# **Bipolar Programmable Power Supply user's manual** V1.1

# Model: DXMP-300



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# 1. Overview

The power supply is a high stability bipolar constant current power supply, which is widely used in the excitation of inductive loads such as electromagnets and Helmholtz coils. The power supply adopts linear power supply structure, with high output current stability and low ripple and noise. The output current of the power supply can continuously change between the positive and negative rated maximum current, and the current can smoothly and continuously cross zero, which can make the electromagnet or coil produce a smooth and stable magnetic field.

With the company's high-precision Gauss meter and probe (option), the power supply can work in magnetic field mode. In the magnetic field mode, the magnetic field value can be set directly, and the power supply will adjust the output current to make the electromagnet quickly reach the set magnetic field, which is convenient and fast, and the magnetic field is stable. The field can be controlled independently at will, or the magnetic field can be scanned continuously. Current mode and magnetic field mode can be switched at any time according to needs, and the operation is flexible.

#### **Functions and features**

#### 1) Bipolar constant current output

the output current of the power supply can change continuously between the positive and negative rated maximum current

the current can smoothly cross the zero point without switching commutation

four quadrant operation of output current and voltage (suitable for inductive load)

the current change rate can be set in the range of 0.0007  $\sim$  0.3 F.S. / S (F.S. is the rated maximum output current)

#### 2) High current stability and low ripple

current stability: better than  $\pm$  25ppm / h (standard type); Better than  $\pm$  5ppm / h (high stability type)

current accuracy:  $\pm$  (0.01% set value + 1mA)

current resolution: 20 bit, for example, 15A power supply, the current resolution is 0.03mA

source effect:  $\leq 2.0 \times 10$ -5 F.S. (change of output current when the supply voltage changes by 10%)

load effect:  $\leq 2.0 \times 10-5$  F.S. (change of output current when the load changes by 10%)

current ripple (RMS): less than 1mA

#### 3) Two working modes

current mode: directly set the current in the magnet or coil

magnetic field mode: directly set the magnetic field in the magnet or coil

Note: the magnetic field mode needs to be matched with the company's high-precision Gauss meter and probe

#### 4) Two operation modes

local control adopts high-definition touch screen display and operation

remote control can be controlled by computer through RS232 interface or RS485 interface, USB and LAN are optional

#### 5) Multiple protection functions

input power failure protection (when the input power fails, the internal protection absorbs the inductive load to recharge energy)

overcurrent protection (automatic current reduction; if the overcurrent is not controllable, turn off the power output and give an alarm)

# 2. Appearance Introduction

## 2.1 Front Panel

The front panel of the power supply is shown in the figure below, including the power switch (POWER), indicator light (STATUS), and a high-definition touch screen.



Figure 2.2 Power Front Panel

## 2.2 Rear panel

The rear panel of the power supply is shown in the figure below. AC IN is the input power socket; FUSE is the fuse socket for power input (10A fuse is installed inside); Ext Fault aviation plug is an external fault interlocking protection terminal; The RS232 port is the RS232 communication terminal of power supply with the computer; The USB port (square port) is the USB communication terminal of power supply with the computer; OUT is the DC current output terminal.



Figure 2.3 Power Rear Panel

# 3. Technical parameters

M	odel	DXMP-300		
Input	Power Supply Mode	Single-phase three-wire		
	Voltage	220VAC ± 10% (50/60Hz)		
	Output Type	Bi-polar constant current output		
	Rated Current	±50A		
	Voltage	±6V		
	Resolution	20 bit		
Output	Source Effect	≤ 2.0×10 <sup>-5</sup> F.S. (When the supply voltage changes by 10%, the output current change)		
	Load Effect	$\leq 2.0 \times 10^{-5}$ F.S. (Change in output current when the load changes by 10%)		
	Current Ripple	1Am		
	Working Temperature	<b>0~30</b> ℃		
Environment	Working Humidity	20~90%RH		
Cooling	Cooling Way	Air cooling		
Communication	Communication interface	RS232		

Note 1: The stability of the current is the relative change of the current when the current is full-scale output, the power supply warm-up time is greater than 30 minutes, and the measurement time is not less than 1 hour. Note 2: The output ripple of the current is the rms value of the AC component of the output current measured by KEITHLEY2700.

# 4. Installation and wiring

## 4.1 Power input connection

The power supply of the equipment is required to be AC 220V, 50 / 60Hz power input, and the voltage range is 220VAC  $\pm$  10%.

The power input interface is located on the rear panel of the power supply, and its identification is AC in. The rated current carrying capacity of the power line shall be greater than 10A.

Warning: input voltage out of range may damage the power supply.

Note: the power line with less than the rated current carrying capacity may overheat and scorch the power line and cause fire.

## 4.2 Load connection

The power output interface is located on the rear panel of the power supply. Its identification is out and its specification is M6 terminal. The red terminal represents the current outflow direction when the power supply is positive, and the black terminal represents the current inflow direction.

Before use, please carefully check whether the output of the power supply and the load are connected correctly and reliably. The current carrying capacity of the connection between the power output and the load shall be greater than the rated current output of the power supply.

Warning: the connection between the power output line and the load should be firm and tight. Otherwise, the power supply will be seriously damaged.

Note: the power output line with less than the rated current carrying capacity may overheat and scorch the line and cause fire.

## **4.3** Communication connection

**1) RS232 communication:** The default mode of power communication is RS232. The port is located on the rear panel of the power supply and its identification is RS232. The communication port is a standard RS232 terminal, and its terminal form is DB9 female. Only three wires (pins 2, 3 and 5) are needed to realize communication.

**2) RS485 communication:** If the power communication is RS485 communication mode (optional), the port is located on the rear panel of the power supply and its identification is RS485. The communication port is DB9 female, and the wiring is defined as follows: A + -- pins 1 and 2, and B --- pins 3 and 4.

**3) USB communication:** If the power communication is USB communication mode (optional), the port is located on the rear panel of the power supply, and its identification is USB. The communication port is a standard B-type USB female (square port), which can be directly connected to the USB port of the computer with a USB cable.

During normal use of power supply, if it is only manual operation, this communication port may not be connected.

## 4.4 External fault connection

There is an external fault interlock protection socket (ext. fault) on the rear panel of the power supply, which is a 4-core aviation plug. The definition of wiring is as follows: 1 - + 12V, 2 - NC normally closed end, 3 - no normally open end, 4 - common end (0V). Users can connect corresponding terminals as needed.

For example, if the user needs to connect a normally closed temperature switch outside, both ends of the temperature switch should be connected to two pins and four pins of the aviation plug respectively; If a normally open temperature switch is to be connected outside the user, both ends of the temperature switch shall be connected to pin 3 and pin 4 of the aviation plug respectively, and pin 2 and pin 4 shall be short circuited at the same time; If the external interlocking is not used, the 2 pins and 4 pins of the aviation plug shall be short circuited (short circuited when leaving the factory), otherwise the external interlocking fault will be alarmed.

## 4.5 Cooling

The power supply adopts air cooling mode. Make sure there are no obstacles or heat sources within 20cm of the air outlet.

# **5.** Power operation

## 5.1 Power standby

1) Confirm that the power input has been connected to AC220V mains power; Confirm that the power output and load are connected.

2) Turn on the switch (power) on the front panel of the power chassis. At this time, the red LED indicator is on, and the screen is on to enter the standby interface.

3) There are four buttons on the standby interface, and their functions are as follows:

"startup power supply": used for power startup;

"remote local": when the power supply is controlled remotely by the computer, other buttons on the screen will be locked and cannot be operated. Press "remote local" to switch to the local state, and the power supply can be operated on the touch screen.

"fault state": open the power failure state interface;

"contact us": open the contact information interface.

In standby mode, if the power supply fails or the emergency stop switch is pressed, the corresponding status will be displayed on the right side of the screen. If "fault" is displayed, you can view the specific fault information in the fault status interface.



Figure 5.1 Power standby interface

## 5.2 Power operation interface

#### 1) Power on:

Click the "start power" button in the standby interface, and the following prompt interface will pop up. Click "yes" to enter the power on self-test. If the self-test process fails, return to the standby interface and display the fault on the screen; If yes, enter the power operation interface. Click "no" to return to the standby interface.

Confirm		
	Turn on the instrument?	
	YES NO	



Figure 5.2 Power main interface

#### 1) Introduction to power operation interface:

Display area: respectively display the current actual output current, actual output voltage, current change rate and current magnetic field value of the power supply (if there is a Gauss meter).

Setting area: used to set the target current. It can be realized in two ways: first, directly click the input box on the right side of "target current" and directly input numbers in the pop-up numeric keyboard; Second, in the input box of "step current", input the step value of each increase or decrease of current, and then click the "+" key or "-" key on the right side of "target current" to change the current.

Status area: some status information is displayed on the right side of the screen. Depending on the working mode of the power supply, "current mode" or "magnetic field mode" will be displayed. "Fault", "emergency stop" and "pause" will be displayed when the corresponding status occurs, but not when it does not occur.

"power off" button: used for power off;

"remote local" button: the power supply has two operation modes: local control adopts touch screen operation, and remote control is controlled by computer through RS232 or RS485 interface (USB, LAN

optional). When the power is turned on, the default is the local control mode. If the upper computer sends effective instructions to the power, the power will enter the remote control mode. When the power supply is controlled remotely by the computer, other buttons on the screen will be locked and cannot be operated. Press "remote local" to switch to the local state, and the power supply can be operated on the touch screen.

"power zero" button: it is a shortcut button to set "target current" to 0A, which is convenient for operation.

"pause" button: after pressing "pause", the power output current remains unchanged. In the pause state, you can set the target current and other operations, but do not execute them. Only after the "pause" is resumed can it continue to execute.

"parameter setting" button: open the parameter setting interface.

"failure status" button: open the power failure status interface

"contact us" button: open the contact information interface.

#### 2) Power off:

Click the "power off" button in the power operation interface to pop up the following prompt interface. Click "yes" to enter the power off process. After shutdown, enter the standby interface.



#### 5.3 Parameter setting

Power communication address: when multiple power connections communicate with RS485, this address must be set from 1 to 255.

Communication baud rate: the default baud rate of power serial communication is 9600, which can be set.

Current change rate: used to set the current change rate of the power supply.

Working mode of power supply: the power supply has two working modes: current mode and magnetic field mode. The default power on mode is current mode. If the power supply is equipped with our Gauss meter, it can be changed to magnetic field mode here, and the power supply will enter magnetic field mode for operation. The magnetic field mode can also be changed to current mode.

"zero calibration of Gauss meter" button: when the power supply has a Gauss meter, you can send a command to calibrate the zero of Gauss meter through this button.

"return" button: return to the original interface.



Figure 5.3 Parameter setting interface

# 5.4 Fault status

If the power supply fails, you can view the specific fault information in the fault status interface. Black font indicates no fault, and red font indicates that the fault occurs.

Control state: some fault states of the control part. In case of fault, the alarm will be shut down.

Power module status: some states of the power module itself. In case of 4 overcurrent and switching power supply faults, the power supply will alarm and shut down; For other items, the power will not be turned off. If the power supply is equipped with a Gauss meter, "with Gauss meter" is displayed below, otherwise, "without Gauss meter" is displayed.

Power module parameters: display the voltage and current of the four bridge arms of the power supply to judge whether the working state of the power supply is normal.

"fault reset" button: when the power supply fails, the power supply cannot be started. It can only be started after troubleshooting and fault reset.

"return" button: return to the original interface.

Fault Status					
Control Status	Module	Status	Module F	Parameters	
Overheated	I_PU Overcurrent	SMPS Failure	I_PU:	0.000 A	
Water-Break	I_PD Overcurrent	Load Open Circuit	I_PD:	0.000 A	
			I_NU:	0.000 A	
Condensation	I_NU Uvercurrent		I_ND:	0.000 A	
External Interlock 1	I_ND Overcurrent		V_PU:	0.000 V	
External Interlock 2	P Voltage Saturation		V_PD:	0.000 V	
Module Not Found	N Voltage Saturation		V_NU:	0.000 V	
Module Fault	P Over Power	Gaussmeter	V_ND:	0.000 V	
Module Startup Failed	N Over Power	No Gaussmeter	Fault Reset	Back	
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Figure 5.4 Fault Status Interface

Contact Us	
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Figure 5.5 Contact interface

#### Matters needing attention:

1) If the power supply is not used for a long time, turn off the power switch on the front panel after shutdown.

2) If the power switch on the front panel is turned off, it needs to wait about 20 seconds before it can be powered on again, otherwise it will not start normally due to incomplete discharge of the internal switching power supply. If there is a fault that cannot be eliminated in the power supply, please call the after-sales service department of Xiamen Dexing Magnet Tech. Co., Limited.

# 6. Computer communication

# 6.1 Instruction format description

The power supply supports two remote control communication modes: RS232 and RS485. Only one interface can be used at the same time. The control command is in text mode, and the specific settings are as follows:

1) The baud rate is 9600 by default and can be set.

2) 1 start bit, 8 data bits, 1 odd check bit and 1 stop bit.

**3)** The instruction terminator is CRLF.

4) The interval between two instructions shall be greater than 100ms, otherwise communication error may be caused.

5) Command strings are not case sensitive.

6) RS485 communication instruction needs to add address to RS232 instruction, and its instruction format is @ <addr>\_< RS232 command >. Where addr is the address number, and the instruction is input without <>\_ Represents a space.

For example: @2 curr 5 functions: set the power supply current with address 2 to 5A.

# **6.2 Instruction set**

Black bold font is command word; > Inside is the command parameter, which is not carried with >. | indicates that one of several parameters is selected. Return refers to the power response output. For the instruction of setting parameters, there is a space between the command word and the parameter value, and multiple parameters are separated by commas. Common instructions for power supply are as follows:

#### \*IDN?

Function: query equipment model and serial number

Return: JZM, jcp-15 / 40, ver1 1,P202008001

Note: JZM: abbreviation of Xiamen Dexing Magnet Tech. Co., Limited

Jcp-15 / 40: power supply model; JCP -- constant current power supply, rated current 15A, rated voltage 40V

Ver1. 1: Current software version

P202008001: power supply serial number

#### LIMIT?

Function: read the limit value of power output parameters (rated current, rated voltage, maximum current change rate)

Rated current, a / s, maximum return rate

POWER <ON|OFF> Function: power switch

Note: power on

Power off

#### **POWER?**

Function: query power status Return: < standby | running | fault > Note: standby indicates standby state, running indicates running state, and fault indicates fault state

Curr< output target current >

Function: set the output target current, unit: a

Note: curr 1.5 sets the power target current to 1.5A

#### CURR?

Function: query current output current

Return: current output current of power supply, unit: a

#### VOLT?

Function: query current output voltage

Return: current output voltage of power supply, unit: v

Rate < current change rate >

Function: set the change rate of output current (temporarily modified, restore the default value after power failure and restart), unit: A / S  $\,$ 

Note: rate 1.5 sets the output current change rate to 1.5a/s

#### RATE?

Function: query output current change rate

Return: current output current change rate of power supply, unit: A / S

Field < output target magnetic field >

Function: set the output target magnetic field (only valid in magnetic field mode), unit: GS

Note: field 100 sets the target magnetic field to 100GS

#### FIELD?

Function: query the current output magnetic field

Return: current output magnetic field, unit: GS

GM:ZERO

Function: zero calibration with matching Gauss meter (the probe should be placed in the zero gauss cavity when in use)

MODE <CURR|FIELD>

Function: set the working mode of power supply (only valid for power supply with Gauss meter)

Mode: curr annotation Set the power supply to current mode

MODE FIELD Set the power supply to magnetic field mode

#### MODE?

Function: query the current working mode of the power supply

Return: <curr|field>

Note: curr indicates current mode and field indicates magnetic field mode

#### FAULT?

Function: query power failure status flag bit

# Limited Warranty Statement: one (1) year warranty

1. Dexing Magnet guarantees that during the warranty period of this product, all instrument replacement or service caused by faults (except those listed in Article 4 of this statement) are free of charge. If Dexing Magnet receives the customer's fault report about the product within the product warranty period, Dexing Magnet will repair or replace the product for free according to its own choice. Repair or replacement of parts can guarantee that the product has 90 days or the original warranty period (whichever is longer).

2. Dexing Magnet is only responsible for products sold through the following sales channels: products sold to customers by Dexing Magnet sales representatives, distributors or original equipment manufacturers (OEMs).

3. Start date of warranty period: the delivery date of the product, or the date when Dexing Magnet's employees install and debug the product. If the installation and commissioning date exceeds 30 days after delivery due to the arrangement or delay of the customer, the starting date of the warranty period starts on the 31st day after delivery. 4. The warranty does not apply to the following:

a) Improper or incomplete maintenance, repair and calibration;

b) Fuse tube and disposable battery;

c) The software, communication interface, parts and other related equipment of the instrument not provided by Dexing Magnet;

d) Unauthorized alteration or misuse of operations other than those published in the manual or manual;

e) Improper site preparation or environment.

remarks

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