Product Manual

TP-P22



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1. Overview

1、 Application Scenarios

This high-voltage direct-current (HVDC) power supply is a specially customized power source, featuring advantages such as small size, light weight, high efficiency, and built-in fan for heat dissipation. Its maximum operating efficiency is ≥97%. The power module adopts an aluminum shell design, which is not only lightweight and aesthetically pleasing but also has a waterproof design. It can serve as a substitute for imported high-voltage direct-current module power supplies.

2、 Product Features

- DC-DC isolated power supply converter: It converts 850–1000 VDC input to 58.5 VDC nominal output, with 22 kW rated output power.
- It has the characteristics of high power density, small size, light weight, etc.
- The design meets the reliability requirements of the power supply: There is over/under-voltage protection for the input, and the output has functions such as over-voltage protection, current limiting, short-circuit protection, and over-temperature protection.

3、 Product Photos



4、 Main Specifications of the Product

Input voltage range	Rated output voltage	Rated output power	Efficiency	Voltage regulation accuracy	Output ripple and noise
850～1000Vdc	58.5±0.5Vdc	22KW	≥97%	≤±1%	≤±2%Vo

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2. Environmental conditions

NO.	Program	Technical indicators	Unit	Remark
1	Operating temperature	-20℃～+40℃	℃	22 kW continuous
2	Storage temperature	-40℃～+80℃	℃	/
3	Relative humidity	≤95	%	No condensation（40℃±2℃）
4	Altitude	0-3000	m	
5	Atmospheric pressure	76～106	Kpa	/
6	Heat dissipation method	Self-contained air cooling	/	/

3. Electrical characteristics

1	Input characteristics			
NO.	Program	Technical requirements	Unit	Remarks
1.1	Rated input voltage	950	Vdc	
1.2	Input voltage range	850～1000	Vdc	
1.3	Maximum input current	32	A	Vin=850Vdc, Po=24KW
2	Output characteristics			
NO.	Program	Technical requirements	Unit	Remarks
2.1	Output rated voltage	58.5	Vdc	/
2.2	Output voltage range	55～59	Vdc	
2.3	Rated output current	400	A	/
2.4	Rated output power	22000	W	/

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2.5	Peak output power	24000	W	
2.6	Output efficiency	≥97	%	Vin=950Vdc，＞50%
2.7	Voltage regulation accuracy	±1	%	/
2.8	Source regulation rate	±1	%	/
2.9	Load regulation rate	±1	%	/
2.10	Output ripple and noise	≤1000	mVp-p	Bandwidth limit: 20 MHz. Connect a 10 μF electrolytic capacitor and a 0.1 μF film capacitor in parallel at the test end.
2.11	Temperature coefficient	±0.02	%/℃	/
2.12	Output rise time	≤1	S	/
2.13	Output delay at startup	≤5	S	Rated load
2.14	Over - shoot amplitude during startup and shutdown	△V：≤±5	%	/
2.15	Dynamic response over - shoot	△V：≤±5	%	/
2.16	Dynamic response recovery time	≤2	ms	25%～50%～25% or 50%～75%～50% load change，25℃
3	**Protection Characteristics**			
NO.	**Program**	**Technical requirements**	**Unit**	**Remarks**
3.1	Input under - voltage protection	730～770	Vdc	The hysteresis is greater than 10V
3.2	Input under - voltage recovery	≦800	Vdc	
3.3	Input over - voltage protection	1030～1070	Vdc	The hysteresis is greater than 15V

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3.4	Input over - voltage recovery	≤1000	Vdc	
3.5	Output over-voltage protection	62～66	Vdc	It can be self-recovered
3.7	Output over-current protection	440～470	A	It can be self-recovered
3.8	Output short-circuit protection	It will not be damaged in case of long-term short circuit		It can be self-recovered
3.9	Over-temperature protection	When the temperature of the outer shell is detected to be higher than 70℃, the output will be protected, and it will be restored when the temperature drops to 60℃	℃	The temperature of the outer shell

4. Safety Characteristics

NO.	Program		Test conditions	Remarks
1	Withstand voltage strength	Input to output	3000Vdc/10mA/1min	There is no arcing and no breakdown.
		Input to enclosure	2000Vdc/10mA/1min	
		Output to enclosure	1000Vdc/10mA/1min	
2	Insulation resistance	Input to output	≥10MΩ@ 500Vdc	At normal atmospheric pressure, when the relative humidity is 90% and the test direct current voltage is 500V
		Input and enclosure	≥10MΩ@ 500Vdc	
		Output to enclosure	≥10MΩ@ 500Vdc	

5. Other Characteristics

1、Flammability requirements：

The flame-retardant grade of the PCB used in the system shall meet the V-0 requirements specified in GB4943.1-2011. The flame-retardant grade of the insulated cable shall meet the requirements specified in GB/T 18380.12-2008. The flame-retardant grade of other insulating materials shall meet the V-1 requirements specified in GB4943.1-2011.

2、System noise

The system noise shall not be greater than 60dB(A).

3、System reliability

MTBF≥100Khour ；

Test conditions: 25℃, rated input, full - load output, predicted by the stress method in MIL - HDBK - 217F Notice2；

4、Protection Level

The protection class shall meet the requirements of IP65 grade. Water accumulation on the top of the power supply shell is not allowed.

5、Three Protections (Moisture-proof, Mildew-proof, Salt Fog-proof)

The circuits such as printed circuit boards and connectors inside the product shall be treated against moisture, mildew and salt spray. Among them, the salt spray resistance shall meet the requirements of Table 9 in GB/T 4797.6, enabling the product to operate normally in outdoor humid and salt - spray environments

6. Product Label

Self-made, or printed according to the customer's requirements.

7. Mechanical dimensions and definitions of connectors

1、 Schematic diagram of the product installation dimensions

Parameters	Indicator
Maximum external dimensions	296mm*201mm*127mm±1mm

Overall enclosure dimensions: 296 × 201 × 127 mm ±1 mm. Confirm mounting positions and the installation drawing for your supplied module with TethPower before installation.

2、 Definition of Connectors

Definition of Power Section

Definition Table：

Functional Name	Definition	Annotation
DC Input	VIN+	Positive terminal of high-voltage
	VIN-	Negative terminal of high-voltage
DC Output	OUT+	Positive terminal of 60V output

	OUT-	Negative terminal of 60V output

3、 Mass (Net Weight):

≤9.5kg

8. Packaging, Transportation, and Storage

1、Packaging

The product name, model, manufacturer's logo, the inspection certificate of the manufacturer's quality department, the manufacturing date, etc. shall be marked on the packaging box. There is an attachment list inside the packaging box.

2、Transportation

The product should be packed in a sturdy packaging box during transportation. The outside of the box should comply with the relevant national standards and bear markings such as "Handle with Care" and "Keep Away from Moisture". The packaging box containing the product is allowed to be transported by any means of transportation. During transportation, direct exposure to rain and snow as well as mechanical impacts should be avoided.

3、Storage

When the product is not in use, it should be stored in the packaging box. The ambient temperature in the warehouse should be between -10°C and 40°C, and the relative humidity should not exceed 80%. There shall be no harmful gases, flammable and explosive products, or corrosive chemicals in the warehouse. There should also be no strong mechanical vibrations, impacts, or strong magnetic fields. The packaging box should be placed on a pad at least 20 cm above the ground and at least 50 cm away from walls, heat sources, windows, or air inlets. Under the conditions specified herein, the storage period is generally 2 years. After more than 2 years, the product should be re - inspected.

9. Safety Precautions

1. Once the safety protection of the equipment is damaged, the equipment must stop operating and be handled in accordance with the relevant maintenance regulations.
2. When the power supply equipment is moved from a cold environment to a warm one, condensation may cause the risk of electric leakage. Therefore, the grounding requirements must be strictly implemented. The equipment must be connected to the power supply by qualified personnel.

3. The power must be cut off and the equipment must be shut down for five minutes to allow sufficient time for the capacitors to discharge before any maintenance work can be carried out on the power supply equipment.
4. Pay attention to safety during use: Avoid touching areas with safety warning signs or high - voltage signs with your hands to prevent electric shock or burns.

10. Referenced Standards and Specifications

GB/T 2423.1-2001 Environmental testing for electrical and electronic products - Part 2: Test methods - Test A: Low temperature

GB/T 2423.2-2001 Environmental testing for electrical and electronic products - Part 2: Test methods - Test B: High temperature

GB/T 2423.3-1993 Basic environmental testing procedures for electrical and electronic products - Test Ca: Test method for constant damp heat

GB/T 2423.4-1993 Basic environmental testing procedures for electrical and electronic products - Test Db: Test method for cyclic damp heat

GB/T 2423.5-1995 Environmental testing for electrical and electronic products - Part 2: Test methods - Test Ea and guidance: Shock

GB/T 2423.6-1995 Environmental testing for electrical and electronic products - Part 2: Test methods - Test Ea and guidance: Collision

GB/T 2423.8-1995 Environmental testing for electrical and electronic products - Part 2: Test methods - Test Ed: Free fall

GB/T 2423.10-1995 Environmental testing for electrical and electronic products - Part 2: Test methods - Test Fc and guidance: Vibration (sinusoidal)

GB/T 2423.11-1997 Environmental testing for electrical and electronic products - Part 2: Test methods - Test Fd: Broadband random vibration - General requirements

GB/T 2423.22-2002 Environmental testing for electrical and electronic products - Part 2: Test N: Temperature change

GB/T 14508-93 Mechanical environmental conditions for freight transportation on class highways

EN55022: 1998 Information technology equipment - Radio interference characteristics - Limits and methods of measurement

EN55024: 1998 Information technology equipment - Immunity characteristics - Limits and methods of measurement

CEI IEC 61000-4-2 2001 Electromagnetic compatibility - Testing and measurement techniques - Electrostatic discharge immunity test

CEI IEC 61000-4-3 2002 Electromagnetic compatibility - Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test

CEI IEC 61000-4-4 1998 Electromagnetic compatibility - Testing and measurement techniques - Electrical fast transient/burst immunity test

CEI IEC 61000-4-5 1999 Electromagnetic compatibility - Testing and measurement techniques - Surge (impact) immunity test

CEI IEC 61000-4-6 2001 Electromagnetic compatibility - Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields

CEI IEC 61000-4-8 1993 Electromagnetic compatibility - Testing and measurement techniques - Power frequency magnetic field immunity test

CEI IEC 61000-4-11 1994 Electromagnetic compatibility - Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests

CEI IEC 61000-4-29 2000 Electromagnetic compatibility - Testing and measurement techniques - Immunity to voltage dips, short interruptions and voltage variations on d.c. input ports

IEC 61000-3-2 2001 Electromagnetic compatibility - Limits - Limits for harmonic current emissions (equipment input current ≤16A per phase)

IEC 61000-3-3 1994 Electromagnetic compatibility - Limits - Voltage fluctuations and flicker in low-voltage supply systems (equipment rated current ≤16A)

GB4943-2001 Safety of information technology equipment

YD/T 282-2000 General test methods for the reliability of telecommunication equipment

GB/T 13722-92 Technical requirements and test methods for mobile communication power supplies

YD/T 732-95 Test methods for DC-DC converters used in telecommunications

YD/T 731-2002 High-frequency switching rectifiers for telecommunications

GB14287.1-2005 Electrical fire monitoring system - Part 1: Electrical fire monitoring equipment