

# **Zhongshan Haoyuan Electrical Equipment Co., Ltd.**

## **MS3A-6 Six-Channel Excitation Multi-Waveform Power Supply**

# **Instruction Manual**

**Address: No. 3-5, Haijing Industrial Village, Shiqi District, Zhongshan  
City, Guangdong Province,  
China Tel: 0760-89935878 Fax:  
0760-88413788 Postcode: 528400**

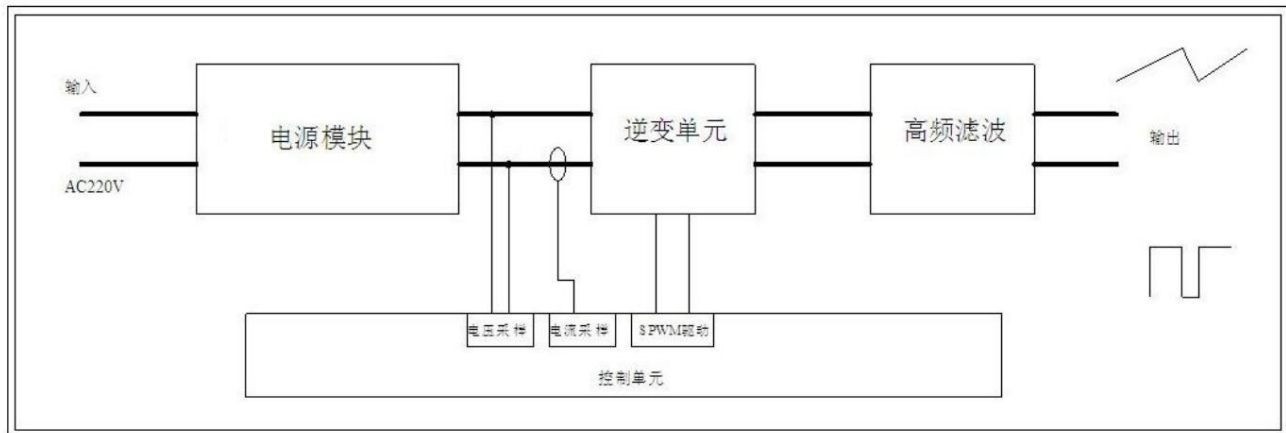
## Danger! The power supply is generating high voltage!

- Any incorrect operation could be life-threatening.
- Carefully read the "Operating Warnings" in this instruction manual to avoid accidents.
- To ensure better use of the power supply, please place the instruction manual next to it.

Disclaimer: Our company may not disclose information regarding the performance, function, structure, appearance, accessories, packaging, or other aspects of this product.

We will improve and refine the terms and conditions without prior notice. Please contact us if you have any questions.

### 1. Working Principle



### 2. Technical Parameters

**Input voltage: AC220V/50Hz**

**Control method: Voltage modulation**

**Protection rating:**

**IP21 Dimensions: 482mm \* 580mm \* 175mm (W x D x H)**

**Output voltage: -20V~+20V;**

**Output current: 3A RMS, 5A Peak per channel;**

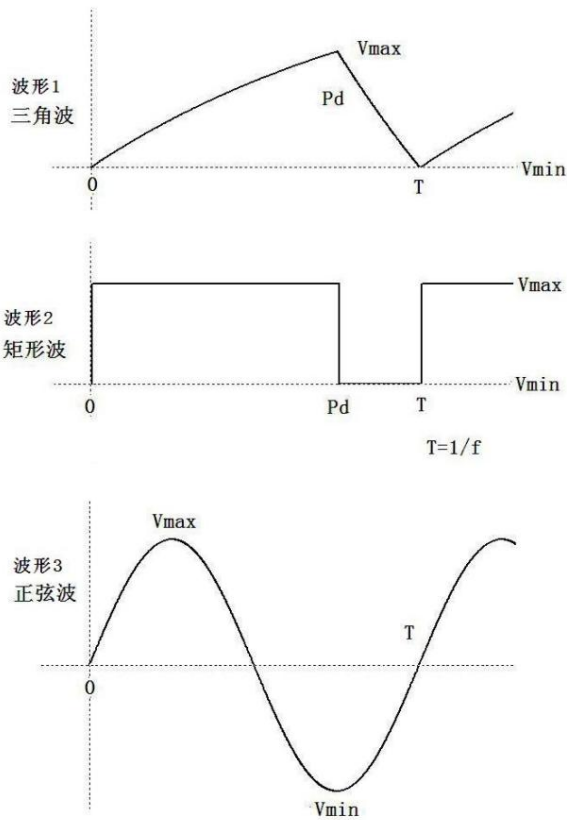
**Output waveform: Triangle, Square, Sine wave**

**Frequency range: 0.10-50.0Hz;**

**Duty cycle range: 10%-90%.**

**Number of output channels: 6**

Waveform description:



Vmin: Waveform low value VL (lowest point - trough value);

Vmax: Waveform high value VH (highest point - peak value);

T: Waveform period,  $T=1/f$  ( $f=[0.10,50.00]$ Hz).

Pd: Waveform duty cycle. This parameter has no effect on sine waves.

The voltage values of each output waveform can be arbitrarily selected between -20.0V and +20.0V. The "+" and "-" markings on the output terminals only indicate the relative positive and negative terminals. That is, when the output waveform falls within the positive voltage range, the "+" potential is higher than the "-" potential; when the output waveform falls within the negative voltage range, the "-" potential is higher than the "+" potential.

### 3. The power supply voltage

requirement for the equipment is single-phase 220V, with a permissible voltage fluctuation of -10% to +10%. Exceeding this range may damage the equipment; please take note.

Due to the high power of this equipment, ensure a secure connection during electrical connection and minimize contact resistance at the connection points to prevent significant voltage drops during operation, which could affect the normal operation of the equipment.

**Warning! Input/output terminals may contain dangerously high or fatal voltages; therefore, ensure proper operation of the equipment.**

Wiring should be performed in accordance with standard safety procedures.

**Grounding wire: To protect the safety of operators, the power socket supplying power to this equipment must be properly grounded.**

4. Front control panel diagram:



5. Operating Instructions

5.1 Power On 1.

Check that the mains voltage is normal.

2. Close the user's power circuit breaker to allow external power to flow to the power source.

5.2 Menu Operation Instructions

1. Display Project Query

1-1 Main Screen A: Displays voltage

manual operation for channels 1-6.  
**1:11.7V 4:14.2V**  
**2:12.3V 5:15.3V**  
**3:13.7V 6:\_. \_V**

Note: 1.

The first "Manual" in the first line means manually controlling the start and stop of the 6 outputs; the second "Manual" means manually setting the waveform parameters of the 6 outputs (parameters include enable/disable, waveform selection, waveform frequency, waveform duty cycle, waveform voltage low value [valley value] and waveform voltage high value [peak value]).

2. Lines 2 to 4 represent the effective voltage values of output channels 1-6. "6:\_. \_V" indicates that channel 6 is disabled, while the other 5 channels have voltage displays.

This indicates that

the channel is enabled. Note: When a channel is disabled, it will have no output regardless of whether the main power switch is "•Run" or "•Off"; when a channel is enabled, it will output according to the set parameters when the main power switch is "•Run", and will have no output when it is "•Off".

Press the "ÿ" key on this screen to switch the display in the

following order: 1-2 Main Screen B: Displays

1-6 current channels manual && manual • run  
**1:0.54A 4:1.42A**  
**2:1.23A 5:1.53A**  
**3:2.25A 6:\_. \_A**

illustrate:

The second to fourth lines represent the effective current values of output channels 1-6. "6: \_\_\_A" indicates that channel 6 is disabled, while the other 5 channels display current.

This indicates that it is enabled.

1-3 Main Screen C: Displays voltage/current for channels 1-3

```
Manual && Manual • Run
1:11.7V/0.54A 2:12.3V/
1.23A 3:13.7V/2.25A
```

1-4 Main Screen D: Displays 4-6 channels of voltage/current

```
Manual && Manual • Run
4:14.2V/1.42A 5:15.3V/
1.53A 6:___V/___A
```

## 2. Viewing and Modifying Waveform Parameters

2-1 Press " " on the main screen (AD) to display the waveform parameters of channels 1-6 in sequence.

```
Parameter settings for channel 1:
Enable—Triangle Wave
f:40.91Hz /P:40%
[ -10.0V, +10.0V ]
```

illustrate:

1. The first line indicates that the parameter is for the first path;

2. The second line "Enable" indicates that the waveform is enabled, and "Disable" indicates that it is disabled.

2-2 Modify waveform parameters

Take modifying the waveform parameters of the third channel as an example.

2-2-1 On the main screen (AD), press " " to select and display the waveform parameter settings for channel 3.

```
Channel 3 parameter settings:
Enable—Triangle Wave
f:40.91Hz /P:40% [ -10.5V,
+12.0V ]
```

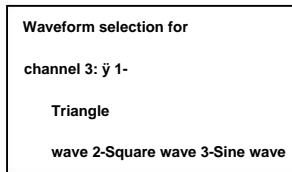
Then press the "SET" button to enter the "Enable?" screen.

2-2-2 "Enable?" screen

```
Is route 3 enabled?
y Enable/
Disable
```

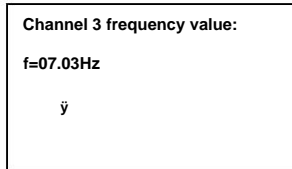
Press the "y" and "y" keys to select whether to enable it, and then press the "SET" key to enter the "Waveform Selection" screen.

2-2-3 "Waveform Selection" screen.



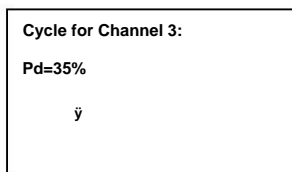
Press the "y" and "y" keys to select the waveform type, and then press the "SET" key to enter the "Frequency Value" screen.



2-2-4 "Frequency Value" screen.



Use the  and  keys to move the cursor, press "y" and "y" to input the corresponding digit value, and then press the "SET" key to enter the "Duty Cycle" screen.

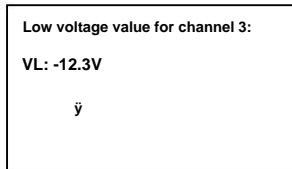
2-2-4 "Duty Cycle" Screen. Duty





Use the  and  keys to move the cursor, press "y" or "y" to input the corresponding digit value, and then press the "SET" key to enter the "Low Voltage" screen.

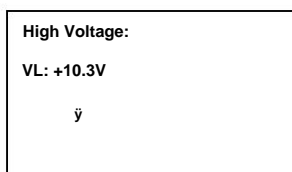
Note: For sine waves, the duty cycle is meaningless.

2-2-5 "Low Voltage" screen.



Use the  and  keys to move the cursor, use "y" and "y" to input the corresponding digit value (voltage value can be between -20.0 and +20.0), and then press the "SET" key to complete the input of the lowest waveform value and enter the "Voltage High Value" screen.

2-2-6 "Low Voltage" screen. Channel 3

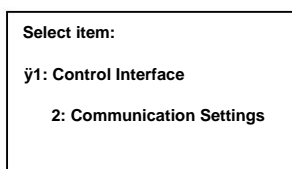


Press the  and  keys to move the cursor, press "y" and "y" to input the corresponding digit value (voltage value can be between -20.0 and +20.0), then press...

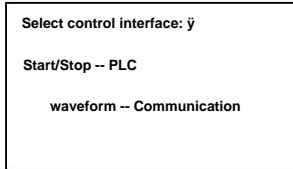
Press the "SET" key to input the highest value of the waveform and return to the main screen.

### 3 Other settings

3-1 On the main screen (AD), press "SET" to enter the "Select Item" screen.



### 3-2 "Select Control Interface" screen



In the 3-1 "Select Item" screen, select "1: Control Interface," and press the "SET" key to enter the "Select Control Interface" screen. Use the  $\bar{y}$  and  $\bar{y}$  keys to move the cursor, and press the key to input the control input interface corresponding to the cursor's interface category. Start/stop controlled inputs can be selected as manual, PLC (external control contact input), or communication (MODBUS); waveform controlled inputs can be selected as manual or communication

(MODBUS). Note: "Start/Stop" refers to the six-channel overall start/stop signal; "Waveform" includes whether a single channel is enabled, waveform type, frequency, duty cycle, and waveform low/high frequency. Values and waveform high values.

### 3-3 "Communication Settings".

In the 3-1 "Select Item" screen, select "2: Communication Settings", and press the "SET" key to set the communication address and byte format of the RS485 communication MOSBUS.

### 5.3 To turn off the

power, press the "OFF" button. If the device will not be used for an extended period, disconnect the mains power supply.

### 6. Warranty Period:

The coating power supply is covered by a one-year warranty from the date of manufacture. Any product quality issues will be repaired free of charge by our company. Damage caused by human error or failure to follow this instruction manual for installation and use is not covered under warranty, but our company will still be responsible for repairs.

## warn!

### 7. Safety Precautions 1. This

series of coating power supplies is specifically designed for magnetron sputtering vacuum coating and must not be used for other purposes. 2. Please read the instruction manual carefully before installing and using this equipment. 3. After the equipment is powered on, some components will have high voltage. Improper connections or contact may cause electric shock, electrical sparks, and other damage. 4. The installation and commissioning of this equipment must be performed by qualified electrical professionals. The equipment should be protected from direct sunlight and rain. 5. Unauthorized alteration of the internal structure of this equipment is strictly prohibited.

**Appendix: Communication settings for six-channel excitation power supply (for use with communication interface).**

This device can be equipped with an RS485 communication interface, using the common Modbus RTU communication protocol. However, due to the limited resources of the MCU within the device, please pay attention to the following when using it.

The following points:

1. This device, as a slave of Modbus RTU, only accepts function codes 03H, 06H, and 10H; it will not respond to other function codes.
- 2: Each read/write operation should keep the register open for no more than 20 words.
- 3: The baud rate can be set to 2400, 4800, or 9600.

**Keep register address allocation**

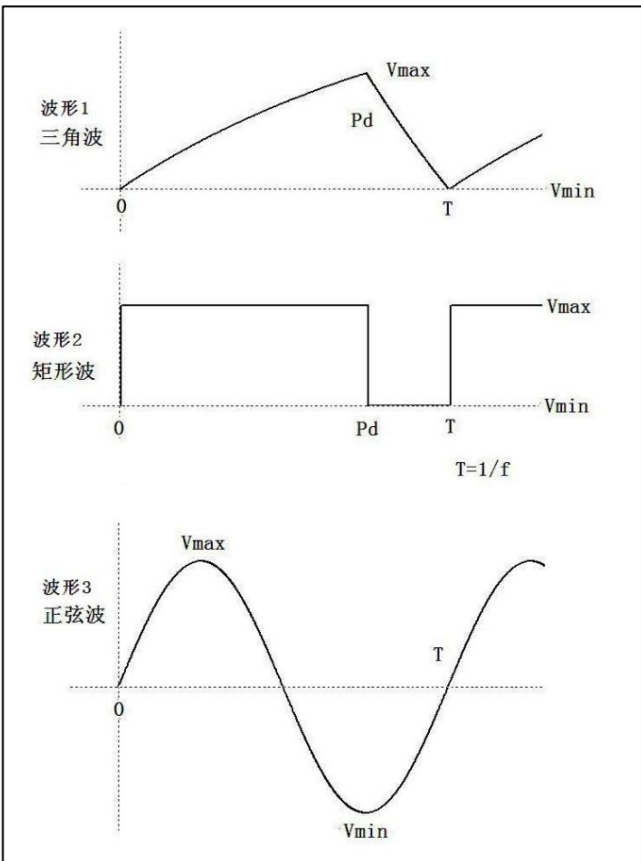
register name	variable address	variable name	variable type	Reading and writing nature	illustrate
4X00001~ 4X00003	00H~ 02H	reserve		R	
4X00004	03H	Fault Return			Pending
4X00005	04H	Total output voltage	Unsigned int		The voltage value R is in units of 0.1V; the same applies below. For example, 0feH equals 254, which means a voltage value of 25.4V.
4X00006	05H	Total output current	Unsigned int		The current value R is in units of 0.01A; the same applies below. For example, 0feH equals 254, which means a voltage value of 2.54A.
4X00007	06H	CH1 Voltage value	Unsigned int		The first output voltage display value is shown as R. $\times 0.1V$
4X00008	07H	CH1 Current value	Unsigned int		The first output current display value (CH1) is shown as $0.01A$ .
4X00009	08H	CH2 voltage value	Unsigned int		The voltage display value for the second output channel (CH1) is 0.1V.
4X00010	09H	CH2 current value	Unsigned int		The second output current display value is shown as $0.01A$ .
4X00011	0AH	CH3 Voltage value	Unsigned int		The third output voltage display value is shown as 0.1V.
4X00012	0BH	CH3 Current value	Unsigned int		The third output current display value is $\times 0.01A$ . The
4X00013	0CH	CH4 Voltage value	Unsigned int		fourth output voltage display value is $\times 0.1V$ . The fourth
4X00014	0DH	CH4 Current value	Unsigned int		output current display value is $\times 0.01A$ . The fifth output
4X00015	0EH	CH5 Voltage Value	Unsigned int		voltage display value is $\times 0.1V$ . The fifth output current
4X00016	0FH	CH5 Current value	Unsigned int		display value is $\times 0.01A$ .
4X00017	10H	CH6 Voltage value	Unsigned int		The voltage display value for the sixth output channel (R) is 0.1V.
4X00018	11H	CH6 Current value	Unsigned int		The sixth output current display value is shown as $0.01A$ .
4X00019	12H	retention		R/W	
4X00020	13H	Start/Stop control	16 Bits	R/W	Bit0: 1-CH1 enabled, 0-CH1 disabled; Bit1: 1-CH2 enabled, 0-CH2 disabled; Bit2: 1-CH3 enabled, 0-CH3 disabled; Bit3: 1-CH4 enabled, 0-CH4 disabled; Bit4: 1-CH5 enabled, 0-CH5 disabled; Bit5: 1-CH6 enabled, 0-CH6 disabled; Bits 6-14: Useless; Bit 15: 1 - Total Start, 0 - Total Stop;  Bit 15 is the overall start/stop control for all 6 outputs; Bits 0-5 control the individual outputs.  Whether the channel is enabled. When Bit15 is set to 0, all 6 channels will not output; when Bit15 is set to 1, all 6 channels will not output.  When bit 0-5 is set to 1, the corresponding output channel will have output.
4X00021	14H	CH1 Waveform Type set up	Unsigned int	R/W	1- Set as a triangular wave; 2- Set as a square wave (rectangular wave); 3- Set as a sine wave.
4X00022	15H	CH1 frequency set up	Unsigned int	R/W	$\times 0.01Hz$ , such as 0feH, equals 254, indicating a voltage value of 2.54Hz.
4X00023	16H	CH1 duty cycle set up	Unsigned int	R/W	R/W is in units of 1%; for example, 1fH equals the decimal number 31, indicating a duty cycle of 31%. This waveform...  When set to a sine wave, the duty cycle parameter is invalid.

4X00024	17H CH1 high value Voltage setting	Signed int	R/W waveform peak voltage setting, $\times 0.1V$ , range [-200, +200]. (e.g., 123) This indicates 12.3V.
4X00025	18H CH1 low value Voltage setting	Signed int	R/W waveform minimum voltage setting, $\times 0.1V$ , range [-200, +200]. (e.g., 123) This indicates 12.3V.
4X00026 ~4X00030	19H CH2 waveform parameters ~1DH set up		See CH1 for waveform parameter settings.
4X00031~ 4X00035	1EH CH3 Waveform Parameters ~22H set up		See CH1 for waveform parameter settings.
4X00036~ 4X00040	23H CH4 Waveform Parameters ~27H set up		See CH1 for waveform parameter settings.
4X00041~ 4X00045	28H CH5 Waveform Parameters ~2CH set up		See CH1 for waveform parameter settings.
4X00046~ 4X00050	2DH CH6 Waveform Parameters ~31H set up		See CH1 for waveform parameter settings.

**Note:**

1. When the master station modifies a variable with only readable (R) attributes, the slave station responds normally but does not modify the variable.

**2. Waveform Description:**



Vmin: Low voltage setting, i.e., trough value (lowest point - trough value);

Vmax: High voltage setting, i.e. peak value (highest point - peak value);

Both Vmax and Vmin can be set between [-20.0V, +20.0V].

However, the condition  $V_{max} \geq V_{min}$  must be met. When  $V_{max} = V_{min}$  (or

When  $V_{max} < V_{min}$ , regardless of the waveform type, it becomes DC.

Output the value, which is Vmin.

T: Waveform period,  $T = 1/f$  (f is between [0.10 Hz, 50.00 Hz])

(Can be set).

Pd: Waveform duty cycle. This parameter has no effect on sine waves.