
Capacitive Torch Height Controller

CHC-400 Instruction

(Revision 2016)



CHC-400 is newest generation capacitive torch height controller improved based on old models "CHC-200E&CHC-200D". It shares the same connection ports with CHC-200E&CHC-200D, and with new features as below:

- Power supply: AC20~24V or DC 20~36V.
- Automatic detecting function: automatically detect the balance position, collision and disconnection status etc.
- HF cables can be used from 800mm to 1800mm, if change the HF cables, will automatically do the detection and adjustment work.
- Improve the collision and disconnection protection function.

SAFETY:

- ◆ Please read this manual fully before use CHC-400
- ◆ DO NOT open cabinet of THC unless trained technician.
- ◆ DO NOT adjust the sealed resistor.
- ◆ Turn off Power supply if when THC is unused.
- ◆ DO NOT put liquid on THC.
- ◆ Attention Anti-dust work, DO NOT let metal dust into THC.
- ◆ DO NOT use on plasma over 100A or HF plasma

Installation Note:

- ◆ GND Port must be well grounded, GND resistor $\leq 1\Omega$.
- ◆ UP/DOWN on THC must be same to Z-axis Lifter

To Customer:

We only supply to re-seller as CNC cutting machine manufacturer, engineering company... end-user please contact our local distributor for product supplying.

We offer technical support to all distributors and users of our product.

The product is under ONE year warranty since delivery, and enjoys life-long service and support.

IMPORTANT NOTE:

All our THCs have been tested in our workshop before delivery, all commissioning work has been done. Please NOT change the setting without informing your supplier.

1 Intro

1.1 Brief

CHC-400 adopts the high performance 32-bit Cortex-M3 ARM Processor, combining with the Analog closed-loop circuit. Comparing to CHC-200E &CHC-200D, it has the same features as follow:

- A. Increased more indicators to shows different states of THC.
- B. Output of collision-alarm, which is optical isolation output from THC, can be sent to CNC's Alarm input to freeze machine's move. This signal is effective on both manual/auto mode. The max output is 200mA, capable to drive most relays.
- C. Anti-collision function. On manual/auto mode, when metal or low-conductive item like hand touches sensor ring, THC would send out collision signal and lift torch up until no collision exist.
- D. When HF cable is disconnected or weakly connected, it would be indicated on the disconnection indicator. So after installation of HF cable, just shake the HF cable, the connection will be showed by the indicator.
- E. Sensitive and Accuracy is increased 100%.
- F. Using digital logic control circuit for logic control, greatly improved anti-interference performance.

Meantime improving the New Features as follow:

a) Power supply : AC 20V~24V, or DC20V~36V

b) HF cables: 800mm~1800mm

If change the HF cable, could do the detection and adjution work automatically.

c) Automatical detection function: automatically detect the balance position, collision and disconnection status.

Application: CHC-400 is suitable for flame cutting/plasma cutting/laser cutting machines etc.

1.2 Basic specs

Power supply:

CHC-400: AC24V \pm 10%, 50Hz/60Hz; or DC20V \sim 36V

DC motor used on lifter:

CHC-400: DC24V;

Motor drive: PWM

Output current:

CHC-400: 1A-4A, max: 100W;

Work temperature: THC-10 \sim 60 $^{\circ}$ C;

HF cable: -10 \sim 200 $^{\circ}$ C;

Sensor parts: -10 \sim 350 $^{\circ}$ C.

Accuracy: \pm 0.1mm (matters with lifter design);

Auto height range: from cutting material surface 1mm — 25mm.

HF-cable: 800mm \sim 1800mm.

Product size shows as figure 1-1

L*W*H: 176mm * 105mm * 50mm.

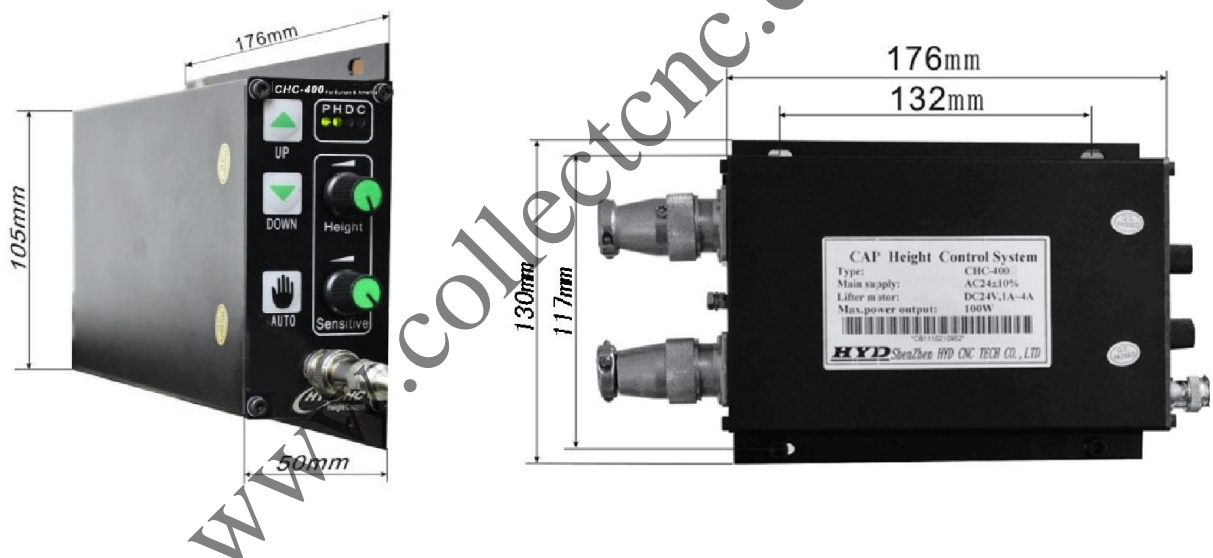


Figure 1-1

1.3 Work elements

CHC-400 work elements: It detects the distance between Sensor ring and the cutting material (steel, metal material) via detecting the capacitance between the two parts, and keeps the two parts at a set distance by control the DC motor move. CHC-400 is a closed-loop control system, with 4 parts: Position Signal Sensing, Signal Process, Logic Control and Motor Drive.

2 Components

2.1 For flame cutting

CHC-400 full package includes follow parts: THC control module, socket connector, sensor ring, elastic connector, insulation part, fixture, HF cable. As figure 2-1shows,

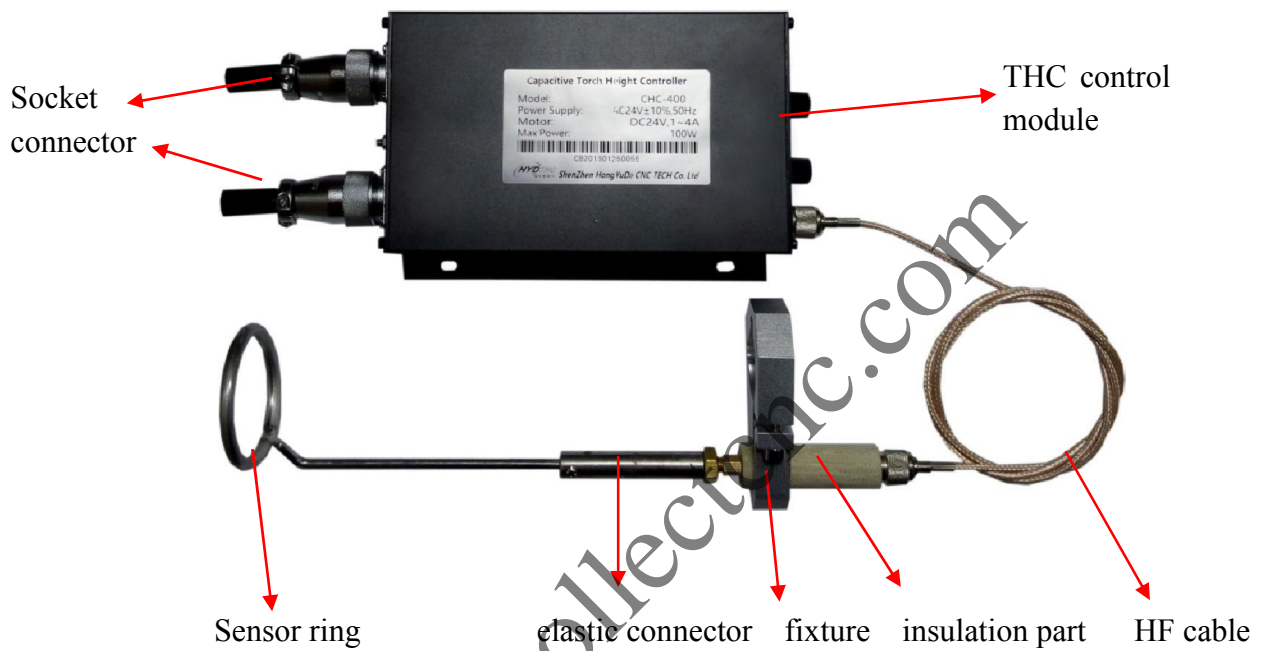


Figure 2-1

3 THC control and connection

3.1 operation panel intro.



Figure 3-1

Indicators:

- P Power:** Power indicator, green. Off means no power supply.
At the auto mode, the “P” light will be on all the time. At the manual mode, if the height from sensor ring to cutting material is close to the setting height, then “P” light will be flashing.
- H Height Found:** Turn on when torch reaches auto height, green.
- D Disconnection :** Disconnection indicator, red. When HF cable is unconnected or disconnected, it turns on. On auto mode, if disconnection happens, torch would keep lifting up until it's solved. If change a new HF cable, the “D” indicator might be on, then please refer to the instruction “Part4 Installation and Commission” to adjust.
- C Collision:** Turn red when sensor ring collision happens, both on manual/auto mode. Torch would keep lifting up until collision disappears, at this moment, press Down doesn't work. If the collision disappears, press the “AUTO” button to recover the auto status. If HF cable short-connected with shield net, it is same as collision to THC.

Buttons on operation panel:

Up/Down Button

It is active on any mode. Priority is always given to Manual mode. For UP and Down, priority's given to UP. In case HF gets problem, it's always on UP mode, so the Down doesn't work.

Auto Button

Press the AUTO button, THC is always on Auto Mode, no matter there is a auto signal from outside or not. During cutting, THC needs to work on Auto Mode and it should be controlled by CNC, having nothing to do with this **Auto** button.

If at alarming or abnormal status, it appears the "D" and "C" lights on, then could press this "Auto" button to recover it.

Height

It is used to adjust cutting torch height during Auto Mode. Height increases when it is turned clockwise. At the first commissioning, turn clockwise maximum to reach the highest height.

Sensitive

On Auto Mode, the Sensitive increases when it is turned clockwise.

Sensor ring Port

One end of HF Cable link with the socket, the other end link with the sensor ring groupware

3.2 THC Connectors

As figure 3-2 shows, CHC-400 has only two connectors for installation, one is to CNC(X1-CNC), the other one is to lifter motor (X2-TORCH).

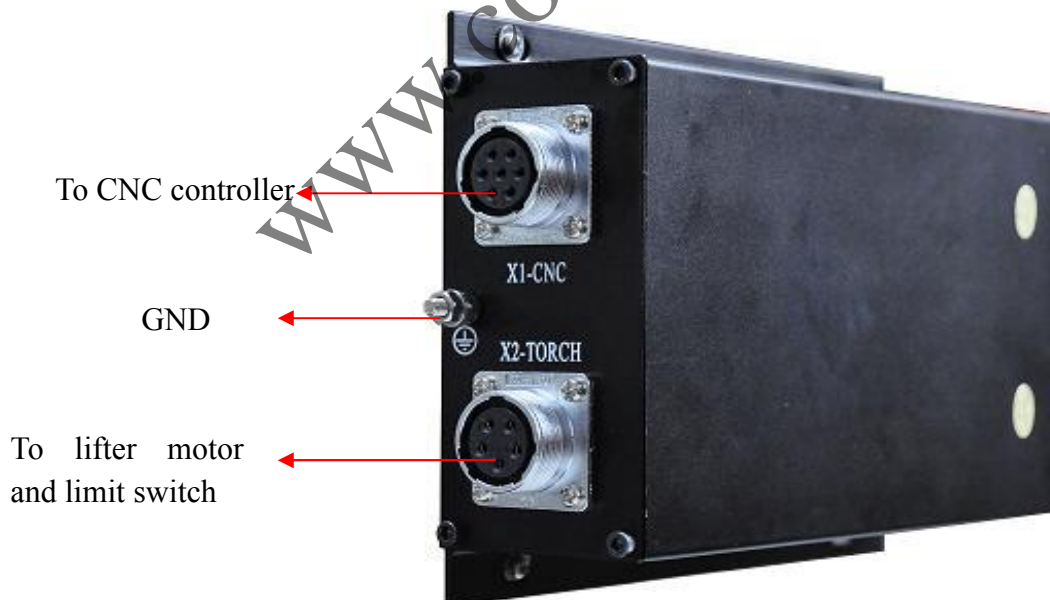


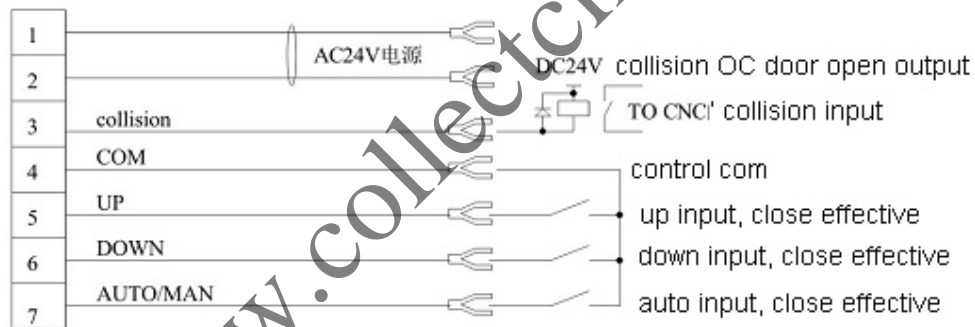
Figure 3-2

3.2.1、X1- CNC (TO CNC)

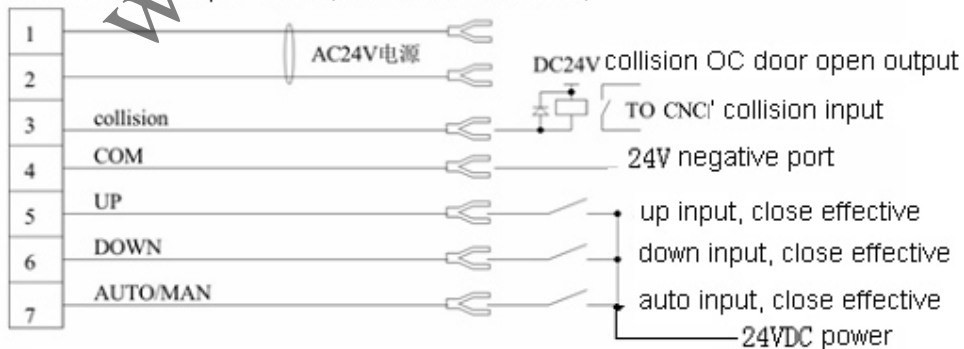
It is a 7-pin socket, pin definition as follow,

Pin	signal	Specs
1 , 2	POWER	AC24V, 50/60Hz Power supply > motor's+20W
3	Collision	Collision output to CNC, OC door open output Max drive current :200mA
4	COM	I/O COM
5	UP	Up control, low-level effective
6	DOWN	Down control, low-level effective
7	AUTO/MAN	Auto control, low-level effective

7-pin socket connection



When collision output works, connection as follow,



If collision output used, DC 24V power negative should connect to COM
change JP3 Jumper position to control 24VDC input

Figure 3-3 X1-CNC port definition

CHC-400 to CNC (X1-CNC), input/output both use optical isolation, UP/DOWN/AUTO is external signal input to THC, Collision output from THC. All those signals share same COM. The input/output shows as Figure 3-4,

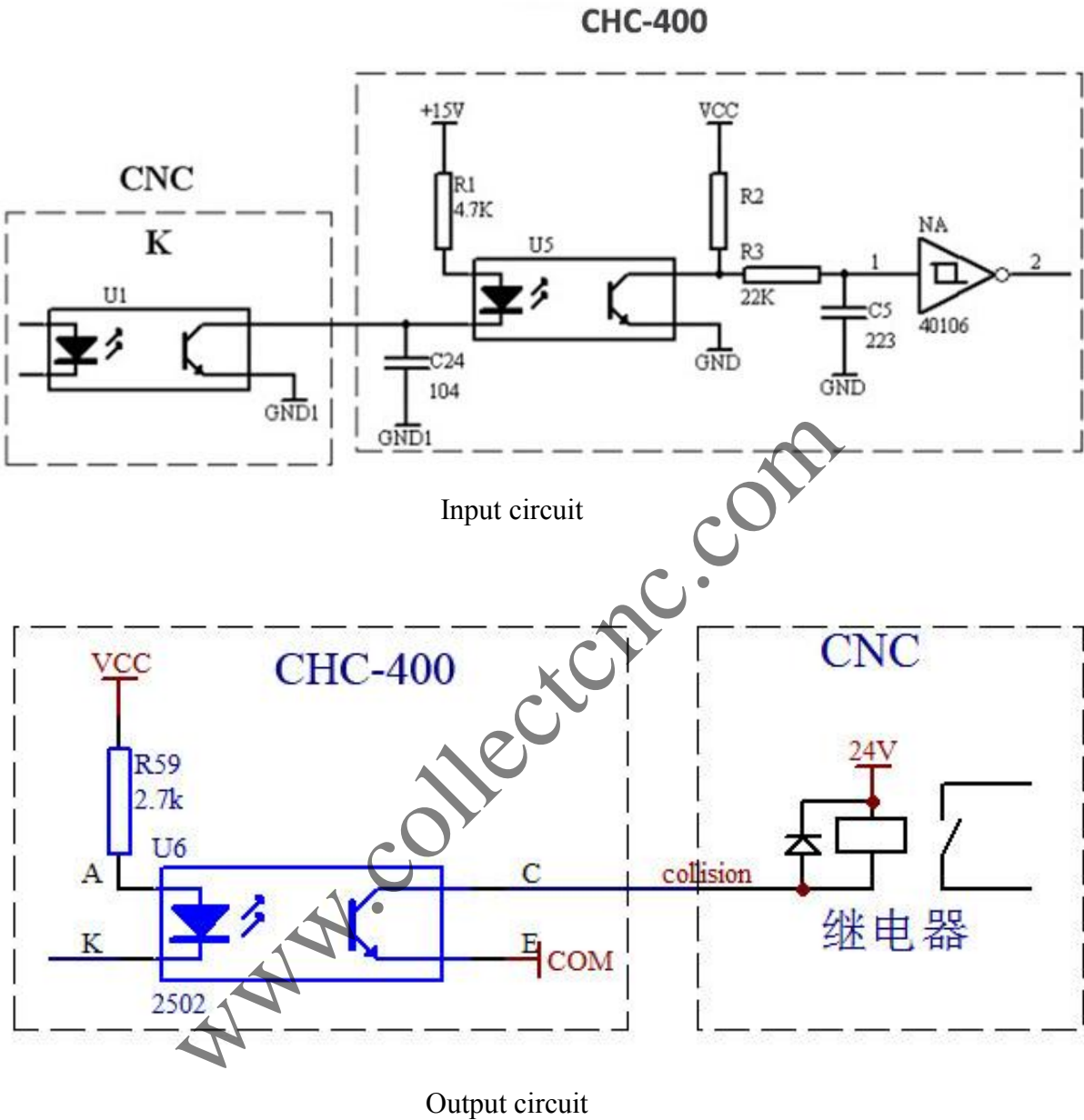


Figure 3-4 Input/Output circuit

3.2.2 X2-TORCH (to torch lifter motor)

It is a 5-pin socket, pin definition as follow,

Pin	signal	specs
1 , 2	DC Motor Drive (Output)	DC motor connection Max 100W PWM
3	LIMIT COM	Limit COM
4	Down LIMIT (Input)	Down limit input Limit switch NC(normally closed)
5	Up LIMIT (Input)	Up limit input Limit switch NC(normally closed)

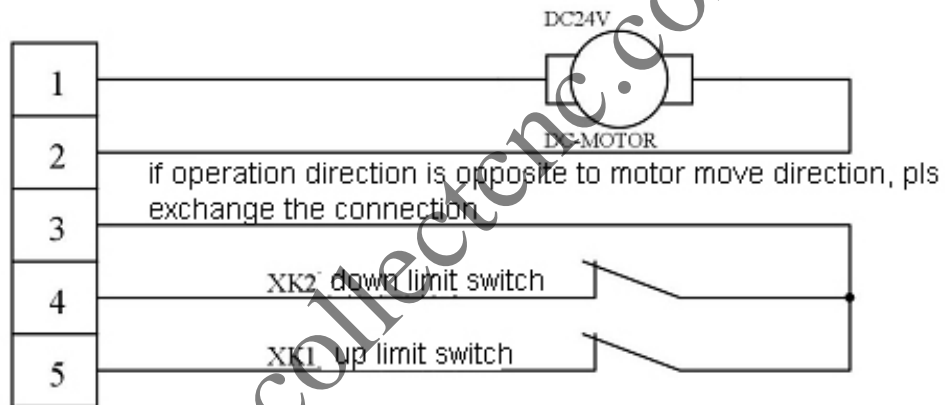


Figure 3-5

Note:

- 1、Pin 1、 2 are DC motor connector, H bridge drive, PWM speed control.
2. CHC-400 limit switch must be normally closed contact, when one side limit is open, the move at this direction must be stopped, but the other direction move is still effective. Limit switch connection as figure 3-6.

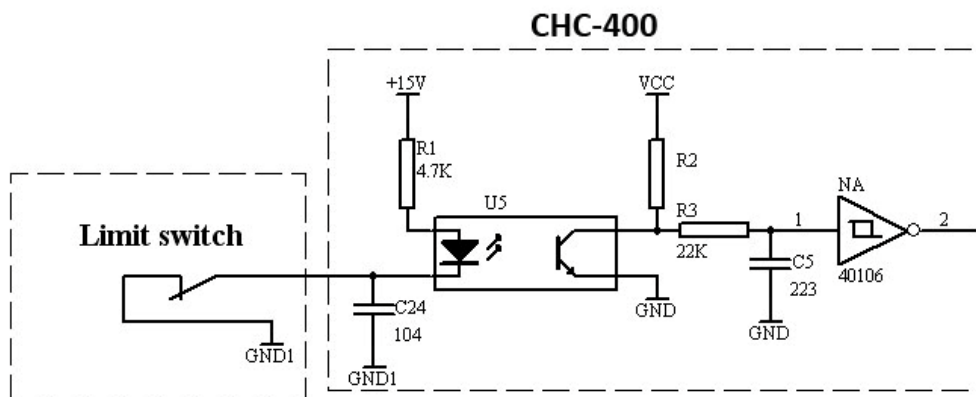


Figure 3-6 Limit input

3.3 Complete THC wiring

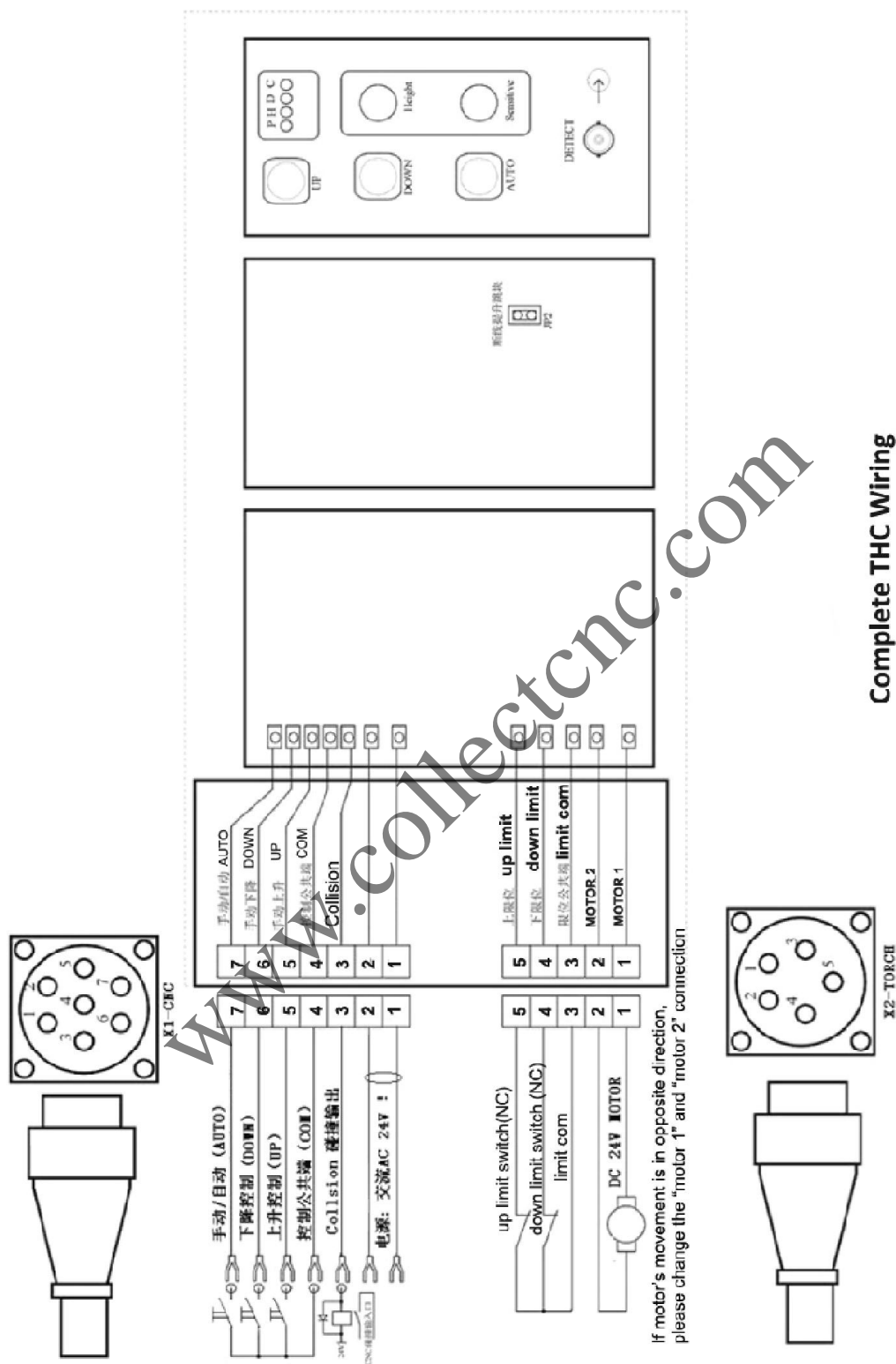
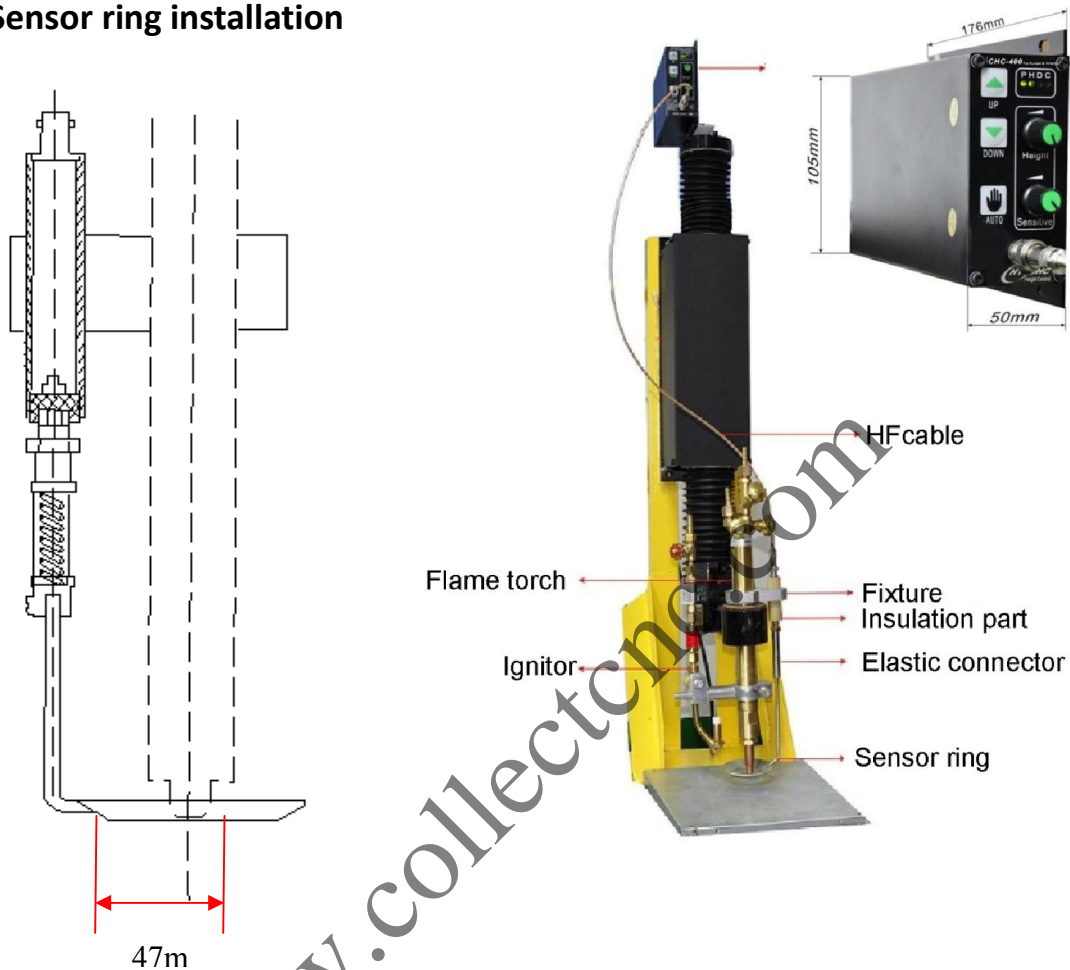


Figure 3-7 Complete CHC-400 wiring diagram

4. Installation and Commissioning.

4.1 Installation

4.1.1 Sensor ring installation



(Note: The flame torch and ignitor is not the parts of the CHC-400)

Figure 4-1 flame cutting installation

1.1 Installation of sensor ring: According to our years practice, sensor ring should be installed lower about 1~2mm than torch head to avoid the edge effect during cutting edge of workpiece, and it anti-collision more effectively, as showed in Figure 4-1.

1.2 While on plasma cutting, the sensor ring shall be installed little higher than the torch head, to avoid the effect of plasma arc voltage, and it needs a special insulation part supplied from HYD. Please inform us when order it.

4.2 Commissioning.

4.2.1 Test after installation

Up/Down connects with GND, motor moves up and down, firstly make sure on Manual mode, torch up/down is same direction as Up/Down control button.

Auto/Manual connects with GND, THC is on Auto Mode. When it's unconnected, the manual mode is active.

On Auto mode, if the sensor ring is not connected with THC and THC is under disconnection protection, the indicator "D" Disconnection would turn on, cutting torch would keep lifting up. If sensor ring is connected with THC, the cutting torch should stop at a position via adjusting the **Height** button (THC finds the Auto Height),

On Auto Mode, the height of cutting torch is under control of **Height** button. At first commission, always turn clockwise maximum to get the highest height, then turn anti-clockwise, the height decreases. If adjusting the height is too low, when cutting torch touches the workpiece; motor will be on a shocking-state.

THC always drives motor to make sensor ring close to the Balance Position (the set Auto Height), and it stops when ring is around the Balance Position, 0.2m lower or higher). The closer, the more slowly the motor runs.

Auto sensitivity meets the request of THC when sensor ring is 5—20mm away from workpiece.

4.2.2 Commissioning Step

1, Install the THC according to the "4.1 Installation", offer the enough power supply to THC (CHC-400 can use the AC/DC 24V, power must be twice than motor's)

2, When power on, check the **red indicator lights** ("D"、"C") to confirm the connection ok or not. "D" light is on, means disconnection; please check the HF cable, insulator, elastic connector and sensor ring are connected well or not. "C" light is on, means collision, it might be short-circuit occur between the sensor ring to torch or HF cable short-circuit.



Fig 4-2 Disconnection



Fig4-3 Collison



Fig4-4 Auto setting(D.C flashing)

"D" light is on, could operate it up/down manually; at auto mode, torch will keep lifting up
 "C" light is on, THC will control the torch to go up until the up limit. The instantaneous collision could not activate the collision alarming signal. When the collision over 0.3s, then will activate the collision alarm signal, and the torch will be lifted up until up limit, and send the collision signal to CNC.

3, When "D" and "C" lights are off, please test the "UP"/ "DOWN" buttons. "UP"---torch goes up; "DOWN"---torch goes down; if the torch moves opposite way, please exchange the connection of the "MOTOR1" and "MOTOR2" shown in Fig 3-5. If the motor don't move, please check the UP_limit switch and Down_limit switch. The limit switch of the CHC-400 is Normally Closed(NC).

4, After all function test ok, then do the auto setting work (found the Height).

First, please turn the "Height" knob at the middle position, and press the "UP" and "DOWN" with 2s at the same time, THC begins to detect and set automatically.

Second, During the Auto setting process, the torch will go up to the up-limit(if not the up-limit switch, THC will go up with 15s, please wait), then do the auto detection work. THC will go up and down to detect the signal until it found the height. After finishing the Auto setting, THC will go up to a certain height quickly.

Third, during the auto setting, the "D" and "C" lights will continue flashing until finishing the auto setting work.

If any unstable situation appears during the auto setting, please do the auto setting again.

5, After complete the auto setting work, can set the cutting height via adjust the "Height" knob, then controlled by the CNC controller via connecting "TO CNC" port.

4.3 THC driver circuit commission

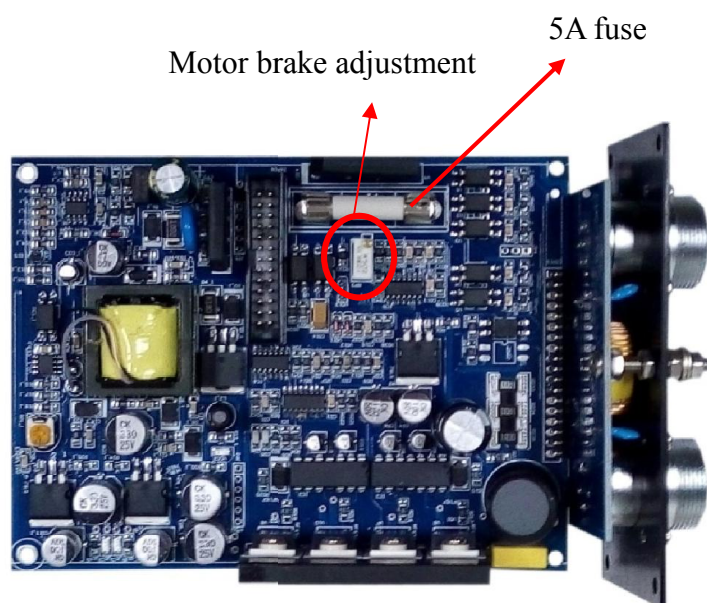


Fig 4-5 THC POWER AND DRIVE CIRCUIT BOARD

1, Motor brake adjustment

The potentiometer RP3 is to adjust the motor stop's brake. Before delivery, we have adjusted it ok, please do not adjust before inquiry.

2, About the buzz sound of the motor when at the balance position

It's normal phenomenon. CHC-400's driver circuit is adopted the H-bridge circuit, controlled by the PWM drive way to realize the speed adjustment. PWM is 9KHz, when at the auto balance mode, the motor will send "buzz" sound.

NOTE: CHC-400 has been adjusted ok before delivery, please DO NOT adjust the THC's inside circuit without permission.