

StonyLab®

HIGHVOLTAGE POWERSUPPLY OPERATION MANUAL

(PLEASE READ THE INSTRUCTION CAREFULLY
BEFORE YOU USE THE MACHINE)



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1. Introduction and Specifications

1.1 Introduction

The device is an intelligent, modular high-voltage power supply. It adopts a fully digital control mode, capable of meeting various customer control settings. Its fast voltage and current transient response capability ensures fault-free operation. This series offers comprehensive functionality, a wide output range, and can also include custom features based on customer requirements through software.

1.2 Specifications

Input: AC 220V $\pm 10\%$, 50/60Hz (Note: The machine requiring 110V voltage is equipped with an AC transformer)

Output: Rated voltage 30kV, rated current 1mA, continuously adjustable from 0 to the maximum voltage, with single positive or negative polarity output.

Front Panel Functions: Power on/off, auto-start enable/disable, memory enable/disable, voltage/current presets, high voltage output on/off, user interface settings, and voltage output adjustment.

Front Panel Status Indicators: Polarity indicator, constant voltage/constant current mode, auto-start status, memory status, preset status, output status, and error code display.

Voltage Control: The built-in rotary encoder allows the output voltage to be set between 0 and the maximum voltage.

Coarse/Fine Adjustment Function: The power supply automatically recognizes coarse or fine adjustments based on the rotation speed of the knob. Fast rotation results in larger steps, while slow rotation results in smaller steps.

Voltage Control: The built-in rotary encoder allows the output voltage to be set between 0 and the maximum voltage.

Voltage Regulation:

- a. Relative to Load: 0.01% (from no load to rated load).
- b. Relative to Input: $\pm 0.01\%$ (for $\pm 10\%$ input voltage variation).

Current Regulation:

- a. Relative to Load: 0.01% (from no load to rated load).
- b. Relative to Input: $\pm 0.01\%$ (for $\pm 10\%$ input voltage variation).

Ripple Voltage: Under rated output conditions, better than 1% rms (0.1% rms available as an option).

Ambient Temperature:

- a. During operation: 0°C to +50°C.
- b. During storage: -20°C to +80°C.

Temperature Coefficient: Voltage and current better than 100ppm/°C.

Stability: Less than 0.1% over 8 hours after 0.5 hours of warm-up.

Voltage and Current Display:

Three-digit LED display, accuracy $\pm 1\%$ under rated output conditions.

Dimensions: Width 141.2mm, Height 40mm, Depth 217mm.

Weight: Approximately 1.8kg.

High Voltage Output Cable: Comes with a non-shielded high-voltage cable. Standard cable length is 2 meters, with an outer diameter of 5.5mm, non-detachable.

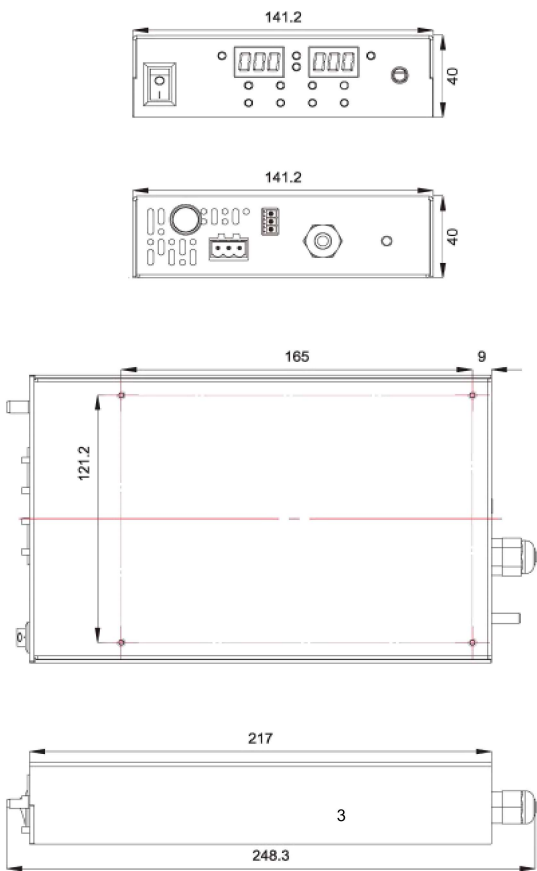
2. Inspection and Installation

2.1 Initial Inspection

After unpacking, inspect the panel and casing for any visible signs of damage. If any issues are found, contact the manufacturer.

2.2 Installation

The power supply can be installed in an electrical cabinet or placed on a workbench.



3. Operating Instructions

3.1 Precautions

- A. Check the label on the bottom of the power supply to ensure that its rated values match your requirements.
- B. Properly ground the power supply: The casing of the high-voltage power supply must be properly grounded. Connect the grounding terminal of the power supply to the ground wire using a copper wire.
- C. Connect the output cables to the load.

The high-voltage power supplies use an AC 220V input (Note: Note: The machine requiring 110V voltage is equipped with an AC transformer). Insert the power cord into the power input socket and switch on the power.

3.2 User Parameter Settings

The default factory settings of the power supply may not fully meet the user's preferences or special requirements. Therefore, the device provides powerful and comprehensive configuration options, allowing users to modify these factory settings before use. Additionally, users can quickly adjust settings during operation using the front panel function keys. By modifying the default values, users can tailor the settings to meet their usage habits and specific needs. Detailed information is provided in the table below.

3.2.1 Accessing the User Parameter Settings Interface

- A. With the high voltage turned off, simultaneously press the "Auto-Start" and "Memory" buttons for 3 seconds to bring up the password input screen (see Figure 3.1).
- B. Use the adjustment knob to input the access password "88" (see Figure 3.2).
- C. Cease operations and wait for 3 seconds to enter the user parameter settings interface (see Figure 3.3). At this point, the current meter on the left will display the "Setting Item" number, while the voltage meter on the right will show the "Default Value" of the "Setting Item" (refer to the table below).



Figure 3.1



Figure 3.2



Figure 3.3

Serial Number	Settings	Scope And Meaning Of Set Value	Setting Value (Default Value)
1	Local Address	Range: 1-247	1
2	Number Of All Failures (Over-Voltage, Over-Current)	Range: 1-999 Fault always self-starting: 999 Fault shutdown: 1	1
3	Limit Time For Counting Failure Times	Range: 1-999 seconds	60
4	Automatic High Voltage Turn On After Being Electrified	0: No self-startup 1: Self-startup	0
5	Baud Rate Setting	Actual Baud Rate = Setting Value * 4800	2

3.2.2 User Parameter Settings

After accessing the user parameter settings interface, use the "Auto-Start" button in conjunction with the adjustment knob to configure user parameters.

- **Setting Item:** Displayed on the left.
- **Setting Value:** Displayed on the right.

- A. Use the adjustment knob to select the "Setting Item" you wish to modify.
- B. Press the "Auto-Start" button briefly (the Auto-Start LED indicator will light up) to enter the "Setting Value" modification mode.
- C. Adjust the knob to change the "Setting Value."
- D. Press the "Auto-Start" button briefly again (the Auto-Start LED indicator will turn off) to return to selecting the "Setting Item."
- E. Repeat the above steps to modify other "Setting Items."
- F. Cease operations and wait for 5 seconds to return to the power-on use interface.

3.2.3 Example Application Scenarios

At the factory, the default settings for the power supply are as follows:

- Address is 1.
 - High voltage turns off after a fault occurs.
 - Does not remember the settings before power-off.
 - High voltage turns off after an arc occurs.
 - High voltage is off when power is applied.
- A. To control multiple power supplies with a single computer and assign different addresses to each unit, modify the "Setting Value" corresponding to "Setting Item" 1.

- B. To have the high voltage turn off after detecting overvoltage or overcurrent three times within 10 seconds to protect the load or troubleshoot, set the "Setting Value" for "Setting Item" 2 to "3" and the "Setting Value" for "Setting Item" 3 to "10."
- C. To ensure the power supply remembers the voltage and current values before power-off the next time it is powered on, press the "Memory" button on the front panel; the "Memory" LED indicator will light up. If you prefer not to remember these values, press the "Memory" button again to turn off the "Memory" LED indicator.
- D. To have the power supply auto-start when an arc occurs, press the "Auto-Start" button on the front panel; the "Auto-Start" LED indicator will light up. If you prefer not to auto-start and instead turn off the high voltage output directly, press the "Auto-Start" button again to turn off the "Auto-Start" LED indicator.
- E. To have the high voltage turn on immediately after applying power, set the "Setting Value" for "Setting Item" 4 to "1."

3.3 Front Panel Function Keys



3.3.1 Power On

Note: The power supply can only be turned on by pressing the "Power Switch" button to

the "I" position if the high-voltage power supply is properly grounded and the output cables are securely connected to the load.

Press the "Power Switch" button to the "I" position; the "mA" and "kV" indicators on the front panel will remain illuminated.

3.3.2 Preset

In the event of a fault, the "Output" button, "Preset" button, and adjustment knob will be inactive, while the "Auto-Start" and "Memory" buttons will function normally. To reset the fault, press and hold the "Preset" button for 3 seconds.

When there is no fault, pressing the "Preset" button will cause the voltage meter to flash. Rotate the "Adjustment" knob, and the voltage meter will display the preset voltage value. Press the "Preset" button again, and the current meter will flash. Rotate the "Adjustment" knob, and the current meter will display the preset current value.

Note: If there is no operation within 3 seconds while the voltage or current meter is flashing, the system will exit the preset mode and display the actual values.

When the "Preset" indicator is off, pressing the "Preset" button will display the current preset values, with both preset voltage and current values flashing. If there is no operation within 3 seconds, the system will return to the actual value display mode.

3.3.3 Memory

Memory Function: When the high voltage is turned off, the preset values are not cleared. When the power is turned back on, the preset values are initialized to the values set before the last shutdown.

No Memory Function: When the high voltage is turned off or the power is restarted, the preset current value will default to the rated value, and the preset voltage value will default to 0.

Setting Memory Function: Press the "Memory" button on the front panel; the "Memory" indicator will light up, enabling the memory function. Press the "Memory" button again; the "Memory" indicator will turn off, disabling the memory function.

3.3.4 Auto-Start

Auto-Start Function: When an arc occurs, the power supply will activate its protection mechanism and then auto-start, resuming operation with the preset parameters.

No Auto-Start Function: When an arc occurs, the power supply will activate its protection mechanism and turn off the high voltage output. It will remain off until manually restarted.

Setting Auto-Start: Press the "Auto-Start" button on the front panel; the "Auto-Start" indicator will light up, enabling the auto-start function.

3.3.5 Output

Output Function: The power supply will output high voltage according to the preset values.

No Output Function: The power supply will turn off the high voltage output.

Setting Output: Press the "Output" button on the front panel; the "Output" indicator will light up, enabling the output function. Press the "Output" button again; the "Output" indicator will turn off, disabling the output function.

3.3.6 Power Off

Press the "Power Switch" button to the "O" position. After 5 seconds, all indicators on the front panel will turn off, cutting the AC power supply to the high voltage power supply device, and the power supply will be completely shut down.

3.3.7 Fault Reset Function

When the power supply is in an abnormal protection state, the digital display will show a fault code. Users can refer to the fault code table to identify and troubleshoot the corresponding issue.

4. Warnings and Safety Precautions

4.1 Warnings

EN: Warnings:

- A. Do not modify, disassemble, or remove the product casing. Doing so may result in electrical shock, burns, or fire. The company assumes no responsibility for such issues.
- B. Certain internal components may generate high voltage and high temperature during operation. Touching these internal components may cause electrical shock or burns.
- C. Keep hands and face away from the product while it is in operation to avoid accidental injury.
- D. The standard client end of the high-voltage cable provided by the company is an unprocessed bare end. Since the company is unaware of the client's on-site protective measures and load conditions, any modifications made by the client or requested by the client do not represent the company's endorsement of the safety of this connection method. The high-voltage cable output end should be properly connected to the load and protected to prevent the cable from falling off and causing injury or even life-threatening situations.

E. Due to the high hardness of the insulation layer in high-voltage cables, coiling the cable is generally not recommended as improper coiling may cause the cable to be compressed or twisted, affecting its performance and lifespan. If coiling the excess cable is necessary, first secure the cable's power end, then coil the cable, and finally secure the cable's load end. It is strictly prohibited to secure both the power end and load end before coiling, as this may cause twisting and damage to the cable. Additionally, a small coiling radius may damage the internal insulation layer and cause partial discharge. Please handle with care.

F. If the device needs to discharge into open air, ensure that electronic components or personnel maintain a distance of at least half a meter from the alligator clip to prevent electrostatic breakdown, which could damage electronic components or pose a safety hazard.

G. Before use, carefully check whether the voltage is correct to avoid equipment damage or potential danger.

H. In case of device failure, immediately disconnect the power supply and contact the manufacturer.

DE: Warnungen:

A. Verändern, zerlegen oder entfernen Sie das Gehäuse des Produkts nicht. Dies kann zu einem elektrischen Schlag, Verbrennungen oder Feuer führen. Das Unternehmen übernimmt keine Verantwortung für derartige Probleme.

B. Bestimmte interne Komponenten können während des Betriebs Hochspannung und hohe Temperaturen erzeugen. Das Berühren dieser internen Komponenten kann zu einem elektrischen Schlag oder Verbrennungen führen.

C. Halten Sie Hände und Gesicht vom Produkt fern, während es in Betrieb ist, um versehentliche Verletzungen zu vermeiden.

D. Das standardmäßige Kundenende des von der Firma gelieferten Hochspannungskabels ist ein unbearbeitetes blankes Ende. Da das Unternehmen die bauseitigen Schutzmaßnahmen und Belastungsbedingungen des Kunden nicht kennt, stellen etwaige vom Kunden vorgenommene oder geforderte Änderungen nicht die Zustimmung des Unternehmens zur Sicherheit dieser Anschlussmethode dar. Das Ausgangsende des Hochspannungskabels sollte ordnungsgemäß mit der Last verbunden und geschützt sein, um zu verhindern, dass das Kabel herunterfällt und Verletzungen oder sogar lebensbedrohliche Situationen verursacht.

E. Aufgrund der hohen Härte der Isolierschicht von Hochspannungskabeln wird das Aufwickeln des Kabels im Allgemeinen nicht empfohlen, da ein unsachgemäßes Aufwickeln dazu führen kann, dass das Kabel zusammengedrückt oder verdreht wird, was seine Leistung und Lebensdauer beeinträchtigt. Wenn das Aufwickeln des überschüssigen Kabels notwendig ist, sichern Sie zuerst das Stromende des Kabels, dann wickeln Sie das Kabel auf und sichern schließlich das Lastende des Kabels. Es ist strengstens untersagt, sowohl das Netz- als auch das Lastende vor dem Aufwickeln zu sichern, da dies zu einer Verdrehung und Beschädigung des Kabels führen kann. Außerdem kann ein kleiner Wickelradius die innere Isolierschicht beschädigen und eine Teilentladung verursachen. Bitte mit Vorsicht behandeln.

F. Wenn das Gerät ins Freie entladen werden muss, stellen Sie sicher, dass elektronische Komponenten oder Personal einen Abstand von mindestens einem halben Meter zur Krokodilklemme einhalten, um elektrostatische Durchschläge zu vermeiden, die elektronische Komponenten beschädigen oder ein Sicherheitsrisiko darstellen könnten.

G. Prüfen Sie vor der Verwendung sorgfältig, ob die Spannung korrekt ist, um Geräteschäden oder mögliche Gefahren zu vermeiden.

H. Trennen Sie im Falle eines Geräteausfalls sofort die Stromversorgung und wenden Sie sich an den Hersteller.

FR: Avertissements :

A. Ne pas modifier, démonter ou retirer le boîtier du produit. Vous risqueriez de vous électrocuter, de vous brûler ou de provoquer un incendie. L'entreprise n'assume aucune responsabilité à cet égard.

B. Certains composants internes peuvent générer des tensions et des températures élevées pendant leur fonctionnement. Le contact avec ces composants internes peut provoquer des chocs électriques ou des brûlures.

C. Tenir les mains et le visage à l'écart du produit lorsqu'il est en fonctionnement afin d'éviter toute blessure accidentelle.

D. L'extrémité client standard du câble haute tension fourni par l'entreprise est une extrémité nue non traitée. Étant donné que la société ne connaît pas les mesures de protection et les conditions de charge du site du client, toute modification apportée par le client ou demandée par ce dernier ne représente pas l'approbation par la société de la sécurité de cette méthode de connexion. L'extrémité de sortie du câble haute tension doit être correctement connectée à la charge et protégée afin d'éviter que le câble ne tombe et ne provoque des blessures, voire des situations mortelles.

E. En raison de la dureté élevée de la couche d'isolation des câbles haute tension, il n'est généralement pas recommandé d'enrouler le câble, car un enroulement incorrect peut entraîner une compression ou une torsion du câble, ce qui nuit à ses performances et à sa durée de vie. S'il est nécessaire d'enrouler l'excédent de câble, il faut d'abord fixer l'extrémité d'alimentation du câble, puis enrouler le câble et enfin fixer l'extrémité de charge du câble. Il est strictement interdit de fixer à la fois l'extrémité d'alimentation et l'extrémité de charge avant d'enrouler le câble, car cela peut provoquer des torsions et endommager le câble. En outre, un faible rayon d'enroulement peut endommager la couche d'isolation interne et provoquer une décharge partielle. Veuillez manipuler le câble avec précaution.

F. Si l'appareil doit se décharger à l'air libre, veillez à ce que les composants électroniques ou le personnel restent à une distance d'au moins un demi-mètre de la pince crocodile afin d'éviter une rupture électrostatique qui pourrait endommager les composants électroniques ou présenter un risque pour la sécurité.

G. Avant toute utilisation, vérifiez soigneusement si la tension est correcte afin d'éviter d'endommager l'équipement ou de présenter un danger potentiel.

H. En cas de défaillance de l'appareil, débrancher immédiatement l'alimentation électrique et contacter le fabricant.

ES: Advertencias:

A.No modifique, desmonte ni retire la carcasa del producto. De lo contrario, podrían producirse descargas eléctricas, quemaduras o incendios. La empresa no asume ninguna responsabilidad al respecto.

B.Ciertos componentes internos pueden generar alta tensión y alta temperatura durante el funcionamiento. Tocar estos componentes internos puede causar descargas eléctricas o quemaduras.

C.Mantenga las manos y la cara alejadas del producto mientras esté en funcionamiento para evitar lesiones accidentales.

D.El extremo cliente estándar del cable de alta tensión suministrado por la empresa es un extremo desnudo sin procesar. Dado que la empresa desconoce las medidas de protección in situ y las condiciones de carga del cliente, cualquier modificación realizada por el cliente o solicitada por éste no representa la aprobación por parte de la empresa de la seguridad de este método de conexión. El extremo de salida del cable de alta tensión debe estar correctamente conectado a la carga y protegido para evitar que el cable se caiga y provoque lesiones o incluso situaciones que pongan en peligro la vida.

E. Debido a la gran dureza de la capa aislante de los cables de alta tensión, no se recomienda generalmente enrollar el cable, ya que un enrollado incorrecto puede hacer que el cable se comprima o retuerza, afectando a su rendimiento y vida útil. Si es necesario enrollar el cable sobrante, asegure primero el extremo de alimentación del cable, después enrolle el cable y, por último, asegure el extremo de carga del cable. Queda terminantemente prohibido fijar tanto el extremo de alimentación como el de carga antes de enrollar el cable, ya que podría retorcerse y dañarse. Además, un radio de enrollado pequeño puede dañar la capa aislante interna y provocar una descarga parcial. Manipúlelo con cuidado.

F. Si el dispositivo necesita descargarse al aire libre, asegúrese de que los componentes electrónicos o el personal mantengan una distancia de al menos medio metro de la pinza cocodrilo para evitar una ruptura electrostática, que podría dañar los componentes electrónicos o suponer un riesgo para la seguridad.

G. Antes de utilizarlo, compruebe cuidadosamente si el voltaje es correcto para evitar daños en el equipo o posibles peligros.

H. En caso de avería del aparato, desconecte inmediatamente la alimentación eléctrica y póngase en contacto con el fabricante.

4.2 Disclaimer

EN: Disclaimer:

The manufacturer is not responsible for any injuries or damages caused by improper use or failure to follow the instructions.

DE: Haftungsausschluss:

Der Hersteller ist nicht verantwortlich für Verletzungen oder Schäden, die durch unsachgemäßen Gebrauch oder Nichtbeachtung der Anweisungen verursacht werden.

FR: Avis de non-responsabilité :

Le fabricant n'est pas responsable des blessures ou des dommages causés par une utilisation incorrecte ou le non-respect des instructions.

ES: Descargo de responsabilidad:

El fabricante no se hace responsable de las lesiones o daños causados por un uso inadecuado o por no seguir las instrucciones.

4.3 Safety Precautions

- A. For safety, ensure that the product's casing ground is reliably connected to the equipment ground. Failure to do so may pose a risk of electrical shock.
- B. Disconnect the input power before performing input and output wiring.
- C. Ensure that input voltage, output current, output power, ambient temperature, and humidity are within the specified range; otherwise, the product may be damaged.
- D. Using the product in environments with moisture, humidity, dust, strong electromagnetic fields, corrosive gases (including sulfur compounds), or where foreign conductive substances may enter could lead to internal component failure.
- E. If the internal fuse of the product blows, do not replace it yourself as there may be other damaged components. Please contact the company's service center.

Improper Use can Pose a Threat to Personal Safety

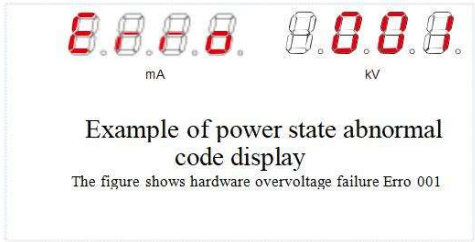
- The high-voltage power supply must be reliably grounded.
- Do not touch high-voltage connectors unless the high-voltage power supply is turned off and the capacitors inside the load and power supply are fully discharged.

- After turning off the high-voltage power supply, wait 5 minutes to allow the internal capacitors to discharge completely.

Safety During Operation

- Do not operate the power supply in a humid environment, and do not ground yourself.
- Maintenance may require removing the power cover while the equipment is energized.
- Operation must be carried out by qualified personnel to prevent electrical shock.
Note: Failure to follow operating procedures may result in personal injury or even life-threatening situations.

Appendix I: Power State Abnormal Code Table



I. Fault: Emergency Shutdown

Code begin with 0, it will not appear when normal operation. Once it appears, it indicates that the working state is abnormal and needs to be shut down immediately.

001: Hardware overvoltage

002: Hardware overcurrent

003: Strong arc

004: Main circuit overcurrent

005: Power grid under-voltage - low voltage of the power grid

006: Power grid overvoltage - power grid voltage is too high

007: Power grid missing items - input three-phase incomplete

008: The load does not match the system parameters

010: Over-temperature

011: IGBT overheating

012: High-voltage rectifier circuit overheating

II. Fault: Non-emergency (for example: the temperature is too high but does not reach the shutdown value)

Code begin with 1. The working state is relatively bad, prompting the user to deal with it.

If it deteriorates further, it may cause shutdown.

101: IGBT temperature is high 102: Abnormal IGBT fan speed

103: The slight arc allowed by the application

104: Unable to reach the set value such as voltage and current (open loop) 110: The power supply temperature is high

111: IGBT temperature is high

112: The temperature of the high-voltage rectifier circuit is high

III. Suspected Failure

Code begin with 2. Application-level failure, the load may not work, but the power supply itself works well.

201: under-voltage, output voltage is too low

202: Undercurrent, the output current is too low

203: Load mismatch——For example, short-circuit power on, etc.

IV. Non-fault: Exceed the protection value set by the user

Code begin with 3

301: The voltage exceeds the user's preset value

302: The current exceeds the user's preset value

Note: The above is the company's fixed code, and not all power supplies contain all the above functions.

Appendix II: High-Voltage Power Supply Communication Protocol

I. Introduction:

The power supply adopts an isolated RS-485 physical interface and a standard Modbus communication protocol.

Protocol configuration:

Transmission mode: RTU (slave station);

Equipment address: 0x01 (default);

Baud rate: 9600 bit/s; Check: None;

Stop position: 1 bit.

II. Protocol register address:

There are four types of registers in the Modbus protocol:

DO, Switch output registers, Scope of address: **00000~0XXXX**.

Function: Send the switch control operation of the upper computer to Power

supply. Comply with "HV ON" "HV OFF" etc.

DI, Switch input registers, Scope of address: **10000~1XXXX**.

Function: Bring the status of power supply reflect to the upper computer.

Comply with whether it is high-voltage output, etc.

AI, Analog input registers, Scope of address: **30000~3XXXX**.

Function: Pass the analog value of the high-voltage power supply to the upper computer. Such as the voltage and current output of the high-voltage power supply.

AO, Analog output register, Scope of address: **40000~4XXXX**.

Function: Send the analog set value of the upper computer to the high-voltage power supply. Comply with set output voltage, Current, etc.

III. High-voltage power supply address allocation:

1) Switch output register (DO)

- High Voltage Setting: **00000 (Address 00 00)**(0-HV OFF, 1-HV ON);
- Control settings: **00010 (Address 00 0A)**(0-front panel control, 1-upper computer control);
- Reset: **00015 (address 00 0F)** (0-Normal, 1-Reset)

2) Switch input register (DI)

- High-voltage indication: **10000(Address 00 00)**(0-high-voltage output off, 1-high-voltage output on);
- Control instructions: **10004 (Address 0004)**(0-front panel control, 1-upper computer control);
- Status indication: **10005 (Address 00 05)**(0-no fault, 1-corresponding failure occurs);
- Overvoltage indication: **10006 (Address 00 06)**(0-no fault,

1-corresponding failure occurs);

- Overcurrent instructions: **10007 (Address 00 07)**(0-no fault, 1-corresponding failure occurs);
- Arc indication: **10008 (address 00 08)**(0-no fault, 1-corresponding failure occurs);

3) Analog input register (AI)

- Voltage indication: **30000(Address 00 00)**(0-65535Corresponding to 0-120% of rated voltage);
- Current indication: **30001(Address 00 01)**(0-65535Corresponding to 0-120% of rated current);
- Voltage indication decimal place: **30003(Address 00 03)** (Voltage display decimal place);
- Current indication decimal place: **30004(Address 00 04)** (Current display decimal place);
- Rated Voltage: **30014 (Address 00 0E)** (Value = Rated Voltage Value x 10^y , y = decimal place. Example: $1000 = 100 \times 10^1$, means rated voltage is 100kV, voltage display decimal place is 1)
- Rated Current: **30015 (Address 00 0F)** (Value = Rated Current Value x 10^y , y = decimal place. Example: $2000 = 20 \times 10^2$, means rated voltage is 20mA, voltage display decimal place is 2)

4) Transmission analog register (AO)

- Voltage setting: 40000 (Address 00 00) (0-65535Corresponding to 0-100% rated voltage);
- Current setting: 40001 (Address 00 01) (0-65535Corresponding to 0-100% rated current);

※Note 1: First digit in address range mentioned, 0, 1, 3 and 4 represent the register type, and the last 4 digits represent the specific address. Ignore the first digit when read and write to the register.

※Note 2: The address mentioned in the article is the address of the communication data frame, not the address of the user layer. When programming with PLC, the starting address is 0001, the corresponding

communication data frame address is 0000.

※Note 3: For safety, the power supply will cut of the high-voltage output after 2 seconds of disconnection, so the host needs to keep querying the status.

※Note 4: For reset operation, send more than 300ms pulse signal to the reset address.

IV. Examples of high-voltage power supply protocol frames (Machine support 01 02 03 04 05 06 0F 10 function code):

1) Read the switch state (The corresponding register address can be found in "Switch input register (DI)")

Tx: 01 02 00 00 00 08 79 CC

Rx: 01 02 01 01 60 48

The upper computer sends Tx meaning of each bit of the frame

1	2	00 00	00 08	79 CC
Equipment address	Read switch input Function code	Starting address	Read Number of coils	Calibrate

The meaning of high-voltage power supply returning to each bit of RX frame:

1	2	1	1	60 48
Equipment address	Function code	Data Number of bytes	State value	Calibrate

Status value meaning:

The status value 01 is converted to binary: 0 0 0 0 0 0 0 1



Corresponding register address: 10007 10006 10005..... 10001 10000

10000 value of the register is 1, corresponding to "1-High-voltage ON". Show the working status of the power supply

2) Read analog input. Corresponding to the output voltage value register address is 30000, Output current value corresponds to register address is 30001

Tx: 01 04 00 00 00 02 71 CB

Rx: 01 04 04 07 D0 0B B8 FC 4B

The meaning of the TX frame and each bit sent by the upper computer:

01	04	00 00	00 02	71 CB
Equipment address	Read analog input function code	Starting address	Read Number of registers	Calibrate

The high voltage power supply returns the RX frame and the meaning of each bit:

01	04	04	07 D0	0B B8	FC 4B
Equipment address	Function code	Data Number of bytes	Output voltage Value	Output current value	Calibrate

The expression of data bit definition:

The value of the output voltage value register 0x07D0, convert to decimal is 2000.
(The corresponding voltage calculation method is: $2000/65535 \times \text{rated voltage} \times 120\%$)

The value of the output current value register 0x0BB8, convert to decimal is 3000
(The corresponding current calculation method is: $3000/65535 \times R \text{ rated current} \times 120\%$)

3) Change the switching output

Example: Send a "HV ON" order to power supply. High-voltage power supply

Switch register address is **00000**

Tx: 01 05 00 00 FF00 8C 3A

Rx: 01 05 00 00 FF00 8C 3A

The meaning of the frame sent by the upper computer:

01	05	00 00	FF00	8C 3A
Equipment address	Write a single switch Function	Address	The setting value is "1"	Calibrate

High-voltage power supply returns the same frame. Successful response.

Example: Send a "HV OFF" order to power supply. The address of the high-voltage power switch register is **00000**

Tx: 01 05 00 00 00 00 CD CA

Rx: 01 05 00 00 00 00 CD CA

01	05	00 00	00 00	CD CA
Equipment address	Write a single switch	Address	Set the value to "0"	Calibrate

High-voltage power supply returns the same frame. Successful response.

4) Change the setting value of high-voltage power supply

01	06	00 01	D6 66	06 40
Equipment address	Function code	Register to be written	Set the current value	Calibrate

Example: Set the high-voltage output to the rated voltage. High-voltage power supply voltage setting register address is **40000**

Tx: 0106 00 00 D6 66 57 80

Rx: 0106 00 00 D6 66 57 80

01	06	00 00	D6 66	57 80
Equipment address	Function code	Register to be written	Voltage setting value	Calibrate

High-voltage power supply returns the same frame. Successful response.

The expression of data bit means:

Set value of the voltage value register 0XD666, converted to decimal is 54886

(The corresponding voltage calculation method is: $54886/65535 * \text{rated voltage} * 120\%$)

Example: Set output current to the rated value. Power supply voltage setting register address is **40001**

Tx: 01 06 00 01 D6 66 06 40

Rx: 01 06 00 01 D6 66 06 40

High-voltage power supply returns the same frame. Successful response.

The expression of data bit means:

Set the value of the current value register 0XD666, convert to decimal is 54886

(Corresponding current calculation method is: $54886/65535 * \text{rated current} * 120\%$)

The above power output settings can also be combined into one instruction, that is, the

high-voltage power supply voltage and current are set to the rated value at the same time.

TX: 01 10 00 00 00 02 04 D6 66 D6 66 F5 B2

RX: 01 10 00 00 00 02 41 C8

The meaning of TX frame and each bit sent by the upper computer:

01	10	00 00	00 02	04	D6 66	D6 66	F5 B2
Equipment address	Function code	Starting address	Number of registers	The number of bytes written	Voltage setting value	Current setting value	Calibrate

V. Note: Description of function code

1. "01" reads the coil status

Sending:

Functional code	1 byte	0x01
Starting address	2 bytes	0x0000~0xFFFF
Number of coils	2 bytes	1~2000 (0x7D0)

Receiving:

Functional code	1 byte	0x01
Number of bytes	1 byte	N
The status of the coil	N bytes	n=N/N+1

N = number of read coils/8, if the remainder is not 0, then N = N + 1

2. "02" reads the input status

Sending:

Function code	1 byte	0x02
Starting address	2 bytes	0x0000~0xFFFF
Number of input points	2 bytes	1~2000 (0x7D0)

Receiving:

Function code	1 byte	0x02
Number of bytes	1 byte	N
Input point status	N bytes	n=N/N+1

N = number of read input points / 8, if the remainder is not 0, then N = N + 1

3. "03" holding register reading

Sending:

Function code	1 byte	0x03
Starting address	2 bytes	0x0000~0xFFFF
Number of registers	2 bytes	1~ 120 (0x7D)

Receiving:

Function code	1 byte	0x03
Number of bytes	1 byte	2*N
Register value.	N*2 bytes	

N = Number of registers

4. "04" reads the input register

Sending:

Function code	1 byte	0x04
Starting address	2 bytes	0x0000~0xFFFF
Number of registers	2 bytes	1~ 120 (0x7D)

Receiving:

Function code	1 byte	0x03
Number of bytes	1 byte	2*N
Register value.	N*2 bytes	

N = Number of registers

5. "05" write a single coil

Sending:

Function code	1 byte	0x05
Coil address	2 bytes	0x0000~0xFFFF
Write the value	2 bytes	0x0000 or 0xFF00

Receiving:

Function code	1 byte	0x05
Coil address	2 bytes	0x0000~0xFFFF
Write value	2 bytes	0x0000 or 0xFF00

6. "06" write a single register

Sending:

Function code	1 byte	0x06
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Register address.	2 bytes	0x0000~0xFFFF
Write value	2 bytes	0x0000 or 0xFFFF

Receiving:

Function code	1 byte	0x06
Register address.	2 bytes	0x0000~0xFFFF
Write the value	2 bytes	0x0000 or 0xFFFF

7. "0F" write multi-coil

Sending:

Function code	1 byte	0x0F
Starting address	2 bytes	0x0000~0xFFFF
Number of write coils	2 bytes	0x0001~0x07B0
The number of bytes written	1 byte	N
Write the value	N bytes	

N = the number of write coils/8, if the remainder is not 0, then $N = N + 1$

Receiving:

Function code	1 byte	0x0F
Starting address	2 bytes	0x0000~0xFFFF
Number of write coils	2 bytes	0x0001 or 0x07B0

8. "10" write multi- registers

Sending:

Function code	1 byte	0x10
Starting address	2 bytes	0x0000~0xFFFF
Number of registers written	2 bytes	0x0001~0x007B
The number of bytes written	1 byte	2*N
Write the value	N*2 bytes	

N = Number of written registers

Receiving:

Function code	1 byte	0x10
Starting address	2 bytes	0x0000~0xFFFF
Number of registers written	2 bytes	0x0001 or 0x007B

VI. The following is a list of commonly used controls and related data frames:

Upper computer control on

Tx: **01 05 00 0A FF 00 AC 38**

Rx: **01 05 00 0A FF 00 AC 38**

Upper computer control off

Tx: **01 05 00 0A 00 00 ED C8**

Rx: **01 05 00 0A 00 00 ED C8**

HV ON

Tx: **01 05 00 00 FF 00 8C 3A**

Rx: **01 05 00 00 FF 00 8C 3A**

HV OFF

Tx: **01 05 00 00 00 00 CD CA**

Rx: **01 05 00 00 00 00 CD CA**

Set to rated voltage + rated current

Tx: **01 10 00 00 00 02 04 D6 66 D6 66 F5 B2**

Rx: **01 10 00 00 00 02 41 C8**

Set to 0 voltage + 0 current

Tx: **01 10 00 00 00 02 04 00 00 00 00 F3 AF**

Rx: **01 10 00 00 00 02 41 C8**

Read the output voltage and output current If output is rated voltage + rated current

Tx: **01 04 00 00 00 02 71 CB**

Rx: **01 04 04 D6 66 D6 66 FD 99**

If output is rated voltage + 0 current Tx: **01 04 00 00 00 02 71 CB**

Rx: **01 04 04 D6 66 00 00 23 D3**

Read upper computer and voltage status

Tx: **01 01 00 00 00 0B 7D CD**

Rx: **01 01 02 01 04 B9 AF**

Upper computer control + HV ON Rx: **01 01 02 00 04 B8 3F**

Upper computer control + HV OFF Rx: **01 01 02 00 00 B9 FC**

Upper computer control off+ HV OFF

Read voltage and current settings

Tx: **01 03 00 00 00 02 C4 0B**

Voltage and current are 0

Rx: **01 03 04 00 00 00 00 FA 33**

Rated voltage and half of rated current

Rx: **01 03 04 D6 66 6B 33 4D 41**

Read before use:

- 1) Slave machine address, function code, register start address, register address, register number, data bytes, data, calibrate.
- 2) Time interval for sending any two instructions can not exceed 2s, otherwise the power supply determine for the communication interruption, power output off.
- 3) The change of switching output and setting value of high voltage power supply should be done under the condition of upper computer control.
- 4) If the power supply operating as a constant voltage source, please set the current to the maximum; if the power supply operating as a constant current source, please set the voltage to the maximum.