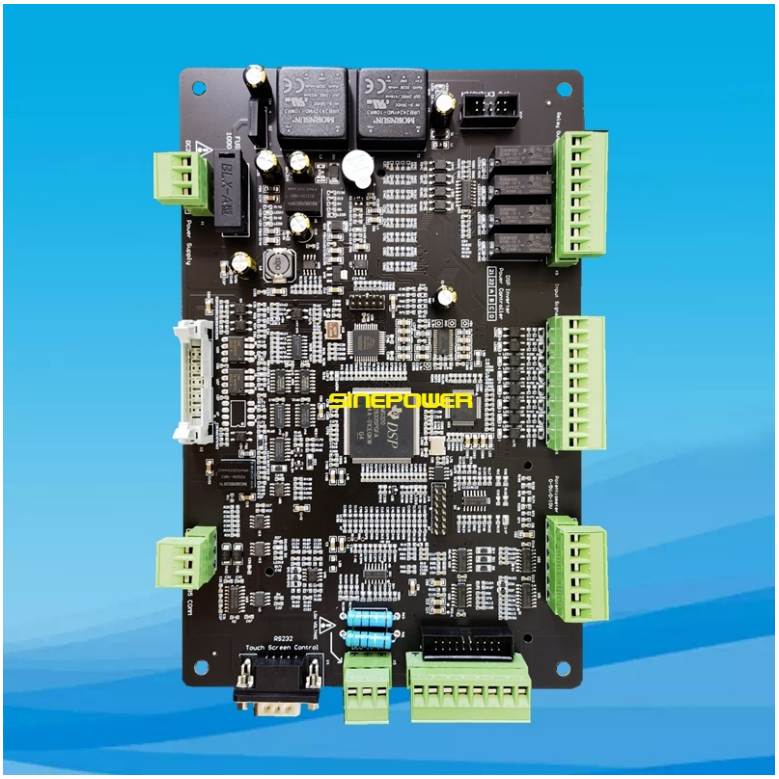
SINEPOWER

SD310

Induction Heater Power Supply User Manual



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Content here just for your reference, we will update the user experiences, like to modify the parameters for better functions.
Pls follow our updates on our website, and download the electronic edition freely.

- **Safety regulations and notes before operation:**

>> Safety regulations:

1. The wrong use may cause permanent damage to the product or serious personal accidents. Therefore, the operating procedures must be strictly follow the user manual, national and industry standards and safety regulations.
2. The installation, maintenance or guidance installation or maintenance control devices should be charged by professional and technical person with relevant experience.
3. Under no circumstances should you plug out the wiring or try to touch the contacts in the socket while it is still on power to prevent electric shock and accidents.
4. This machine is designed to be used in a cool and dry environment. It needs to maintain a good ventilation and heat dissipation environment. Please do not soaking in water or exposing under the sun. And pls don't run it in the environment where the temperature exceed the electric requirements, and clean the control card regularly.
5. Under no circumstances should the control panel be operated beyond the design limit.
6. Please strictly follow the instructions. For any equipment or personal injury caused by failure to follow these operating instructions, we do not take any civil and criminal responsibility.
7. Trying to repair the damaged control board (regulator) may cause permanent damage to the equipment. If there is a trouble, please contact us, we will provide technical support as soon as possible. Please do not attempt to repair the unit all by yourselves.
8. This manual can only be applied to its supporting equipment. We will be continuously upgrade and improve our products and to modify the versions of user manual as well. Pls follow our latest updates on website, we won't contact you directly for the latest update technical data!!!
9. Pls connect the ports according the wiring diagram carefully, to prevent interferences, the given control wire, IGBT control wire and the main circuit power supply wire should be connect separately. If not, pls use twisted shield wire for the control wires; and pls strictly obey the relations between the control board and IGBT wires.
10. **The external control terminal has the related power supply deploy, pls don't send an active signal into that port, or there be will be an irreparable damage**
11. We are not responsible for the damage of other units which is not from our control card.
12. Inductor is forbidden to install on metal platform or stay, prohibit the use of metal wire tied to the inductor.
13. The induction heater is heating rapidly, prohibit to touch the work piece directly or put into the inductor which is running by hand.
14. The running induction coil of the induction power supply, has high voltage, and there is electrical magnetic around, people with pacemakers are prohibited from approaching.
15. Service commitment, during the normal operation, we provide one year free warranty, but the shipping cost back and forth, as well as the custom duty should all be paid by buyer. After one year, we still provide technical support, and the small spare parts is provide with cost.

Before operating this control panel, please read the user manual carefully to avoid incorrect operation and accidents!

I. Summary:

SD310 series induction heating power supply IGBT control card is using DSP + CPLD structure design, highly digital exquisite industrial quality design. Supporting a variety of network remote control and on-site control methods, it is an inductive heating power supply product with international advanced technology level developed independently for the second generation by SinePower. Working frequency within 100kHz, power within 100kW. It is using IGBT or MOSFET as the inverter device, digital control, it can assure IGBT works at ZSC switch status under any working condition, strong ability in adapting sensor and site conditions. Meanwhile, it is with complete fault detection, running monitoring and event recording function, the system will record the running status or system fault in real-time. It is suitable for metal material hot processing, heat treatment, hot assembly, welding, and melting.

The main control card continues to lead the innovation of the core control algorithm and software technology in the industry. The structure and operation processing speed of the control software package can ensure the adjustment of all control loops finish quickly. Meanwhile, it has good reliability and strong anti-interference ability, with unique anti-interference measures, it can be operated normally in harsh interference environment. The input and output are all isolated, and the scope of application is wide. It has perfect fault detection, alarm indication, and protection function. All parameters are digital, no temperature drift changes, which will improve the adjustment accuracy and power utilization efficiency.

Application:

Forging

Smelting

Casting

Fiber drawing

Sapphire melting

Crystals growth

II. Technical specifications:

2.1 .Input power supply: 24Vdc ±15% , upper than 100W
2.2 .Main circuit working power: 5 ~ 1000Vdc
2.3. Inverter output frequency: 400Hz ~ 100 kHz, DC chopper frequency: 1k ~ 20 kHz
2.4. Temperature adjust range: 0~2000 degree
2.5. Voltage and current adjust range: 0 ~ 1000V (valid in chopper or DC phase shift power adjustment mode), 0 ~ 2000A
2.6. Power adjust range: Within 600kW
2.7. PID respond: 1mS
2.8. Stable accuracy: better than 0.05%， 16 bytes high accuracy sampling
2.9. Input signal: DC0-5V, 0-10Vdc, 10K potentiometer adjust or touch screen HMI given
2.10. Control methods: Series resonance power supply, PSM/PFM/DCM
2.11. 8 roads of input signal, 4 roads of relay output. (I/O isolated control)
2.12. Alarm relay contact capacity: 250Vac/10A
2.13. Voltage isolation: 3500 VRMS
2.14. Working environment: temperature: -20℃~ 60℃, RH: ≤ 90%RH（nodew）
Install: No flammable or explosive, no corrosive gas, no conductive dust, and altitude shall below 3000 M, upper than 3000 M should be properly reduce the capacity level.
2.14. Mechanical size: 230 * 150 * 35mm Installation holes size: 215 * 135mm
2.15. Weight: 0.3KG

III. Features:

1. Adopt DSP+CPLD digital control system, automatic frequency tracking and other advanced control technologies to make the equipment more stable and more efficient. Fully automatic SMD process manufacturing, stable and reliable performance; HMI support Chinese and English language display.
2. Working mode: Constant current, constant power, constant temperature (optional function), process procedure (optional function), users can choose according to different working situation, support 12 bytes normal accuracy or 16 bytes high accuracy (optional function) sampling control.
3. The main control board comprehensively improves the system control accuracy and adjustment speed, current and voltage display resolution can reach 0.1or 0.01V/A, power display reaches 0.01kW resolution, output is stable.
4. Great fault detection and alarm function, real-time detection of load status, load current, control signal, feedback signal loss and other parameters, for the short circuit and open circuit fault in the heating sensor, designed with over frequency / low frequency protection functions, the protection system is more perfect and reliable. The current loop (voltage loop) feedback input signal supports various analog input signals such as transducer, Hall current (voltage) sensor 0-5V, etc.
5. Intelligent PID control solution, parameter openness, can be flexibly set to any physical quantity, suitable for different loads, and of good dynamic characteristics;
6. Interface compatibility: support 0-5Vdc, 0-10Vdc and other input signals, can be directly connect with various instruments and PLC, also can be manually controlled by potentiometer;
7. The main control board is with DC/DC isolated module, all output ports and switch digital input ports adopt electrical isolation design, which has better electromagnetic anti-interference protection effect.
8. Highly integrated main control board, wide frequency automatic tracking system, with fewer fault points and more precise control. Wide-band design load adaptability, single power supply can meet a variety of workpiece heating needs, no need to change multiple motherboards frequently; can facilitate users to quickly and accurately find the best frequency, temperature, heating depth and energy consumption through adjustment process matching relationship.
9. DSP real time detect the current changing state of the IGBT with high speed. Calculate the best control angle for the present running by frequency sweep phase lock (PLL), and adjust the phase lock frequency and phase position of the

resonance inverter device, to ensure the power supply to work at its best performance.

10. Good resistance to voltage fluctuations, ensuring normal operation when the grid voltage fluctuates between 330V and 440V. It adopts voltage/power and current double closed-loop control, with constant voltage, constant current and constant power running functions, i.e., the output voltage or power does not change along with external factors, which can ensure the stability of load heating.

11. With Event Record function, HMI touch screen or external U disk will store 7 days records, the system will record the ON/OFF or system fault situation timely, convenient for users to query the running status and fault information, and find the related problem solve method; on-site display of fault, the touch screen will shows the fault content, click the related fault assist can help to find the related fault solve method. These can help the operator to solve 90% of the problem quickly, reduced the dependence of the operator's skill level.

12. Inverter voltage and inverter current are collected in real time to make an output curve trend graph, which is convenient for long-term observation of the operation of the machine. The historical output function can be traced, displayed in a graphical form, the output parameters during the operation will be saved, and these can be printed out (print function, optional)

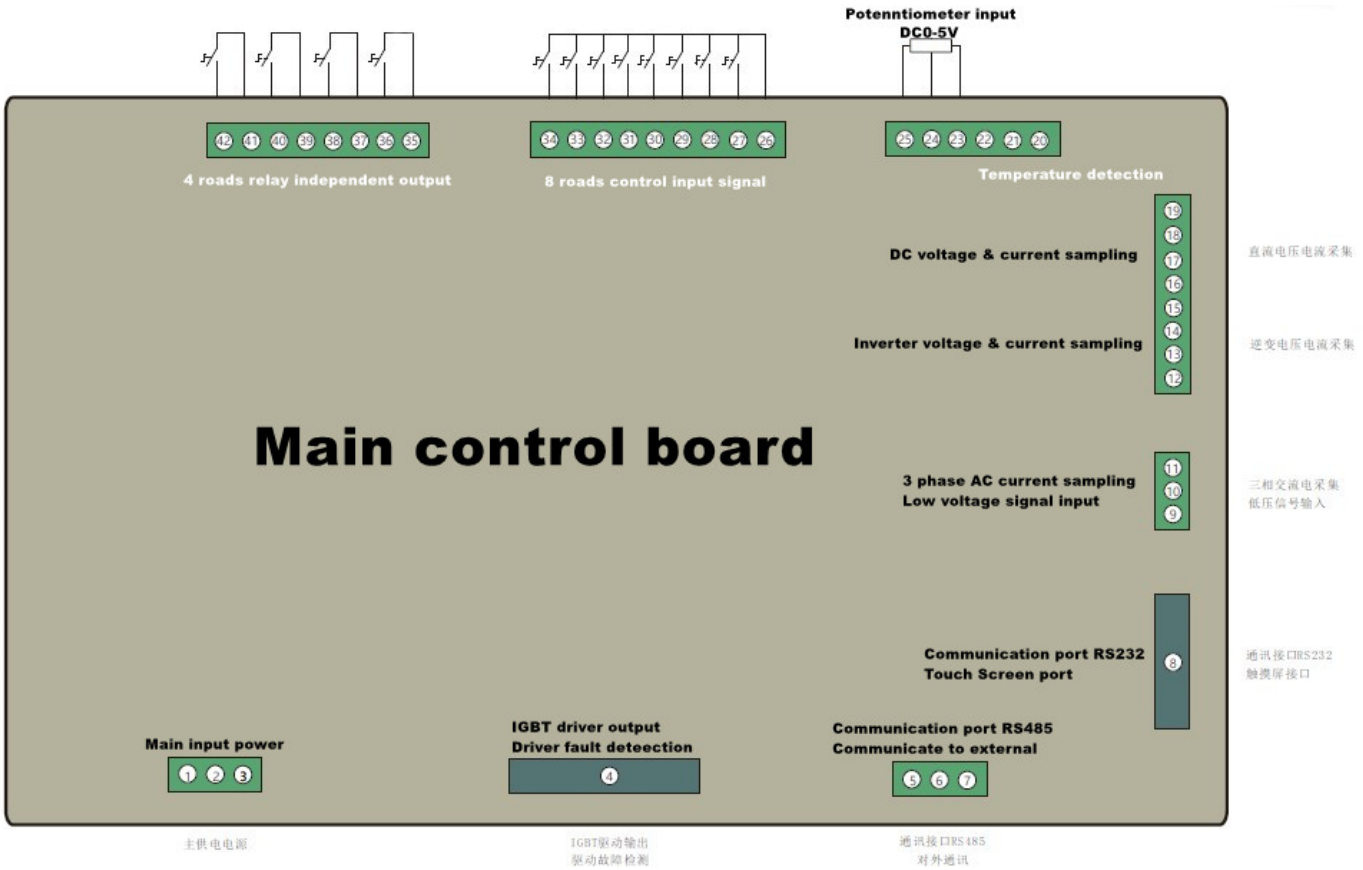
13. MODBUS fieldbus communication function, fully isolation control. The RS485 can exchange data with an external controller, and transmit all internal parameters of the above mentioned power supply to the host computer or the central control bus.

14. Uninterruptible running design, when there is a power main circuit fast switching or flickering, the control board will run a self-diagnose, after repower on, it will auto-recover and return to normal working to avoid the production loss by out of service.

15. The IGBT driver control board is an attached with the main control board, it uses the innovative fast protection IGBT driver circuit, which reduces the dead zone time, and it is with anti-explosion tube protection which can add the stability of the whole machine.

16. The process procedure running allows user to preset current curve (or voltage, temperature and power curve), so as to finish the complex heat treatment process or heating process requirements, the main control board supports a maximum of eight process programs, each process program can be programmed with eight operation steps, each step can be timed and programmed with different modes, and the parameter will be saved after setting.

IV. Control card terminal definition:



Terminal	Function	Symbol	Terminal explanation
1	Power supply input	+24V-	Connect with 24Vdc positive, main control card power supply.
2		+24V-	Connect with 24Vdc negative
3		NC	NC, None connect (do Not connect)
4	IGBT drive ports	IGBT DR	IGBT drive port, for specific connection pls refer to the drive terminal definition
5	Communication ports	GNDC	Communication ground
6		A+	RS485 communication A+
7		B-	RS485 communication B -
8		RS232	RS232 port, standard connection methods, connect to touch screen
9	3 phase AC current detection ports	GND	Signal common ground
10		AB	3 phase AC current, AB wires low voltage signal, DC0-1V, the isolated sampling board is our SV800, purchase additionally
11		AC	3 phase AC current, AC wires low voltage signal, DC0-1V, the isolated sampling board is our SV800, purchase additionally
12	Inverter signal detect	SR-	Inverter current sampling terminal
13		SR+	Inverter current sampling terminal, default secondary as 1A Ferrite transformer, range set X2, such as using 500:1 transformer, then the inverter current total range shall be 100A.
14		SV-	Heating temperature sampling negative terminal
15		SV+	Heating temperature sampling positive terminal, default as

			4-20mA/0-20mA
16	Bus signal detection	DI-	DC current sampling negative terminal
17		DI+	DC current sampling positive terminal, default as DC0-5V
18		DV-	DC voltage sampling negative terminal
19		DV+	DC voltage sampling positive terminal, default as DC0-5V
20	Temperature detection ports	GND	Signal common ground. Notes: Temperature sensor standard is NTC3950 10K 1%
21		TP1	1st temperature detection, IGBT heat sink temperature detection (can be defined as other function)
22		TP2	2nd temperature detection, transformer temperature detection (can be defined as other function)
23	& external input signal	GND	Signal common ground, negative
24		AIN	Signal input terminal, using 1K potentiometer, can connect 0-5Vdc or 0-10Vdc analog signal, default is 0-5Vdc
25		P+	+5V power supply, positive, the control board has inserted with power supply, do not connect external power.
26	8 roads switch input (Passive switch)	COM	Switch common ground, input signal is valid for common ground.
27		D1	The 1st switch input, ON switch (Normally open type)
28		D2	The 2nd switch input, OFF switch (Normally open type)
29		D3	The 3rd switch input, emergency stop switch (Normally close type)
30		D4	The 4th switch input, RST reset switch
31		D5	The 5th switch input, water pressure switch (Normally open type)
32		D6	The 6th switch input, temperature switch 1 (Normally open type)
33		D7	The 7th switch input, main contactor pull in control, pls refer to power supply pull in and out control introduction.
34		D8	The 8th switch input, main contactor pull out control (valid when Jog pull in)
35	4 switch output (5A 250V contactor)	CO1	The 1st relay output common ground terminal, fault signal output
36		NO1	The 1st relay output, normally open
37		CO2	The 2nd relay output common ground terminal, running signal output
38		NO2	The 2nd relay output, normally open
39		CO3	The 3rd relay output common ground terminal, charging contactor pull in control signal output
40		NO3	The 3rd relay output, normally open
41		CO4	The 4th relay output common ground terminal, main contactor pull in control signal output
42		NO4	The 4th relay output, normally open

* D3 emergency switch, D5 water pressure switch, D6 temperature switch, these 3 switches can be set to normally open or close switches(for specific setting pls consult with our engineer).

***Attention: the selection on Touch Screen power supply pull in and pull out control & charging time:

Self lock pull in: single switch control, it is self lock type pull in switch, when connect D7 and COM, the charging contactor pull in, charging the secondary large capacity by snubber resistance, when finished charging, the main contactor pull in; When D7 and COM disconnect, the main contactor pull out automatically.

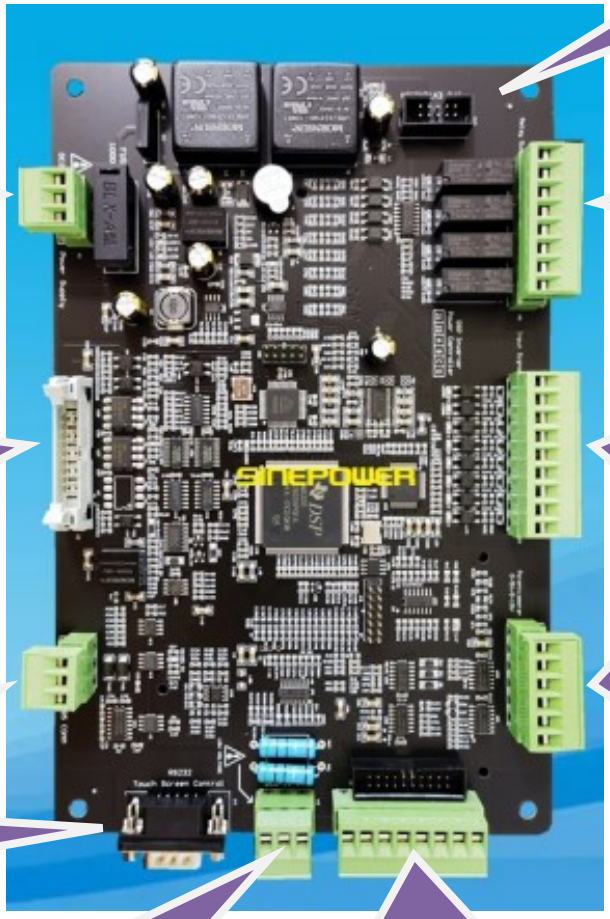
Jog pull in: Jog type control switch, when jog control D7 and COM, the charging contactor pull in, charging the secondary large capacity by snubber resistance, when finished charging, the main contactor pull in; When jog control by D8 and COM, the main contactor pull out automatically.

If using the motor-operated mechanism as the main power control, pls contact our engineer to change the control method, we will need to change the 4th relay terminal to control, at this moment, the main contactor pull in control signal is invalid, the main control power can only be one of them; **When there is a system fault, the charging contactor and the main contactor will automatically pull out and turn off the main power supply, to prevent from power damage.**

The inverter current signal sampling: using the ferrite transformer, the inverter current total range is default as X2, also can be customized as requesed X1, X3, X4 rate, for example, when it is X1, and use 200:1, then the total range shall be set as 200A, when it is X2, 200:1, then the total range shall be set as 400A, when it is X4, 200:1, then the total range shall be 800A.

Please pay attention to the quality and operating frequency of the ferrite transformer core. In the Test mode, output a frequency signal shall close to the resonance point and observe if the sampling signal is normal and stable not. When the power supply operating frequency is high, use an ordinary ferrite core (or Power working frequency magnetic core) will fail to collect the correct current signal!

Main control board physical interface:



Expand interface, connect to SFP90 expand module if needed

Power supply DC24V（100W power supply）

4 roads independent relay output signal， contact capacity 250V5A

PWM driver control signal， connect to driver card SK600 or SK601 （purchase additionally）

8 roads external input signal, it has been insert with power supply, cannot connect with active signal, or the terminal will be broken.

RS485 communication port, communicate with external

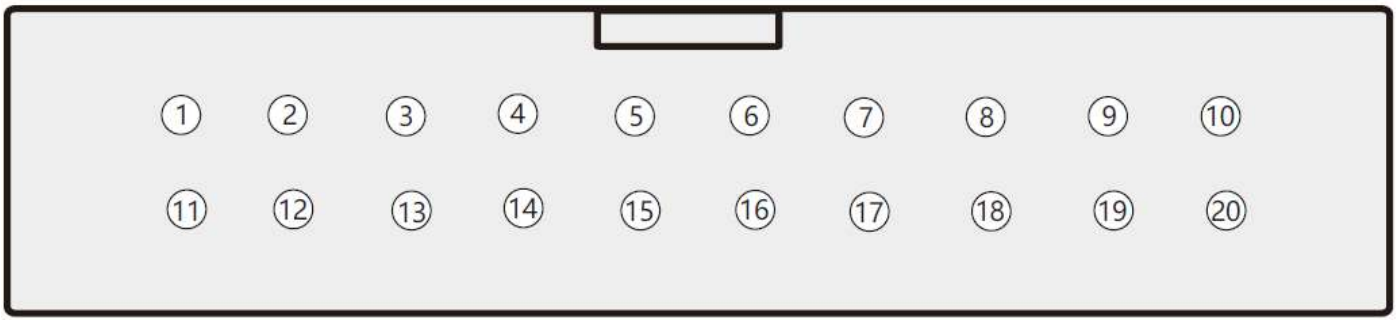
2 roads temperature analog signal detection, using transducer NTC3950, 10K, 1%;
Potentiometer or external input signal， 0-5Vdc or 0-10Vdc signal (Default is 0-5V)

RS232 port， connect to HMI （7inch or 10inch， purchase additionally）

3 phase AC voltage detection，cannot connect AC380V directly. Input low voltage signal, used as phase loss detection and AC voltage recognize, with electricity isolation. Can use with out SV800, purchase additionally

1 road DC voltage signal sampling, 1 road heating temperature sampling, 2 roads current signal sampling

V. IGBT drive terminal definition:

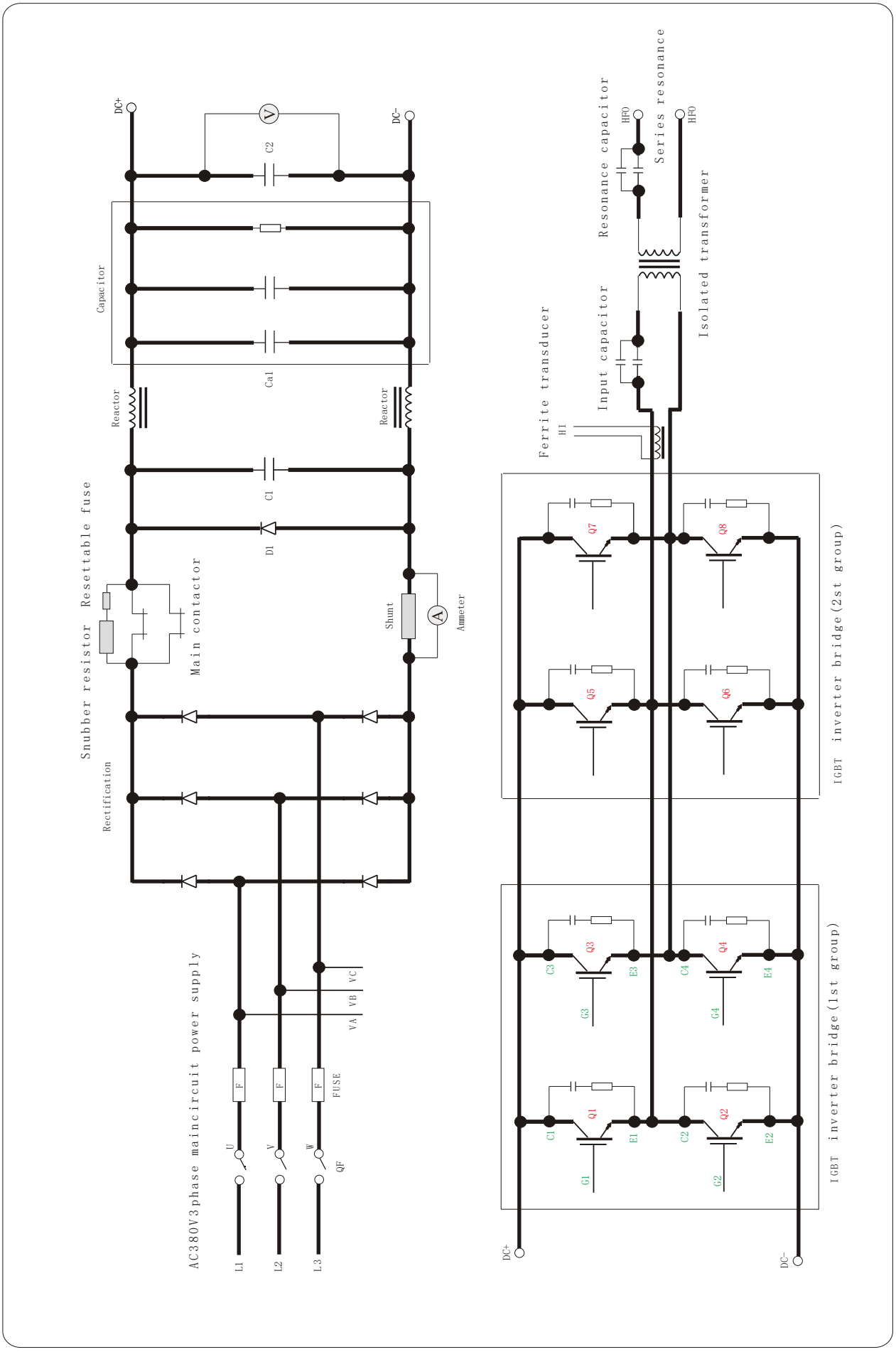


2 IGBT output ports, pin definition are the same, the card can control many groups at the same time

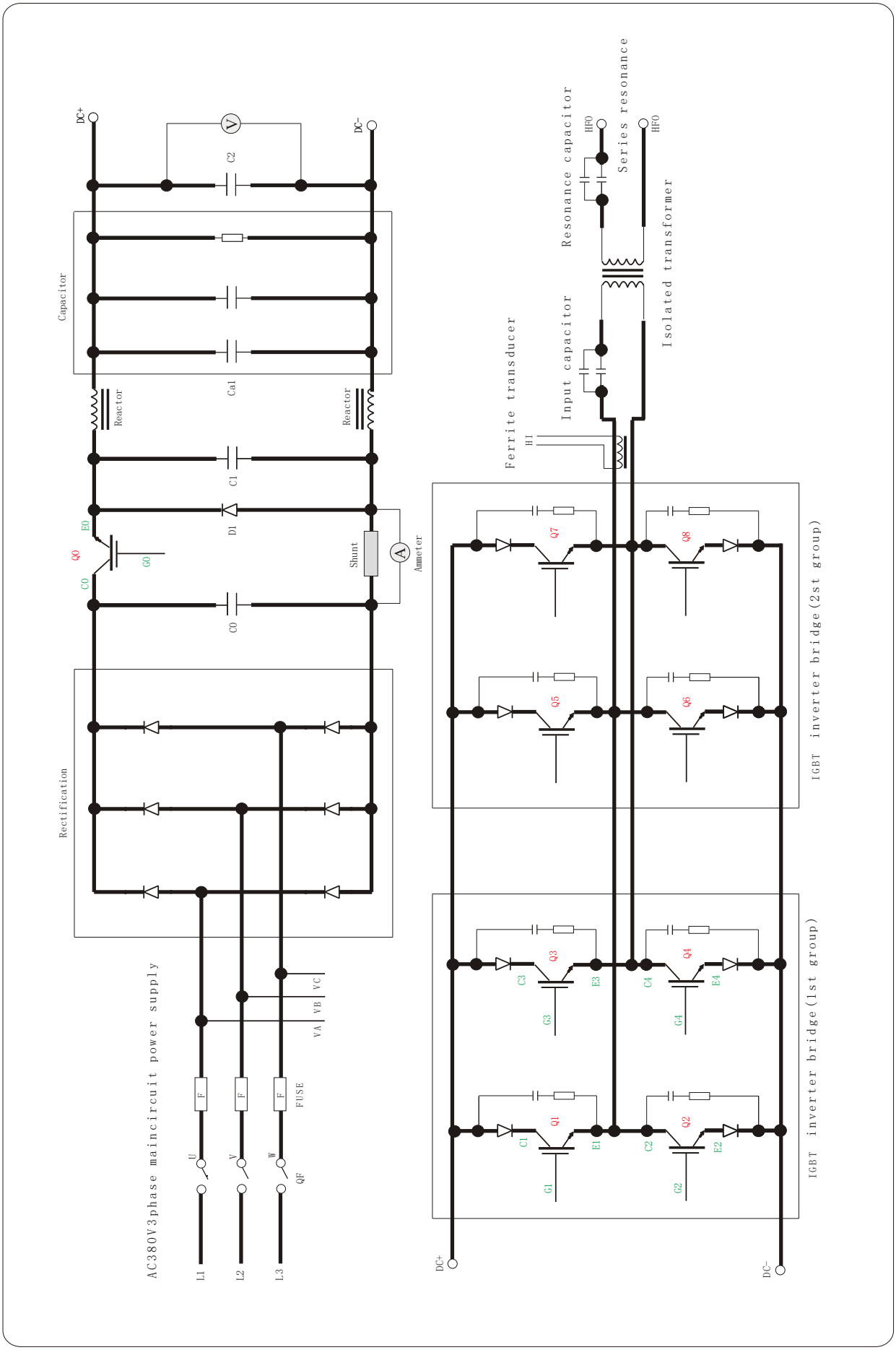
Terminal	Function	Terminal explanation
1	Power supply	24V power supply, negative -
2	Over current detection 1	IGBT driver card 1, over current short protection detection
3	IGBT drive signal	The 5th PWM signal output
4		The 1st PWM signal output
5		The 2nd PWM signal output
6		The 3rd PWM signal output
7		The 4th PWM signal output
8		The 6th PWM signal output
9	Over current detection 2	IGBT driver card 2, over current short protection detection
10	Power supply	24V power, positive +
11	Power supply	24V power, negative -
12	Driver detection	IGBT driver detection, to detect if the driver cards working normal
13		NC
14	Power supply, negative	The negative power supply terminal of the main control card
15		The negative power supply terminal of the main control card
16		The negative power supply terminal of the main control card
17	Power supply, positive	The positive power supply terminal of the main control card
18		The positive power supply terminal of the main control card
19		The positive power supply terminal of the main control card
20	Power supply	24V power, positive

VII: Suitable Wiring:

一、PSM Series resonance method:



二、BCM Series resonance method:



Product Naming Rules

1. SD300 series: Series resonance induction heating power supply main control board, for medium high power use
2. SD310 series: Series resonance induction heating power supply main control board, for medium small power use
3. SD320 series: Parallel resonance induction heating power supply control unit
4. SD500 series: simplified version of SD300
5. SD510 series: Simplified version of SD310

6. Item instruction: SD310A series resonance, inverter phase shift power adjustment PSM, 16 bytes accuracy

Item differences	
SD310A	PSM (inverter phase shift power adjustment) methods
SD310B	DCM (DC chopper power adjustment) methods
SD310C	PFM (inverter frequency & power adjustment) methods
SD310Z	Customized with customer

7. Common purchase, out of stock: SD310X main control board *1, there will be NO other accessories.

If buying the unit, without special request, then out of stock as below:

I. SD310XT control unit including			II. SD310XT driver unit including	
SD310X main control board	* 1		SK600/601/602/603 driver card	* 1
7 inch touch screen	* 1		15V 15W power supply	* 1
24V 150W power supply	* 1		20 PIN cable(50mm long)	* 1
RS232 wire (1.5m long)	* 1			

