Qingdao Uneed Industry & Trade Co., Ltd.

AHa Series Torch Height Controller Manual
(AHa-S1 & AHa-L1)

Working range and principle

AHa plasma arc voltage THC (torch height controller) works based on the characteristics of constant current of plasma power source. THC checks the arc voltage of plasma power source to control the torch height.

Technical parameters

Power supply: DC24V 1A, voltage max. fluctuation 10%

Matching motor: 2-phase hybrid stepper motor

　　　　　AHa-L1 motor current output 0.6~4.5A (adjustable)

　　　　　AHa-S1 motor current output 0.4~1.7A

Motor power supply: AHa-L1 DC24~40V 4A 10%

　　　　　AHa-S1 DC24 2A 10%

Manual adjustment: 0~100mm

Automatic height control: 3~30mm

Automatic height adjustment speed: 3000mm/min (30° slope)

Control accuracy: +/- 0.5mm

Working temperature: -10~50℃

Voltage divider board: ratio 50:1

Warning

1. Don't install, plug in and out when be powered.

1

2. The THC housings must connect ground very well to avoid electric shock.

3. The shielded wire connects THC and CNC cutting controllers to reduce electromagnetism interference. The shielded wire must connect ground well.

4. The metal plate must connect the ground and the THC housings well to better control height.

Quick use instruction

1. connection
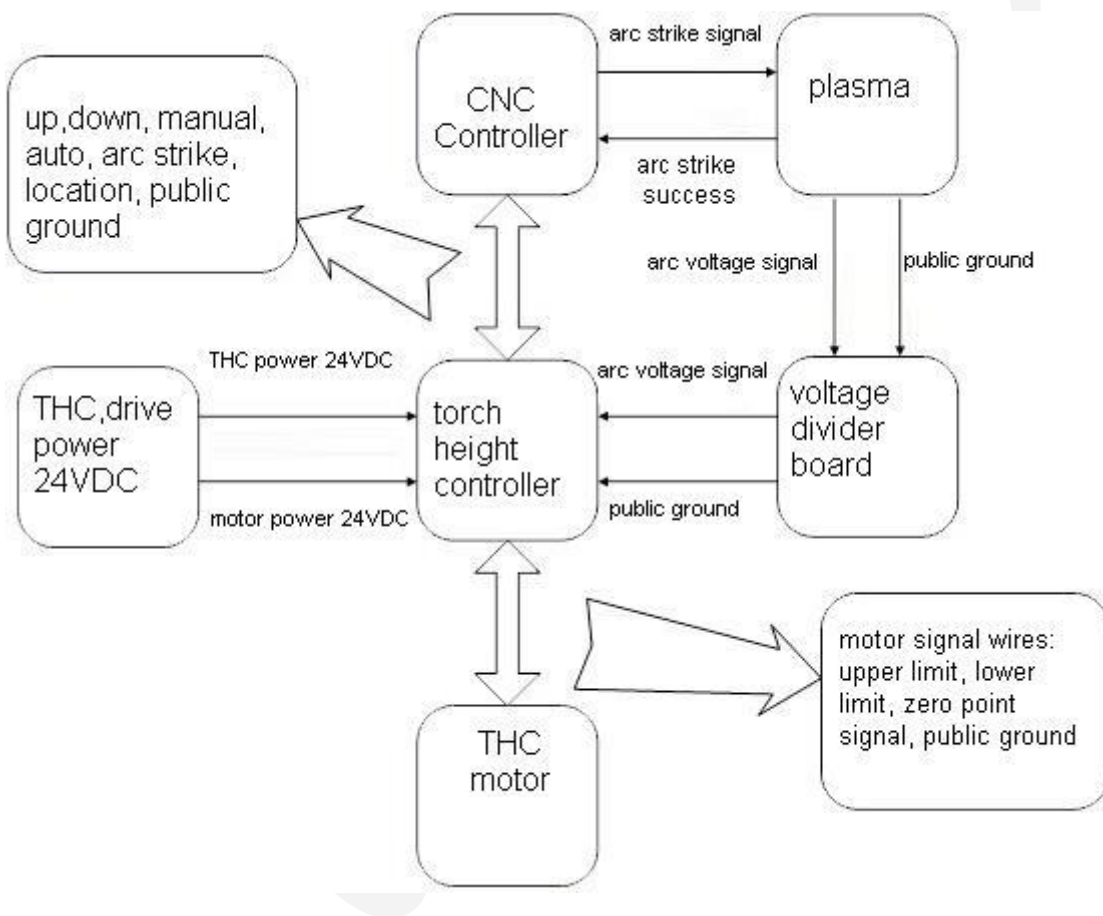
Remark

a. the signal of arc strike success to CNC controller can be offer by THC or by plasma power source.

b. from CNC controller to THC, shielded wire diameter can't be less than 0.3. From THC to lifting device, motor signal wire diameter is up to motor models.
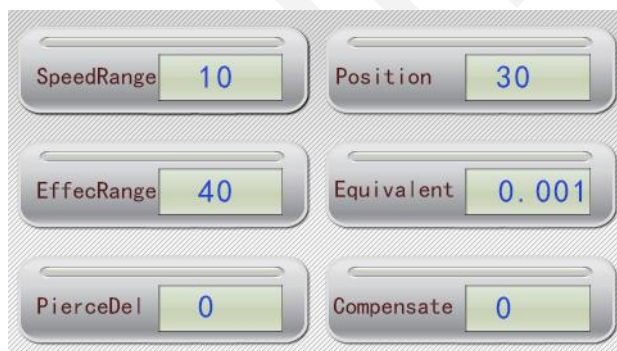
2. parameter setup

AHa-L1

a. Check basic parameters setup of first use

Adjust SetArc according to the plate thickness, 5 is recommended for sensitivity, set to Auto, press Zero Test to check whether the location height is proper for cutting height, if you need to adjust, rotate the knob of Up/Down (interface/parameter shift) to the following menu
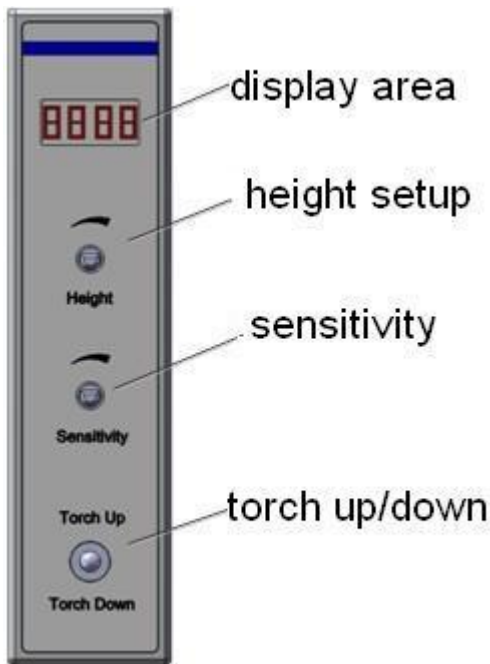

Adjust the location height by "+1" or "+10" knobs, press Zero Test to escape, and then test the location height again.

b. Test cutting height arc voltage

c. Start to cut

After above operations, back to the initial interface, then start to cut. During cutting, the height and sensitivity can be adjusted by knobs, or in the manual mode, the height can be set by Up/Down knob.
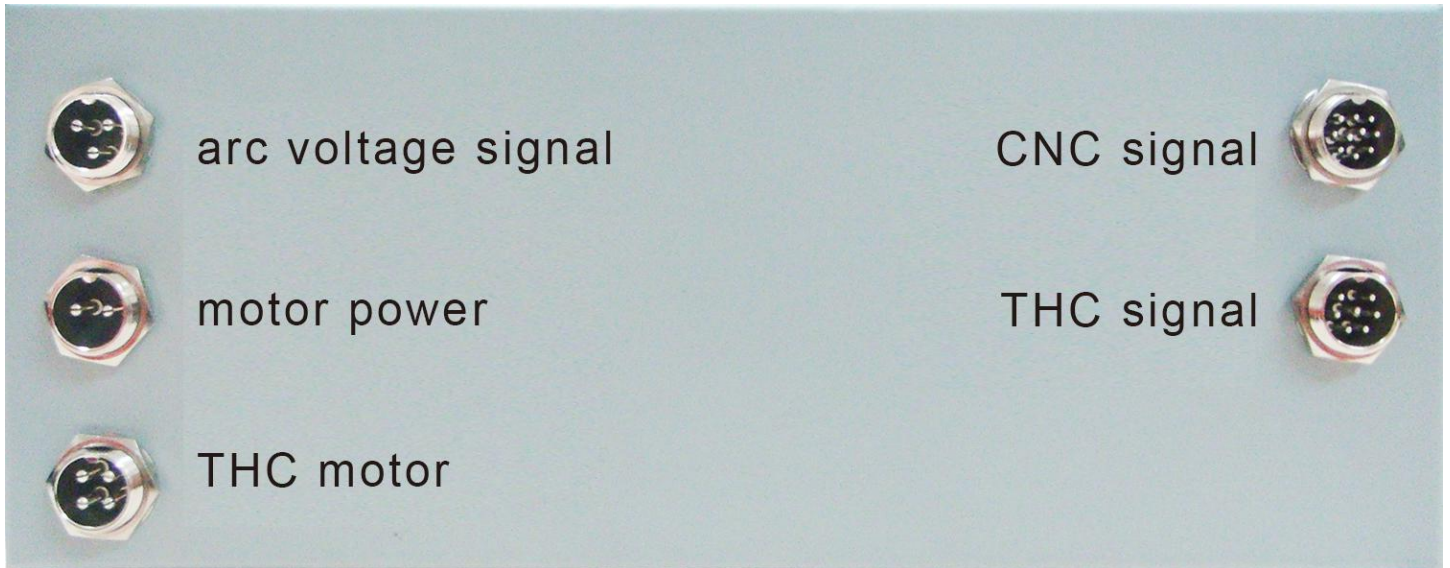
3. AHa-S1

In main interface, press Sensitivity, initial location tests. Press Height to adjust parameters, A is for location height, press Height to be back.

4. automatically cut figures from CNC

Note: changing set arc voltage is to change cutting height, and the smaller the sensitivity is, the better the motor runs, but maybe the motor shakes.

AHa-L1 port connection

THC motor

1	Motor signal A+
2	Motor signal B-
3	Motor signal B+
4	Motor signal A-

CNC controller signal

1	+24V
2	Arc strike success（output）
3	Auto cycle（input）
4	24VG
5	Initial location success（output）
6	null
7	Arc strike（output）
8	Man/auto（input）
9	Manual up（input）
10	Manual down（input）

THC signal

1	24VG
2	Zero point
3	Lower limit
4	Upper limit
5	null
6	null
7	null

Arc voltage signal

1	Arc voltage signal
2	Ground connection
3	24VG

Motor power

1	Motor power+
2	Motor power-

AHa-S1 port connection

24-pin port

1	Arc voltage signal (input)
2	24G
3	24G

4	+24
5	Upper limit (input)
6	Lower limit (input)
7	Zero point (input)
8	null
9	24G
10	+24
11	Manual up (input)
12	Manual down (input)
13	Man/auto (input)
14	Arc strike success (output)
15	null
16	Location success (output)
17	24G
18	null
19	24G (motor power-)
20	+24 (motor power+)
21	A+ (motor signal)
22	B+ (motor signal)
23	A- (motor signal)
24	B- (motor signal)

Motor 10-pin port

1	A+ (motor signal)

|		
2	B+ (motor signal)	
3	B- (motor signal)	
4	A- (motor signal)	
5	null	
6	24G (connect pin 3 of 24-pin)	
7	+24 (connect pin 4 of 24-pin)	
8	Upper limit (connect pin 6 of 24-pin)	
9	Lower limit (connect pin 5 of 24-pin)	
10	Zero point (connect pin 7 of 24-pin)	

AHa-S1 circuit connection

10-pin air plug

voltage divider
board 9-pin

24-pin port

24-pin port			
1	Arc voltage signal	13	Manual/auto
2	24VG	14	Arc strike success
3	24VG	15	unoccupied
4	+24V	16	Location success
5	Upper limit	17	24VG
6	Lower limit	18	unoccupied

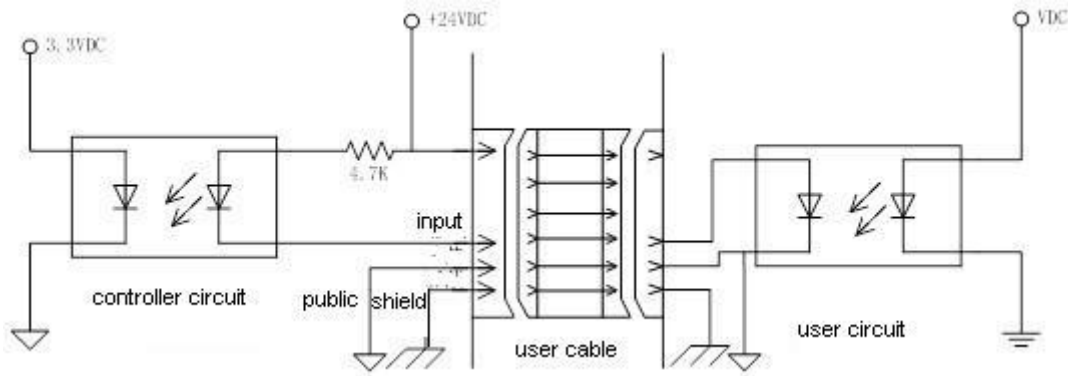| 7	Zero point	19	Motor power -24V
8	unoccupied	20	Motor power +24V
9	24VG	21	A+
10	+24V	22	A-
11	Manual up	23	B+
12	Manual down	24	B-

Circuit example

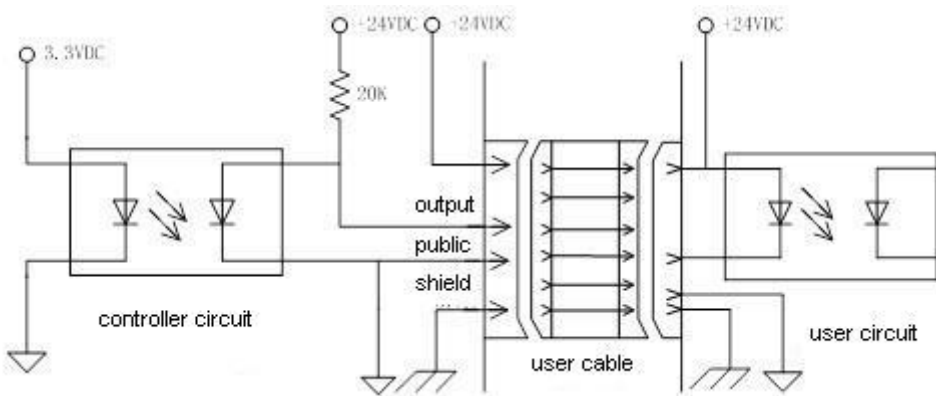1. Input connects limit position, zero point normal-closed switch (AHa-S1)
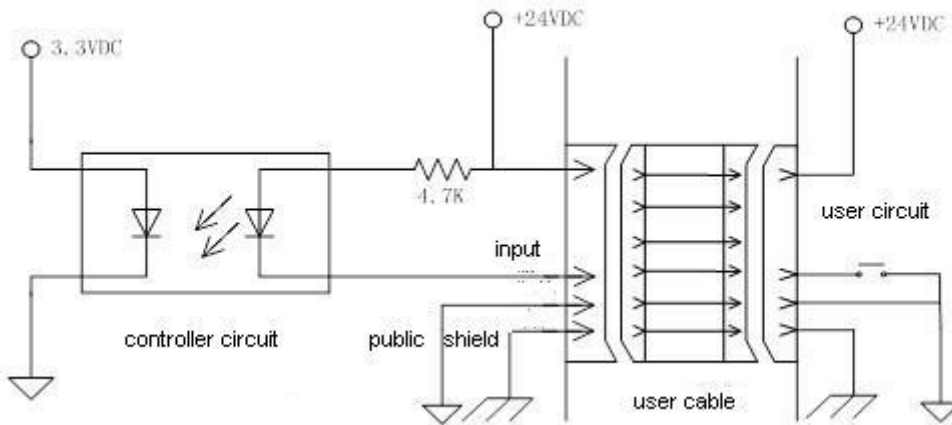
2. Input connects limit position, zero point normal-open switch (AHa-L1)
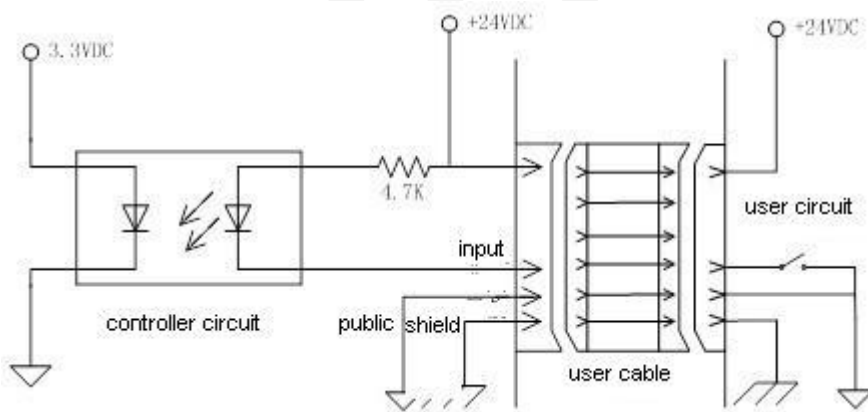
3. Input connects photoelectric isolation

4. Output connects photoelectric isolation

Note: all shielded wires need to connect ground with insulation, and public terminal connects 24VG.

Basic functions

Initial location: after THC receives the signal of torch down from CNC controllers (Microstep brand), or after CNC controllers send the signal of location cycle start, the torch moves down to touch the location switch, then the torch moves up to the initial location height, THC will send the signal of location success after location finish.

Automatic operation

Mode 1 use location finish feedback and plasma power source arc strike success feedback

after THC receives the signal of torch down from CNC controllers (Microstep brand), initial location starts, after location, THC sends the signal of location finish to CNC controllers, torch

down is over, then strike arc, after plasma power source receives the signal of arc strike success from CNC controllers, start to cut, after THC auto delay (arc voltage is steady), CNC controllers give THC the auto signal, THC starts to automatically adjust the torch height according to arc voltage change.

Mode 2 use location finish feedback and THC arc strike success feedback

after THC receives the signal of torch down from CNC controllers (Microstep brand), initial location starts, after location, THC sends the signal of location finish to CNC controllers, torch down is over, then strike arc, after THC detects relatively steady arc voltage signal, THC sends the signal of arc strike success to CNC controllers, start to cut, after THC auto delay (arc voltage is steady), CNC controllers give THC the auto signal, THC starts to automatically adjust the torch height according to arc voltage change.

Mode 3 don't use local finish feedback and THC arc strike success feedback

Some CNC controllers have no functions of local finish feedback and arc strike success feedback, after THC receives the signal of torch down from CNC controllers, initial location during torch down delay, the time of torch down delay should be longer than the time of initial location, after torch down delay, strike arc and cut, after THC auto delay (arc voltage is steady), CNC controllers give THC the auto signal, THC starts to automatically adjust the torch height according to arc voltage change.

When THC is in auto mode, torch height setup and auto height control sensitivity can be adjusted by knobs.

Manual operation

In manual mode, torch height can be adjusted by THC panel torch up/down switch or THC up/down input port. Initial location and arc strike test can be done separately.

Arc strike delay: after THC receives auto signal from CNC controllers, delay sends arc strike success signal.

Torch up after arc break: torch will automatically move up after arc break to avoid nozzle and other parts damage.

Torch anti-collision: extra anti-collision switch

Arc strike success output: after THC detects relatively normal arc voltage, THC sends arc strike success signal.

Initial location finish output: after initial location, send location finish signal, the signal is on-off.

Sequence chart
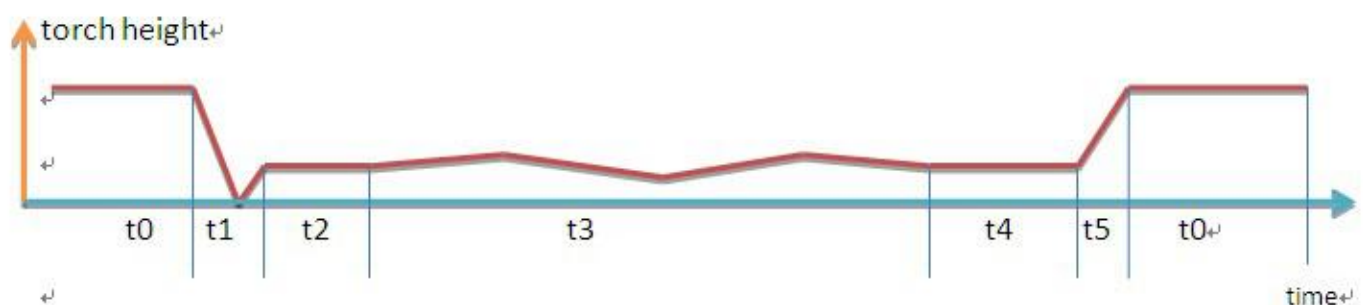
T0: torch moves to the point G00

T1: initial location, CNC controllers send the signal of initial location start, after location finish, THC gives the signal of initial location finish to CNC controllers.
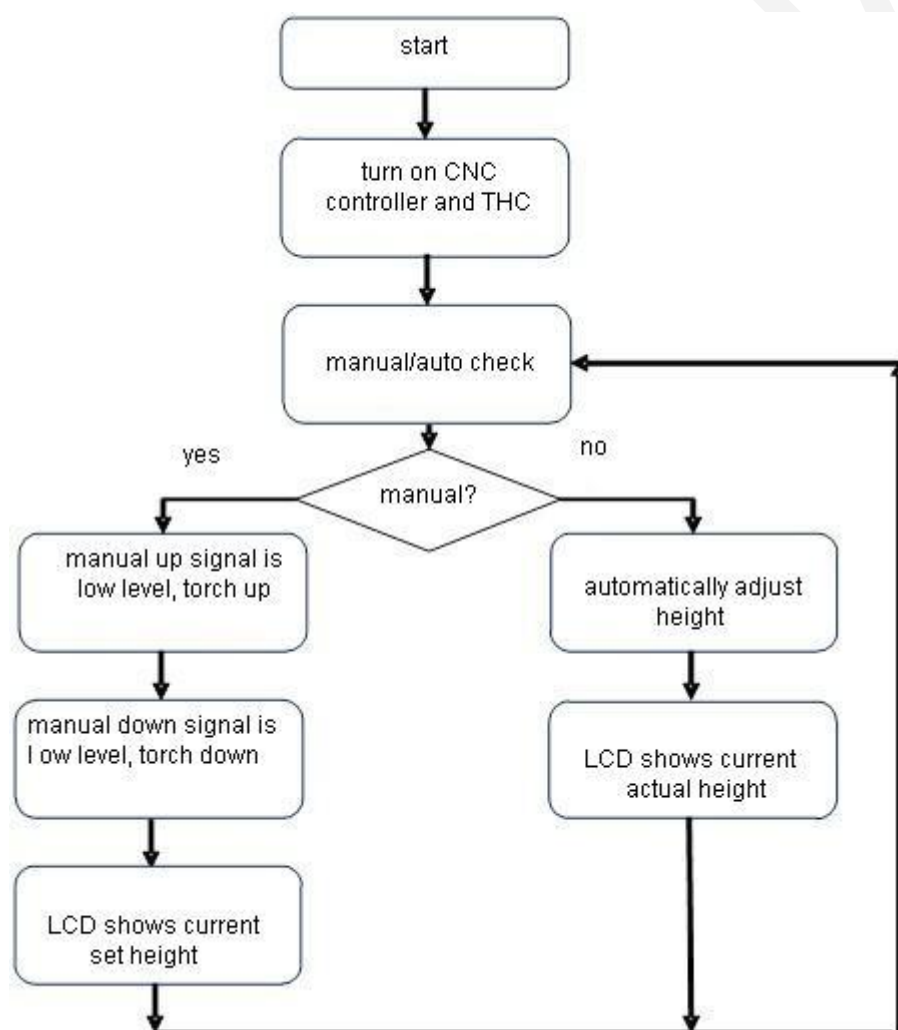
T2: arc strike delay, pierce delay, THC auto delay and other delays are over, CNC sends the signal of THC auto.

T3: the state of auto height control comes after THC receiving the signal of THC auto from CNC controllers.

T4: turn off auto THC in advance before finishing point

T5: torch up delay

Workflow

AHa-L1 panel control operation and parameter setup

Panel as below

Buttons and knobs

Auto/Manual: switch of auto and manual. When the switch is for auto, THC is in the control of CNC controller THC auto/manual. When the switch is for man, THC is out of controller of CNC controller THC auto/manual, only manual state. THC LCD shows auto or manual.

Torch up/torch down: torch up/down switch. THC LCD shows up or down.

Arc strike: arc strike test, valid in manual mode. Press the button, plasma power source will gets arc strike signal, THC shows arc voltage value and LCD "ARC" is on.

Zero test: initial location to check whether the initial location height is proper. During the initial location, before the torch moves down to touch the plate, torch up/down will stop the initial location test.

Sensitivity: clockwise turn the knob to increase, anticlockwise to decrease

Height: in auto mode, it's a reference value during cutting.

Up/down: in main menu, change different parameter interface.

Parameter setup

ARC: show the actual arc voltage value after arc strike, 000 is for no arc voltage value.

SetArc ： set arc voltage value according to the plate thickness and cutting speed and the parameter list of plasma power source. The arc voltage value decides the torch height to the plate. The value is bigger, the height is higher. In auto mode, during cutting, arc voltage value adjustment is cutting height adjustment.

Sensitivity: the value is smaller, torch height adjustment response is slower, vice versa.

State display

Manu: without auto signal from CNC controllers, the light is on.

Auto: when receiving auto signal from CNC controllers, the light is on.

Up: when manual up, the light is on.

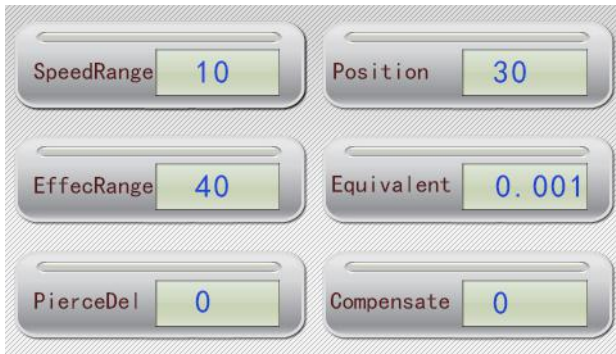**Down**: when manual down, the light is on.

Lim+: when torch up, the motor gets to upper limit, the light is on.

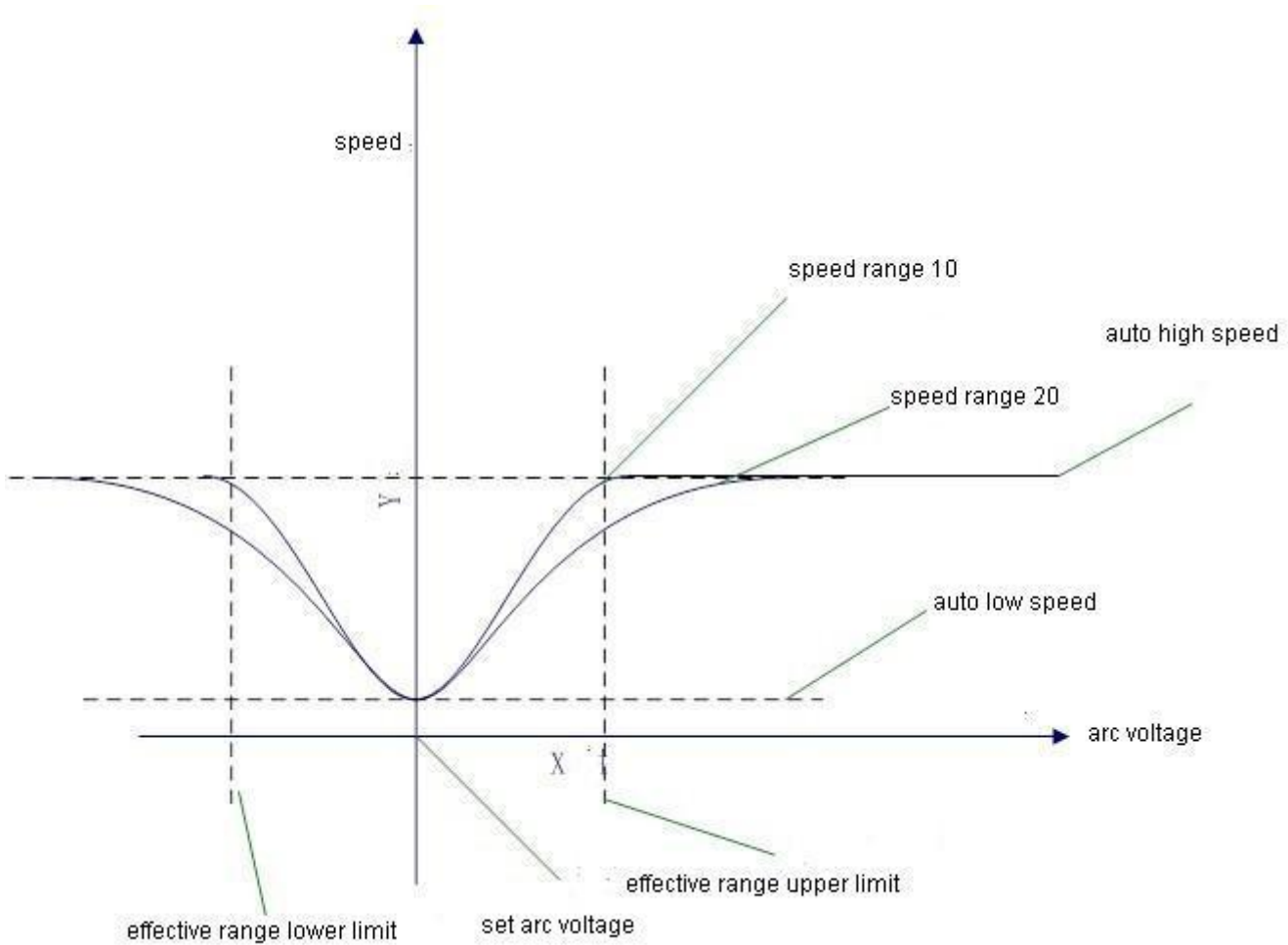**Lim-**: when torch down, the motor gets to lower limit, the light is on.

Zero test: press Zero Test button, the light is on.

Arc: when detect the arc voltage, the light is on.

SpeedRange	10	Position	30
EffecRange	40	Equivalent	0.001
PierceDel	0	Compensate	0

SpeedRrange (Speed Range)

The speed range is bigger, and THC motor up/down speed change is slower, the tracing speed is slower. The speed range is smaller, and THC motor up/down speed is faster, and the motor will vibrate when too fast.

EffecRange (effective range): Arc voltage automatically cut between the effective range lower limit and the effective range upper limit. Beyond the range, torch moves up. The effective range is bigger, auto cutting range is bigger, the effective range is smaller, auto cutting range is

smaller, the recommend range of effective range is 40.

PierceDel (pierce delay): In auto mode, pierce delay is the time of THC sending the signal of arc strike success to CNC controllers after THC collects arc voltage value. Unit: ms.

Position (location height): The torch moves down and touches the plate, then the torch moves up to the height, unit: mm

Equivalent: The distance of very impulse, unit: mm

Equivalent = lead screw thread pitch * 1000/(360*subdivision/step angle*transmission ratio)=lead screw thread pitch*1000/(impulse per motor revolution* transmission ratio).

Compensate (compensation value): when the actual location height is different from set location height, the parameter will compensate the lost distance.

Note: in this interface, height setting is invalid. The status bar moves by Up/Down knob and when it moves to a certain parameter, Sensitivity knob will adjust the value of the parameter to plus 1 or minus 1, and Height knob will adjust the value of the parameter to plus 10 or minus 10. After setting, press Zero Test button and return to main menu. In the interface, press Zero Test button long time to enter the following interface:

StartSpeed	600	AutoHSpeed	1800
TopSpeed	3000	AutoLSpeed	600
SpeedRate	50	Language	0

StartSpeed: start speed of THC motor, don't be over start frequency of the motor, unit: mm/min.

TopSpeed: max. speed of THC motor, the bigger the value is, the faster the speed of touching the limit is. Unit: mm/min.

SpeedRate: the multiplying power factor needed from start speed to max. speed, the bigger the value is, the longer the acceleration time of is.

AutoHSpeed (auto high speed): during auto working, max. speed of motor up/down, don't exceed motor start frequency, so fast speed maybe cause motor lock rotor.

autoLSpeed (auto low speed): during auto working, min. speed of motor up/down, don't exceed auto high speed.

Language: 0 for Chinese, 1 for English

Note: choose the language, turn off and turn on again to show new language.

AHa-S1 panel control operation & parameters setting

Parameters instruction

Current arc voltage (H): detected and collected by plasma power

Set arc voltage (A): according to cutting thickness and speed, set an arc voltage recommended by the plasma power reference list. The arc voltage value decides the height between the torch and the plate. The bigger it is, the higher the distance is. In the auto mode, the set arc voltage adjustment will change the cutting height.

Location height (b): the torch moves down, touch the zero point, then moves up to the height. The bigger it is, the higher the distance is, vice versa.

Sensitivity (E): speed of the torch movement up and down, the smaller the sensitivity is, the faster the torch movement up and down is, vice versa.

Max. speed (F): in the auto mode, the bigger the difference of current arc voltage and set arc

voltage is, the closer the torch speed is to the max. speed. When the difference is maximum, the torch speed is max. speed.

Min. Speed (L): in the auto mode, the smaller the difference of current arc voltage and set arc voltage is, the closer the torch speed is to the min. speed. When the difference is minimum, the torch speed is min. speed.

Working speed (P): in the manual mode, torch speed of movement up and down

Effective range (d): in the arc voltage effective range, it's auto cutting. Beyond the range, the torch moves up. The bigger the effective range is, the bigger the auto cutting range is, vice versa.

Operation instruction

1. Clockwise rotate the Height knob, C flash, set arc voltage (A) plus 1, anticlockwise rotate the Height knob, A flash, set arc voltage (A) minus 1, press Sensitivity to be back.

2. Clockwise rotate the Sensitivity knob, E flash, sensitivity (E) plus 1, anticlockwise rotate the Sensitivity knob, E flash, sensitivity (E) minus 1, press Sensitivity to be back.

3. Press Height knob to the state of parameters setting, then rotate Height knob to show different parameters, rotate Sensitivity knob to change the value of different parameters, press Sensitivity to be back.

4. During cutting, ARC is for current arc voltage (H), when there is no arc voltage signal, ARC is (A).

Voltage divider board

1. It is a functional module to reduce the voltage in proportion after arc strike and to be a

low-voltage signal to reflect the height between the nozzle and the plate.

2. Ports instruction

J3 ~220V±10%

J2 arc voltage input for plasma power arc voltage

J1 arc voltage output for THC and CNC controller
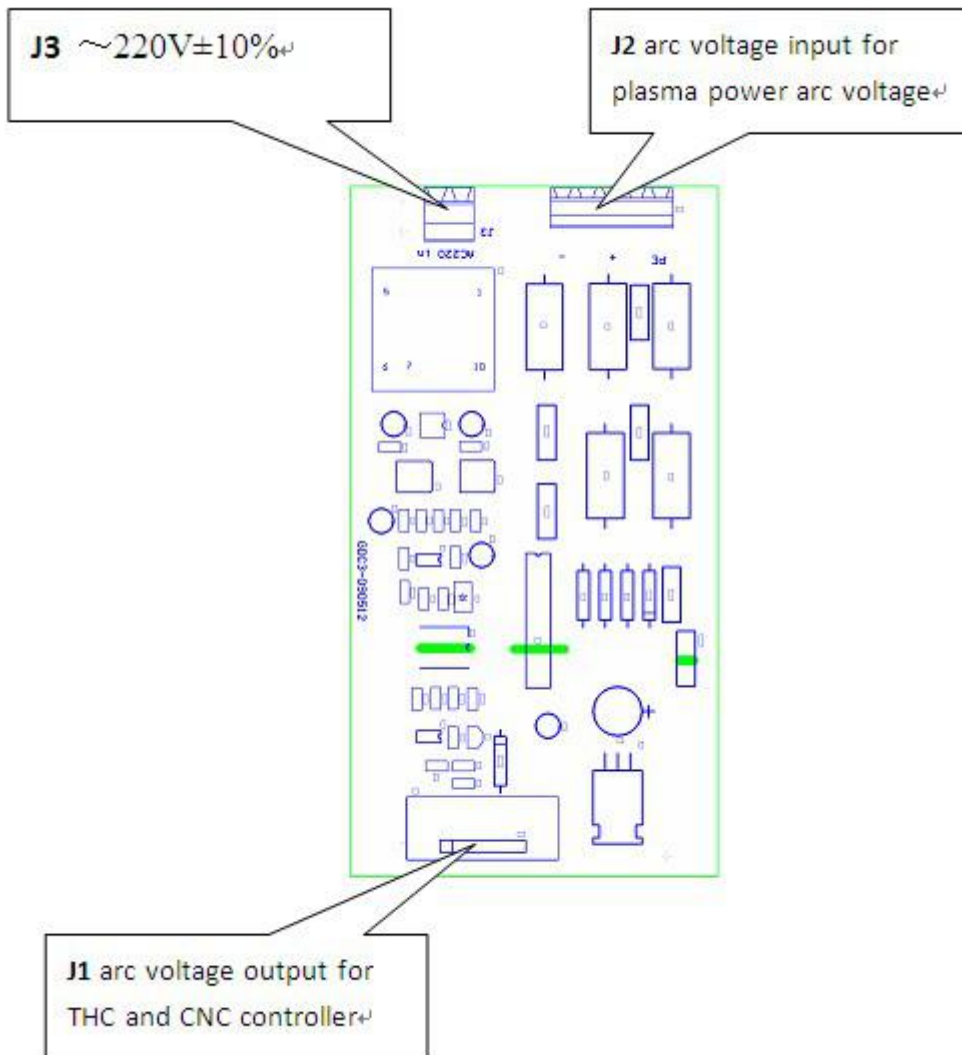
3. J1 definition

No.	Definition	Instruction
2	power	Power 24V ground from THC
5	power	Power 24V ground from THC
6	output	Arc voltage signal, plasma nozzle height signal
9	power	Power 24V + from THC

4．J2 definition

No.	Definition	Instruction
1	power	Connect ground
2	input	Plasma arc voltage + (plate clamp)
3	input	Plasma arc voltage -（arc voltage output）

5．J3 definition

No.	Definition	Instruction
1	power	～220V±10%
2	power	～220V±10%

The installation position of the voltage divider board is up to your need. Please pay attention, J1 is low-voltage signal; J2 is high-voltage signal. To avoid high voltage and high frequency interfere low-voltage signal and to improve stability, J1 and J2 separately connect.
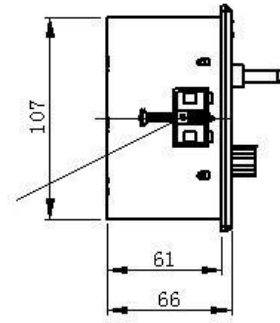
Troubleshooting:

Trouble	Inspection	Solution
The motor doesn't rotate	power	Turn on
	Power voltage	Check power
	Lock-rotor	Reduce load

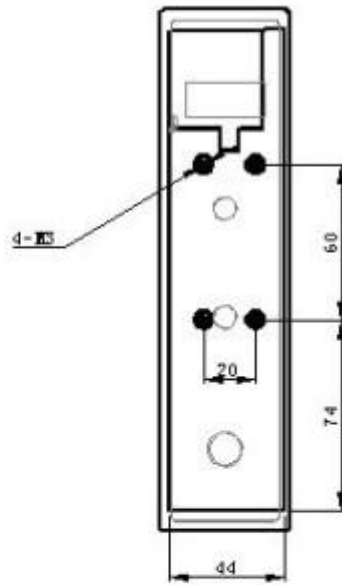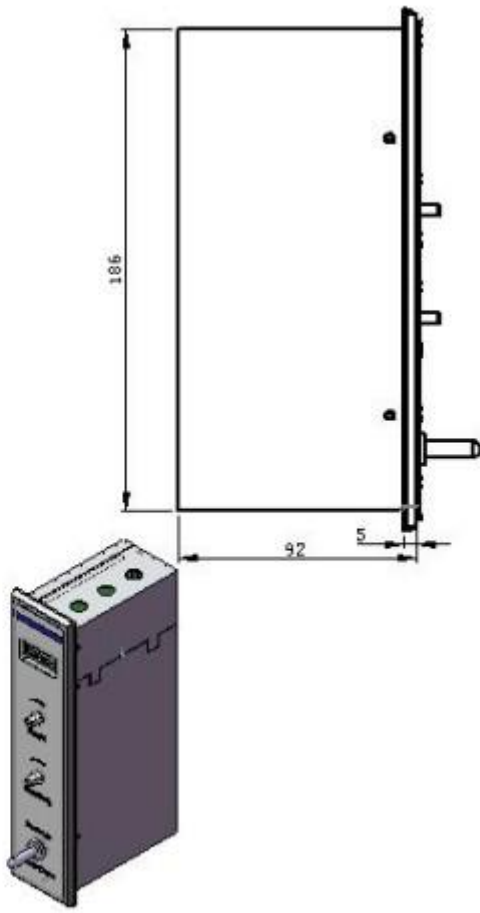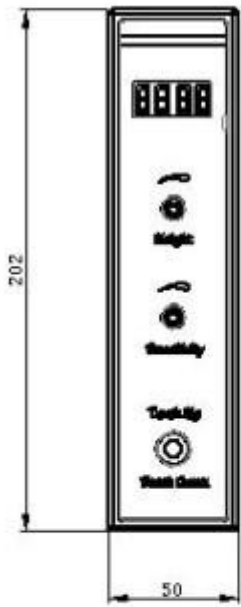| No display	power	Turn on
Lim+ is bright	Over mechanical upper limit	Check upper limit switch
Lim- is bright	Over mechanical lower limit	Check upper lower switch
Unsteady signal	Plate connects ground	Connect ground well
Incorrect height	Working temperature	Change height setup
Detect slowing	Speed down zone value	Lower speed down zone area
Shake slightly	sensitivity	Increase sensitivity
Low accuracy	sensitivity	Decrease sensitivity

Mechanical installation:

AHa-L1

AHa-S1

202

50

186

92

5

Height

Sensitivity

Test Up

Test Down

4-M3

60

74

20

44