

HP103

Focus on NC cutting height control field

Portable CNC Plasma Torch Height Control

Operation Manual

VISION: 1211



1.IMPORTANT INFORMATION

1.1 SERVICE ASSISTANCE AND CONTACT INFORMATION

For service assistance, have the following information available:

- HP103 model, part and serial number located on a label
- Type of cutting application you are using

1.2 RECEIVING AND UNPACKING

After receiving the HP103 you should:

- Carefully, unpack and inspect the equipment.
- Compare the received shipment with the packing list.
- Report any damage to the carrier and your representative.
- Store equipment that will not be used in a clean, dry location.
- Take appropriate precautions to prevent moisture, dust and dirt from accumulating in storage and installation areas.

1.3 SAFETY CONSIDERATIONS

Safety practices should not be an after thought. Before installing or servicing the controller, review and follow applicable policies and procedures to ensure worker safety. Machinery must be in a safe state and you must be aware of any additional hazards that can arise.

1.4 PRE-INSTALLATION CONSIDERATIONS

Before installing the HP103:

- Check to be sure that you have all of the required parts.
- Familiarize yourself with the parts of the HP103.
- Check to be sure that the torch lifter motors you are using with the HP103 are within the acceptable range.
- Review the instructions for Configuring the Lifter Mechanics.

1.5 CONFIGURING THE LIFTER MECHANICS

Proper configuration of the torch lifter mechanism is an important factor for establishing the accuracy of your cutting system.

Be sure that:

☐ Gear reduction is selected on the torch lifter so that the maximum suspension speed does not exceed 3000 mm/min (120 IPM). If higher accuracy is required, maximum suspension speed should be set to 1500 mm/min (60 IPM).

☐ Gears, racks and spindles have minimal backlash.

☐ Oversizing is avoided. The mass of moving parts, including armature inertia must be as small as possible. Motors with low nominal RPM are preferred.

☐ Only DC motors with the following ratings are used:

MOTOR RATINGS: DC MOTOR

MOTOR VOLTAGE: DC24V

MAX CURRENT: 4A

2. Brief Intro

2.1 Summarize

HP103 plasma arc voltage height controller is equipped with constant current plasma . During cutting course, the current always equals the given current. And the cutting arc voltage will be changed with the fixed speed being the height of torch changing. When the distance gets farther, the arc voltage increases; On opposite, the arc voltage will decrease. HP103 plasma arc voltage height controller will inspect the voltage change, then control the distance between cutting torch and material via the lift motor. So that the arc voltage is fixed, the same is the height of cutting torch.

Generally, the instruction will list all the cutting parameters for some type of plasma . The user can refer to these parameters. Adjust the voltage in arc voltage height controller to match the selected current. The torch height will keep constant under regular speed. In fact, the user should set the arc voltage according to the height of the cutting torch.

In the status of automation ,the arc voltage more high, then the height of the cutting torch more high

2.2 Technical parameter

- I Working voltage: DC24 or AC24 $\pm$ 5%, 50Hz/60Hz, Please prepare a isolated power, do not shared with others such as electronic valve . Especial Pay more attention the AC 24V

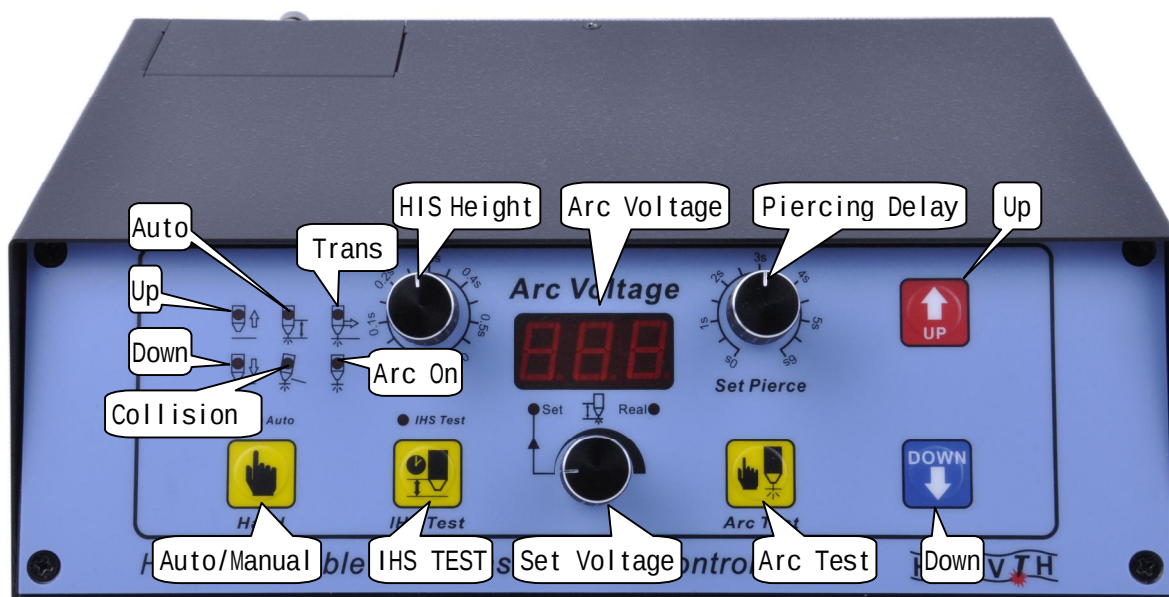
- | Lift motor: DC24V DC motor
- | Drive mode: PWM
- | Output current: 1A-4A.
- | Output power: 100W.
- | Working temperature: Height controller -10~60°C
- | IHS style: Switch inspecting IHS (suitable for all plasma both above-water and under-water cutting), Plasma Shield Protector IHS (suitable for above-water cutting's touch leading arc voltage plasma)
- | Running transfer: Alternative Arc transfer and pierce transfer
- | Divided voltage ratio:100:1
- | Accuracy: $\pm 1V \sim \pm 5V$, adjustable
- | Outer Dimension: Length X Width X Height:
272mmX225mmX80mm

2.3 Application

HP103 Supports almost all plasma cutters on market like Hypertherm, Kjellberg, Thermal Dynamics ...

And it supports all CNC cutting controllers on market like Hypertherm, Burny industrial level controllers or Mach3 such DIY controllers.

2.4 Operation panel



Arc Voltage

Before Arc Start it shows the Set Arc Voltage. after it shows the Actual Arc Voltage

3. INSTALLATION

3.1 working process:

Mode 1: When the Arc-ON signal with "IAON" (the Arc-On signal with IHS) is available, the height controller should process the IHS firstly; Secondly auto-control the Arc-on, the height controller will send the signal of arc transfer and pierce transfer to the NC system after producing the transfer arc. At the mean time, the controller delay time to put the arc voltage into the single chip system. If "Auto Permitted" is available in height controller and NC system has sent out AUTO height adjusted signal, the controller is on status of "Height Auto adjusted"

Mode 2: When the Arc-ON signal with “EAON” (the Arc-On signal without IHS) is available, the height controller will not process the IHS but control the plasma to Arc-on directly; the height controller will send the signal of arc transfer and pierce transfer to the NC system after producing the transfer arc. At the mean time, the controller delay time to put the arc voltage into the single chip system. If “Auto Permitted is available in height controller and NC system has sent out AUTO height adjusted signal, the controller is on status of “Height Auto adjusted

ATTN: When the NC system that you use can not receive the signal of arc-on and pierce, please delay the time to control the NC system's running. It just means that the NC system send arc-on signal to the height controller, delay time to run the NC system.

3.2 INSTALLATION CONTROLLER :

The following section provides you with the procedure to follow when installing the HP103. Some of the steps direct you to other sections in this manual that provide you with more detailed instruction.

1. Determine a mounting location for the HP103. Keep the following points in mind:

To avoid overheating and potential damage to the control box from cutting process fumes, DO NOT choose a mounting location

directly above the torch. Find a mounting location away from the torch lifter unit.

2. Attach the wires from the CNC, the plasma, the lifter motor and lifter limit switches to a connector and then to the control box at the receptacle. To reduce noise emission, 20 AWG (0.5 mm²) shielded cable is recommended. Filters consisting of a resistor and capacitor can be connected only directly to the motor.

3. Connect a 12 AWG (2.5 mm²) ground wire to the ground screw located on the control box and then, to the machine ground rail of your cutting system.

3.3 Divided voltage board

Controlling the arc voltage must inspect the changing of plasma arc voltage. The plasma arc voltage equals the voltage that is between the pole and ground. The anticathode which put out the plasma power is connected to the ground. The Cathode connects to the pole which is in the cutting gun. So the voltage in the electrode is negative. When process the cutting, the arc voltage absolute value is usually higher than 100V. If so, the voltage must be divided in order to process the control in the controlling circuit.

ATTN: the voltage that put into the height controller is negative.
If the polarity is connected in reverse, the Height Auto-adjusted is not available.

Our company's isolated divided voltage ratio is 100:1. The divided voltage ratio is set up as 100:1 before our company's height controller leave factory.

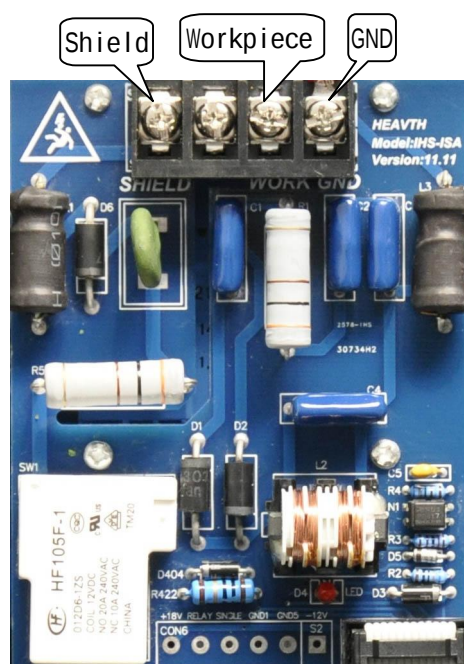
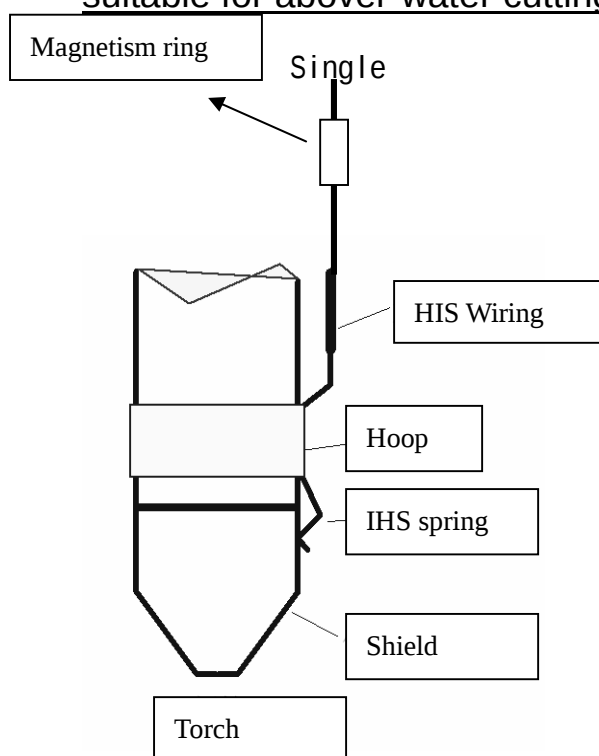
3.4 IHS introduction

Two types of IHS style of height controller

1. Plasma Shield protector IHS inspecting style

The material of the protector should be metallic. They can transmit each other when it gets to the material.

ATTN: The cutting torch protector IHS inspecting style is
suitable for above-water cutting only.



Working process: After the height controller receives the arc-on signal which is sent out from NC system, the cutting torch will fall down immediately. When the protector get to the material, the

height controller will receive this signal, and then control the cutting torch to rise to the given Height of IHS. The height controller will control the plasma to arc on after IHS.

2. inductive proximity switch IHS style (switch mode: NPN Mode, 2mm, outer diameter Φ 12, the distance of screw thread: 1.0mm)

When this style is adopted, the client should design the tongs according to the IHS cutting torch tongs sketch map which is provided by our company. All the plasma IHS, whatever over-water cutting and under-water cutting, can adopt this IHS style. Please adopt the approach switch IHS style if you use the high frequency input arc plasma and under-water cutting.

The tongs sketch map: Please see the appendix

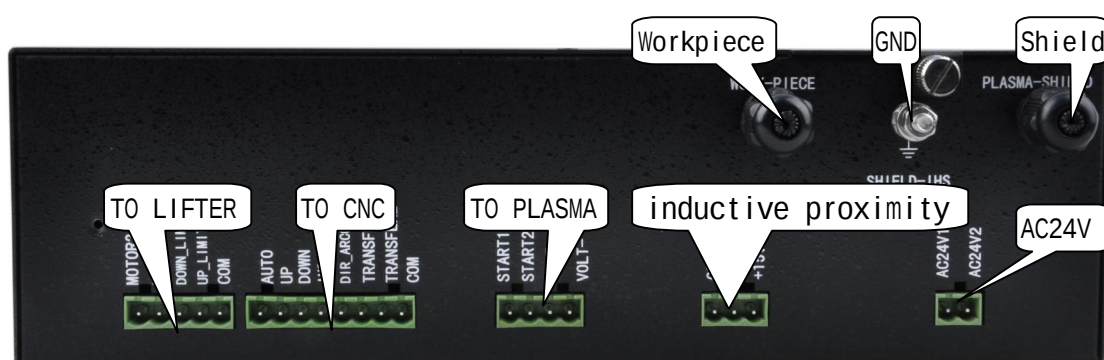
Before IHS, the approach switch is on approaching status. The cutting torch will rise once the switch is broken away.

Working process: After the height controller receives the arc-on signal which is sent out from NC system, the cutting torch will fall down immediately. When the cutting torch gets to the material, the approach switch will break away from the approaching spot. The height controller receives this signal, and then controls the cutting torch to rise to the given Height of IHS (the approach switch will reposition automatically during the rising). The height controller will

control the plasma to arc on automatically after IHS. This IHS style is suitable for all plasma IHS.

The approach switch is connected to the height controller via the SWITCH-IHS aviation socket.

3.5 Socket

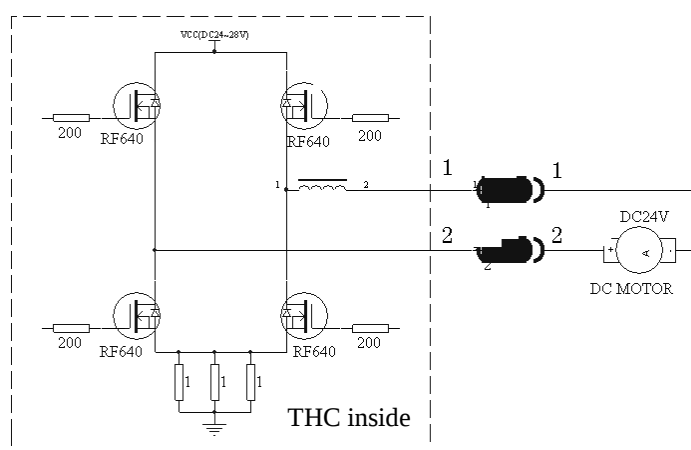


1、 The power ports of arc voltage height controller

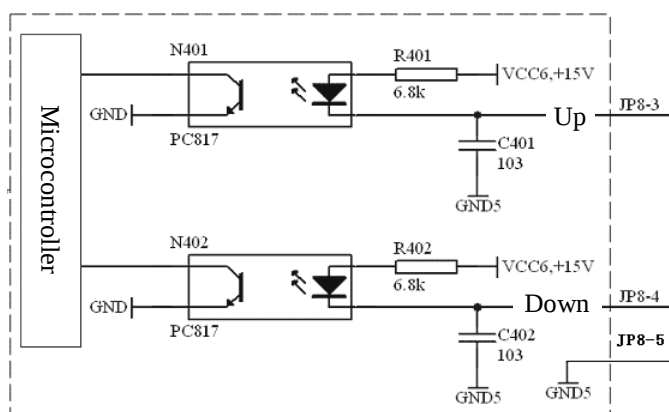
The power of arc voltage height controller is AC24V, connects to the height controller JP2.

2、 The port connected to the plasma cutting torch.

The motor output port:



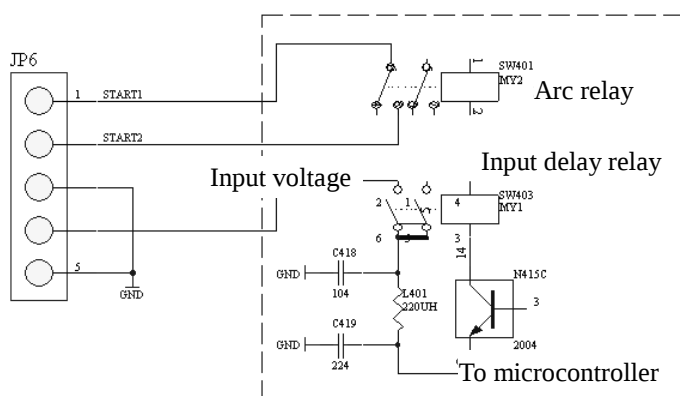
The position limited ports for Lift up and drop down:



ATTN: Position limited switch should meet the cutting – off spot usually. set JP2,JP3 can use the cutting –no spot usually.

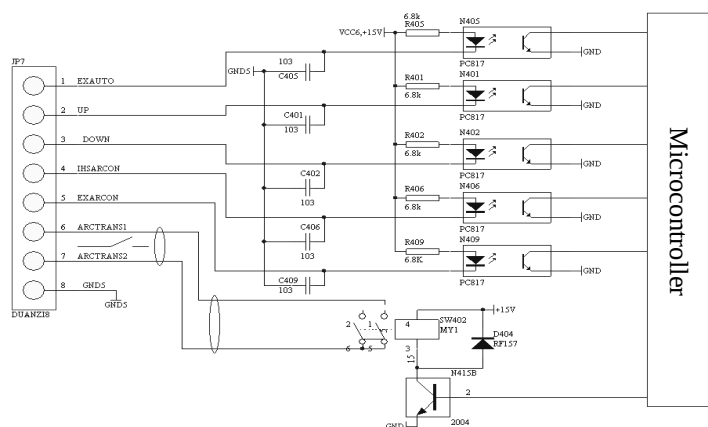
3、 The port connected to plasma

CON-PLASMA with 4 core socket connects to the port JP6 in main board.



Plasma Arc on signal is controlled by main board relay in height controller. The arc voltage will be postponed to enter into the main board.

4、 The ports to the NC system, the port circuit between height controller and NC system.



There are 6 ports with photo electricity insulated style between singlechip and NC system

A、 AUTO/MANUAL signal (EXAUTO): AUTO depends on high electricity level, HAND with low electricity level. Can use the JP7 set to the opposite state

B、 UP: It will rise when low electricity level is available.

C、 DOWN: It will drop when low electricity level is available.

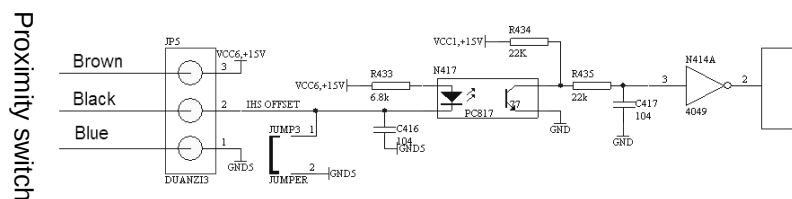
D、 IHS Arc-on signal (IHS ARC ON): It is available for low electricity level. IHS should be processed before working. The arc-on will be automatically once IHS finished.

E、 The arc-on signal without IHS(EX ARC ON): It is available for low electricity level. Arc-on directly.

F、 Arc transfer 1 and Pierce transfer 2 (ARCTrans1、 ARCTrans2) :

Signal type :relay

5、 Inductive Proximity switch IHS port



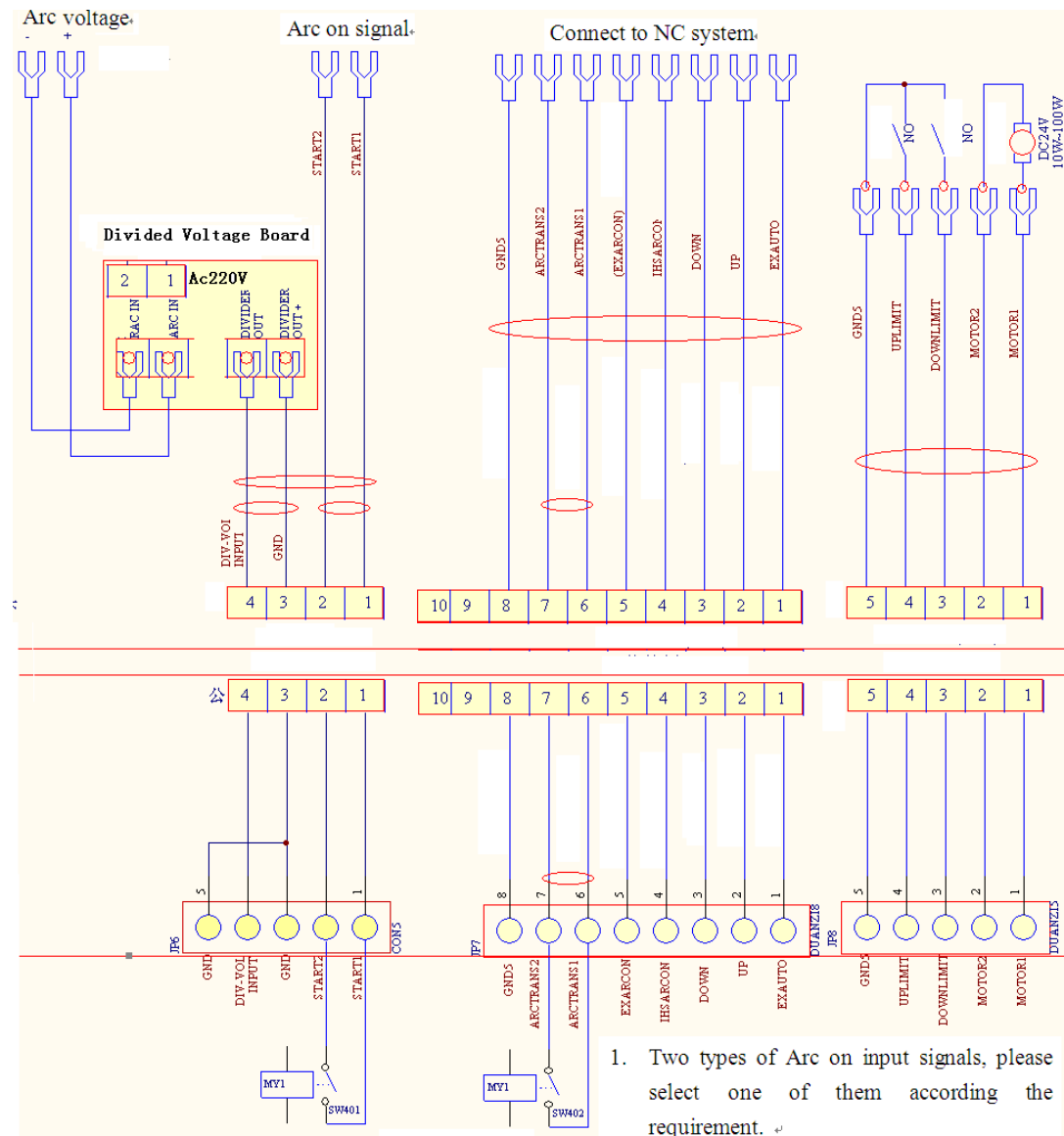
6. Isolated divided voltage board wiring diagram.

ATTN:

1. To reduce noise emission, 20 AWG (0.5 mm²) shielded cable is recommended.
2. The arc lead in THC is negative, if the pole mis-connected, THC can not work.
3. HF plasma must use isolation voltage divide. The actual arc output should be connected at plasma's rectifier output, better not connect directly to Electrode and work where have serious HF interference during arc starting time.
4. Non Isolation Voltage Divide is backup for Isolation voltage divide. On non isolation voltage divide.AC220V power can be unconnected.

Electrical Schematic

Chart 2



1. Two types of Arc on input signals, please select one of them according to the requirement.
2. arc on finishing signal (JP7-PIN6,7) and arc on signal (JP6-PIN1,2) are type of relay
3. Please refer to the chart 5 about **Divided Voltage Board**

Chat3

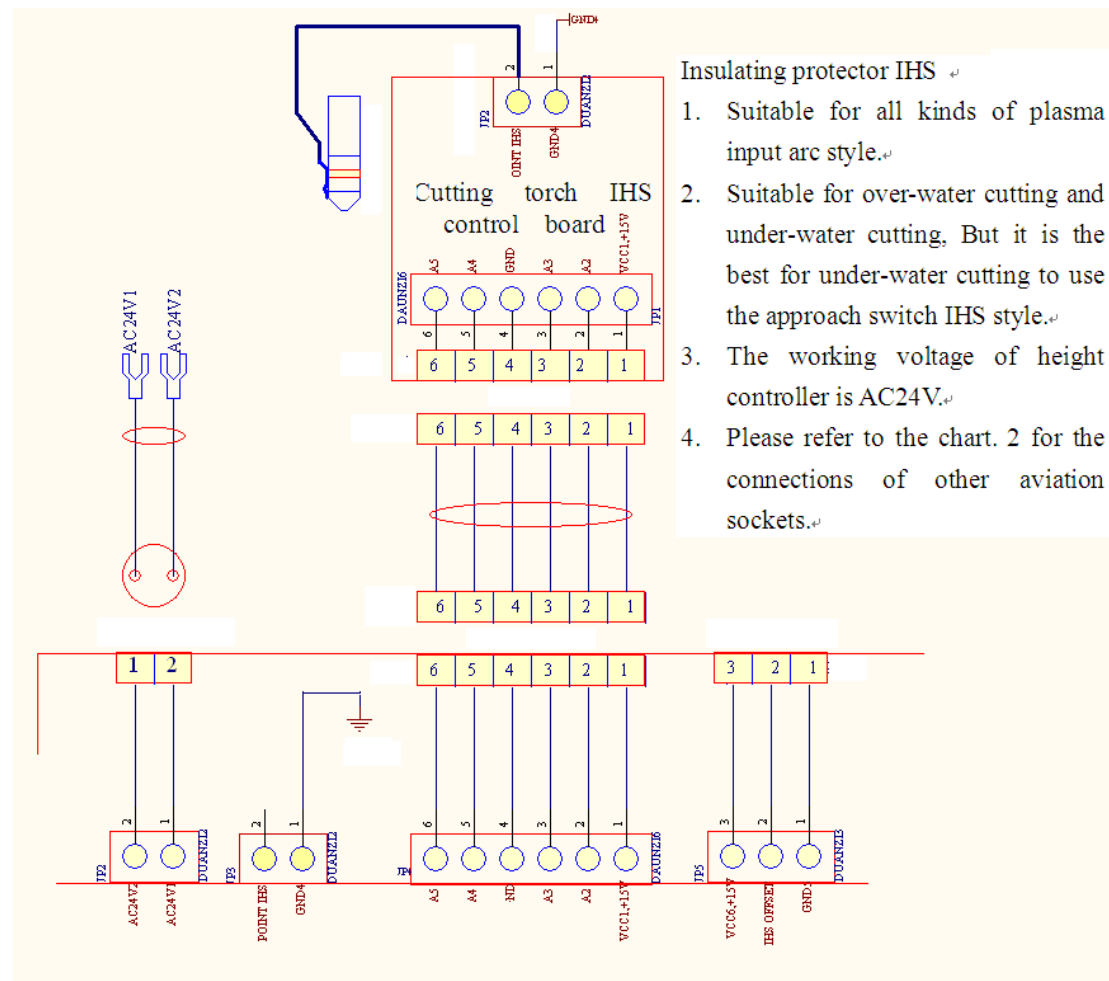
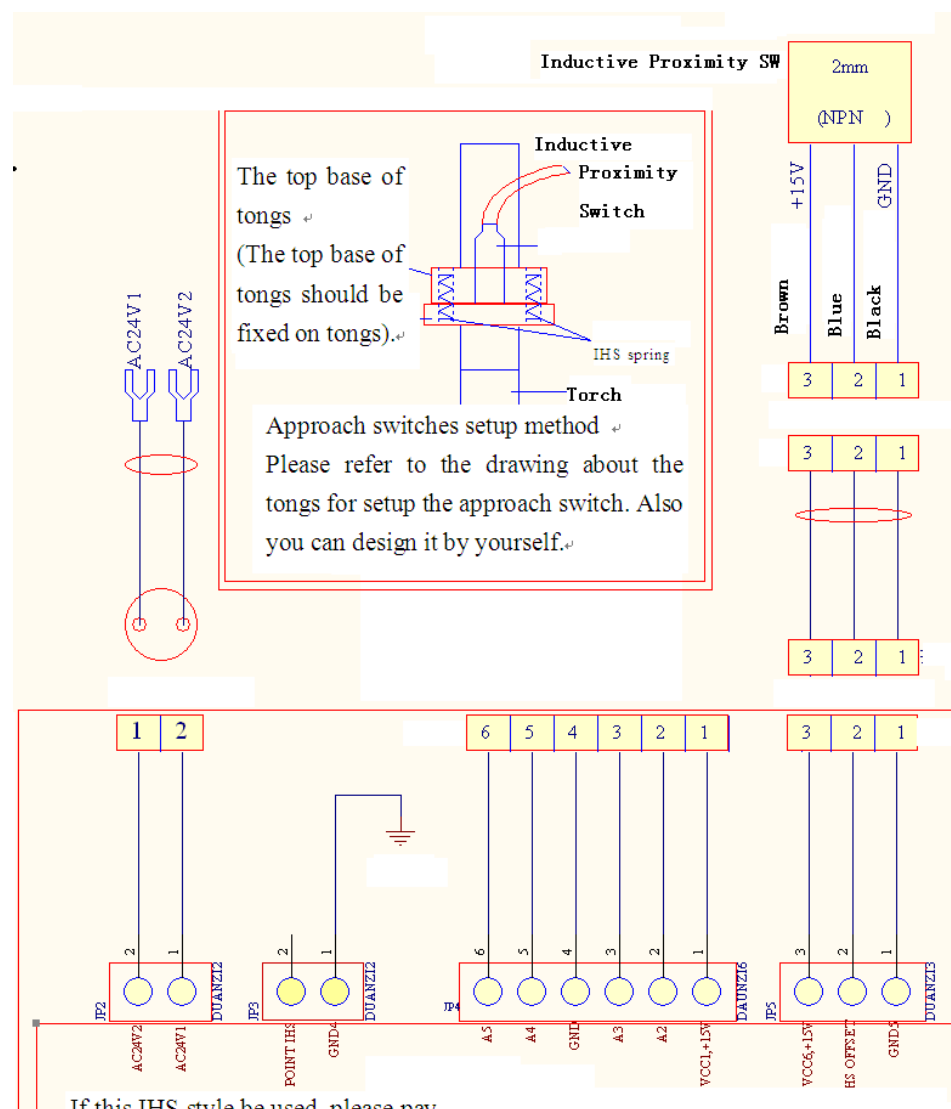


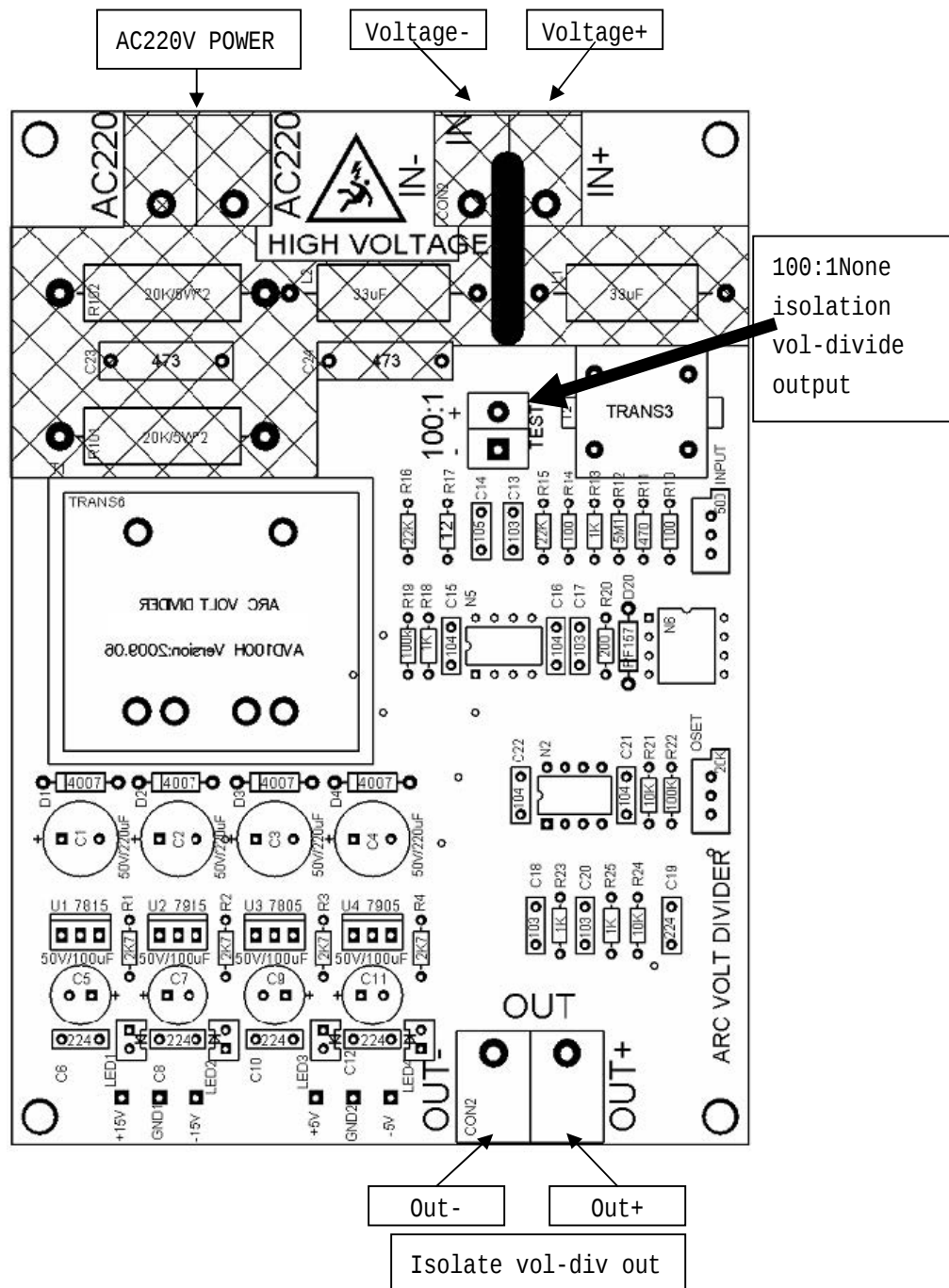
Chart 4



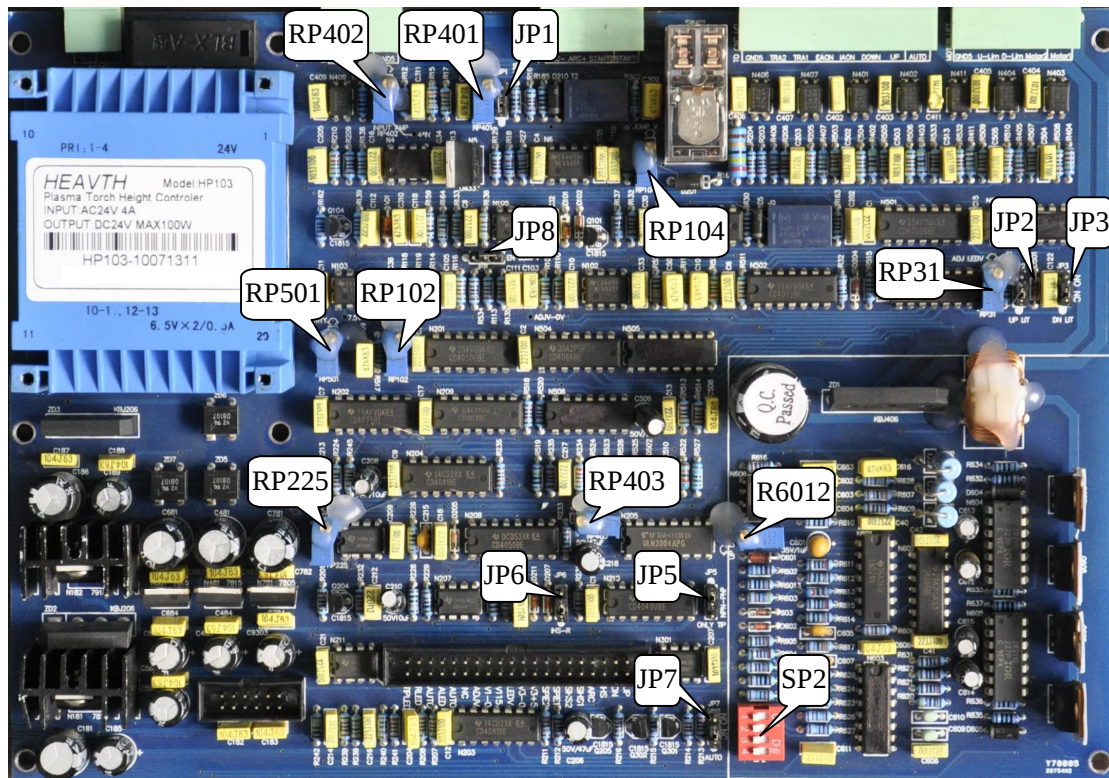
If this IHS style be used, please pay attention to the line aside of JP5 socket in the inner of Height controller. Move it out. It is short connected originally.

1. use for over-water cutting and under-water cutting.
2. This IHS style is suitable for high frequency arc plasma.
3. This IHS style is suitable for under-water cutting.
4. It is permitting that no connection between the JP3 and JP4.

Chart 5



3.4 Parameter adjusted:



Clockwise rotation becomes bigger, counterclockwise rotation becomes smaller.

- RP402: Input arc voltage amplify set.
- RP401: Internal imitation arc voltage set.
- RP104: Arc max error set up. Initialization: 030

During the cutting course, the cutting torch have the cutting crack (out-in line), the arc voltage will be raised immediately. If no ARC MAX ERROR, the cutting torch will bump to the material with high speed. The torch will be damaged. So setup this parameter can protect the cutting torch.

- RP501: Auto PWM amp.

This parameter is used for setting up the PWM speed adjusted coefficient when the arc voltage is changing. The parameter is bigger, more sensitive for the height controller. But the running stability of the cutting torch will get lower.

On opposite, the parameter is smaller, sensitive will be lower and the running stability will be higher. So a appropriate coefficient selected can get a good balance between the sensitive and stability.

- RP102: Control voltage zero adjustment
- RP31: Arc voltage display value adjustment
- RP225: Arc voltage delay input time setup.

The arc voltage will be affected seriously during the leading arc. So the arc voltage will be delay to put in the circuit.

- RP403: Torch cutting end, torch rise time.
- JP1: Set down input the external arc voltage.

Set up input the internal imitation arc voltage.

- JP2: Select the type of Up limited switch.

Set down use the Normally open spot.

Set up use the Normally closed spot.

- JP3: Select the type of Down limited switch.

Set down use the Normally open spot.

Set up use the Normally closed spot.

- JP5: Select the type of proximity switch.

Set up use NPN normally closed.

Set down use PNP normally open.

- JP6: Set isolation shield delay.

- JP7: AUTO/MANUAL signal (EXAUTO)

Set up AUTO with low electricity level.

Set down AUTO with high electricity level.

- JP8: Enable arc max error. Set left disable, set right enable.
- SP2: Set the maximum current and PWM Frequency.

电流	1-8	2-7	3-6	4-5
4A	OFF: PWM=9KHZ ON: PWM=18KHZ	OFF	OFF	OFF
3A		OFF	OFF	ON
2A		OFF	ON	ON
1A		ON	ON	ON

4. Troubleshooting

NO.	Fault	cause	action
1	NO display on LED screen, and darkly on screen	The error of Power AC24V	Check the power AC24V
2	the motor do not run or run in one direction	1.Drive IR2110 damaged	1、replace the IR2110
		2.No driving signal from the foregoing controlling	Replace the (4071) (4049) if they are damaged.
		3.over current error protect	Q606↔Q609(IRF640) maybe damaged
3	Turn on the power , cutting gun run upward all along	1. It is something wrong with the inductive proximity switch IHS on cutting torch. Maybe is on opening status.	Assemble the inductive proximity switch well.

		2. inductive proximity switch damaged.	Replace the inductive proximity switch (signal: 2MM, NPN type.)
4	Do not Arc-on after IHS	1. inductive proximity switch is damaged. No signal feedback.	Replace a new switch
		2. The IHS time is very short. No signal feed back	Prolong the IHS time
5	Arc voltage is unsteadily	Inspect the grounding wire(working lead connection) Inspect the water's leakage or not and the air humidity.	
6	Plasma is ARC ON before IHS	When processing EXARCON signal, the prolong time of NC system is too short.	Prolong the delay time to the NC system IHS.
7	The cutting torch can not arc-on.	1. Make sure the plasma power is on working status 2. Inspect the IHS pierce height. 3. Inspect the accessory of cutting torch.	
8	The plasma on the cutting torch can not transfer to the workpiece.	1. inspect the working lead connection 2. Inspect the accessory of cutting torch.	

9	The cutting torch is moved before the cutting torch pierces material.	It is very short for the delay time setup in operation menu "IHS time"
10	The cutting torch drop toward the workpiece when the NC system is driving.	1. Increase the "Given arc voltage" setup 2. prolong the time of auto-enter in NC system 3. Reduce setup for the over arc voltage protecting value
11	The plasma arc is off after arc transfer and pierce is bigger.	The prolong time is too long on the parameter setup interface "pierce time". (Before the machine moves, the plasma arc is easier to be off if the cutting torch stay at the position of pierce for long time.
12	During the protector IHS, the cutting torch gets to the material and do not rise.	1. The IHS time is too short. 2. The connection is not well between the induction lead and protector.

5.PowerMax1250 Parameters List

Current	ARC (V)	Pierce time (Sec)	Thickness (MM)	Speed(MM/Min)
Steel 80A	132	0.25	4.8	3556
	134	0.5	6.4	2667
	137	0.5	9.5	1549
	140	0.5	12.7	991
	145	1.0	15.9	660
	148		19.0	508
	150		22.2	381
	156		25.4	254

Current	ARC (V)	Pierce time (Sec)	Thickness (MM)	Speed(MM/Min)
Stainless 80A	134	0.25	4.8	3556
	136	0.5	6.4	2616
	139	0.75	9.5	1372
	142	0.75	12.7	838
	145		15.9	559
	150		19.0	406

	153		25.4	229
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Current	ARC (V)	Pierce time (Sec)	Thickness (MM)	Speed(MM/Min)
Aluminum 80A	134	0.25	3.2	7493
	136	0.5	6.4	2896
	143	0.75	9.5	1524
	146	0.75	12.7	940
	154		19.0	483

Current	ARC (V)	Pierce time (Sec)	Thickness (MM)	Speed(MM/Min)
Steel	147	0	0.5	10541
	148	0	0.8	8255
	149	0	1.3	5156
	152	0	1.5	2896
	144	0.25	1.9	5613
40A	146	0.5	3.4	2489
	147	0.75	4.7	1600
	149	1.0	6.4	1219

Current	ARC (V)	Pierce time (Sec)	Thickness (MM)	Speed(MM/Min)
Stainless	139	0	0.5	10414
25A	139	0	0.8	8179
40A	142	0.25	1.3	8509
	144	0.25	1.5	6172
	144	0.25	1.9	3658
	147	0.50	3.4	1778
	149	0.75	4.7	1118
	149	1.0	6.4	787

Current	ARC (V)	Pierce time (Sec)	Thickness (MM)	Speed(MM/Min)
Aluminum 25A	150	0	0.8	10084
	152	0	1.5	4420
40A	146	0.25	2.4	4826
	149	0.50	3.2	3378
	151	1.00	6.4	1245

Please refer to the plasma instruction for the details.