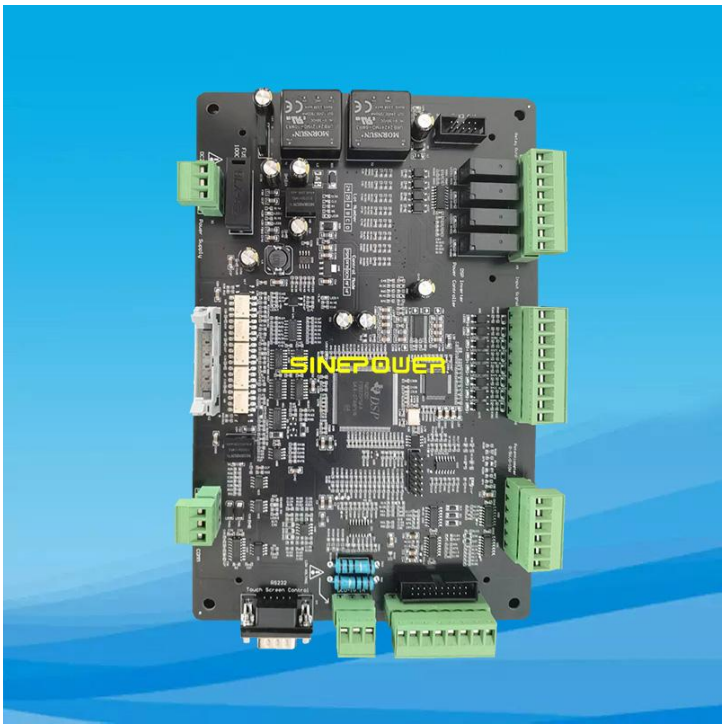
SD310
Induction Heater Power Supply User Manual



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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:

The SD310 series induction heating power supply adopts a high-speed DSP core architecture design, featuring a highly digital and precision-engineered design. It supports both remote and on-site control methods and is a third-generation, independently developed and manufactured induction heating power supply product from Sinopower, possessing internationally advanced technology. It operates at frequencies up to 200KHz and power levels up to 600KW, using IGBT or MOSFET as inverter devices. It features fully digital precise control, automatic tracking of the resonant frequency, and ensures that the IGBT always operates in the ZCS switching state under various working conditions, providing stronger adaptability to inductors and on-site working conditions. The system also has comprehensive fault detection, operation monitoring, and event recording functions, recording the operating status or system faults in real time. It is suitable for industries such as metal material heat processing, heat treatment, thermal 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.

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:


Forging


Smelting


Casting


Fiber drawing


Sapphire melting


Crystals growth

II. Technical specifications:

2.1 .Input power supply: 24Vdc ±15%　100W or more

2.2 .Main circuit working power: 5～1000Vdc

2.3. Inverter output frequency:400Hz～200KHz,DC side output frequency:1K～100KHz

2.4、Temperature adjustment range：0～2000.0℃（Temperature sampling along the heating path.）

2.5、Voltage adjustment range:0～1000.0V（Chopping or DC phase-shift power control is effective.）

2.6、Current adjustment range：0～2000.0A

2.7、Power adjust range:power range can be Within 600KW

2.8、PID respond:：1mS（Voltage and current sampling time are adjustable.）

2.9、Output control accuracy：better than0.05%　16-bit high-precision sampling

2.10、Input signal: DC0-5V、DC0-10V、10Kpotentiometer adjust or touch screen HMI given

2.11、Control methods: Series resonance power supply, PSM/PFM/VCM

2.12、8 roads of input signal, 4 roads of relay output. (I/O isolated control)

2.13、Relay contact capacity：250Vac/5A

2.14、Voltage isolation: 3500 VRMS

2.15、Working environment: temperature: -20℃~ 60℃, RH: ≤ 90%RH（no dew）

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.

2.16、Mechanical size: 230X150X35mm　　Installation holes size:215X135mm

2.17、Weight: 0.3KG

III. Features:

3.1、**Adopt DSP 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.**

3.2、 **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.**

3.3、 **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.

3.4、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, including current transformers, Hall effect current (voltage) sensors, and 0-5V signals;

3.5、Intelligent PID control solution, parameter openness, can be flexibly set to any physical quantity, suitable for different loads, and of good dynamic characteristics;

3.6、 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;

3.7、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.The highly integrated main control board features fewer failure points and more precise control. Its wide-band design offers strong load adaptability, allowing a single power supply to meet the heating needs of various workpieces without the need for frequent replacement of multiple main boards.

3.8、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.

3.9、It features a timed operation function; when the system detects that the workpiece temperature reaches the set value, it performs the action or shuts down after the temperature is reached, meeting the timing application requirements for different working conditions.

3.10、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.

3.11、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)

3.12、**MODBUS field bus 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).

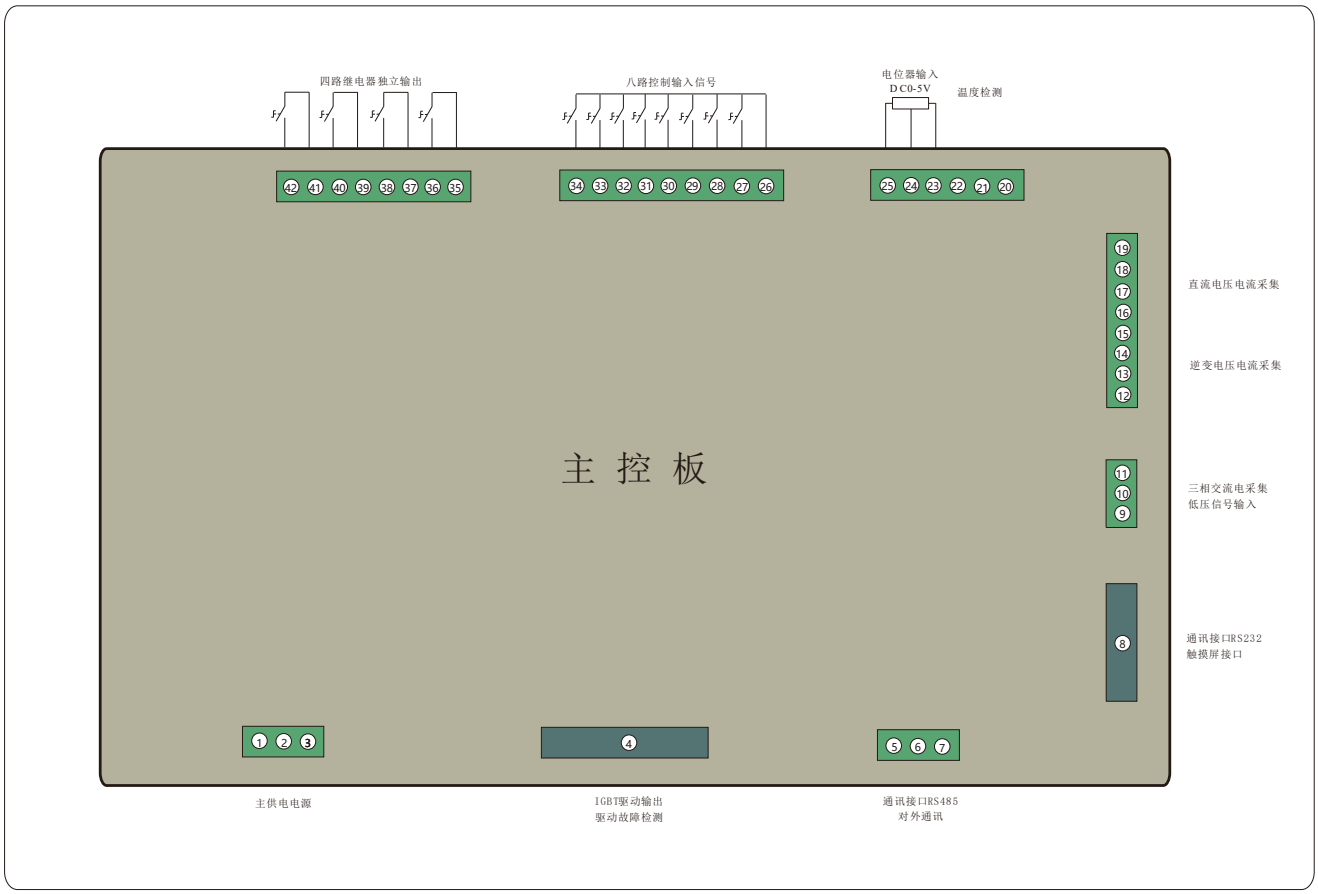
3.13、Uninterruptible running design, when there is a power main circuit fast switching or flickering, the control board will run a self-diagnose, after repower on, it will auto-recover and return to normal working to avoid the production loss by out of service.

3.14、 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.

3.15、**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.**

3.16、The start/stop method offers three options: two-button jog control, single-button self-locking control, and single-button start/stop control, capable of handling various start/stop operations without blind spots. The emergency stop switch, temperature control switch, and water pressure switch have normally open or normally closed control options, which can be customized by the user.

IV. Control card terminal definition:



4.1、主控板接口功能定义：

Terminal	Function	Symbol	Terminal explanation
1	Power supply input	+24V-	Connect with 24Vdc negative, main control card power supply.
2		+24V-	Connect with 24Vdc positive, main control card power supply.
3		NC	NC, None connect (do Not connect)
4	IGBT drive ports	IGBT DR	IGBT driver interface，Refer to the driver interface definition for specific wiring instructions.
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 ground
10		AB	Three-phase AC power, A and B phase low-voltage signals，DC0-1V
11		AC	Three-phase alternating current (AC) low-voltage signal，DC0-1V
12	Inverted signal detection	SR-	Inverter current sensing terminal (or output current)
13		SR+	The inverter current acquisition terminal defaults to the secondary 1A ferrite current transformer signal, with a range setting of X2. If a 200:1 current transformer is used, the total inverter current range is set to 400A.
14		SV-	Heating temperature probe negative terminal
15		SV+	The heating temperature probe collects the positive terminal signal, default 4-20mA/0-20mA.
16	Busbar signal detection	DI-	DC current acquisition negative terminal
17		DI+	DC current acquisition positive terminal, default DC 0-5V
18		DV-	DC voltage acquisition negative terminal
19		DV+	DC voltage input positive terminal, default range: DC 0-5V
20	Temperature detection interface and external input signals	GND	Signal ground connection. Note: The temperature sensor specifications are NTC3950 10K 1%.
21		TP1	Channel 1 temperature detection, IGBT heatsink temperature detection (other functions can be defined)
22		TP2	Second channel temperature detection, transformer temperature detection (other functions can be defined)
23		GND	Signal common ground, negative terminal
24		AIN	The signal input terminal uses a 10K potentiometer and can accept 0-5V or 0-10V analog signal input; the default is DC 0-5V.
25		P+	+5V power supply, positive terminal. The control board

			already has a built-in power supply; no external power supply should be connected.
26	Eight-channel digital input (passive switch)	COM	The switch connects to a common ground; the input signal is referenced to this common ground.
27		D1	First digital input channel, heating switch (default factory setting is normally open type)
28		D2	Second digital input, shutdown switch (default factory setting is normally open type)
29		D3	Third digital input channel, emergency stop switch (default factory setting is normally closed type)
30		D4	Fourth channel digital input, reset switch, resets system faults and anomalies.
31		D5	Fifth digital input channel, water pressure switch (default factory setting is normally open type)
32		D6	Sixth channel digital input, temperature control switch (default factory setting is normally open type)
33		D7	Digital input 7: Main contactor closing switch or rectifier activation switch. Please refer to the power supply switching control description.
34		D8	Eighth digital input, main contactor trip switch or rectifier shutdown, momentary closing is effective.
35	Four-channel relay output (5A 250V contacts)	CO1	The common terminal of the first group of relays, fault signal indication, closed means active.
36		NO1	First group of relays, normally open contacts
37		CO2	The common terminal of the second group of relays, heating operation indicator, closed means active.
38		NO2	Second group of relays, normally open contact
39		CO3	The common terminal of the third group of relays, outputting the control signal for the charging contactor's coil activation.
40		NO3	Third group of relays, normally open contact.
41		CO4	The common terminal of the fourth group of relays, outputting the control signal for the main contactor's coil.
42		NO4	Fourth group of relays, normally open contact.

4.2、* D3 emergency switch, D5 water pressure switch, D6 temperature switch ， these 3 switches can be set to normally open or close switches.(For specific settings and usage instructions, please consult the company's technical staff).

4. 3、***Attention: the selection on Touch Screen power supply pull in and pull out control & charging time:

Automatic closing: Automatically closes the circuit after power-on if there are no faults or abnormalities. The closing and opening switch ports also function as temperature control switches 2 and 3, respectively, and are only used for direct control of low-power induction heating power supplies.

Self-locking closing: Single switch control, a self-locking type closing switch. When D7 is connected to COM, the charging contactor closes, charging the downstream large capacitor through a buffer resistor. After reaching a certain DC voltage or charging time condition, the main contactor closes; when D7 is disconnected from COM, the main contactor automatically opens.

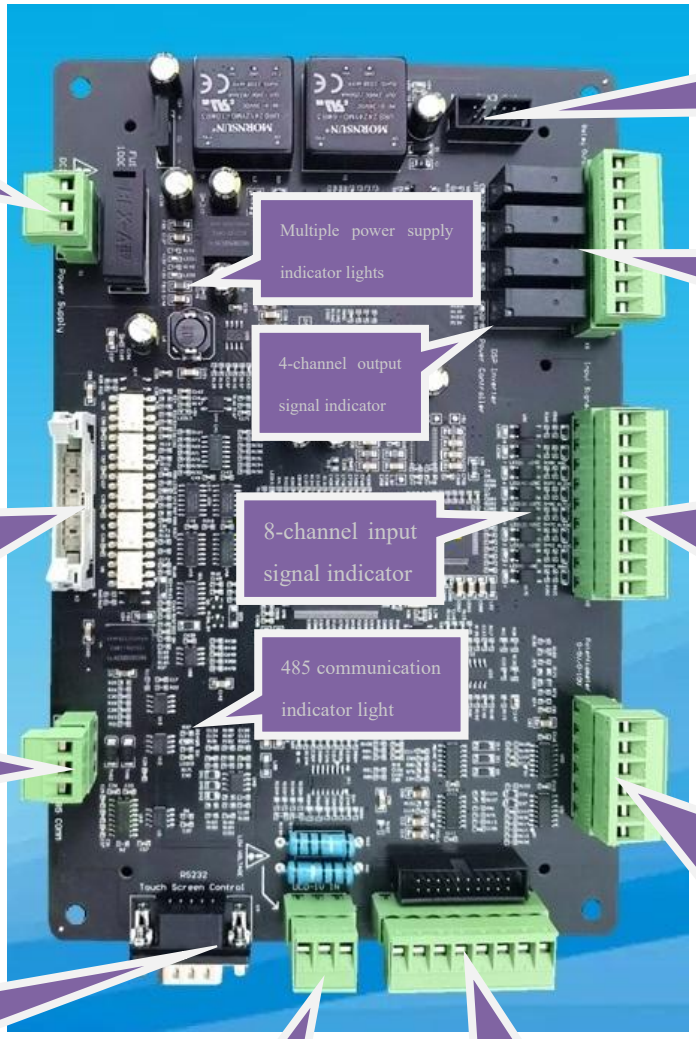
Momentary closing: Momentary control switch. When D7 is momentarily connected to COM, the charging contactor closes, charging the downstream large capacitor through a buffer resistor. After reaching a certain DC voltage or charging time condition, the main contactor closes; when D8 is momentarily connected to COM, the main contactor opens.

4.4、If using an electric operating mechanism as the main electrical control, please contact our company's technical personnel to change the relay control method: change to the second relay for opening control and the fourth relay for closing control; when the system malfunctions, the charging contactor and the main contactor will automatically open to disconnect the main power supply to prevent damage to the power source.

4.5、Inverter current signal acquisition: A ferrite current transformer is used. The total range of the inverter current is factory-set to a magnification of X2 by default, but can also be customized to X1 or X5 according to customer requirements. For a 200:1 ratio, X1 sets the total range to 200A, X2 sets the total range to 400A, and X5 sets the total range to 1000A.

Please pay attention to the quality and operating frequency of the ferrite core in the inductor. In test mode, output a frequency signal close to the resonant point and observe whether the sampled signal is normal and stable. When the power supply operating frequency is high, using a common ferrite core (or power frequency core) may result in the inability to acquire the correct current signal!

4.6、Main control board physical interface:



Power supply DC24V (100W switching power supply or above).

The expansion interface can be connected to the SV890 expansion module when needed.

4 roads independent relay output signal , contact capacity 250V5A

PWM driver control,Connect to the IGBT driver module SK600 or SK609 via ribbon cable (sold separately).

This device has eight external input signals and an internal power supply. Active input signals must not be connected, as this will damage the interface.

RS485 communication interface for external communication

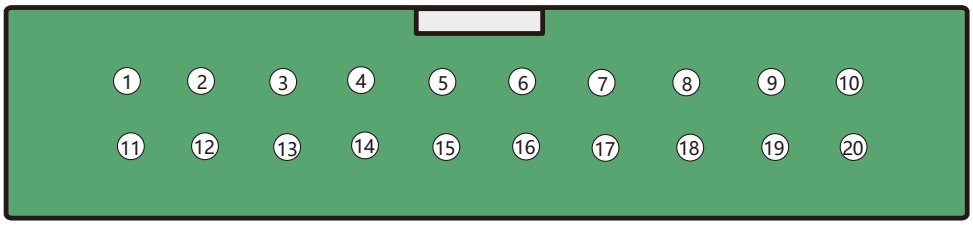
Dual-channel analog temperature signal detection, using NTC3950, 10K, 1% sensors; potentiometer or external signal input, 0-5V or 0-10V signal.

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

3 phase AC voltage detection , direct connect with 380V , used as phase loss detection and AC voltage recognize, use with electricity isolation

It features one DC voltage signal acquisition channel, one heating temperature acquisition channel, and two current signal acquisition channels, which can be connected to the SV800 acquisition module (sold separately).

V.IGBT drive terminal definition:

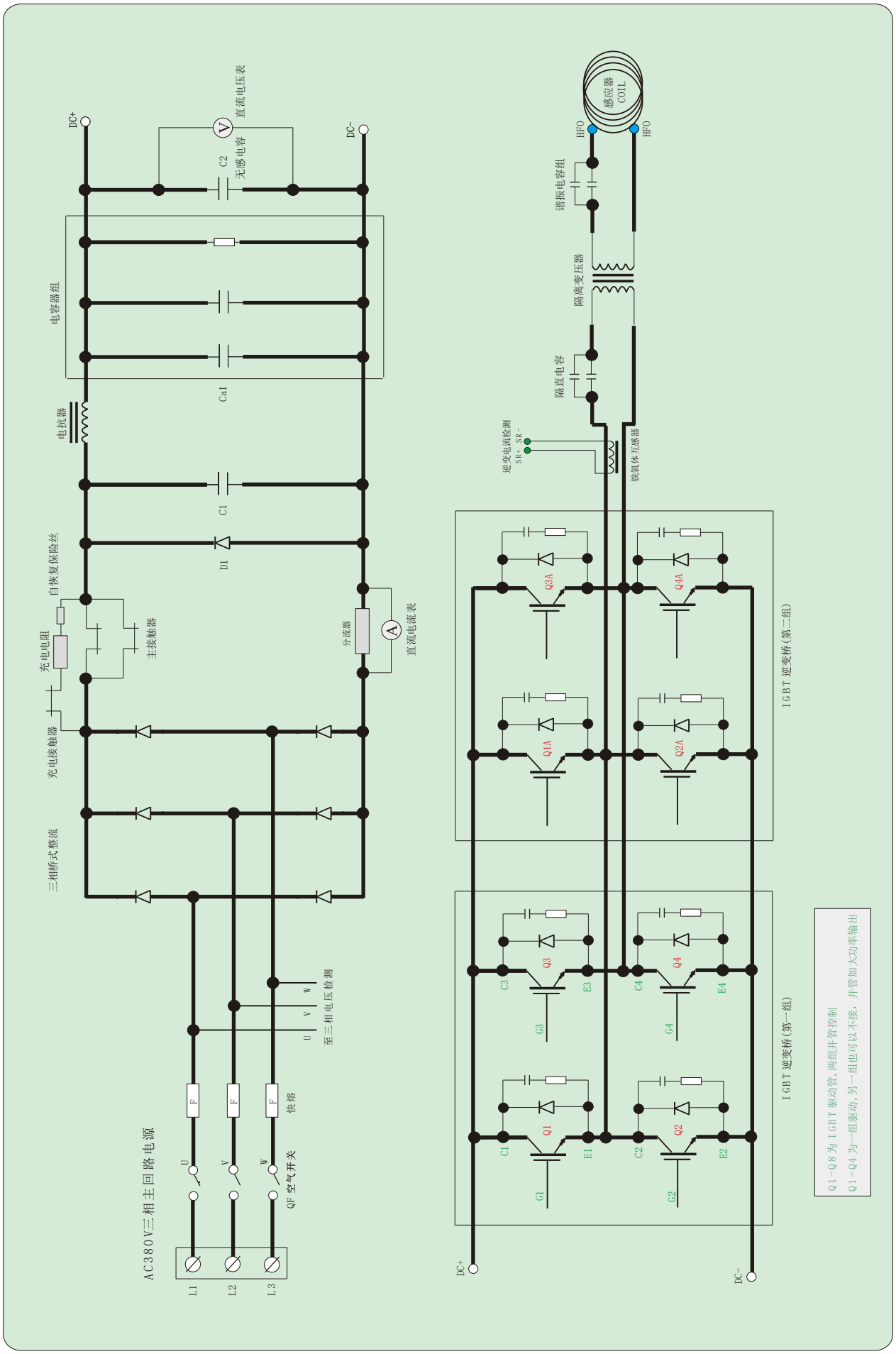


2 IGBT output ports, pin definition are the same, the card can control many groups at the same time

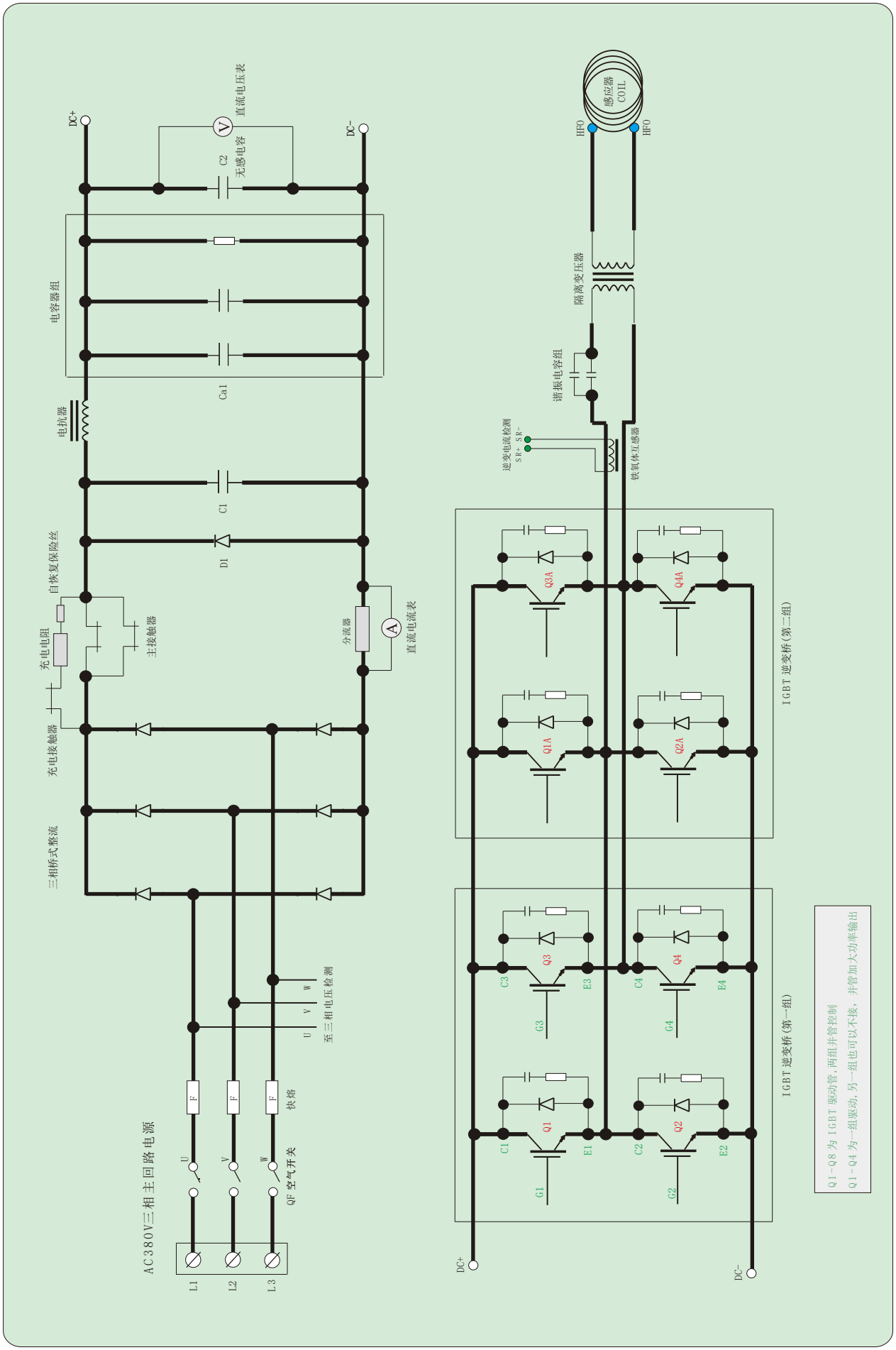
Terminal	Function	Terminal explanation
1	P+	Feature retained, not currently in use
2	Driver detection	Is the IGBT driver power supply functioning correctly? The high voltage level is normal.
3	IGBT drive signal	The 5th PWM signal output
4		The 1stPWM signal output
5		The 2nd PWM signal output
6		The 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	P-	Feature retained, not currently in use
11	P+	Feature retained, not currently in use
12	Over current detection 1	IGBT driver card 1, over current short protection detection
13	NC	Feature retained, not currently in use
14	Power supply, negative	The negative power supply terminal of the main control card 0V
15		The negative power supply terminal of the main control card 0V
16		The negative power supply terminal of the main control card 0V
17	Power supply, positive	The positive power supply terminal of the main control card +15V
18		The positive power supply terminal of the main control card +15V
19		The positive power supply terminal of the main control card +15V
20	P-	Feature retained, not currently in use

Ⅵ、Induction heating power supply wiring diagram:

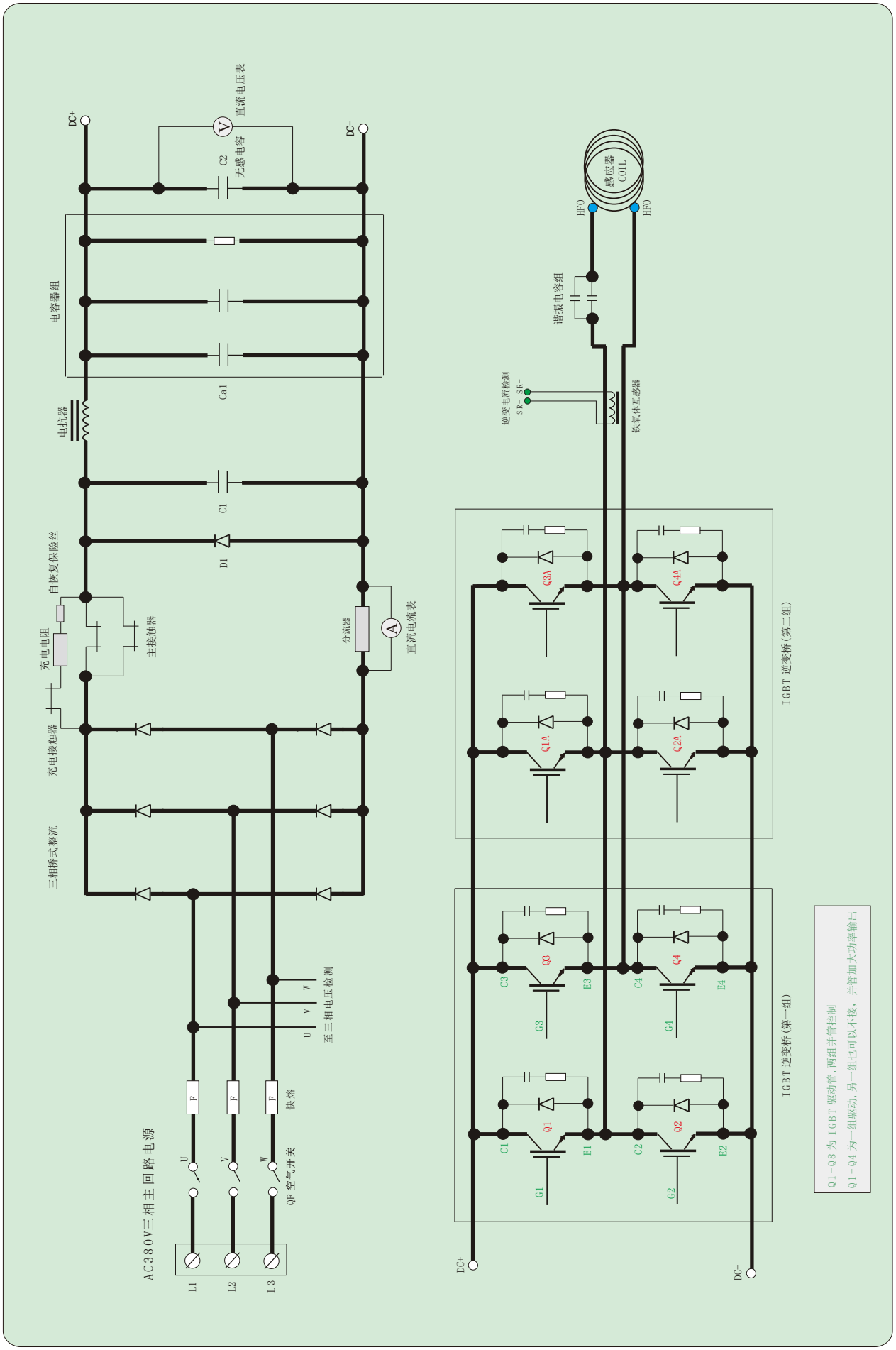
一、串联谐振感应加热电源全桥控制接线示意图（逆变桥调功带隔离变压器次级谐振）：



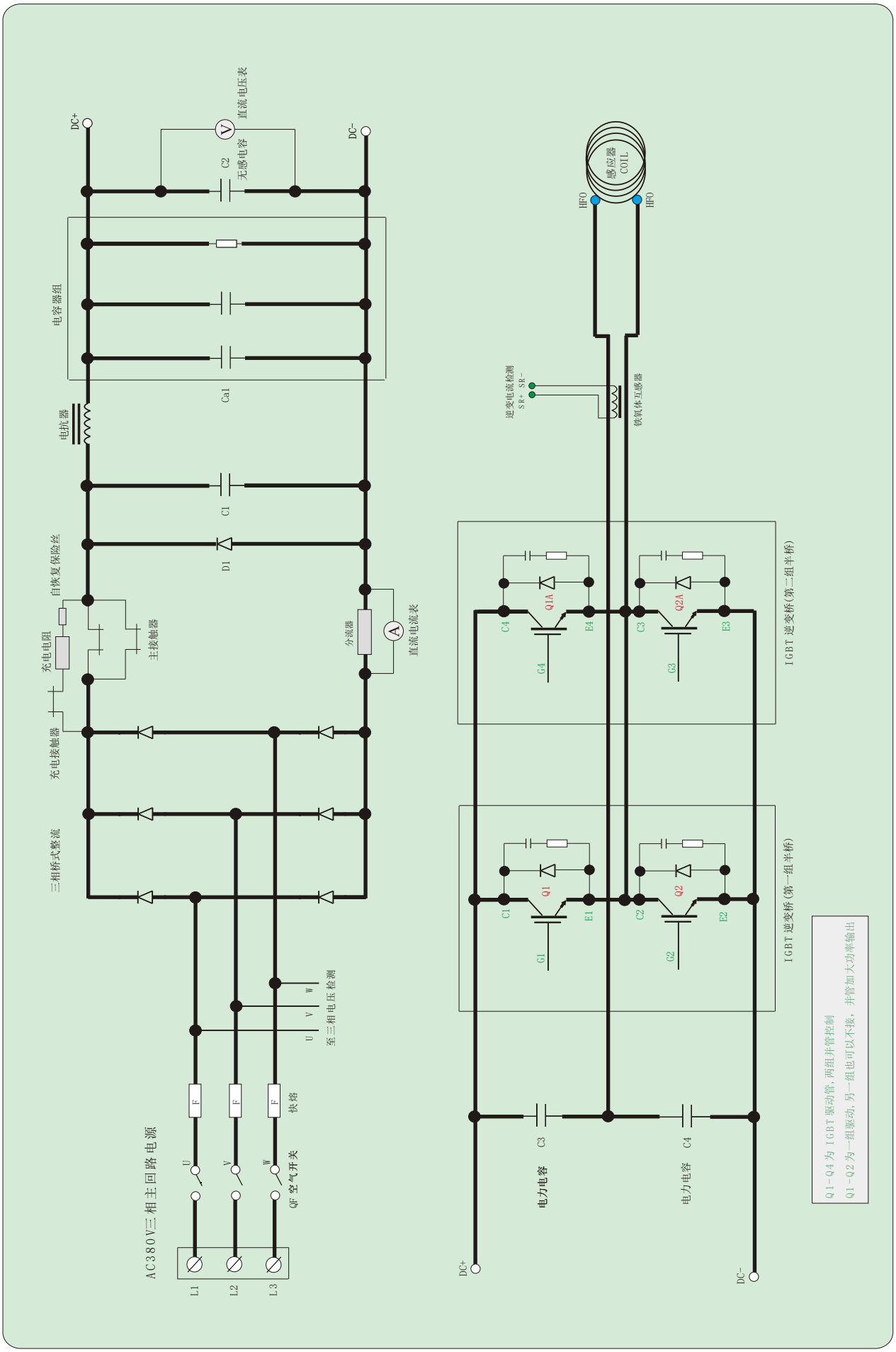
二、串联谐振感应加热电源全桥控制接线示意图（逆变桥调功带隔离变压器初级谐振）：



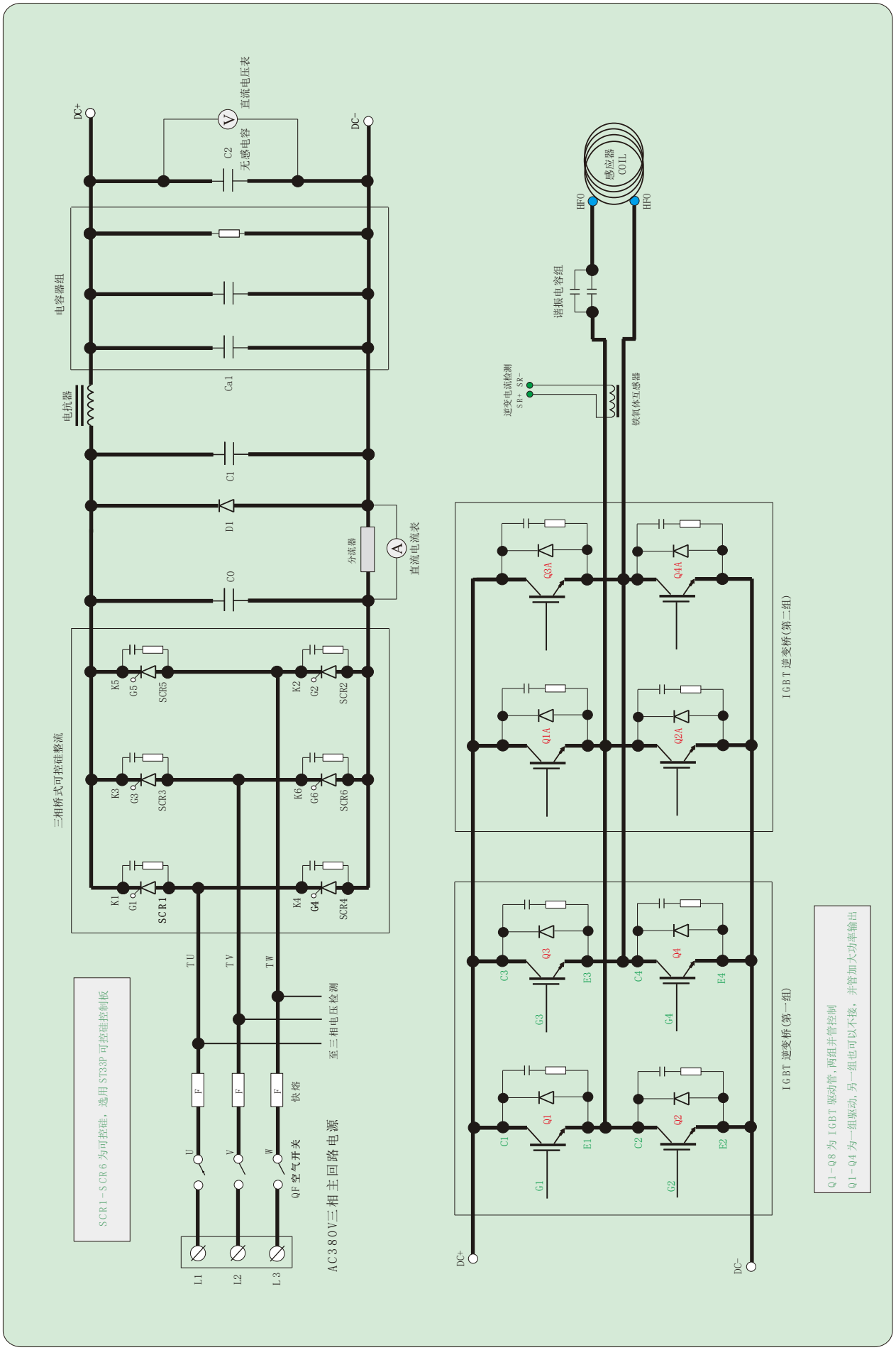
三、串联谐振感应加热电源全桥控制接线示意图（逆变桥调功不带隔离变压器）：



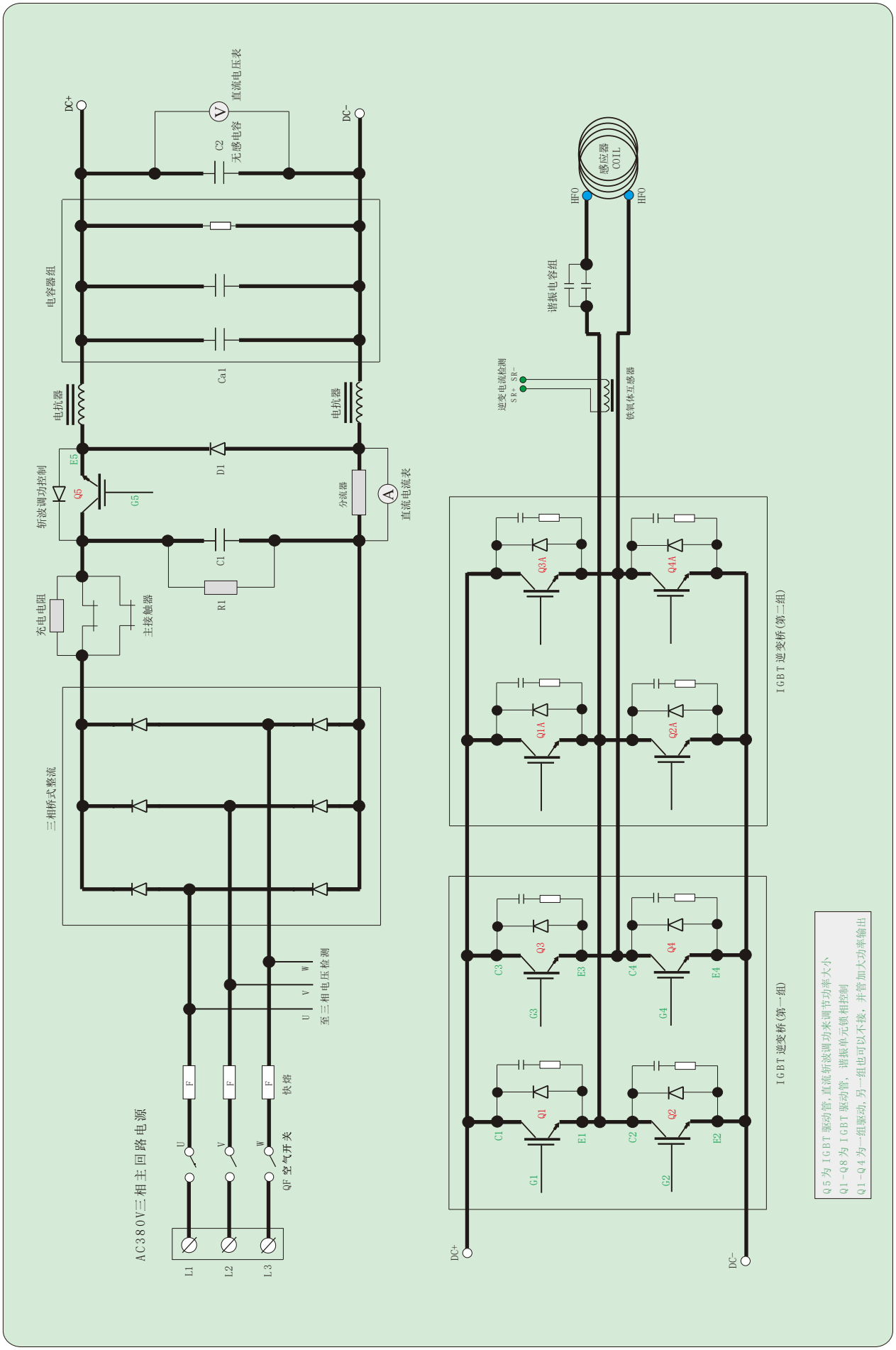
四、串联谐振感应加热电源半桥控制接线示意图（逆变桥调功不带隔离变压器）：



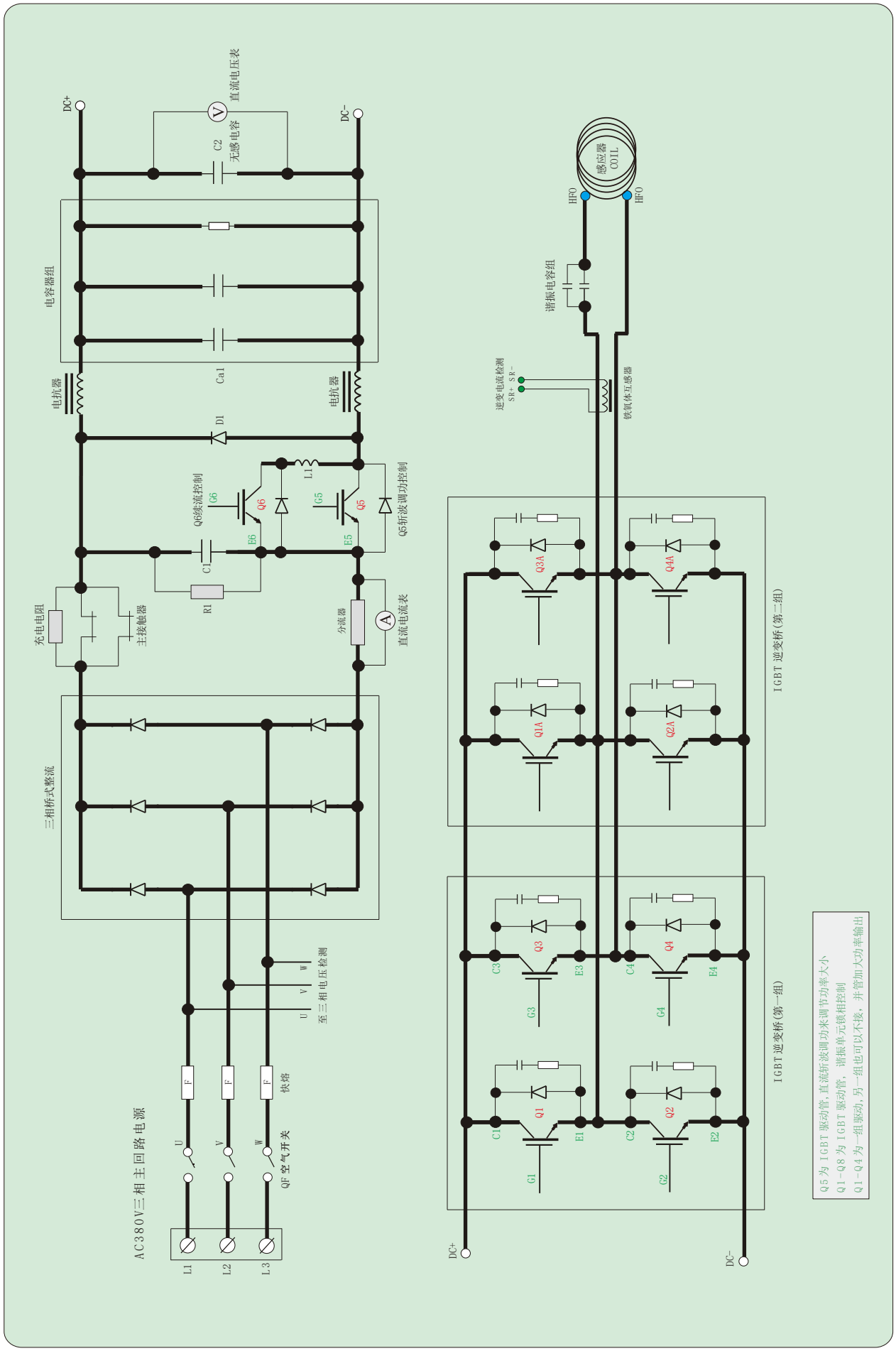
五、串联谐振感应加热电源全桥控制接线示意图（直流移相调功不带隔离变压器）：



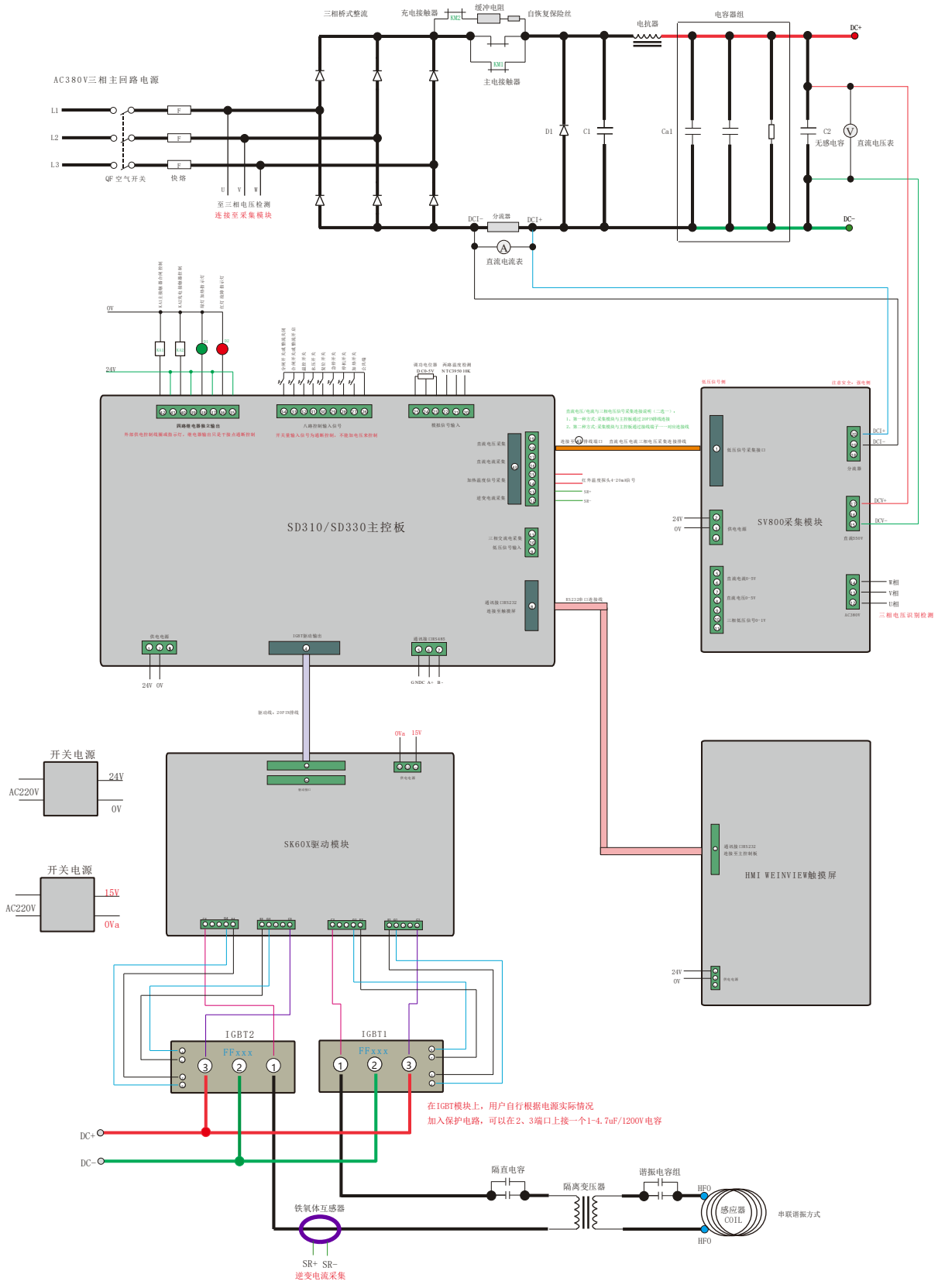
六、串联谐振感应加热电源中高频全桥控制接线示意图（斩波调功不带隔离变压器）：



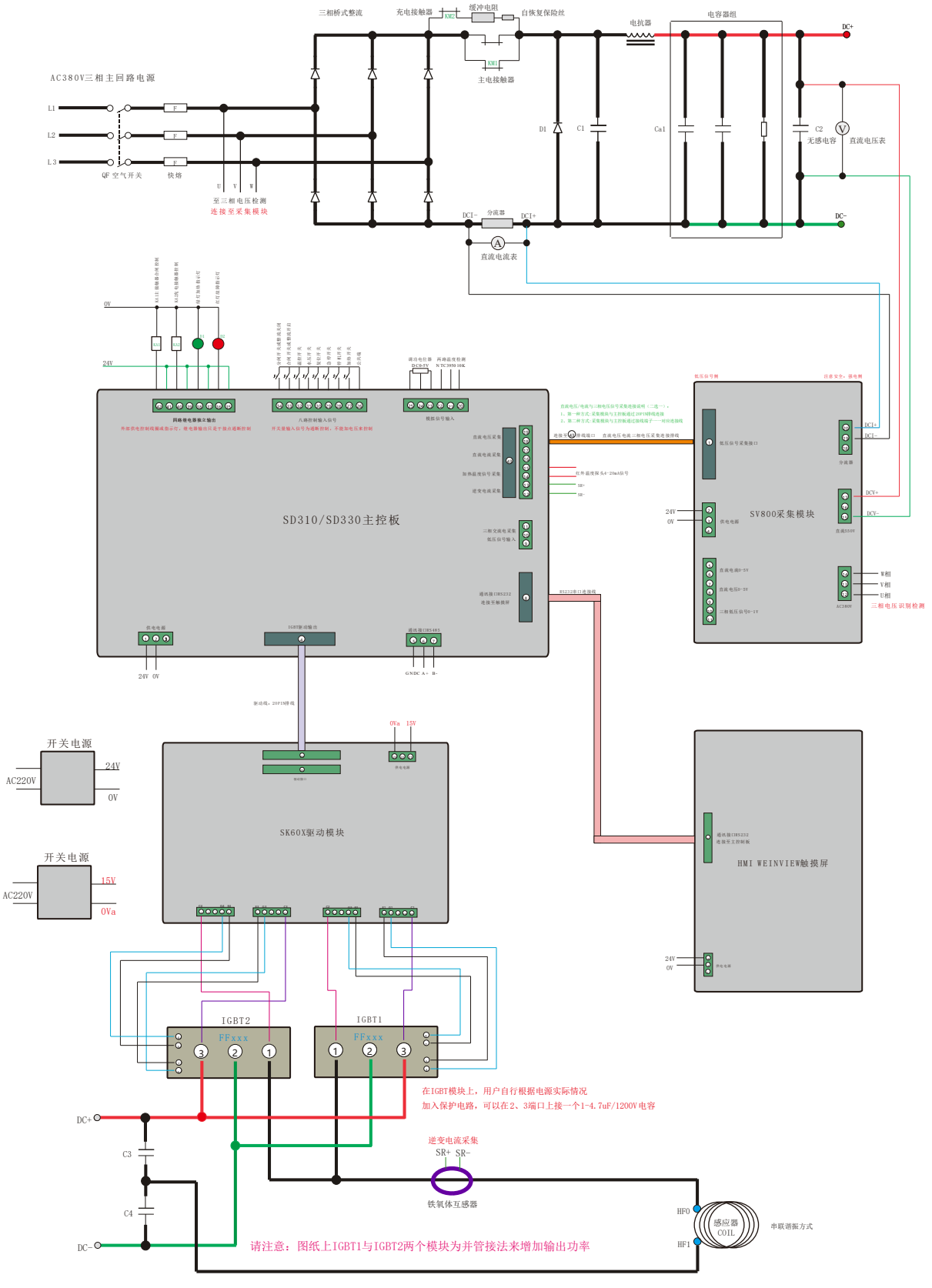
七、串联谐振感应加热电源中高频全桥控制接线示意图（斩波调功带续流控制）：



SD310/SD330控制系统接线示意图--全桥方式



SD310/SD330控制系统接线示意图--半桥方式



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		Use specific frequency bands
		Super-audio frequency 20K-100KHz		
		High frequency 100K-1MHz		
2	Actual power	Below 100KW		Actual power consumption
		100K-1000KW		
		Over 1MW		
3	Inverter/DC voltage	AC/DC560V		
4	Inverter/DC current	10-5000A		
5	Resonance control method	Parallel: Frequency sweep phase shift power adjustment SPSM		
		Parallel: Frequency sweep DC chopper power adjustment DCM		
		Series: Frequency sweep phase shift power adjustment PSM		
		Series: Frequency sweep DC chopper power adjustment DCM		
		Series: Variable Frequency power adjustment PFM		
		Series: Frequency sweep phase shift power adjustment SPSM		SCR+IGBT, automatic resonant frequency tracking
6	Special running method	Constant temperature mode OR 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%		
8	Industrial	Weinview 7inch / 10inch		Optional

	HMI touch screen			
9	Driver module	4 roads driver output SK600/601/609		Optional
		5 roads driver output SK602/604		
10	Special function requirement	Ethernet, LAN networking, etc		Optional

11、Series control	Phase shifting power regulation PSM / Frequency modulation and power modulation PFM			Chopping Waves and Adjusting Power DCM / DC phase shift power regulation SPSM		
	Constant current mode	Constant temperature mode	Constant power mode	Constant current mode	Constant voltage mode	Constant power mode
Power adjustment sampling signal	Inverter current	Heating temperature	DC voltage and current	DC current	DC voltage	DC voltage and current
Frequency signal source	Inverter current	Inverter current	Inverter current	Inverter current	Inverter current	Inverter current
Limit output current	●	●	●			
Limit heating temperature	●	●				
Limit DC current			●	●	●	●
Limit DC voltage				●	●	●
Overcurrent, overvoltage, and overtemperature protection	●	●	●	●	●	●
Temperature reached, delayed shutdown	●	●	●	●	●	●

●This indicates that the function is effective when the mode is in operation. Constant power mode is controlled by DC power. If different power adjustment sampling signals are required for control, please contact us for customization.

Product Naming Rules

1、SD300： Series resonant induction heating power supply main control board for medium and high power applications

2、SD310： Series resonant induction heating power supply main control board for small and medium power applications

3、SD320： Parallel resonant induction heating power supply control kit with thyristor power regulation

4、SD330：Parallel resonant induction heating power supply control kit with chopper power regulation for low-power applications.

5、SD350：Integrated assembly design of series resonant induction heating power supply main control board

6、SD360：Series resonant induction heating power supply main control board, customized model for small and medium power users.

7、Model Description: SD310A series resonant, inverter phase-shift power modulation PSM, 16-bit high precision

Shipped model distinction		Remark
SD310A	Inverter phase-shift power modulation PSM, 16-bit high-precision sampling, RS232+RS485, dual isolated power supply	
SD310B	DC chopper power modulation (DCM), 16-bit high-precision sampling, RS232+RS485, dual isolated power supply	
SD310C	Inverter frequency and power modulation PFM, 16-bit high-precision sampling, RS232+RS485, dual isolated power supply	
SD310Z	Customized versions according to customer requirements	

8、If you purchase a main control board as standard, the shipped product will be: SD310X main control board X1, which does not include any other accessories.

9、If you purchase a kit, the following shipment method will be provided unless otherwise specified:

一、SD310XT The control kit includes			二、SD310XT The driver kit includes	
SD310X main control board	X1		SK601/603/608/609 driver module	X1
7 寸 touchscreen	X1		15V150W Switching power supply	X1
SV800/810 Data Acquisition Module	X1		20PIN Connecting ribbon cable (50mm long)	X1
24V150W Switching power supply	X1			
RS232 Connecting cable (3.0 meters long)	X1			