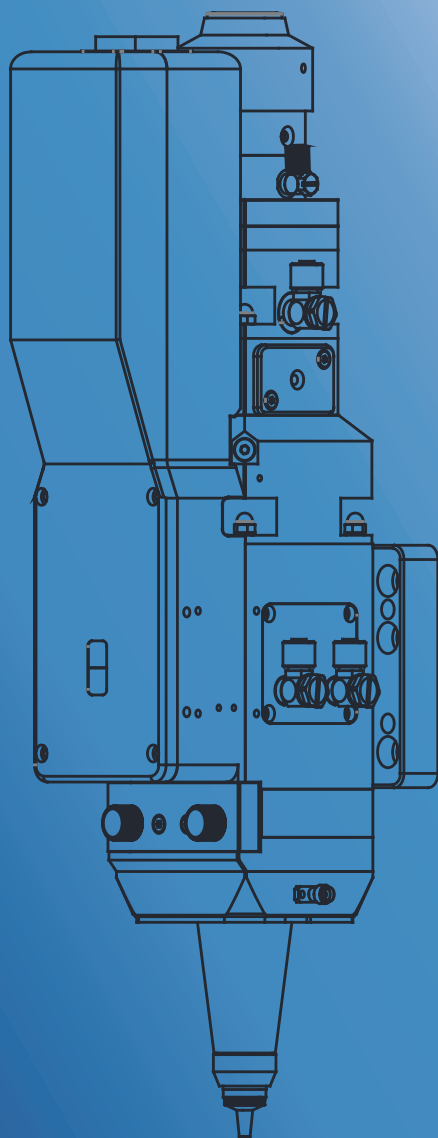




Auto Focusing Fiber Laser Cutting Head
NC30C
User Manual

Attention

Please read this manual carefully and make sure you understand its contents before using the laser head.

Please keep this manual for future operation and maintenance.

Test Condition

Correct wiring, normal electric, good earthing with smoothing and voltage stabilizing circuit.

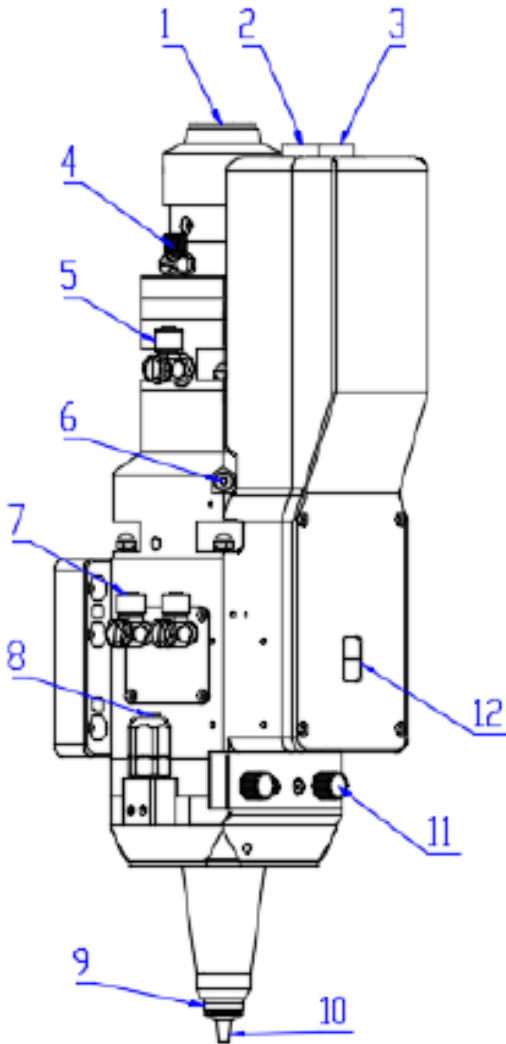


Steps

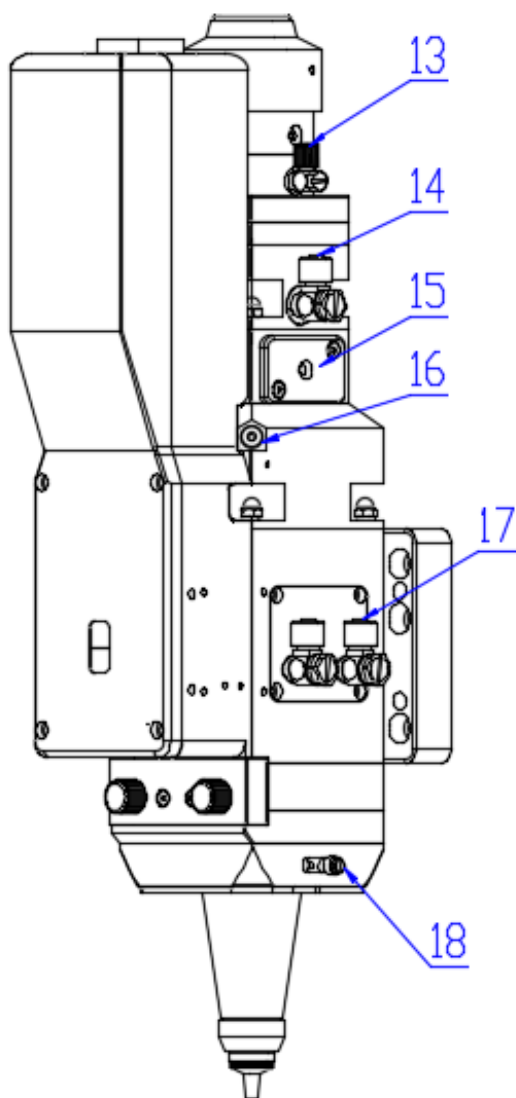
1. Adjust soft limitation to -100~100
2. Set inching speed to 1mm/s
3. Inching at positive direction until reach positive limitation
4. Inching at negative direction until reach negative limitation
5. After confirming effectiveness of positive & negative limitation, set back to origin
6. Restore soft limitation & inching speed to origin

Instruction

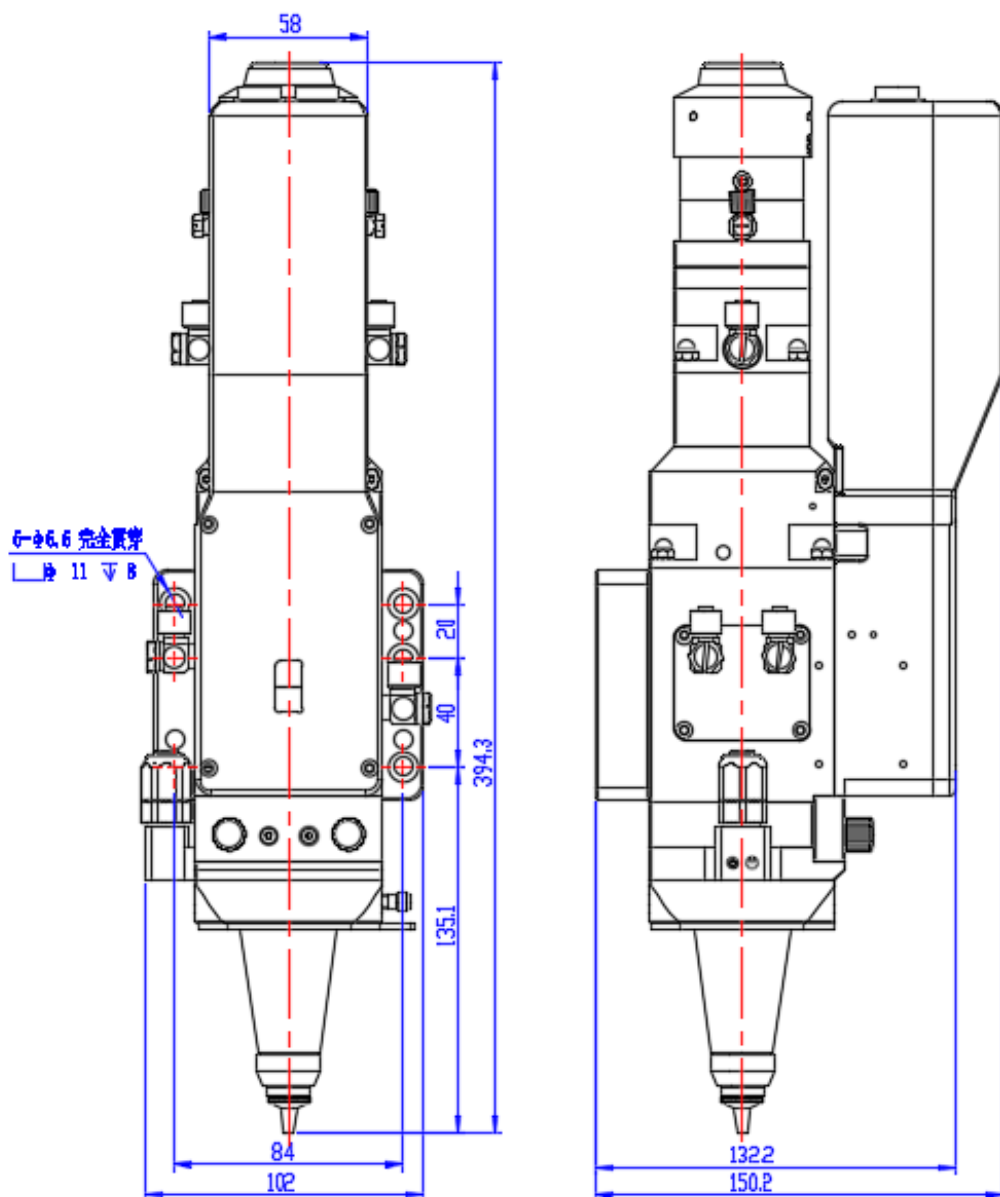
1. Make sure manual inching can find limit switch
2. Reduce manual speed to ensure that invalid limitation will not cause structural damage.
3. Make sure wire connection of negative limitation switch is correct and signal is normal
4. It's allowed to restore to origin automatically only after confirming positive & negative limitation
5. Restore parameters to ensure system running correctly

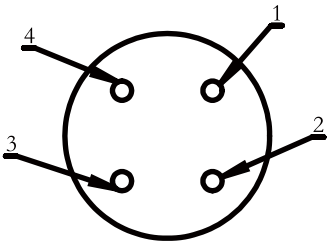
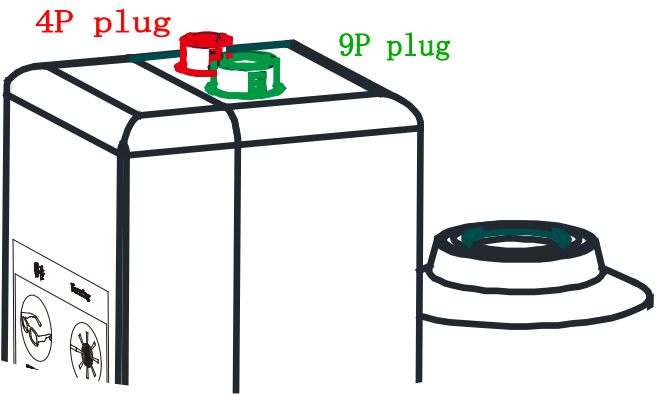


1. Fiber Access (QBH-F8)
2. Triphase power wire
3. Encoder&Limitation Signal
4. Cooling Water Connector (WJT-001)
5. Cooling Water Connector (WJT-001)
6. Horizontal adjustment screw (LC01-129T3)
7. Cooling Water Connector (WJT-008)
8. Cooling Gas Connector (WJT-005)
9. Ceramic Ring (WTC-04)
10. Nozzle (SW-Plus-S/D-diameter)
11. Bottom protective window (D30*5)
12. Focus Scale



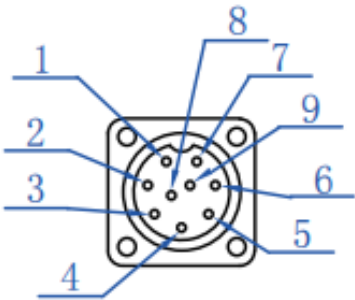
- 13. Cooling water connector (WJT-001)
- 14. Cooling water connector (WJT-001)
- 15. Top protective window (D22.35*4)
- 16. Horizontal adjustment screw
- 17. Cooling Water Connector (WJT-008)
- 18. Sensor Signal connector (SMKF1 rhombus 2h)





1	W
2	U
3	V
4	FG (Ground)

Servo Motor Power Supply Interface (Red)

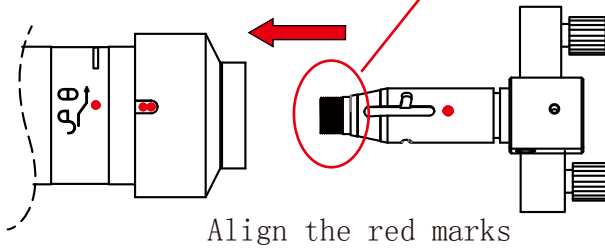


1	FG	(Shield Wire)
2	-D	(Encoder Signal Data-)
3	+D	(Encoder Signal Data+)
4	SG	(Signal Ground Wire)
5	VCC	(Encoder Power +5V)
6	+24V	(Approach Switch Power Line)
7	0V	(Approach Switch Power Line)
8	W+	(Approach Switch Signal Line)
9	W-	(Approach Switch Signal Line)

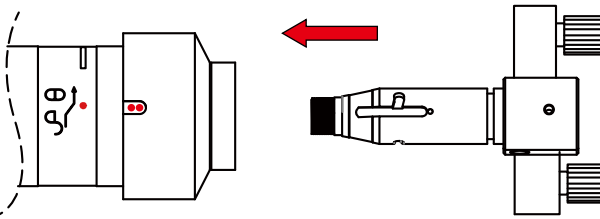
Servo Motor Encoder & Approach Switch Interface (Green)

1. Place the laser head and optical fiber connector in a horizontal state;
2. Clean the QBH and fiber connector with clean rod and ethyl alcohol.

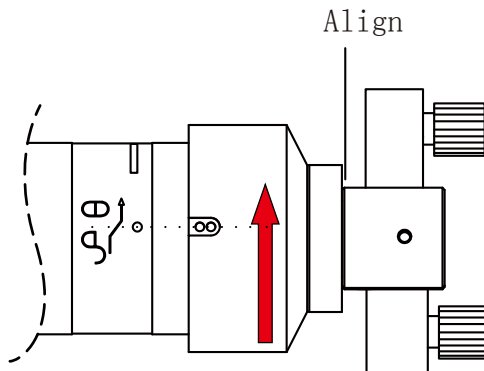
Inside the red circle is the plug of fiber rod; it is equipped with a protective cover. Before installation, tighten the cover to avoid it being loose during the processing which may cause offset light path and bad cutting quality or even cause burn damage to the fiber rod and cutting head.



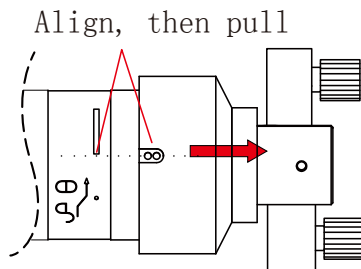
3. Insert the fiber connector into QBH gently;



4. After inserting, turn the turning rim in the arrow direction until the two red marks are aligned to the white mark

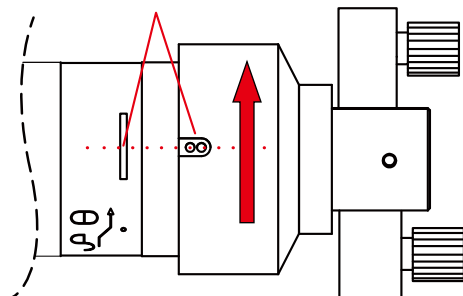


5. Then pull the turning rim as the picture below;



6. Turn the rim in the direction as picture below at moderate intensity to make it tight (Use thumb and index finger).

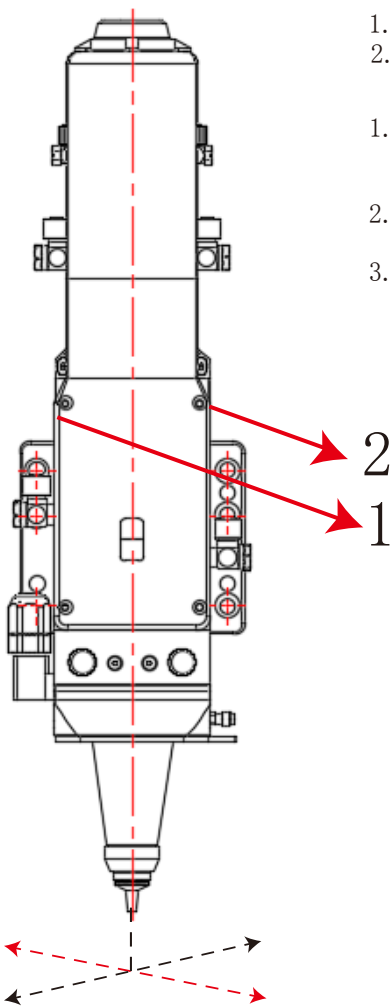
The red marks can be aligned to or over the middle of the white bar, but do not twist any more when it is in the right position.



Note: Do not twist vigorously , it may cause damage to precision machinery.

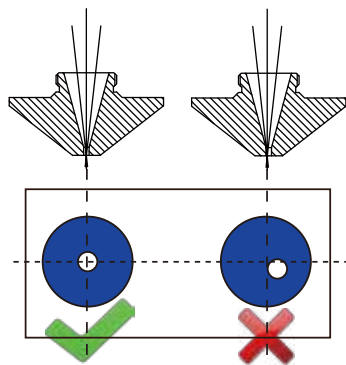


To avoid dust or dirt entering into the fiber optic connector by accident, please clean the fiber rod first. Insert the fiber plug with the laser head in a horizontal position.



1. Y-Direction Horizontally Adjusting Screw
2. X-Direction Horizontally Adjusting Screw

1. Adjust the X/Y screw as Picture 14 by allen wrench and make the beam pass through the center of nozzle;
2. The cutting effect is perfect when the beam pass through the center of nozzle;
3. If the beam does not pass through the center of nozzle, it may cause the beam could not be emitted out or bad cutting effect and so on.

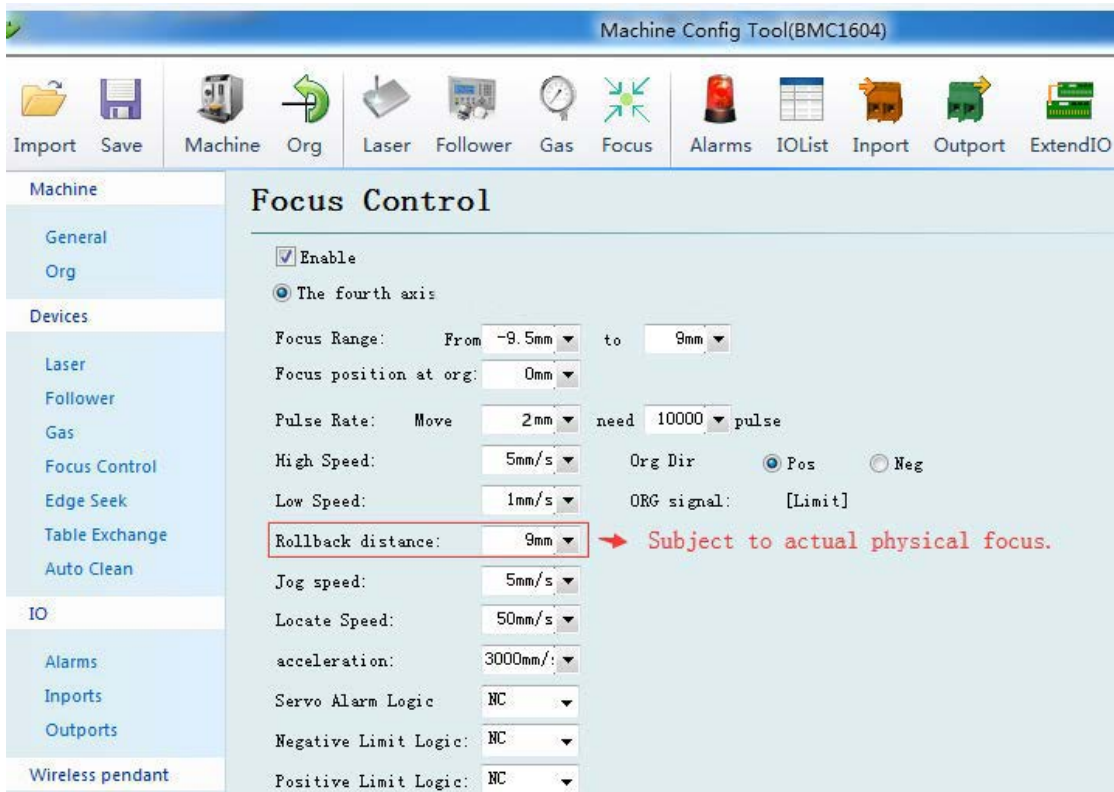


beam passes
through the
center (correct)

beam does not
pass through the
center (incorrect)

Methods of testing whether the beam pass through the center of nozzle:

1. Paste the transparent tape on the outlet of the nozzle (prefer to a new or undeformed nozzle);
2. Set the power of laser machine to 50W (take 500W for example, adjust the short burst power for 10%);
3. Take off the transparent tape after the beam has been emitted for 1 - 2 seconds;
4. Face the tape to light source and observe the round mark of nozzle on the tape and burning spot of laser passing through the tape.
5. If they are concentric, the testing result is good, but if not, please keep adjusting.
6. When adjustment is finished, tighten the center locking ring (red part) immediately.



Note: 1.This parameter is default value; when user changes it, please avoid hard ware damage;

2. Please contact technician to get specific parameters of different lens combinations.

Return Org

☐ Soft limit ☐ Prompt go Org at start ☐ Prompt go Org in warning

X ORG direction: ☒ Neg ☐ Pos Y ORG direction: ☒ Neg ☐ Pos

ORG signal: ☒ Org ☐ Limit Limit logic:

Z-Phase signal: ☒ Enable

High Speed: X rollback dis

Low Speed: Y rollback dis

Name	Logic
X +limit	☒ NO ☐ NC
X -limit	☒ NO ☐ NC
X origin	☒ NO ☐ NC
Y +limit	☒ NO ☐ NC
Y -limit	☒ NO ☐ NC
Y origin	☒ NO ☐ NC
W +limit	☐ NO ☒ NC
W -limit	☐ NO ☒ NC
W origin	☐ NO ☒ NC

Note: 1.Please choose normally closed mode for normally closed limitation switch.

Maintenance of Protective Window & Ceramic Ring & Nozzle



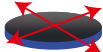
Check



Distance



Replace



Adjust the lens



Maintenance



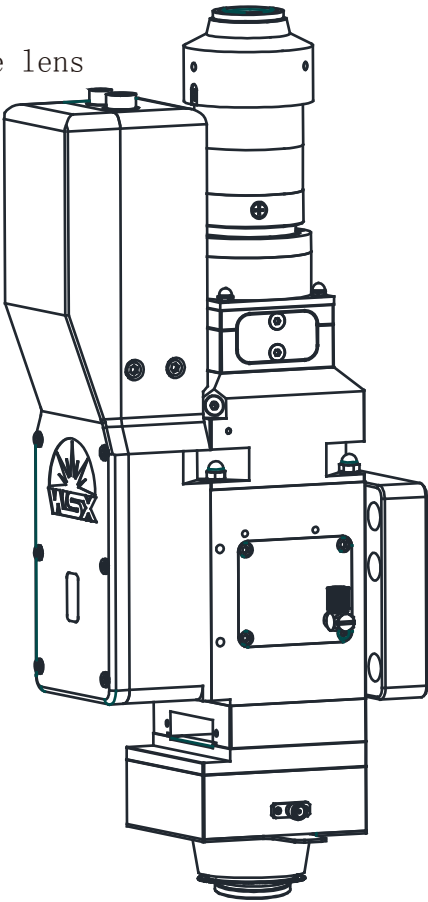
Maintenance Period



Calibration

Note:
Before maintenance, clean away the dust on the surface of the head with compressed air; then use clean cloth and ethyl alcohol to clean the related parts.

Note:
When the maintenance of ceramic ring & nozzle is finished, it is necessary to calibrate every time.



























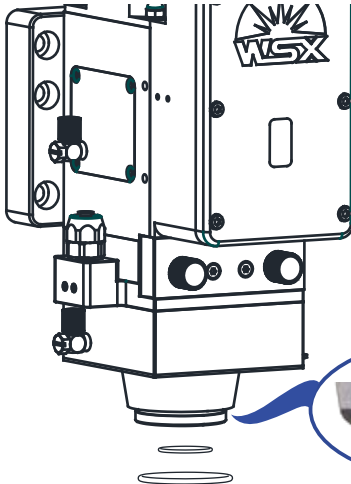












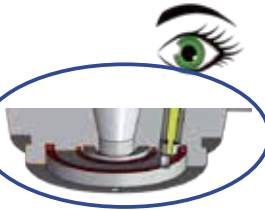
POWER



COOLING GAS

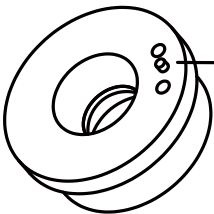


CUTTING GAS



Note:

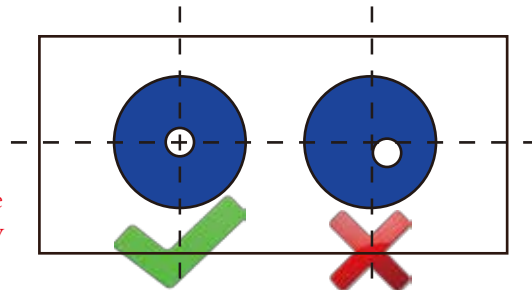
Before maintenance, clean away the dust on the surface of the head with compressed air; then use clean cloth and ethyl alcohol to clean the related parts.



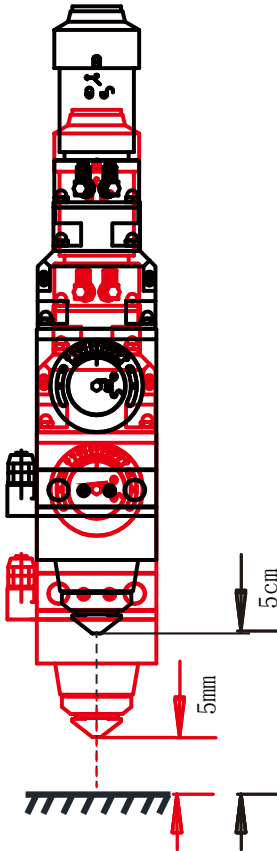
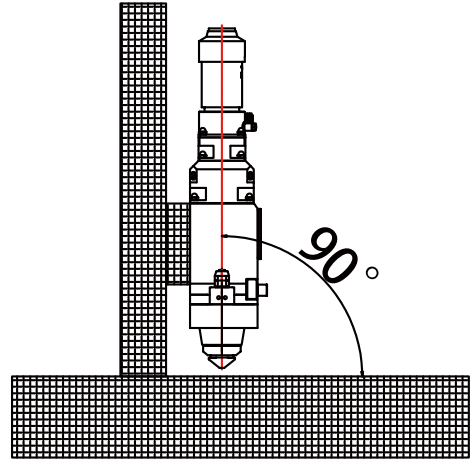
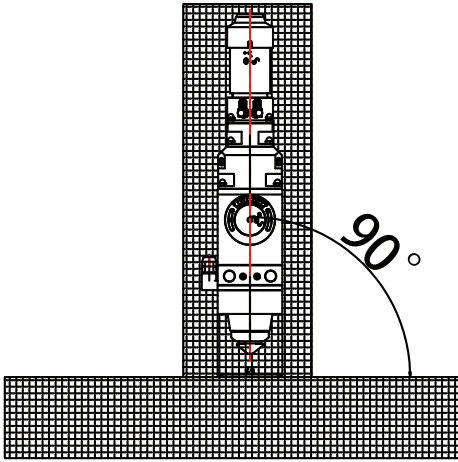
position of pin

Note:

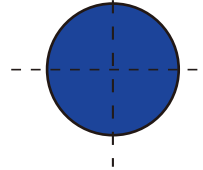
When the maintenance of ceramic ring & nozzle is finished, it is necessary to calibrate and test the beam to see whether it is in the center.



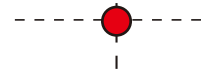
center checking



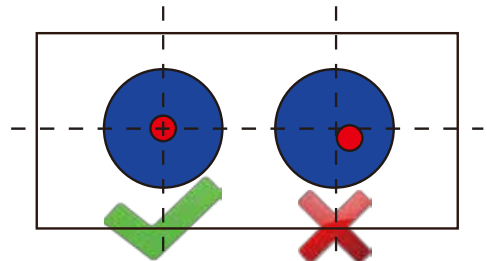
Step 1: set the laser power to 500W, make a short burst at the height of 5cm from the plate to burn a round scorch on the plate;

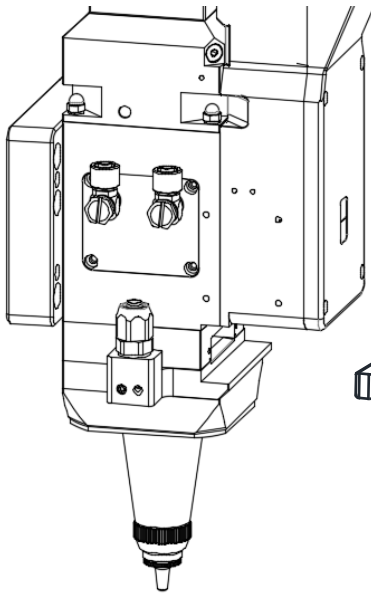


Step 2: set the laser power to 100W, make a short burst at the height of 1~5 cm from the plate to burn a round scorched spot on the plate;



Step 3: compare the concentricity;





Note:

Before maintenance, clean away the dust on the surface of the head with compressed air; then use clean cloth and ethyl alcohol to clean the related parts.



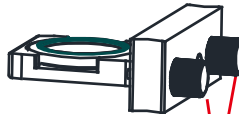
POWER



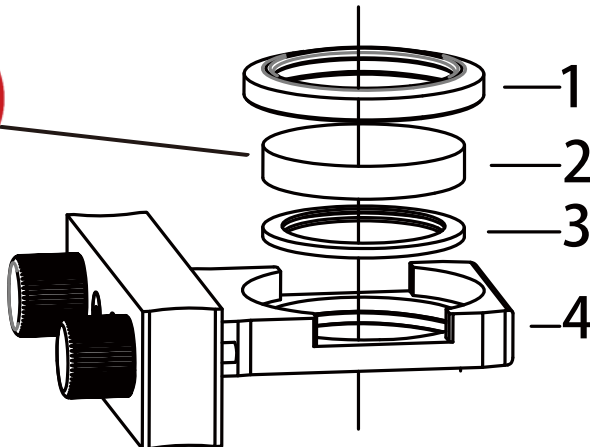
COOLING GAS



CUTTING GAS



Before maintenance, record the position and orientation of the lens; After maintenance, assemble as the record



1 Fixing Ring 2 Protective Window 3 Seal Ring 4 Pedestal

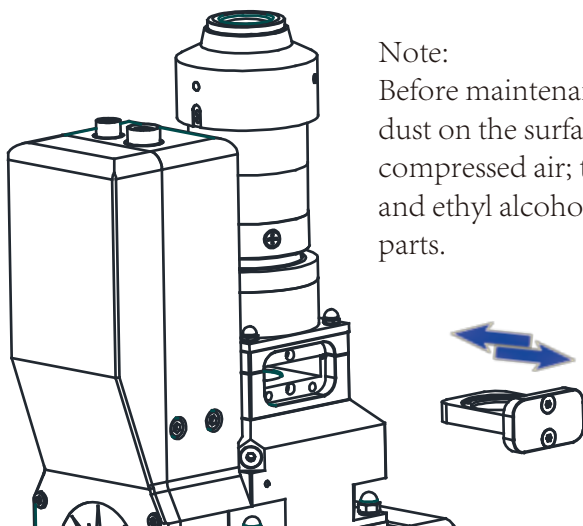
Note: All the parts must be removed in the direction of the arrow, otherwise it may cause damages.

DO NOT operate with wrench or iron plier.



Note:

Before maintenance, clean away the dust on the surface of the head with compressed air; then use clean cloth and ethyl alcohol to clean the related parts.



POWER



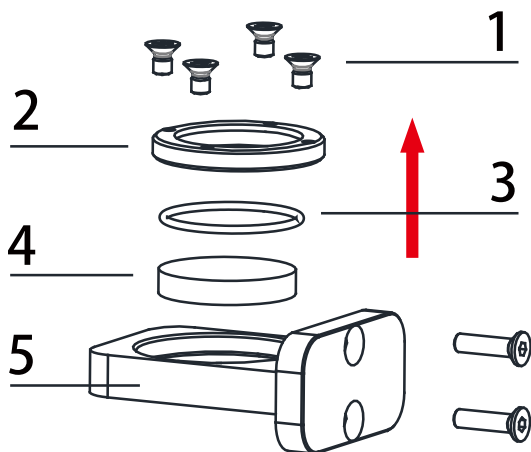
COOLING GAS



CUTTING GAS



Beware of Dropping

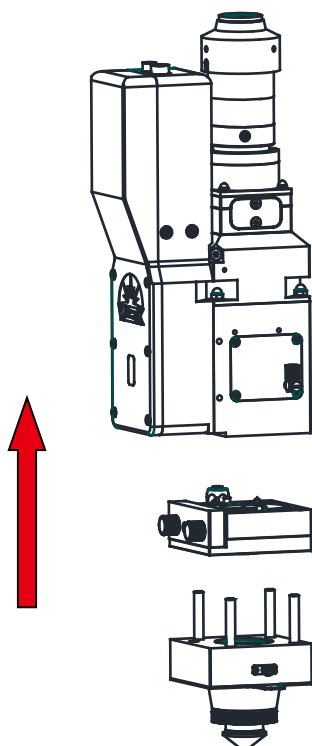


Before maintenance,
record the position and
orientation of the lens;
After maintenance,
assemble as the record

1 4-M3 Screw 2 Gland 3 Seal Ring

4 Protective Window 5 Pedestal

Note: Part 1~4 must be removed in the direction of the arrow, otherwise it may cause damages.



Note:

Before maintenance, clean away the dust on the surface of the head with compressed air; then use clean cloth and ethyl alcohol to clean the related parts.

Before maintenance, record the position and orientation of the lens; After maintenance, assemble as the record



POWER



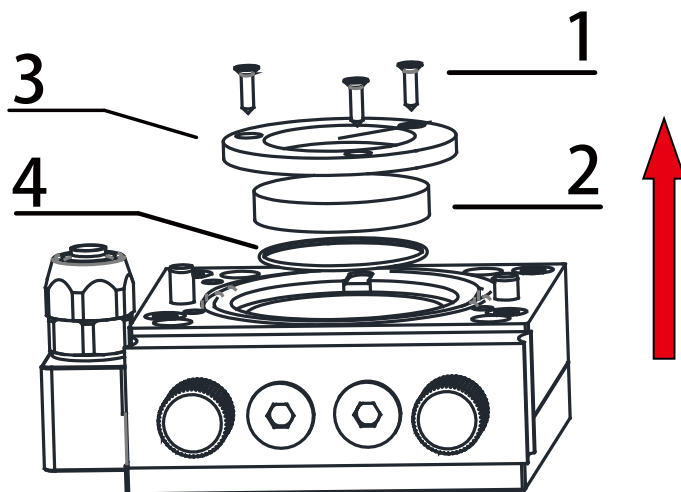
COOLING GAS



CUTTING GAS

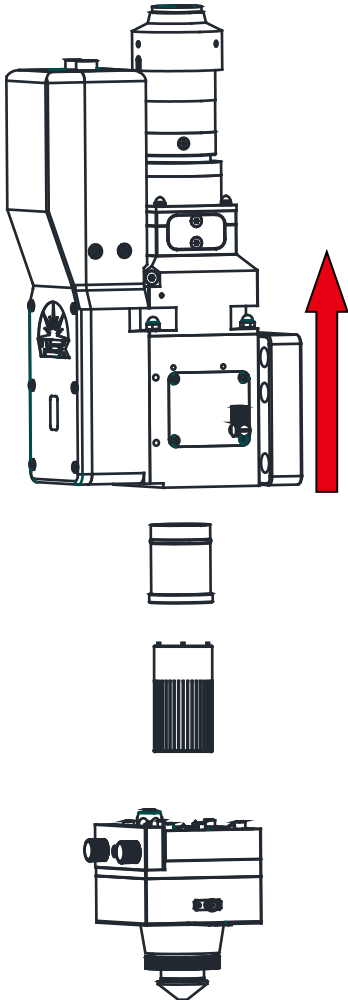


Beware of Dropping



1 3-M3 Screw 2 Protective Window

3 Gland 4 O-Type Spring outer30*1.0



Note:

Before maintenance, clean away the dust on the surface of the head with compressed air; then use clean cloth and ethyl alcohol to clean the related parts.



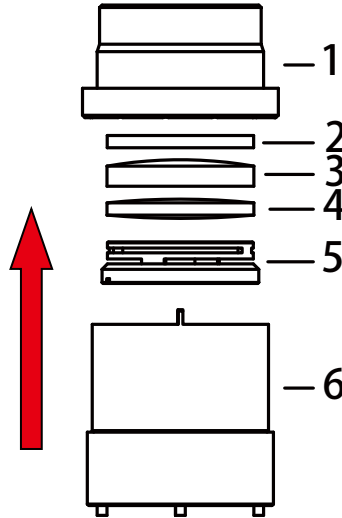
POWER



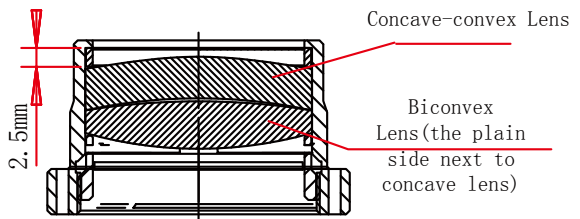
COOLING GAS



CUTTING GAS

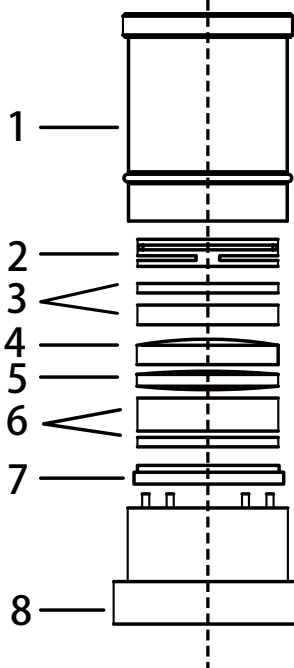
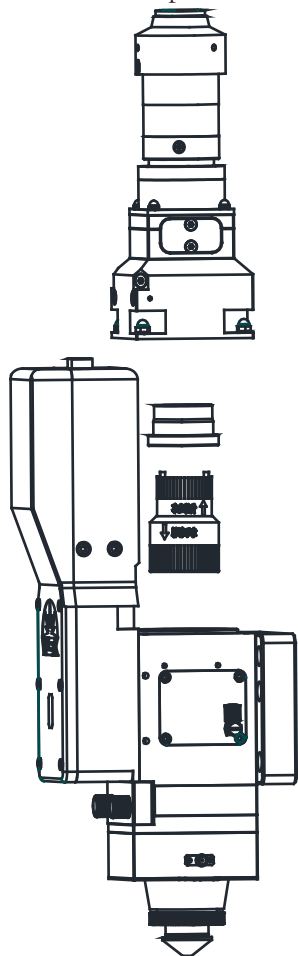


1. Before maintenance, record the position and orientation of the lens; After maintenance, assemble as the record
2. Twist to the end and then turn backward 1/5 circle to prevent the lens being affected by temperature variation.



Note:

Before maintenance, clean away the dust on the surface of the head with compressed air; then use clean cloth and ethyl alcohol to clean the related parts.



POWER



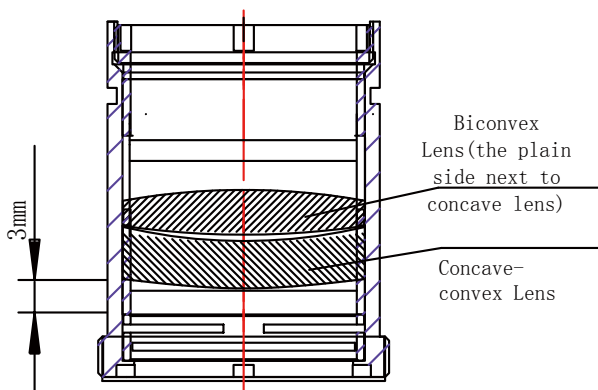
COOLING GAS



CUTTING GAS

1. Before maintenance, record the position and orientation of the lens; After maintenance, assemble as the record

2. Twist to the end and then turn backward 1/5 circle to prevent the lens being affected by temperature variation.



Checking of wiring between laser head and driver

(1) Check the mark of the A+A-B+B- cable, which should correspond one-to-one with the A+A-B+B- on the plug.

(2) The A+A-B+B- cables cannot be connected to the ground wire and the casing, and the resistance between the A+A-B+B- and the casing is greater than $5\text{M}\Omega$.

Test conditions: one end of the cutting head is connected, and one end of the driver is not connected.

(3) The resistance between A+A-B+B- electrodes is about 20Ω . If the resistance is 0 (short circuit) or the multimeter shows infinity (open circuit), it is regarded as abnormal.

Test conditions: one end of the cutting head is connected, and one end of the driver is not connected.

(4) Ground (very important).

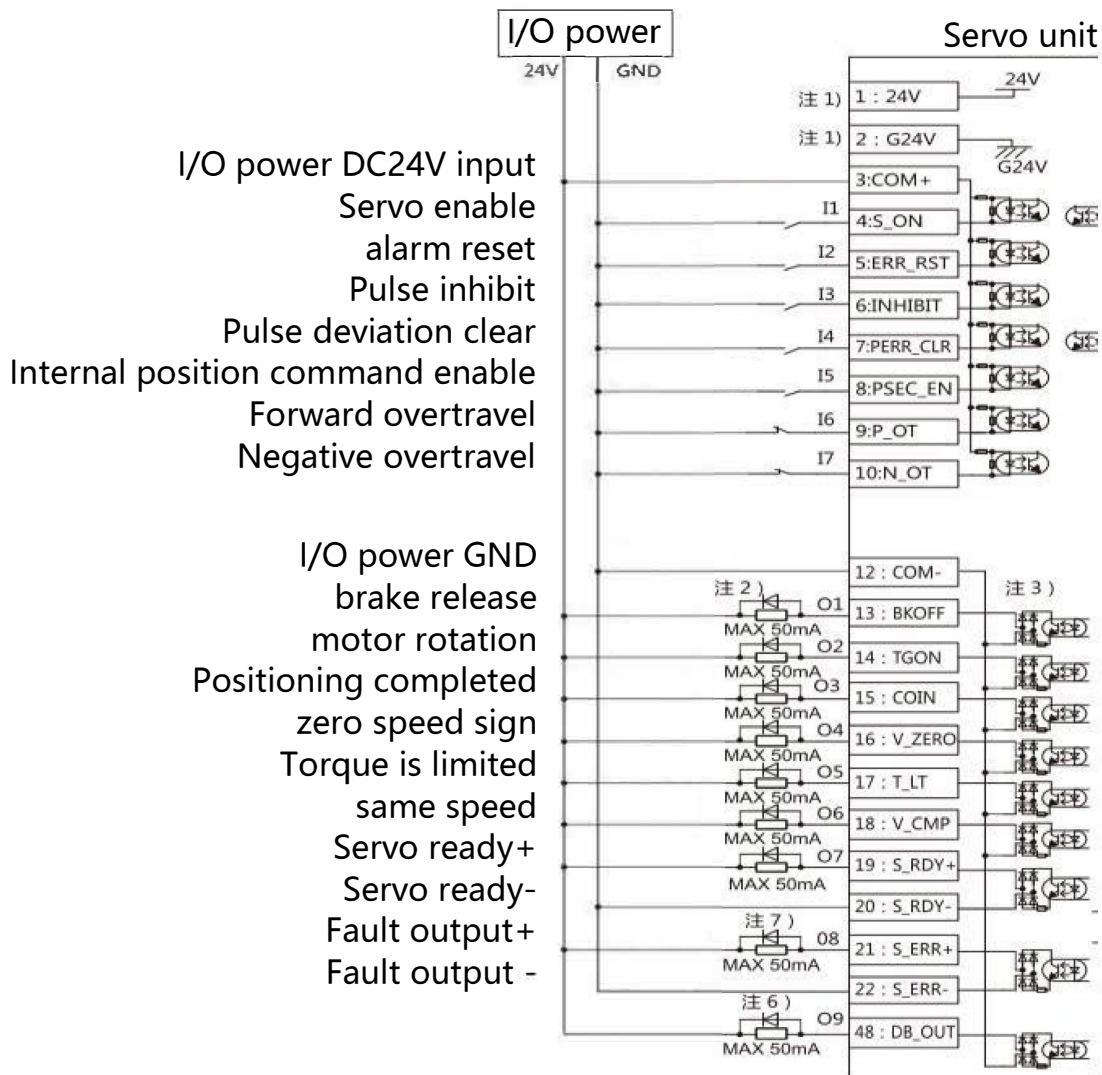
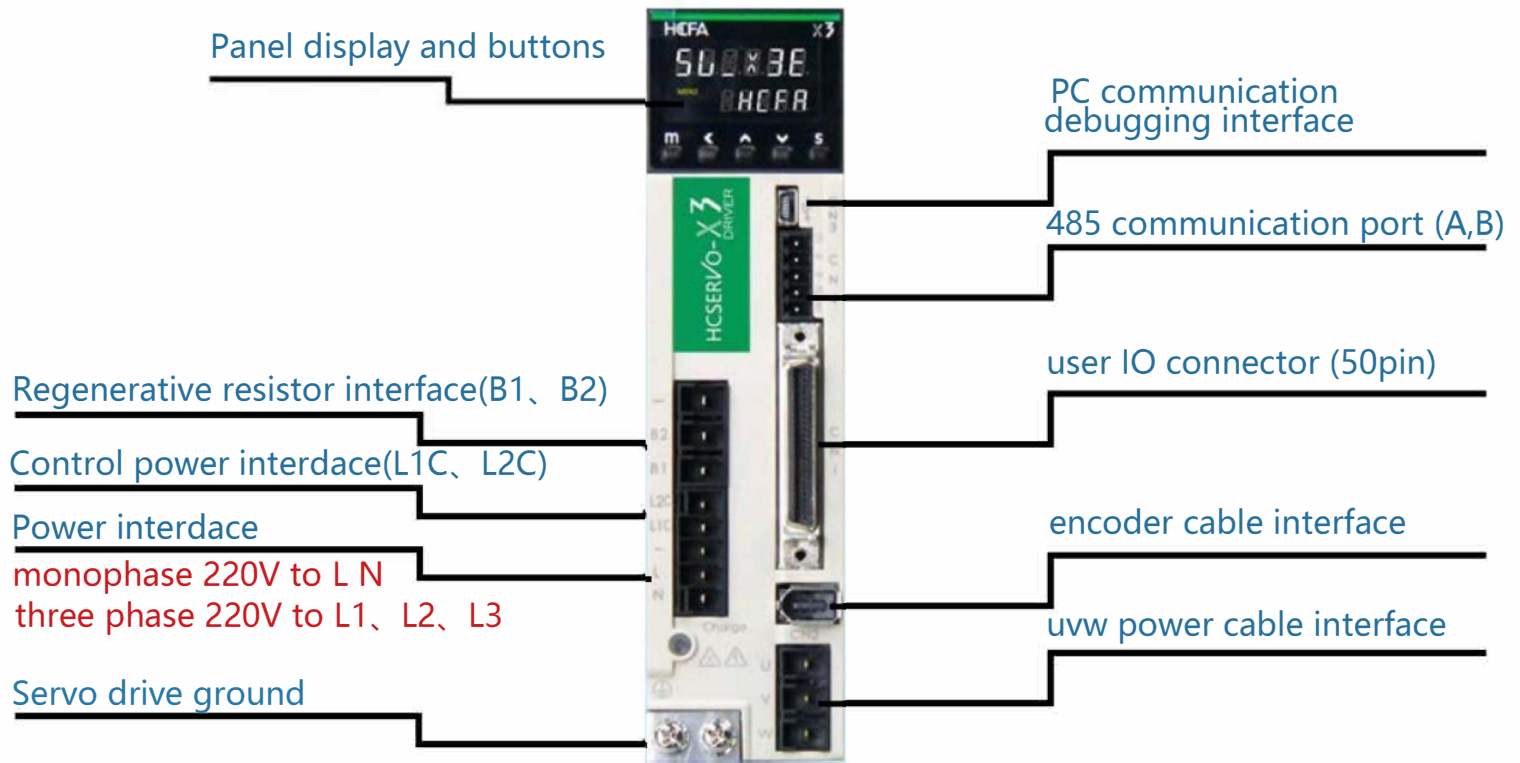
(5) When connecting the aviation plug, be sure to follow the steps below:

Step 1: Use an air gun to blow off the water, oil, dust and other debris in the aviation plug.

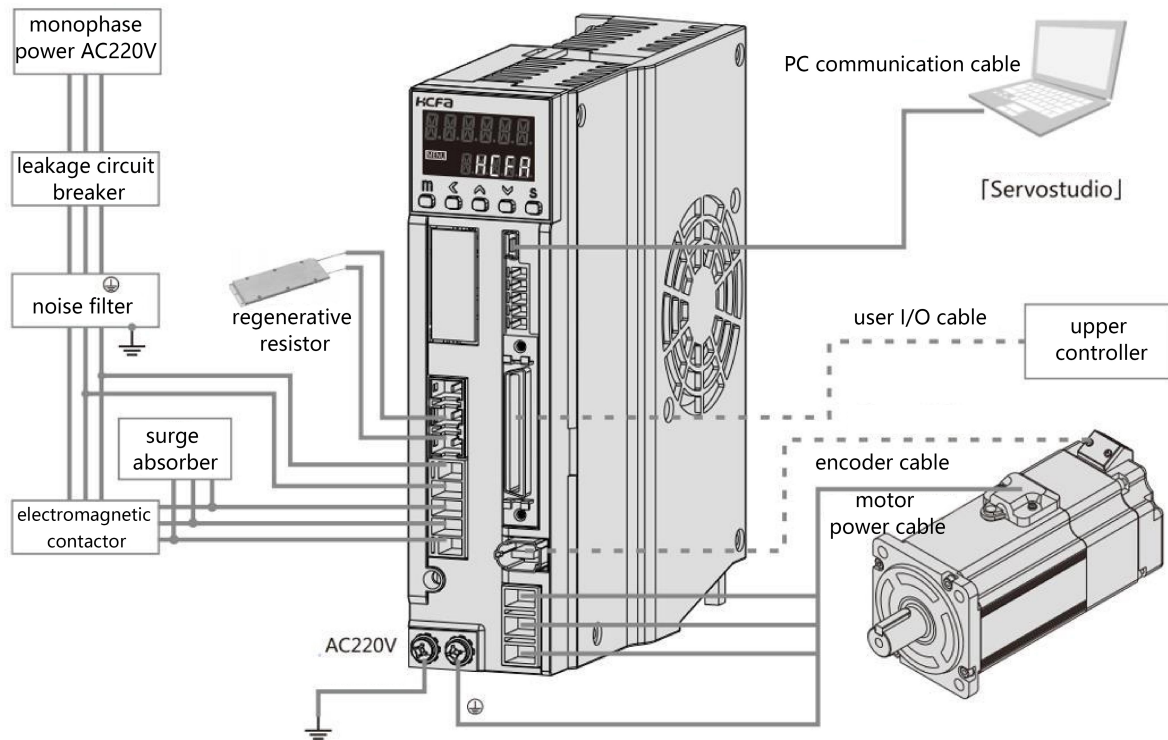
Step 2: Tighten the male and female headers of the aviation plug.

Step 3: Use masking tape or electrical tape to wrap the air plug to prevent moisture, oil and dust from entering the aviation plug.

Servo port definition



HCFA servo connection



Wiring points

The control circuit power supply and the main circuit power supply should be wired from the same AC220V main power supply;

For user I/O cables, please use shielded twisted pair cables

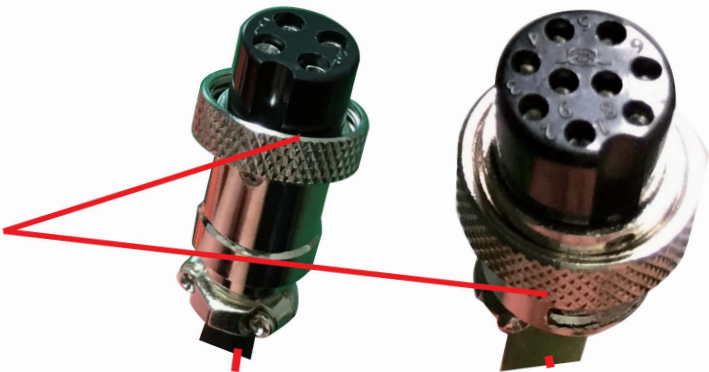
The length of the encoder cable should be less than 20M.

Note: For the debugging of the servo drive, please refer to the HCFA manual

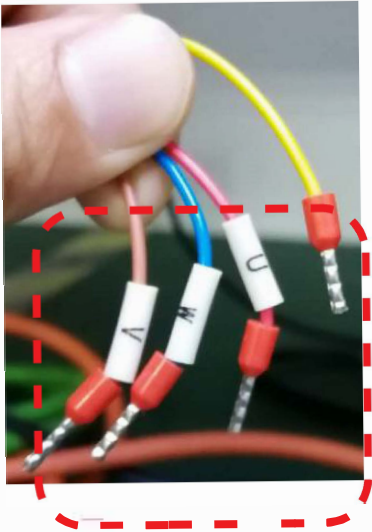
Servo wiring and checking



Lock to prevent loosening



U, V, W order cannot be reversed





CChecking of wiring between laser head and driver

(1) Check the mark of the UVW cable, which should correspond one-to-one with the UVW on the plug.Ω.

(2) The UVW cannot be connected to the ground wire and the casing, and the resistance between the UVW and the casing is greater than 5MΩ.

Test conditions: one end of the cutting head is connected, and one end of the driver is not connected.

(3) The resistance between UVW electrodes is about 20Ω. If the resistance is 0 (short circuit) or the multimeter shows infinity (open circuit), it is regarded as abnormal.

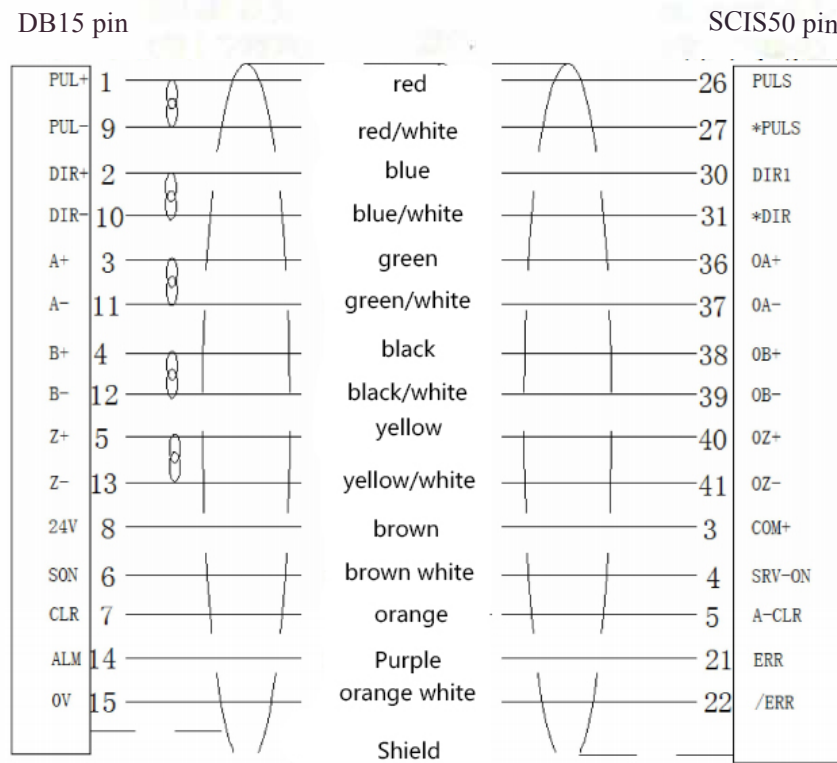
Test conditions: one end of the cutting head is connected, and one end of the driver is not connected.

(4) Ground (very important).

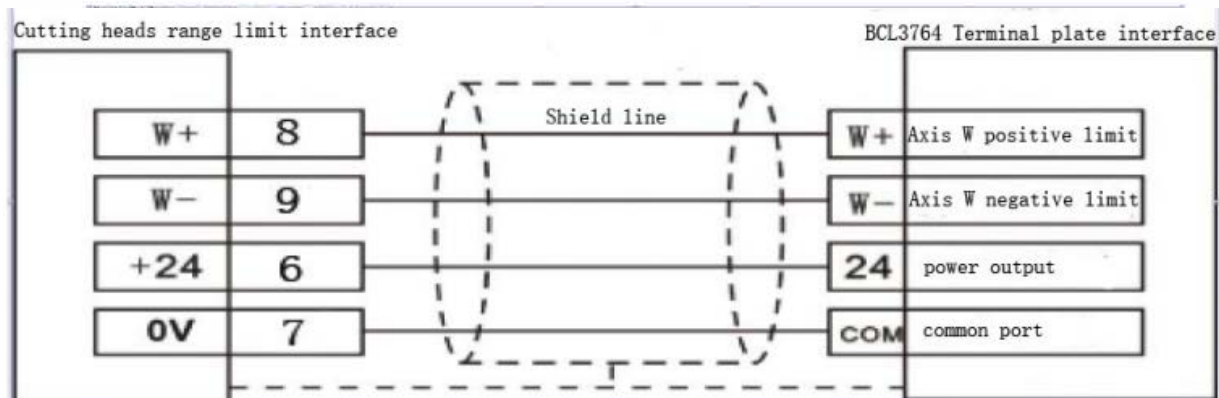
(5) When connecting the aviation plug, be sure to follow the steps below:
Step 1: Use an air gun to blow off the water, oil, dust and other debris in the air port. Step 2: Tighten the male and female headers of the aerial plug.

Step 3: Use masking tape or electrical tape to wrap the air plug to prevent moisture, oil and dust from entering the air plug.

FSCUT2000A laser cutting control system BCL3764 terminal board w-axis DB15 servo control interface connection HCFA servo driver 50P interface definition



Cutting head focus adjustment range stroke limit switch interface definition



Parts of parameter list, subject to actual using and HCFA servo instruction.

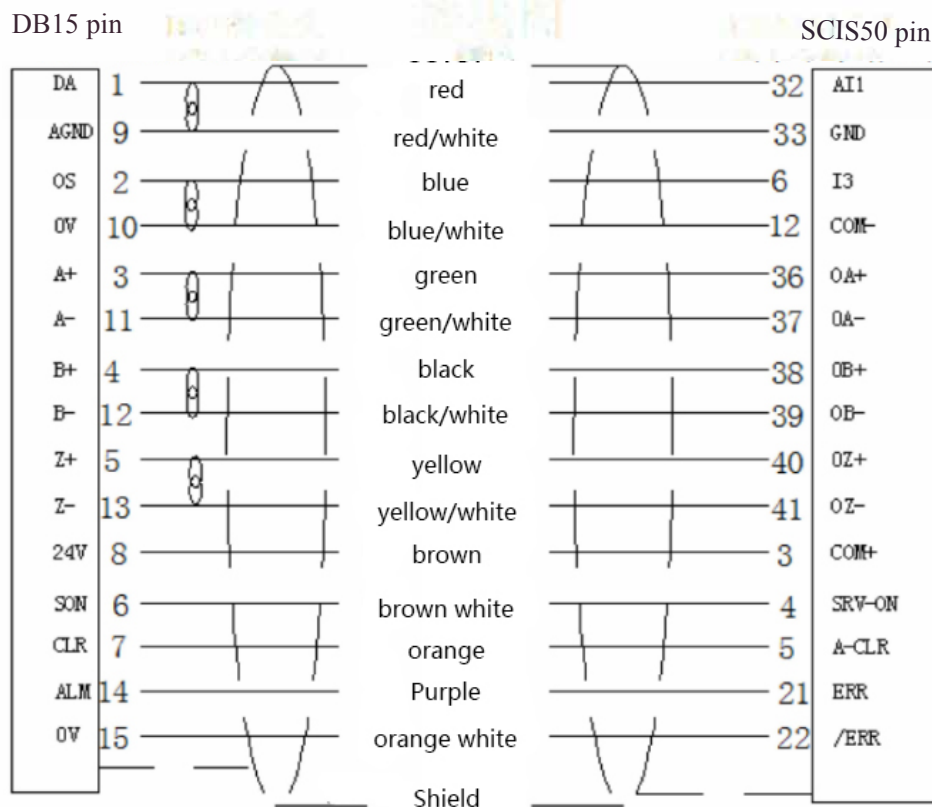
NC30A parameter

parameter	value	parameter	value	parameter	value
P0. 00	1	P0. 08	10000	P03. 10	600
P0. 01	0	P0. 14	2500	P06. 40	80
P0. 03	14	P03. 09	600		

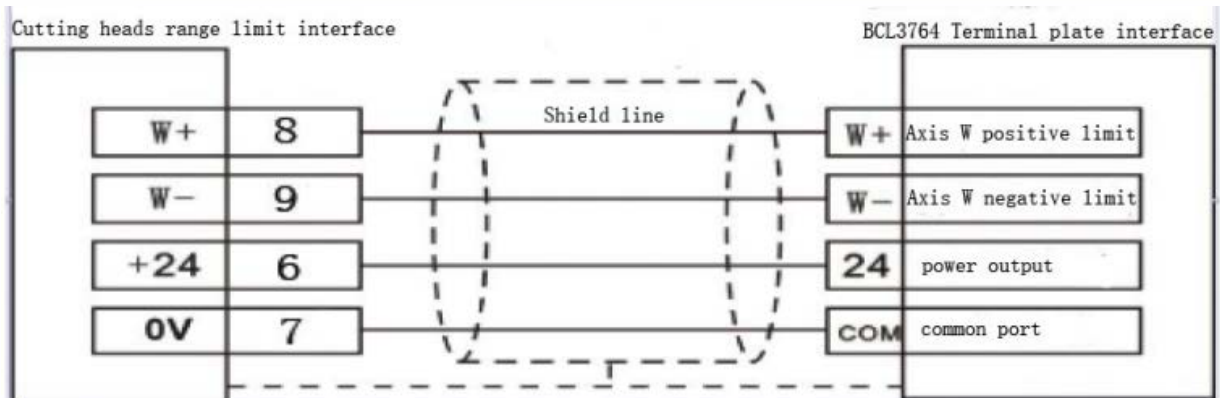
Note: 1.Definitions of servo driver and servo motor connector shown in HCFA servo driver instruction; 2.Please use uniphase power, L connects to L1; N connects to L2.

Servo connection and debugging (HCFA & FSCUT close loop)

FSCUT2000A laser cutting control system BCL3764 terminal board w-axis DB15 servo control interface connection HCFA servo driver 50P interface definition



Cutting head focus adjustment range stroke limit switch interface definition



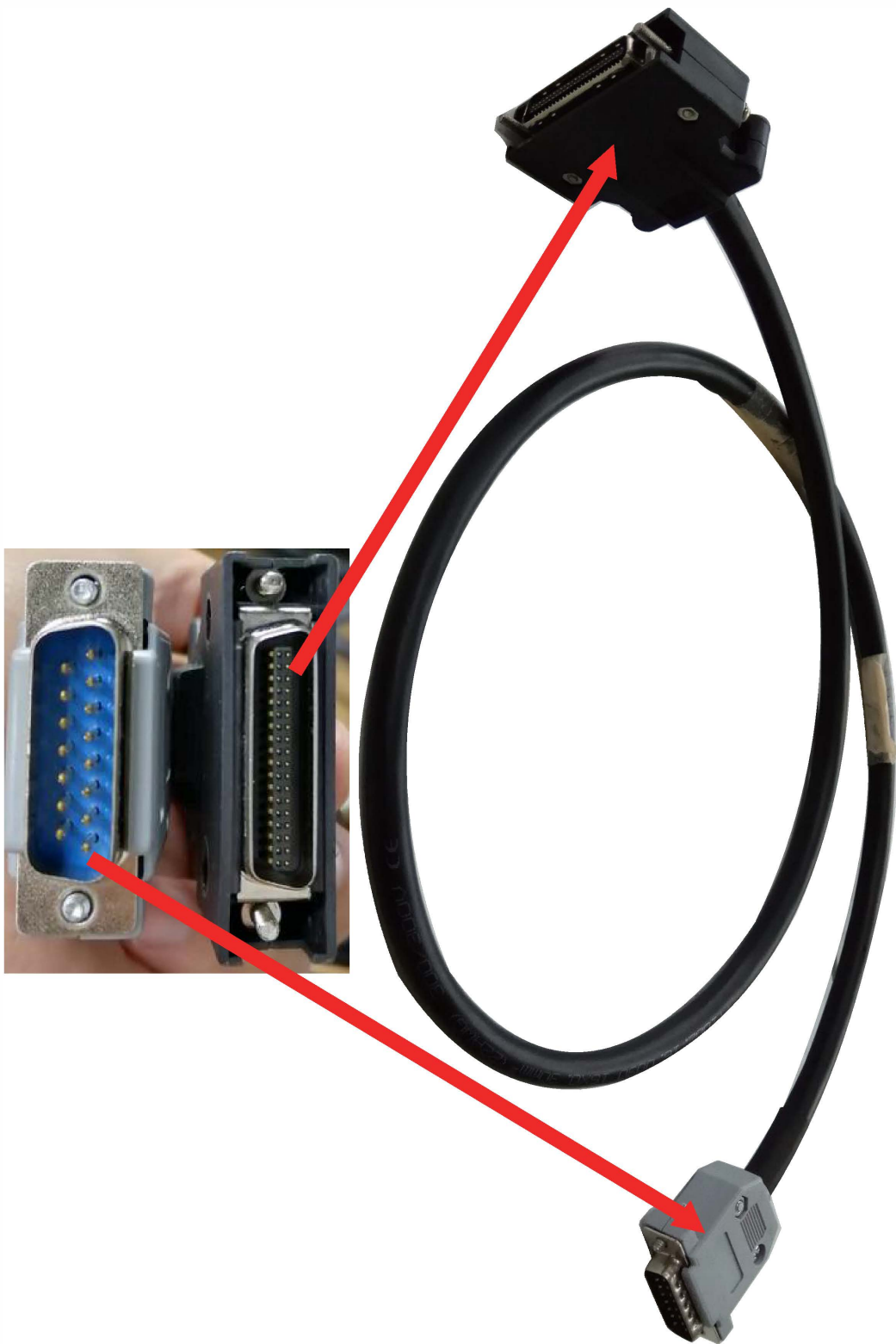
Parts of parameter list, subject to actual using and HCFA servo instruction.

NC30A parameter

parameter	value	parameter	value	parameter	value
P0. 00	1	P0. 08	10000	P03. 10	600
P0. 01	1	P0. 14	2500	P06. 40	80
P0. 03	14	P03. 09	600	P04. 03	12

Note: 1.Definitions of servo driver and servo motor connector shown in HCFA servo driver instruction; 2.Please use uniphase power, L connects to L1; N connects to L2.

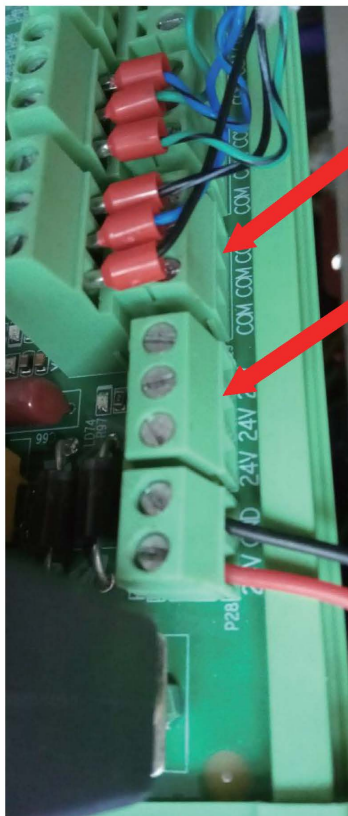
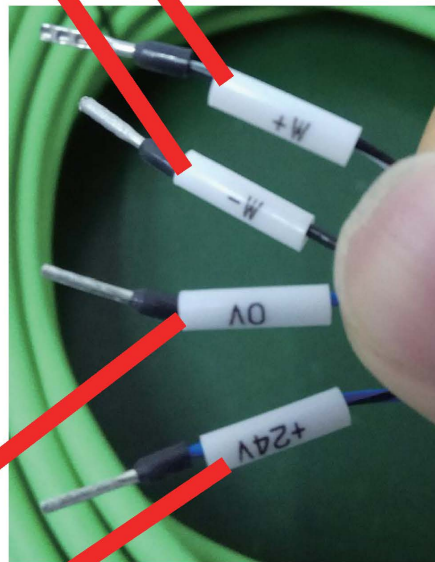
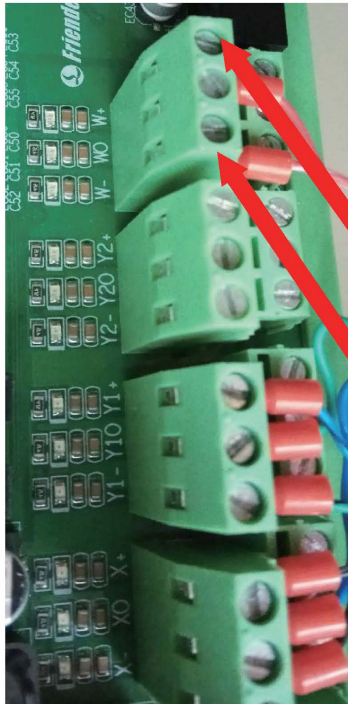
50P in plug
connects to drive CN1



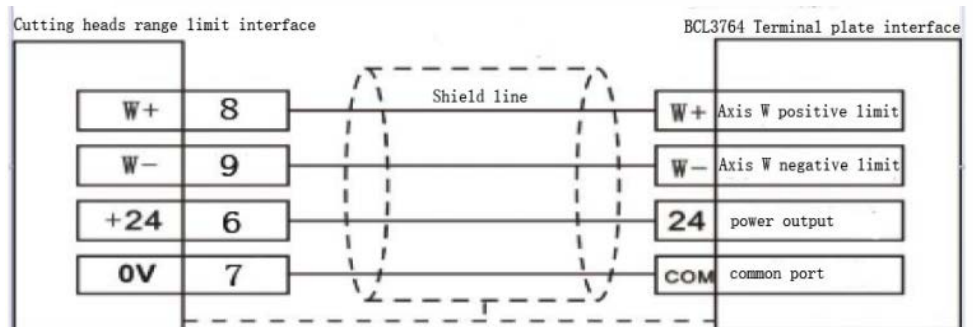
15Pin plug connects to W-axis



W
Y2
Y1
X



Definition of laser focusing adjustment range limitation switch connector





Limit signal inspection method:

Test condition

- (1) Connect the DC24 power supply.
- (2) Do not connect W+ W- first.
- (3) The laser head scale 0 is in the middle of the window..

Steps

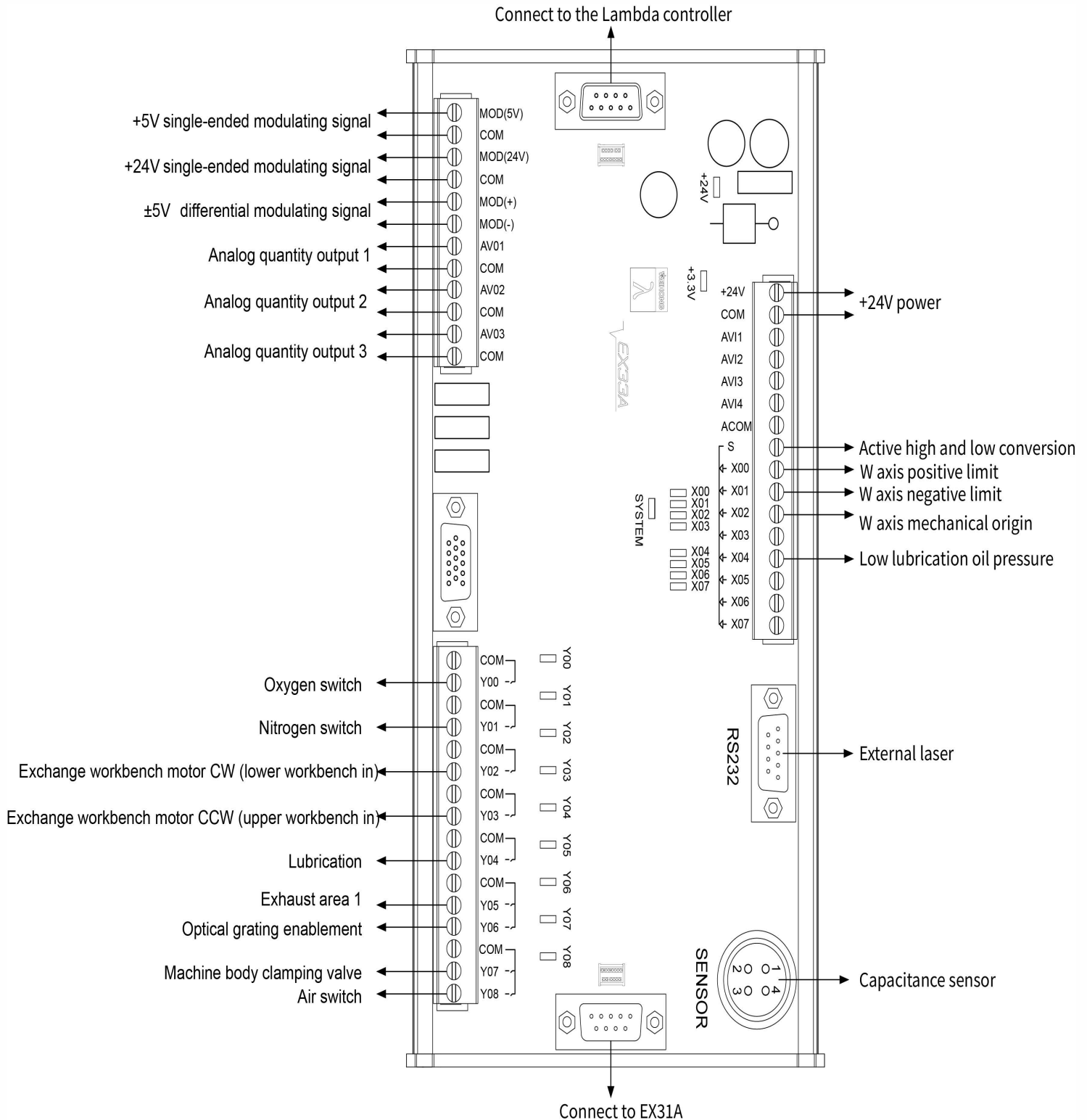
- (1) Select the "DC voltage" gear for the multimeter, 200V or above.
- (2) The red test lead is connected to the DC24V end, and the black test lead is connected to the W+ end (the side of the laser head line).
- (3) If the displayed voltage value is greater than 18V, it is normal (theoretical value is 24V), and if it is less than 14V, it is abnormal (theoretical value is 0V).
- (4) Jog in the positive direction, observe that the voltage changes, and the voltage difference is more than 12V, which is normal.
- (5) The red test lead is connected to the DC24V end, and the black test lead is connected to the W- end (the side of the laser head line).
- (6) If the displayed voltage value is greater than 18V, it is normal (theoretical value is 24V), and if it is less than 14V, it is abnormal (theoretical value is 0V).
- (7) Jog in the positive and negative directions in turn, observe that the voltage has changed, and the voltage difference is greater than 12V, which is normal.
- (8) Connect W+ W- to the corresponding port of the system expansion card.
- (9) Open the control software, the limit logic high is normally closed. Jog the movement to the positive and negative limit and observe whether the system can detect the limit.
- (10) The above is the detection method of the normally closed limit switch, and the opposite is true for the normally open type.

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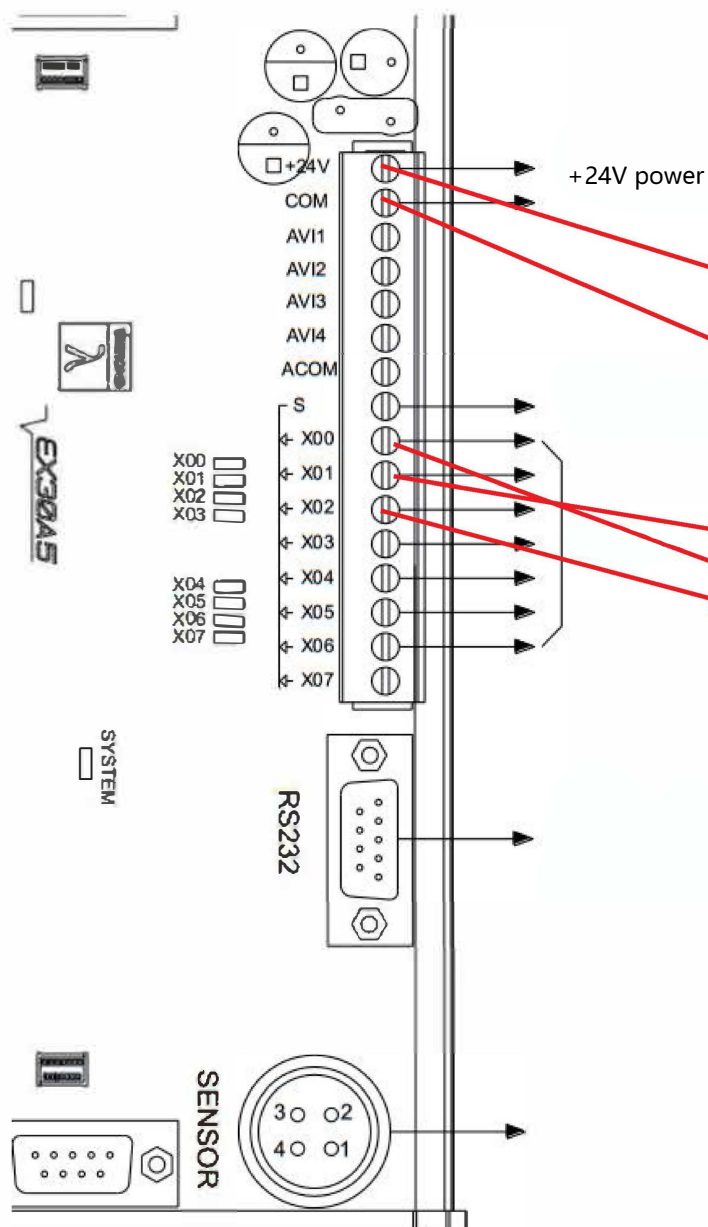
Terminal board wiring diagramam



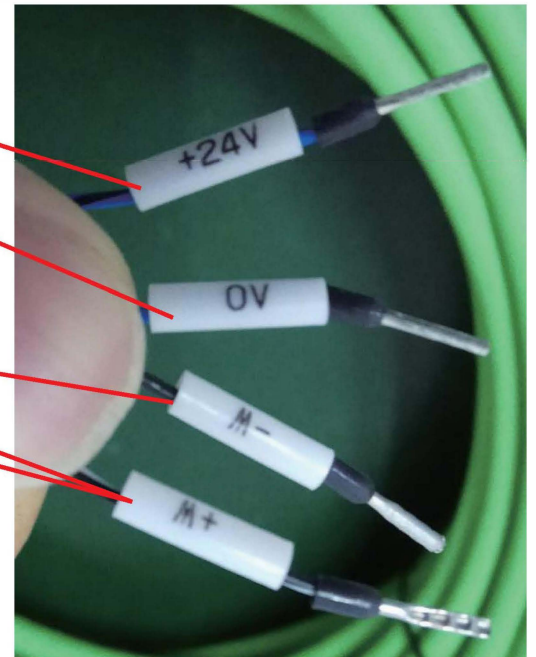
Weihong expansion board 2



Connection of limit line and Weihong



Please connect +24V to the "+24V" port and S port on the board.



please connect W- with "x01", W+ with "x00", "x02"

Limit logic parameter configuration

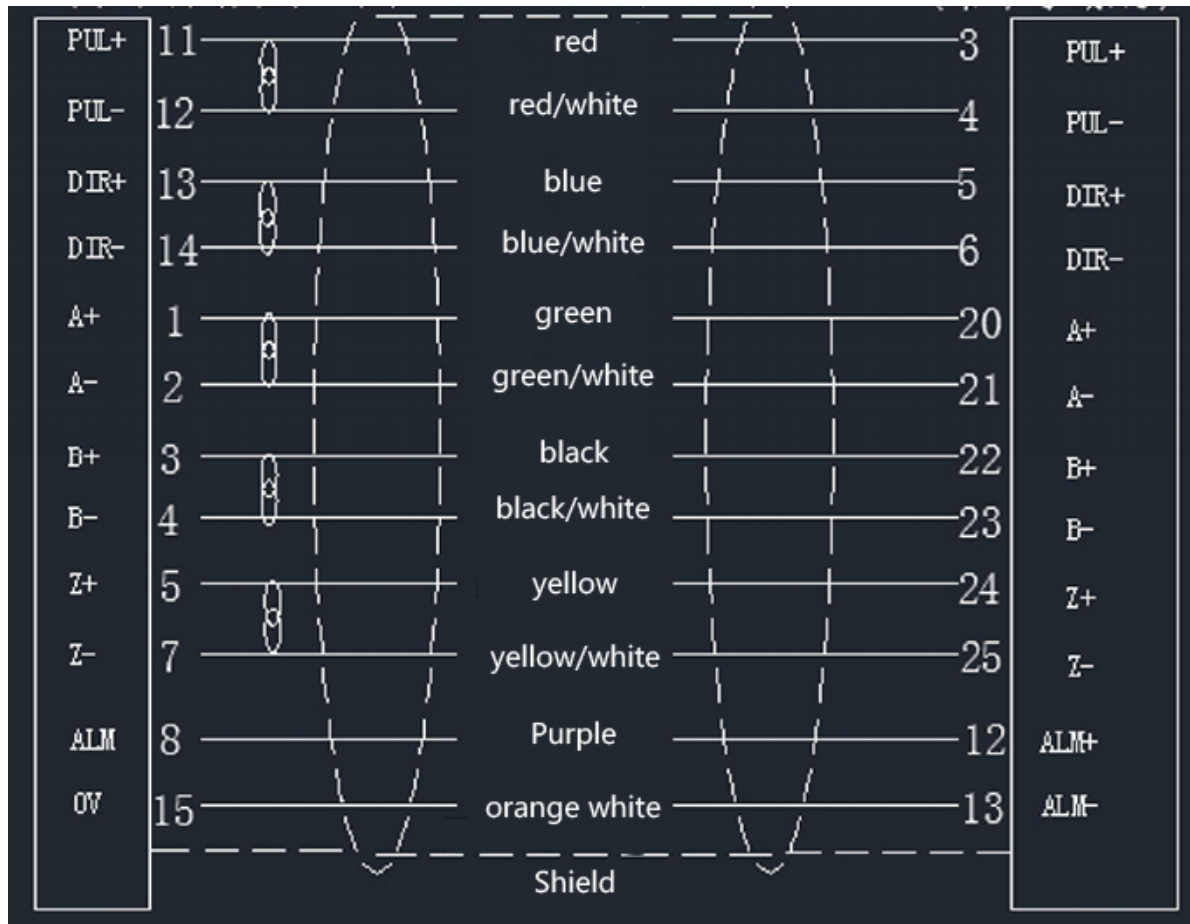
EX00	P	00072	E,F:16ms S:4ms	W axis + limit
EX01	P	00073	E,F:16ms S:4ms	W axis - limit
EX02	P	00074	E,F:16ms S:4ms	W axis zero

Connection of HCFA and Weihong (NC30A))

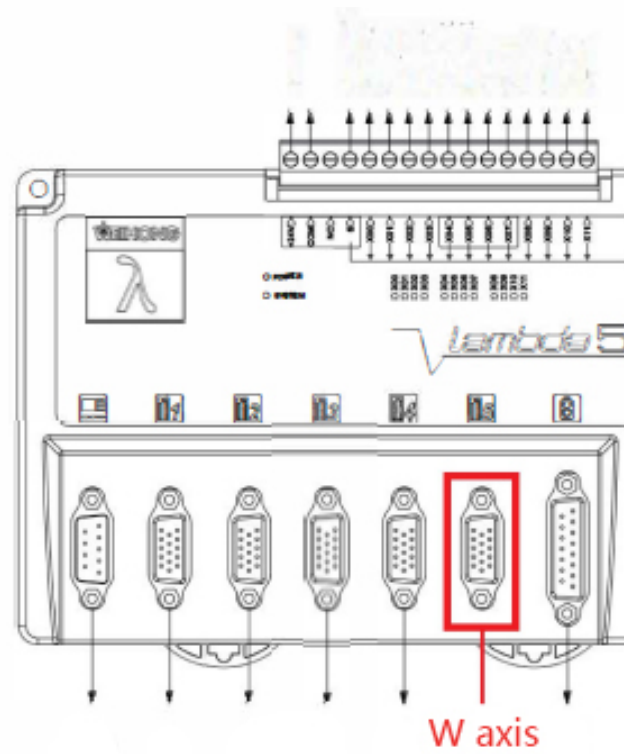
Connection of HCFA and Weihong communication line (NC30A))

Weihong 15P

HCFA 50P



parameter	value	parameter	value	parameter	value
P0. 00	1	P0. 08	10000	P03. 10	600
P0. 01	1	P0. 14	2500	P06. 40	80
P0. 03	14	P03. 09	600		



Name	Value	Unit	Effective
1.0.3 W-axis			
Encoder Direction(W)	1		Immediately
Axis Direction(W)	1		Immediately
Pulse Equivalent(W)	0.001	mm/p	Immediately
Command Pulse Count Per Rev	10000		Immediately
Feedback Pulse Count Per Rev	65536		Immediately
Upper Limit of Soft Limit (W)	100	mm	Immediately
Lower Limit of Soft Limit (W)	-100	mm	Immediately
Enable Soft Limit Protection (W)	Yes		Immediately
Max Speed of Axis (W)	48000	mm/min	Immediately
Check Axis Encoder Error(W)	No		Immediately
Encoder Static Tolerance(W)	0.1	mm	Immediately
Encoder Dynamic Tolerance(W)	40	mm	Immediately

Limit logic parameter configuration

	EX00	P	00072	E,F:16ms S:4ms	W axis + limit
	EX01	P	00073	E,F:16ms S:4ms	W axis - limit
	EX02	P	00074	E,F:16ms S:4ms	W axis zero

Name	Value	Unit	Effective
1.1.4 Origin Setting(W)			
Use Z Phase Signal(W)	No		Immediately
Coarse Positioning Direction(W)	1		Immediately
Coarse Positioning Speed(W)	600	mm/min	Immediately
Fine Positioning Speed(W)	60	mm/min	Immediately
Retract Distance(W)	2	mm	Immediately
Retract Speed(W)	200	mm/min	Immediately
Min Distance between Coarse a	0.5	mm	Immediately
Enable Latch(W)	Yes		Immediately

Focus Control

Parameters

Locate speed: 1200 mm/min
Jog speed: 120 mm/min
Focus offset: 0 (Focus pos after home)

Control

Focus Pos: 0.000 + -
0 Locate
Home Stop

3.4.0 General Parameters

Enable Exchange Workbench	Yes		Immediately
Control Mode at Workbench Ex	1		Immediately
Exchange Workbench by jog	No		Immediately
Workbench released machining	No		Immediately
Protect the machine tool when	Yes		Immediately
Delay after Exchanging Stoppin	2000	ms	Immediately

3.4.1 Z-axis Travel

Use Different Lower Limit for W	No		Immediately
Soft Limit Lower Limit for Upper	-300	mm	Immediately
Soft Limit Lower Limit for Lower	-500	mm	Immediately
Z-axis docking position of the u	-10	mm	Immediately
Z-axis docking position of the k	-10	mm	Immediately

3.4.2 Clamping Device

Delay as Signal to Clamp Machi	Yes		Immediately
Delay to Clamp Machine Bed	3000	ms	Immediately
Delay as Signal to Release Mact	No		Immediately
Delay to Release Machine Bed	3000	ms	Immediately

3.4.3 Protection Door

Enable Protection Door	No	Immediately
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3.5 Focus Control

Enable Focus Control	No		After Restart
Focus control mode	0		After Restart
Foucs Reached Check Delay	1000	ms	Immediately
Go Home Check Delay	20	s	Immediately

Name: Enable Camera

Value: No

Desc.: Whether to enable camera.

Focus Control

Parameters

Locate speed: 1200 mm/min
Jog speed: 120 mm/min
Focus offset: 0 (Focus pos after home)

Control

Focus Pos: 0.000 + -
0 Locate
Home Stop

Appendix 1: Common electrical faults and solutions

Fault code	Fault cause	Troubleshooting and handling methods
Err.007	Encoder initialization failed	Check the encoder wiring, or replace the encoder cable
Err.013	Encoder communication exception	1. Check the encoder wiring, or replace the encoder cable 2. Check that the encoder is well grounded
Err.017	Torque saturation timeout	Check that the UVW is disconnected
Err.018	Control power underpressure	1. Check the input power supply and wiring 2. Replace the drive
Err.019	Speed failure	1. Check the UVW and the encoder wiring 2. Check the drive & motor
Err.020	Overvoltage	Check the input power supply voltage
Err.043	The position deviation is too large	Check whether the motor line is disconnected