User Operation Manual for BF02K-mini Wobble laser weld head

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Foreword

Dear users:

Thank you for purchasing our products!

This manual explains in detail the installation and commissioning of Ruitu BF02K-mini wobble laser weld head, so that you can start using this product quickly; If you have other matters to know, you can consult our company directly.

Due to the constant updating of product features, the product you receive may differ in some respects from what is stated in this manual. I would like to express my apologies!

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If you find any errors in this document, please notify us as soon as possible.

The data contained in this manual are used only to describe the product and should not be considered as a statement of security interest.

For the benefit of our customers, we will constantly try to ensure that the products we develop are in line with the latest technology.

The information provided in this manual includes:

Product structure characteristics and technical characteristics

Product functional features and maintenance

Electrical connection

Software instructions

This manual is suitable for the following users:

Installation or wiring personnel

Trial operation adjustment personnel

Maintenance or inspection personnel

Catalog

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1. Overview

This manual covers the BF02K-mini and gives an overview of the corresponding controls.

In the field of laser welding, wobble laser welding has fast welding speed, good surface forming, white weld seam, small radiation, sanitation and environmental protection, and is used in the welding field of thin stainless steel, iron plate, galvanized plate, copper plate, aluminum alloy plate and other metal materials;

In recent years, wobble laser weld heads are widely used in power batteries, automobiles, hardware and electrical appliances and other industries.

1.1 PRODUCT INTRODUCTION

1.1.1 Product Profile

Compared with traditional (laser) welding methods, the use of wobble laser weld heads for welding can improve the stability of the welding process, repeatability and weld appearance. The wobble head widens the weld seam in a controllable way, and even if there is a certain gap between the welded workpieces, the wobble head can still achieve high-quality welding. At the same time, thanks to its flexibility (adjustable wobble mode, amplitude and frequency), it is easier to optimize welding parameters for dissimilar materials and welding workpiece shapes.

The overall structure of the wobble laser weld head is shown in Figure 1.1:

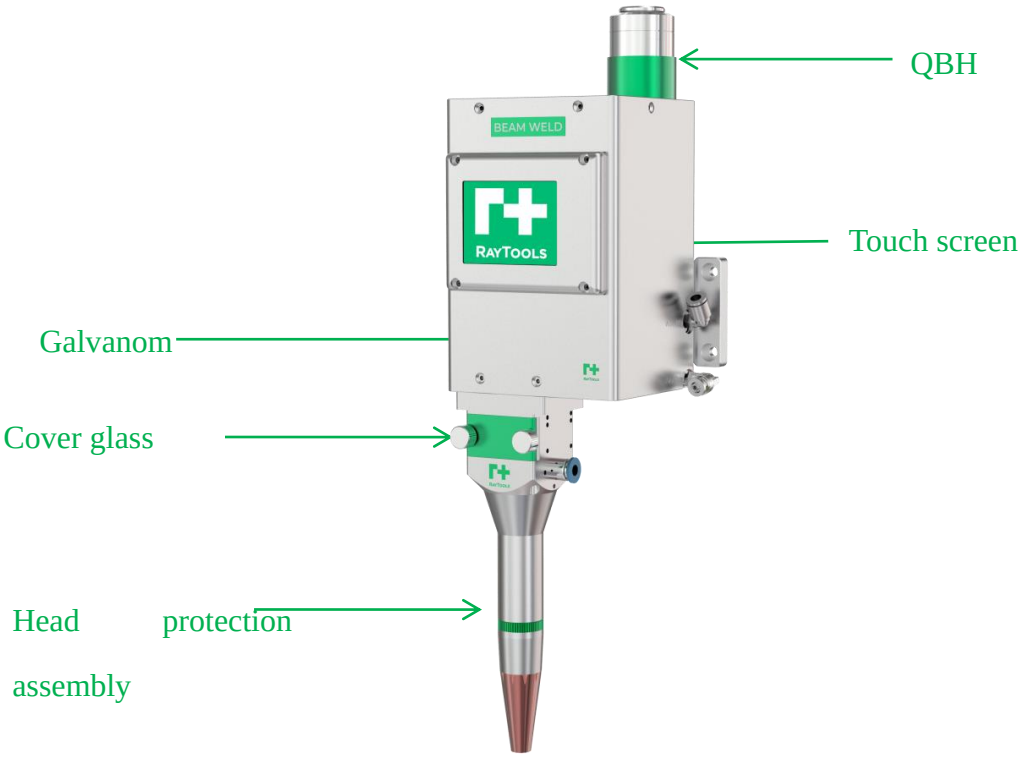


Figure 1.1

1.1.2 Product Advantages

- Lightweight design, the overall weight is 2KG, which greatly reduces the load of the manipulator, the integrated design of the motor and drive control, and the wiring is simple
- 8 wobble modes, built-in display screen, easy operation, and automatic offline operation at the same time
- Built-in motor driver, avoiding interference caused by external drive, the signal line between drive and motor is too long, and the operation is more stable
- Through IO control start-stop and program selection, the control is simple and easy to integrate
- Built-in CCD camera mechanical fully enclosed design
- Fully enclosed dust-proof design to avoid dust pollution of the optical part
- Full main body water cooling design, simple water connection

1.2 Product performance

1.2.1 Product parameters

The relevant parameters of BF02K-mini wobble laser weld head products are shown in Table 1.1:

Model	BF02K-mini
Maximum laser power (W)	2000
Collimation focal length (mm)	100
Focal length (mm)	200/250/300
Scanning range	X: 0 ~ 5mm; Y: 0 ~ 5mm;
Highest frequency (Hz)	500
Optical aperture (mm)	14
Interface form	QBH

Table 1.1

1.2.2 Wobble mode

Supports eight wobble modes, as shown in Figure 1.2:

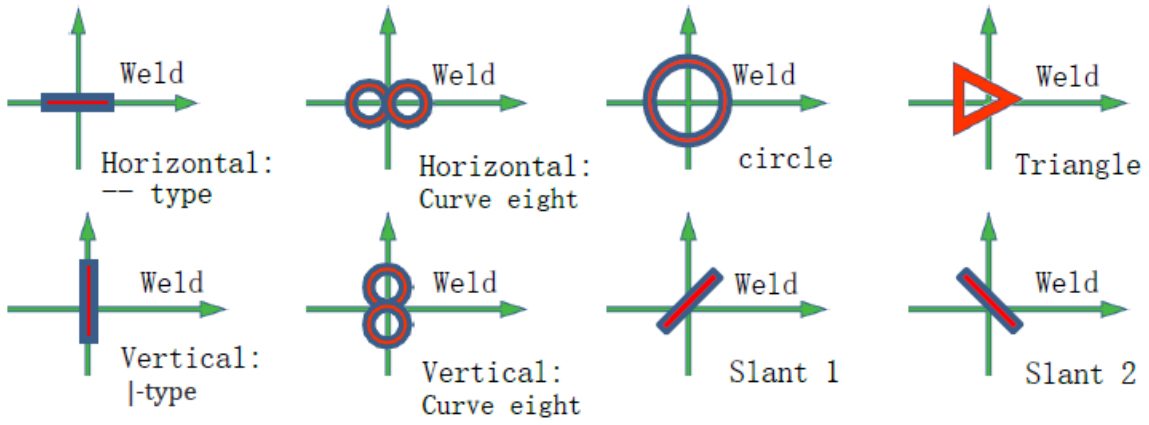


Figure 1.2

In addition to the wobble mode, the wobble frequency and wobble amplitude can be adjusted to optimize the welding process.

Note: The highest frequency is inversely proportional to the amplitude of the wobble.

2 Installation Instructions

2.1 Mechanical assembly

2.1.1 Full head installation instructions

The fixing method of the whole head of the wobble laser weld head is shown in Figure 2.1 below:

The reference ratio is 100: 200, and the length of the direct blow head increases by 50mm for every 50mm increase in the focus distance

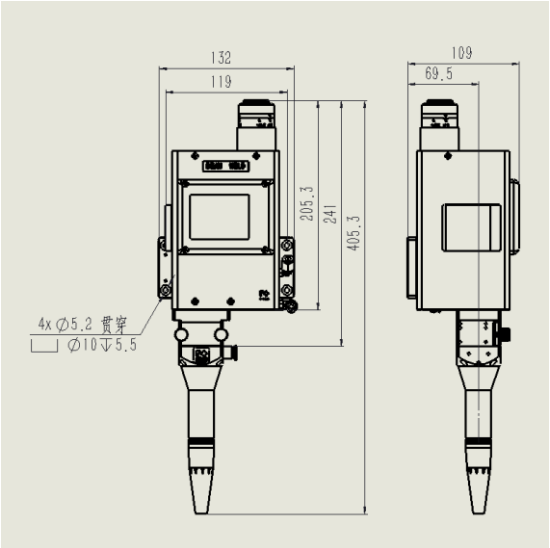


Figure 2.1

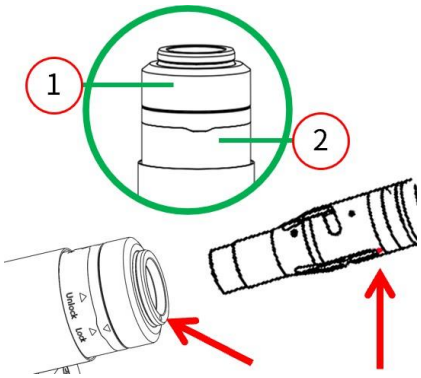
2.1.2 Fiber Optic Connection Instructions

The wobble laser weld head adopts the dust-proof design of the whole body, and the connection between the CBH connector and the optical fiber needs to be operated according to the following requirements.

Remove the fiber optic dust cover and check that the protective cap protecting the crystal head of the fiber is locked. Check whether there is dust and other dirt on the optical fiber crystal head, if there is, clean the optical fiber head with a dust-free cotton swab and absolute ethanol, as shown in Figure 2.2.

Figure 2.2

Connecting laser fiber



	Perform all maintenance on the laser head only at a clean station and maintenance work.
	Before connecting the laser fiber every time, it is necessary to remove the all the dust and dirt.
	In order to prevent dust and dirt from accidentally entering the optical fiber socket, when connecting optical fiber, it is recommended to place the laser head horizontally.

- Place the laser head horizontally and loosen the ① QBH steel sleeve counterclockwise;
- Align the "Unlock" part of the locking ring with the arrow;
- Check the end face of the optical fiber to ensure that the end face of the optical fiber is not contaminated;
- Remove the protective cover on the optical fiber socket;
- Align the red mark of the optical fiber output end with the QBH red mark and insert it directly to the bottom;

- Rotating the locking ring to the "Lock" position;
- Rotate and lock ① QBH steel sleeve clockwise until it is locked;
- Slightly twist the optical fiber output end to ensure that the optical fiber output end is reliably connected with the laser head.

ⓘ	If the site environment is dusty, it is recommended at the optical fiber connection Use masking paper for further sealing treatment.

2.2 Water and air connection

2.2.1 Waterway connection

The wobble laser welded joint adopts a water-cooled design of the whole body, and it needs to be connected to a water channel to dissipate heat inside the wobble head during operation. The internal water cooling-related connections have been strictly connected and a protective pipe cover is added. The user is simple to connect the water. He only needs to connect the water inlet and return port to complete the waterway cycle. The connection method is shown in Figure 2.4:

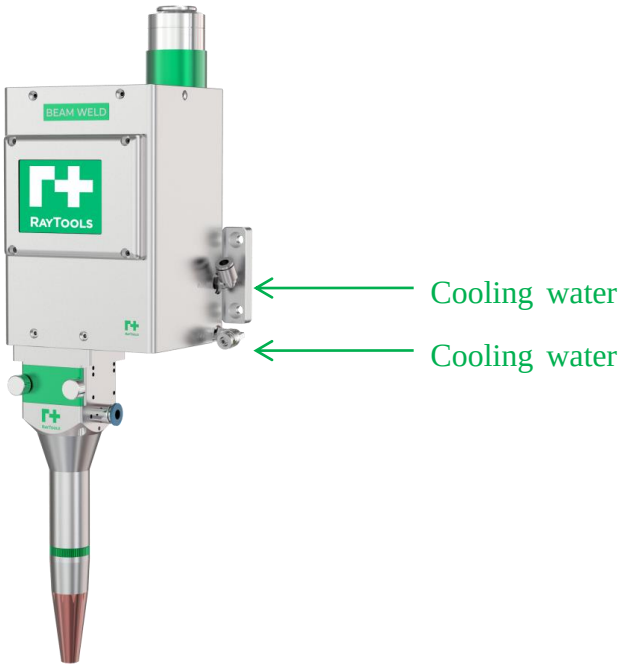


Figure 2.4

2.2.2 Air circuit connection

If the shielding gas of wobble laser weld head adopts the air knife mode, it can protect the optical cavity against slag and smoke during the light output process, and the air knife needs to be connected with dry clean compressed air. The interface is shown in Figure 2.5:

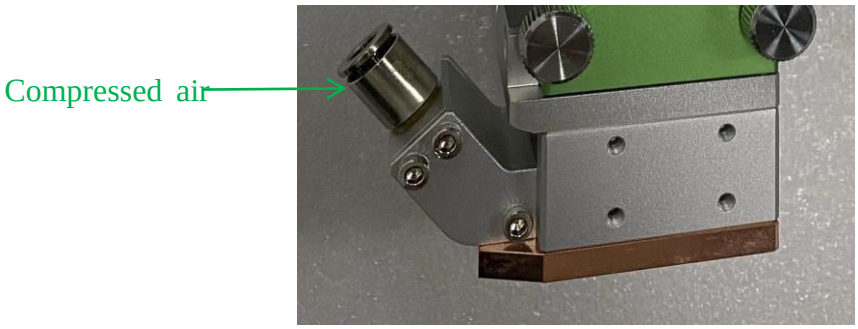


Figure 2.5

If the shielding gas of the wobble laser weld head is directly blown, the slag and smoke protection function of the optical cavity is carried out during the light output process, and the direct blown head needs to be connected with the relevant shielding gas. The interface is shown in Figure 2.6:

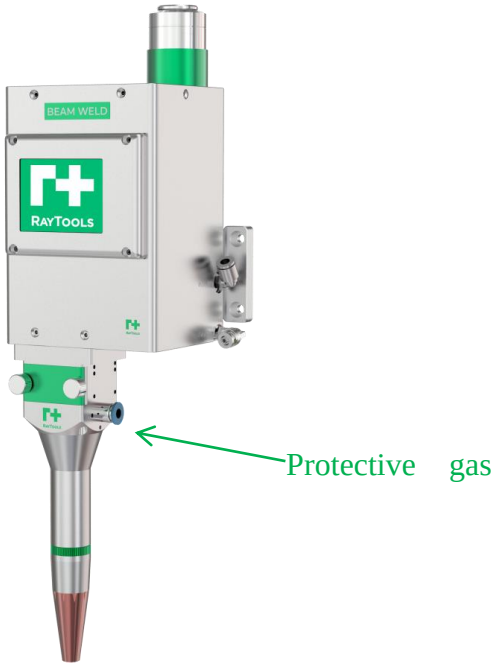


Figure 2.6

2.3 Harness connection

2.3.1 Overall description

As shown in Figure 2.7, the electrical interfaces of the BF02K-mini wobble laser weld head are all integrated on the upper panel,

The interfaces include: upper computer interface (IPC), Power interface (Power), monitoring Power interface (12VDC In), monitoring output interface (Video Out), and External Control interface (External Control).

Figure 2.7

2.3.2 Description of Power Interface and Host Computer Interface

Power interface: The pin position definition of the 3-core navigation plug-in power cord is as shown in Table 2.1. The user needs to access a ± 15 V, 3A switching power supply, such as: Hengfu HF-100W-D-L plus or minus ± 15 switching power supply (can be purchased with the laser head).

Power cord (3-core navigation plug)		
1	+15V	I
2	-15V	I
3	GND	I

Table 2.1

Upper computer interface: If customers have needs, they can choose to match the upper computer accessories package or prepare a 4-core navigation plug (male) cable by themselves. The 4-core navigation plug (male) interface is connected with the wobble head. The upper computer and the

wobble head use the same interface, and the two can be connected by a straight line. Among them, the 15V of foot 1 does not need to be connected! The pin definitions of the 4-core navigation plug are shown in Table 2.2 below:

Foot position	Signal name	Direction	Remarks
1	+15V	Output	Output power supply + 15V from the laser head, forming a loop with 4 pins
2	B	Bidirectional	Communication Line B
3	A	Bidirectional	Communication Line A
4	GND	Output	+ 15V power supply ground

Table 2.2

2.3.3 Externally controlled IO interface description

If customers need external control to emit light, they can use the DB9 external control cable that comes with it. The definition of DB9 male external control interface pin is shown in Table 2.3:

External Control Interface (DB9 Male)			
1	VCC _ 24V	I	Optocoupler power supply + 24V
2	IN0	I	Start
3	IN1	I	Program 1
4	IN2	I	Program 2
5	IN3	I	Reserve
6	GND24	I	Optocoupler Power Supply GND24
7	OUT0	O	Ready
8	OUT1	O	Run
9	OUT2	O	Reserve

Table 2.3

2.3.4 Monitoring Connection Description

1、The complete wiring of the wobble laser weld head monitoring system is shown in Figure 2.8:

Figure 2.8

2. The wobble laser weld head is equipped with the function of monitoring the welding process in real time, and the wiring of the camera is shown in Figure 2.9 below:

Figure 2.9

2.4 Monitor Adjustment Instructions

This wobble laser weld head provides customers with high-quality optical solutions. The laser head integrates CCD and industrial lens configurations inside, and can be directly used with external monitors and blue light sources;

The optical scheme is specially optimized mainly for monitoring, so that the welding process is clearly visible. Cameras and industrial lenses are installed and centered on welded joints before leaving the factory. The blue light source needs to be installed and wired by the customer (12-24V). The blue light source is shown in Figure 2.10 and Figure 2.11:

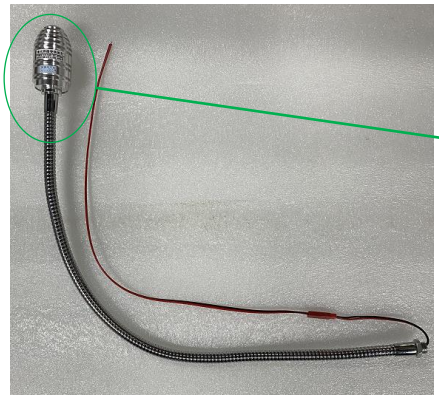


Figure 2.10 Figure 2.11

The matching status of the monitor and the adjustment method are shown in Figure 2.12:

◆按键便捷操作◆

十字线左右移动
The crosshair moves left and right

十字线上下移动
The crosshair moves up and down

菜单键
menu

十字线开启/关闭、长按2S可复位十字线到中心点
Cross hair on/off, long press 2S to reset Cross line to center point

电源按键 可关机、开机
The power button can be turned off, Boot

◆规格参数◆

产品名称 product name	工业监视器
屏幕分辨率 Screen resolution	1024(RGB)x768
显示区域 Display area	162.048(H)x121.536(V)
屏幕比例 aspect ratio	4:3 (H:V)
对比度 Contrast ratio	800:1 (Typ.)
可视角度 visible angle	89/89/89/89 (Typ.)(CR≥10)
亮度 Brightness	300 cd/m²
响应时间 Response time	≤12m/s
刷新率 refresh rate	60HZ-75HZ
制式 standard	PAL/NTSE自适应
工作温度 Working temperature	(0℃-50℃)
语言 Language	中英文 (默认中文)
视频接口 Video interface	BNC
电源 Power Supply	12V2A
整机功率 Whole machine power	≤10W
外观尺寸 Appearance dimension	200mmx165mmx33mm
壁挂尺寸 Wall hanging size	75mmx75mm
包装尺寸 Packing size	330mmx250mmx70mm

◆标准配件◆

电源适配器 Power adapter	X1
牛角底座 Ox horn base	X1
立柱 Column	X1
底座贴纸 Base sticker	X1
说明书 Instructions	X1

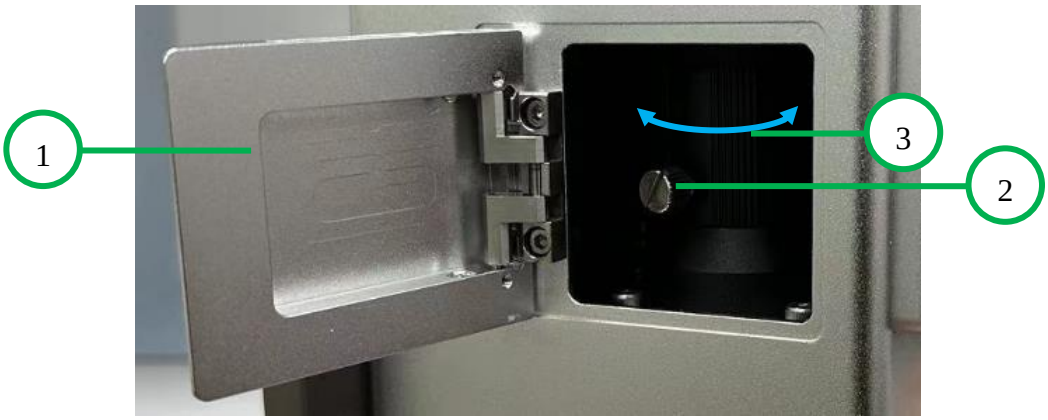
注意事项

1、十字线调整移动后会自动保存数据、复位后可回到中心点。
After the reticle is adjusted and moved, it will automatically save the data and return to the center point after reset.
2、屏幕避免尖锐物品或者硬物接触敲打防止刮花、破屏现象。
Avoid sharp objects or hard objects touching the screen to prevent scratches and screen breakage.
3、车载用时请使用12V稳压电源、避免电压不稳定烧坏机器。
Please use 12V regulated power supply to avoid burning the machine due to unstable voltage.

Figure 2.12

Lens adjustment

The BF02K-mini wobble laser weld head uses the design of a built-in monitoring module. When using it, the user only needs to open the side cover and loosen the locking screw according to the actual use situation, and then adjust the focal length of the monitoring module according to the actual process use situation to obtain better visual monitoring effect.



- Adjust the laser head to the working height;
- Open ① Adjust the cover plate;
- Unscrew ② Lens locking screw;
- Left and right adjustment ③ Monitoring lens focal length adjustment sleeve;
- Lock ② Lens lock screws to prevent lens focal length from shifting due to vibration;
- Cover the adjustable cover plate.

3 Display screen operation instructions

The wobble head developed by our company adopts a unified interface for control, and can be controlled by a touch screen of the wobble head. The wobble touch screen can adjust the working state of the wobble head, and after adjusting the parameters, it can realize offline work, and the operation is stable and reliable. The touch screen can be embedded in the wobble head.

3.1 Externally controlled display

If the touch screen is in the external control mode, the appearance of the wobble head touch screen panel is shown in Figure 3.1 below:

Figure 3.1 Controller Panel

3.2 Main interface

The touch screen of BF02K-mini wobble laser weld head has three interfaces, namely the main interface, the system parameter interface and the process parameter interface. After the power switch is turned on, the touch screen enters the main interface.

The main interface displays the current parameter number (0 ~ 3), control mode (internal control,

external control), as well as switch buttons (start/stop), "system parameters" button, and "process parameters" button. The interface is shown in Figure 3.2:

Figure 3.2

3.3 System parameter

The system parameter interface is mainly used to set various system parameters and display the current version number. The interface is shown in Figure 3.3:

Figure 3.3

The specific meanings and adjustment ranges of the parameters are shown in Table 3.1 below:

Parameter	Meaning	Scope	Default
Version number of weld head	Display weld head version number	Version control of weld head	-
Touch screen version number	Display Touch Screen Version Number	Touch screen program control	-
X-offset	X Offset (in 0.1 mm);	-100 ~ +100	0
Y-offset	Y offset (unit: 0.1 mm);	-100 ~ +100	0
X gain	X gain coefficient	0.2 ~ 1.99	0.63
Y gain	Y gain coefficient	0.2 ~ 1.99	0.63
Control mode	Switch internal and external control	Internal/External Control	Internal control

Main interface	Return to main interface		
Application	Parameters for Applying Settings		

Table 3.1

3.4 Main process parameter

The wobble head can save 4 groups of program numbers, which are 0 ~ 3 respectively. The interface is shown in Figure 3.4 below:

Figure 3.4

Click on the parameter number to select one of the parameters for setting. The 4 sets of parameters can be set independently, and can be switched on the screen in actual use, or selected with external IO.

Select the wobble trajectory by directly clicking the corresponding graph. Currently, 8 wobble trajectories are supported, namely 0, →, 8, ∞, Delta,\,/.

The scan size can be entered through the keyboard, and the range is between 0 and 5mm.

The wobble frequency can be input through the keyboard, and the range is between 1 and 500Hz. The actual wobble frequency is related to the scan size, and the maximum frequency can reach 500Hz when the size is less than or equal to 1.5 mm; The maximum frequency can reach 300Hz when the diameter is greater than 1.5 mm.

4 Safety Instructions, Maintenance and Overhaul

4.1 Safety Instructions

This product belongs to Class 4 laser control products. Improper use will cause damage to eyes and skin. Please carry out safety protection according to EU EN60825-1 standard.

1. Do not use it in a humid environment. The electrical part may cause electric shock or short circuit when it encounters water. When there are abnormal phenomena such as burnt smell, abnormal sound, abnormal heat, smoke, etc., please turn off the power supply and stop operation, otherwise it is easy to cause electric shock, fire and other dangers.

2. After the indicator light is turned on, it is strictly forbidden to expose the eyes to the indicator light to avoid harm.

3. The laser is infrared invisible light. After the laser is turned on, it is strictly forbidden to expose any part of the body to the laser, so as not to cause personal injury.

4. During laser processing, it is recommended to wear laser protective glasses. Please select protective glasses according to the wavelength range of the shield. It is strictly forbidden to hold the muzzle of the gun against any part of the human body. After the end of processing, the welded workpiece is still in a high temperature state, please do not touch the workpiece to prevent high temperature scalding.

5. Please ensure that the PE wire of the power cord is reliably grounded to avoid losses.

6. Please do not damage the anti-disassembly label on the controller shell, so as not to lose the warranty right.

4.2 Maintenance and overhaul

Protective lens cleaning or replacement:

1. As shown in Figure 4.1, the protective lenses are regularly checked for dirt before initial

use every day, and if dirty, they are cleaned or replaced; When the power is weakened during use, or the effect is not good, check whether the two protective lenses are dirty, damaged, etc., and then clean or replace them.

2. Manually loosen the screw of the protective mirror, and after the screw detaches from the cavity. Pull out the mirror drawer. Masking paper for connection to drawer Seal well to prevent dust from entering, then remove the pan-plug seal, carefully take out the protective mirror to clean or replace.

3. Put the cleaned or replaced protective lens into the protective mirror drawer again, then press the pan-plug seal, then tear off the masking glue, insert the drawer into the cavity, and finally lock the protective mirror screw.

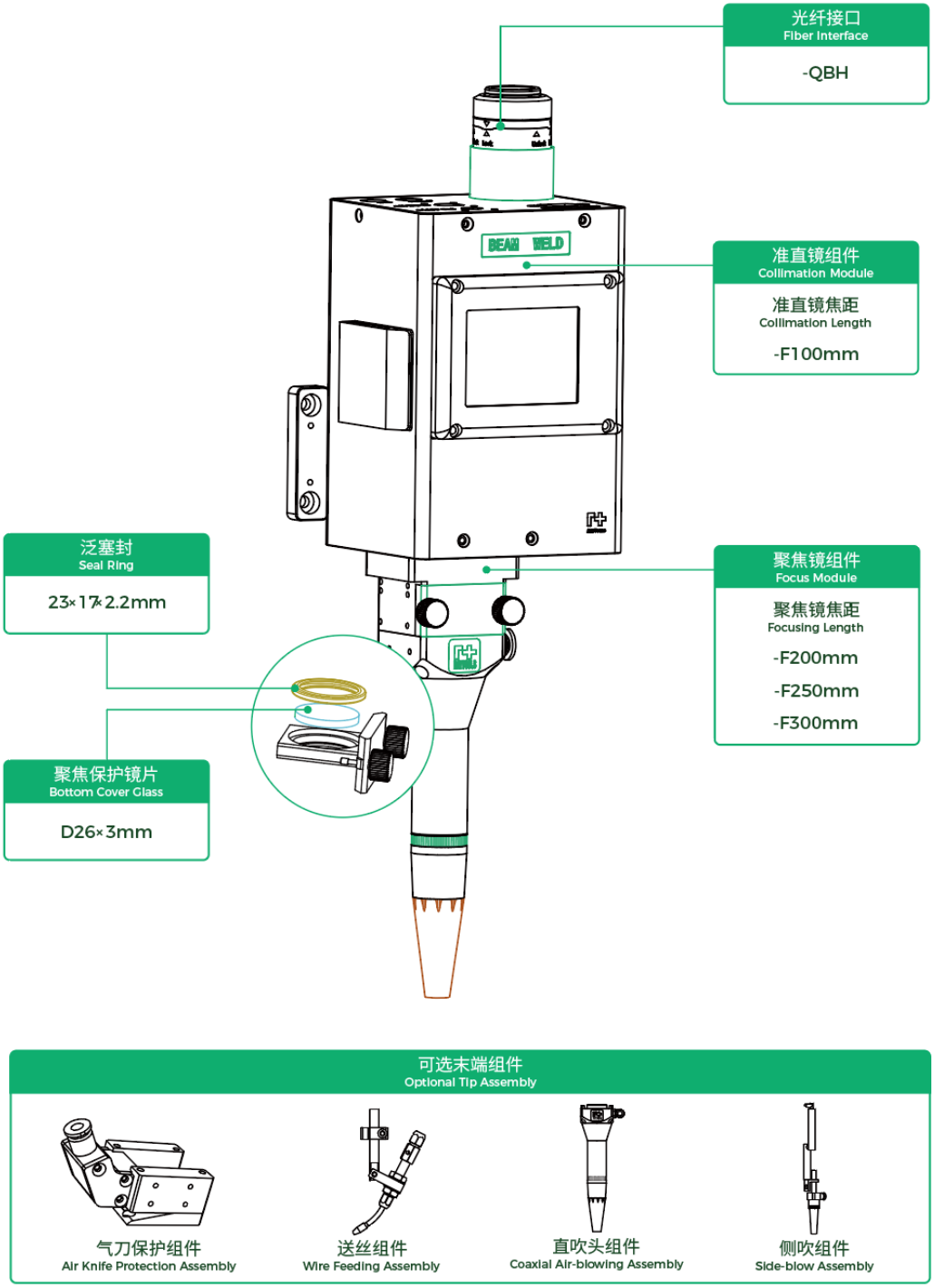

光纤接口
Fiber Interface
-QBH
准直镜组件
Collimation Module
准直镜焦距
Collimation Length
-F100mm
聚焦镜组件
Focus Module
聚焦镜焦距
Focusing Length
-F200mm
-F250mm
-F300mm
泛塞封
Seal Ring
23×17×2.2mm
聚焦保护镜片
Bottom Cover Glass
D26×3mm
BEAM
WELD
可选末端组件
Optional Tip Assembly
气刀保护组件
Air Knife Protection Assembly
送丝组件
Wire Feeding Assembly
直吹头组件
Coaxial Air-blowing Assembly
侧吹组件
Side-blow Assembly

Figure 4.1

Alarm message:

After the power is turned on, the touch screen will read the current status of the wobble head, and if there is an alarm message, it will be displayed. If there is an alarm message, please contact our after-sales personnel to solve it.

Precautions:

1、When plugging and unplugging the connector, please turn off the power supply first, and prohibit live plugging and

2、If the main interface cannot display the current state, it means that the communication connection is unsuccessful. At this time, check whether the wobble head is connected to the connecting wire of the controller, repower and try to connect again.

Instructions for emitting light:

Be sure to read the following and safety guidelines before performing light emitting operations.

- After the red light is turned on, it is strictly forbidden to expose the eyes to the indicated light to avoid harm;
- The laser is infrared invisible light. After the laser is turned on, it is strictly forbidden to expose any part of the body to the laser to avoid personal injury;
- When processing laser equipment, it is recommended to wear special protective glasses that can effectively shield the corresponding laser wavelength;
- Please ensure that the PE wire of the power cord is reliably grounded to avoid losses;
- Please check the lenses before using them for the first time every day to ensure that the lenses are free of pollution and burning points;
- Please turn on the red light wobble to check the red light wobble before exiting the light, and check whether the red light wobble is blocked;
- When it is necessary to enter the laser emission range for operation, it must be ensured that the laser switch has been turned off.

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