
Pin Number	Signal Definition	Functional Description
1	Abnormal laser signal	Set the "Laser Alarm Level" on the display setting page to match the alarm level of the actual laser being used.
2	Laser Output Enablement	Enable +, connect to the laser's enable +.
3	24V Output	24V output, normal output 24V voltage after power up.
4	GND	for common ground (reference ground for pins 1/2/3/5)
5	Analog +	Analog output (default is 0 to 10V analog voltage).
6	RF-(PWM-)	PWM-Modulating Signal
7	RF+ (PWM+)	PWM + modulation signal

3.1.6 Controller - communication port

Table 3.4 Communication port function description

communications port		
Pin Number	Signal Definition	Functional Description
1	TX	232 communication interface. Connects to wire feeder line, line labeled [RX].
2	RX	232 communication interface. Connects to wire feeder line, line labeled [TX].
3	GND	signal reference ground
4	RS485-B	485 communication interface, connected to the upper computer 485B
5	RS485-A	485 communication interface, connected to the upper computer 485A
6	5V Output	Reserved port, normal output 5V

3.1.7 Controller - driver interface

Table 3.5 Driver Interface Functional Description

drive interface		
Pin Number	Signal Definition	Functional Description
1	RS485-B	Connection to 7-pole aerial plug-in system connection cable, cable label [RS485-B]
2	RS485-A	Connection to 7-pole aerial plug system connection cable, cable label [RS485-A].
3	ALM	Connection to 7-pole avionics system connection cable labeled [ALM]
4	GND	Connect the 7-pole plug-in system connection cable labeled [GND].
5	-15V	Connection to 7-pole aerial plug system connection line, line marking [-15V].
6	+15V	Connection to 7-pole aerial plug system connection cable, line marking [+15V].

3.1.8 Controller - reserved port

Table 3.6 Functional description of the reserved port

reserved port		
Pin Number	Signal Definition	Functional Description
1	Input 1	Corresponds to IO-1
2	GND	
3	Input 2	Corresponds to IO-2
4	GND	
5	Input 3	Corresponds to IO-3
6	GND	
7	Output 1	Alarm output. When the system triggers any one of the alarm signals such as "air pressure", "temperature", "chiller", etc., which will force the light to be cut off, 24V will be output.
8	GND	

3.2 Welding torch

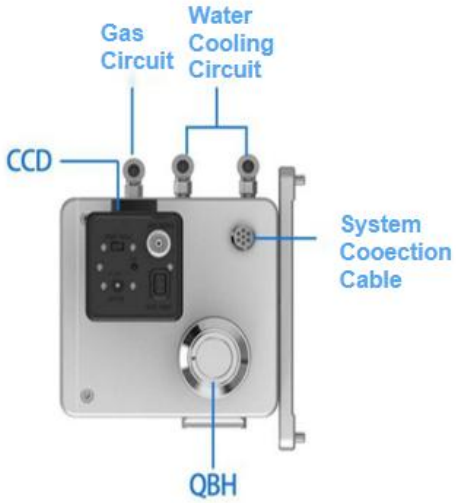


Figure 3.3 Weld head interface diagram

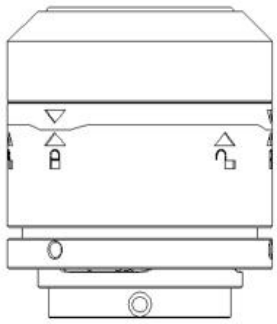


Figure 3.4 QBH localization

3.2.1 Automation torch connection

The product [QBH] interface is suitable for most industrial lasers, including IPG, RuiKe, Chuangxin, FIBO, Hotspur, Japhet, Keplin and so on. Attention should be paid when installing:

① Keep the inside and outside of the device clean;

② The fiber head is placed horizontally with [QBH] during installation;

③ Subject to the [Locked] and [Unlocked] scales in Fig. 3.4, rotate to loosen the QBH first, insert the fiber head and then lock it. After locking, the fiber optic head is placed in [QBH] without shaking.

3.2.2 Water and gas connections

The interface of [water circuit] and [gas circuit] is equipped with Φ6mm quick connector, which can be inserted directly. The cooling system is divided into the water part of the welding head and the water part of the fiber optic head, which are connected in series, as shown in the following figure:

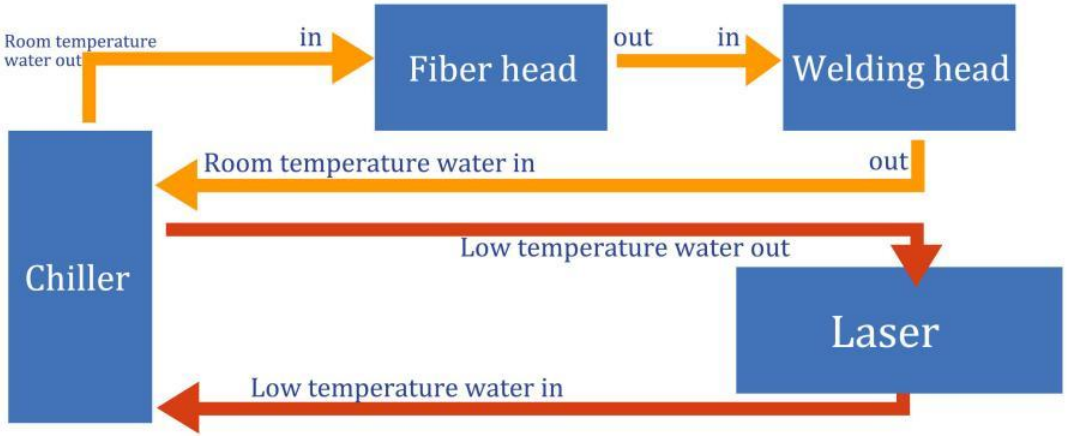


Figure 3.5 Schematic diagram of the water path between the welding head and the fiber optic head

3.2.3 Control box connection

The double pendulum welding head is connected to the control box via the [7-pole aerial plug system connection cable] supplied with the unit. See [Driver Interface] above for control box wiring definitions.

3.2.4 CCD module connection

Detailed installation and use of CCD is shown in the demo video.

① The main components are shown in Figure 3.6 below:

Figure 3.6 CCD Components

serial number	name (of a thing)	note
1	screen (TV, computer or movie)	8", 800x600 resolution
2	Stand base	
3	Multi-directional collet	
4	camera shot (in a movie etc)	Mounted on weld head

② The CCD display size and keys are shown in Figure 3.7:

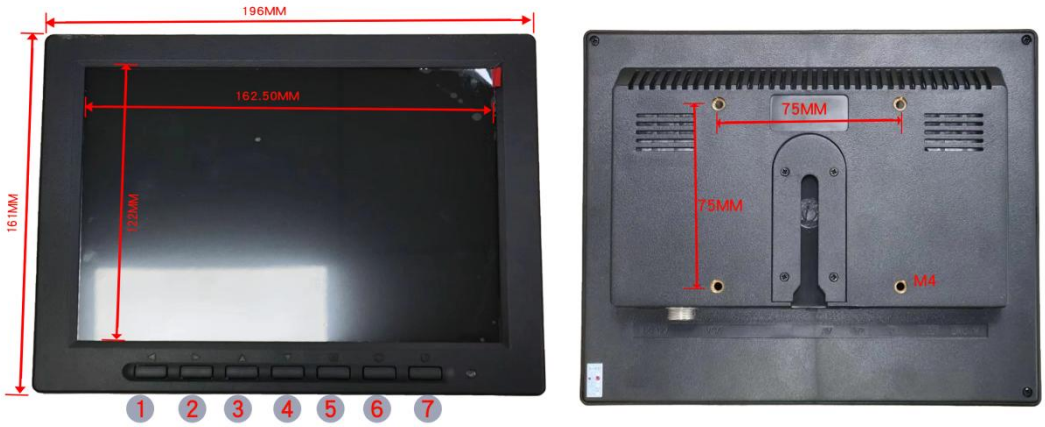


Figure 3.7 CCD Screen

Screen size 161mmX196mm, with M4x4 screw holes on the back for more than 75mmx75mm, and a slot in the center for fixing the [Multi Clamp].

on-screen button	functionality
1	Vertical line left
2	vertical line right
3	vertical line moving up
4	vertical line down
5	Big Cross Switch
6	Small Cross Switch
7	power switch

Figure 3.8 CCD Wiring

③Wiring and connections are shown in Figure 3.8:

Part number	name (of a thing)	interface number	connect a wire	note
1	composite line	①	Connecting the camera ①BNC connector	Video Signal Input
		②	Connecting to the camera ③ Power connector	12V Output
		③	reserve	12V Output
		④	Connect to CCD display	Video Signal Output
		⑤	Power cord ⑤ connector	12V Input
		④	reserve	12V Output
2	power cable (of an appliance etc)	⑤	Connection to composite line ⑤ connector	220V to 12V

3	CCD Lens Camera	①	Connection to Composite Line ① Connector	Video Signal Output
		③	Connection to Composite Line ③ Connector	12V Input

Unlabeled or reserved ports do not affect the use and do not need to be wired.

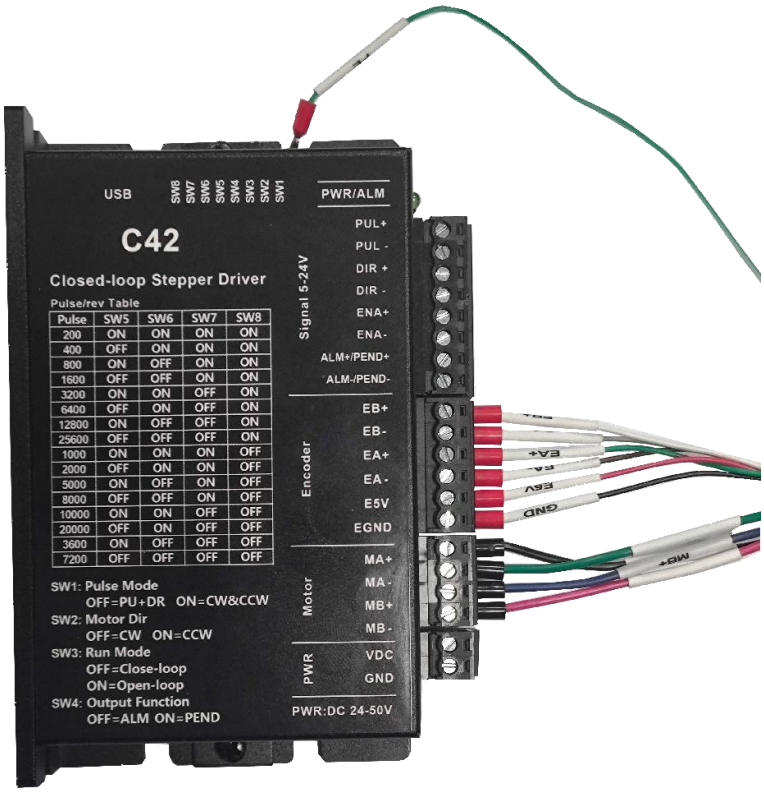
3.3 Rotating wire feed module

The rotary wire feed assembly consists of 1, a rotating structural member of the gun body and 2, a motor driver. And comes with the welding head with 1, black 4-core (AB phase) wire. 2, gray 7-core wire (encoder) wire 3, black 4-core (limiter) wire.

Basic parameters:

Driver Segmentation	3200
gear ratio	1:4
drive control	Pulse + Direction

3.3.1 Drive Interface



1、【PWR】is the power interface, please connect DC 24~50V.

2、【Motor】is the motor AB phase interface, please connect the black 4-core wire corresponding to the wire label.

3、【Encoder】is the encoder interface, please connect the gray 7-core wire corresponding to the wire label, in which the white and green wires are connected to the earth.

4、【Signal】is the signal interface, please connect the external control signal.

3.3.2 Limiters (photoelectric switches)

NPN type limiters, when the movement to the limit triggers a level change, the output signal of the white line changes from a low level to a high resistance state (disconnected), and the output signal of the black line changes from a high group state (disconnected) to a low level.

color of thread	define
coir (coconut fiber)	Power supply + (5~24V)
indigo plant	Power supply -
stare coldly	normally closed output
(loanword) hack (computing)	normally open output

IV. Product Operation Interface

This chapter describes the interface between the 4" screen on the body and the 7" screen connected to the main control board.

4.1 Home page

Switches used to display the current process, alarm messages and to adjust the main output signals.

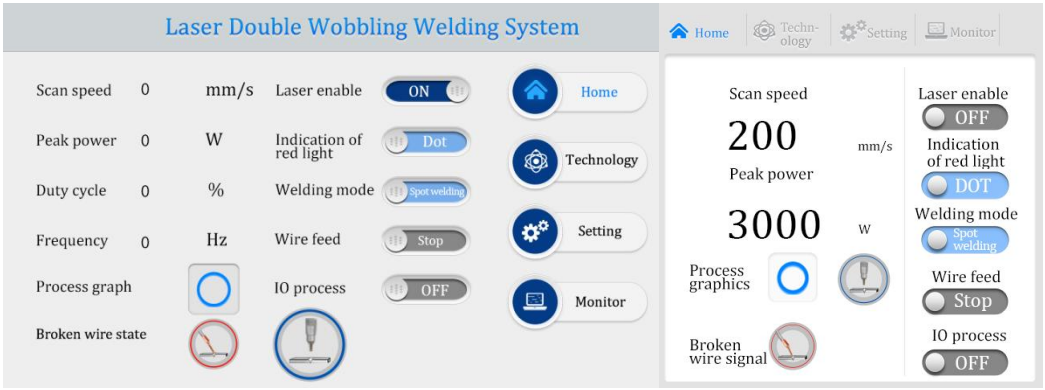


Figure 4.1 Interface-Home

① [Laser Enable-On/Off]: Controls and indicates whether or not to output the [Laser Output Enable Signal].

② [indicate red light - point / line]: control, indicate whether the vibrating mirror motor swing, adjust the red light for [point] or [line], does not affect the red light with or without.

③ [Welding Mode - Spot Welding/Continuous]: Usually [Continuous] is used, [Spot Welding] is the intermittent light output according to the parameter of the setup page, which is used for fish scale welding.

④ 【Feeding-Run/Stop】: After communicating with 【Feeding machine】 through 【Communication port】, it is used to switch the state of feeding, and it can be cut to 【Stop】 without additional debugging of the feeding machine when there is no need to feed wire. If it is not connected, it has no effect.

⑤ [Process Graphics]: corresponds to the current process scanning graphics.

4.2 Process page

Figure 4.2 Interface - Process

Used to select process graphics, and adjust process parameters.

① [Scanning Speed]: The line speed of the focused spot movement, affecting the welding quality. Take [circle] [diameter] 3mm as an example, usually set to 200~600. [Welding speed] increases, [scanning speed] increases correspondingly.

② [Peak Power]: The maximum power at the time of light output, or processing power, welding power.

③ [Duty Cycle, Pulse Frequency]: Usually set [Duty Cycle 100%] [Pulse Frequency 2000]. According to the characteristics of the laser by adjusting the duty cycle and pulse frequency to change the equivalent processing power, usually do not adjust.

④ [Diameter, Width, Height]: corresponds to the geometry of the spot and controls the spot size. Adjusted depending on the size of the weld.

⑤ [Rotation Angle]: Controls the rotation of the spot around the geometric center. Usually not adjusted.

⑥ [Wire Feeder - Connected / Not Connected]: Indicates the communication status between the welding board and the wire feeder board, and the main control board is connected to the wire feeder through the [communication port]. When [Connected], click to enter the parameter page of wire feeder. When [Not connected], it has no effect.

⑦ [Craft Patterns]: Provides 6 craft patterns, click to switch.

4.3 Setup Page

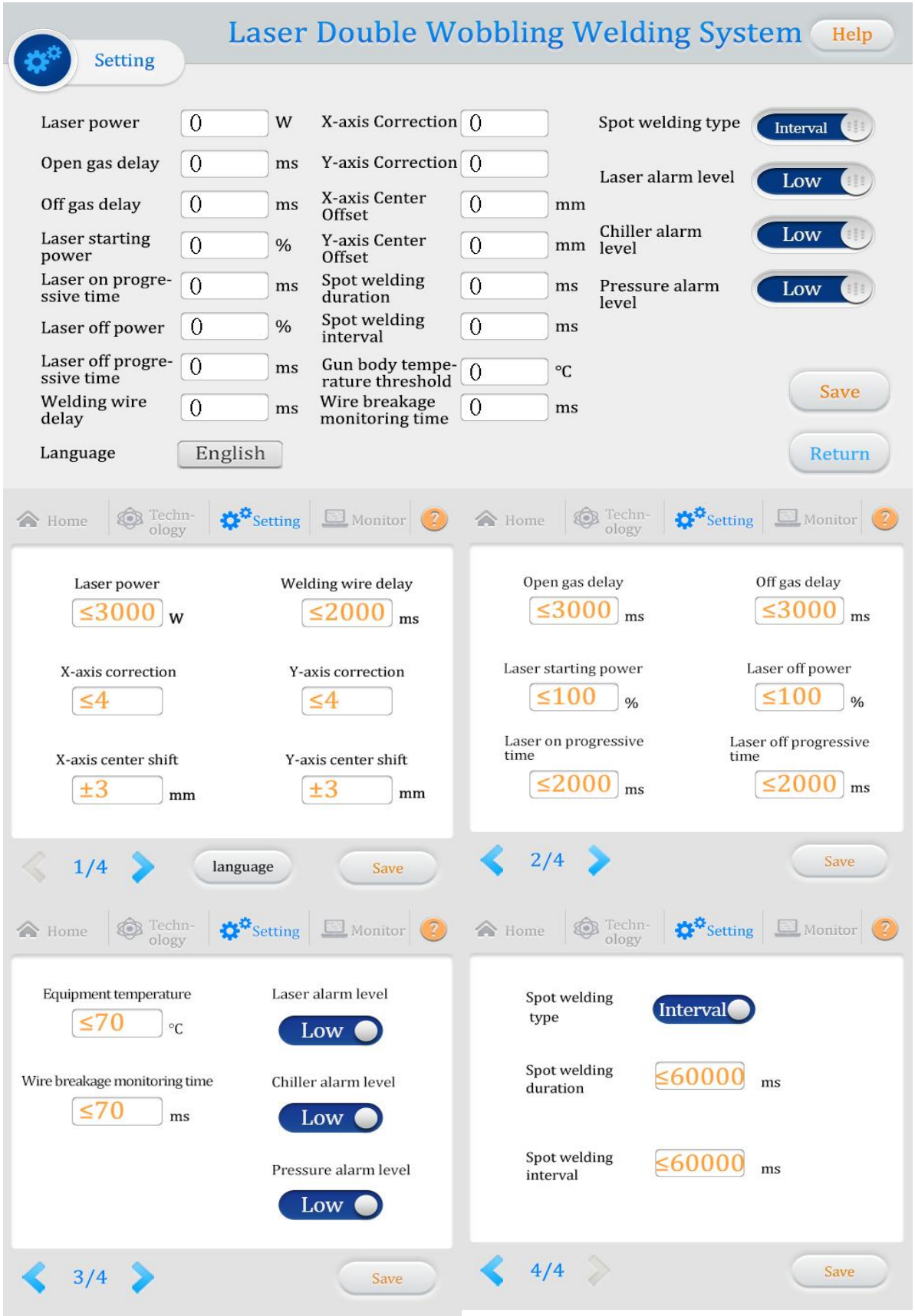


Figure 4.3 Interface - Settings

Used to set factory parameters, including the unit's power and alarm levels.

① [Laser power]: Subject to the actual laser.

② [Feed delay compensation]: Feed the wire in advance. Example: If 1000 is set, after the trigger is pressed, the wire will be fed first for 1s and then the light will come out.

③ [X/Y correction]: correction factor = target line width / measurement line width, used to adjust the actual spot size, so that it is consistent with the system display.

④ [X/Y Axis Center Shift]: [-] means left shift, [+] means right shift. Used to adjust the light spot to make centering.

⑤ [Open Air Delay]: Before the light is released, the air is released in advance.

(6) [Delay in turning off the gas]: After turning off the light, delay in turning off the gas.

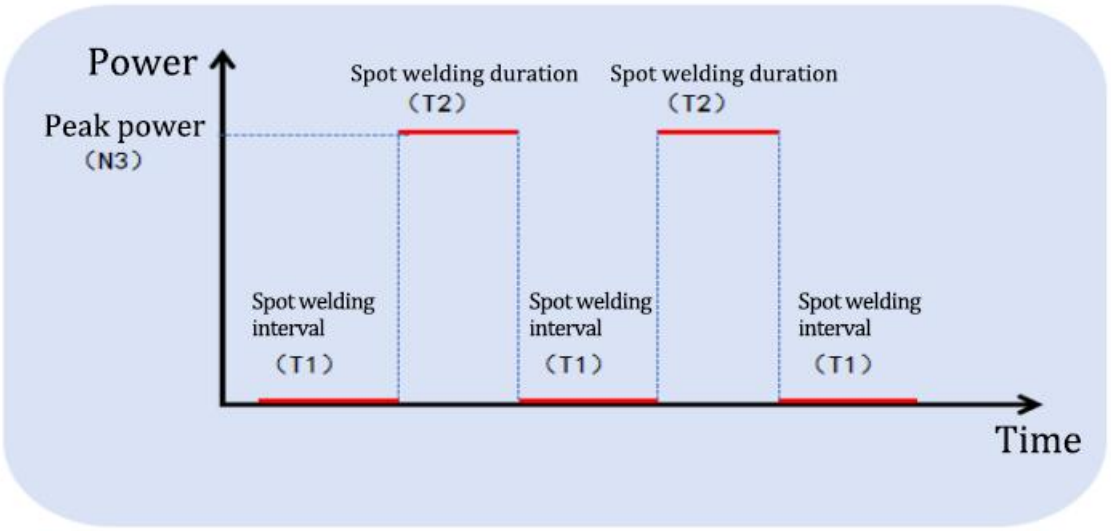
⑦ [On/Off Power] [On/Off Progressive Time]: As shown, [On Progressive Time T1] indicates the time from [On Power N1] to [Peak Power N3], and [Off Progressive Time T2] indicates the time from [Peak Power N3] to [Off Power N2].

⑧ [Temperature threshold]: maximum 70 ℃, the value is set to 0, do not detect the temperature alarm.

⑨ [Alarm Level-High/Low]: set to low level when not in use, according to the external device setting.

⑩ [Spot Welding Type - Intermittent/Fish Scale]: [Fish Scale] is applicable to fish scale pattern welding, [Intermittent] is applicable to segmental welding.

⑪ [Spot Duration] [Spot Interval]: As shown in the figure, [T1] does not emit light, [T2] emits light.



4.4 Monitoring page

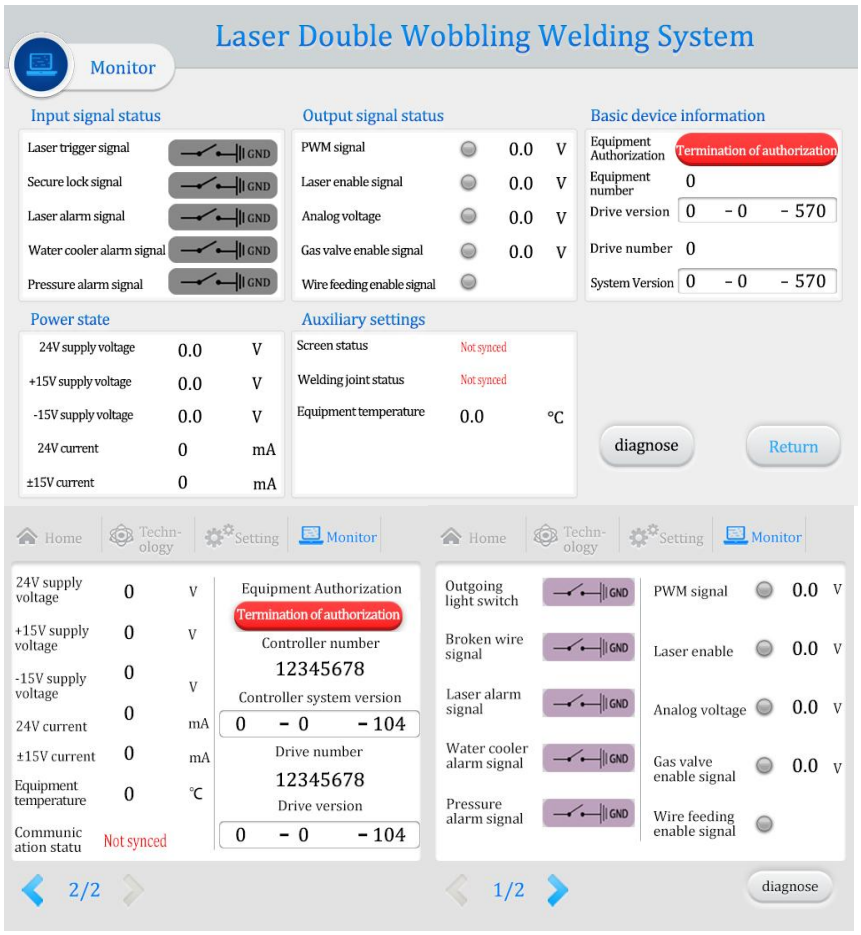


Figure 4.4 Welding Gun Interface-Monitoring

Displays information about the monitored live machine.

① where [Controller System] on the [480 x 480 small interface] refers to the [Main Control Board] in the control box [Driver] refers to the [Driver Board] in the welding head.

② [Device Authorization] is used for device encryption.

4.5 Diagnostic page

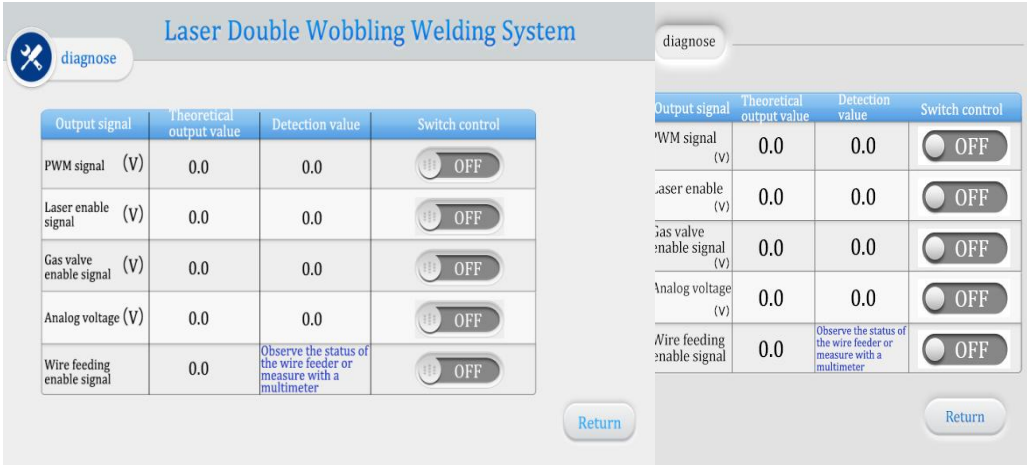


Figure 4.5 Welding Gun Interface-Diagnostics

This mode can only do single [output signal] output, used in the security situation to determine whether the main control board each output signal is normal, this mode can not be out of the light.

4.6 Wire Feed Sheet

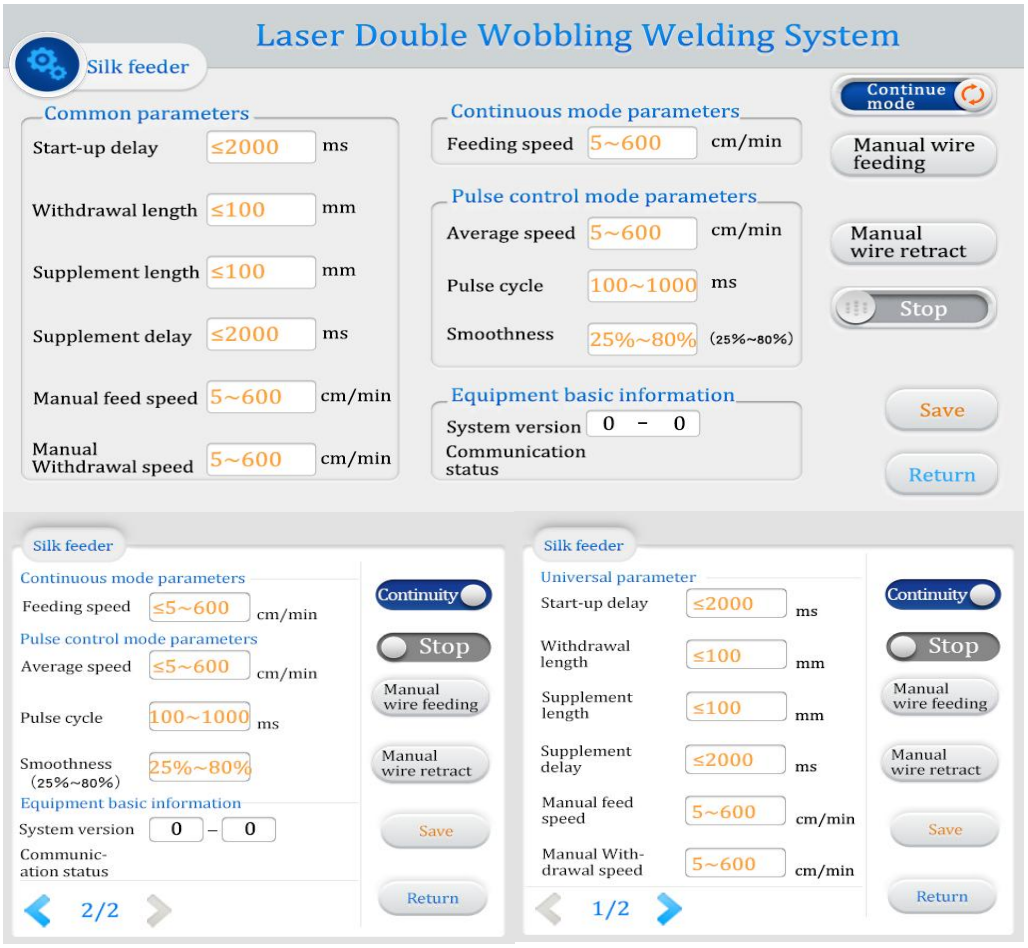


Figure 4.6 Welding Gun Interface - Wire Feed

When the device communicates with the wire feeder, it can enter the [interface of wire feeder], which can be used to quickly adjust the parameters of wire feeding. When there is no communication, this interface cannot be accessed and this function is not effective.

① [Continuous Mode Parameter] is effective only when [Continuous Mode], and [Pulse Mode Parameter] is the same.

② [General Parameters] takes effect globally.

V. Product routine maintenance

1. It is recommended that users replace the water to the chiller once a month to effectively prevent clogging of the water pipe inside the welding head, the water quality requirements for pure water or distilled water, low-temperature state need to add antifreeze.
2. Lens maintenance and replacement should be carried out in a relatively clean field environment. When open operations such as opening the protective mirror, focusing mirror compartment cover, pulling out the lens holder, etc. are performed, they should be well protected (covered with a beautiful paper). Replacement of different lenses for all gun models can be found in the WeChat program →→ Lens Installation.
3. When using it, please hold it gently. For complex production environment, please clear the ash in time.

Ⅵ. the product common problems and measures to deal with

Descriptions of common alarms and solutions to problems are listed below:

Items at issue	impunity	prescription
Temperature alarms to indicate high temperatures in all categories	HomePrompt XXX temperature is too high	The general lens temperature alarm is usually checked first for damage to the lens and the damaged lens is replaced. If the lens is normal, you need to block this alarm directly in the setup page, and set the corresponding lens temperature alarm threshold to 0 in the setup page to save it.
Chiller/Laser/Air Pressure Alarm	HomePop-up window showing chiller/laser/air pressure alarms	Alarm Logic for Levels: The alarm input level captured is judged to be an alarm if it is the same as the alarm level on the setup page. Typically a relay shorting signal is considered to be low. Usually, the alarm is caused by wrong alarm level setting, so change the corresponding alarm level. If an alarm signal is connected and an alarm occurs, regardless of whether it is set high or low, unplug the alarm signal wire and set it low.
Poor soldering results	Starts out strong and slowly gets weaker/lighter, making it impossible to fuse the wire	Typically the welding gun lens is damaged, including but not limited to the protective lens, focus, collimation, reflection, any one or more of which can cause this situation. Replace the protective lens and look at the focus, then check the reflection and collimation, and replace the damaged lens. About the copper nozzle at the spark may be the focus problem, should be ruled out first. Also look at the laser fiber head section for dirt or damage.
Motor does not oscillate	The spot is a point	I. Whether the software part is set correctly Setup-Scan Correction: 1.0 or 1.33 Process-scan width: greater than 0 Home-Indicating red light: line II. Hardware part check (first installation) 1. The power supply of the swing motor is 15V power supply, we should first measure whether the power supply of the 15V switching power supply is normal. 2. Check the main control board - drive interface 15V is normal, 15V is divided into positive and negative, the wrong wiring will also make the motor does not work.
Abnormal motor oscillation	① Whistling of the motor at the end of the	The driver inside the body controls the motor swing and is connected through the motor cable. ① may occur when there is a signal error (poor contact, short circuit, or

	welding head after power on/abnormal swinging red light/heat/unable to adjust the swinging width. ② Directly burned out the lens, there are seals and focusing lenses burned out at the same time	broken motor cable), external interference, or a mismatch between the driver and the motor. If the ② problem occurs, it is recommended to exclude the strong electromagnetic interference sources around the equipment. If there is no source of interference, it may be the driver board and the control box (no control box is ± 15V switching power supply) between the connection is abnormal, you can try to gently shake the harness interface to reproduce (or eliminate) the phenomenon, to confirm that the harness is connected to the impact of the replacement of materials.

For more solutions, please refer to the WeChat app [Problem Handling] page.

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