LGK-120/200/300/400HD

AIR PLASMA CUTTING MACHINE

MANUAL INSTRUCTION

(PLEASE READ IT CAREFULLY BEFORE OPERATION)

Safety Depends on You

HUAYUAN arc welding and cutting equipments are designed and built with ample safety consideration. However, proper installing and operating can ensure your safety.

DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT CASUALLY WITHOUT READING THIS MANUAL THROUGHOUT.

Special Notes (Very Important):

1. Pay attention to avoiding the machine falling down when it is placed on the gradient ground.

2. It is forbidden to unfreeze the pipeline by the cutter.

3. The shield rank of this series of cutter is IP21S, so working in rain is not suitable.

4. The cutter has external static characteristic with rated duty cycle 100%, which means the machine can work continuously at the rated cutting current. The machine has the function of thermal protection. When the internal temperature exceeds a set temperature, thermal protection moves on and the abnormity indicator lamp on the panel turns ON, then there is no output in cutter. The machine can become normal and work only after the internal temperature drops down and the abnormity indicator lamp on the panel turns OFF.

Purchase Date：_____

Serial Number：_____

Machine Model：_____

Purchase Place：_____

Cautions	Arc and arc rays can hurt.

All performing welding workers ought to have health qualification from the authority organization to prevent you and others from arc radiation and burn. It should be prevented for children to enter into dangerous area as well.
Be careful reading the following important items and the welder safety byelaw from the authority organization. Be sure that qualified professionals perform all installation, maintenances and repair procedures.

1 Electric shock: The welding circuits are not insulated when welding. If you touch the two output electrodes of the machine with your bare skin at the same time, it will lead to electric shock, sometimes even fatal dangers. Users need to follow the items below to avoid electric shocks:

- If possible, lay some insulating materials, which are dry and large enough, in your working field. Otherwise, use the automatic or semiautomatic welding machine, DC welding machine as possible as you can.
- Components in the automatic and semiautomatic welding machine such as the welding wire reel, feed wheel, contact tip and welding head are all electric components. .
- Always be sure the machine has been connected perfectly to the work piece with the work cables and should be as close as possible to the working area.
- The work piece should be grounded perfectly.
- Make sure that the insulating material of the electrode holder, the grounding clamp, the welding cable and the welding head are not affected by damp, mildewed or spoilt, and be replaced momentarily.
- Never dip the electrode in water for cooling.
- Never touch electric components of two welding machines at the same time, because this voltage is supposed to be two times of welding voltage while the grounding mode is not clear.
- While working high above the ground or other places having the risk of falling, please be sure to wear safety belt to avoid losing balance caused by electric shock.

2 Arc: Use an arc welding mask to protect your eyes and skin from sparks and the rays of the arc, pay special attention to the filter glass, which must be conformable to the national standard.

- Use clothing made from durable flame-resistant material or sailcloth to protect your skin from hurting by the arc rays.
- Remind other nearby personnel before working lest arc rays hurt them by accident.

3 Fumes and Gases: Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. While working in limited room, use enough ventilation and/or exhaust to keep fumes and gases away from the breathing zone, or use the respirator. Do not weld at the same time when using of degreasing, cleaning or spraying operations. The heat and rays of the arc can react with these gases to form phosgene, a highly toxic gas,

- Some protective gases used in welding might displace the oxygen in the air, and can lead to hurt or even death.
- Read and understand the manufacturer's instructions for this equipment, and validate the health certification of consumptive materials, make sure they are innocuous.

4 Spatter: Spatter can cause fire or explosion.

- Remove fire hazards from the welding area. Remember that spatter from welding can easily go through small cracks and touch fire hazards. Protect all kinds of lines going though welding area, including hydraulic lines in the wild.

- Where compressed gases are to be used in the field, special precautions should be used to prevent explosion.
- When welding stops, make certain that no live part is touching the work piece or the work stage. Accidental contact can create a fire hazard.
- Do not weld containers or lines, which are not proved to be innocuous.
- It is very dangerous to heat, cut or weld tanks or containers at entry holes. Does not start work until the proper steps have been taken to insure that there is no flammable or toxic gas.
- Spatter might cause burn. Wear leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair to prevent from burning by spatter. Wear the ear shield when performing sideways or face up welding. Always wear safety glasses with side shields when being in a welding area.
- The welding cables should be as close to the welding area as possible, and the short, the better. Avoid welding cables going through the building framework, lifting chains, AC or DC cables of other welding machines and appliances. The welding current is strong enough to damage them while having short circuit with them.

5 Cylinder: Damage of it might cause explosion.

- Make sure that the gas in the storage cylinder is qualified for welding, and the decompression flow-meter, the adapter and the pipe are all in good condition.
- Make sure that the installation of cylinder is by the wall and bundled tightly by a chain.
- Be sure to put the cylinder in the working space with no crash or shake, and far from welding area.
- It is forbidden to touch cylinder with the welding clamp or the work cables.
- Avoid facing the cylinder while installing the decompression flow-meter or the gasometer.
- When not working, please tighten the valve.

6 Power: (For electrically powered welding and cutting equipment) Turn off input power before installation, maintenances and repair, so that avoid accident.

- HUAYUAN welding equipment is I class safeguard equipment; please install the equipment in accordance with the manufacturer's recommendations by specific persons.
- Ground the equipment perfectly in accordance with the manufacturer's recommendations.

7 Power:(For engine driven welding and cutting equipment)

- Work in ventilated place or outdoors.
- Do not add fuel near to fire or during engine starting or welding. When not working, add fuel after engine is cooling down; otherwise, the evaporation of hot fuel would result in dangers. Do not splash fuel out of the fuel tank, and do not start the engine until complete evaporation of the outside fuel.
- Make sure that all the safeguard equipment, machine cover and devices are all in a good condition. Be sure that arms, clothes and all the tools do not touch all the moving and rotating components including V belt, gear and fan etc.
- Sometimes having to dismantle some parts of the device during maintenance, but must keep safety awareness strongly every time.
- Do not put your hand close to fans and do not move the brake handle while operating.
- Please remove the connection between the engine and the welding equipment to avoid sudden starting during maintenance.
- When engine is hot, it is forbidden to open the airtight cover of the radiator water tank to avoid hurt by the hot vapor.

8 Electromagnetic: Welding current going though any area can generate electromagnetic, as well as the welding equipment itself.

- Electromagnetic would affect cardiac pacemaker, the cardiac pacemaker users should consult one's doctor first.

■ The effect of electromagnetic to one's health is not confirmed, so it might have some negative effect to one's health.

■ Welders may use following method to reduce the hazardous of electromagnetic:

a. Bundle the cable connected to the work piece and the welding cable together.

b. Do not enwind partially or entirely your body with the cable.

c. Do not place yourself between the welding cable and the ground (work piece) cable, if the welding cable is by your left side, then the ground cable should be by your left side too.

d. The Welding cable and the ground cable are as short as possible.

e. Do not work near to the welding power source.

9 Lift Equipment: carton or wooden boxes package the welding machines supplied by HUAYUAN. There is no lifting equipment in its wrapper. Users can move it to the prospective area by a fork-lift truck, and then open the box.

■ If having rings, the machine can be transited using rings. While HUAYUAN Welding Machine Manufacture reminds users, there is possible risk to damage the welding machine. It is better to push the welding machine moving in use of its rollers unless special situations.

■ Be sure that the appurtenances are all removed off when lifting.

■ When lifting, make sure that there is no person below the welding machine, and remind people passing by at any moment.

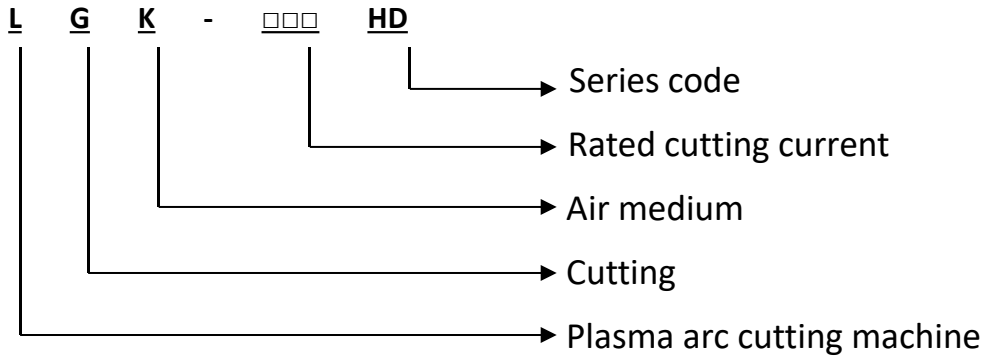
■ Do not move the hoist too fast.

10 Noise: HUAYUAN Welding Machine Manufacture reminds users: Noise beyond the limit (over 80 db) can cause injury to vision, heart and audition depending on oneself. Please consult local medical institution. Use the equipment with doctor's permission would help to keeping healthy.

Content

1 Summary

1.1 Model Description



1.2 Features

LGK-120、200、300、400HD series plasma cutting machine have below features：

- 100% (40℃) rated duty cycle, suitable for work in heavy industry;
- Adopt gas pressure sensor, the cutting torch can be properly protected when the gas pressure is too low;
- Adopt liquid flow sensor, the cutting torch can be properly protected when the liquid flow is too low, and the liquid flow is displayed on the display meter;
- The gas pre-flow time, gas post-flow time, current up-slope time can be separately set according to the torch cable length;
- The plasma gas pressure can be adjusted on the panel, the pressure is displayed on the meter, friendly operation;
- There is digital communication connector, can be connected with different automation equipment;
- With torch monitoring function, warning to change the consumables, to longer the torch working life;
- Intelligent fan is used to reduce the dust;
- With automatic protection of over-heating and lack-voltage.

1.3 Usage

It is suitable for cutting kinds of metal materials like low carbon steel, alloy steel and non-ferrous metal and is widely applied in the manufacturing of boiler pressure container, chemical container, industrial power station construction, metallurgy, aerospace industry, automobiles, building an so on.

1.4 Symbol Instruction

	Read the manual carefully		Dangerous voltage
	Over-heat		Input voltage
	Power abnormal		Output current
	Air pressure		Voltage output
	Coolant liquid input		Voltage input
	Coolant liquid output		Cutting
	Plasma torch		Check gas
	Lock		Ground lead
	Unlock		Protection ground lead
	Water cooling		Remote control
	Air cooling		Increase/ Decrease
	The nozzle connection of plasma torch		Plasma gas and torch electrode
	Current		Coolant liquid and torch electrode

2 Safety and attention

Please follow the notes for the safety of you and others.

- It is forbidden to unfreeze the pipe line by cutting power or other usages except for cutting.
- The cutter casing should ground reliably. Please make sure the grounding bolts of power ground reliably in case of electric shock.
- Cutter is the equipment with high voltage. Please wear insulated protective

shield when cutting.

- When exchanging torch and wearing parts, please turn off the supply power first.
- Protective shield should be worn.
  In order to avoid any hurt to eyes from ultraviolet radiation and strong light and to skin from spatter, please wear protective shield according to related rules and regulations of labor protection.
- It is forbidden to inhale harmful gases.
  The fumes and gases produced during cutting is hazardous to health. Please wear protective shields and install aerator according to related rules and regulations of labor protection.
- Cutting cannot proceed in closed container.
- The work-piece just after being cut is at high temperature. Please prevent from scald.
- Protective gas cylinder and air compressor must be placed in a fixed position and prevented from collision.
- Cutter and cutting place should be far away from flammable materials.
- Prevent foreign bodies from entering inside the machine. And protect the cable from sharp materials.
- Protect the machine from fall or collision.
  In case of fall or collision, it can be used only after professional checking.
- In the surface or inside of the cutting work-piece, there should be no flammable and explosive materials or chemical materials harmful to human.
- Installation and repair person must have state-authorized electrician operation certificate.
- Cutting operation person should read this manual carefully and know the operation method well.

3 Working Environment Requirements

If not reach the flowing conditions, the cutting capacity may not reach the technical specification values

1) Please use the machine in a clear place without any of dust, corrosive gas and inflammables and explosives; Do not use it in open air and rain;

2) Required air relative humidity should ≤90％(at 20℃)，40℃≤50％(at 40℃)；

3) Environment temperature range should be at-10℃～40℃;

4) The coolant liquid cannot be frozen when use;

5) Any metal materials cannot be put on or insider the power source;

6) Keep the machine away from the wall of some other closure things at least 30cm, two machines distance at least 30cm.

7) Use it under altitude lower than 1000m.

4 Technical Parameters

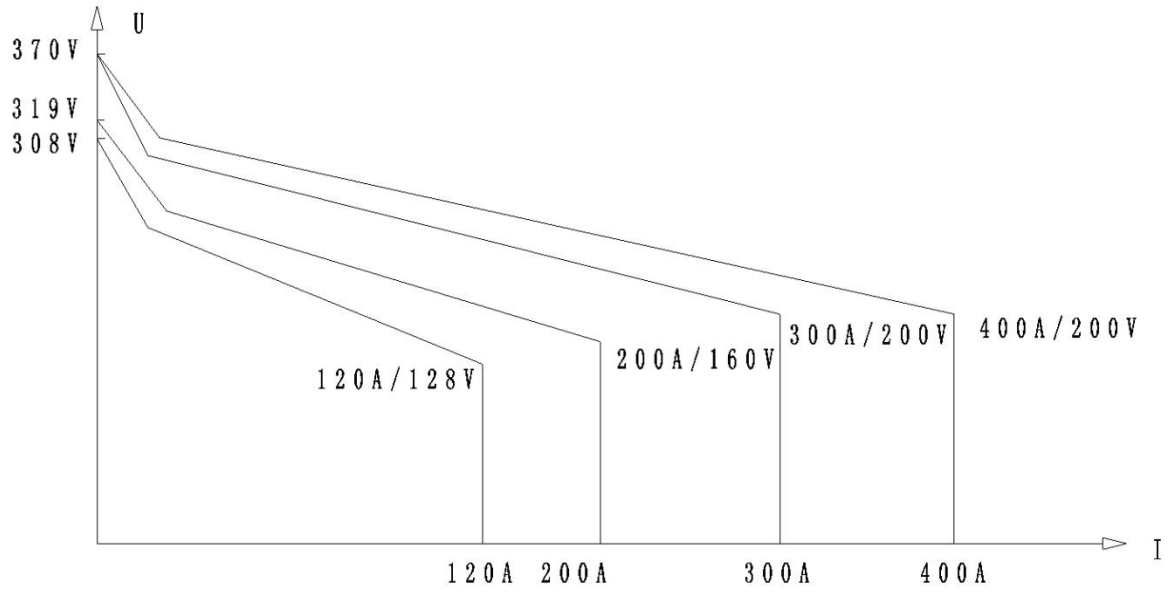
4.1 Main Technical Parameters

Parameters \ Model	LGK-120HD	LGK-200HD	LGK-300HD	LGK-400HD
Rated input voltage	3～380/415V 50/60Hz			
Rated input capacity	21.23VA	46.5kVA	70.42kVA	92.34kVA
Rated output current	120A	200A	300A	400A
Rated output voltage	128V	160V	200V	200V
Rated duty cycle	100%	100%	100%	100%
Open circuit voltage	308VDC	319VDC	370 VDC	370VDC
Current adjust range	30～120A	40～200A	60～300A	60～400A
Quality Cutting Thickness (Carbon steel, manual cutting)	0.3～25mm	1～45mm	1～50mm	1～60mm
Max. Cutting Thickness (Carbon steel, manual cutting)	45mm	65mm	80mm	90mm
Plasma gas	Compressed Air			
The working plasma gas pressure	0.3～0.5MPa	0.4～0.6MPa	0.4～0.6MPa	0.4～0.6MPa
Torch cooling mode	Air Cooling	Air Cooling / Water Cooling		
Arc striking mode	HF			
Insulation grade	F			
Protection grade	IP21S			
Dimension mm(L×W×H)	675×320×605	863×385×800	985×445×910	1015×445×910
NET WEIGHT	46kg	86 kg	129 kg	148 kg

4.2 Plasma gas condition

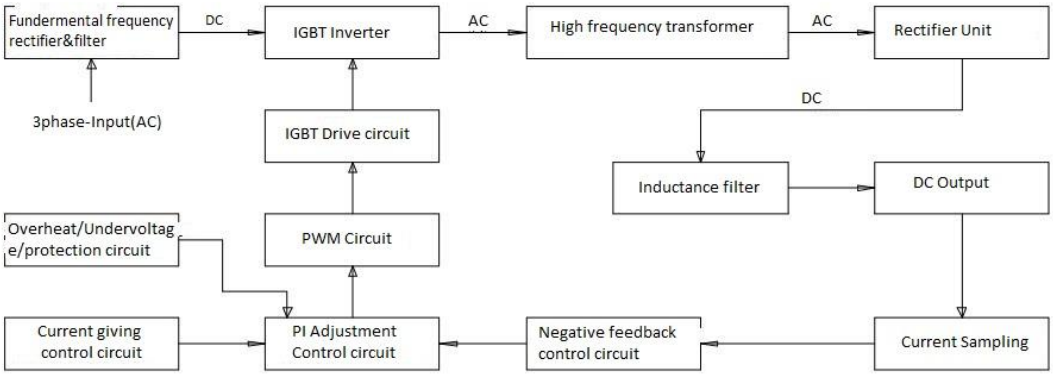
- Gas pressure range：0.5MPa～0.7MPa
- Gas supply pipe compression strength：≥1MPa
- Gas supply pipe inner dimension：≥Φ8
- Gas flow：≥180L/min
- Filter the water in the gas, then feed into the plasma

4.3 External characteristic curve



5 Basic Principle

The control circuit of this cutting machine adopts advanced electronic part IGBT as the main inverter switch component. Three-phase AC power is converted to 20KHz high-frequency DC current after being rectified by three phase rectifier. Then under the function of IGBT inverter the DC current is inverted to AC high frequency current, which is inverted to DC current after experiencing voltage reduction in high frequency transformer, current rectifying in fast recovery diode. This DC current is filtered through reactor, and the output cutting current is obtained. Control circuit can control output current by controlling driven pulse width. The real time cutting current, which is obtained through current sensor connected to output terminal in series, is used as negative feedback control signal. After comparing with current adjusting signal, the negative control signal is sent to PWM adjusting integrated circuit, then a controlled driving pulse is output to control IGBT. Thereby a constant output current can be maintained, and a steep dropping & constant current external characteristic is obtained. Striking arc adopts high-frequency striking model. The main circuit refers to appendix figure, and principle diagram of control circuit is shown as below figure：



6 Installation and operation

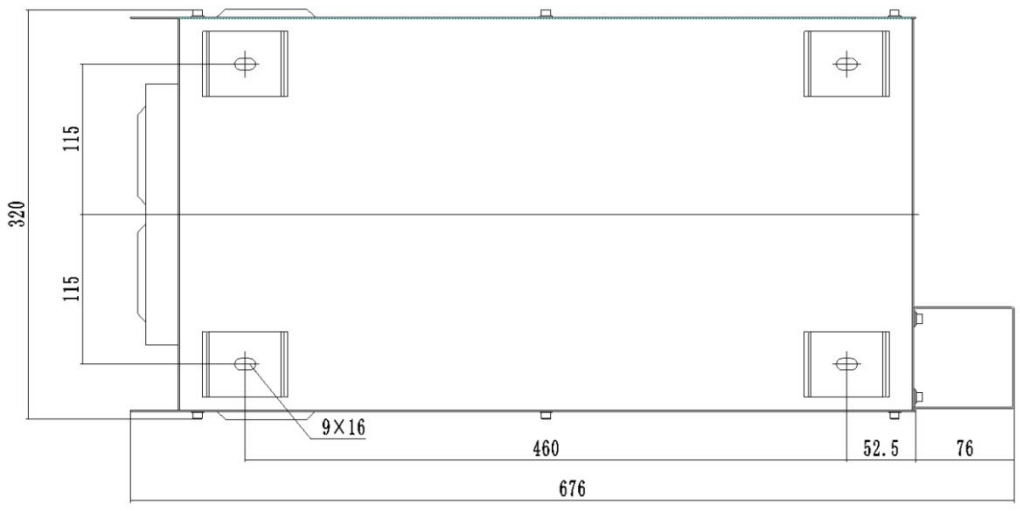
6.1 Moving and lifting

- Power source should be shut off before moving the cutter；
- The cutter bottom should be kept downwards during transportation. It is forbidden to have cutter placed transversely or upended；
- When lifting, it must be lifted vertically；
- During the long-distance transportation, it must prevent the cutter from raining and moving back and forth inside box. Shock absorption foam should be placed around cutter；

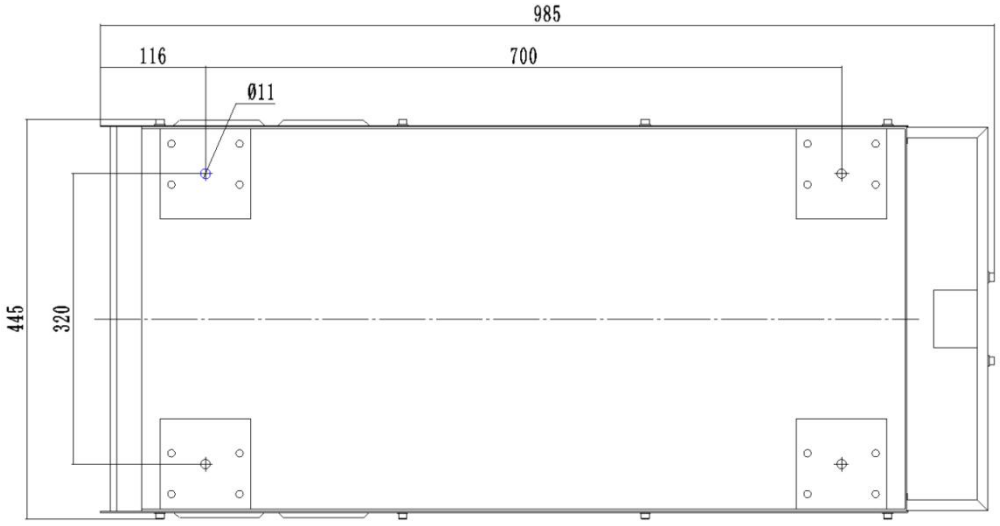
6.2 Open the packing and check

1) Check the machine and packing according to the packing list, of there is any damage, please try to contact the supplier

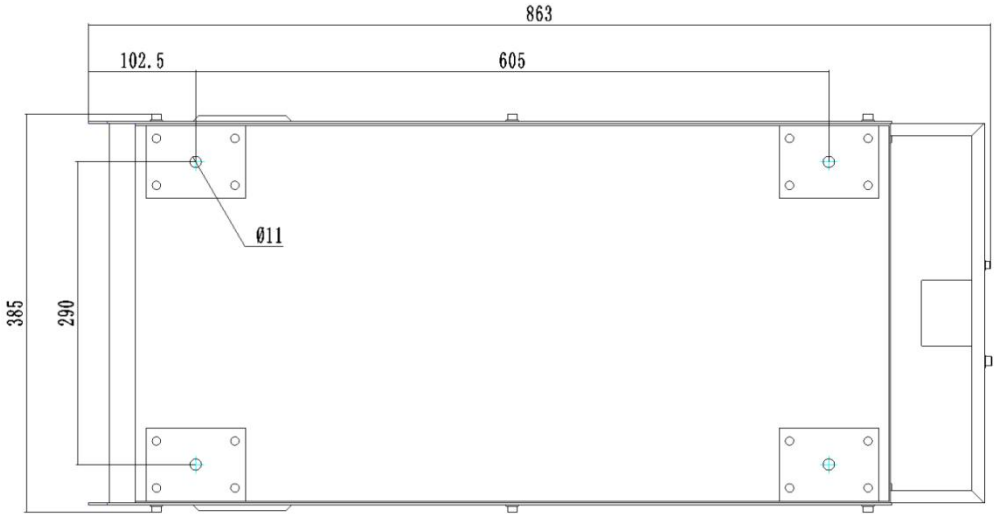
6.3 The fix and installation of the power source



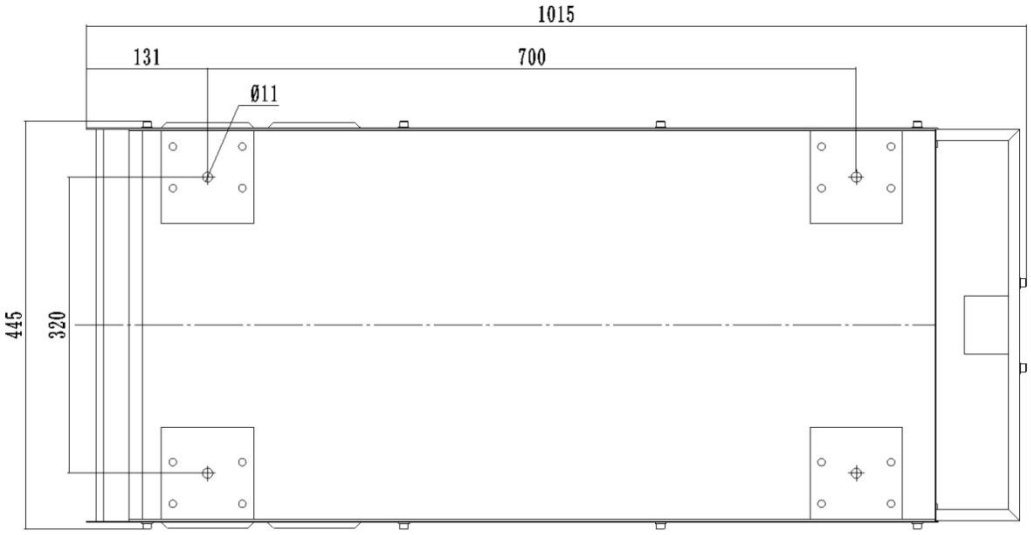
LGK-120HD Dimension and installation size



LGK-200HD Dimension and installation size



LGK-300HD Dimension and installation size



LGK-400HD Dimension and installation size

6.4 The connection of 3 phase input power cable

- **Power supply condition**

1) Voltage fluctuation≤±10％；
2) Frequency fluctuation≤±1％；
3) Unbalance rate of three phase voltage≤5％；
4) The power supply condition please check the chart below:

Model	The sectional area of input copper cable (mm^2)	The sectional area of ground cable (mm^2)	Fuse (A)	Contact capacity (A)
LGK-120HD	≥6	≥6	60	63
LGK-200HD	≥16	≥16	125	125
LGK-300HD	≥25	≥25	160	150
LGK-400HD	≥50	≥50	200	250

- **The connection of power lead**

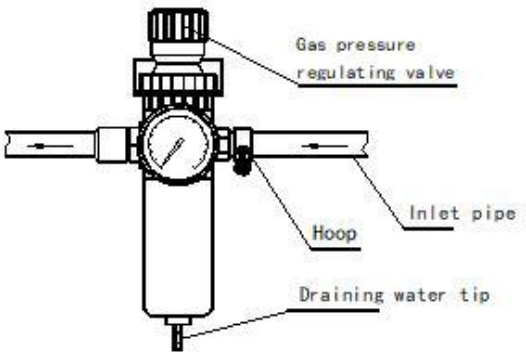
  Use eligible cables and sockets to connect it, and must be operated by a qualified electrician.

- **Connection of ground cable**

  Connect it to ground on marking ⏚ of the machine body), the sectional area must match the requirements in above form, to ground firmly. Ground connecting method should follow state standard.

6.5 The connection of compressed air and the operation of pressure regulating filter

The function of pressure regulating filter please check the below figure



Pic 7：Air filter regulator

1) The compressed gas should meet the requirement mentioned in point “4.2 Plasma

gas conditions". Connect the gas pipe with the gas inlet of air filter on the rear panel and hoop it tightly.

2) The air filter regulator should be checked periodically. If the water level reaches two-thirds of filter glass, it must be drained, or the cutting incision quality will be effected. The gas supply valve should be closed during water draining, and Gas Checking function is selected in panel. When the indicated valve of gas pressure meter is zero, water will drain out from drainage mouth automatically.

6.6 Connection of cooling water

LGK-120HD does not have this function

Connect the copper tip marked with "water inlet" on the rear side with water supply pipe, and tighten it. Connect the copper tip marked with "Backwater" with water recycle pipe, and tighten it.

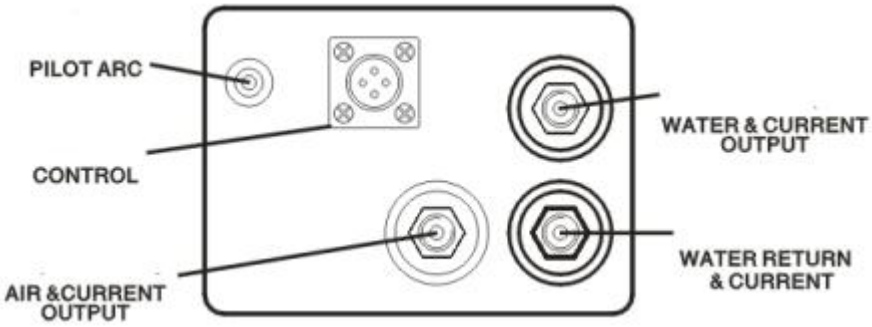
Notes: when use air cooling torch, the torch selection switch on panel must be set to air-cooled torch position, and the cooling water cannot be connected. The cooling water is for cooling torch only, and cutter power source does not need water cooling.

6.7 The connection of output terminal

- The connection of the torch

1) Connectors instruction

- The pilot arc: to connect the arc striking wire of the torch;
- Control: Pin 1 and 2 is start control, to connect the control switch of the torch. Pin 3 and 4 is water cooling/air cooling. When use air cooling torch, short connect the pin 3 and 4, when use water cooling torch, don't connect the pin 3 and 4;
- Air & Current output: the negative output connector of the machine is the plasma gas output connector, the connector thread is M14×1.5;
- Water & Current output: the negative output connector of the machine is the cooling water output connector, to connect the water inlet of the water cooling torch, the connector thread is M16×1.5;
- Water Return & Current: the negative output connector of the machine is the cooling water return connector, to connect the return water of the water cooling torch, the connector thread is M16×1.5 ;



Pic 8 The connectors of torch

2) The connection of air cooling torch (Please refer to the Pic 8 as above)

Firstly connect the torch air inlet cable connector with the copper tip marked with **Air & Current output** on the front bottom panel; then connect the torch pilot wire to terminal marked with **Pilot arc** on the front panel; Finally, connect the torch control connector to the terminal marked with **Control** on the front panel and screw down the nut;

3) The Connection of water-cooling torch (Not for LGK-120HD) (Please refer to the Pic 8 as above)

Firstly connect the torch cable connector (cooling water return) with the copper tip marked with **Water Return & Current** on the front panel. Connect the torch cable connector (cooling water output) with the copper tip marked with **Water & Current output** on the front panel. Connect the torch gas pipe nut with the copper tip marked with **Air & Current output**. then connect the torch pilot wire to terminal marked with **Pilot arc** on the front panel; Finally, connect the torch control connector to the terminal marked with **Control** on the front panel and screw down the nut;

4) The requirements of control plug connection when customers use different torches

- Use WS20J4TQ 4-pins plug;
- Requirements on air cooling torch connection:
  a) Connect the 1, 2 pin of 4- pins plug to switch control wire of cutting torch;
  b) Short connect 3, 4 pin of 4-pins plug by gummed wire;
  c) Pilot arc wire connects cold-press joint UT-8;
- Requirements on water cooling torch:
  a) Connect the 1, 2 pin of 4-pins plug to switch control wire of cutting torch;
  b) The 3, 4 pin don`t connect any of wire;
  c) Pilot arc wire connects cold-press joint UT-8;

5) Connection of cutting ground cable

- LGK-120HD: Connect the fast connector of cutting ground cable with the

adapter base on the front panel and screw down it clockwise. The other end of the cutting ground cable is firmly connected to work-piece.

- LGK-200/300/400HD: Connect the cutting ground cable with the copper tip on the front panel with nuts. The other end of the cutting ground cable is firmly connected to work-piece.

6.8 The connection of control signal connectors

For CNC Automatic cutting connection

The socket model of the connector is : WS20K4Z, and the function for each wire pin is as following:

1) Connector pin 1 and pin 2 is signal output of success arc striking, it is one group of contact terminal of relay, and its rated load capability is 0.3A/125VAC or 1A/30VDC.
2) Connector pin 3 and pin 4 is start control wire of the cutter, its starting method is controlled by operating selection switch. Usually 2-Step is selected, that is, it starts under short connection, and stops after cutting off. The two wire is used in parallel with torch control socket pin 1, pin 2 on the front panel.

6.9 The connection of water cooling machine intelligent communication interface

There is no this interface on LGK-120HD, when LGK-200/300/400HD work with water cooling, this interface will be used

The socket model of the connector is : WS20J7TQ, and the function for each wire pin is as following:

1) Connector pin 3 and pin 4 is start control wire of the cutter, it is one group of contact terminal of relay, it's on closing status when the torch switch is on, and it's on breaking status when the torch switch is off. Its rated load capability is 0.3A/125VAC or 1A/30VDC
2) Connector pin 5 and pin 6 is protection signal that water cooling machine output to plasma cutter, when short connect the pin 5 and 6, there will be no current and voltage output from the plasma cutter.

   Special note: To confirm the good cooling performance, and lengthen the consumable life, you'd better choose the water cooling machine from HUAYUAN.

6.10 Panel and it's function instruction

Note: The title number is corresponding to the number on the Pic 9, for example, the "1）" is corresponding to "1"on Pic 9.

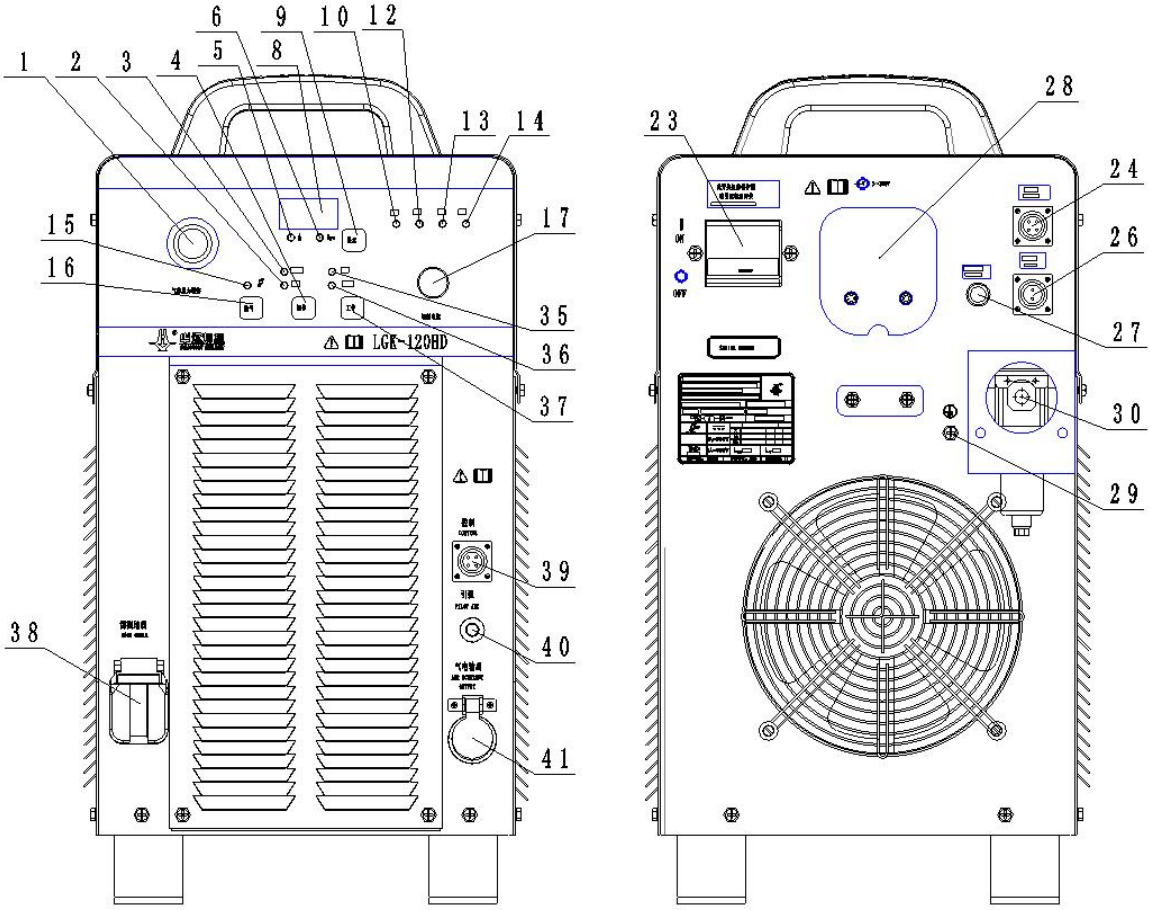
1) The gas pressure adjusting valve: to adjust the gas pressure, pull it out and contra rotate to reduce the gas pressure, rotate it clockwise to increase the gas pressure;

2) Torch lock function indicator: Press “OPERATE” key, when this indicator is on, mean it’s on “torch lock” status;
3) Torch unlock function indicator: Press “OPERATE” key, when this indicator is on, mean it’s on “torch unlock” status;
4) ”OPERATE” key: To choose the “torch unlock” and “torch lock” function. When it turns on “torch lock”, the torch switch should be pressed in the process of cutting, and the cutting stops after loosening the switch. When it turns on “torch unlock”, press the torch switch and loosen it, the cutting starts to work, and the stops after pressing the switch again;
5) Current display indicator light: Press “DISPLAY” key, when this indicator is on it, means the digital displaying meter (Number 8) is displaying the current value. When there is starting signal (No.12 indicator light is on), the output current value is displaying, when it’s not starting, the pre-setting current value is displaying;
6) Plasma gas pressure displaying indicator light: Press “DISPLAY” key, when this indicator is on it, means the digital displaying meter (Number 8) is displaying the plasma gas pressure value;
7) Water coolant flow displaying indicator light: Press “DISPLAY” key, when this indicator is on it, means the digital displaying meter （Number 8） is displaying the water coolant flow value;
8) Digital displaying meter: Displaying pre-set cutting current, real current, plasma gas pressure, parameters on secondary menu and error code;
9) The “DISPLAY” key: to swift the different displaying function of “A”/ “Mpa”/“L/min” (There is no “L/min” displaying function on LGK-120HD);
10) AIR PRESSURE indicator light：to indicate the status of plasma gas pressure.
    - If this indicator light is ON: means the plasma gas pressure ≥0.38MPa, it’s normal.
    - The indicator light 0.3s on and 0.3s off (Quick flashing): means the plasma gas pressure is in warning value range(0.3MPa≤air pressure＜0.38MPa), now the cutter can work, but the cutting quality may get bad, and the consumables may burned faster;
    - The indicator light is off: means the plasma gas pressure ＜0.3MPa, now the cutter stop working;
    - The indicator light 1s on and 1s off (Slow flashing): means the plasma gas pressure was too low but back to normal now. And this slow flashing status will keep 3 minutes. It’s normal.
11) COOLANT FLOW displaying indicator light (There is no this indicator on LGK-120HD):

to indicate the torch coolant flow status.

- If this indicator light is ON: means the coolant flow ≥2.7L/min, it's normal.
- The indicator light 0.3s on and 0.3s off (Quick flashing): means the coolant flow is in warning value range(2.0L/min≤ coolant flow＜2.7L/min), now the cutter can work, but the consumables may burned much faster;
- The indicator light is off: means the coolant flow ＜2L/min, now the cutter stop working;
- The indicator light 1s on and 1s off (Slow flashing): means the coolant flow was too low (＜2L/min)but back to normal now. And this slow flashing status will keep 3 minutes. It's normal.

12) START indicator light: When the light ON means the cutting machine got the starting signal, start to cut;
13) OVER LOAD indicator light: when the inner cutter temperature is too high (Usually when the cooling fan is broken), this indicator light flashing (Light on 0.3s and off 0.3s), and the cutter stop working. After the temperature is back to normal, the indicator light will slow flash and start to work again;
14) INPUT FAULT indicator light: when the power supply is lower than 280VAC, this indicator start flashing (0.3s on and 0.3s off) and stop working. After the power input back to normal, the indicator light will slow flash and start to work again;
15) AIR CHECKING indicator light: when this indicator is on, mean it's on air checking status;
16) AIR CHECKING key: press this key and the indicator light will on(No.15), now the cutter is in gas checking status, all the gas valve of the cutter will be opened;
17) Cutting current adjusting knob: Adjusting cutting current; at the same time, it's also a choose key as secondary menu;

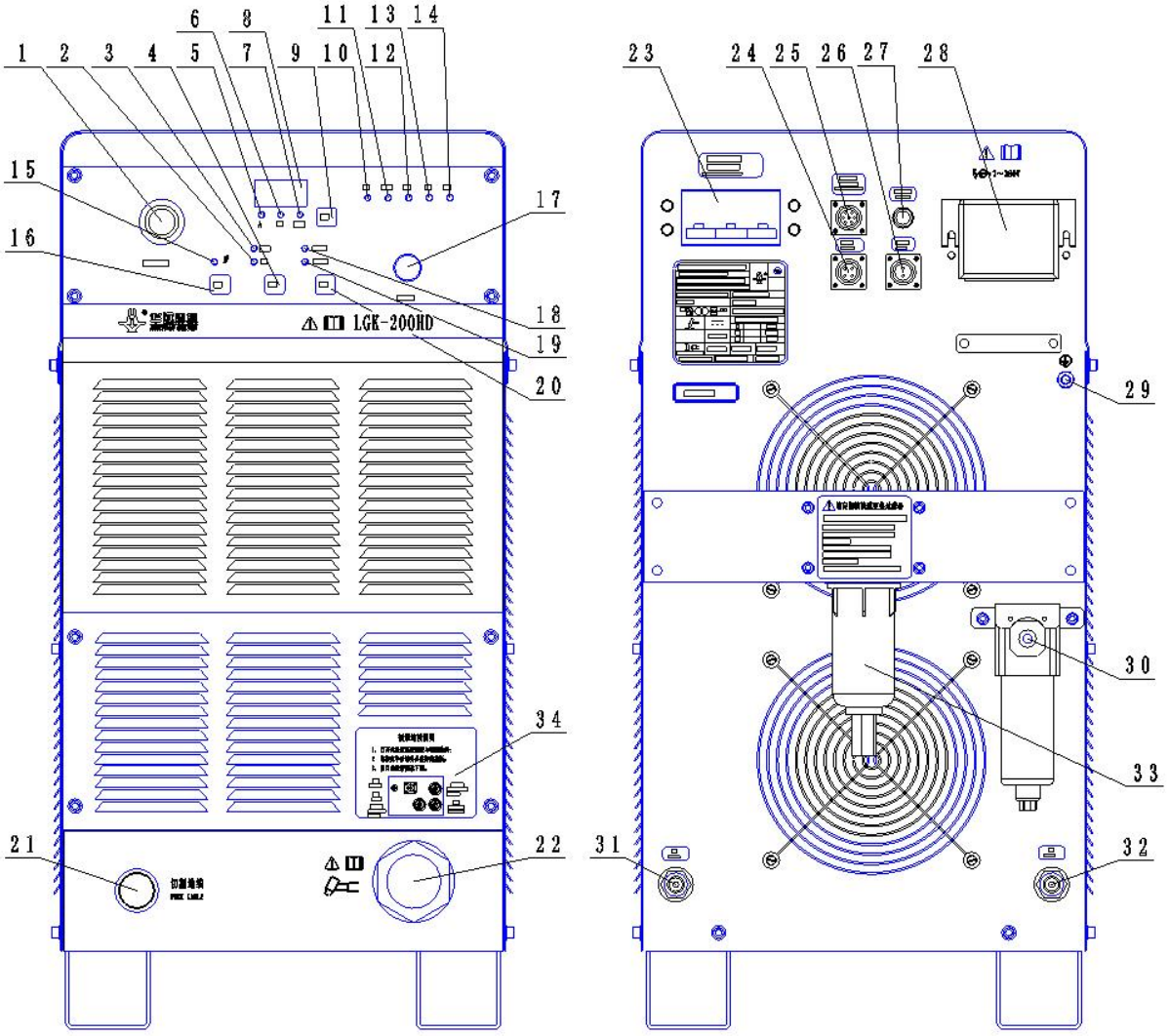


Pic 9：LGK-120HD Panel function view

18) AIR COOLING indicator light (There is no this indicator on LGK-120HD)： Press “TORCH” key, when this light is on, means the air cooling torch can be used, the maximum current will be limited under 120A;
19) WATRT COOLING indicator light (There is no this indicator on LGK-120HD)： Press “TORCH” key, when this light is on, means the water cooling torch can be used;
20) TORCH style selection key (Not on LGK-120HD)：to choose a suitable torch;
21) Cutting ground cable connection thread hole: To pass through the cutting ground cable;
22) Cutting torch connection thread hole: To pass through the cutting torch cable;
23) Power switch: To control the ON/OFF of 3-phase power supply of cutter;
24) Control signal connector: To control automatic cutting equipment (there is starting signal and arc striking success signal)
    - Pin 1 and 2 is pilot arc signal output, it’s a group of relay contact inside, after striking the arc, the contact closed, can control the load with rated loading capacity of 5A/250VAC or 5A/30VDC;
    - Pin 3 and 4 is starting signal, the starting mode please check No.4;

25) Intelligent communication connector of water cooling machine (Not on LGK-120HD): only if work with a water cooling machine, connect with this connector;

- Pin 3 and 4 is the starting signal output of the water cooling machine, it's a group of relay contact inside, when there is starting signal. the contact closed, can control the load with rated loading capacity of 0.3A/125VAC or 1A/30VDC;
- Pin 5 and 6 is the protecting signal input of the water cooling machine, the cutter stop working as soon as get this signal from the water cooling machine;

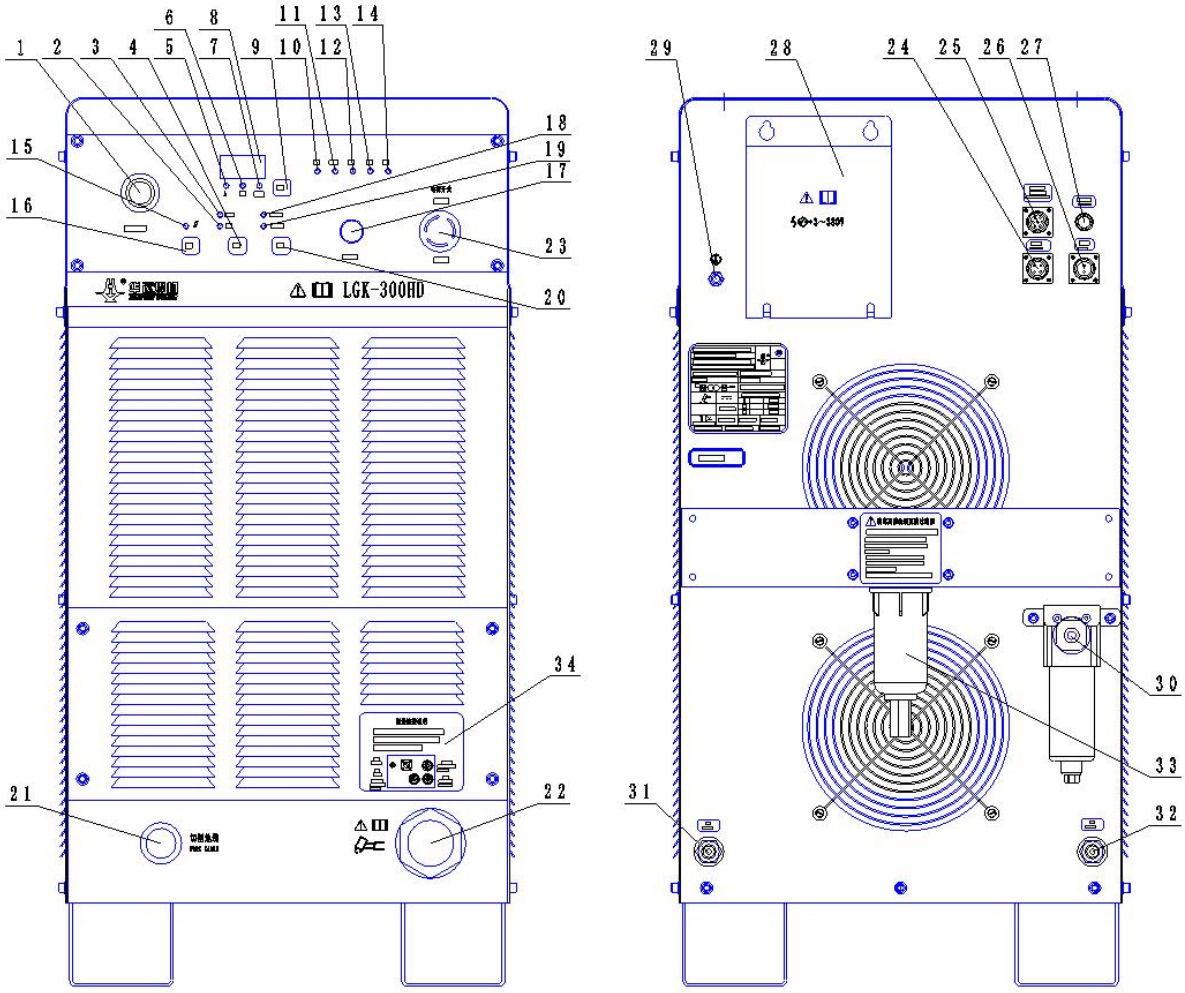


Pic 10：LGK-200HD Panel function view

26) Arc voltage output: the cutter output arc voltage, Pin 1 is "＋" and pin 2 is "—". The default arc voltage output is 1:1. There is also 1：20, 1:50 and 1:100 arc voltage output inside the machine, If it is needed, please open the cutter top cover, and use two-core rubber wire to connect the wire terminal on printed board PL13, Please connect the wire according to the requirements, and pay attention to the negative and positive electrode. This signal is not insulated, please make sure there is no any of potential relationship between the connected equipment and the

cutter;

27) Fuse holder of arc voltage signal;
28) The power input connecting box: to connect the 3 phase power input;
29) Ground protection terminal;
30) The plasma gas inlet: to connect the compressed air;



Pic 11：LGK-300/400HD Panel function view

31) Water inlet connector (Not on LGK-120HD): to connect the outlet pipe of the water cooling machine, the pipe inner diameter is Φ10;
32) Water back connector (Not on LGK-120HD): to connect the backwater pipe of the water cooling machine, the pipe diameter is Φ10;
33) The water coolant filter (Not on LGK-120HD): to filter the water coolant back to the cooling machine from the torch;
34) The torch connection instruction;
35) SHEET METAL cutting function indicator light (Only on LGK-120HD): Press “WORKPIECE” key, when the indicator is on, if the plasma arc stop during cutting process, the cutter will not work anymore until get a new starting signal, this

function is for normal cutting;

36) MESH METAL cutting function indicator light (Only on LGK-120HD): Press "WORKPIECE" key, when the indicator is on, if the plasma arc stop during cutting process, the cutter will strike the arc again within 0.3s, this function is for cutting the work-piece which have gaps;
37) "WORKPIECE" key (Only for lgk-120HD), to choose the suitable work-piece;
38) Cutting ground cable socket: to connect the ground cutting cable;
39) The control socket of cutting torch: to connect the control signal wire of the cutting torch.

    Pin 1 and 2 is starting control, when the external switch is on, the cutter start to work. Pin 3 and 4 not using;
40) Torch arc striking terminal: to connect the arc striking wire of the torch;
41) Air & Current output: the negative output connector of the machine is the plasma gas output connector; the connector thread is M14×1.5.

6.11 Protection function introduction

1) Air pressure protection

- When the cutting air pressure is lower than 0.3MPa, the protection circuit starts working and the cutter cannot start, and error code E80 will be displayed;
- When the air pressure is lower than 0.3MPa during cutting, the protection circuit starts working and the cutter cannot start, the cutting arc will extinguish automatically;

  Note: When adjust the air pressure, the panel function must be set to 'GAS TEST'!

2) Water pressure protection(LGK-120HD does not have this function)

- When the water supply flow is lower than 2L/min, the COOLANT FLOW indicator light will not on, if press the torch switch 0.9S, the water flow still lower than 20.L/min, protection circuit starts working and cutter cannot start;
- When the water supply is lower than 2L/min during the process, protection circuit starts working and cutting arc extinguishes automatically;

3) Over-heat protection

When the ambient temperature is too high or the cooling fan is broken, the cutter will be over heated under the rated current, and heat protection circuit starts working, the cutting arc will extinguish automatically;

4) Power supply input fault protection

When 3 phrase power supply is lower than 280VAC, protection circuit starts

working and there is no arc striking;

Note: the water and air pressure protection function is for protecting the torch only!

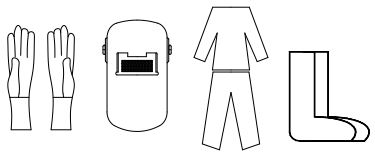
5) Notes of anti-interference (Specially pay attention when work on CNC automatic cutting equipment)

- Cover the whole torch cable (from torch holder to output terminal) of the cutter with shielding layer, the shielding layer should be metal hose or shielding net pipe made of aluminum or copper, metal materials which is magnetic conducted cannot be used, the shielding layer don't need to connect with ground;
- All the control lines which connected with plasma power source should be shielding wire, the shielding layer should be connected ground well;
- The control system of CNC cutting machine should be away from the cutting table, torch cables and cutting torch head, especially the cutting torch heard. When striking arc, the high frequency spark arc on the cutting torch head may produce strong space spreading high frequency disturb signal, which may crash the control system;
- There should be shields on the controller of CNC system, and the shielding layers should be ground connected well;
- All the lines connected with CNC controller and cutting table should be shielding wire (Such as the control wire of step motor ,limit switch etc.), and the shielding layers should be ground connected well;
- The pile of the ground cable should be connected with ground well.

6.12 Operation

1) Safety note

<table>
<tr><td> 
Notes:</td><td colspan="3">Operation strictly accordant with the following steps</td></tr>
<tr><td rowspan="2">  </td><td> 
Notice</td><td>Electric shock may hurt or even kill man.</td><td rowspan="2">  </td><td rowspan="2">Cutting may cause fire or explosion
(Splashes may ignite flammable materials nearby. Those materials should be 10m away from the working place.</td></tr>
<tr><td colspan="2">(Shut off the power during connection
(Do not touch the conducted parts</td></tr>
</table>

	Fume & dust is harmful. (Do not breathe in the fume and dust caused by cutting (Clean up the oil spot on work piece. (Keep fresh air in working place (Fume extraction equipment should be prepared.		Arc may hurt your eyes and skin. (Strong arc may hurt your eyes. (Ultraviolet radiation generated by arc may hurt skin and eyes. Please wear shielded guard when cutting.
	Overheated part may hurt your skin. (Do not touch the overheated part on the work piece. (Do not touch hot cable or torch just by hands.		Fast moving thing may injure you. (Do not put your hands or other things into the fan shield. (Cover the opened case shell well during cutting operation.
	In case of injury for your skin and eyes, please wear required guards according to Labor Security and Hygiene rules. Electrode and nozzle should be replaced only after the cutter is power off. Operation should proceed according to related Labor and Security regulations.		

Turn on the power switch after installation and connection. Then the power indicator lamp is ON;

2) Start gas supply equipment and turn on the gas supply switch, the power indicator lamp on the panel is ON. If the gas pressure is less than 0.3Mpa, the lamp will be OFF, a error code E80 will be displayed on the meter, then the gas source should be checked;
3) Start water supply equipment. The indicator lamp of water pressure on panel is ON when opens water supply valve. (LGK-120HD does not have this function)
4) Place the gas control switch to “GAS TEST”, adjust the Adjusting knob of air filter regulator to make the output pressure and flux fit cutting condition. After adjusting, press the “GAS TEST” again to place it on “Cutting “process (The “GAS TEST” indicator lamp is off).
5) Press “OPERATION” key and put it on “TORCH UNLOCK”, then the torch switch should be pressed continuously during cutting. After loosening, the cutting stops. When put it to “TORCH LOCK”, press the torch switch and then loosen it, and cutting can start. User can make selection according to his operation habit;
6) Checking the panel indicator lamps. The indicator lamps status, under which cutting

can be operated is shown as following sheet.

Lamp	Air pressure	Coolant flow	Over load	Input fault
Status	On	On	Off	Off

Sheet 4：Indicator lamp status

Notes: there is no water pressure indicator on LGK-120HD, and the water pressure indicator will be OFF when gas-cooled torch is equipped on LGK-200/300/400HD cutter.

7) Keep the torch nozzle 2mm~ 5mm away from work-piece. The axis line of nozzle should be perpendicular to work-piece, and starts cutting from the edge of work-piece. When the plate thickness is ≤ 12mm, the piercing can be done wherever on the work-piece, and start the cutting. The cutting torch should be inclined to one side a little during piercing on work-piece, so that the molten metal can be blown away easily. Piercing is not recommended, because it damages nozzle easily, it is better to drill a hole in arc striking point first, then strikes arc on the edge of the hole. Press down torch switch, compressed gas sprays out from nozzle, and cutting indicating lamp is ON. After gas pre-flows for 1 second (The default gas pre-flow time of LGK-200/300/400HD is 1 second, LGK-120HD is 0.5 second) , high frequency is generated, arc is stroke, and cutting begins by moving torch;

8) When the control switch of operation method on front panel is at “Torch Unlock”, press the torch switch and the cutting starts after arc striking. After loosening the switch, there is no voltage output, and cutting stops, and compressed gas stops supplying after 10 seconds. When it is at “Torch Lock”, press down the switch and loosen it, and cutting starts after arc striking automatically. Press the switch again or press it till the arc is off, then there is no voltage output, cutting stops, and compressed gas stops supplying after10 seconds.

7 Operation and setting

7.1 Power on self test

After power on, the cutting machine self testing steps as below, need 7 seconds:

① Test the LED status, firstly all the LED will be on, then all off, and the normally display;

② Make one self test of gas and display the air pressure value;

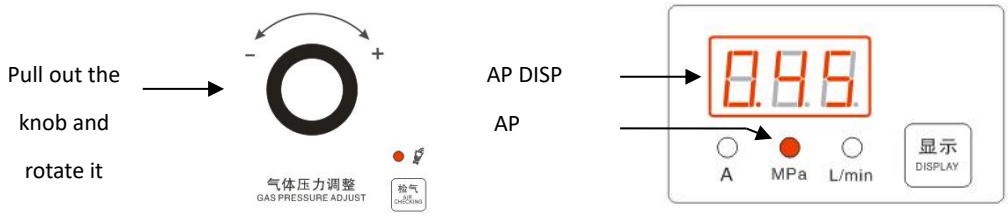
③ The last memory status is recalled and displayed on the panel, then turn to standby mode;

Note: a intelligent cooling fan is used on the cutting machine, the cooling fan works

when cutting, the cooling fan stops after stopping cutting 8 munities.

7.2 The air pressure adjust and display

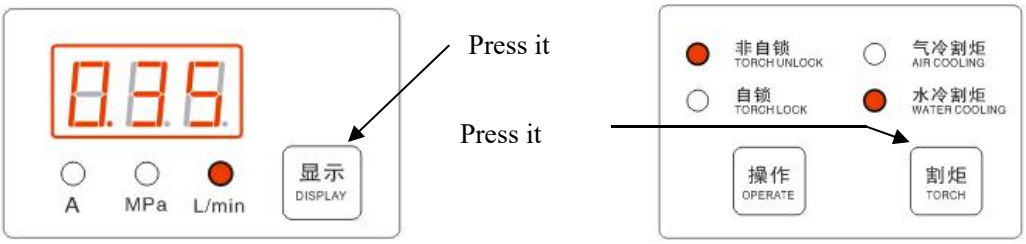
Press “DISPLAY” key and display the air pressure on the meter, now the “MPa” lamp is on, press “GAS TEST” key and open the big&small gas valve, pull out the knob and rotate it to



adjust the pressure.

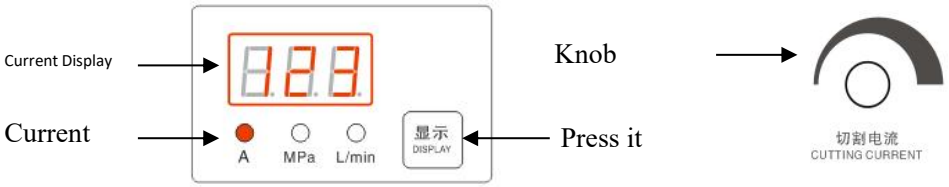
7.3 Liquid flow display (Not on LGK-120HD)

Firstly press “TORCH” key and switch to WATER COOLING status, then press “DISPLAY” key and switch to liquid flow display on the meter, then the “L/min” lamp will be on.



7.4 Cutting current setting

Press “DISPLAY” key and display the current on the meter, then rotate to adjust the current. The below picture is based on LGK-200HD.



① In standby mode, the meter displays the pre-setting current.

② In cutting mode, the meter displays the actual cutting current, when adjust the current, the meter will display the pre-setting current again, after adjusting, meter displays the actual current again.

7.5 Secondary menu

7.5.1 Operation

① In standby mode, press “OPERATE” key 5 seconds, turn to secondary menu;

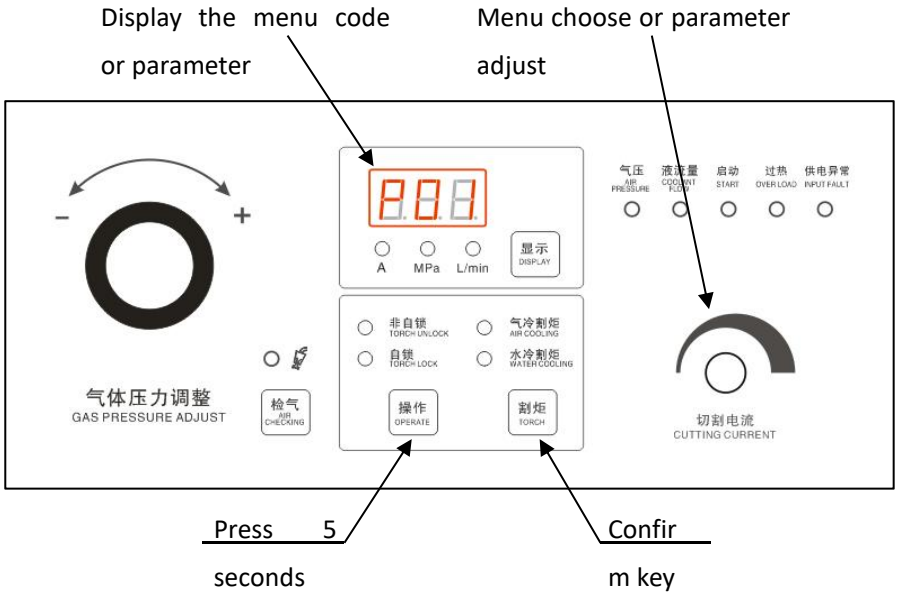
② Rotate the knob, choose content, press confirm key and entre parameter adjusting;

③ Rotate the knob, adjust the parameter value, press confirm key to save the

parameter;

④ Press “OPERATE” key 5 seconds again to quit the secondary menu. If there is no any of operation in 30 seconds, it will quit the secondary menu automatically.

(The confirm key of LGK-120HD is “WORKPIECE” key, the confirm key of LGK-200/300/400HD is “TORCH” key)



7.5.2 Secondary menu content

Code	Content	Adj. range	Unit	Default	Remarks
P01	Gas pre-flow time set	0.2～5	s	0.5 or 1	LGK-120HD is 0.5s，LGK-200/3000/400HD is 1 s
P02	Gas post-flow time set	5～100	s	10	
P03	Current up-slope time set	0.1～1	s	0.2	
P04	Cutting time set	1～999	Min.	999	If reach the set value, there will be warning or controlling, cutting stops
P05	Piercing time set	1～999	Time	999	
P06	Cutting rest time disp.	-	Min	-	
P07	Piercing rest time disp.	-	Time	-	
P08	Monitor control switch	0 or 1	-	0	On (1): Cannot cut after warning Off (0)： Can cut after warning
P09	Monitor parameter reset	Reset (1) Keep (0)	-	0	1 means reset immediately, the cutting time and arc striking time rest
P10	Monitor warning function	On (1) off (0)	-	0	To open/close the torch monitoring function
Note: long press “DISPLAY” key 7 seconds, can restore factory setting, the the P01~P10 back to default values.					

Sheet 5: The content of secondary menu

7.6 Torch monitoring function

1) To confirm the cutting quality and protect the torch from overusing of nozzle and electrode, can choose to use this monitoring warning function, to monitor the piercing times, and actual cutting time; it displays the warning codes when reach the set values; When the nozzle and electrode is monitored to reach the working life, there are two options set in the secondary menu: stop working or just display the warning information.
   - If you want to use the monitoring function, please set it refer to “2) **how to use**;
   - If you want to use the monitoring function, enter secondary menu and choose “P10 monitoring warning function”, set the value to “0” and press confirm key. (The factory default is on “0”)
2) How to use:

   After change a new electrode and nozzle, please use the monitoring warning function.
   - Step 1: enter secondary menu and choose “P09 monitoring parameter reset”, set the value to “1” and press confirm key, then the cutting time and arc striking time back to 0;
   - Step 2: enter secondary menu and choose “P04 cutting time set” and “P05 piercing time set”, set a suitable value according to the working life of nozzle and electrode;
   - Step 3: enter secondary menu and choose “P08 monitoring control switch”, set the value to “1” and press confirm key, then the cutting will be stopped after warning, if set the value to “0”, then only the warning information will be displayed, the machine can keep working;
   - Step 4: enter secondary menu and choose “P10 monitoring warning function”, set the value to “1” and press confirm key and finish the setting, quit the secondary menu.

   Note: for detailed operation information of function key and secondary menu, please refer to “7.5 **secondary menu**.
3) If the torch monitoring function has warning the nozzle/electrode working life correctly, the cutting time and arc striking time will be set back to 0 automatically after changing the new nozzle/electrode.
4) If the nozzle/electrode working condition is still good when the warning, then the set cutting time and piercing times should be set to longer;

8 Brief introduction of the cutting technology

8.1 Main cutting parameter and the technical basis

1) The cutting material kind and thickness

The cutting material kind and thickness is the basis to choose a cutting parameter, for example, if the material is thick, then we choose a bigger cutting current and bigger diameter nozzles. Even the thickness is same, but different material, we have to choose a different cutting technology.

2) Cutting current and arc voltage

The selection of cutting current should be according to the diameter of the nozzle, the relationship between the two should be as: I(current A)＝(70～100)× Φ(mm). As the increase of the metal thickness, the influence of arc current to the cutting speed will become less. But as the increase of current, the burning damage will be worse for the electrode and the nozzle. So when cutting a thick metal work-piece, usually increase the arc voltage to increase the cutting speed. The actual arc voltage is decided not only by the gas type (or fixed gas type), but also the gas flow and nozzle shape (specially the nozzle diameter). Working voltage increases with the increase of gas flow.

3) Gas flow Q

The arc voltage increases as the increase of air flow, that is, the arc power, the cutting speed, as well as the cutting capacity and quality is improved accordingly. Because the arc compression level increases, the energy is more concentrated, the arc beam temperature, the arc spraying speed, as well as the arc current impulsion increases. But overlarge current may cause the instability of the plasma arc. Usually no change is made to air flow for one torch. But it can be adjusted a little when the cutting torch or cutting thickness is different

4) The distance between the nozzle and the work-piece (d)

If the d is too big, the blow power of plasma arc for molten metal decreases, so does the cutting ability, and the burr on the bottom increases, meanwhile the instability of the arc increases. However, if the d is too small, it increases the possibility of short circuit between the nozzle and the work-piece. Usually d should be as small as possible on condition that no short circuit is caused between nozzle and work-piece. The d under normal cutting of air plasma is usually 2～5mm. The work-piece can also contact with the nozzle during air plasma cutting, that is, the nozzle glide on the surface of the work-piece. This cutting method is called contact cutting, and the

cutting thickness is the half as the ordinary cutting

5) Open circuit voltage

The power source with high open circuit voltage is required for cutting thick work-piece. The open circuit voltage is related with air type, for example, by using argon the open circuit voltage may be lower, while it is higher by using air, nitrogen, hydrogen.

6) Cutting speed

The cutting speed is related with many parameters. The main parameters determining cutting speed include work-piece thickness, cutting current, air flux and nozzle aperture. A proper drag is allowed during cutting. The cutting speed should be increased as much as possible, but the incision quality must be guaranteed.

8.2 Cutting burr eliminating issue

1) The characteristics of the cutting burr

The ordinary cutting surface is smooth and clean, but if the parameter selection is not suitable, and electrode centering is not good, then burr may be formed on the cutting surface.

Slag is formed by molten metal and its oxide which is adhesive to the bottom edge of incision and solidified. The reason for forming this slag is that the molten metal adhesive strength is bigger than the gravity and blow strength of metal oxide.

When cutting the alloy steel (stainless steel), the molten metal is difficult to be blown away because of its bad fluidity, in addition, the alloy steel have bad thermal conductivity, the incision bottom is over-heated easily, the left molten metal and incision bottom melts into one, thereby the irremovable and tough burr is formed.

On the contrary, when cut copper or aluminum, the incision bottom is difficult to be melted together with molten metal, and the burr formed under incision is come off easily.

2) The factors affecting the forming of burr

- The fluidity of the molten metal is not good, when the power is too small or the plasma arc compression effect is not good, the temperature of molten metal during the cutting process is low, fluidity is weak, even if the air current blow force is strong, it is still difficult to blow away the metal completely, so the burr is formed.
- When cutting the thick plate, the burr is caused by the drag of overlarge cutting seam. During the cutting process, the heat received by different parts of metal is different, the heat on the upper incision is larger than that of the lower

incision, so the upper part melting speed is faster than that of lower part, thereby a distance between them is formed, it is called drag L of cutting seam. The drag size is related to plasma arc shape and cutting speed. When the flame is short while the cutting speed is too fast, drag L increases, so the vertical and horizontal blow force of the arc is formed, the vertical one helps to blow away the molten metal, while the horizontal one makes the molten metal flow backward along with incision bottom, this over-heated metal will melt parts of the bottom metal again, then the burr is formed when they cool down and melt together.

- The burr is caused by overheat bottom. When the cutting speed is too slow, but the incision bottom is so over-heated that it melts, the liquid metal flows to bottom metal and combines into one which makes the difficulty to blow away molten metal by air current, and then the burr is formed.
- The air current blow force is not enough. When cutting with plasma, the arc blow force consists of the air current blow force and the arc electromagnetic force, the air current blow force acts the main function. If the air current blow force is not strong enough, it cannot ensure all the burr is flown away, then the burr is formed.

3) The measurement to eliminate burr

- Ensure the centering between electrode and nozzle precisely, so that the compression of the plasma arc is not damaged, the concentration of flame and cutting capacity can be guaranteed.
- Enough power to ensure the fluidity of molten metal, as well as increase the stability of the cutting speed and operation. This makes it possible to adopt large air flux to enlarge the air blow force, and beneficial for eliminating burr.
- Adjust suitable air flow and cutting speed. If the air flow is too small, the blow force is not enough, while if too big, the plasma arc will be shorten, the incision will be “V” shape, the drag enlarge. The burr can be formed under both conditions.
- When cutting speed is too slow, the incision is large and rough, the bottom is easy to be over-heated, while the cutting speed is fast, the drag is enlarged, this is not beneficial for eliminating burr.
- So under certain circumstance, there exists a proper selection range for air flow and cutting speed.

4) Diminish the cutting surface slanting and rounding issue

The incision surface is a little slant and the upper side is a little round during cutting

with air plasma. Though the slanting range is acceptable during the cutting process, in order to improve the cutting quality, people begins to pay attention to this problem. Usually slowing down the cutting speed properly can avoid the slanting, but this may enlarge the effect zone and incision width, as well as decrease the production capacity, so this measurement is not wildly used. Recently, people can avoid the slanting by improving the nozzle structure, this is called super cutting method. By adopting multi-hole nozzle during the cutting process, the air current from the small hole is parallel with that from the main hole, this can avoid the dispersing of the plasma flame on metal top, and then a parallel incision, square upper side and no metal slag seam on the lower side is obtained.

8.3 Cutting table

To get excellent cutting quality, reduce the burr as soon as possible, we recommend user refer to the “cutting table” and choose a suitable cutting parameter. However, according to different working conditions and cutting materials, user should adjust it as actual condition.

Cut from edge unless you have to make a piercing.

Choose suitable consumables according to different cutting technology. When change the consumables, power have to be off, and use the equipped torch use wrench.

The values in the cutting table below is based on “System components” in this operation manual, it’s a useful reference for some cutting condition.

NOTE: If different torch is used, then the consumables different, the values should be different with the below table.

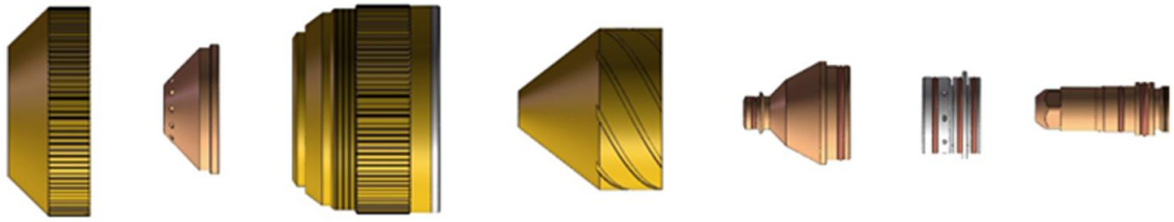
Cutting table 1:

Low carbon steel

Air

400A cutting current

Shielding cap	Shielding cap sleeve	Out shielding cap	Inner shielding cap	Nozzle	Swirl ring	Electrode
HY02711	HY02701	HY02601	HY02501	HY02435	HY02301	HY02211



Plasma gas	Thickness	Distance between torch and work-piece	Arc voltage	Cutting speed	Initial piercing height	Piercing time
Pressure Mpa	mm	mm	V	mm/min	mm	s
0.45	20	4.5	165	1650	8	1.0
	25	5	168	1250	11	1.2
	30	5.5	172	1150	13	2.8
	32	6	175	950	14	3.0
	35	7	178	700	15	3.2
	40	7	180	550	16	3.5
	50	7.5	182	450	Cut from edge	3.0
	60	8	185	350		3.2
	80	8.5	190	150		4
	90	9	195	120		4.5

- The gas pressure in this table is the gas pressure that displayed on the plasma power source panel when cutting.
- The values in the table is based on the plasma working with Huayuan water cooler.

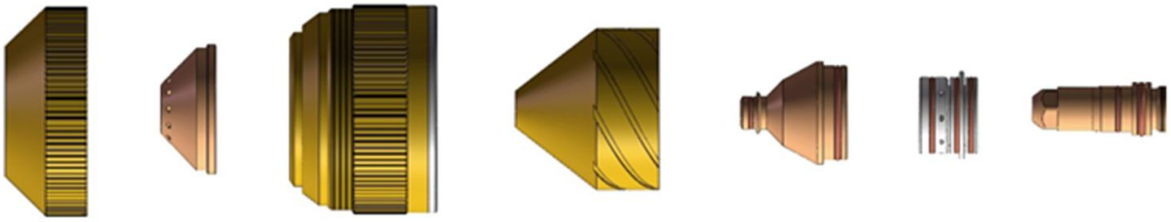
Cutting table 2:

Low carbon steel

Air

300A cutting current

Shielding cap	Shielding cap sleeve	Out shielding cap	Inner shielding cap	Nozzle	Swirl ring	Electrode
HY02711	HY02701	HY02601	HY02501	HY02428	HY02301	HY02211



Plasma gas	Thickness	Distance between torch and work-piece	Arc voltage	Cutting speed	Initial piercing height	Piercing time
Pressure Mpa	mm	mm	V	mm/min	mm	s
0.47	8	1.5	125	4000	6	0.5
0.49	12	2.5	135	3000	7	1
	16	3.5	139	2400	8	
	20	3.5	145	1900	9	1.5
	25	5.5	155	1500	11	2
	30	7.5	168	1200		2.5
0.52	32	8.5	172	900	12	
0.57	35	9.5	175	650	Cut from edge	
	38		180	600		
0.60	50	10	198	300		

- The gas pressure in this table is the gas pressure that displayed on the plasma power source panel when cutting.
- The values in the table is based on the plasma working with Huayuan water cooler.

Cutting table 3:

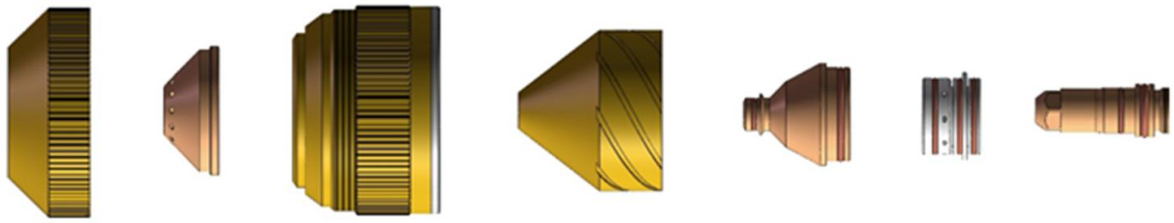
Low carbon steel

Air

260A cutting current

Shielding cap Shielding cap Out shielding cap Inner shielding cap Nozzle Swirl ring Electrode sleeve

HY02711 HY02701 HY02601 HY02501 HY02425 HY02301 HY02211



Plasma gas	Thickness	Distance between torch and work-piece	Arc voltage	Cutting speed	Initial piercing height	Piercing time
Pressure Mpa	mm	mm	V	mm/min	mm	s
0.47	8	1.3	128	4000	5	0.4
	12	1.7	135	3000	6	0.5
0.49	16	2	137	2100	8	
	20	4	150	1600	9	0.8
	25	5	158	1300	11	1.2
0.50	30	8	170	1000	12	1.2
0.57	35	8	177	700	Cut from edge	
0.58	38	8.5	184	600		
0.60	50	9	200	300		

- The gas pressure in this table is the gas pressure that displayed on the plasma power source panel when cutting.
- The values in the table is based on the plasma working with Huayuan water cooler.

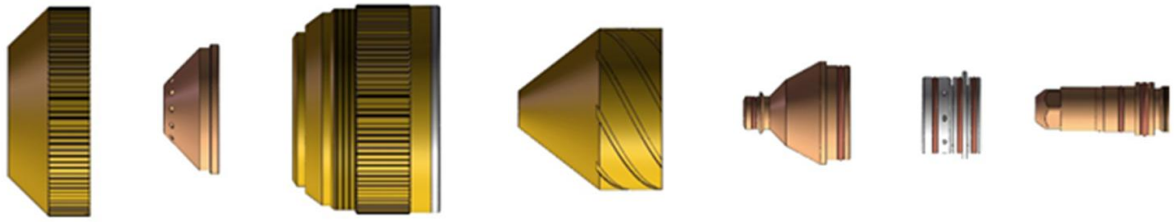
Cutting table 4:

Low carbon steel

Air

200A cutting current

Shielding cap	Shielding cap sleeve	Out shielding cap	Inner shielding cap	Nozzle	Swirl ring	Electrode
HY02711	HY02701	HY02601	HY02501	HY02423	HY02301	HY02211



Plasma gas	Thickness	Distance between torch and work-piece	Arc voltage	Cutting speed	Initial piercing height	Piercing time
Pressure Mpa	mm	mm	V	mm/min	mm	s
0.47	8	2	137	3000	5	0.5
	12	2	139	2500	5	0.8
0.49	16	4	150	1800	8	1
	20	4	152	1200	8	1.2
	25	5.5	162	950	11	1.5
0.50	30	5.5	166	650	Cut from edge	
	32	6	168	500		
	50	7	185	200		

- The gas pressure in this table is the gas pressure that displayed on the plasma power source panel when cutting.
- The values in the table is based on the plasma working with Huayuan water cooler.

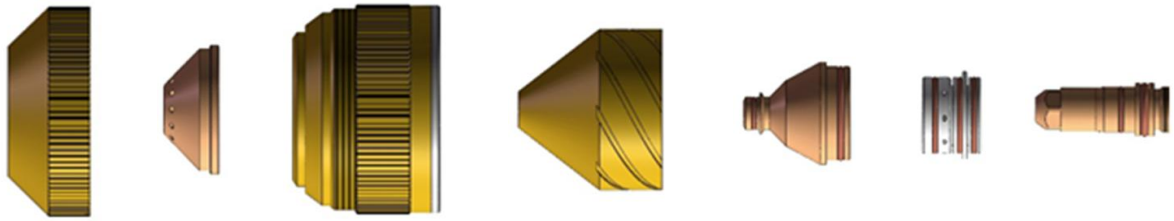
Cutting table 5:

Low carbon steel

Air

160A cutting current

Shielding cap sleeve	Shielding cap	Out shielding cap	Inner shielding cap	Nozzle	Swirl ring	Electrode
HY02711	HY02701	HY02601	HY02501	HY02419	HY02301	HY02211



Plasma gas	Thickness	Distance between torch and work-piece	Arc voltage	Cutting speed	Initial piercing height	Piercing time
Pressure Mpa	mm	mm	V	mm/min	mm	s
0.47	6	2	145	3300	4	0.4
	8	2.5	147	2800	5	0.5
0.50	12	3	155	2300	6	0.6
	16	3.5	160	1500	7	0.7
	20	4	165	1000	8	0.9
	25	4.5	172	700	Cut from edge	
	30	4.5	178	450		

- The gas pressure in this table is the gas pressure that displayed on the plasma power source panel when cutting.
- The values in the table is based on the plasma working with Huayuan water cooler.

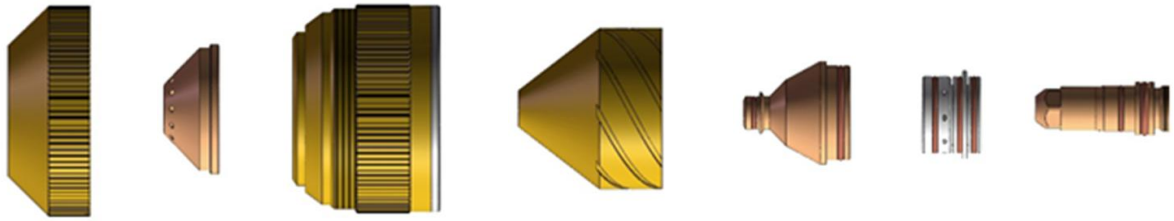
Cutting table 6:

Low carbon steel

Air

100A cutting current

Shielding cap	Shielding cap sleeve	Out shielding cap	Inner shielding cap	Nozzle	Swirl ring	Electrode
HY02711	HY02701	HY02601	HY02501	HY02417	HY02301	HY02211



Plasma gas	Thickness	Distance between torch and work-piece	Arc voltage	Cutting speed	Initial piercing height	Piercing time
Pressure Mpa	mm	mm	V	mm/min	mm	s
0.45	4	2	140	4400	4	0.4
	6	2	145	3100	4	0.4
	8	3	150	2200	6	0.6
	10	3	155	1800	6	0.8
	12	3	160	1300	6	1
	16	4	168	800	Cut from edge	
	20	4	178	450		

- The gas pressure in this table is the gas pressure that displayed on the plasma power source panel when cutting.
- The values in the table is based on the plasma working with Huayuan water cooler.

9 Packing List

9.1 Packing list of plasma power source

1. Plasma power source * 1 set
2. M16 thread adaptor * 1 set (Not on LGK-120HD)
3. Ground cable * 1 piece
4. Hose clamp *6 pieces (2 pieces on LGK-120HD)
5. Fuse
6. Copper terminal *3 pieces
7. Control connector (Only for CNC use)
8. Hex wrench * 1 piece
9. Documents: Operation manual * 1 copy, Certificate 1 copy, Guarantee card * 1 copy

9.2 System packing list

1. Plasma power source
2. Water cooling Torch (Buy separately) (Not on LGK-120HD)
3. Air cooling torch (Buy separately)

10 Maintenance

1） Do not use or store the plasma cutting machine under strong sunlight;

2） Do not use or store the plasma cutting machine in wet environment;

3） Do not cover the plasma cutting machine when working;

4） Use and store it in a well ventilated working environment;

5） Open and clear inside the machine with dry compressed air, at least once a year, to clear the dust and metal filing;

6） Check the insulation of all cables regularly, repair or change it if any damages;
Check the insulation of all connections inside the machine, tighten it if any loosen;

7） Discharge the water and impurities in the filter regularly;

8） Clear or change the liquid filter regularly, the recommended period is every 6 months or 300 arc hours. If find there is some impurities on the filter cylinder or filter net, open the discharge valve on the bottom to clear automatically, if can not clear well, rotate and remove the cylinder, take out the filter net and clear again, if the filter net is broken, have to change a new one. (Not on LGK-120HD)

Note: only guaranteed electrician can maintain this machine, and the power have to be cut when do the maintenances.

11 Troubleshooting

There is high voltage inside the machine, only guaranteed electrician can repair this machine!

11.1 Please firstly check following items if any troubles

1) The three-phase power should be 380/415±40VAC，check if it default phase or voltage fluctuation exceeds its required range of power supply;
2) Check if the supply abnormal indicator lamp is ON. If it is ON, check if the three-phase power switch of distribution box is damaged, and if the fuse and the machine power wire are well equipped. Otherwise it will cause phase missing or bad contact, which makes the machine work abnormally;
3) Check if the torch switch and its wire are damaged or short-circuit, and if the nozzle and electrode are damaged；
4) If the control plug is connected mistakenly after user exchanging a different torch from another manufacturer, please proceed the checking as per “torch connection” mentioned in instruction manual;
5) Check if the cutting ground cable is well connected；
6) Check if the water in compressed air filter fixed at the back of machine is drained regularly；
7) Check if the gas pressure indicator lamp on the panel is ON. If it is not ON, check if compressed gas pipe is well connected, and if the gas pressure is normal. When the gas pressure is less than 0.3Mpa, the lamp is not ON, when 0.3MPa≤gas pressure<0.38MPa, the lamp blink and warn, when the gas pressure is higher than 0.38Mpa, the lamp keep on;
8) When the water cooling torch is applied, check if the water pressure indicator lamp on panel is ON. If it is not ON, check if the cooling water current is normal. When the water flow is lower than 2.0L/Min, the lamp is not ON, when 2.0L/min ≤ water flow<2.7L/min, the lamp blink and warn, when the water flow is higher than 2.7L/min, the lamp keep on;
9) Check if the overheat indicator lamp on panel is ON. If yes, check if the temperature relay on the radiator is damaged or not;
10) Open the machine top to check if the lead-typed fuse next to the control transformer has been fused;

11.2 Ordinary troubleshooting as following sheet

Code	Trouble	Possible reasons	Solutions

/	When the power is switched on, the lamp and the digital meter are not ON.	1.Three-phase power misses phase 2.Supply power switch is damaged 3.Power control fuse 3A is broken	1.Check three-phase power source 2.Change power switch 3.Change power control fuse
E80	Cannot start the cutting, the gas pressure indicator lamp is off	1．No gas pressure; 2．Gas pressure too low;	1．Connect the gas supply; 2．Adjust the gas pressure;
E81	Cannot start the cutting, the water flow indicator lamp is off	1. No water flow; 2. Water flow is too low;	1. Connect the cooling water supply; 2. Check if the water flow is normal, the water cooling flow should higher than 2.0L/min;
E82	No arc striking, and the power supply abnormal indicator lamp is ON	1．Three-phase power default phase; 2. Three-phase power is overload under voltage;	Check three-phase power source to ensure the supply voltage accords with the supply requirements.
E84	Cannot start the machine	The plasma receive a protection order from the intelligent water cooling unit;	Check if the water cooling unit is over-heating;
E85	/	The torch monitoring function is on, and the nozzle, electrode consumption life is over;	”Cut off the power and change the consumables, please refer to “7.6 torch monitoring function”
/	3. No arc striking or arc breaking during cutting. Overheat indicator lamp is ON.	1．The ambient temperature is too high. 2．When cutting, cooling fan rotates slowly or do not rotate, so the cooling effect is weak. 3．Temperature relay is damaged	1．Let the cutter rest for a while, and will come to work normally later. 2. Check fan power source or change cooling fan 3．Change temperature relay
/	No arc striking, cutting indicator lamp, gas pressure lamp are ON, and power supply abnormity indicator lamp and overheat lamp are not ON.	1．Cutting ground wire is not well connected. 2．Gas pressure is too high. 3．Torch electrode and nozzle are badly broken. 4．Torch electrode and arc striking wire is short circuit, which cause the damage of torch. 5. HF board is damaged.	1．Connect the cutting ground wire well 2．Lower the gas supply pressure 3．Change the electrode and nozzle 4．Change the torch 5. Change HF board
/	Bad cutting quality	1．Gas pressure is too high or too low. 2. The Air filter regulator cup is filled. 3．Work-piece is too thick 4．Torch electrode and nozzle are broken 5．Plasma arc is not perpendicular to the work-piece 6. Cutting speed is too fast or too slow	1．Adjust gas pressure 2. Water draining regularly 3．The thickness of work-piece should be within the quality cutting range. 4．Change electrode and nozzle 5．Adjust torch angle 6．Adjust cutting speed
/	Electrode and nozzle work life is very short.	1, Gas pressure is two low 2, Nozzle is too close to work-piece. The distance is less than 2mm. 3. Nozzle aperture is small, and not matched with applied current. 4. Electrode and nozzle is under quality problem. 5. The torch bought by user himself is under quality problem.	1．Adjust gas pressure 2．The distance should be within 2mm to 5mm 3. Select a proper nozzle matched with applied current. 4. Change a good quality electrode and nozzle. 5. Buy a good quality torch.

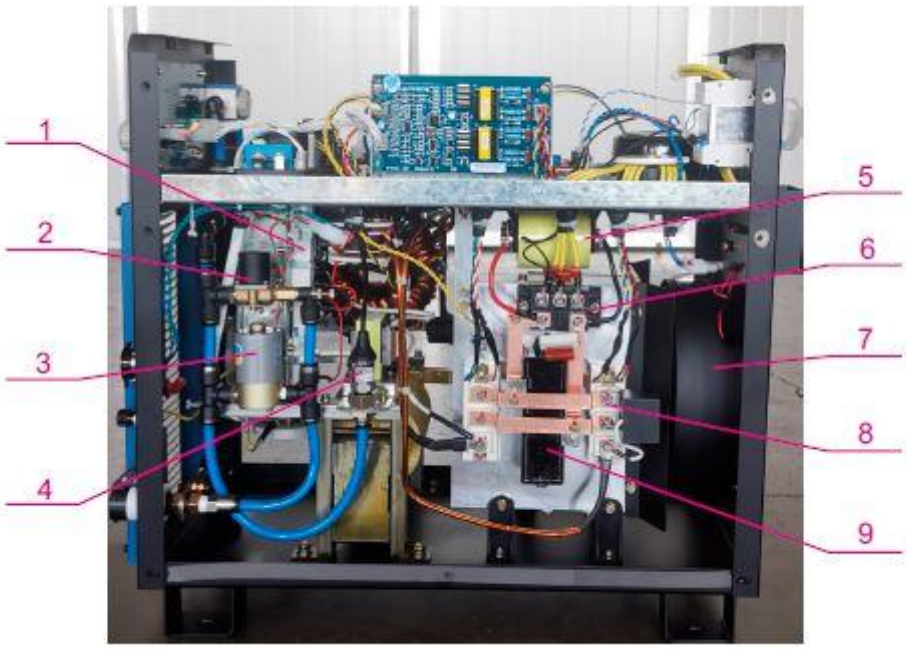
/	9.supply power trips	1.three phases rectifier is damaged. 2.IGBT module is damaged. 3.other components in main control circuit is damaged.	1.change a three phases rectifier under same model. 2.change IGBT module under same model. 3.check and change the damaged components.
	No arc striking, and guiding arc spraying out, but there is high frequency.	1. Fast recovery diode of secondary rectifying is damaged. 2. High frequency board PL13 is damaged. 3. High frequency leakage in cutter output circuit.	1. Change fast recovery diode under same model. 2. Check and change the damaged frequency board PL13. 3. Check leakage point, and strengthen insulation function.
/	Supply power trips	1. Three phases rectifier is damaged. 2. IGBT module is damaged. 3. Other components in main control circuit is damaged.	1. Change a three phases rectifier under same model. 2. Change IGBT module under same model. 3.Check and change the damaged components.

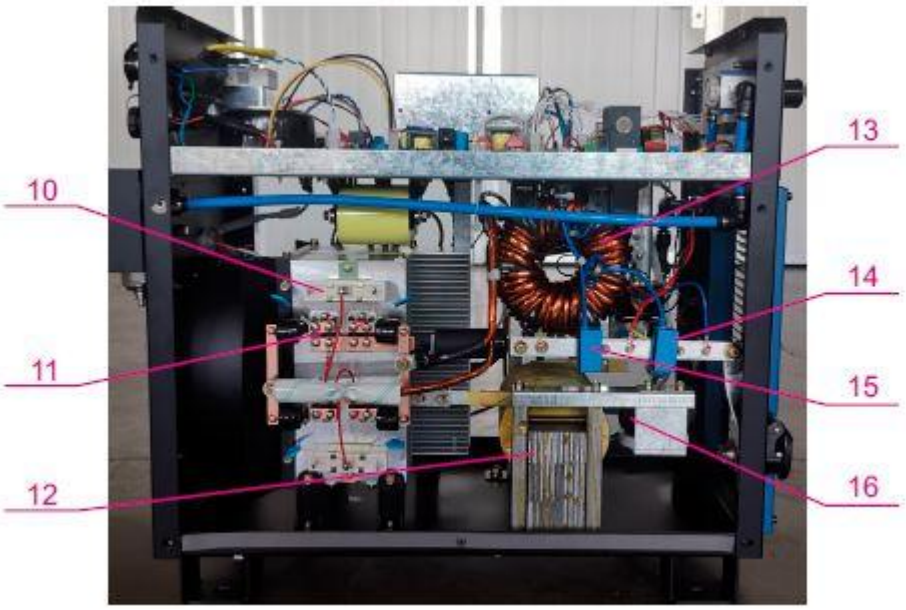
Sheet 6: Error code and troubleshooting

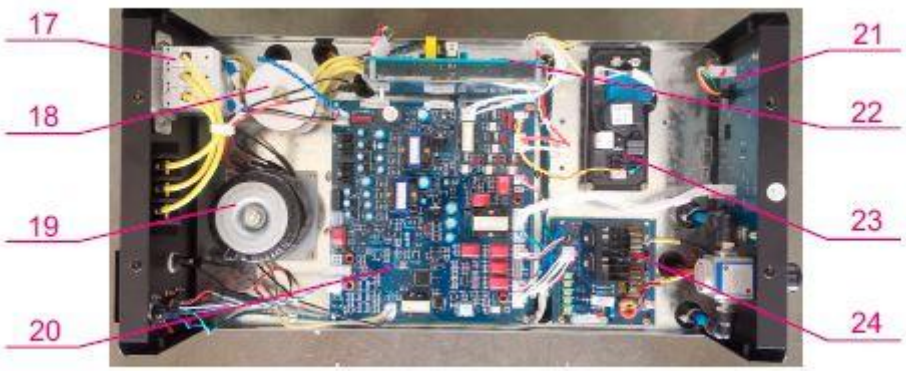
If got any problems not included in this sheet and cannot solved, please try to contact the local agent or the manufacture.

11.3 Main components list

LGK-120HD



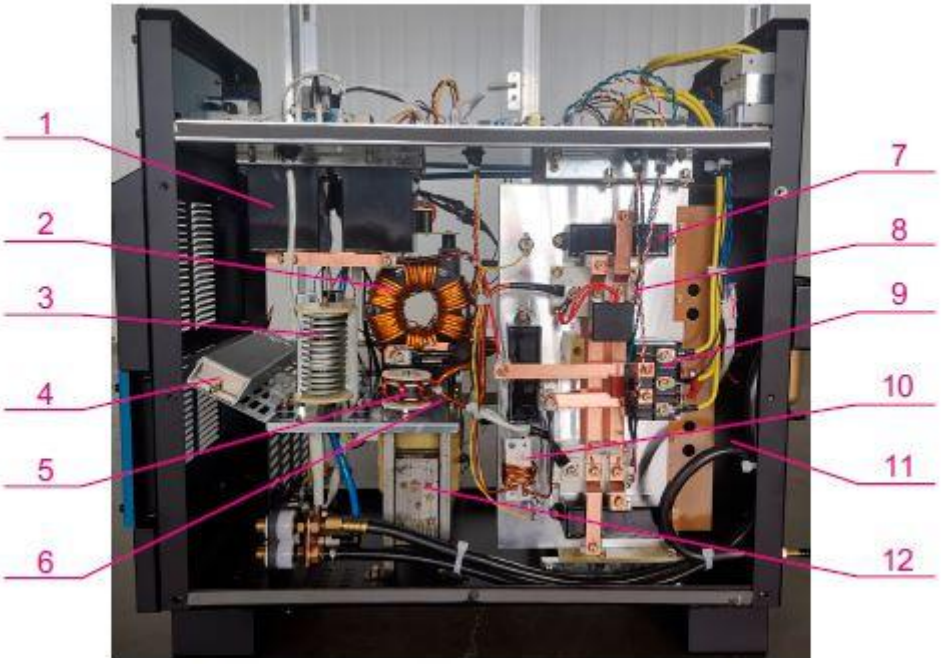


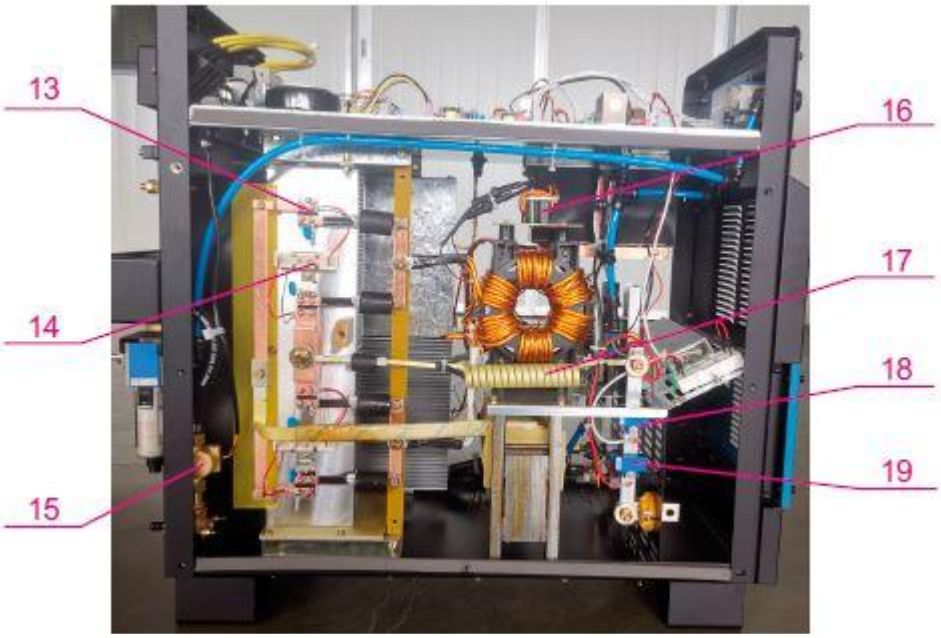


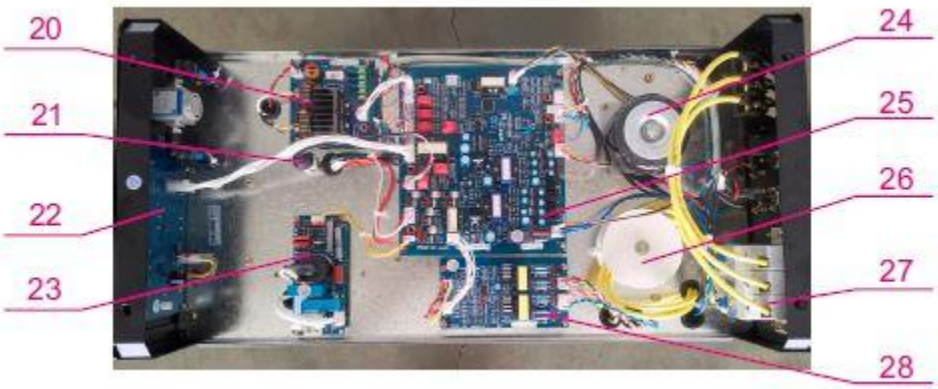
No.	Item	Model	Note
1	Resistor	RXG7-50W-10Ω	
2	Gas valve	DF2-3B-AC36V(3mm)纹 G1/8	
3	Gas valve	Q-5AC36V(5mm)G1/8	
4	Air pressure sensor	IP11C	
5	Capacitor	500VAC-100μF	
6	Bridge rectifier	MDS100-12	
7	Cooling fan	200FZY2-D/AC220	
8	IGBT	2A100HB12C1U or GD100HFF120C1SL	
9	Capacitor	HYC4003	
10	Resistor	RXG7-20W-30Ω+30Ω	
11	Diode	SE2F100P60S	
12	Filter reactor		
13	Main transformer		
14	Hall sensor	TKC200BR	
15	Hall sensor	TKC200BR	
16	HF coupled inductance		
17	Air breaker	DZ47-63/3P D63	
18	Three phase common mode inductance		
19	Control transformer	TL07	
20	Main PCB	PL12	

21	Panel PCB	PL15	
22	Drive PCB	PT05(15Ω)	
23	HF PCB	HY-110V	
24	Arc pilot PCB	PL13	

LGK-200HD



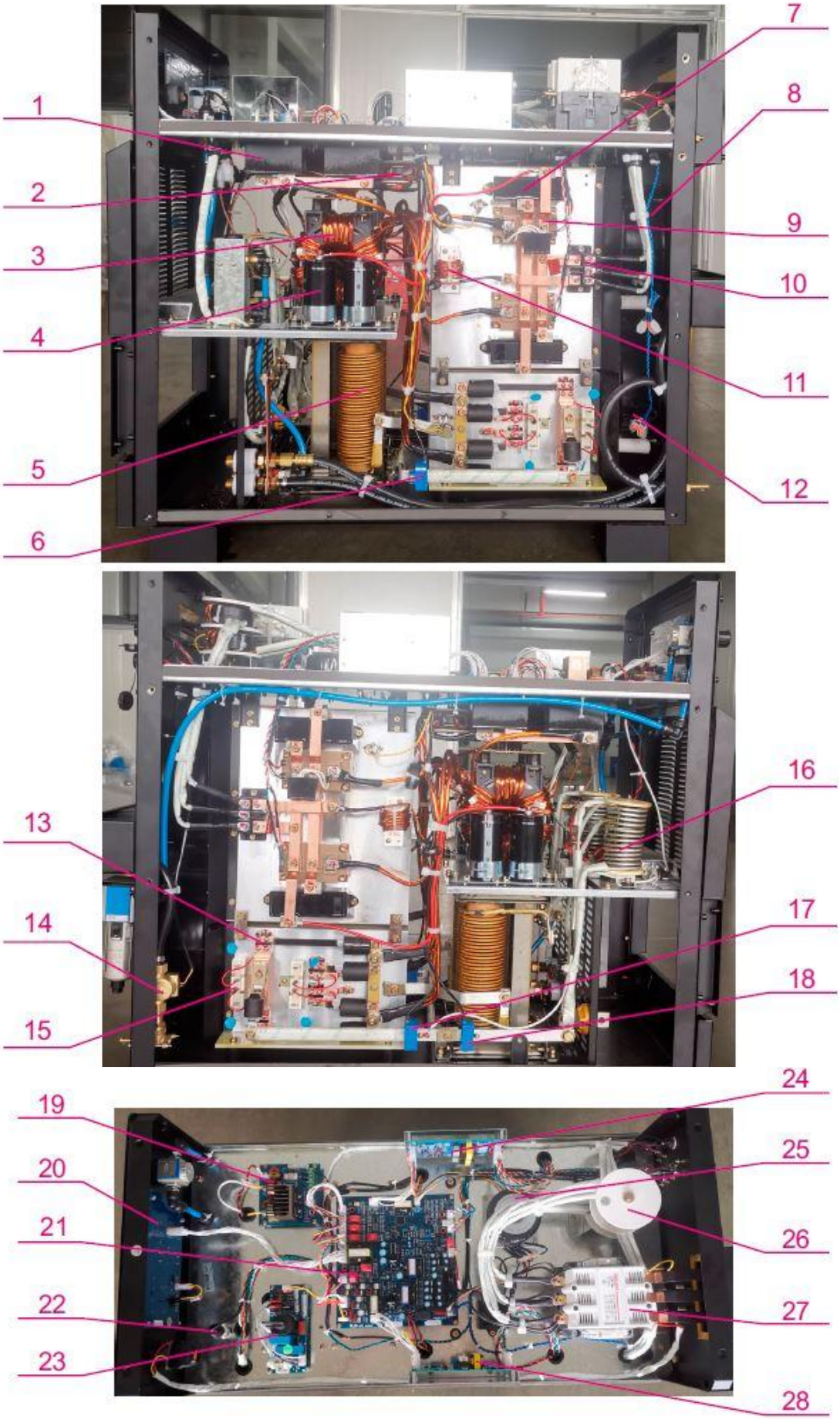




No.	Item	Model	Note
1	Capacitor	HYC4004	
2	Main transformer		
3	HF coupled inductance		
4	Resistor	RXG14-400W-1.5Ω J	
5	Saturation inductance		
6	Capacitor	HYC3002	
7	Capacitor	HYC4003	
8	IGBT	CM200DC-24NFM	
9	Bridge rectifier	MDS150-16	
10	Chock inductance		
11	Cooling fan	200FZY2-D/AC220	
12	Filter reactor		
13	Diode	DBA200UA60	
14	Resistor	RXG7-20W-30Ω+30Ω	
15	Water flow sensor	SEN-HZ21WC	
16	Linear inductance		
17	Positive output inductance		
18	Hall sensor	TKC200BR(BL2Y2-200IOV2L)	
19	Hall sensor	TKC200BR(BL2Y2-200IOV2L)	
20	Arc pilot PCB	PL13	

21	Air pressure sensor	IP11C	
22	Panel PCB	PL14	
23	HF PCB	HFAP1	
24	Control transformer	TL07	
25	Main PCB	PL12	
26	Three phase input inductance		
27	Air breaker	CDB2-125/3P/D80	
28	Drive PCB	PT05(6.8Ω)	
29	Air filter	GF30010	Refer to page 16 photo，No.30
30	Water filter	HYTYJ-30-006	Refer to page 16 photo，No.33

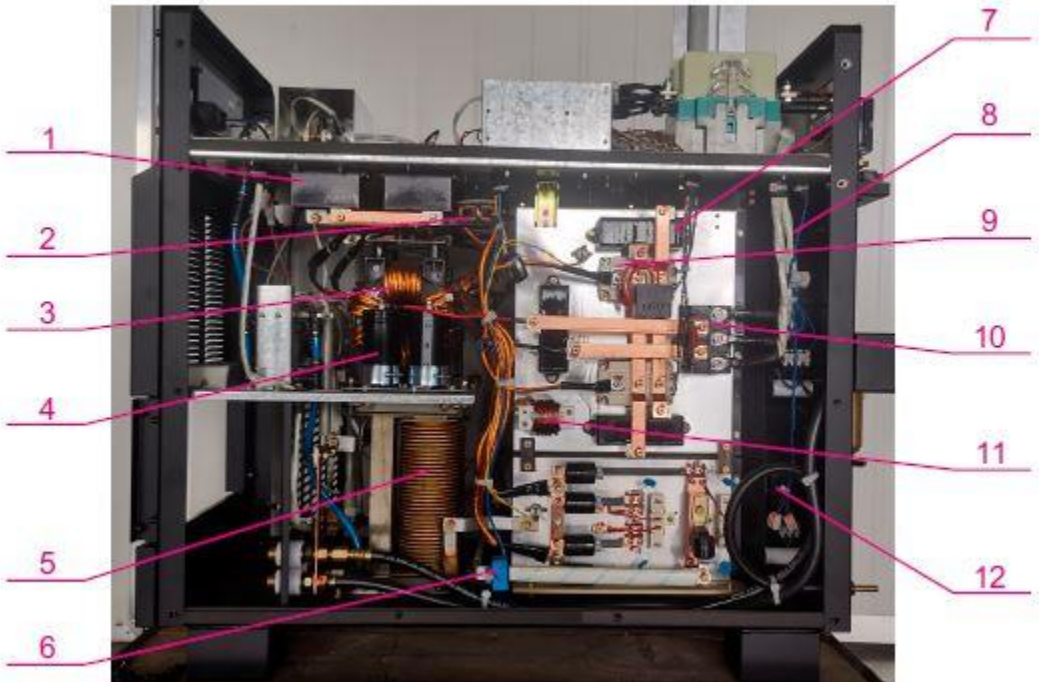
LGK-300HD

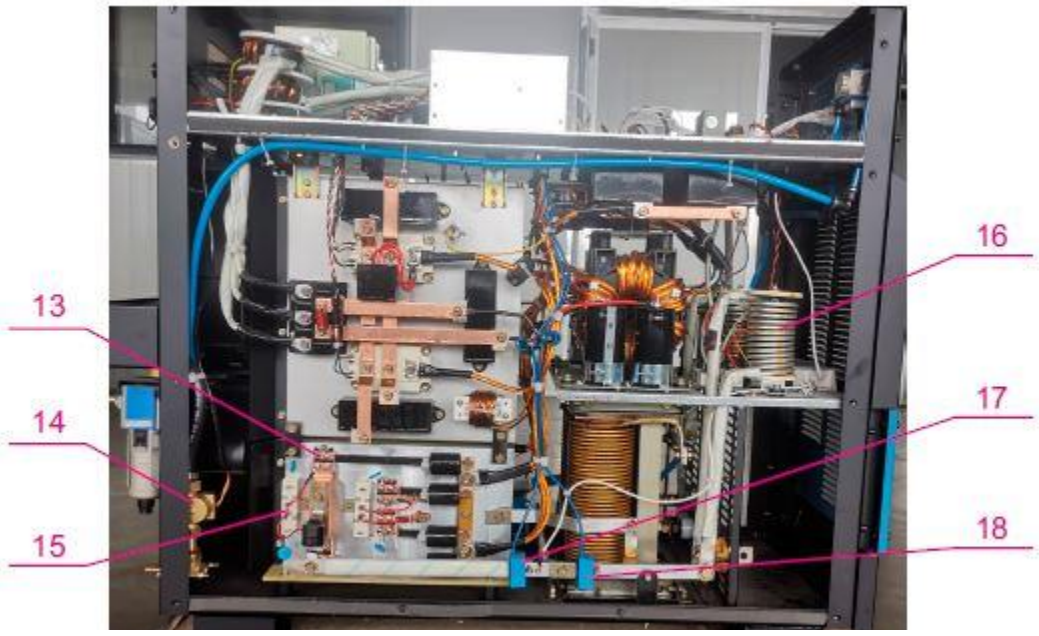


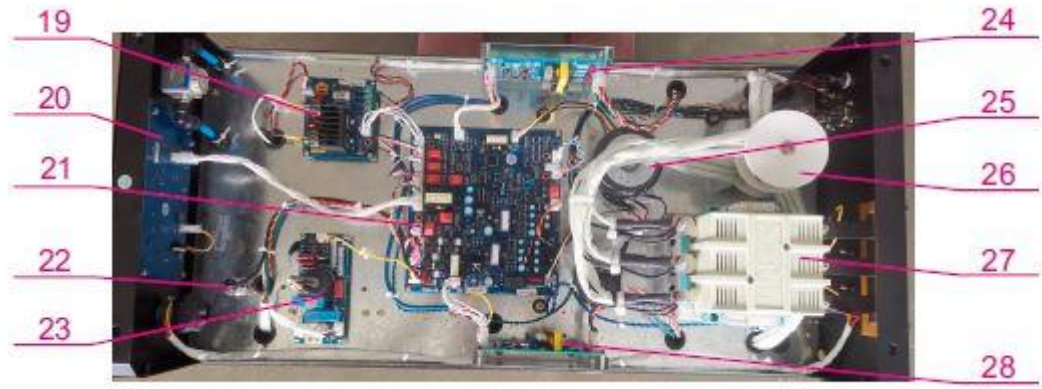
No.	Item	Model	Note
1	Capacitor	HYC3002	
2	Saturation inductance		
3	Main transformer		
4	Capacitor	CD135-400V-2200μF	
5	Filter reactor		
6	Hall sensor	TKC200BR（BL2Y2-200IOV2L）	
7	Capacitor	HYC4003	
8	Cooling fan	200FZY6-SF/200V	
9	IGBT	CM150DC-24NFM/FF200R12KT4	
10	Bridge rectifier	MDS100-12	
11	Chock inductance		
12	Cooling fan	200FZY6-SF/200V	
13	Diode	DBA200UA60	
14	Water flow sensor	SEN-HZ21WC	
15	Resistor	RXG7-20W-30Ω+30Ω	
16	HF coupled inductance		
17	Hall sensor	TKC200BR（BL2Y2-200IOV2L）	
18	Hall sensor	TKC500BR（BL2Y2-500IOV2L）	
19	Arc pilot PCB	PL13	

20	Panel PCB	PL14	
21	Control PCB	PL12	
22	Air pressure sensor	IP11C	
23	HF PCB	HFAP1	
24	Drive PCB	PT05(10Ω)	
25	Control transformer	TL07	
26	Three phase input inductance		
27	Contactor	CJ20-100/380V	
28	Drive PCB	PT05(10Ω)	
29	Air filer	GF30010	Refer to page 17 photo，No.30
30	Water filter	HYTYJ-30-006	Refer to page 17 photo，No.33

LGK-400HD



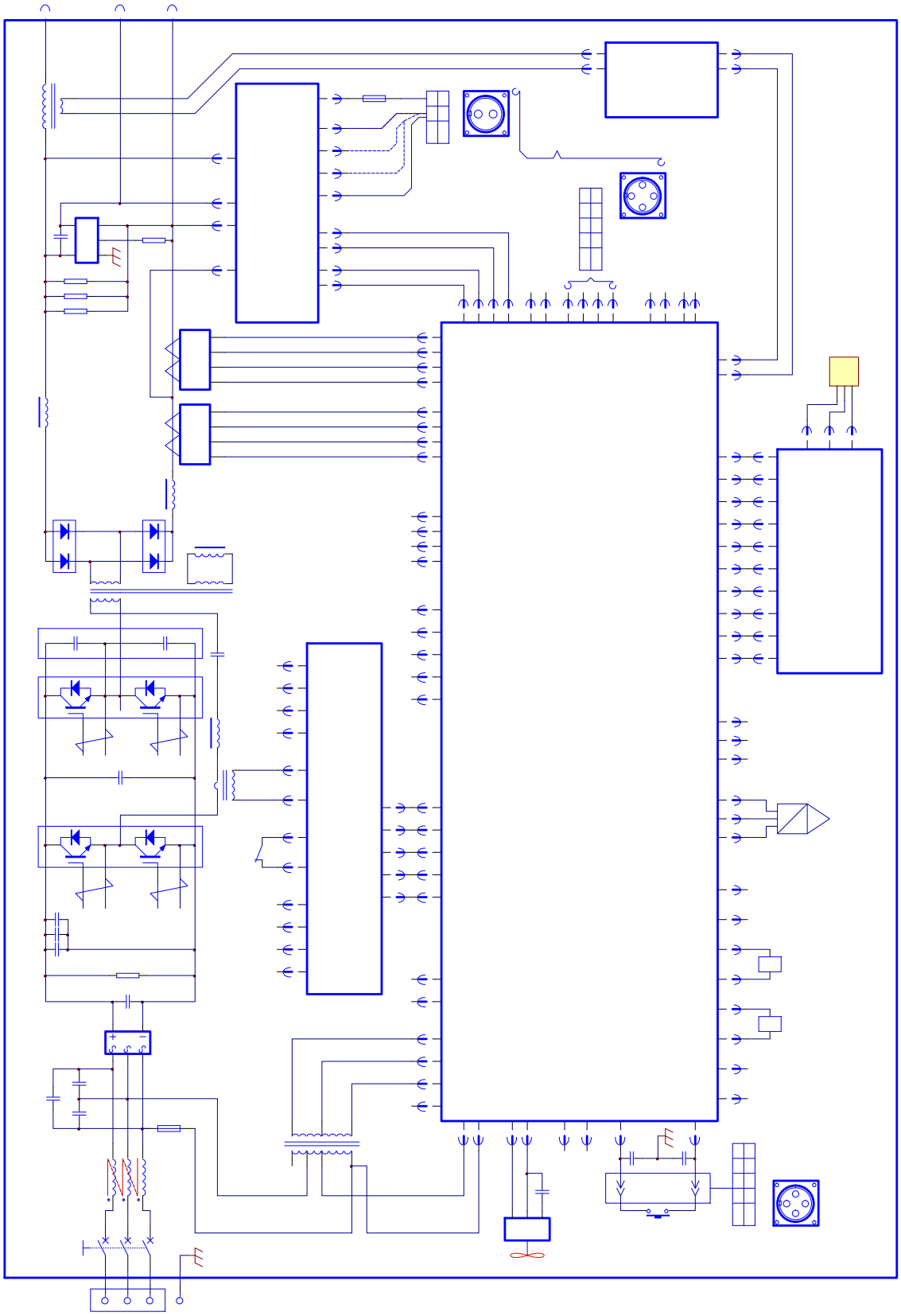


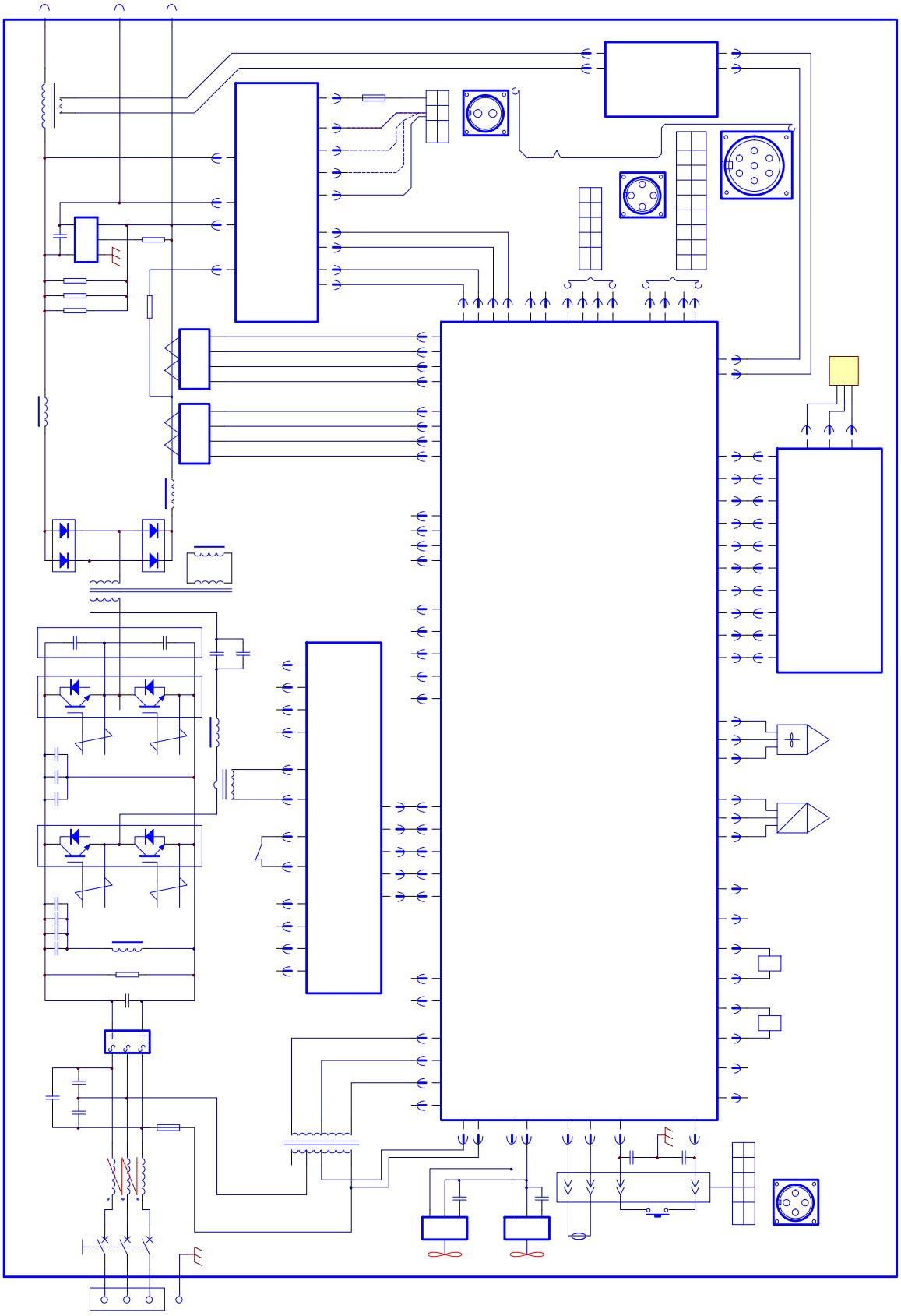


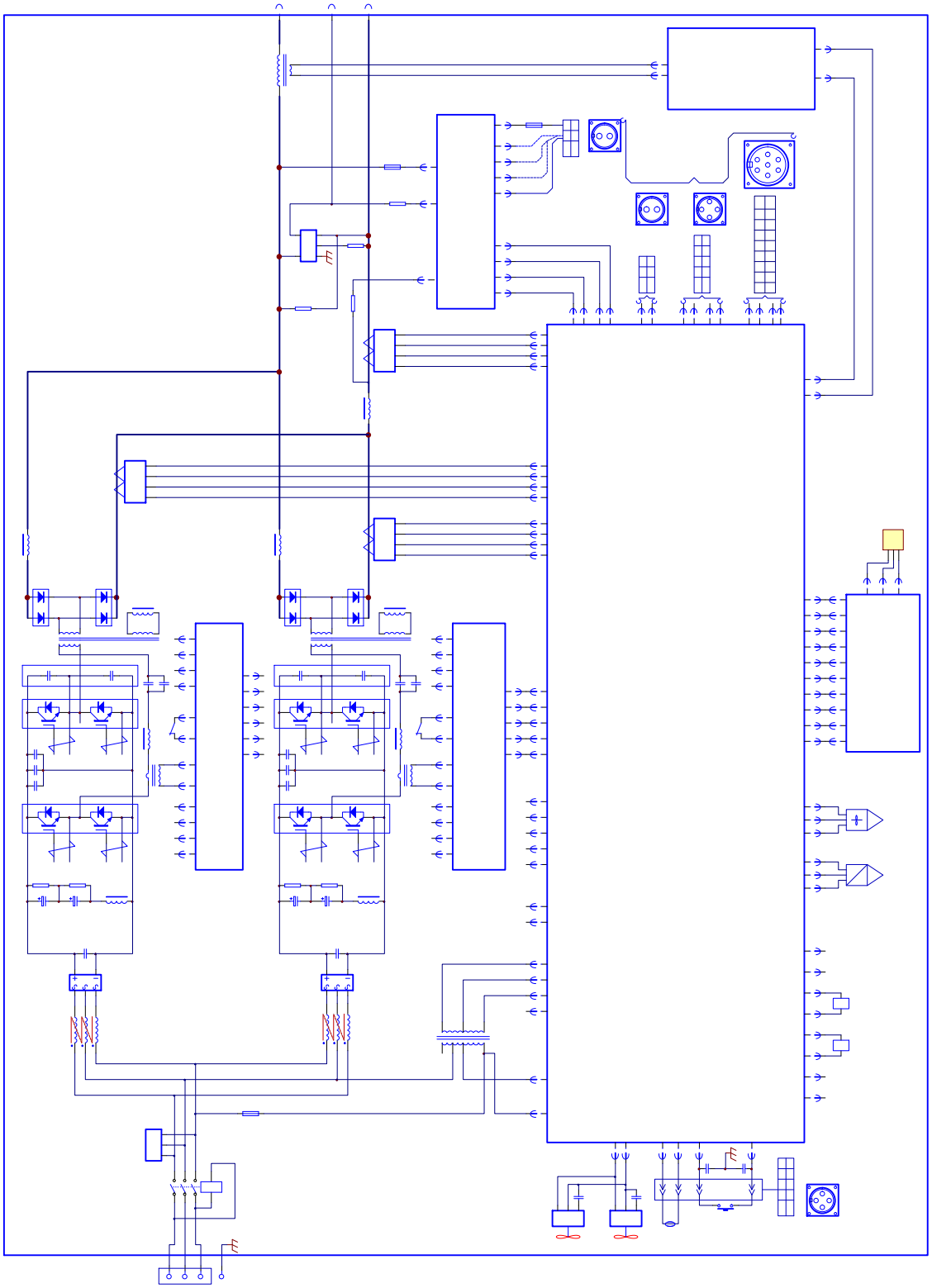
No.	Item	Model	Note
1	Capacitor	HYC3002	
2	Saturation inductance		
3	Main transformer		
4	Capacitor	CD135-400V-2200μF	
5	Filter reactor		
6	Hall sensor	TKC200BR（BL2Y2-200IOV2L）	
7	Capacitor	HYC4003	
8	Cooling fan	TG28080HA2BL-C	
9	IGBT	FF200R12KT4	
10	Bridge rectifier	MDS150-16	
11	Chock inductance		
12	Cooling fan	200FZY6-SF/200V	
13	Diode	DBA200UA60	
14	Water flow sensor	SEN-HZ21WC	
15	Resistor	RXG7-20W-30Ω+30Ω	
16	HF coupled inductance		
17	Hall sensor	TKC200BR（BL2Y2-200IOV2L）	
18	Hall sensor	TKC500BR（BL2Y2-500IOV2L）	
19	Arc pilot PCB	PL13	

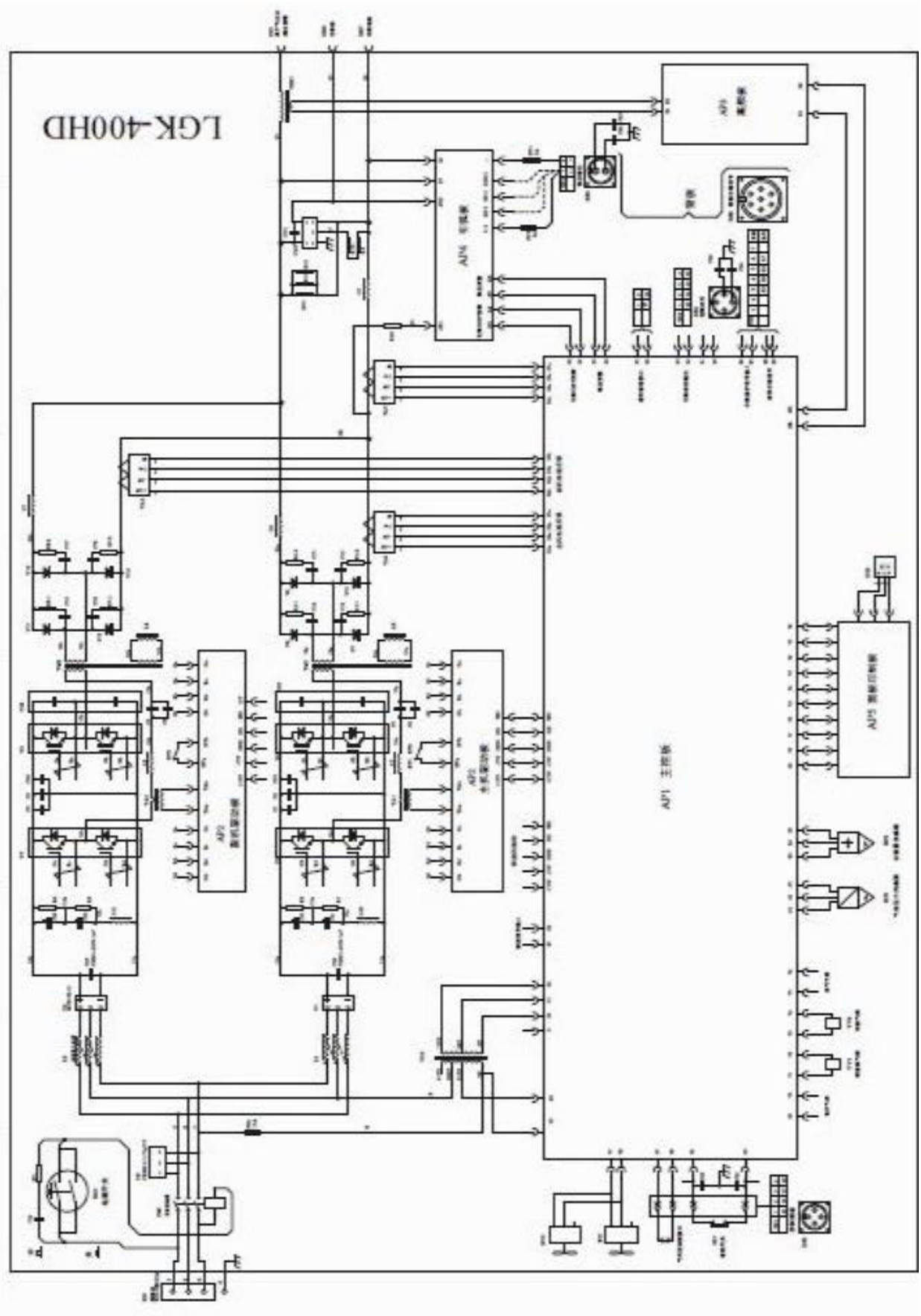
20	Panel PCB	PL14	
21	Control PCB	PL12	
22	Air pressure sensor	IP11C	
23	HF PCB	HFAP1	
24	Drive PCB	PT05(6.8Ω)	
25	Control transformer	TL07	
26	Three phase input inductance		
27	Contactor	CJ20-160/380V	
28	Drive PCB	PT05(6.8Ω)	
29	Air filer	GF30010	Refer to page 17 photo，No.30
30	Water filter	HYTYJ-30-006	Refer to page 17 photo，No.33

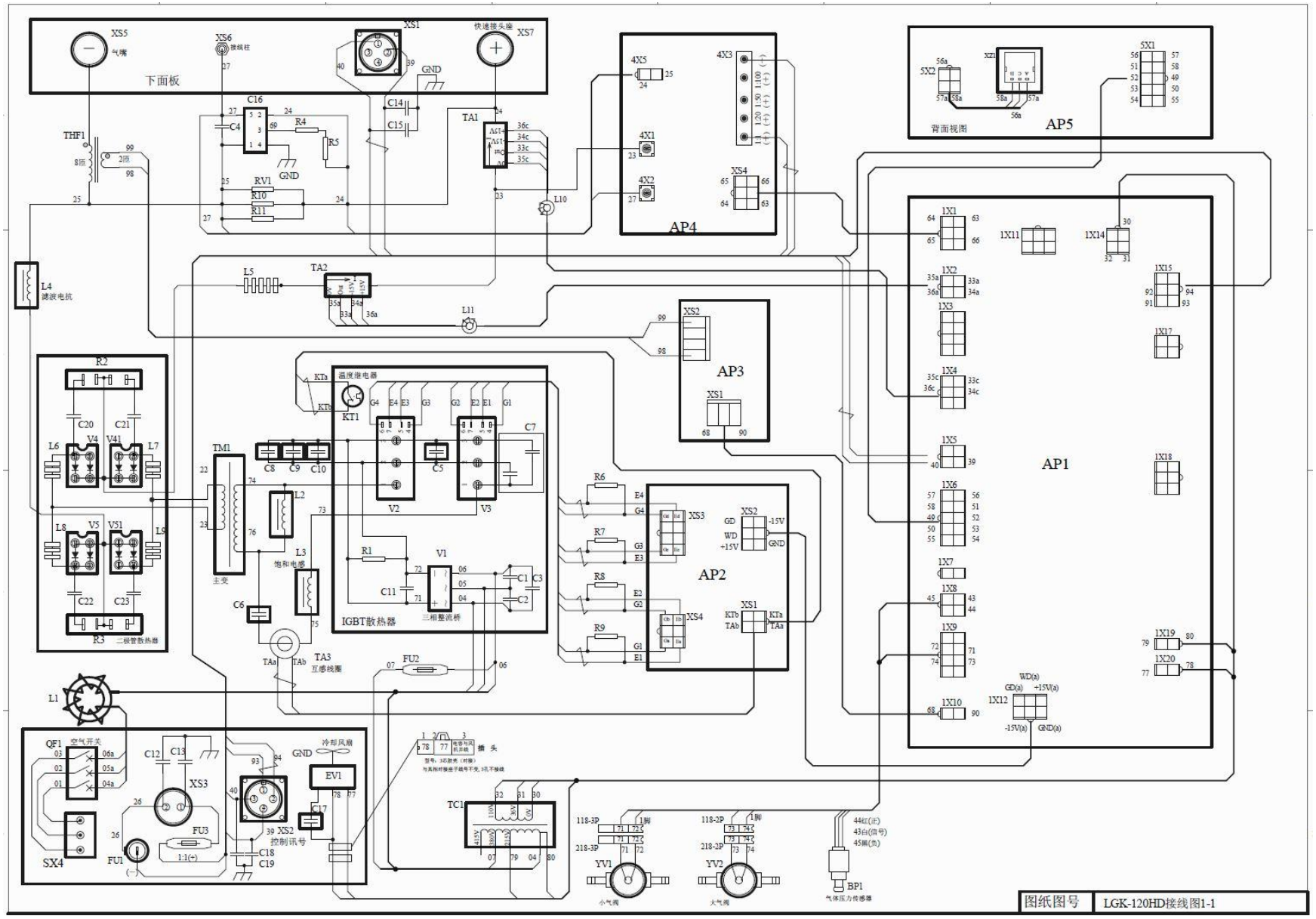
Attached diagram

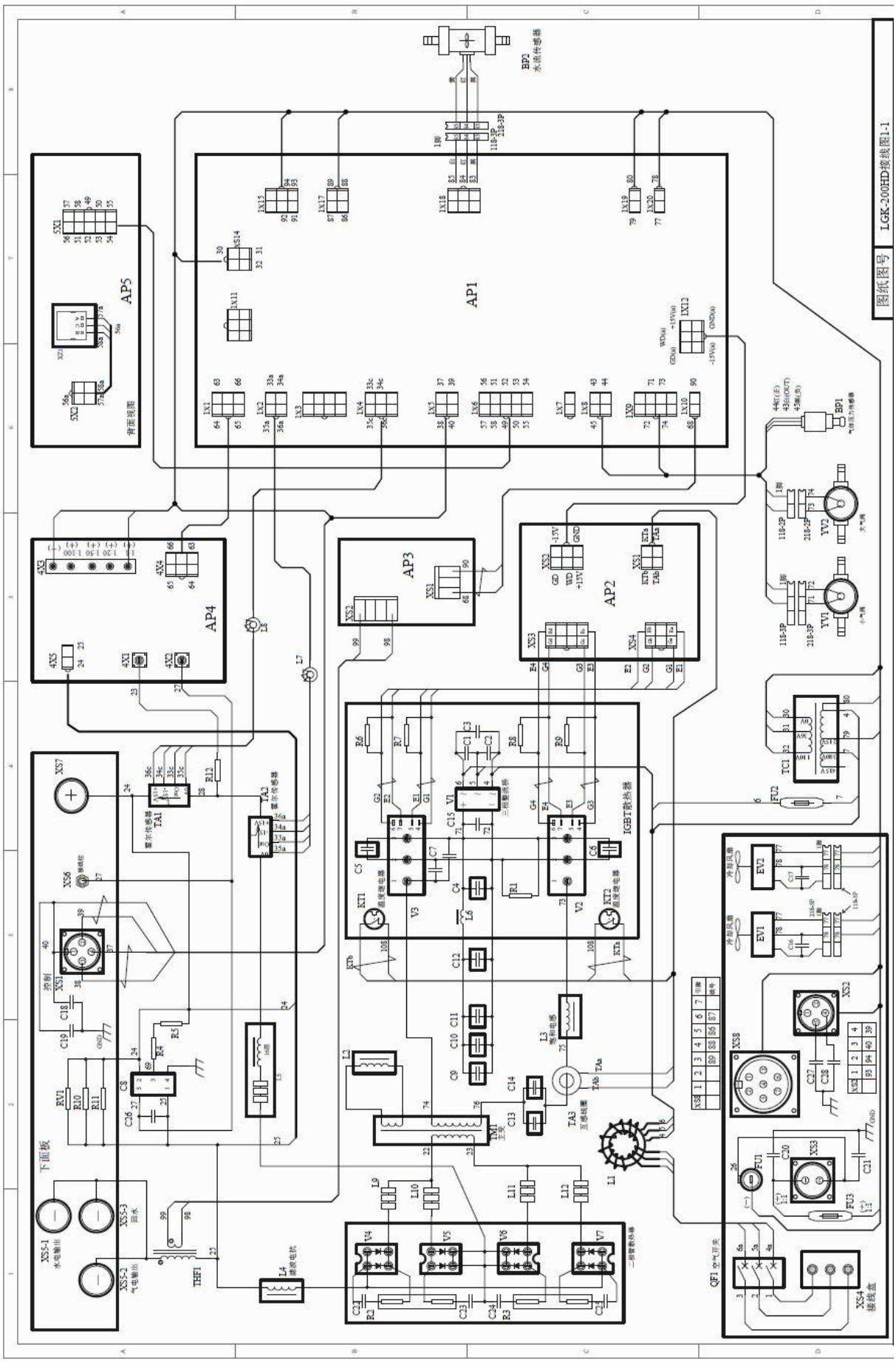


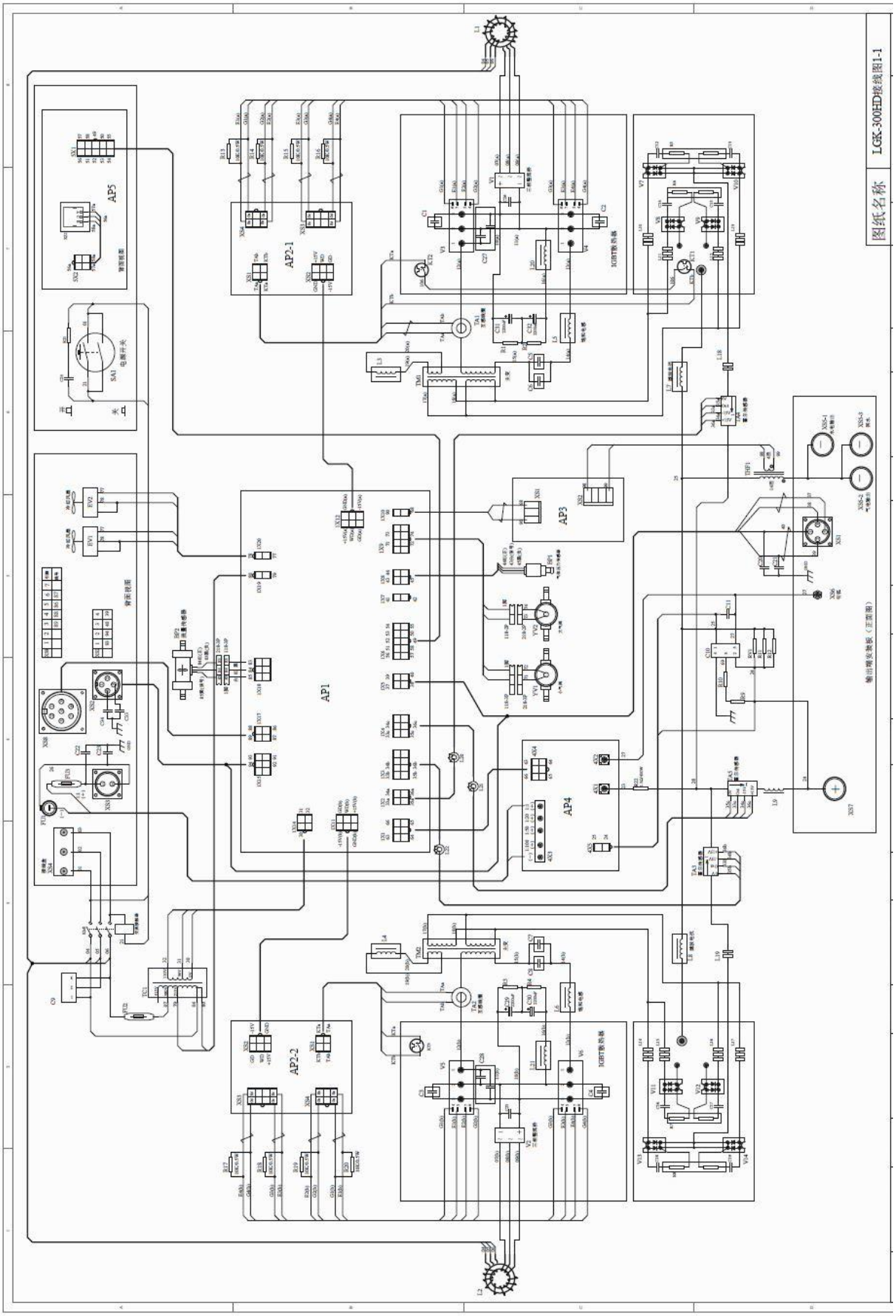


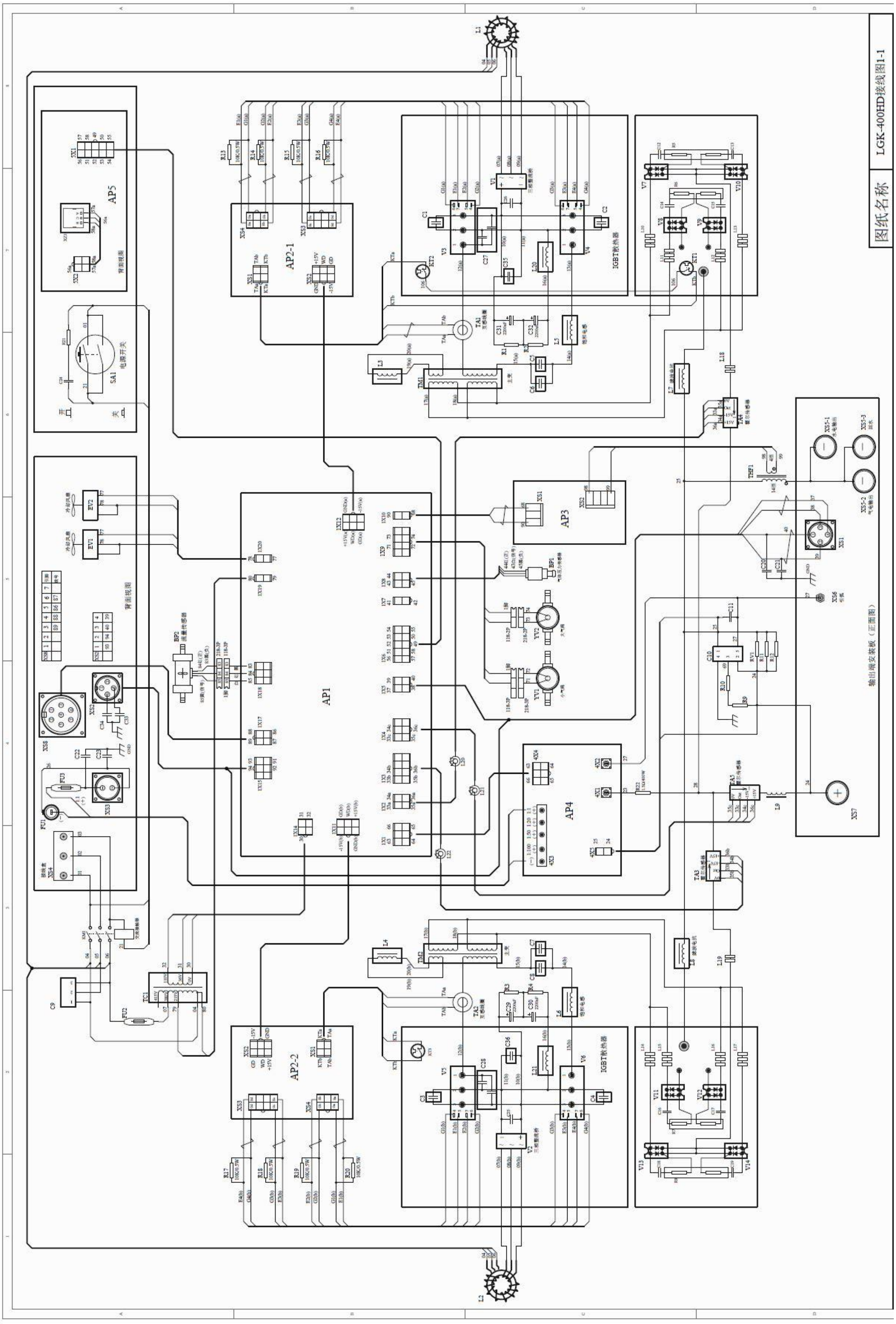



LGK-400HD


下面板
XS5
气嘴
XS6
接线柱
XS1
快速接头座
XS7
GND
THF1
C16
C4
R4
R5
C14
C15
TA1
RV1
R10
R11
L10
4X5
4X1
4X2
4X3
XS4
AP4
5X2
5X1
背面视图
AP5
L4
滤波电抗
L5
TA2
L11
XS2
AP3
XS1
R2
C20
C21
V4
V41
L6
L7
L8
V5
V51
L9
C22
C23
R3
二极管散热器
TM1
主变
C8
C9
C10
KTa
KTb
温度继电器
KT1
G4
E4
E3
G3
G2
E2
E1
G1
C7
C5
V2
V3
L2
L3
饱和电感
C6
R1
C11
V1
三相整流桥
C1
C3
C2
IGBT散热器
TAa
TAb
TA3
互感线圈
FU2
R6
R7
R8
R9
XS3
XS4
AP2
GD
WD
+15V
-15V
GND
KTb
TAb
KTa
TAa
AP1
1X1
1X11
1X14
1X15
1X2
1X3
1X17
1X4
1X5
1X18
1X6
1X7
1X8
1X9
1X19
1X20
1X10
1X12
WD(a)
GD(a)
+15V(a)
-15V(a)
GND(a)
L1
QF1
空气开关
SX4
C12
C13
XS3
FU3
FU1
C18
C19
冷却风扇
GND
EV1
C17
XS2
控制讯号
插 头
TC1
118-3P
218-3P
YV1
小气阀
118-2P
218-2P
YV2
大气阀
44红(正)
43白(信号)
45黑(负)
BP1
气体压力传感器
图纸图号
LGK-120HD接线图1-1


图纸图号
LGK-200HD接线图1-1
AP1
AP2
AP3
AP4
AP5
IGBT散热器
下面板
QF1 空气开关
XS4 接线盒


LGK-300HD接线图1-1
图纸名称
AP1
AP2-1
AP2-2
AP3
AP4
AP5


图纸名称
LGK-400HD接线图1-1
AP1
AP2-1
AP2-2
AP3
AP4
AP5
IGBT散热器
L1
L2

Chengdu Huayuan Electric equipment Co.,Ltd.

Address: No.1299 Konggang 2nd Road, Shuangliu Area, Chengdu, China

Postcode: 610207

E-mail: hwayuansales@163.com

Website: www.hwayuan.com