

Multiple fault protection

Arc and short circuit protection

Excellent multi-machine parallel capability

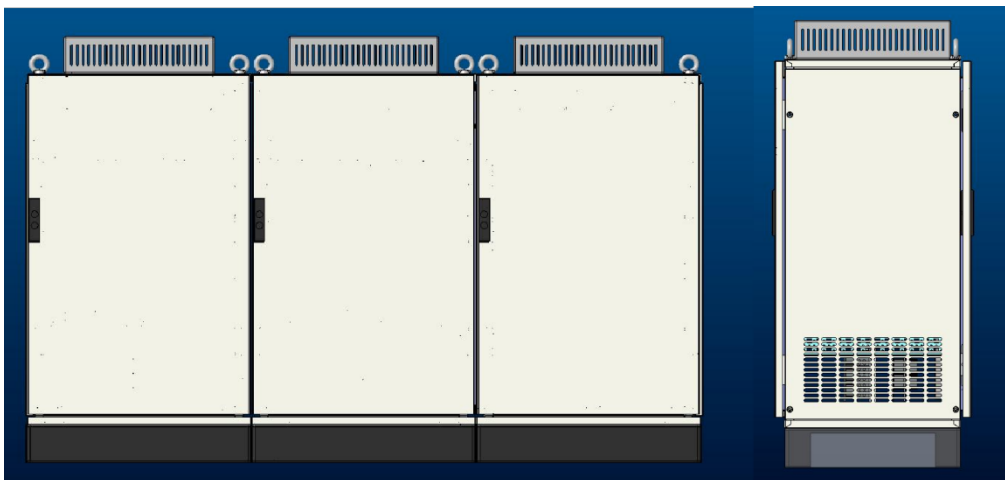
Multiple communication interface selection

1.Overview

The 100kV/500kW HVDC power supply system provides energy for the post-stage equipment. The output voltage is adjustable from 0-100kv, the output current is 0-5A, and the average output power is 500kW.

The modular design idea is adopted. Each power module is designed as 35kW, and the whole system is composed of 15 modules in parallel, providing a redundancy of 25kW.

The whole system consists of 4 cabinets, 3 of which are installed with power module, and one cabinet is installed with input power distribution, control system and output filter protection system. The size height of the whole system is 2000mm, the width is 2400mm, the depth is 800mm, and the weight of the system is about 2.0t.



2.Input distribution

Each cabinet is equipped with a 300A ac contactor and a lightning protection module, and then through 1 to 5 line divider, each line divider is equipped with a 100A circuit breaker, and then input each power module. The control part is equipped with 32A air switch with leakage protection.

3.High voltage power supply module

3.1 module overview

ZY303 series high voltage power supply adopts active power factor correction technology to achieve high power factor and low harmonic, LCC high frequency resonance circuit to realize soft switch, and frequency modulation plus phase shift technology to achieve reliable and stable output. The output power is 35kW, can choose positive polarity and negative polarity output, output voltage from 0 to 100kV can choose. It can be through the full function front panel for simple local control, but also through CAN or 485 interface to achieve remote control.

ZY303 series high voltage power supply has perfect protection circuit and superior resistance to ignition and discharge short-circuit performance, can be applied to all kinds of working conditions, is the ideal choice for harsh environment applications.

3.2 Typical applications

Ion beam injection

Semiconductor technology

Electron beam welding

Capacity charge

High power RF transmitter

Electrostatic precipitator

X-ray system

3.3 technical parameters

(1) Input voltage: 324vac-530vac, three-phase five-wire system

(2) Input frequency: 49hz-55hz

(3) Input power factor: 0.95

(4) THDi:< 5%

(5) Output power: 35kW

(6) Output voltage: 0kv-100kv, positive and negative polarity can be selected

(7) Voltage regulation:

Source effect : $\pm 0.05\% + 500\text{mV}$

Load effect : $\pm 0.05\% + 500\text{mV}$

(8) Current regulation:

Source effect : $\pm 0.05\% + 100\mu\text{A}$

Load effect : $\pm 0.05\% + 500\mu\text{A}$

(9) Ripple:

0.2% peak-to-peak value +1Vrms

(10) Efficiency: $\geq 92\%$

(11) Stability

After 1 hour preheating, 0.02% per hour

(12) Temperature coefficient: 100 PPM / °C

(13) Environment

Temperature range : $-20^{\circ}\text{C} \sim +40^{\circ}\text{C}$

Storage temperature : $-20^{\circ}\text{C} \sim +85^{\circ}\text{C}$

Humidity : 10%-90% relative humidity, no condensation

(14) Cooling: forced air cooling, forward wind and out wind

(15) Overall dimensions: height 311mm (7U), width 482mm (19 in.), depth 650mm.

(16) Weight: about 80kG

3.4 Other technical features

Support more than 20 power supply parallel operation.

Achieve input overvoltage, undervoltage, unbalanced three-phase/lack of phase, the converter output over-current, over-voltage, light output over-current, moderate protection power component temperature, shutdown, when the temperature of the environment more than 50° c. limit light power run times or time exceeds a certain value (programmable), shut off the power output for a period of time by air insulation high-pressure components or transformer insulation, can adjust voltage rise rate.

3.5 Control port

Stitch	Signal	Parameter
1	Power common terminal	GND
2	Reset/high voltage suppression	Usually open circuit, low level effective
3	External interlock	Open circuit for +24V, current <25mA
4	External interlock returns	External interlock returns
5	Current monitoring	0 to 10 VDC = 0-100% of the rated output, Zout = 1 k Ω , 1%
6	Voltage monitoring	0 to 10 VDC = 0-100% of the rated output, Zout = 1 k Ω , 1%
7	+10Vdc reference output	+10Vdc@1mA
8	Current SPC	0 to 10 VDC = 0-100% of the rated output, Zin>10M Ω
9	Local mA programming output	0 to 10 VDC = 0-100% of the rated output, Front panel potentiometer
10	Voltage programmable	0 to 10 VDC = 0-100% of the rated output, Zin>10M Ω
11	Local kV programming output	0 to 10 VDC = 0-100% of the rated output, Front panel potentiometer
12	Remote power output	The open circuit is +24V and the closed circuit is <25mA
13	Remote power on return	Remote power on return
14	Remote high voltage shutdown	Open for +24V, close<25mA connection to 15 feet for front panel operation
15	Remote high voltage close/open common terminal	Remote high voltage close/open common terminal

16	Remote high voltage switch	The open circuit is +24V, and the closed <25mA connection to 15 feet is the opening high voltage
17	High pressure closing indication	+24V@25 mA= high pressure off
18	High pressure open indication	+24V@25 mA= high pressure on
19	Power common terminal	GND
20	+ 24 VDC output	+24Vdc@maximum100mA
21	Voltage mode state	Open collector, low level = effective
22	Current mode state	Open collector, low level = effective
23	Current mode state	Open collector, low level = effective
24	Mutual locking and closing state	Open collector, low level = effective
25	Power test point	0-10vdc =0-100% rated output, Zout=5kΩ
26	Standby application	
27	Standby application	
28	Remote overvoltage adjustment	0-10Vdc=0-100% rated output
29	Power failure	Open collector, low level = effective
30	Ovevoltage Fault	Open collector, low level = effective
31	Overcurrent fault	Open collector, low level = effective
32	System failure	Open collector, low level = effective
33	RGLT fault	Open collector, low level = effective
34	Arc	Open collector, low level = effective
35	Thermal failure	Open collector, low level = effective
36	AC fault	Open collector, low level = effective
37	Standby application	
38	Standby application	
39	Standby application	
40	Remote power programming output	0-10Vdc=0-100% rated output, Zin>10MΩ
41	Local power programming output	0-10Vdc=0-100% rated output , Internal potentiometer
42	+5Vdc output	+5Vdc@maximum100mA
43	+15Vdc output	+15Vdc@maximum100mA
44	-15Vdc output	-15Vdc@maximum10mA
45	RS485 A+	
46	RS485 B+	
47	RS485GND	
48	CANH	
49	CANL	
50	CAN GND	
25	Power common terminal	GND

4. Output filtering

In order to further reduce the ripple of power supply output, all power supplies are pooled and then output after passing through high-voltage LC filter. The total output voltage and current are collected through the general control system.

5. Control system

In order to achieve high reliable control, the NI CompactRIO high-performance controller is adopted to protect and control the whole system. Communication with power module through CAN bus. Communicate with upper computer through Ethernet. The output voltage and current are collected through 16-bit AD, and the Settings of output voltage and current are set through 16-bit DA. External fault signal protection is realized through high speed digital I/O module.



CAN bus is used for communication with modules. Each module has a different address, and the state of each module CAN be transmitted to the upper computer. Each module CAN be controlled independently.

The power on and power off of the cooling fan can be realized by controlling the ac relay on and off. When the power system is working, the cooling fan will start, and when the power system is in standby mode, the cooling fan will stop working.

The panel of the main control cabinet is equipped with two LED lights. When the system is in standby mode, the green light flashes; when the system is working, the green light is always on; when the system fails, the red light is always on.

Both the system and the voltage-sharing and current-sharing are realized through the CAN bus. Under the condition of constant current, the total current set is divided by the number of modules and output to each module. Under the condition of constant voltage, each module adjusts itself by comparing with the set value.

6.Heat dissipation design

The cooling system is mainly used to reduce the ambient temperature inside the cabinet. Five modules are installed in each cabinet. Each cabinet is cooled by 6 axial fans, which are located at the back of the cabinet. The specifications of each fan are 120mm*120mm*38mm, with a voltage of 24V and a power of 20W. It is driven by 200 W switching power supply. The fan is controlled by a small relay named cdch8s-20a. The current is 20A. The control signal of the relay comes from the controller. The whole cooling air duct is front and rear air ducts. The side of the cabinet receives air and the rear of the cabinet gives air.

7. Electromagnetic compatibility design

First, the cabinet is installed with shielding cabinet to prevent interference. Photoelectric isolation is adopted for system input and output to improve anti-interference. EMI filter is installed on the input and output of the module. Photoelectric isolation is adopted for the input and output of the module.

8. Protection features

The system has the functions of under-voltage, over-voltage, unbalanced/missing phase, over-voltage, over-current and short-circuit protection, which improves the reliability of the system.