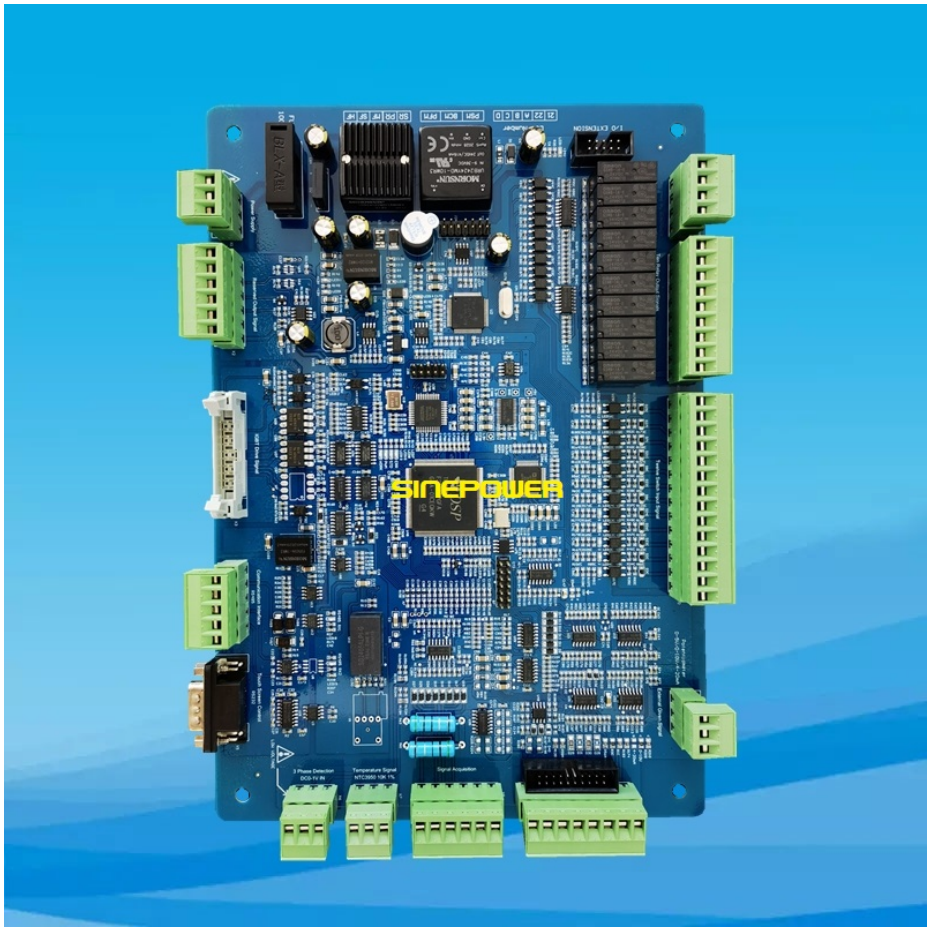
SINEPOWER

SD300
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:

SD300 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, 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. Complete protection functions such as self-diagnosis, load operation protection, power failure protection, overvoltage protection, overload protection, short circuit protection, etc. Therefore, no matter external or internal interference types and fault signals, the performance of the control card will be safer and more reliable due to the above mentioned protection functions. 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.

This control system support the industrial Ethernet connection (optional function), users can monitoring easily by a remote area computer or mobile phone, it can achieve the device monitoring in anywhere as long as you have a network, and to visit the running system conveniently. Our company has a strong non-standard design team, with our rich power supply design experience, we can provide customers with reasonable advice and reliable guarantees for specific working conditions.

Application:

II. Technical specifications:

2.1 .Input power supply: 24Vdc ±15%, power upper than 100W
2.2 .Main circuit working power: 5 ~ 1000Vdc
2.3. Inverter output frequency: 100Hz ~ 100 kHz (can be customized to 500Khz), DC side output frequency: 1k ~ 100 kHz
2.4. Temperature adjust range: 0-5000.5 degree (support 2 roads heating temperature sampling)
2.5. Voltage and current adjust range: 0 ~ 1000V (valid in chopper or DC phase shift power adjustment mode)
2.6. 0 ~ 2000A/5000A (According to the power value)
2.7. Power adjust range: power range can be 100kW,300kW, 500kW, 1000kW or higher.
2.8. PID respond: 1mS (voltage & current sampling time can be adjusted)
2.9. Stable accuracy: better than 0.05%, 16 bytes high accuracy sampling
2.10. Input signal: DC0-5V, DC0-10Vdc, 10K potentiometer adjust or touch screen HMI given
2.11. Control methods: Full bridge or hall bridge, Series resonance power supply, PSM/PFM/DCM/SPSM
2.12. 12 roads of input signal, 10 roads of relay output. (I/O isolated control)
2.13. Multiple roads of 12bytes regular accuracy/16 bytes high accuracy analog sampling signal.
Invter voltage current X2, DC voltage current X2, 3 phase AC voltage current X2, heating temperature detector X2, external given signal X1, heat sink transformer temperature detector signal X2, reserved analog signal X1
2.14. Alarm relay contact capacity: 250Vac/10A OMRON
2.15. Voltage isolation: 3500 VRMS
2.16. 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.
2.17. Mechanical size: 260 * 180 * 35mm Installation holes size: 240 * 160mm
2.18. Weight: 0.4KG
2.19. Product meet the standards:
IEC60947-4-2: Low-voltage switchgear and controlgear
GB14048.6-1998: Low voltage switch device & control device
GB3797-89: Electronic control device Part II--electronic control device with electronic components
IEC61000-4: Electronic magnetic compatible, testing and measurement technology.
IEC65: The safely of electronic net power supply using at home & general purpose electronic and related equipment

III. Features:

1. Adopt DSP+CPLD digital control system, automatic frequency tracking, frequency feedback adaptive 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, process procedure (optional function), users can choose according to different working situation, support 16 bytes high accuracy sampling control.
3. The main control board comprehensively improves the system control accuracy and adjustment speed, current and voltage display resolution can reach 0.1V or 0.1A, power display reaches 0.01k 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, 4-20mA 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. Single 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)

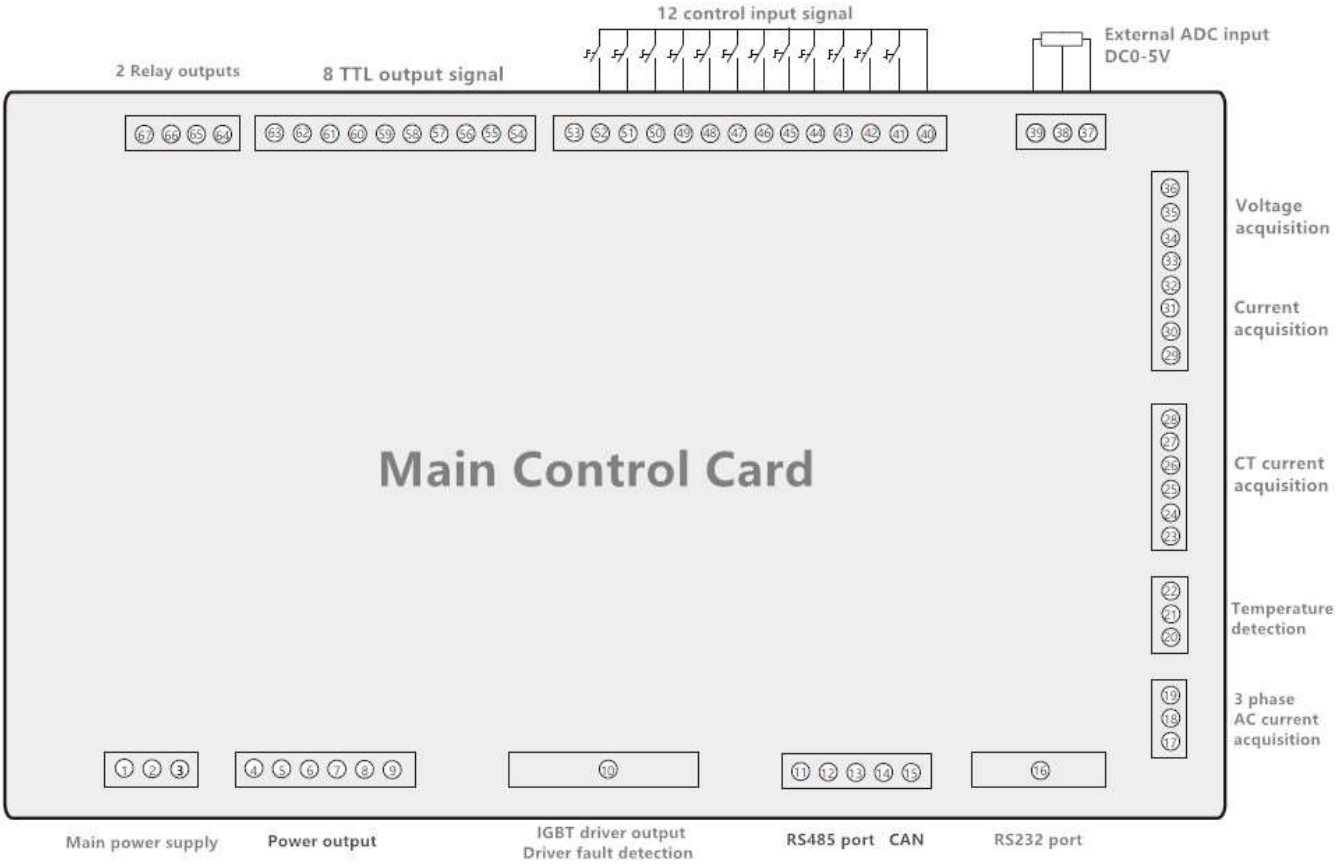
13. MODBUS fieldbus communication function, fully isolation control. The RS485 or CAN interface can exchange data with an external controller, and transmit all internal parameters of the above mentioned power supply to the host computer or the central control bus; also, the control board support Ethernet to remotely monitoring (optional).

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, main control card power supply.
3		NC	NC, None connect (do Not connect)
4	Function reserved	-DA1	Function reserved
5		+DA1	Function reserved
6		-DA2	Function reserved
7		+DA2	Function reserved
8	Power output	-Vcc	-12V power output, max current 100mA, can be used for Hall sensor power

9		+Vcc	+12V power output, max current 100mA, can be used for Hall sensor power
10	IGBT drive ports	IGBT DR	IGBT drive port 2, for specific connection pls refer to the drive terminal definition
11	Communication ports	GNDC	Communication ground
12		A+	RS485 communication port A+ （Some version print as 1A+）
13		B-	RS485 communication port B - （Some version print as 1B-）
14		CANH	CAN main wire H+ （Some version print as 2A+, function reserved）
15		CANL	CAN main wire L- （Some version print as 2B-, function reserved）
16		RS232	RS232 port, standard connection methods, connect to touch screen
17	3 phase AC current detection ports	PV-	Signal Common Ground
18		AB	3 phase AC current, AB wire low voltage signal, DC0-1V, isolated sampling boards is our SV800 (purchase additionally)
19		AC	3 phase AC current, AV wire low voltage signal, DC0-1V, isolated sampling boards is our SV800 (purchase additionally)
20	Temperature detection ports	TP-	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	Signal detection	-DIT1+	Incoming current (or Current transformer), default DC0-5V
24			
25		-DVT1+	Resonance voltage (or inverter voltage), default DC0-5V
26			
27		-TEMP+	The 2nd road heating temperature detector signal input, default 4-20mA/0-20mA
28			
29	Inverter signal detection	SR-	Inverter current sampling port (or output current)
30		SR+	Inverter current sampling port, , default is using ferrite transformer signal with Secondary 1A, range set X2, for example, if using 500:1 transducer, then the inverter current range shall be set as 1000A
31		SV-	The 1st road heating temperature detector sampling negative port
32		SV+	The 1st road heating temperature detector sampling positive port, default 4-20mA/ 0-20mA
33	Bus signal detection	DI-	DC current sampling - port
34		DI+	DC current sampling + port, default fixed as DC0-5V,
35		DV-	DC voltage detection, -
36		DV+	DC voltage detection, +, default fixed as DC0-5V
37	Potentiometer or external ADC signal input	P-	Signal common ground, negative
38		AIN	Signal input terminal, use 10k potentiometer, can connect with 0-5V or 0-10Vdc analog signal input, default is DC0-5V

39		P+	Positive power supply, +5V power, control board has inserted power, pls don't connect external power.
40	12 switch input (Passive switch)	COM1	Switch common ground
41		D1	The 1st switch input, ON switch
42		D2	The 2nd switch input, OFF switch (Normally open type)
43		D3	The 3rd switch input, emergency stop switch (Normally closed type)
44		D4	The 4th switch input, RST reset switch
45		D5	The 5th switch input, water pressure switch (Normally open type)
46		D6	The 6th switch input, temperature switch 1 (Normally open type)
47		D7	The 7th switch input, temperature switch 2 (Normally open type)
48		D8	The 8th switch input, temperature switch 3 (Normally open type)
49		D9	The 9th switch input, main contactor pull in control, pls refer to power supply pull in and out control introduction.
50		D10	The 10th switch input, main contactor pull out control (valid when Jog pull in)
51		D11	The 11th switch input, when set by HMI, it's the key of output set value increase
52		D12	The 12th switch input, when set by HMI, it's the key of output set value decrease
53		+24V	+24V positive power
54	8 switch output (5A 250V contactor)	COM2	Switch common ground (common ground of C1-C8 switch control), normally open point control.
55		C1	The 1st switch output, fault signal indication, valid if closed
56		C2	The 2nd switch output, running output signal indication, valid if closed
57		C3	The 3rd switch output. Main control power is motor-operated mechanism, closing pull in (ON) signal.
58		C4	The 4th switch output. Main control power is motor-operated mechanism, opening pull out (OFF) signal.
59		C5	The 5th switch output, automatically change the transformer's turn ratio. Turn ratio is high when it's closed.
60		C6	The 6th switch output, Fan 1 (cooling fan of IGBT heat sink), start work when area temperature over 50 degree, heat control is automatic. (Can used for other function)
61		C7	The 7th switch output, Fan 2 (cooling fan of Transformer temperature), start work when area temperature over 50 degree, heat control is automatic. (Can used for other function)
62		C8	The 8th switch output, monitor heating temperature over limit indicate, valid if closed
64	Two road Relay output (5A 250V contactor)	CO1	The 1st relay common ground terminal, charging contactor pull in control signal output.
65		NO1	The 1st relay, normally open terminal
66		CO2	The 2nd relay common ground terminal, main contactor pull in control signal output

67		NO2	The 2nd relay, normally open terminal

* D3 emergency switch, D5 water pressure switch, D6 temperature switch 1, D7 temperature switch 2, D8 temperature switch 3, these 5 switches can be set to normally open or close switches.

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

Self lock pull in: single switch control, is self lock type pull in switch, when connect D9 and COM1, the charging contactor pull in, charging the secondary large capacity by snubber resistance, when finished charging, the main contactor pull in; When D9 and COM1 disconnect, the main contactor pull out automatically.

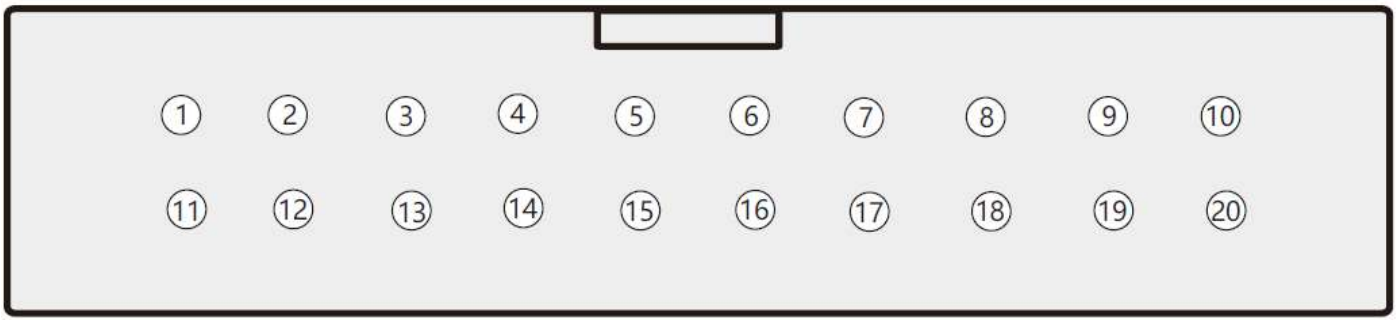
Jog pull in: Jog type control switch, when jog control D9 and COM1, the charging contactor pull in, charging the secondary large capacity by snubber resistance, when finished charging, the main contactor pull in; When jog control D10 and COM1, the main contactor pull out automatically.

If using the motor-operated mechanism as the main power control, pls use the terminal C3 and C4, 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 contator will automatically pull out and turn off the main power supply, to prevent from power damage.**

Main control board physical interface:


Power supply DC24V（over 100W power supply）
Functional interface, not used
PWM driver control signal，connect to driver card SK600 or SK601（purchase additionally）
2 groups of RS485 communication port
RS232 port， connect to HMI （7inch or 10inch，purchase additionally）
Expand interface, connect to SFP90 expand module if needed
2 roads independent relay output signal，contact capacity 250V5A
8 roads relay output signal，share the same COM, contact capacity 250V5A
12 road external input signal, insert with power supply, do not connect active input signals, or the interface will be damaged
Potentiometer or external input signal，0-5V or 0-10 V
3 phase AC voltage detection，input low voltage，used as phase loss detection and AC voltage recognize. Can purchase and use our SV800
2 road temperature analog signal detection, used sensor is NTC3950，10K, 1%
3 roads AD signal detection sampling, incoming current, resonance voltage, #2 detector heating temperture
1 road DC voltage signal sampling, 1 road heating temperature signal sampling, 2 roads current signal sampling (SV800 for DC voltage, DC current and AC 3 phase current sampling module sampling, purchase additionally)

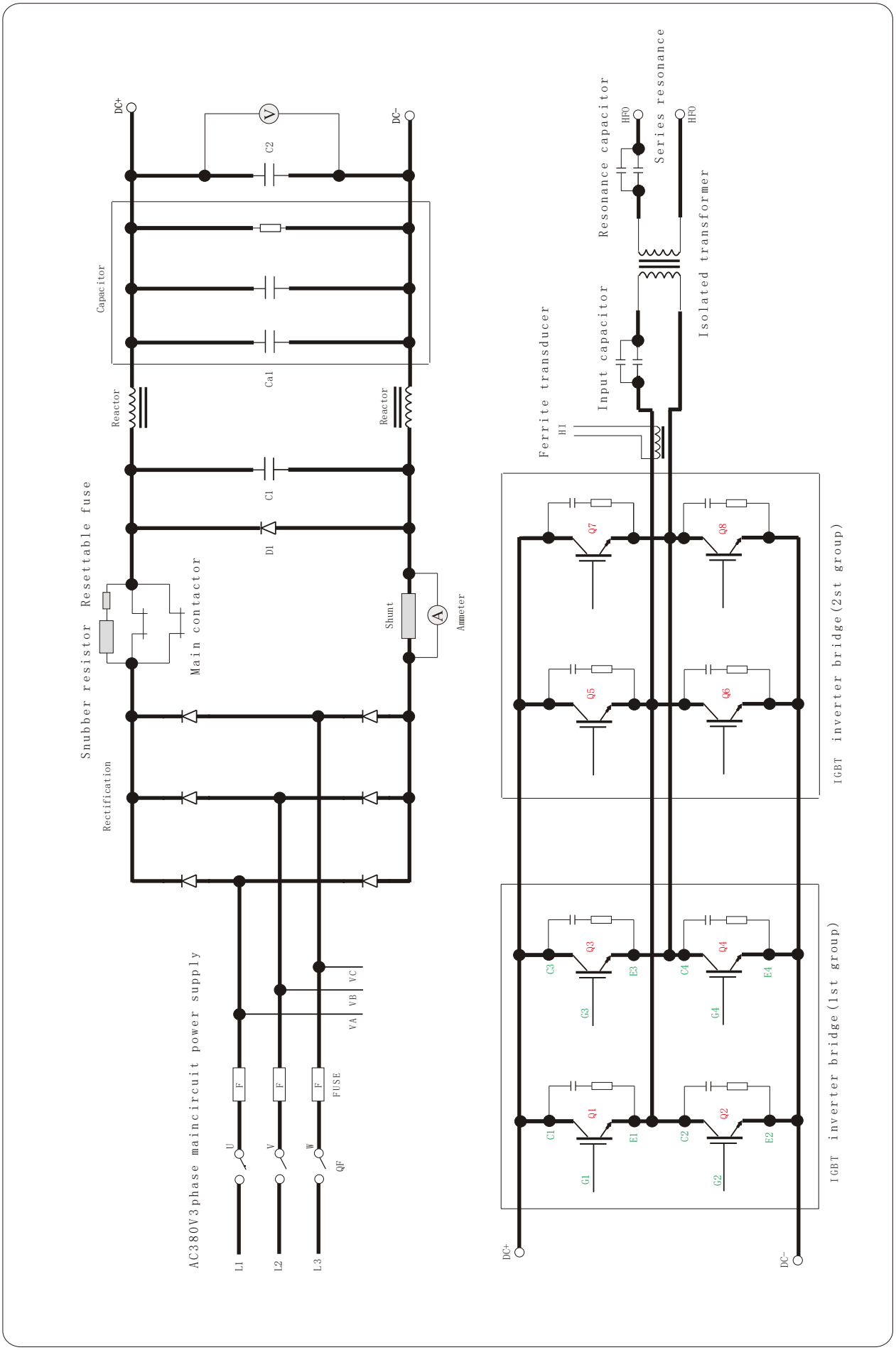
V.IGBT drive terminal definition:



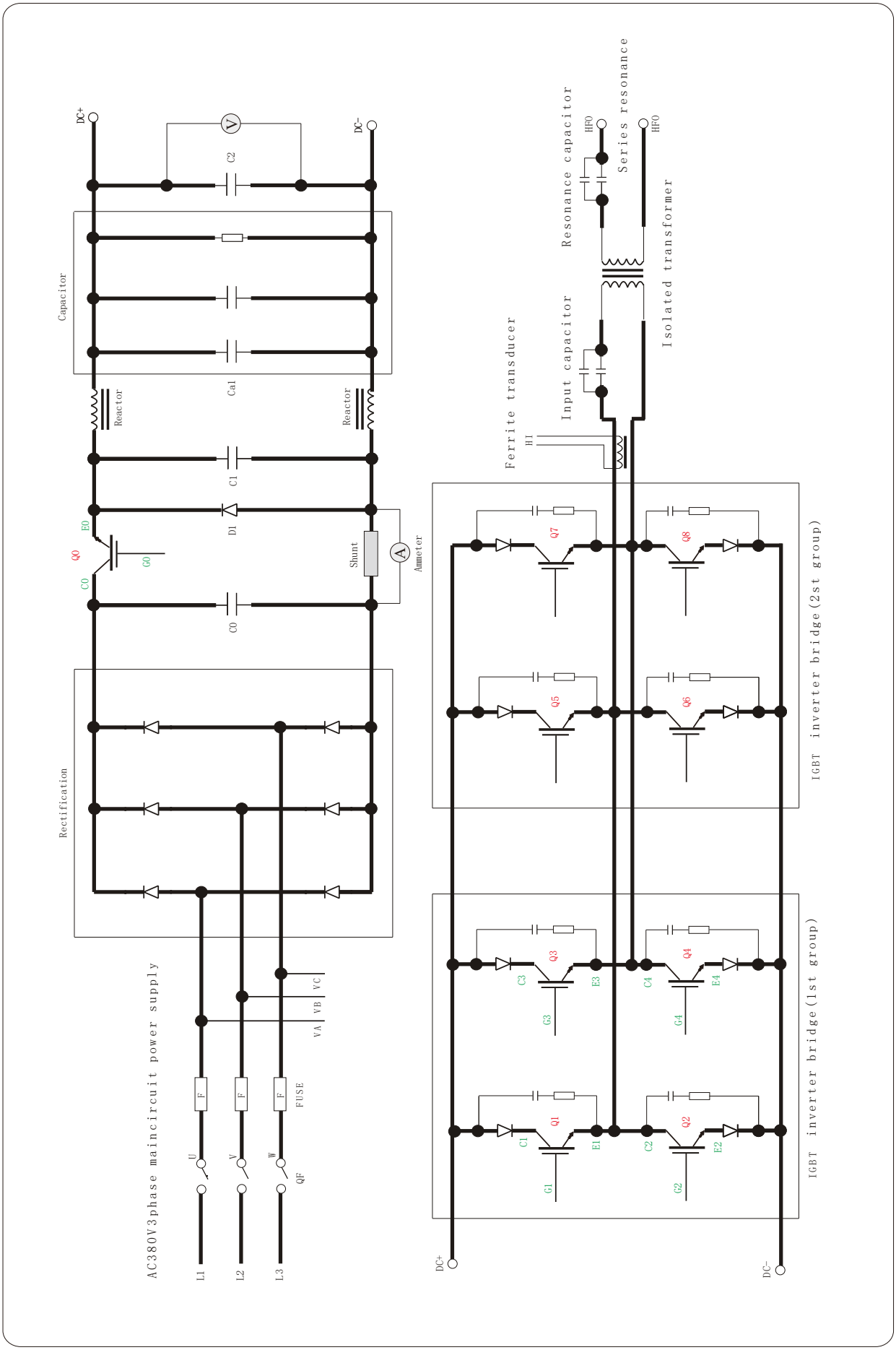
2 IGBT output ports, pin definition are the same, the card can control many groups at the same time

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:



二、BCM Series resonance method:



Product Purchase Instruction

For us to know and serve you better, please kindly choose or mark your needs out：

No.	Content	Performance require	Yes or No	Remark
1	Frequency range	Middle frequency 0.1K-20KHz		Pls write your specific frequency range,especially when you are using frequency over 60kh, because it requires another different boards. If you choose 20K-100Khz, pls tell your specific frequency range or your resonance point. Usually the frequency is around one point, and the board will sweep and track the frequency.
		Super-audio frequency 20K-100KHz		
		High frequency 100K-1MHz		
2	Actual power	Lower than 100kw		Pls write us your specific power.
		100KW-1000KW		
		Higher than 1MW		
3	Inverter/DC voltage	AC/DC560V		
4	Inverter/DC current	10-5000A		
5	Resonance control method	Parallel: DC phase shift power adjustment SPSM		Resonance frequency auto tracking mode.
		Parallel: DC Chopper power adjustment DCM		Resonance frequency auto tracking mode.
		Series: Inverter phase shift power adjustment PSM	Default	Resonance frequency auto tracking mode.
		Series: DC chopper power adjustment DCM		Resonance frequency auto tracking
		Series: Variable Frequency & power adjustment PFM		Current is changing along with the frequency, and there is no resonance frequency auto tracking function
6	Special running method	Constant temperature mode		This function is optional, purchase additionally
		Process procedure mode		This function is optional, pls remark if you need it
7	Control accuracy require	High accuracy（16 bytes） better than 0.05%	Default	
8	Driver module	4 roads driver output SK600/SK601		Optional, purchase additionally
		5 roads driver output SK602 / 604		Optional, purchase additionally
9	Industrial HMI touch screen	7 inch		Optional, purchase additionally
		10 inch		Optional, purchase additionally
10	Special function requirement	Ethernet, LAN networking, etc		Optional， purchase additionally, customize with 10 inches touch screen.
11	IGBT module number			Pls advice specific for us to equipt driver card

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. Item instruction: SD300A series resonance, inverter phase shift power adjustment PSM, 16 bytes accuracy

Item differences	
SD300A	PSM (inverter phase shift power adjustment) methods
SD300B	DCM (DC chopper power adjustment) methods
SD300C	PFM (inverter frequency & power adjustment) methods
SD300D	SPSM (DC phase shift power adjustment) methods (SCR+IGBT type)
SD300Z	Customized with customer

6. Common purchase, out of stock: SD300X main control board *1, there will be NO other accessories.

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

I. SD300XT control unit including			II. SD300XT driver unit including	
SD300X main control board	* 1		SK600/601/602/603 driver card	* 1
7 inch touch screen	* 1		15V 150W power supply	* 1
24V 150W power suply	* 1		20 PIN cable(50mm long)	* 1
RS232 wire (1.5m long)	* 1			

