

Constant-Voltage/Constant-Current DC Power Supply

# **ZX-S-HN/HANseries** Instruction Manual

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# Safety Precautions

This instruction manual uses the various symbols below to indicate areas of caution.  
Please thoroughly read and understand these symbols and their significance prior to use.

The section “For your safety” contains information on items not included with your purchased product.

■ This manual uses the following marks and symbols to assist you in the proper use of this product.

|                                                                                                  |                                                                                                                                              |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>Danger</b>  | Failure to observe precautions indicated by this symbol and improper use or handling of the product will result in serious injury or death.  |
|  <b>Warning</b> | Failure to observe precautions indicated by this symbol and improper use or handling of the product may result in serious injury or death.   |
|  <b>Caution</b> | Failure to observe precautions indicated by this symbol and improper use or handling of the product may result in injury or property damage. |

■ Items that must be observed are classified into the following marks.

|                                                                                     |                                                  |
|-------------------------------------------------------------------------------------|--------------------------------------------------|
|    | This mark indicates items that are “Prohibited”. |
|   | This mark indicates items that are “Mandatory”.  |
|  | This mark indicates general “Caution”.           |

■ Symbols used within this manual are described below.

|                                                                                     |                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Contact with areas on the product indicated by this symbol may result in electric shock.                                                                                                                                                                         |
|  | Unplug the power supply plug from the outlet. Continual use of the product if<br>■ Continual use of the product if there are abnormal noises or smells<br>■ Smoke appears ■ Water or foreign objects enters the product<br>may result in fire or electric shock. |
|  | Dismantling or modifications to the product is prohibited. Do not open the cover.<br>■ This may result in fire or electric shock. ■ For repairs and adjustments please contact your retailer.                                                                    |
|  | Protective Earth Terminal. Please make a connection in earth.                                                                                                                                                                                                    |
|  | Please connect for loads with earth terminals                                                                                                                                                                                                                    |
|  | Direct Current (DC)                                                                                                                                                                                                                                              |
|  | Alternating Current (AC)                                                                                                                                                                                                                                         |
|  | AC and DC                                                                                                                                                                                                                                                        |
|  | 3-Phase Alternating Current                                                                                                                                                                                                                                      |



### Caution

1. Reproduction of the material contained within this manual without notice is strictly prohibited.
2. Information contained within this manual may be altered without notification.
3. All material contained within this manual has been thoroughly examined. If by chance, any errors, suspicious items, or omissions are discovered, please contact Takasago.
4. Takasago Co., Ltd. shall undertake no responsibility, regardless of clause 2, for any impact this product may have on results.

## For your safety

.....

This product is a power supply system for business use, which uses an input power of AC85V~250V (single phase).

Improper use of this product may result in injury, electric shock or death, and may also result in fire.

Please thoroughly read and understand this manual prior to use. Further, this product should only be handled by a specialist knowledgeable in electricity safety, or under the supervision of such a person.

Please read through this manual to ensure the proper placement and use environment for this product before turning on power.

If any problems arise, please unplug the power supply plug from the outlet power immediately and contact Takasago.



### Caution

Using this product near receivers (radios, televisions, etc.) may interfere with reception.

Please do not use this product in any medical, nuclear, or work involving human life.

## Exporting

Please contact Takasago in advance if wishing to export or carry this product outside of Japan.

# About this Product

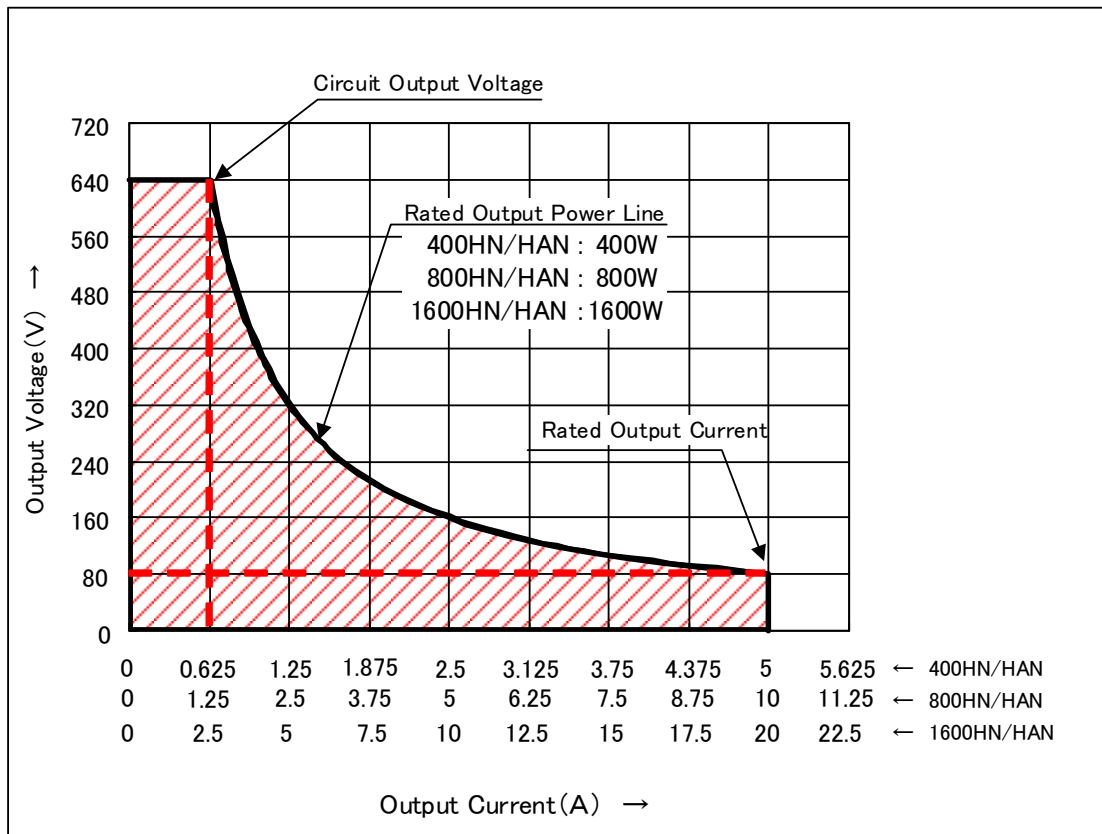
The ZX-S Series is the Switching DC Constant Voltage/Constant Current Power Supply capable of changing from zero-volt and zero-ampere.

By applying the Zoom method, an extension ratio of 8 times is possible within the range of the rated output power. (See Note 1)

- The ZX-S series allows the use of both the Constant Voltage and Constant Current modes, along with the ability to be able to freely set the power from zero to full scale.
- The ZX-S series, with full digital control, also grants settings with superior accurate reproduction.

Note 1. Zoom method is the ability to output a high voltage in areas with low current, and high current in areas with low voltage, while maintaining the output range for the rated power, as shown in the diagram below.

【Output Voltage/Current Range】



## Features

### ✧ Multi-Functional Zoom Power Supply

Able to handle any combination of voltage and current.

Perfect for experiments requiring both voltage and current.

### ✧ Serial Communication Port Standardized System

Equipped with a multi-drop communication port, one RS-232C or RS-485 port is capable of controlling up to 31

ZX-S Series units.

※ For multiple connections, the KXC-300 cable (sold separately) is required.

### ✧ Improved Parallel Operation (New Master/Slave)

CV transient recovery properties will not degrade, even when increasing the number of parallel units, due to both the master and slave units being controlled simultaneously.

### ✧ Useful Functions

#### ☐ Memory

Saves and loads 3 set panel settings

Perform voltage variation tests and other tests effortlessly.

#### ☐ Variable Slew Rate

Changes the slew rate for the rising and falling of the voltage/current.

#### ☐ Startup Mode Selection

Equipped with a CC Priority Mode for loads with nonlinear V-I characteristics similar to diodes, this function is capable of preventing current overshoot when output is ON.

#### ☐ Sequential ON/OFF

Sets the order outputs are toggled ON/OFF through a multi-connection cable.

### ✧ Protection Functions

Guards valuable loads and power supplies with Over Voltage Protection, Over Current Protection, Over Power Protection, Over Heating Protection, Excessive Input Current Protection, etc

### ✧ External Analog Control (ZX-S Series Type-HAN)

Able to control ON-OFF output with external contact points, and voltages and currents based on external DC voltage (0 ~ 10V) and external resistance (0 ~ ∞ or 0 ~ 10k Ω)

※ Full-scale and offset adjustments can be performed with the front panel dials.

### ✧ Analog Monitor (ZX-S Series Type-HAN)

Outputs the output voltage and output current with 0 ~ 10V DC.

※ Not suited for monitoring transient voltage/current waveforms.

### ✧ Status/Alarm Output (ZX-S Series Type-HAN)

Outputs an alarm or operation status with a photocoupler output (open collector) insulated from outputs and the earth.

### ✧ Variable Internal Resistance (ZX-S Series Type-HAN)

Intentionally generates voltage drop through load current when running in constant voltage mode.

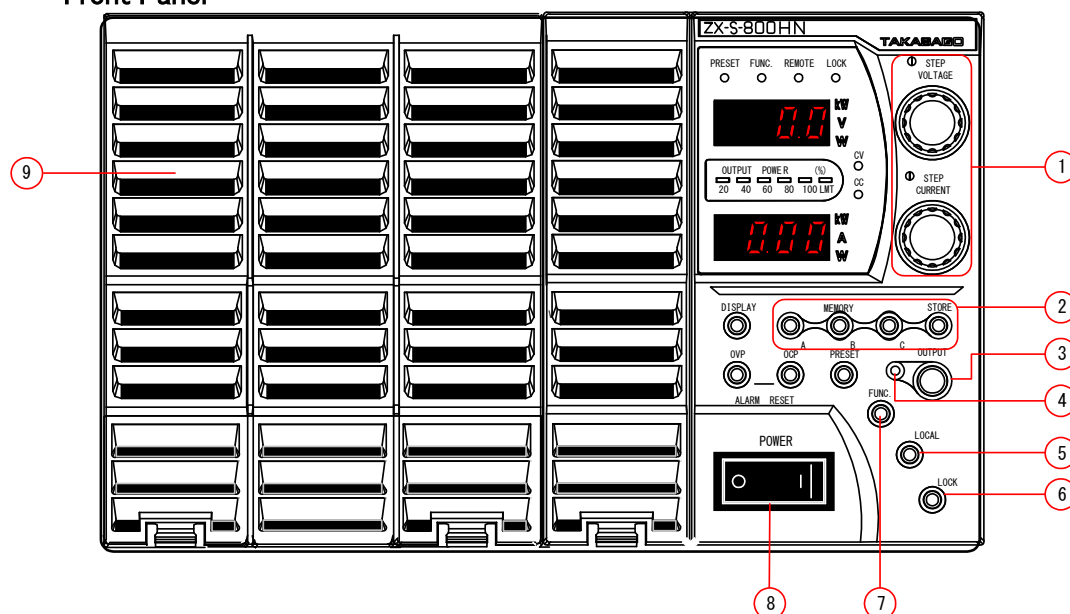
With this function, the power supply is capable of approximating an internal resistance of chemical batteries (during electric discharge) and I-V characteristics of solar/fuel cells.

※ Restricted to direct current operations. Not suited for approximating transient effects.

## About this Product

### Part Names and Functions

Front Panel



#### ①. STEP VOLTAGE/CURRENT

##### Setting/Selection Dial

Selects the voltage, current, OVP, OCP settings and various other parameters. Press the dial to change the settings number place.

#### ②. MEMORY

##### Memory Display/Settings Key

Saves and loads the panel settings with keys "A", "B", and "C". Also, depending on the Function item setting, this can be used to select One-Action or Two-Action loading method.

#### ③. OUTPUT

##### Output ON/OFF Toggle Key

Toggles output ON/OFF.

The factory default setting for the output, after inserting power, is OFF.

#### ④. Output ON/OFF Display Lamp

Lights when the output is set to ON.

#### ⑤. LOCAL

##### LOCAL Key

Switches between "LOCAL", operated from the panel, and "REMOTE", operated by control via serial data communication.

#### ⑥. LOCK

##### LOCK Key

Locks panel from use.

Below are the 3 types of Lock settings. Each function setting key (FUNC.) can be changed.

- Locks everything but the LOCK key
- Locks everything but the OUTPUT and LOCK key
- Locks only the Voltage/Current Dial, PRESET, and FUNC. keys.

#### ⑦. FUNC.

##### Function Key

Used for setting various functions

#### ⑧. POWER

##### Input Power Switch

Toggles power ON/OFF

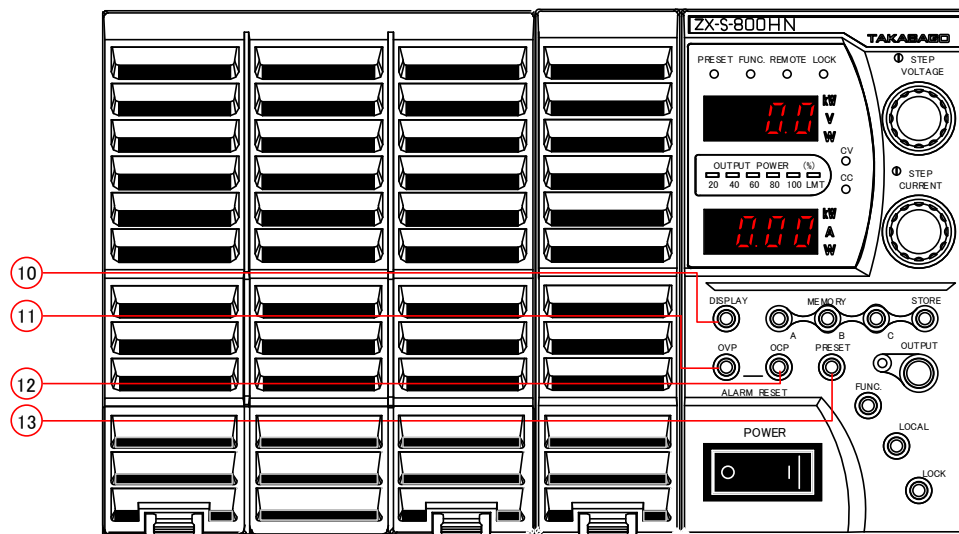
#### ⑨. Ventilation Panels

Panels which allow cool air to enter and cool the product internally.

※This is the front panel of the ZX-S-800HN



## Front Panel



※Front panel diagram of ZX-S-800HN

### ⑩. DISPLAY

#### Display Key

Toggles the displayed measurement information.

Can be toggled between 3 display modes:

Voltage/Current, Voltage/Power, Power/Current.

### ⑪. OVP

#### Over Voltage Protection(OVP) Key

Sets the trigger point for the OVP circuit. Hold down together with ⑫ (OCP) key for 1 second or more to cancel and OVP alarm.

### ⑫. OCP

#### Over Current Protection(OCP) Key

Sets the trigger point for the OCP circuit. Hold down together with ⑪ (OV) key for 1 second or more to cancel and OCP alarm.

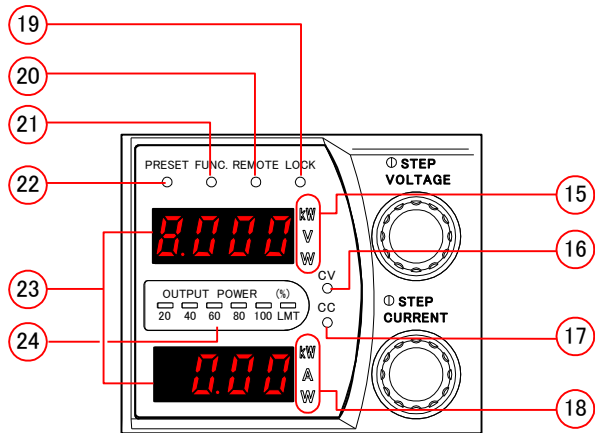
### ⑬. PRESET

#### Preset Key

Used to set the output voltage and output current.

## About this Product

### Display Panel



#### ⑮. kW, V, W

##### Measurement Unit Display Lamp

Lights when top Number Display displays a voltage/power value.

#### ⑯. CV

##### Constant Voltage Display Lamp

Lights when output is set to "ON" during constant voltage mode.

#### ⑰. CC

##### Constant Current Display Lamp

Lights when output is set to "ON" during constant current mode.

#### ⑱. kW, A, W

##### Measurement Unit Display Lamp

Lights when bottom Number Display displays a current/power value.

#### ⑲. LOCK

##### Key Lock Display Lamp

Lights when Lock has been enabled.

#### ⑳. REMOTE

##### Remote Display Lamp

Lights when control has been transferred to an external computer, etc. being accessed via serial interface.

#### ㉑. FUNC.

##### Function Display Lamp

Lights when Function settings are available.

#### ㉒. PRESET

##### Preset Display Lamp

Lights when Preset settings are available.

#### ㉓. Number Display

Displays the output voltage, output current, and output power.

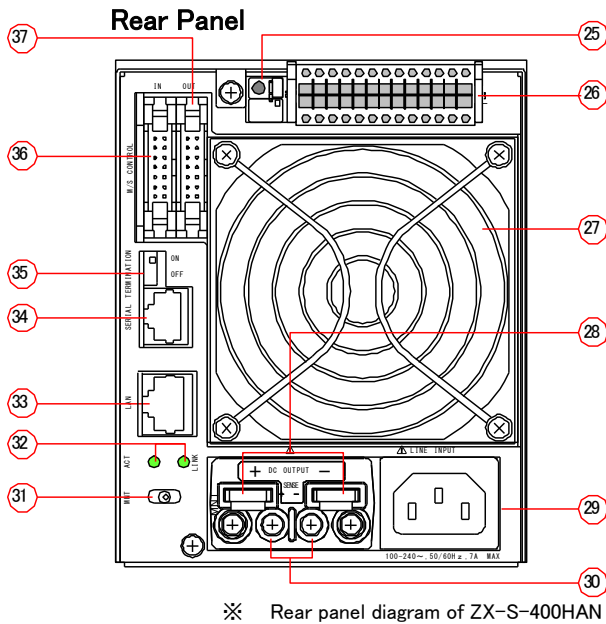
When setting functions with the Function key, the item number will be displayed on the top and its parameter will be displayed on the bottom.

#### ㉔. OUTPUT POWER

##### Output Bar Graph

Displays an approximate value of the output power (Output Voltage × Output Current) in 20% intervals.

LMT lamp will light when the output power Limiter has been activated.



### 25. Series Operation Control Connectors

#### (ZX-S Series Type-HAN)

Connector for series connections.

When using the Slave unit, connect with the Master unit's minus output terminal using wires.

### 26. External Control Connector

#### (ZX-S Series Type-HAN)

Connectors for the external analog control, analog monitor output, and status/alarm output.

Use the included specialized connectors.

### 27. Fan Motor

Cools the device internally.

The fan motor's rotation speed will change in response to the output power and output current.

### 28. DC OUTPUT

#### Output Terminal

Direct Current Output Terminal

**⚠ A Crimp-Style Terminal must be used. Please be sure to tighten all attachment screws.**

**❗ After connecting, attach the output terminal cover before use.**

### 29. LINE INPUT

#### Input Terminal

Inlet connector connects power to the device.

Use the included input power cable.

The nominal voltage for the power supply is indicated on the rear panel.

**❗ Please use only the input power cable that is included.**

**⊘ Do not use the included input power cable with any other products.**

### 30. SENSE

#### Sensing Terminal

Terminal for Remote Sensing

### 31. MNT

#### MNT Switch

Switch for the maintenance to rewrite F/W.

Do not operate the switch during working. If operate, the product may not work normally.

### 32. LINK/ACT

#### LINK/ACT Lamp

Lamp to indicate the status of LAN connection establishment and the communication status.

LINK: Lights at LAN connection establishment.

ACT: Blinks in the status of data communication.

### 33. LAN

#### Connector for LAN Communication

Connector to connect to computer etc. by LAN communication cable (cross).

### 34. SERIAL I/F

#### Multi-Channel Connectors

Connectors for when controlling multiple ZX series units or for controlling RS-485 type, serial ports.

Connect using KXC-300 (300mm) cable.

### 35. TERMINATION

#### Parallel Operation Control (Output)

#### Termination Resistor ON/OFF Switch

Sets the termination resistor settings.

When controlling one ZX series power supply via serial port, please set the toggle switch to ON.

When using 2 or more power supplies, please set the first and last ZX series DC power supply units' termination resistor ON/OFF switch to ON. (For all other units, set to OFF)

## About this Product

---

### ③⑥. M/S CONTROL (IN)

#### **Connector for Parallel Operation Control (Input) and Output ON/OFF Control with External Contacts**

Slave Control Signal Input Connector for parallel operations.

Use for toggling the output ON/OFF with external contacts.

### ③⑦. M/S CONTROL (OUT)

#### **Parallel Operation Control (Output)**

Connector for parallel connections.

Outputs parallel operation control signals

This is blank page.

# Preparation & Connecting

## Unpacking

When unpacking, please verify the following accessory items are included. Also, please verify that there are no scratches or indentations present on the power supply's exterior.

- |                                                                                                                                  |                                          |
|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| ①. Input Power Cable (AC125V Rating)                                                                                             | 1 item (400HN/HAN,800HN/HAN)             |
| ※The included power cable cannot be used for AC200V inputs. Please contact Takasago Sales Department for the proper power cable. |                                          |
| ②. 2P/3P Adapter (AC125V Rating)                                                                                                 | 1 item (400HN/HAN, 800HN/HAN)            |
| ③. Input Power Cable (3-conductors VCT cable 5.5mm <sup>2</sup> )                                                                | 1 item (1600HN/HAN)                      |
| ④. Output Terminal Cover                                                                                                         | 1 package                                |
| ● Output Terminal Cover                                                                                                          | 2 items (identical shape)                |
| ● Support Post for attaching cover                                                                                               | 1 item                                   |
| ● M3 × 6mm screws                                                                                                                | 2 items                                  |
| ⑤. Output Terminal Screws                                                                                                        |                                          |
| ● M5 × 12mm bolts (includes Flat washers and Spring washers)                                                                     | 2 packages<br>(Attached to power supply) |
| ⑥. Dummy Connector (Attached to power supply)                                                                                    | 2 items                                  |
| ⑦. Instruction Manual                                                                                                            | 1 copy                                   |
| ⑧. External Control Connector                                                                                                    | 1 item (ZX-S Series Type-HAN)            |

## Placement

To ensure proper and safe use of this product, please observe the following.



### Warning



Prohibited

Do not use in areas exposed to rain and water.



Prohibited

Do not place in areas in which flammable gases are present.



Prohibited

Do not insert any metallic pins, wires, screws, etc. in the front ventilation panels and in the rear fan motor. Doing so may result in electric shock and/or fire.



### Caution



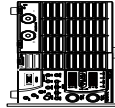
Prohibited

This product was designed to be used in stable areas. Do not use or place in areas prone to vibration. Improper placement of the power supply may result in damage. Please see below for proper placement.

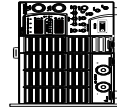
How to place:



Correct



Incorrect



Incorrect



### Caution



Mandatory

Use only in areas with a room temperature of 0~50°C, humidity of 20~80%RH, and which is absent of any corrosive gases.

(However, in areas above 40°C a 2.5% to 1°C ratio is required for derating the output power and output current.



Prohibited

This power supply uses a forced air cooling system. Do not obstruct the front ventilation panels and rear fan motor. If affixing to a rack, attach ventilation panels to the rear of the rack to prevent exhaust from the power supply from being released inside the rack.



Caution

Using this product near receivers (radios, televisions, etc.) may interfere with reception.

## Preparation & Connecting

---

### Connecting the Power Supply

This product operates on a 85V~250V and 45Hz~65Hz single-phase AC power supply. The maximum input current during rated output is approximately 7A when the AC power supply's voltage is 85V.

To ensure proper and safe use of this produce, please observe the following.



#### Danger



Mandatory

Ground the green cord when using the 2P-3P adapter.



Mandatory

A noise filter is built into the device to prevent EMI (Electromagnetic Interference). Due to this, even the slightest amount of leaked current may result in electric shock if not properly grounded.  
For safety reasons, please ground the device.



#### Caution



Mandatory

Please use input power within ranges of 85V~250V and 45Hz~65Hz (single-phase).  
Nominal Power Supply Voltage is displayed near the rear panel inlet.



Mandatory

Please connect to a power supply capable of providing the maximum electric power consumption.



Mandatory

Please use the input power cable included with the product.  
Do not use the input power cable with any other products.



## Connecting Loads

For wiring to the output terminal, please attach the M5 crimp-style terminal and be sure to tightly fasten the M5 screws. (※)

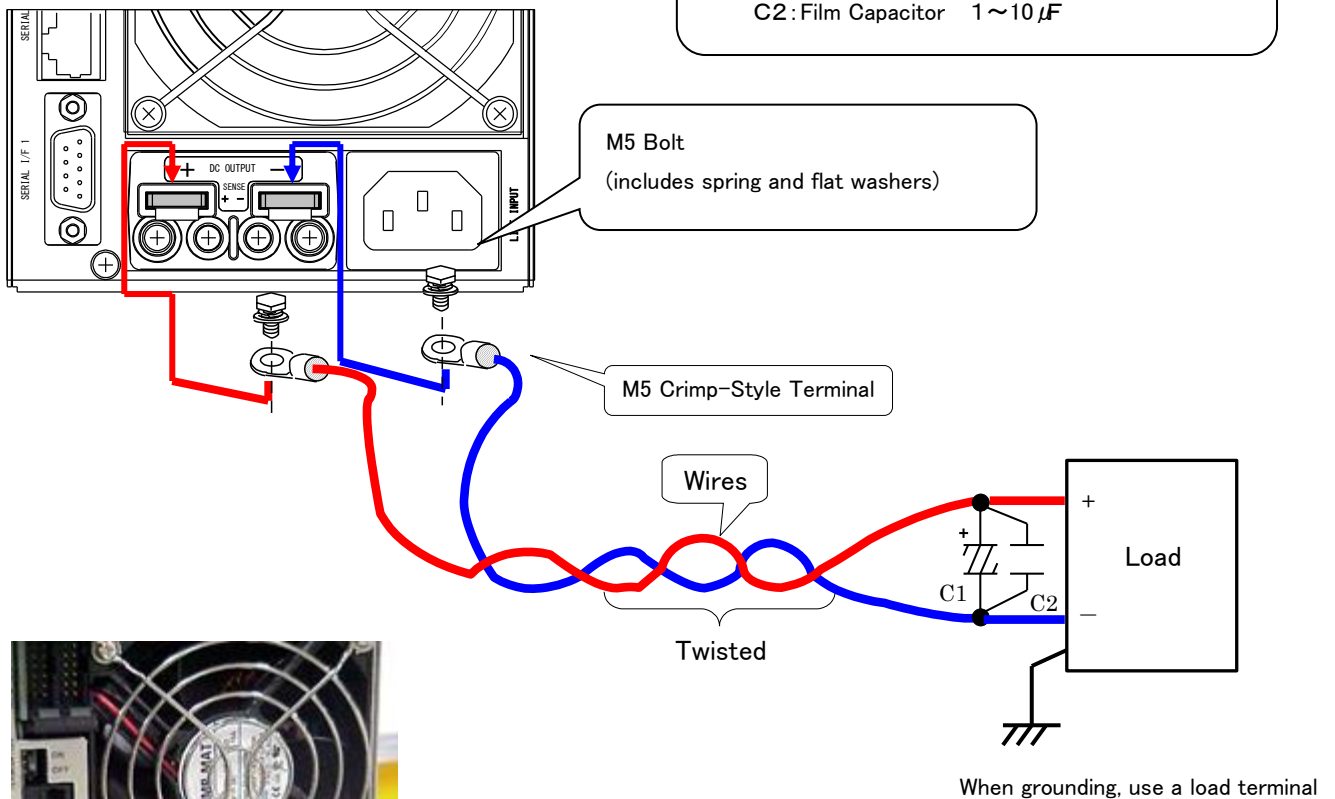
### MEMO

- Twisting wires can minimize the ripple and noise at the load terminal.
- The noise level can be minimized smaller than the standard value by connecting the C1 and C2 close to the load terminal.

Using a small, high-frequency impedance for C1 and C2, cut the lead wire as short as possible and connect.

C1: Electrolytic Capacitor 100~1000  $\mu F$

C2: Film Capacitor 1~10  $\mu F$



### Mandatory

Please attach the terminal cover after wiring.

Terminal Cover



### Danger



Mandatory

Verify that the main power supply for the power supply is turned off when connecting loads.



Prohibited

Do not wire loads when voltage is being outputted from the power supply.



### Caution



Mandatory

Use wires with sufficient cross section areas for load currents.

Ex.) See Appendix Load Current vs Cross section areas.



Mandatory

Attach crimp-style terminals to wires and securely fasten.

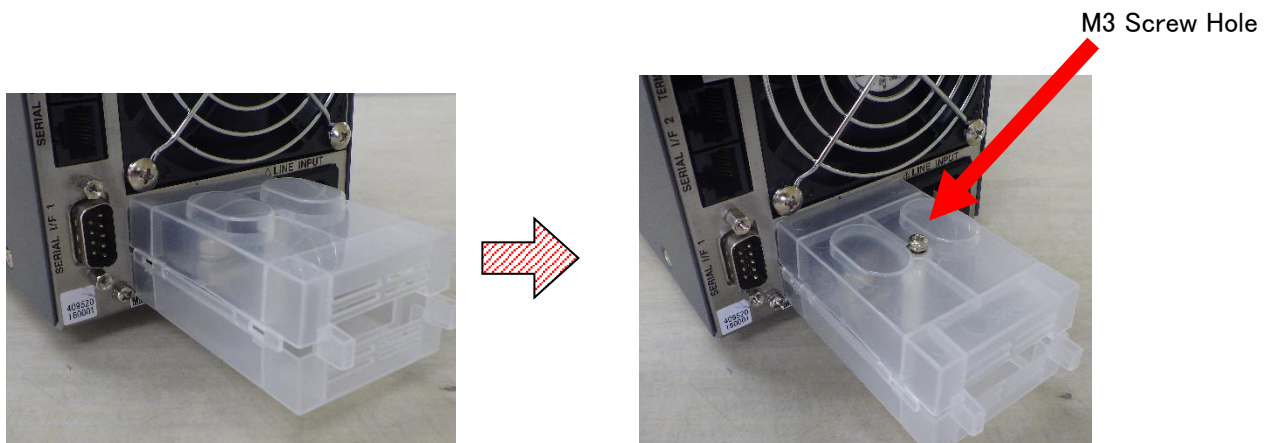
If insecurely fastened, wires may become deformed or burn out due to the generated heat at connection points.

### Attaching the Output Terminal Cover

1. Hook and attach one terminal cover (both covers are identical in shape) on the upper grooves of the Output Terminal platform.



2. Attach the support rod to the remaining terminal cover (inserting it into the center part of the cover) and affix the rod in place by screwing an M3x6mm into it from the bottom of the cover.
3. Hook the terminal cover (with attached support post) on the lower grooves of the Output Terminal platform, then raise and snap the terminal cover in place with the upper-half.

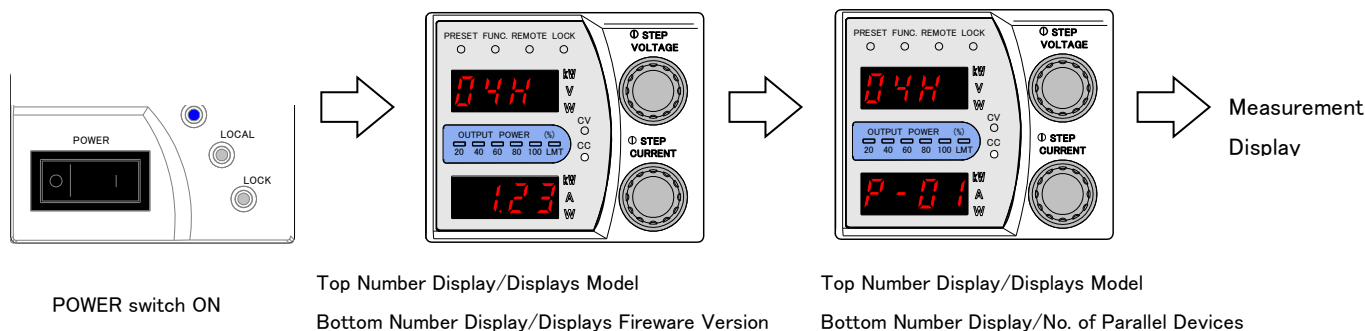


4. Fasten a M3 × 6mm screw from above.

# Basic Operations

## Startup Display

Once power is turned on (POWER switch pushed to ON), the power supply model will be displayed in the top Number Display and the firmware version and number of parallel connected devices will be displayed in the bottom Number Display.



If there is a disagreement in the number of parallel connected devices (if there is a difference between the number of parallel devices used previously and now), the error code “E011” will be displayed in the top Number Display and the number of detected devices will be displayed blinking in the bottom display. After confirming the number of parallel devices, hold down the FUNC. key for more 2 seconds to approve and proceed to measurement display mode.

### MEMO

Models ●ZX-S-400HN: **04H**    ●ZX-S-800HN: **08H**    ●ZX-S-1600HN: **16H**  
Displayed as: ●ZX-S-400HAN: **04HA**    ●ZX-S-800HAN: **08HA**    ●ZX-S-1600HAN: **16HA**

## Default Settings

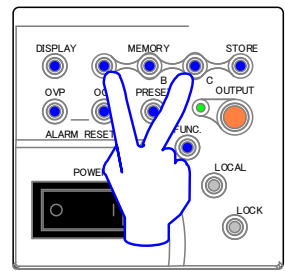
Factory settings and settings after initialization are as followed:

| Settings Item                           | 400HN/400HAN                                                                                     | 800HN/800HAN | 1600HN/1600HAN |
|-----------------------------------------|--------------------------------------------------------------------------------------------------|--------------|----------------|
| Constant Voltage Set Value              | 0.0V                                                                                             | 0.0V         | 0.0V           |
| Constant Current Set Value              | 5. 250A                                                                                          | 10. 50A      | 21. 00A        |
| Over Voltage Protection (OVP) Set Value | 704V                                                                                             | 704V         | 704V           |
| Over Current Protection (OCP) Set Value | 5. 5A                                                                                            | 11. 0A       | 22. 0A         |
| Settings Values in Memory A, B, C       | Same with the above CV set values, CC set values, OVP set values, OCP set values                 |              |                |
| Function Settings                       | See page 24 on Default Values for Function Settings (excluding section 20~38 Calibration Values) |              |                |

### Returning Factory Settings

All power supply settings can be initialized.

To return settings to factory default settings, turn the POWER switch ON while holding down the MEMORY keys “A” and “C”. Release the keys once the Number Display lights up.



### Backing-Up Settings

This power supply saves all settings in non-volatile memory (EEPROM) just before the POWER switch is turned off or immediately before power is cut off.

All previous settings will remain the same when power is turned on again.

※No batteries are used. There is no need to replace batteries.

## Basic Operations

### Operating as Constant Voltage Power Supply

Please verify that the settings for Over Voltage Protection (OVP) circuit (page 28) and Over Current Protection (OCP) circuit (page 30) are in effect.

#### Turn the POWER switch ON to startup the power supply.

The voltage measurement value will display in the top Number Display, and the current measurement value will display in the bottom Number Display. Lamp "V" and "A" will light. (If parameters for FUNCTION settings item 52 is set to 1, PRESET value will be displayed)

#### Press the PRESET key

PRESET lamp will light.

Press the PRESET key again if you wish to discontinue and return to the measurement display mode.

The voltage PRESET value will display in the top Number Display and the current limit PRESET value will display in the bottom Number Display.

#### Turn the VOLTAGE dial to adjust the Constant Voltage Set Value

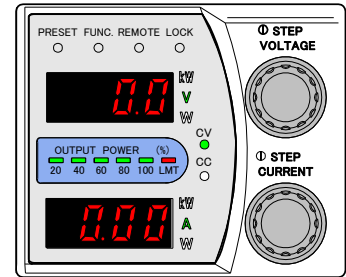
(Turn the dial right to raise or left to lower the set value.)

##### MEMO

Press the VOLTAGE dial to display the current number position. The selected number will be brightened. Press to change position. If all 4 places are brightened, numbers will change from the lowest place.

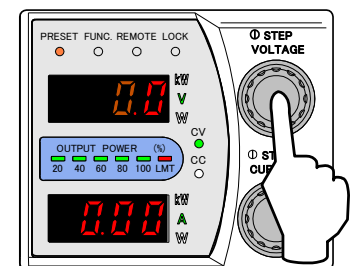
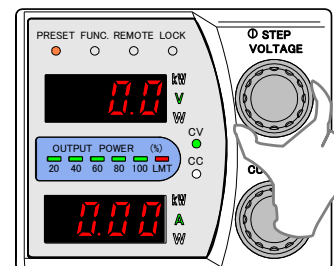
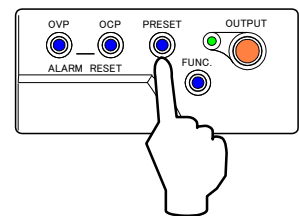
If the parameter for FUNCTION item 50 is set to 0, press the PRESET key again. The output voltage will be changed once PRESET mode has been exited.

If the parameter for FUNCTION item 50 is set to 1, promptly change the set value using the VOLTAGE dial.



##### MEMO

When POWER is turned OFF the top and bottom Number Displays will be displayed in the same manner when POWER is turned ON again.



⇒Continued on next page

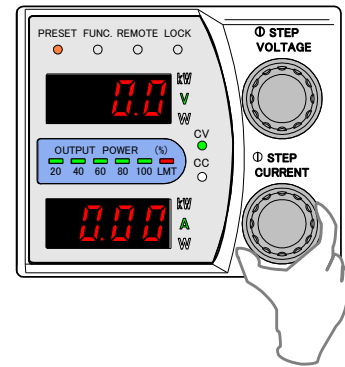
### Turn the CURRENT dial to adjust the Current Limit Value

Set a value greater than the required load current.

(Turn dial right to raise or left to lower set value.)

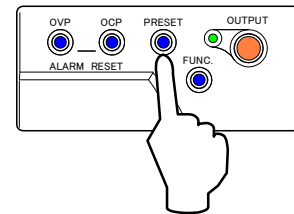
#### MEMO

If the current limit value is set to a value lower than the required load current, current will be restricted and constant current will be used. (CC lamp lights)



### Press the PRESET key to finalize settings.

Confirms PRESET settings and returns to the measurement display mode.

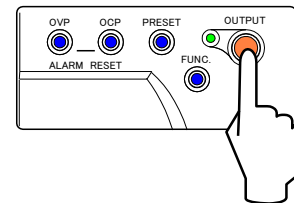


### Press the OUTPUT key.

Outputs with the set settings. The OUTPUT and CV lamps will light.

#### MEMO

While the PRESET lamp is lit, all other keys not mentioned in the above setting procedures cannot be used. (OUTPUT key can be used)



## Basic Operations

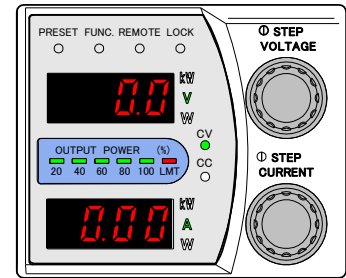
### Operating as Constant Current Power Supply

Please verify that the settings for Over Voltage Protection (OVP) circuit (page 28) and Over Current Protection (OCP) circuit (page 30) are in effect.

#### Turn the POWER switch ON to startup the power supply.

The voltage measurement value will display in the top Number Display, and the current measurement value will display in the bottom Number Display. Lamp "V" and "A" will light.

(If parameters for FUNCTION settings item 52 is set to 1, PRESET value will be displayed)



#### MEMO

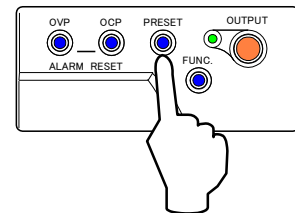
When POWER is turned OFF the top and bottom Number Displays will be displayed in the same manner when POWER is turned ON again.

#### Press the PRESET key.

PRESET lamp will light.

Press the PRESET key again if you wish to discontinue and return to the measurement display mode.

The voltage limit PRESET value will display in the top Number Display and the current PRESET value will display in the bottom Number Display.

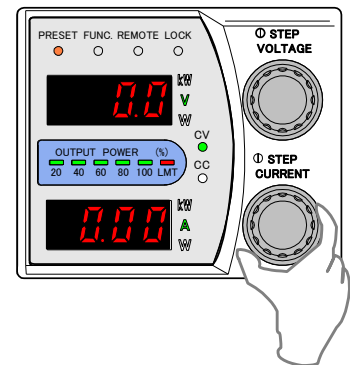


#### Turn the CURRENT dial to adjust the Constant Current Set Value.

(Turn the dial right to raise or left to lower the set value.)

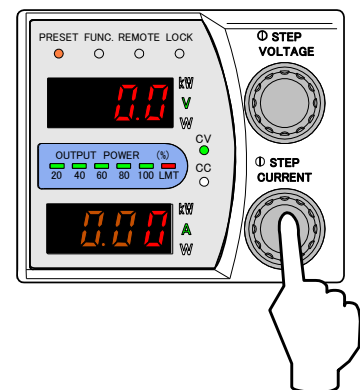
#### MEMO

Press the CURRENT dial to display the current number position. The selected number will be brightened. Press to change position. If all 4 places are brightened, numbers will change from the lowest place.



If the parameter for FUNCTION item 50 is set to 0, press the PRESET key again. The output voltage will be changed once PRESET mode has been exited.

If the parameter for FUNCTION item 50 is set to 1, promptly change the set value using the VOLTAGE dial.



⇒Continued on next page

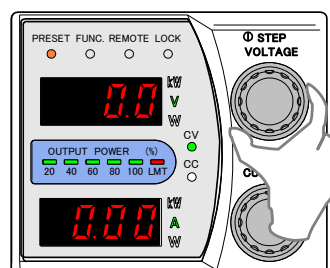


### Turn the VOLTAGE dial to adjust the Voltage Limit Value

(Turn dial right to raise or left to lower set value.)

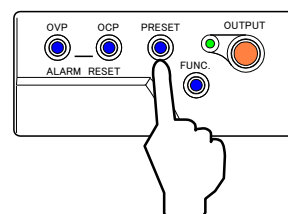
#### MEMO

If the voltage limit value is set to a value lower than the required load voltage, voltage will be restricted and constant voltage will be used. (CV lamp lights)



### Press the PRESET key to finalize settings.

Confirms PRESET settings and returns to the measurement display.

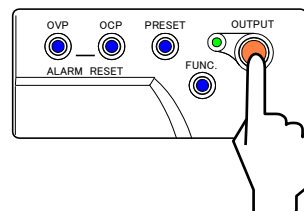


### Press the OUTPUT key.

Outputs with the set settings. OUTPUT and "CV" lamp will light.

#### MEMO

While the PRESET lamp is lit, all other keys not mentioned in the above setting procedures cannot be used. (OUTPUT key can be used)

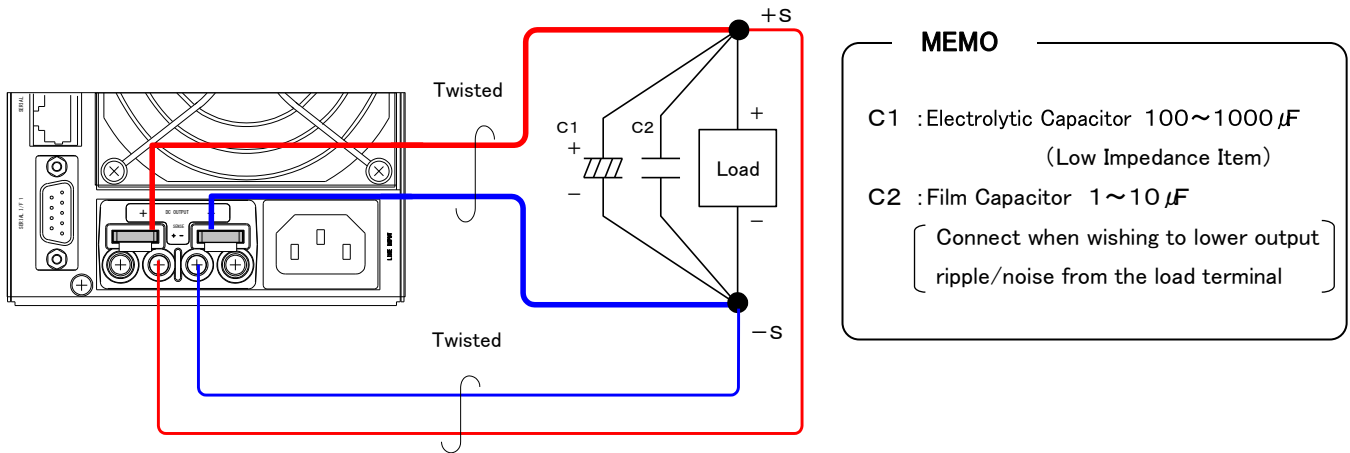


## Basic Operations

### Remote Sensing

Remote sensing is used for solving problems with voltage drop between the output terminal and load due to wiring by compensating for the voltage drop. Remote sensing is able to compensate voltages up to 1V per direction (one-way).

Wire as shown in the diagram below.



#### Danger

Turn POWER switch OFF before wiring to the output terminal.



#### Caution

- While using remote sensing, do not switch output lines using switches, etc. Doing so may lead to damaging the power supply..
- Because the output terminal's voltage is detected by the OVP circuit, please set the voltage value of the OVP to include the voltage drop amount (round trip) of the wires outputting the voltage you wish to protect.

## Function Settings

This section covers about setting parameters for various functions. Parameters that can be set are the device address, bitrate, parity, Output ON/OFF Toggle at external contact, current sinking functions ON/OFF, OUTPUT settings when POWER is ON, voltmeter and ammeter display when OUTPUT is OFF, etc. For details, see the FUNCTION Settings Items List. (page 23)

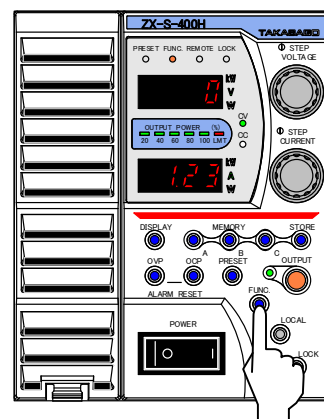
### Setting Functions

#### Setting Procedures

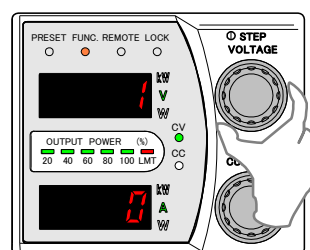
##### Press the Function “FUNC” key.

FUNC. lamp will light.

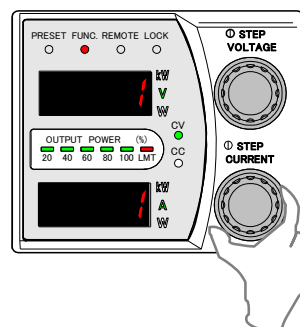
The Setting Item Number will display on the top Number Display and the parameter will be displayed in the bottom Number Display.



##### Select the Item Number with the VOLTAGE dial.



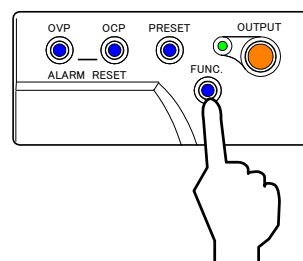
##### Change the Parameter with the CURRENT dial.



##### Press the FUNC. key to finalize settings.

The top and bottom Number Displays will return to measurement display mode.

It is possible to continue to change other setting items without pressing the FUNC. key. In this case, press the FUNC. key to confirm settings once changes are finished.



#### MEMO

When setting the device address, bitrate, and parity, the POWER switch must be turned OFF and ON, after settings have been set using the FUNC key before changes can take affect.

## Basic Operations

### Settings Items List

#### 【FUNCTION Settings Items】

| Item No. |                   | Settings Item                                                                 | Parameters and their Ranges                                                                                                                | Default Value                                         |          |
|----------|-------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|----------|
| 0        | General Functions | Firmware Version                                                              | Displays version only<br>(cannot be changed)                                                                                               |                                                       |          |
| 1        |                   | Current Sinking Functions<br>ON/OFF                                           | 0=OFF                                                                                                                                      | 1=ON                                                  |          |
|          |                   |                                                                               | 1=ON                                                                                                                                       |                                                       |          |
| 2        |                   | Startup Mode Selection                                                        | 0=CV Priority, High Speed                                                                                                                  | 0=CV Priority, High Speed                             |          |
|          |                   |                                                                               | 1=CC Priority, High Speed                                                                                                                  |                                                       |          |
|          |                   |                                                                               | 2=CV Priority, Slew Rate                                                                                                                   |                                                       |          |
|          |                   |                                                                               | 3=CC Priority, Slew Rate                                                                                                                   |                                                       |          |
| 3        |                   | CV Slew Rate Rising                                                           | 1V/s~1280.0V/s                                                                                                                             | 1280.0V/s                                             |          |
| 4        |                   | CV Slew Rate Falling                                                          | 1V/s~1280.0V/s                                                                                                                             | 1280.0V/s                                             |          |
| 5        |                   | CC Slew Rate<br>Rising                                                        | 400H/HA                                                                                                                                    | 0.01A/s~10.00A/s                                      | 10.00A/s |
|          |                   |                                                                               | 800H/HA                                                                                                                                    | 0.01A/s~20.00A/s                                      | 20.00A/s |
|          |                   |                                                                               | 1600H/HA                                                                                                                                   | 0.01A/s~40.00A/s                                      | 40.00A/s |
| 6        |                   | CC Slew Rate<br>Falling                                                       | 400H/HA                                                                                                                                    | 0.01A/s~10.00A/s                                      | 10.00A/s |
|          |                   |                                                                               | 800H/HA                                                                                                                                    | 0.01A/s~20.00A/s                                      | 20.00A/s |
|          |                   |                                                                               | 1600H/HA                                                                                                                                   | 0.01A/s~40.00A/s                                      | 40.00A/s |
| 7        |                   | Serial I/F2                                                                   | 0=Serial Data Communication<br>Control (Remote Mode)                                                                                       | 0=Serial Data Communication<br>Control (Remote Mode)  |          |
|          |                   |                                                                               | 1=Use for Sequential ON/OFF<br>(Local Mode)                                                                                                |                                                       |          |
| 8        |                   | ON Delay Time                                                                 | 0.00s~99.99s                                                                                                                               | 0.00s                                                 |          |
| 9        |                   | OFF Delay Time                                                                | 0.00s~99.99s                                                                                                                               | 0.00s                                                 |          |
| 10       |                   | Operation during Alarm<br><br>※Can only select<br>1600H/HA parameters (0,1,2) | 0= Stop switching<br>1= Input power relay TRIP<br>(Only for serious failures)<br>2= Input power relay TRIP<br>(Serious failures &OVP, OCP) | 0= Stop switching<br>※For 400H/HA<br>800H/HA, 0=Fixed |          |
| 11       |                   | Output ON/OFF Toggle with<br>External Contact                                 | 0=Invalid                                                                                                                                  | 0=Invalid                                             |          |
|          |                   |                                                                               | 1=When short Output ON,<br>When open Output OFF                                                                                            |                                                       |          |
|          |                   |                                                                               | 2= When short can be ON/OFF<br>depending on panel control,<br>When open Output OFF                                                         |                                                       |          |
| 12       |                   | Measurement Value Moving<br>Average Processing                                | 0=No                                                                                                                                       | 0=No                                                  |          |
|          |                   |                                                                               | 1=Yes                                                                                                                                      |                                                       |          |

# Settings Items List (Continued)

## 【FUNCTION Settings Items】

| Item No. |                            | Settings Items                                      | Parameters and their Ranges                                                                                              | Default Value                                                                                                                 |
|----------|----------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| 13       | General Functions          | Linearity Compensation Function<br>Operatation Mode | 0=Compensation Mode OFF<br>1 = Operates when Output is<br>turned ON/OFF or when<br>2=Performs continuous<br>compensation | 1 = Operates when Output is<br>turned ON/OFF or when<br>settings are changed.<br>Saves compensation value<br>after converging |
| 20       | Calibration                | Voltage Setting Offset                              | Not displayed                                                                                                            |                                                                                                                               |
| 21       |                            | Voltage Setting Full-Scale                          | Not displayed                                                                                                            |                                                                                                                               |
| 22       |                            | Current Setting Offset                              | Not displayed                                                                                                            |                                                                                                                               |
| 23       |                            | Current Setting Full-Scale                          | Not displayed                                                                                                            |                                                                                                                               |
| 24       |                            | Voltage Measurement Offset                          | Not displayed                                                                                                            |                                                                                                                               |
| 25       |                            | Voltage Measurement Full-                           | Not displayed                                                                                                            |                                                                                                                               |
| 26       |                            | Current Measurement Offset                          | Not displayed                                                                                                            |                                                                                                                               |
| 27       |                            | Current Measurement Full-                           | Not displayed                                                                                                            |                                                                                                                               |
| 28       | Calibration (ZX-S Type-HA) | External<br>Analog<br>Input                         | Voltage Setting<br>Offset                                                                                                | Not displayed                                                                                                                 |
| 29       |                            |                                                     | Voltage Setting<br>Full-Scale                                                                                            | Not displayed                                                                                                                 |
| 30       |                            |                                                     | Current Setting<br>Offset                                                                                                | Not displayed                                                                                                                 |
| 31       |                            |                                                     | Current Setting<br>Full-Scale                                                                                            | Not displayed                                                                                                                 |
| 32       |                            | Voltage Monitor Output Offset                       |                                                                                                                          | Not displayed                                                                                                                 |
| 33       |                            | Voltage Monitor Output Full-                        |                                                                                                                          | Not displayed                                                                                                                 |
| 34       |                            | Current Monitor Output Offset                       |                                                                                                                          | Not displayed                                                                                                                 |
| 35       |                            | Current Monitor Output Full-                        |                                                                                                                          | Not displayed                                                                                                                 |
| 36       |                            | —                                                   |                                                                                                                          | —                                                                                                                             |
| 37       |                            | Slave unit Voltage Offset                           |                                                                                                                          | Not displayed                                                                                                                 |
| 38       |                            | Slave unit Voltage Full-Scale                       |                                                                                                                          | Not displayed                                                                                                                 |
| 50       | Panel<br>Operation         | Methods for Determining<br>PRESET Contents          | 0=Determines PRESET contents<br>after PRESET mode is complete<br>1=Determines PRESET contents<br>during PRESET mode      | 0=Determines<br>PRESET contents<br>after PRESET mode<br>is complete                                                           |

## Basic Operations

### Settings Items List (Continued)

#### 【FUNCTION Settings Items】

| Item No. |                                 | Settings Items                               | Range & Contents of Parameter                           | Default Value                |
|----------|---------------------------------|----------------------------------------------|---------------------------------------------------------|------------------------------|
| 51       | Panel Operation                 | OUTPUT Status when POWER ON                  | 0=OFF (TOGGLE)                                          | 0=OFF (TOGGLE)               |
|          |                                 |                                              | 1=MODE1 (HOT START)                                     |                              |
|          |                                 |                                              | 2=MODE2 (HOT START) (※1)                                |                              |
| 52       |                                 | Voltmeter/Ammeter Display when OUTPUT is OFF | 0=Displays Measurement Values                           | 0=Displays Measurement Value |
|          |                                 |                                              | 1=Displays Set Values                                   |                              |
| 53       |                                 | LOCK Mode Selection                          | 0=only LOCK key is valid                                | 0=only LOCK key is valid     |
|          |                                 |                                              | 1=only OUTPUT and LOCK keys are valid                   |                              |
|          |                                 |                                              | 2=VOLTAGE/CURRENT and accompanying key are invalid.(※2) |                              |
| 54       |                                 | Panel Memory Key Load Procedure              | 0=Single-Action                                         | 1=Double-Action              |
|          |                                 |                                              | 1=Double-Action                                         |                              |
| 60       | Communication Functions         | Device Address                               | 1~50                                                    | 1                            |
| 61       |                                 | Birate                                       | 0=2400bps                                               | 1=9600bps                    |
|          |                                 |                                              | 1=9600bps                                               |                              |
|          |                                 |                                              | 2=19200bps                                              |                              |
|          |                                 |                                              | 3=38400bps                                              |                              |
| 62       |                                 | Parity                                       | 0=No                                                    | 0=No                         |
|          |                                 |                                              | 1=ODD                                                   |                              |
|          |                                 |                                              | 2=EVEN                                                  |                              |
| 63       |                                 | Command Form                                 | 0=SCPI Standard Conformance                             | 0=SCPI Standard Conformance  |
|          |                                 |                                              | 1=EX Series Compatible                                  |                              |
| 70       | External Control (ZX-S Type-HA) | CV Control<br>EXT R/V, PANEL<br>Settings     | 0=Front Panel                                           | 0=Front Panel                |
|          |                                 |                                              | 1=External Voltage(0~10V)                               |                              |
|          |                                 |                                              | 2=External Resistance(0~10kΩ A)                         |                              |
|          |                                 |                                              | 3=External Resistance(0~10kΩ B)                         |                              |
|          |                                 |                                              | 4=External Resistance(0~10kΩ C)                         |                              |
| 71       |                                 | CC Control<br>EXT R/V, PANEL<br>Settings     | 0=Front Panel                                           | 0=Front Panel                |
|          |                                 |                                              | 1=External Voltage(0~10V)                               |                              |
|          |                                 |                                              | 2=External Resistance(0~10kΩ A)                         |                              |
|          |                                 |                                              | 3=External Resistance(0~10kΩ B)                         |                              |
|          |                                 |                                              | 4=External Resistance(0~10kΩ C)                         |                              |
| 80       |                                 | Software PL Status                           | 1=enable (cannot be changed)                            | 1=enable                     |

※1 If ALM occurs and recovers from TRIP, turn OUTPUT OFF and then press the OUTPUT key to re-output.

※2 PRESET/FUNC/OVP/OCP are invalid.

# Settings Items List (Continued)

## 【FUNCTION Settings Items】

| Item No. |                                 | Settings Items                            | Range & Contents of Parameter                                         | Default Value                   |
|----------|---------------------------------|-------------------------------------------|-----------------------------------------------------------------------|---------------------------------|
| 72       | External Control (ZX-S Type-HA) | Internal Resistance Settings              | 0.00~128.0 Ω (400HA)<br>0.00~64.00 Ω (800HA)<br>0.00~32.00 Ω (1600HA) | 0.00Ω                           |
| 73       |                                 | Series Operation                          | 0=Master                                                              | 0=Master                        |
|          |                                 |                                           | 1=Slave                                                               |                                 |
| 74       |                                 | LEVEL1_ALM                                | CV_STS<br>0=Is not included in LEVEL1_ALM<br>1=Included in LEVEL1_ALM | 0=Is not included in LEVEL1_ALM |
| 75       |                                 |                                           | CC_STS<br>0=Is not included in LEVEL1_ALM<br>1=Included in LEVEL1_ALM | 0=Is not included in LEVEL1_ALM |
| 76       |                                 |                                           | PL_STS<br>0=Is not included in LEVEL1_ALM<br>1=Included in LEVEL1_ALM | 0=Is not included in LEVEL1_ALM |
| 80       |                                 | Software PL State                         | 1= valid<br>(Can't change it only by indication.)                     |                                 |
| 100      | Sequential Operation Function   | Sequential Operaton Mode                  | 0=disable<br>1=enable(Normal Mode)<br>2=enable(Continue Mode)         | 0 = disable                     |
| 101      |                                 | Sequential Operating Number of repetition | 0 to 9999times<br>0= Continuous Operation                             | 0=Continuous Operation          |
| 102      |                                 | Memory A Operating Time(h)                | 0~999h(Setting Resolution:1h)                                         | 0h                              |
| 103      |                                 | Memory A Operating Time (m)               | 0~59m(Setting Resolution:1m)                                          | 0m                              |
| 104      |                                 | Memory A Operating Time (s)               | 0~59.9sec(Setting Resolution:0.1s)                                    | 0.0s                            |
| 105      |                                 | Memory B Operating Time (h)               | 0~999h(Setting Resolution:1h)                                         | 0h                              |
| 106      |                                 | Memory B Operating Time (m)               | 0~59m(Setting Resolution:1m)                                          | 0m                              |
| 107      |                                 | Memory B Operating Time (s)               | 0~59.9sec(Setting Resolution:0.1s)                                    | 0.0s                            |
| 108      |                                 | Memory C Operating Time (h)               | 0~999h(Setting Resolution:1h)                                         | 0h                              |
| 109      |                                 | Memory C Operating Time (m)               | 0~59m(Setting Resolution:1m)                                          | 0m                              |
| 110      |                                 | Memory C Operating Time (s)               | 0~59.9sec(Setting Resolution:0.1s)                                    | 0.0s                            |
| 111      |                                 | Sequence Operating OFF Time (h)           | 0~999h(Setting Resolution:1h)                                         | 0h                              |

## Basic Operations

---

### Settings Items List (Continued)

#### 【FUNCTION Settings Items】

|     |                               |                                                                                  |                                  |          |
|-----|-------------------------------|----------------------------------------------------------------------------------|----------------------------------|----------|
| 112 | Sequential Operation Function | Sequential Operating<br>OFF Time (s)                                             | 0~59.9s(Setting Resolution:0.1s) | 0.0s     |
| 113 |                               | Sequential Operating<br>OFF Time (s)                                             | 0~59.9s(Setting Resolution:0.1s) | 0.0s     |
| 114 |                               | OUTPUT OFF at the<br>end of the limited<br>repetition of<br>Sequential Operation | 0=disable<br>1=enable            | 1=enable |



### Setting Output ON/OFF Toggle Mode

It is possible to nullify the use of the OUTPUT key.

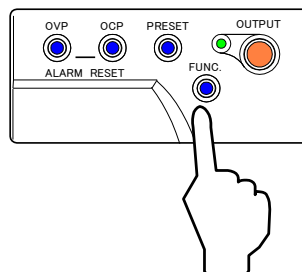
To do so, set the settings to 1, and when the POWER switch is turned ON, output will begin even if the OUTPUT key is not pressed.

#### Setting Procedures

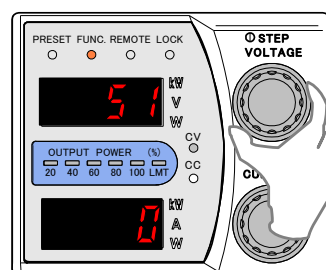
##### Press the Function FUNC key.

“FUNC.” Lamp lights.

The Setting Item Number will display on the top Number Display and the parameter will be displayed in the bottom Number Display.



##### Select Item No. 51 with the VOLTAGE dial.

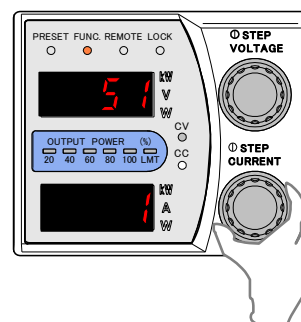


##### Set Parameter to 0 or 1 with the CURRENT dial.

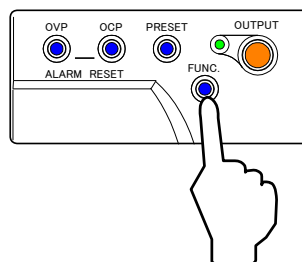
Parameter=0 Output is OFF (COLD START) after power is turned on

Pressing the OUTPUT key will toggle it ON/OFF.

Parameter=1 Output turns ON approximately 2 seconds after power is turned on.  
(HOT START)



##### Press the FUNC. key to finalize settings.



### Over Voltage Protection(OVP) Circuit

In the event of an over voltage due to circuit failure of the power supply, improper use, load opens in constant current mode, etc. the output is turned OFF and switching is ceased to protect the load.

The OVP voltage can be set from 10V to 704V.

### Setting/Canceling Over Voltage Protection

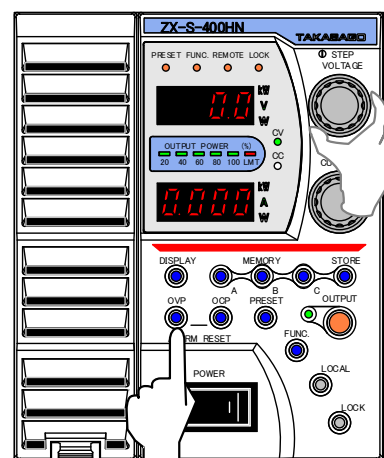
---

#### Setting Over Voltage Protection Level

- ①. Set the output to OFF with the OUTPUT key.
- ②. Press the OVP key to display the current OVP set value in the top Number Display.
- ③. Change the set value by turning the VOLTAGE dial while pressing down the OVP key.  
(Turn the dial right to raise or left to lower the set value.)
- ④. Release the OVP key to confirm set values and to return to measurement display mode.

#### MEMO

- Press the VOLTAGE dial to display the current number position. The selected number will be brightened. Press to change position. If all 4 places are brightened, numbers will change from the lowest place.
- Press the OVP key to display the set values in the top Number Display.
- While setting, the CURRENT dial cannot be used.



#### Verifying Over Voltage Protection Operation

After settings are complete, please follow the procedures below to test verify operation.

- ①. Disconnect the load from the power supply.
- ②. Turn the POWER switch ON with the Output ON/OFF Toggle mode set to "0".
- ③. Set the output voltage settings lower than OVP level.
- ④. Turn OUTPUT to ON.
- ⑤. Gradually increase the Output Voltage with the VOLTAGE dial. Verify that the output turns OFF once the OVP set voltage has been reached and that the error code "E004" appears in the top Number Display and "OUP" appears in the bottom Number Display.
- ⑥. Hold the OVP and OCP keys simultaneously for more than 1 second to cancel the alarm.  
Return the CV set value to its original value.

### Canceling Over Voltage Protection Operation

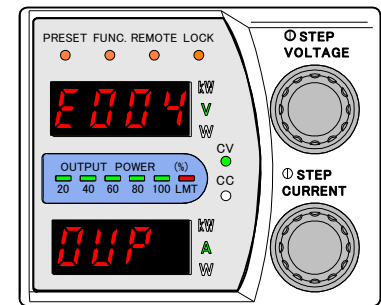
When Over Voltage Protection Circuit is triggered, the OUTPUT is set to OFF and an error code (top) and alarm message (bottom) will be displayed in the Number Display.

Error Code "E004" will be displayed in the top Number Display and OUP will be blinking in the Current/Power meter.

#### MEMO

When OVP is triggered, the falling slew rate setting, based on the slew rate function, is set invalid and the voltage is immediately decreased.

Press the OUTPUT key to start output.



Hold down the OVP and OCP keys simultaneously for more than 1 second to erase the displayed error code and OUP.

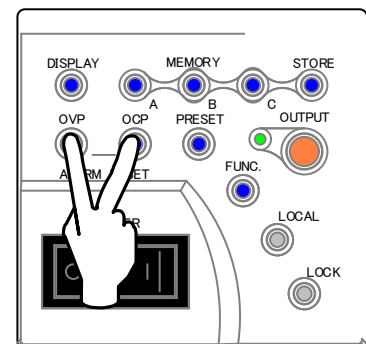


#### Caution

If the error code and OVP does not erase after holding down the OVP and OCP keys, the power supply may be damaged. Turn power off immediately and please contact Takasago or your retail store.

#### MEMO

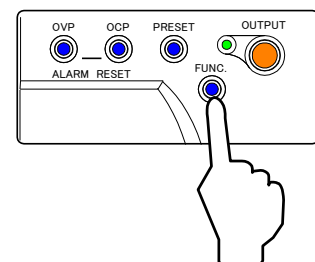
- During serial data communication, recovery from alarm status is possible using commands.
- During parallel operation where the Master unit is operating normal, if any Slave unit triggers an alarm, the error code "E006" will be displayed in the Master and functioning Slave units.  
(Information concerning the alarm will be displayed on the Slave unit that triggered the alarm)



### Remove cause which triggered the OVP

(Change CV set values, OVP set values, load status)

Press the OUTPUT key to start output.



## Basic Operations

### Over Current Protection (OCP) Circuit

In the event of an over current due to a short circuit in the load, the output is turned OFF and switching is ceased to protect the load.

The OCP current can be set from 1.25% to 110% of the rated current.

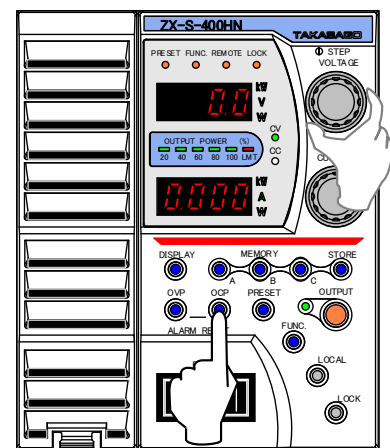
### Setting/Canceling Over Current Protection

#### Setting Over Current Protection Level

- ①. Set the output to OFF with the OUTPUT key.
- ②. Press the OCP key to display the current OCP set value in the top Number Display.
- ③. Change the set value by turning the VOLTAGE dial while pressing down the OCP key.
- ④. Release the OCP key to confirm set values and to return to measurement display mode.

#### MEMO

- Press the VOLTAGE dial to display the current number position. The selected number will be brightened. Press to change positions. If all 4 places are brightened, numbers will change from the lowest place.
- Press the OCP key to display the set values in the top Number Display.
- While setting, the CURRENT dial cannot be used.



#### Verifying Over Current Protection Operation

After settings are complete, please follow the procedures below to test verify operation.

- ①. Disconnect the load from the power supply and short between the +/- output terminals using cross section area wires that can flow rated current.
- ②. Turn the POWER switch ON with the Output ON/OFF Toggle mode set to "O"
- ③. Set the Output Current settings lower than OCP level.
- ④. Turn OUTPUT to ON.
- ⑤. Gradually increase the Output Current with the CURRENT dial. Verify that the output turns OFF once the OCP set current has been reached and that the error code "E005" appears in the top Number Display and "OCP" in the bottom Number Display.
- ⑥. Hold the OVP and OCP keys simultaneously for more than 1 second to cancel the alarm.  
Return the CC set value to its original value.

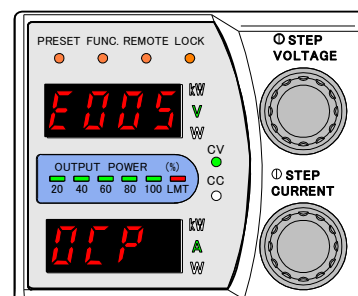
### Canceling Over Current Protection Operation

When Over Current Protection Circuit is triggered, the OUTPUT is set to OFF and an error code (top) and alarm message (bottom) will be displayed in the Number Display.

Error Code “E005” will be displayed in the top Number Display and OCP will be blinking in the bottom Number Display

#### MEMO

When the OCP is triggered, the Falling slew rate setting, based on the slew rate function, is set invalid and the output current is immediately decreased.



Hold down the OVP and OCP keys simultaneously for more than 1 second to erase the displayed error code and OCP.

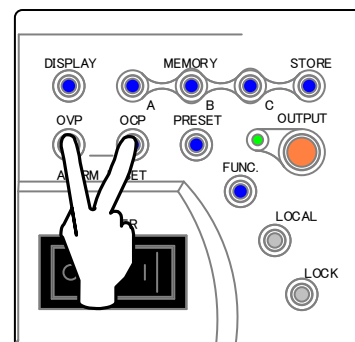


#### Caution

If the error code and OCP does not erase after holding down the OVP and OCP keys, the power supply may be damaged. Turn power off immediately and please contact Takasago or your retail store.

#### MEMO

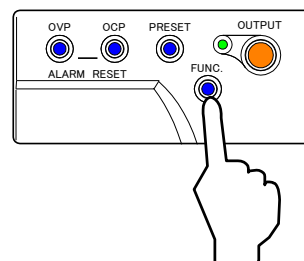
- During serial data communication, recovery from alarm status is possible using commands.
- During parallel operation where the Master unit is the operating normal, if any Slave unit triggers an alarm, the error code “E006” will be displayed in the Master and functioning Slave units.  
(Information concerning the alarm will be displayed on the Slave unit that triggered the alarm)



**Remove cause which triggered the OCP.**

(Change CC set values, OCP set values, load status)

**Press the OUTPUT key to start output.**



## Basic Operations

### Error Codes

| Item \ Position                            | Number Display Top | Number Display Bottom | Cause                                                                                                                                    | Verify/Recovery                                                                                                                                                                                                                       |
|--------------------------------------------|--------------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WDT                                        | E001               | —                     | CPU may have performed an illegal operation                                                                                              | Turn POWER switch OFF and restart                                                                                                                                                                                                     |
| AD_OV                                      | E002               | —                     | Abnormal voltage detected in the power supply circuit                                                                                    | May be damaged.<br>Contact Takasago Sales Dept.                                                                                                                                                                                       |
| OHP                                        | E003               | OHP                   | Over heating protection is triggered.                                                                                                    | <ul style="list-style-type: none"> <li>● Turn power OFF. Leave device to cool down. Turn power ON</li> <li>● Check environmental temperatures</li> <li>● Verify Fan Motor rotates when power is turned on. (OUTPUT is OFF)</li> </ul> |
| OVP                                        | E004               | OUP                   | Over voltage protection was triggered                                                                                                    | Check OVP values.<br>See page 29 to cancel alarm.                                                                                                                                                                                     |
| OCP                                        | E005               | OCP                   | Over current protection was triggered                                                                                                    | Check OCP values<br>See page 31 to cancel alarm                                                                                                                                                                                       |
| BST                                        | E006               | —                     | Slave unit malfunctioned.<br>(Displays only on Master when in Parallel operation)                                                        | Check slave unit display                                                                                                                                                                                                              |
| P_ERR                                      | E007               | —                     | May have May have had a short interruption or voltage dip at the main power                                                              | Turn power switch OFF. Check device's power supply.                                                                                                                                                                                   |
| BST_NRDY                                   | E008               | —                     | Slave unit's input voltage is abnormal or POWER switch is OFF                                                                            | Check whether slave unit's power switch is ON                                                                                                                                                                                         |
| Device Detection Failure                   | E009               | —                     | Cannot detect number of parallel devices                                                                                                 | Restart power supply                                                                                                                                                                                                                  |
| Max. Device No. OVER                       | E010               | —                     | More than 11 parallel devices are connected                                                                                              | Verify No. of parallel devices.<br>Restart power supply                                                                                                                                                                               |
| Device No. Disagreement                    | E011               | —                     | Difference in the current No. of connected parallel devices and the previous No. of parallel devices remembered by the ZX-S power supply | If the present number of parallel devices is satisfactory, hold the FUNC. key for more than 2 seconds and confirm the detected number of devices.                                                                                     |
| TRIP<br>(1600HN/HAN)<br>※Displayed briefly | E012               | Shdn                  | TRIP function was triggered                                                                                                              | Cancel by pressing OVP + OCP keys simultaneously or by the remote control command ALARM CLEAR.                                                                                                                                        |
| Communication Failure                      | E100               | —                     | Data was not received                                                                                                                    | Re-verify sent message.<br>Recovered if normal message is received.                                                                                                                                                                   |
| E2P Failure                                | E110               | —                     | Failure to initialize during startup                                                                                                     | Cancel by pressing OVP + OCP keys simultaneously or by the remote control command ALARM CLEAR.                                                                                                                                        |

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# Useful Function

## Memory

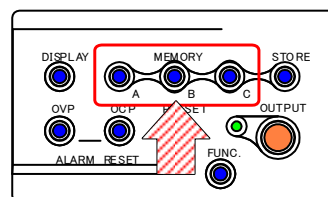
Saves and loads the set values of the voltage, current, and various functions in memories “A”, “B”, and “C”.

### MEMO

Settings Items that can be saved in memory are listed on page 38, “Panel Memory Savable Settings”.

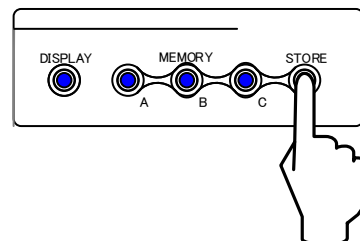
## Saving in Memory

This function will save the current set values in memory “A”, “B”, and “C”.



### Press the STORE key.

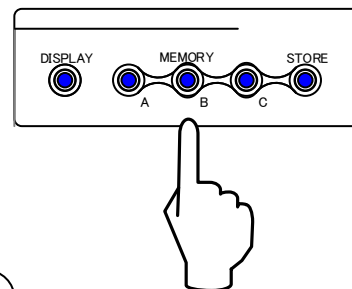
The voltage set value will display in the top Number Display and the current set value in the bottom Number Display.  
(Press the STORE key again to cancel.)



### Select destination by holding down Memory “A”, “B”, “C” key for more than 1 second.

Saves current set values.

The light will blink faster until finished. Once saving is complete the display will return to measurement display mode.



### MEMO

Only the OUTPUT ON/OFF and keys mentioned in the setting procedures can be used.

Values can be saved to memory regardless of OUTPUT ON/OFF status.

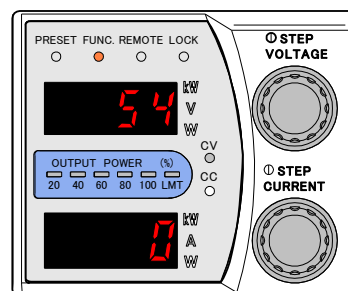


## Loading from Memory

### [Single-Action Loading]

Set the parameter for FUNCTION settings item 54 to "0".

(See page 24 Function Settings on how.)



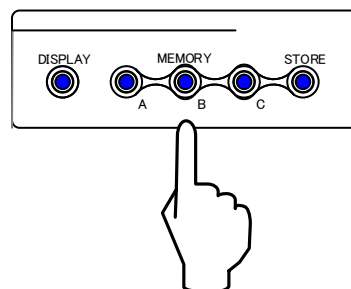
Press the memory key you wish to load from.

The settings stored in memory will take affect.

#### MEMO

Only the OUTPUT ON/OFF and keys mentioned in the setting procedures can be used.

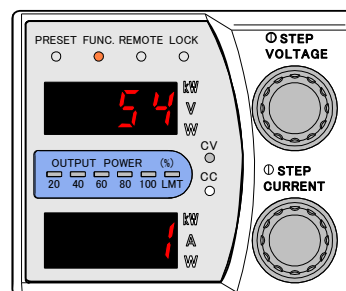
Memory can be read out regardless of OUTPUT ON/OFF status.



### [Double-Action Loading]

Set the parameter for FUNCTION settings item 54 to "1".

(See page 24 Function Settings on how.)

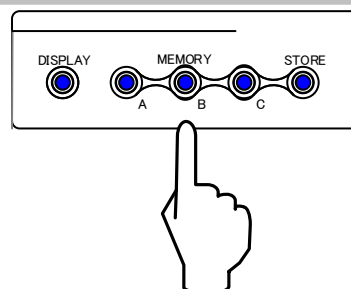


Press the A, B, or C memory key you wish to load from

The voltage and current values stored in memory will blink in the Number Display.

(Press the same memory key to cancel.)

Pressing a different memory key at this point will display the voltage and current values stored in the pushed key.)



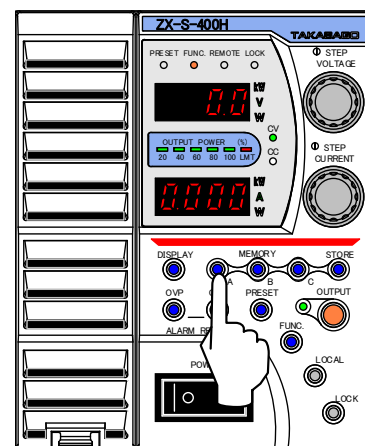
Hold down the memory button you wish to load from for more than 1 second.

The light will blink faster until finished. Once loading is complete the display will return to measurement display mode.

#### MEMO

Only the OUTPUT ON/OFF and keys mentioned in the setting procedures can be used.

Values can be saved to memory regardless of OUTPUT ON/OFF status.



## Useful Function

---

### Panel Memory Savable Settings

| Keys used to set | Savable Parameters |                              |
|------------------|--------------------|------------------------------|
| PRESET           | CV Set Value       |                              |
|                  | CC Set Value       |                              |
|                  | OVP Set Value      |                              |
|                  | OCP Set Value      |                              |
| FUNC.            | 2                  | Selection of Startup Mode    |
|                  | 3                  | CV Slew Rate Rising          |
|                  | 4                  | CV Slew Rate Falling         |
|                  | 5                  | CC Slew Rate Rising          |
|                  | 6                  | CC Slew Rate Falling         |
|                  | 8                  | ON Delay Time                |
|                  | 9                  | OFF Delay Time               |
|                  | 72                 | Internal Resistance Settings |

## Startup Mode Selection

Allows you to select the optimal output startup properties for each use.

### 1. Constant Voltage (CV) Priority Mode

Perfect when using as a normal constant voltage power supply for testing equipment and devices.

### 2. Constant Current (CC) Priority Mode

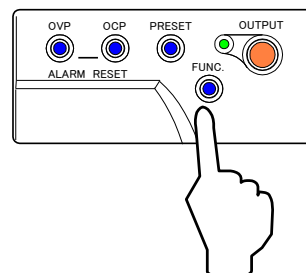
Perfect when wishing to control the current of electromagnets etc. or when wishing to include the constant current pulse to nonlinear loads such as diodes etc.

## Setting Procedures

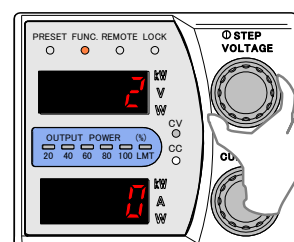
**Press the Function “FUNC.” key.**

FUNC. lamp will light.

Settings Item Number will display on the top Number Display  
and parameters on the bottom Number Display.



**Select Item Number 2 with the VOLTAGE dial.**

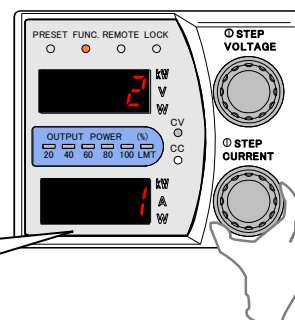


**Select either 0 or 1 with the CURRENT dial.**

Set Value 0 = CV Priority Mode

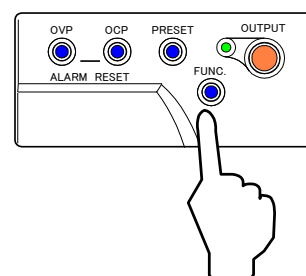
Set Value 1 = CC Priority Mode

Set to 0 or 1



**Press the FUNC. key again to finish.**

Confirms settings and returns the Number Display to  
measurement display mode.



### MEMO

It is possible to continue to change other setting items without pressing the “FUNC.” key. In this case, press the “FUNC.” key to confirm settings once changes are complete.

## Useful Function

### Variable Slew Rate

Sets the increasing and falling rate for each output voltage and output current individually.

#### ■ Constant Voltage (CV) Slew Rate

Use when a small transition rate is desired in the output voltage when using constant voltage.

Range: 0.1V/s ~ 160.0V/s

#### ■ Constant Current (CC) Slew Rate

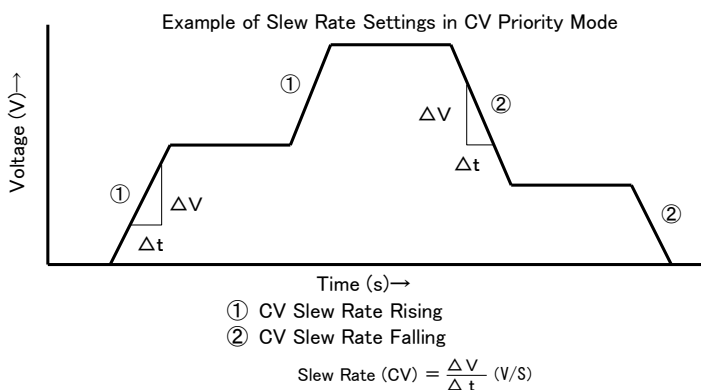
Use when a small transition rate is desired in the output voltage when using constant current.

Range:

400HN/HAN : 0.01A/s ~ 10.00A/s

800HN/HAN : 0.01A/s ~ 20.00A/s

1600HN/HAN : 0.01A/s ~ 40.00A/s



#### Caution

The range will vary for the Constant Current(CC) Slew Rate depending on the number of parallel devices.

Ex: For 400HN/HAN

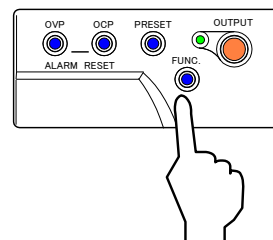
- |                              |                               |
|------------------------------|-------------------------------|
| ① 2 Devices: 0.01 ~ 20.00A/s | ⑥ 7 Devices: 0.01 ~ 70.00A/s  |
| ② 3 Devices: 0.01 ~ 30.00A/s | ⑦ 8 Devices: 0.01 ~ 80.00A/s  |
| ③ 4 Devices: 0.01 ~ 40.00A/s | ⑧ 9 Devices: 0.01 ~ 90.00A/s  |
| ④ 5 Devices: 0.01 ~ 50.00A/s | ⑨ 10 Devices: 0.01 ~ 100.0A/s |
| ⑤ 6 Devices: 0.01 ~ 60.00A/s |                               |

### Setting Procedures

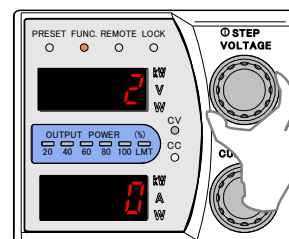
Press the Function “FUNC.” key.

FUNC. lamp will light.

Settings Item Number will display on the top “Number Display” and parameters on the bottom Number Display.



Select Item Number 2 with the VOLTAGE dial.

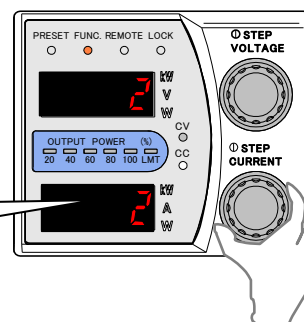


Assign the Startup Priority Mode by setting the parameter to 2 or 3 with the CURRENT dial.

Set Value 2 = CV Priority, Variable Slew Rate

Set Value 3 = CC Priority, Variable Slew Rate

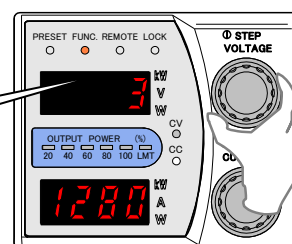
Set to 2 or 3



## When selecting Constant Voltage (CV) Priority, Variable Slew Rate mode (Item 2 set to 2)

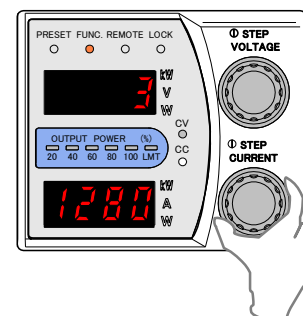
Set the Item Number to either 3 or 4  
using the **VOLTAGE** dial.  
Set Value 3=Rising Voltage Slew Rate  
Set Value 4=Falling Voltage Slew Rate

Set to 3 or 4



Assign the set value using the **CURRENT** dial.

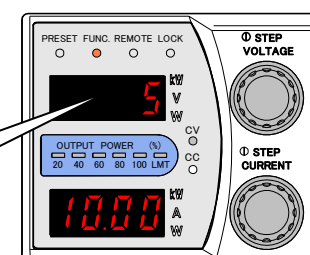
Range: 1.0V/s~1280V/s



## When selecting Constant Current (CC) Priority, Variable Slew Rate mode (Item 2 set to 3)

Set the Item Number to either 5 or 6  
using the **VOLTAGE** dial.  
Set Value 5=Rising Current Slew Rate  
Set Value 6=Falling Current Slew Rate

Set to 5 or 6



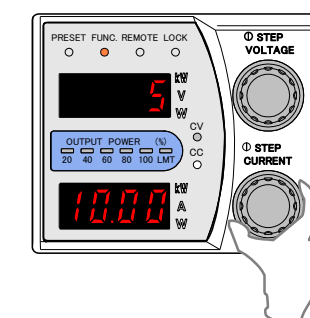
Assign the set value using the **CURRENT** dial.

Range:

400HN/HAN : 0.01A/s ~ 10.00A/s

800HN/HAN : 0.01A/s ~ 20.00A/s

1600HN/HAN : 0.01A/s ~ 40.00A/s



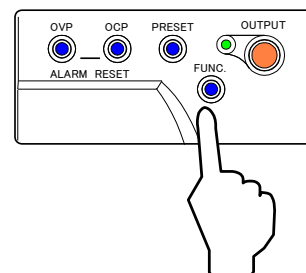
If using with master slave parallel operation, see  
caution on page 40.

**Press the FUNC. key again to finish.**

Confirms settings and returns the Number Display to  
measurement display mode.

### MEMO

It is possible to continue to change other setting items without  
pressing the "FUNC." key. In this case, press the "FUNC." key to  
confirm settings once changes are complete.



### Sequential ON/OFF

Toggles the Output ON/OFF for multiple ZX-S Series power supplies using time delays.

Optional cables KXC-300(300mm) or  
KXC-600(600mm) are required for connection.  
(Sold Separately)



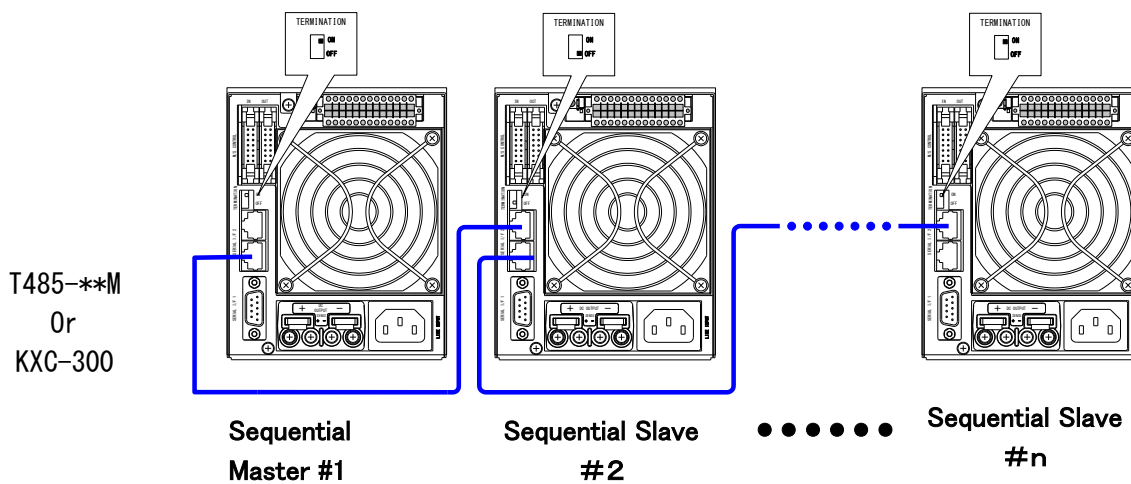
#### Caution

● **TERMINATION Settings (Termination Resistor)**

Set the sequential master (#1) and last sequential slave (#n) TERMINATION switch to ON. Set all other sequential slaves to OFF.

#### Sequential ON/OFF Connections (1)

If toggling ON/OFF manually:



※Rear Panel Diagram of ZX-S-400HA

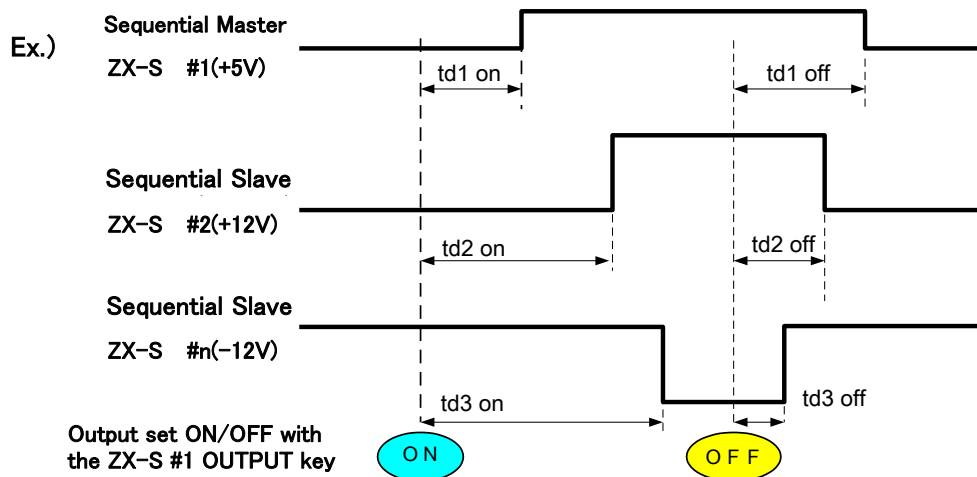
#### Sequential ON/OFF Connections

**Using the Sequential Function**

Toggles the output ON/OFF once the delay time, set as the trigger of each unit for the sequential Master unit's "OUTPUT ON" signal, has surpassed.

**MEMO**

It is possible to set the delay time (tdon, tdoff) for the sequential master unit.

**Setting Procedures****Set Sequential ON/OFF to ON for LOCAL**

Press Function "FUNC." key.

FUNC. lamp will light.

Settings Item Number will display on the top "Number Display" and parameters on the bottom Number Display.

Select Item Number 7 with the VOLTAGE dial, then set the parameter to 1 with the CURRENT dial.

**Set the Delay Time**

ON-Delay Time and OFF-Delay Time settings have a range of 0.00s~99.99s.

Factory default is 0.00s (no delay time)

**Setting ON-Delay Time**

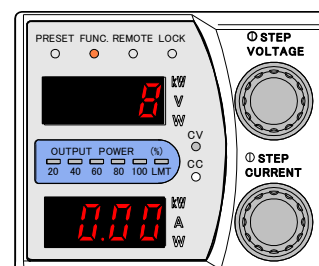
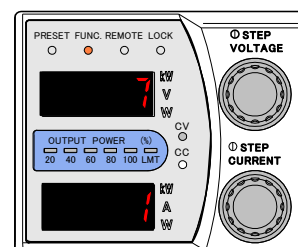
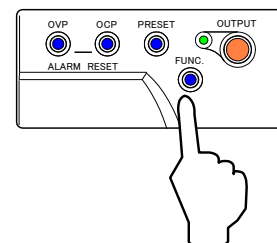
Select Item Number 8 with the VOLTAGE dial.

Set ON-Delay Time with the CURRENT dial.

**Setting OFF-Delay Time**

Select Item Number 9 with the VOLTAGE dial.

Set OFF-Delay Time with the CURRENT dial.



⇒Continued on next page

## Useful Function

---

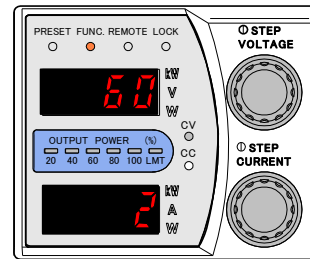
### Set the Sequential Master and Sequential Slave Unit Settings

Select Item Number 60 with the  
VOLTAGE dial.

Set the Master and Slave settings with the  
CURRENT dial.

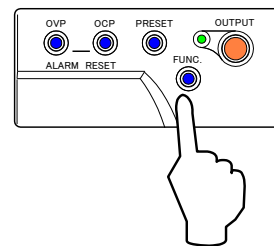
Master Unit is Address "1".

Set the Slave Unit Address to any value except "1".



**Press the FUNC. key to finish.**

Number Display will return to measurement display mode.





## Key Lock

Use the LOCK key when protecting settings from careless operations is desired.

### Key Lock Settings

Pressing the LOCK key will restrict key inputs.  
LOCK lamp will light.

The status of the Lock Key can be selected under the  
FUNCTION Settings Item Number 53 parameters from  
the following 3 types below.

Parameter=0:

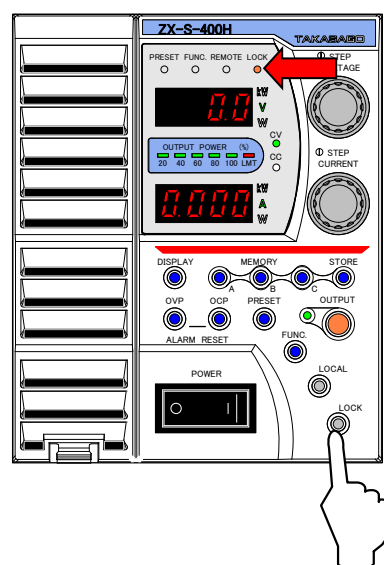
Only the LOCK key can be used

Parameter=1:

Only the OUTPUT key and LOCK key can  
be used.

Parameter=2:

Only the DISPLAY key, A, B and C memory  
keys, STORE key, OUTPUT key, and LOCK  
key can be used.



### Canceling Key Lock

Press the LOCK key again to release lock on  
keys. LOCK lamp will turn off.

## Useful Function

### Variable Internal Resistance (ZX-S Series Type-HAN)

This function intentionally generates a voltage drop due to load current when running in Constant Voltage mode. This function is capable of approximating an internal resistance of chemical batteries (during electric discharge) and I-V characteristics of solar/fuel cells.



#### Caution

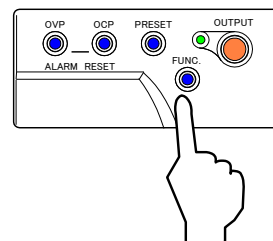
Variable Internal Resistance function is restricted to only DC operations.  
Not suited for approximating transient phenomenon.

#### Setting Procedures

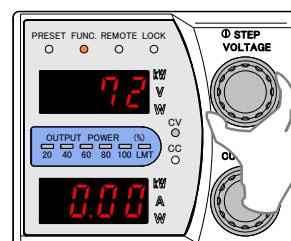
##### Press The Function “FUNC.” key.

FUNC. lamp will light.

Settings Item Number will display on the top “Number Display” and parameters on the bottom Number Display.



##### Select Item Number 72 with the VOLTAGE dial.



##### Set the Internal Resistance value with the CURRENT dial.

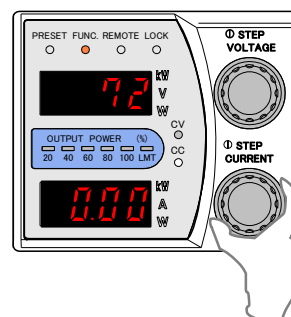
Range is  $0.00\ \Omega \sim 128.0\ \Omega$

400HN/HAN :  $0.00\ \Omega \sim 128.0\ \Omega$

800HN/HAN :  $0.00\ \Omega \sim 64.0\ \Omega$

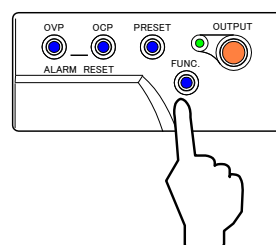
1600HN/HAN :  $0.00\ \Omega \sim 32.0\ \Omega$

Factory default is  $0.00\ \Omega$  (No Internal Resistance)



##### Press the FUNC. key again to finish.

Confirms settings and returns Number Display to measurement display mode.



#### MEMO

It is possible to continue to change other setting items without pressing the “FUNC.” key. In this case, press the “FUNC.” key to confirm settings once changes are complete.

### Measurement Display Smoothing

Use when wishing to stabilize displayed values when the load current is periodically fluctuating at high speeds. The displayed value will be the average value of data, including new data, measured within the past 2 seconds. This is renewed approximately every 200ms. (This method is known as the Moving Average Method)

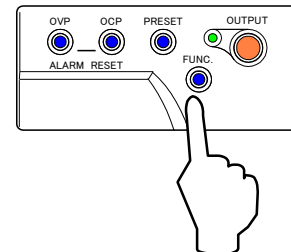
#### Setting Procedures

**Press the Function “FUNC.” key.**

FUNC. lamp will light.

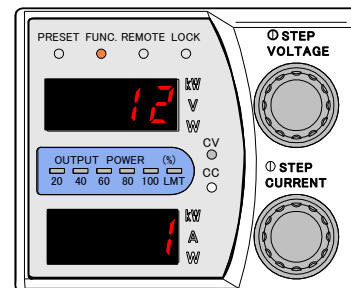
Settings Item Number will display on the top “Number

Display” and parameters on the bottom Number Display.



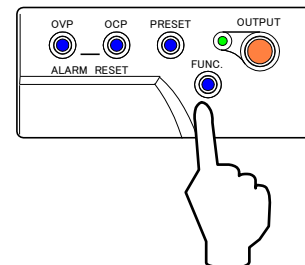
---

**Select Item Number 12 with the VOLTAGE dial.**  
**Set the parameter to 1 with the CURRENT dial.**



**Press the FUNC. to finish.**

Returns Number Display to measurement display mode.



### Linearity Compensation

This function provides a high output setting accuracy by measuring and compensating the nonlinearity of the output caused by feedback systems or DA converters/Error Amplifiers used as a DC power supply voltage or current reference value. This is normally used when the compensation function is turned ON (Parameter 1 or 2).

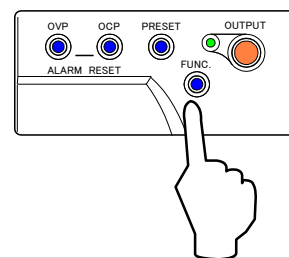
#### Setting Procedures

**Press the Function “FUNC.” key.**

FUNC. lamp will light.

Settings Item Number will display on the top “Number

Display” and parameters on the bottom Number Display.



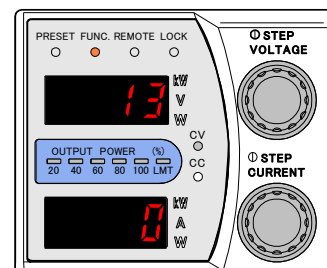
**Select Item Number 13 with the VOLTAGE dial.**

**Set Compensation Mode with CURRENT dial.**

0=Compensation Function is turned OFF

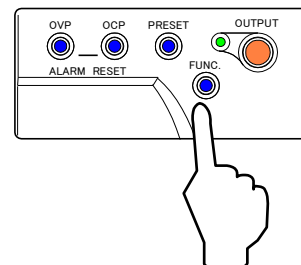
1=Once compensation has concluded, the Output is then turned ON, the set values are changed, and the compensation value is maintained until there is a change in the Output mode (CV/CC).

2=Compensates continually (200ms cycles)



**Press the FUNC. key again to finish.**

Returns Number Display to measurement display mode.



## Supplementary Information

It may happen to have some minor change in output when OUTPUT ON, when OUTPUT setting change during OUTPUT ON and when OUTPUT mode changing such as CV to CC or CC to CV.

It is recommended to set the Linearity Compensation to OFF, if there is any concern on the minor change in output against the test specimen at load side.

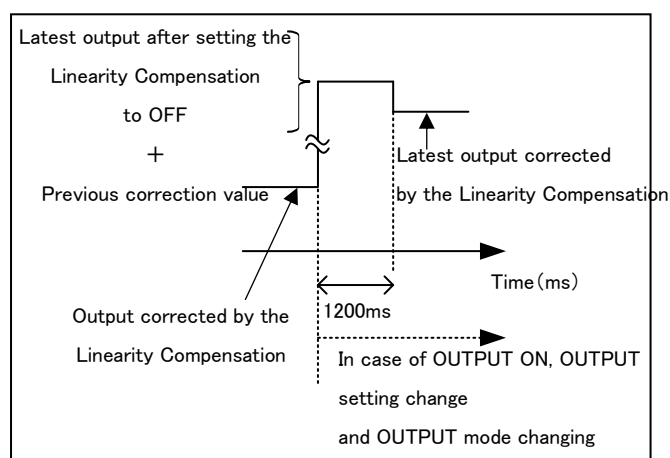
## Variation by output mode

CV mode:  $\pm (0.3\% + 300\text{mV})$  for 400HN/HAN, 800HN/HAN and 1600HN/HAN

CC mode:  $\pm (1.5\% + 15\text{mA})$  for 400HN/HAN

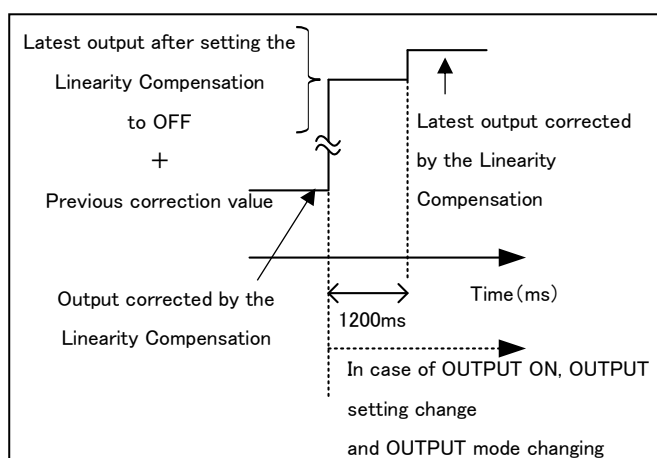
$\pm (1.5\% + 15\text{mA})$  for 800HN/HAN

$\pm (1.5\% + 30\text{mA})$  for 1600HN/HAN



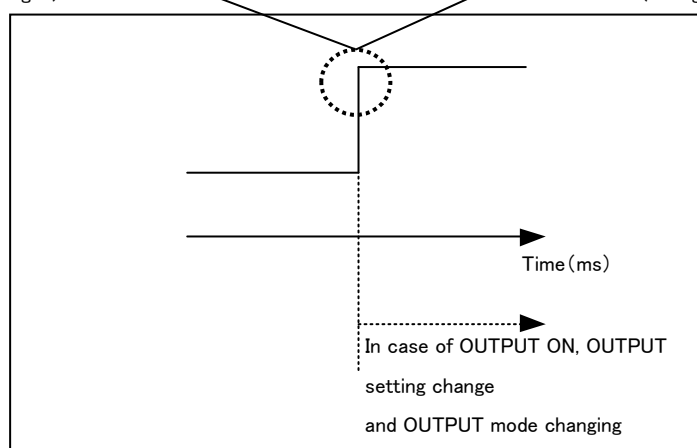
In the event of the previous corrected value is positive

(enlarged)



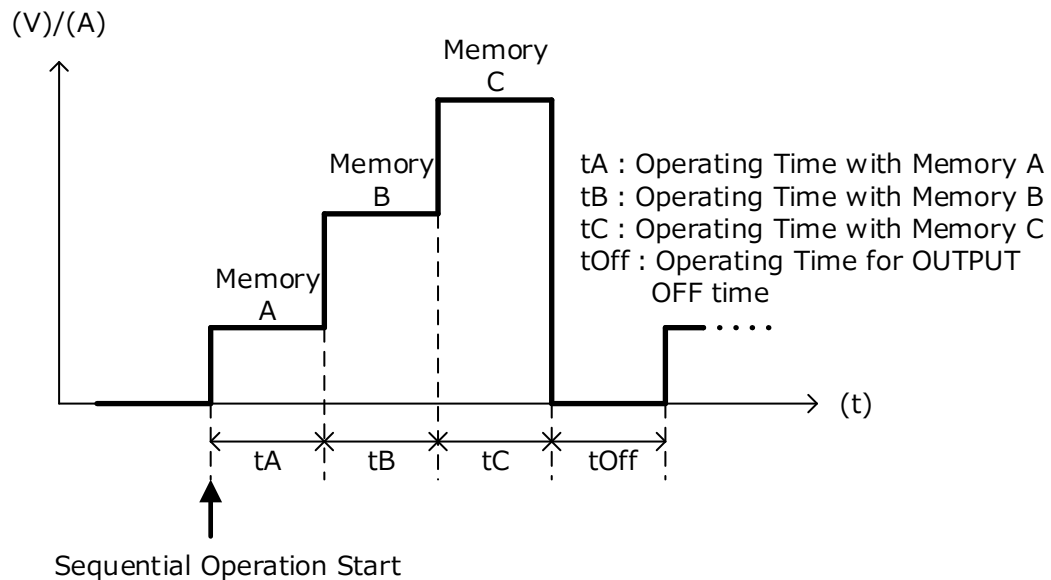
In the event of the previous corrected value is negative

(enlarged)



### Sequential Operation Function

The sequential operation function of ZX-S series is automatic sequential output control function either regularly or continuously by setting control time for memory setting and OUTPUT OFF.



#### 《Setting for Sequential Operation Function》

- Number of repetition : Continuous Operation from 1 to 9,999 times.
- Operating time of each memories : 0-999h, 0-59m, 0.0-59.9sec
- Operation time for OUTPUT OFF : 0-999h, 0-59m, 0.0-59.9sec

Note) The accuracy of the sequential operating time is Approx.  $\pm 0.5\%$  and settable Min. resolution is 0.1 sec. However it may happen to have any influence against rising and falling time of output by programming time and load conditions and falling time

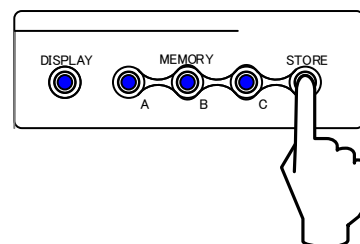
#### 《Recordable setting for memory function》

- CV, CC, OVP and OCP setting
- Selection for rising mode (Setting of FUNCTION 2)  
0: Priority on CV, 1: Priority on CC, 2: CV priority slew rate, and 3: CC priority slew rate
- Rising for CV slew rate (Setting of FUNCTION 3)
- Falling for CV slew rate (Setting of FUNCTION 4)
- Rising for CC slew rate (Setting of FUNCTION 5)
- Falling for CC slew rate (Setting of FUNCTION 6)
- Internal Resistor Setting (Setting of FUNCTION 72) (※) Only for ZX-S series A type

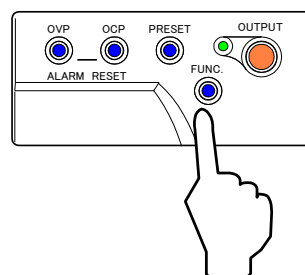
Note) Please refer to "Useful Function for Memory" in the Instruction Manual for the detail and how to set of the Memory Function.

### How to use sequence operation function

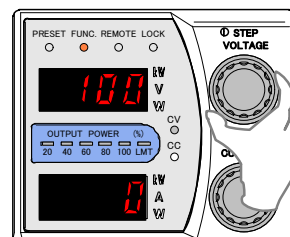
Set the desired value of voltage, current and various function to memory A, B and C, referencing "Useful Function -Memory Function" in the Instruction Manual.



Press Function Key "FUNC.".

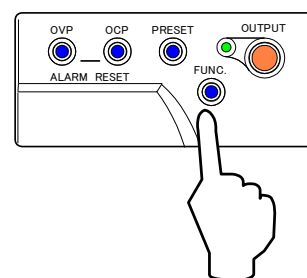


Set the required parameters for items from 100 to 114.  
For the items and parameters, please refer to "List of Setting Items".



ZX-S series will be ready for sequence operation after setting "1" or "2" for item 100 and pressing "FUNC" button.

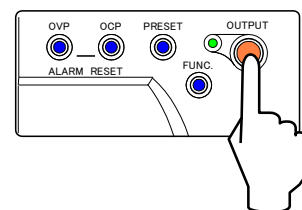
- 0 = Sequential Operation disable
- 1 = Sequential Operation enable (Normal Mode)
- 2 = Sequential Operation enable (Continue Mode)



## Useful Function

Sequential Operation will be started after pressing "OUTPUT" button.  
 "OUTPUT" lamp will be blinking once the sequential operation is started.  
 The sequential operation will be stopped, if the "OUTPUT" button is pressed during the operation.  
 Please take note that the sequential operation is able to start or stop by remote command or external contact.

The "OUTPUT" lamp is blinking during the sequential

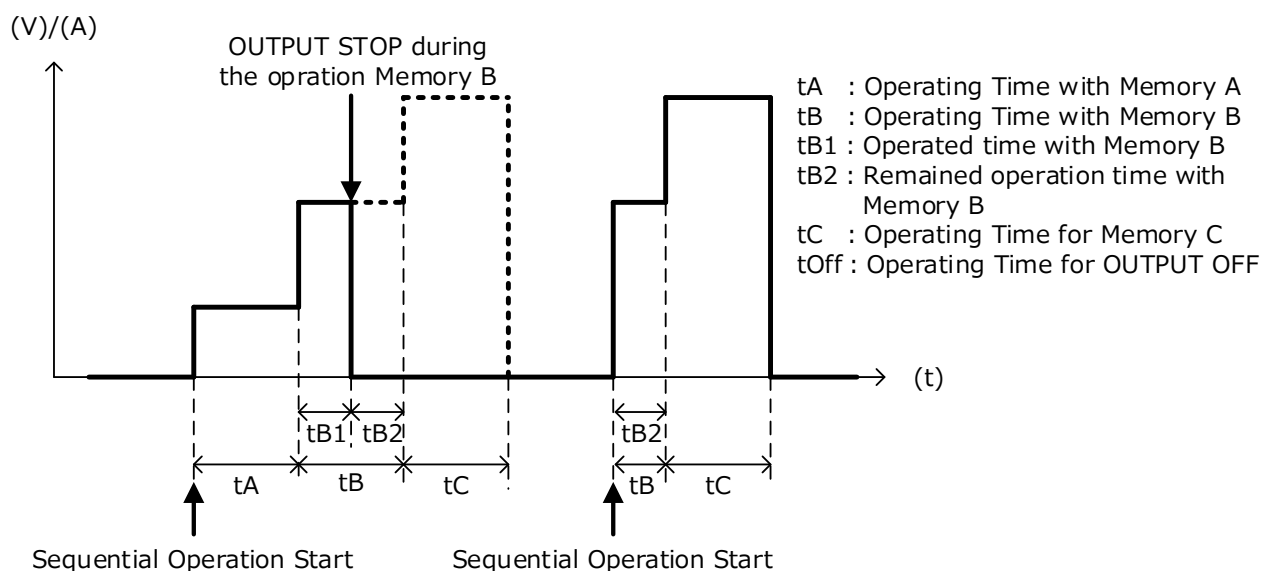


### NOTE

Only the "OUTPUT" button, "DISPLAY" button, and "LOCK" button will be enable during the sequential operation. Other buttons will be disable during the operation.

## Continue Mode Function

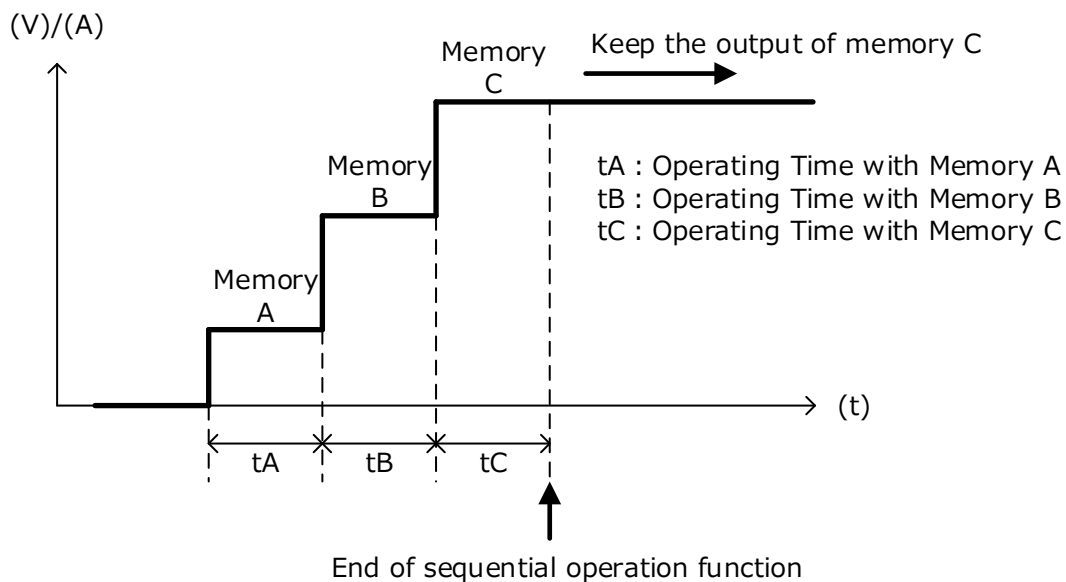
The sequential operation will be restarted from the latest status by setting "2" for the setting item 100 even the output will be stopped during the sequential operation due to the error and turning off of the ZX-S series.



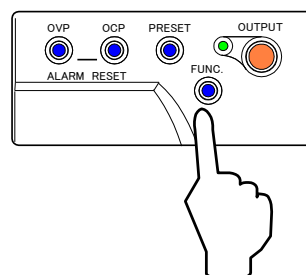


## OUTPUT OFF at the end of the limited repetition of Sequential Operation

It is enable to select either OUTPUT OFF or keeping the latest status at the end of the sequential operation by switching the item 114.



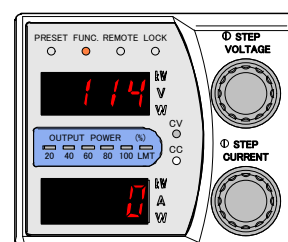
Press Function Key "FUNC.".



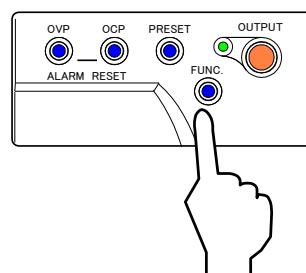
Set the required parameters for item 114.

For the items and parameters, please refer to "List of Setting Items (additional)" in page 2.

- 0 = Disable (Keeping the OUTPUT status at the end of the sequential operation)
- 1 = Enable (OUTPUT OFF at the end of the sequential operation)



Press Function Key "FUNC" again to complete the setting.



## Useful Function

---

### Detail for Sequential Operation Function

1. The sequential operation time is the sum of each operation time such as hrs., min. and sec. of Function Setting Item from 102 to 113.

e.g. The operation time for Memory A will be 1 hrs., 10 min. and 23.4 sec. under the followings.

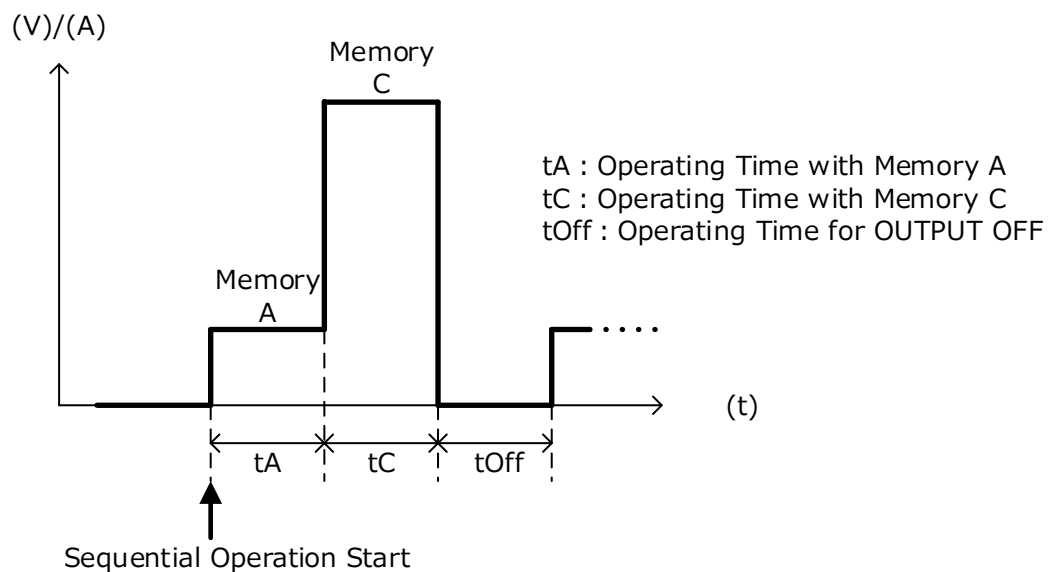
FUNCTION Setting Item 102 : 1 hrs.

FUNCTION Setting Item 103 : 10 min.

FUNCTION Setting Item 104 : 23.4 sec.

2. The sequential operation will not be executed with the setting of 0 hrs. , 0 min. , and 0.0 sec.

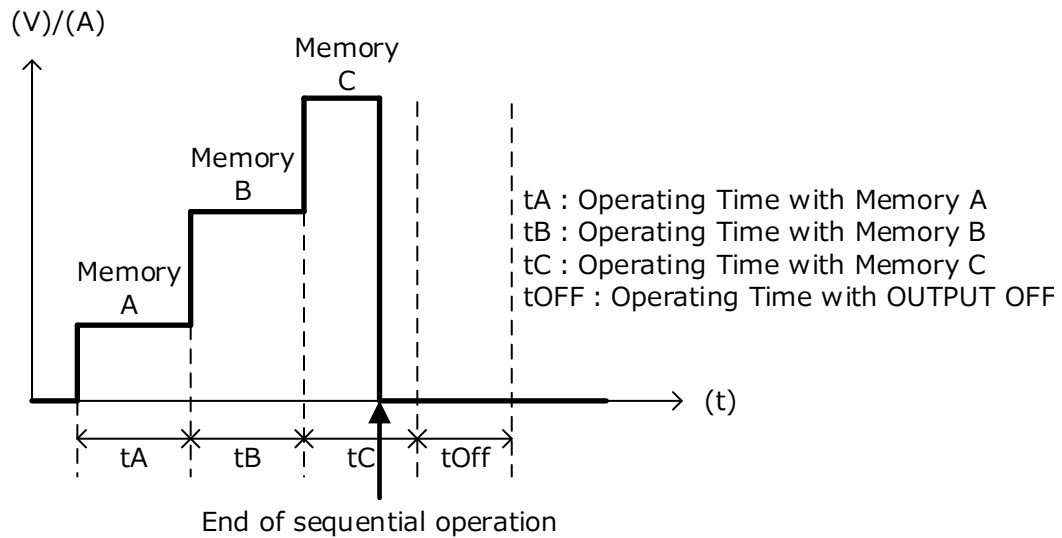
e.g. 1) There is no OUTPUT with the Memory B, if the operation time for the Memory B is set as "0 hrs., 0 min. , 0.0 sec".



e.g. 2) There is no sequential operation and OUTPUT, if the operation time for the Memory A, Memory B, Memory C and OUTPUT OFF are set as "0 hrs., 0 min. , 0.0 sec".

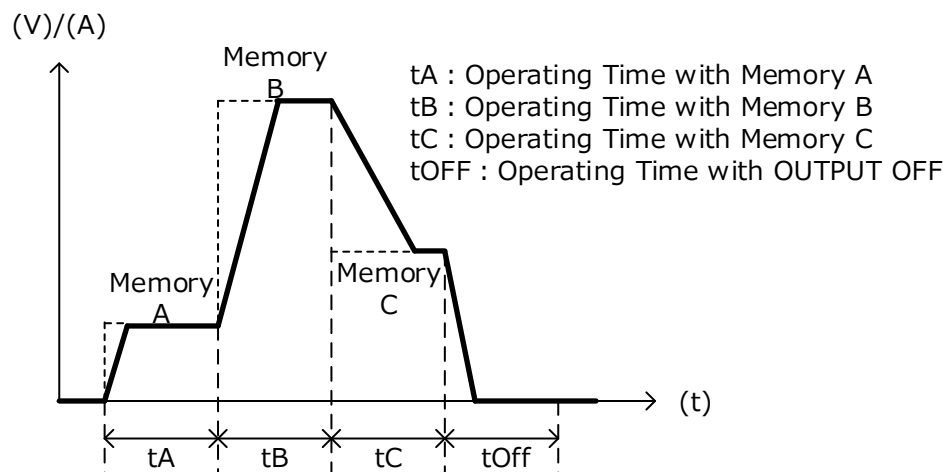
3. It is enable to stop the sequential operation forcibly by OUTPUT OFF during the sequential operation.

e.g. Once the sequential operation is stopped by OUTPUT button during the output with the Memory C setting, the OUTPUT will be OFF when any operation time is set for Memory A, Memory B, Memory C and OUTPUT OFF.



4. It is enable to use slew rate during the sequential operation. The time during the change of the slew rate will be considered as the sequential operation time.

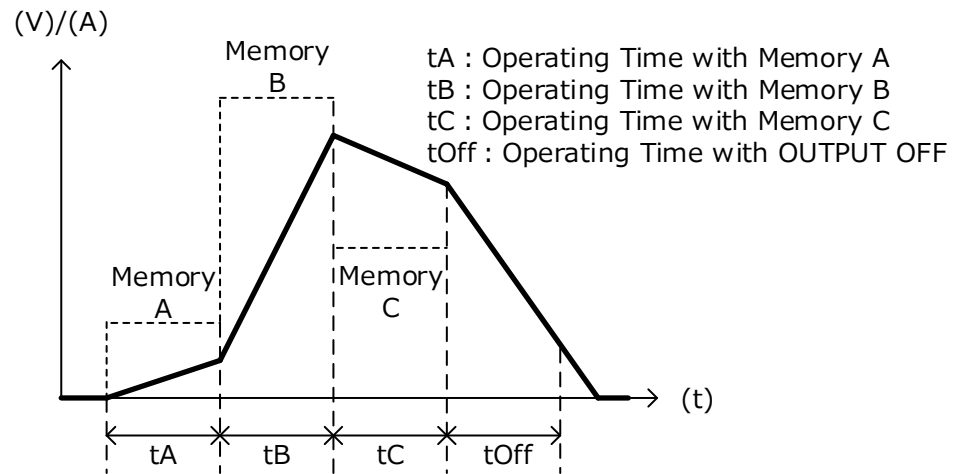
e.g. 1) The operation in case of achieving the target value by slew rate



## Useful Function

---

e.g. 2) The operation in case of non-achieving the target value by slew rate



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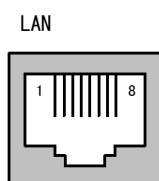
# Using via Digital Data Communication

## Overview

Remote control via LAN communication or conforming to RS-485 is possible by connecting [LAN] connector in the rear of the product to LAN port of PC, or connecting [SERIAL I/F] connector to COM port of the communication terminal of computer, sequencer etc. Furthermore, the remote control of multiple ZX-S series units by one communication terminal can be realized, if the multi [SERIAL I/F] connectors are connected. The command format can be selected between two formats, one is the format of IEEE488.2 common command and conforming to SCPI protocol and the other is the format conforming to the command of TAKASAGO's EX series product.

## LAN Communication

Connector form(RJ-45) of remote control connector「LAN」



Main unit side:RJ-45 connector

| Pin No. | Name | IN/OUT | Pin No. | Name | IN/OUT |
|---------|------|--------|---------|------|--------|
| 1       | TXD+ | OUT    | 2       | TXD- | OUT    |
| 3       | RXD+ | IN     | 4       | NC   | -      |
| 5       | NC   | -      | 6       | RXD- | IN     |
| 7       | NC   | -      | 8       | NC   | -      |

Pin assignment of remote control connector 「LAN」



### Caution

#### ●Connection to LAN connector

Connect to PC which is used, by UTP cable(cross) of category 3,4,5.

The standard cable length is max. 100m, but please use a short LAN cable as possible, if it is laid in noisy environment.



### Caution

#### ●About the data of LAN port

This product uses TCP/IP as LAN protocol. In such network in which many other network devices are connected, the delay of data transceiving may happen.



### Caution

#### ●About the operation at LAN cable disconnection

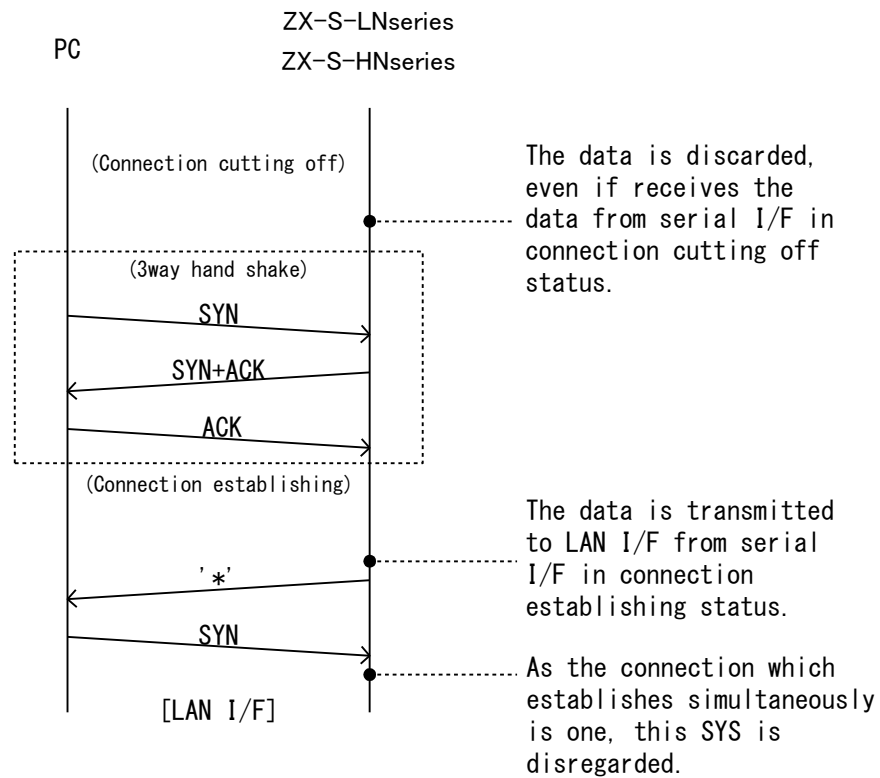
Please note that, if LAN cable connected to the main unit is disconnected during the remote control, this product retains the setting status and output status just before LAN cable disconnection.

## Operation Contents of LAN Communication

### ■ About TCP/IP connection

In PC connection, this product is set in waiting connection(passive-open)

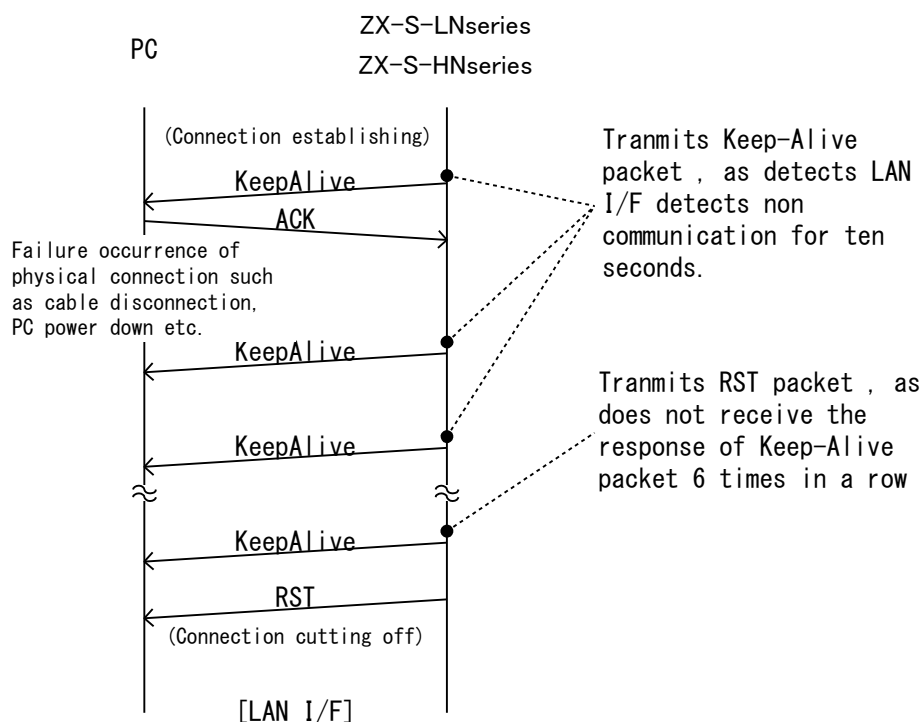
The connection in the product which establishes simultaneously is one.



(Fig. Connection of the product)

## Using via Digital Data Communication

After establishing connection, each time LAN I/F side detects non communication state for ten seconds, the product transmits Keep-Alive packet to PC. If this product does not receive the response of Keep-Alive packet 6 times in a row, transmits RST packet and cuts connection.



(Fig.Physical connection monitoring by Keep-Alive packet)

### MEMO

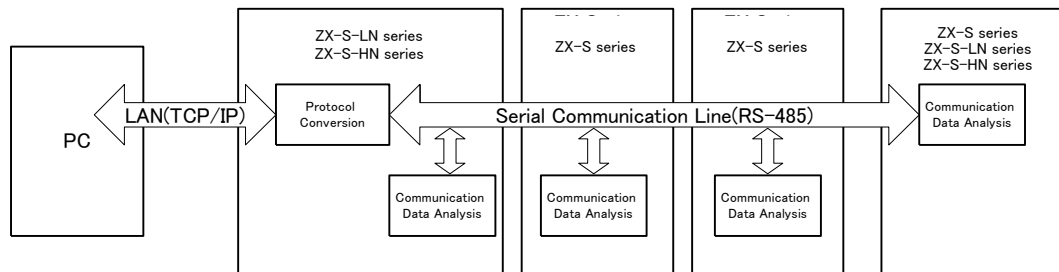
Usually, OS, TCP protocol stack responds Keep-Alive packet, the user needs not be conscious, in user program.



## Using via Digital Data Communication

### ■ Internal Operation of ZX-S-LN Series/ZX-S-HN Series Communication Line

ZX-S-LN·ZX-S-HN series convert the data received from LAN I/F in TCP/IP Packet, to the serial I/F, and transmit to the serial communication line Of TAKASAGO's power supply.



(Fig. Internal Operation of ZX-S-L Series/ZX-S-HN Series Communication Line)

### Settings Change(Maintenance Mode)

### Settings of IP Address etc

Change the network settings of this product, using the terminal emulator(hyper terminal etc.) from PC.  
In this case, the operation of the product changes over from the usual operation to the maintenance mode.

#### ■ Transition Procedure from LAN port to Maintenance mode

- ① Connect PC to LAN port by connection cable, then power on the product.
- ② Connect by PC to IP address「192.168.0.1」, port 23 of this product(active-open)
- ③ 「Display Ex.1」 is displayed, when the connection is established(ESTABLISHED), and changes to the maintenance mode.

```
MM-2490 : ZX-S series LAN I/F  
version : 0.00 (build: Jan 01 2012, 00:00:00)  
Copyright(c) TAKASAGO,LTD. 2012 All Rights Reserved.
```

(Display Ex. 1)



#### Caution

- The connection which has been already connected as the usual operation is cut.
- Restart the product, in case that reflects the setting change and terminates the maintenance mode.
- Can not operate as a usual interface converter, during operating in the maintenance mode.
- Do not forget to save by 「S」command, after settings change.
- Do not power off the product, till 「save E2PRO. . . Done.」 appears on the display, after saving the settings change.

#### Initialization of IP Address

If IP address of this product is forgotten after its change, please follow the default settings described in Page 15.

The network settings are initialized by default settings of this product(press A+C, then start up)

※MAC address is not initialized.

Please refer to Page 64 about the default value of network settings.

### ■ Procedure to change the settings

In case of settings change in maintenance mode, input Configuration Menu number of 「Display Ex.2」 followed by the command prompt.

Input referring to the displayed settings guide, and press Enter key at the end.

「Change xxxxxxxx」 is displayed once the settings are accepted

Do not forget to save by 「S」command, after settings change.

```
>?
*- Configuration Menu -----*
|   MAC Address      00:00:00:00:00:00   |
| 2 : set IP Address  192.168.0.1         |
| 3 : set subnet mask 255.255.255.0       |
| 4 : set gateway     0.0.0.0             |
| 7 : port no.        50001               |
| S : save E2PROM                                           |
| V : version                                                |
| ? : Configuration Menu                                   |
*-----*
>
(Display Ex. 2)
```

Configuration Menu Command

```
>2

IP address : 192.168.0.1
Set new IP address (xxx.xxx.xxx.xxx)
>192.168.0.122

Changed IP address : 192.168.0.122

>S
save E2PROM... Done.

>

(Display Ex. 3)
```



#### Caution

- MAC Address cannot be changed
- If wants to reflect the settings, please save the current settings by "s" command and then restart the product.

## Using via Digital Data Communication

'Command error' is displayed as shown in (Display Ex. 4) in the cases of syntax error·range error

>2

IP address : 192.168.0.1

Set new IP address (xxx.xxx.xxx.xxx)

>192.168.100.1222

Command error

>

(Display Ex. 4)



### Caution

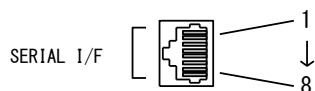
- MAC Address cannot be changed
- If wants to reflect the settings, please save the current settings by "s" command and then restart the product.

Configuration Menu Command

| Configuration Menu Command | Name               | Contents                                                                                   |
|----------------------------|--------------------|--------------------------------------------------------------------------------------------|
| 2                          | IP Address         | Set subnet mask of LAN I/F<br>(Initial setting value:255.255.255.0)                        |
| 3                          | subnet mask        | Set subnet mask of LAN I/F<br>(Initial setting value:255.255.255.0)                        |
| 4                          | gateway            | Set default gateway of LAN I/F<br>(Initial setting value:0.0.0.0)                          |
| 7                          | port no.           | Set passive-open port of LAN I/F<br>(Initial setting value:50001,Setting range 1 to 65535) |
| S                          | save E2PROM        | Save current setting information in E2PROM                                                 |
| V                          | version            | Display ZX-S series LAN I/F F/W version                                                    |
| ?                          | Configuration Menu | Display Configuration Menu                                                                 |

## RS-485 Communication

Connector form(RS-485) of external control connector「SERIAL I/F」



Main unit side:RJ-45(Female)

※Please note that IN/OUT of TX± and RX± signal in Pin No. 3 to 6 becomes reversed in each product's setting status.

•Remote Control(at Master unit setting)

| Pin No. | Name | IN/OUT | Pin No. | Name | IN/OUT |
|---------|------|--------|---------|------|--------|
| 1       | NC   | –      | 2       | NC   | –      |
| 3       | TX+  | IN     | 4       | TX–  | IN     |
| 5       | RX+  | OUT    | 6       | RX–  | OUT    |
| 7       | NC   | –      | 8       | GND  | –      |

•Sequential Control(at Master unit setting)

| Pin No. | Name | IN/OUT | Pin No. | Name | IN/OUT |
|---------|------|--------|---------|------|--------|
| 1       | NC   | –      | 2       | NC   | –      |
| 3       | TX+  | IN     | 4       | TX–  | IN     |
| 5       | RX+  | OUT    | 6       | RX–  | OUT    |
| 7       | NC   | –      | 8       | GND  | –      |

•Remote control(at Slave unit setting)

| Pin No. | Name | IN/OUT | Pin No. | Name | IN/OUT |
|---------|------|--------|---------|------|--------|
| 1       | NC   | –      | 2       | NC   | –      |
| 3       | TX+  | OUT    | 4       | TX–  | OUT    |
| 5       | RX+  | IN     | 6       | RX–  | IN     |
| 7       | NC   | –      | 8       | GND  | –      |

•Sequential Control(at Slave unit setting)

| Pin No. | Name | IN/OUT | Pin No. | Name | IN/OUT |
|---------|------|--------|---------|------|--------|
| 1       | NC   | –      | 2       | NC   | –      |
| 3       | TX+  | OUT    | 4       | TX–  | OUT    |
| 5       | RX+  | IN     | 6       | RX–  | IN     |
| 7       | NC   | –      | 8       | GND  | –      |

Pin assignment of External Control Connector 「SERIAL I/F」

### ■Connection to 『SERIAL I/F (RS-485)』

Connect by TAKASAGO's option 「T485-\*\*M」 or 「KXC-\*\*」 to ZX-S 「SERIAL I/F」.



#### Caution

. If you prepare the cable by yourself, please check carefully RS-485 specification and then connect it.



#### Caution

●About the operation in the case of external control cable disconnection

Please note that the product holds the setting and output status just before the disconnection, if the product is disconnected from external control cable.

## Using via Digital Data Communication

### Multiple Connections

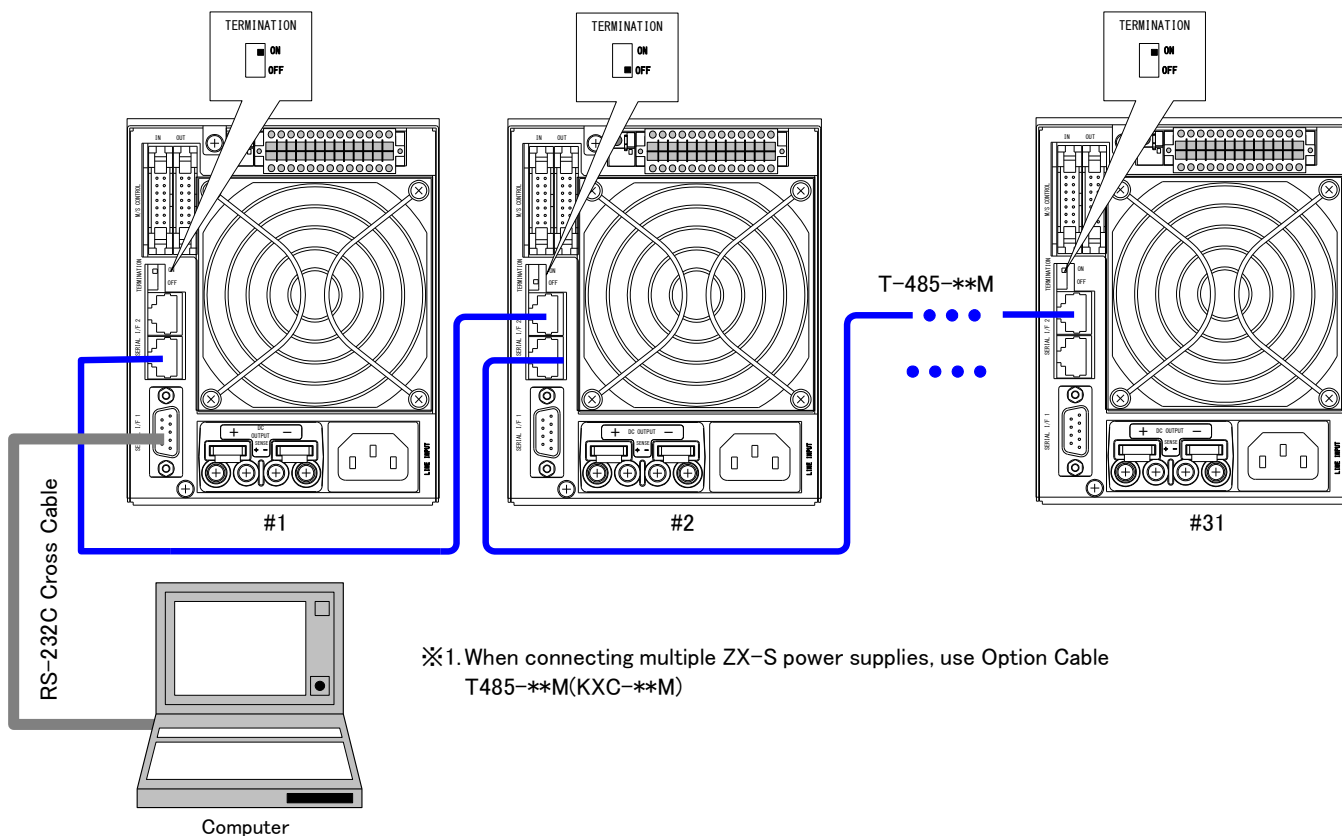
The diagram below shows the connections for controlling multiple ZX-S Series power supplies with one computer.

By setting each individual address for the ZX-S Series power supplies, it is possible to control up to a maximum of 31 devices with one RS232-C port.



#### Caution

- When connecting multiple ZX-S Series power supplies, the communication terminal (computer, etc.) can only connect to the SERIAL I/F 1 of only one device. **Please set the device address for the ZX-S power supply connecting to the terminal to 1.**
- Settings can be done under FUNCTION Settings Item 60 "Device Address".
- Please set the TERMINATION switch to OFF for when there is 2 SERIAL I/F 2 cable connections.
- Please set the TERMINATION switch to ON for when there is none or only one SERIAL I/F 2 cable connection.



Controlling ZX-S Series power supplies on multiple channels via computer

### Serial Port Settings

Below is the serial port settings for ZX-S Series power supplies.

| Serial Port Settings |                                   |
|----------------------|-----------------------------------|
| Item                 | Set Value Ranges                  |
| Bitrate              | 2400、 <u>9600</u> 、19200、38400bps |
| Data Length          | 8bit (fixed)                      |
| Parity               | <u>NOT</u> 、ODD、EVEN              |
| Stop Bit             | 1bit (fixed)                      |
| Flow Control         | None                              |

※The underlined items are used in the default settings.

Please adjust communication terminal serial port settings with ZX power supply serial port settings.

Communication cannot be established if settings differ. Set the bitrate and parity under FUNCTION Setting Item 61 “Bitrate” and Item 62 “Parity” (See page 22). Setting changes will take affect from next startup.

### Command Send Interval

When sending commands continuously to the ZX-S power supply due to there being no flow control function, a delay is required on the communication terminal side.

If receiving has failed, the ZX Series power supply will return an alarm response “ALM 128”.

Standard command send intervals are shown below.

| Command Send Intervals |            |
|------------------------|------------|
| Bitrate                | Delay Time |
| 2400bps                | 200ms      |
| 9600bps                | 50ms       |
| 19200bps               | 40ms       |
| 38400bps               | 20ms       |

## Using via Digital Data Communication

### Accessing

#### Access Procedure

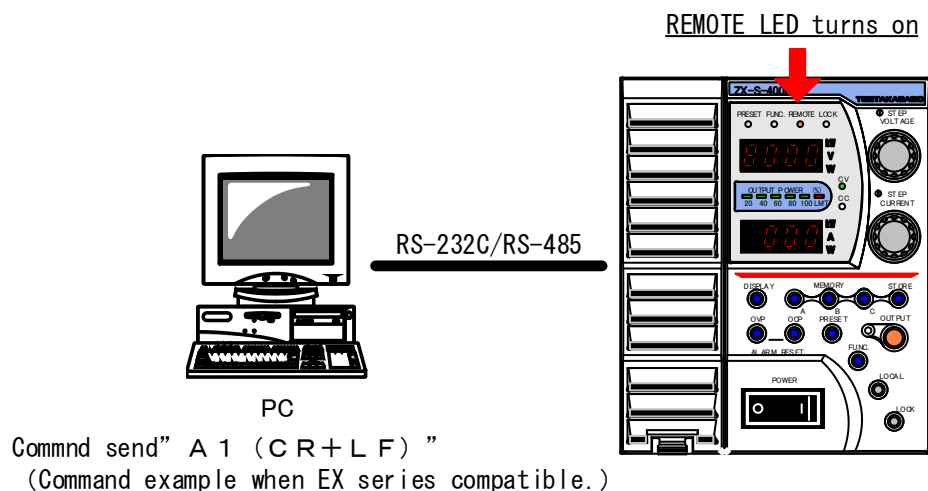
For controlling via communication commands, match the address assigned by the “Device Address Assign” command with the device address, set under FUNCTION Settings Item 60 “Device Address”.

At this point, the front panel “REMOTE” LED will light and control via communication commands will be granted. (hereinafter Remote Control Status). Simultaneously, control via the front panel will be taken away. (See diagram below)

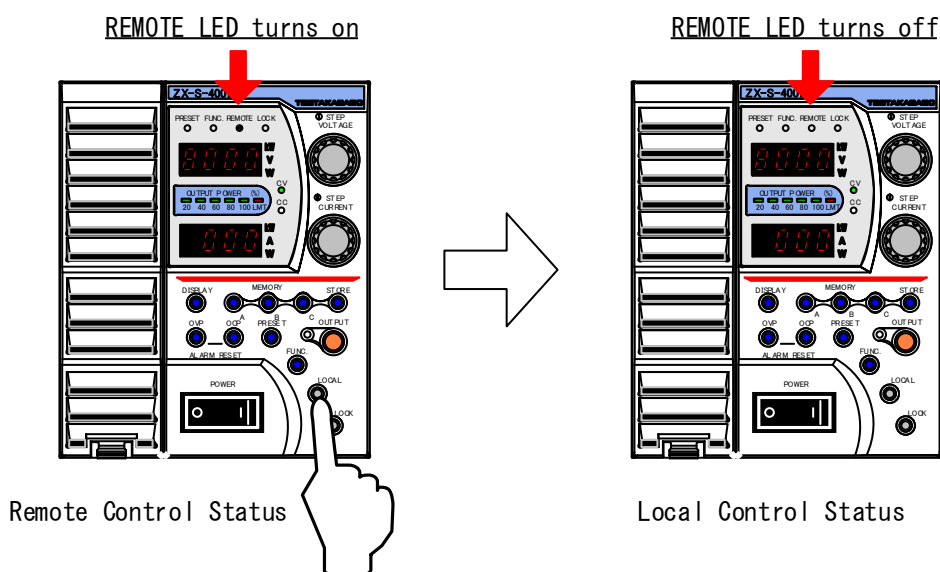
If the set device address differs with the address of the “Device Address Assign” command received, control via communication commands from that point will be released.

Again, when controlling via communication commands, command controls will take affect once the device address has been set with the “Device Address Assign” command.

When returning Local Control to the front panel from Remote Control Status, press the LOCAL key on the front panel. The REMOTE LED will turn off and Local control with the front panel will be granted.



#### Starting Remote Control

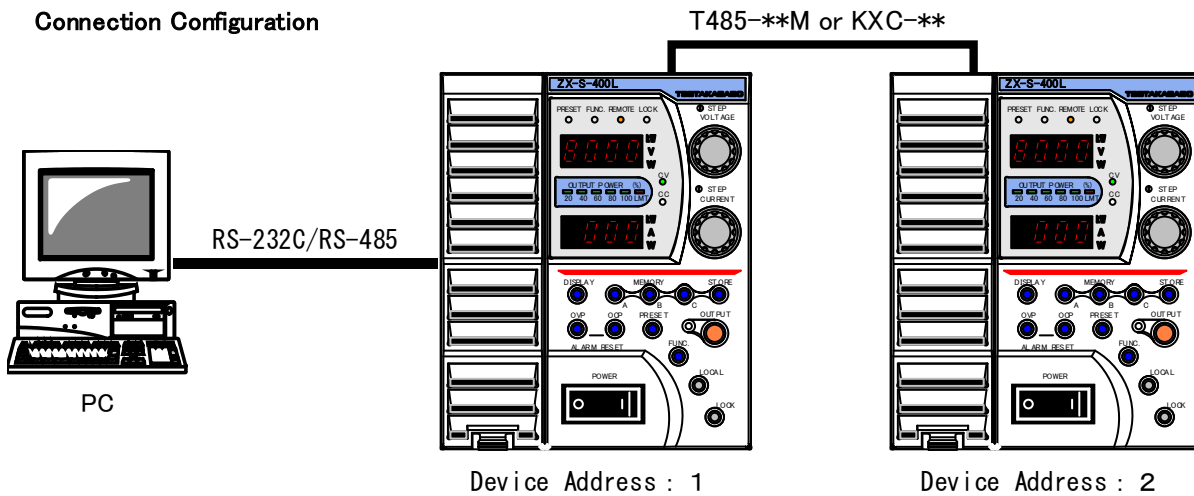




## Communication with Multiple Connections

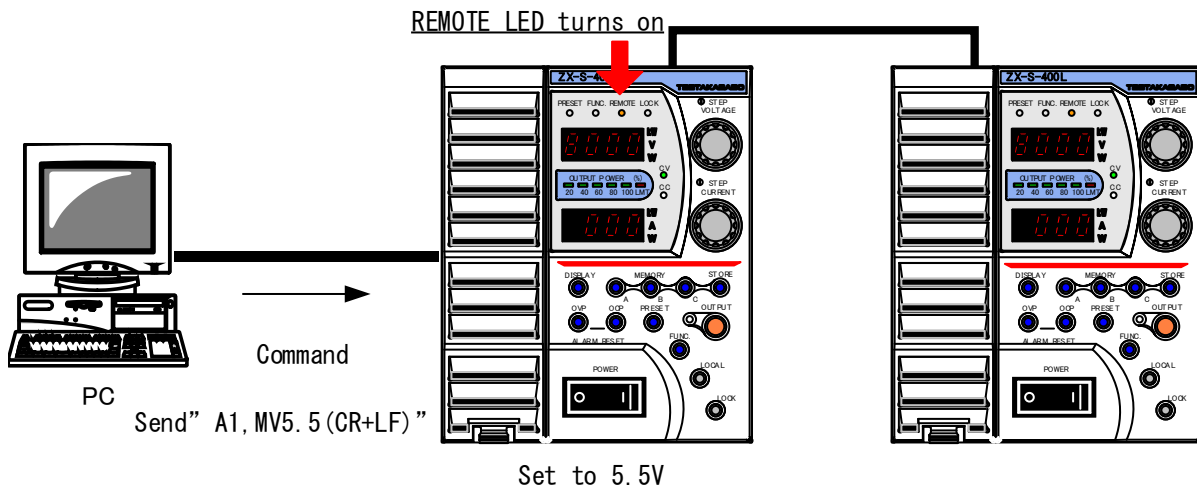
Below are Remote Control examples when connected to two ZX-S Series power supplies.

### Connection Configuration

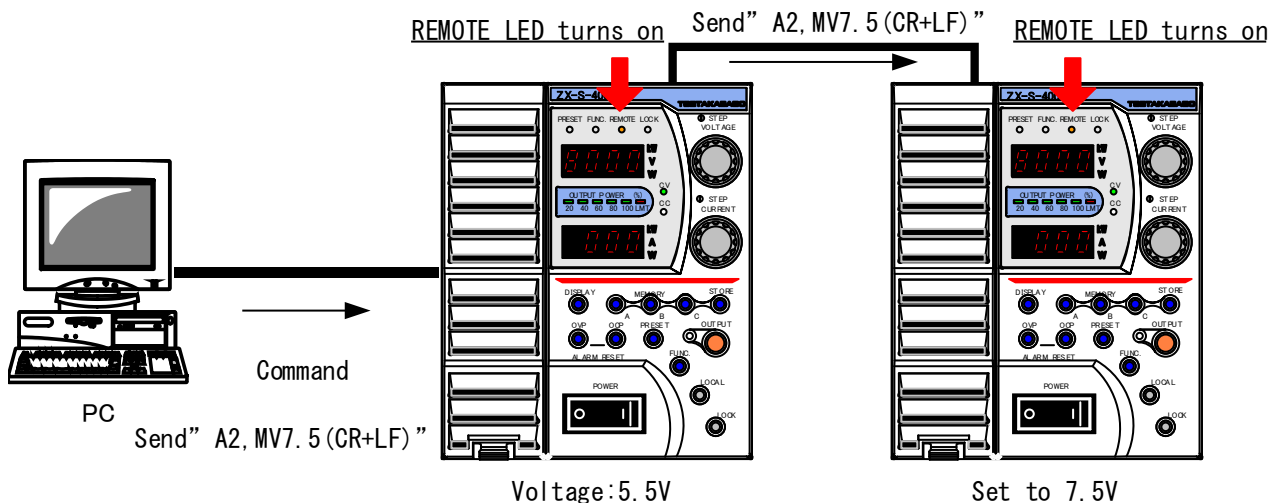


(Caution) For RS-485 control, set it to other than "1"

- ① Set voltage to 5.5V for ZX power supply with device address set to 1.



- ② Set voltage to 7.5V for ZX power supply with device address set to 2.



### Communication Commands

Command forms can be selected from 2 types; ZX standard command forms in conformance with IEEE488.2 Common Command and SCPI Protocol, or EX command compatible forms in conformance with Takasago EX Series Commands.

Command forms can be selected under FUNCTION Settings Item 63 “Command Forms” (See page 22). Setting changes will take affect from next startup.

### ZX Standard Commands

ZX Standard commands are commands (hereinafter SCPI commands) that conform to IEEE488.2 Common Command (hereinafter Common Command) and SCPI Protocols.

### ZX Standard Command Format

#### Command Description Basics

All commands and responses are ASCII character strings.

One character space “ ” is required between command words and parameters.

<Ex.>

ADDRes 1

Within text, command word stands for command characters such as ADDRes, OUTPut, etc.

Further, program message stands for a series of send strings such as ALM:CONTain:CC, etc.

#### QUERY Command

Within commands there are two types, SET commands and QUERY commands. SET commands are commands which set the parameters. QUERY commands are commands which request the current set values. QUERY commands are discriminated by the “?” placed at the end of the command word.

<Ex.>

OUTPut ?

#### OPTION Command

Within command words are OPTION commands which can be abbreviated. Inside this text, OPTION commands are represented by surrounding brackets ([ ]). Be careful to omit these brackets when sending.

<Ex.>

Bottom 2 commands are the same command

OUTPut

OUTPut[:STAT]

### Upper and Lower-Casing Discrimination

Common Command and SCPI Command do not discriminate between upper and lower casing.

<Ex.>

OUTPUT

Output

Outp

OUTP

OUTPut

### Short Form & Long Form

SCPI Command has two forms; abbreviated (Short) and normal (Long) form. Either can be sent. Command words must use either of the two forms. If neither are used an error will occur and the command will not execute.

<Ex.>

OUTPut                      Long Form

OUTP                        Short Form

OUTPut[:STAT]            Combination of Long and Short Form

OUTPu                      Recognized as illegal command

### Inputting SCPI Commands

SCPI commands use the following hierarchical structure.

<Ex.>

ALM                        Root Command

  :CLEar                  Command

  :CONTain                Pass Command

  :CC<NRf>                Command & Parameters (NRf is a number parameter. Omit <> when inputting.)

  :CV?                    Query Command

The program message must begin with the root command with the OPTION command omitted. Root commands with an OPTION command are processed as a root command on the next level (Command).

A colon ( : ) can be placed at the head of the program message.

<Ex.>

Bottom 2 commands are the same command.

stat:pres

:stat:pres

Multiple program messages can be connected by separating them with semi-colons ( ; ).

<Ex.>

ALM:CLEar;:ALM:CONTain:CC<NRf>

⇒ Continued on next page

## Using via Digital Data Communication

---

Further, when using semi-colons, if there are commands of the same command level the root can be omitted.

<Ex.>

Due to there being a command within the same level, everything after CONTain is executed.

ALM:CLEar;CONTain:CC<NRf>

When a colon “:” is detected in the program message, the next command level is moved on to. If a colon “:” is detected right after a semi-colon “;” the pass pointer is reset to the root level. If there is no colon after a semi-colon to connect the characters, the root is interpreted to be omitted. If there is a colon after a semi-colon, then the root is interpreted to be reset.

<Ex.>

Due there being no colon after the semi-colon, the command level for everything after the semi-colon is interpreted as ALM:. Since there is no ALM command after ALM: it is interpreted as an error.

ALM:CLEar;ALM:CONTain:CC<NRf>

Common Commands can be inputted so that they are not affected by the SCPI Command's pass pointer. Further, pass pointers also will not be affected by Common Commands.

<Ex.>

ALM: CLEAR;\*IDN?;CONTAIN:CC?

### Delimiter

Please attach any of the following to the end of the program message; CR/LF/CR+LF (CR: Carriage Return (0x0d)、LF: Line Feed 0x0A).

### Executing Commands

Commands will execute in the order in which they appear in the program message.

Invalid commands are interpreted as errors and will not be executed.

If valid and invalid commands are included in a multi-command program message, valid commands will be executed immediately before invalid commands are detected. Everything after an invalid command is ignored even if it includes valid commands.

<Ex.>

Everything up to ALM:CLEar is a valid command so it is executed; everything after becomes an invalid command and is ignored.

ALM:CLEar;ALM:CONTain:CC<NRf>

### Assigning Device Address

All program messages being received are ignored if the device address is not assigned.

The device address only needs to be assigned once, once assigned it can be omitted.

<Ex.>

The device address is assigned to 1 for the first time, all commands then after are executed for the device address 1 ZX-S power supply.

ADDRess 1;:ALM:CLEar;CONTain:CC<NRf>

ALM:CONTain:CV?

### Acknowledge Message

When a normal command is received, return "OK". When an abnormal command is received, return "Error".  
Settings can be set, via command, so that no return is received when normal.  
(When receiving QUERY commands, the response message becomes the Acknowledge Message.)

### ZX Standard Command Details

#### IEEE488.2 Common Command

This section explains about the commands which conform to IEEE488.2 Common Command.

Common Command List

| Command Name | Summary                     | Command Type |
|--------------|-----------------------------|--------------|
| *IDN         | Requests device information | QUERY Only   |
| *RST         | Resets set parameters       | SET Only     |

#### \* IDN : Identification Query

---

Function: Retrieves device information (Name of Manufacturer, Name of Model, Software Version)

Format: \* IDN ?

Type: QUERY command only

Response: Name of Manufacturer, Name of Model, Software Version

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- Sequence operation in progress

<Ex.>

\*IDN?

TAKASAGO,ZX-S-400HN,1.00

#### \* RST : Reset

---

Function: Resets set parameters (Factory Default Settings)

Format: \* RST

Type: SET command only

No parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- Sequence operation in progress

<Ex.>

\*RST

### SCPI Command

This section explains about commands which conform to SCPI Protocol.

### ADDRess Level

ADDRess level command is only for assigning the device address.

| Command Name | Summary                | Command Type |
|--------------|------------------------|--------------|
| ADDRess      | Assigns device address | SET only     |

### ADDRess: Assigns Device Address

---

Function: Assigns the device address for ZX power supplies

Format: ADDRess <NRf>

Type: SET command only

Range: 0~50

Address 0 is a global address. Assign addresses to all multi-connected ZX-S Series DC power supplies. Once the global address is assigned, only Output ON/OFF Toggle SET command "OUTPut[:STATe]" is valid.

Further, no Acknowledge Responses will be sent only while the global address is assigned.



#### Caution

Do not set redundant ZX-S power supply addresses within the same system.

<Ex.>

ADDR 1

## ALM Level

ALM level command corresponds to external output settings for alarm reset and status information.

| Command Name | Summary                                             | Command Type |
|--------------|-----------------------------------------------------|--------------|
| ALM          | —                                                   | —            |
| :CLEar       | Executes alarm reset                                | SET only     |
| :CONTAin     | —                                                   | —            |
| :CC          | Sets whether to include CC_STS in LEVEL1_ALM or not | Both         |
| :CV          | Sets whether to include CV_STS in LEVEL1_ALM or not | Both         |
| :PL          | Sets whether to include PL_STS in LEVEL1_ALM or not | Both         |
| :PONB        | Sets whether to include P_ON_B in LEVEL1_ALM or not | Both         |

### ALM:CLEar: Executes Alarm Reset

Function: Executes alarm reset (Cancels generated Over Voltage/Over Current alarm)

Format: ALM:CLEar

Type: SET command only

No parameters

<Ex.>

ALM:CLE



**Caution**

Note: Execute alarm reset only once cause has been resolved.

### ALM:CONTAin:CC: Sets whether to contain CC\_STS in LEVEL1\_ALM

Function: Sets whether to contain CC\_STS status in LEVEL1\_ALM output condition.

Same settings as FUNCTION Settings Item 75

Format: ALM:CONTAin:CC <NRf>

Type: SET command, QUERY command

Parameters: 0 ...Does not include in LEVEL1\_ALM

1 ...Includes in LEVEL1\_ALM

Response: 0, 1

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- If analog option is not attached
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

ALM:CONT:CC 1

ALM:CONT:CC?

1

### ALM:CONTain:CV: Sets whether to contain CV\_STS in LEVEL1\_ALM

---

Function: Sets whether to contain CV\_STS status in LEVEL1\_ALM output condition

Same settings as FUNCTION Settings Items 74

Format: ALM:CONTain:CV <NRf>

Type: SET command, QUERY command

Parameters: 0 ...Does not include in LEVEL1\_ALM

1 ...Includes in LEVEL1\_ALM

Response: 0, 1

Restriction: Alarm response is returned for normal SET commands in the following conditions

- If analog option is not attached
- While operating as parallel operation slave unit
- Sequence operation in progress

<Ex.>

ALM:CONT:CV 0

ALM:CONT:CV ?

0

### ALM:CONTain:PL: Sets whether to contain PL\_STS in LEVEL1\_ALM

---

Function: Sets whether to contain PL\_STS status in LEVEL1\_ALM output condition

Same settings as FUNCTION Settings Item 76

Format: ALM:CONTain:PL <NRf>

Type: SET command, QUERY command

Parameters: 0 ...Does not include in LEVEL1\_ALM

1 ...Includes in LEVEL1\_ALM

Response: 0, 1

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- If analog option is not attached
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

ALM:CONT:PL 1

ALM:CONT:PL ?

1



## ALM:CONTain:PONB: Sets whether to include P\_ON\_B in LEVEL1\_ALM

---

Function: Sets whether to include P\_ON\_B status in LEVEL1\_ALM output condition

Same settings as FUNCTION Settings Item 76

Format: ALM:CONTain:PONB <NRf>

Type: SET command, QUERY command

Parameters: 0 ... Does not include in LEVEL1\_ALM

1 ... Includes in LEVEL1\_ALM

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- If analog option is not attached (Type which A is not attached to end of name, like ZX-S-400HN)
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

ALM:CONT:PONB 0

ALM:CONT:PONB ?

0

## Using via Digital Data Communication

---

### OUTPut Level

OUTPut level command corresponds to functions concerning output control.

| Command Name | Summary                                                    | Command Type |
|--------------|------------------------------------------------------------|--------------|
| OUTPut       | —                                                          | —            |
| :DELay       | —                                                          | —            |
| :ON          | Sets Output ON Delay Time                                  | Both         |
| :CFF         | Sets Output OFF Delay Time                                 | Both         |
| :EXTernal    | —                                                          | —            |
| :MODE        | Sets operation mode for output control at External Contact | Both         |
| :HOT         | Sets output status when POWER is ON                        | Both         |
| :MODE        | Sets Startup Mode                                          | Both         |
| [:STATe]     | Sets Output ON/OFF                                         | Both         |

### OUTPut:DELay:ON: Sets Output ON Delay Time

---

Function: Sets Output ON Delay Time

Same as FUNCTION Settings Item 8

Format: OUTPut:DELay:ON <NRf>

Type: SET command, QUERY command

Parameters: 0. 00~99. 99

Response: Same as parameters

Restriction: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

OUTP:DEL:ON 12.34

OUTP:DEL:ON ?

12.34

## OUTPut:DELaY:OFF :Sets Output OFF Delay Time

---

Function: Sets Output OFF Delay Time

Same as FUNCTION Settings Item 9

Format: OUTPut:DELaY:OFF <NRf>

Type: SET command, QUERY command

Parameters: 0. 00~99. 99

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

OUTP:DEL:OFF 56.78

OUTP:DEL:OFF ?

56.78

## OUTPut:EXTErnal:MODE :Sets operation mode for Output Control at External Contact Points

---

Function: Sets operation mode for Output Control at External Contact Points

Same as FUNCTION Settings Item 11

Format: OUTPut:EXTErnal:MODE <NRf>

Type: SET command, QUERY command

Parameters: 0...Invalid

1...When close Output is ON, When open Output is OFF

2...When close normal operation, When open Output is OFF

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

OUTP:EXT:MODE 1

OUTP:EXT:MODE ?

1

### OUTPut:HOT : Sets Output status while POWER is ON

---

Function: Sets Output status while POWER is ON

Same settings as FUNCTION Settings Item 51

Format: OUTPut:HOT <NRf>

Type: SET command, QUERY command

Parameters: 0...OFF

1...MODE1 (HOT START)

HOT START is valid also when recovered from ALM or TRIP

2...MODE2 (HOT START)

Powers up with OUTPUT status OFF when recovered from ALM or TRIP

HOT START is valid again on next startup.

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

OUTP:HOT 1

OUTP:HOT ?

1

### OUTPut:MODE : Sets Startup Mode

---

Function: Sets the Output Startup Mode

Same settings as FUNCTION Settings Item 2

Format: OUTPut:MODE <NRf>

Type: SET command, QUERY command

Parameters: 0...CV Priority, High Speed

1...CC Priority, High Speed

2...CV Priority, Slew Rate can be set

3...CC Priority, Slew Rate can be set

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

OUTP:MODE 3

OUTP:MODE ?

3

## OUTPut[:STATe]: Sets Output ON/OFF

---

Function: Sets the Output ON/OFF

Format: OUTPut[:STATe] <String>

Type: SET command, QUERY command

Parameters: ON...Output ON  
OFF...Output OFF

Response: Same as parameter

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as series operation slave unit
- While operating as parallel operation slave unit

<Ex.>

OUTP ON

OUTP?

ON

### MEASure Level

MEASure level command corresponds to functions concerning measurement.

| Command Name | Summary                                                  | Command Type |
|--------------|----------------------------------------------------------|--------------|
| MEASure      | —                                                        | —            |
| :CORRection  | —                                                        | —            |
| :MODE        | Sets operation mode for the Linear Compensation Function | Both         |
| :MVAV        | Sets Moving Average process for measurement values       | Both         |
| [ :SCALar]   | —                                                        | —            |
| :CURRent     | —                                                        | —            |
| [ :DC]       | Retrieves current measurement values                     | QUERY only   |
| :POWer       | —                                                        | —            |
| [ :DC]       | Retrieves power measurement values                       | QUERY only   |
| :VOLTage     | —                                                        | —            |
| [ :DC]       | Retrieves voltage measurement values                     | QUERY only   |

## MEASure: CORRection: MODE: Sets operation mode for the Linearity Compensation Function

---

Function: Sets the operation mode for the Linearity Compensation Function

Same settings as FUNCTION Settings Item 13

Format: MEASure: CORRection: MODE <NRf>

Type: SET command, QUERY command

Parameters: 0...Compensation OFF

1...Executes only when Output is toggled ON/OFF or when there is a setting change

2...Continual compensates

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

MEAS:CORR:MODE 0

MEAS:CORR:MODE ?

0

## MEASure: MVAV: Sets Moving Average process for Measurement Values

---

Function: Sets the Moving Average process for Measurement Values

Same settings as FUNCTION Settings Item 12

Format: MEASure: MVAV <NRf>

Type: SET command, QUERY command

Parameters: 0...Moving Average for measured value is not processed

1...Moving Average for measured value is processed

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

MEAS:MVAV 0

MEAS:MVAV ?

0

### MEASure[:SCALar]:CURRent[:DC] :Retrives Current Measurement Values

---

Function: Retrives current measurement values.

Format: MEASure[:SCALar]:CURRent[:DC] ?

Type: QUERY command only

Response: Returns same resolution data as the Ammeter

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a parallel operation slave unit

<Ex.>

ZX-S-400HN(Independent Operation)

MEAS:CURR?

5.000

### MEASure[:SCALar]:POWer[:DC] :Retrives Power Measurement Values

---

Function: Retrives electric power measurement values

Format: MEASure[:SCALar]:POWer[:DC] ?

Type: QUERY command only

Response: Returns same resolution data as the Power Meter

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a parallel operation slave unit

<Ex.>

ZX-S-400HN(Independent Operation)

MEAS:POW?

400.0

### MEASure[:SCALar]:VOLTage[:DC] :Retrives Voltage Measurement Values

---

Function: Retrives voltage measurement values

Format: MEASure[:SCALar]:VOLTage[:DC] ?

Type: QUERY command only

Response: Returns same resolution data as the Voltmeter

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a parallel operation slave unit

<Ex.>

ZX-S-400HN(Independent Operation)

MEAS:VOLT?

640.0



### SOURce Level

SOURce level command corresponds to functions concerning output settings, and settings for voltage/current values.

| Command Name  | Summary                             | Command Type |
|---------------|-------------------------------------|--------------|
| [SOURce]      | —                                   | —            |
| :CURRent      | —                                   | —            |
| [ :LEVel]     | —                                   | —            |
| [ :IMMediate] | —                                   | —            |
| [ :AMPLitude] | Sets Output Current                 | Both         |
| :PROTection   | —                                   | —            |
| [ :LEVel]     | Sets OCP Current                    | Both         |
| :SLEW         | —                                   | —            |
| :RISing       | Sets CC Slew Rate Rising            | Both         |
| :FALLing      | Sets CC Slew Rate Falling           | Both         |
| :MEMory       | —                                   | —            |
| :RECall       | Loads from Panel Memory             | SET only     |
| :MODE         | Sets Loading Order for Panel Memory | Both         |
| :STORe        | Saves to Panel Memory               | SET only     |
| :RESistance   | —                                   | —            |
| [ :LEVel]     | —                                   | —            |
| [ :IMMediate] | —                                   | —            |
| [ :AMPLitude] | Sets Internal Resistance            | Both         |
| :VOLTage      | —                                   | —            |
| [ :LEVel]     | —                                   | —            |
| [ :IMMediate] | —                                   | —            |
| [ :AMPLitude] | Sets Output Voltage                 | Both         |
| :PROTection   | —                                   | —            |
| [ :LEVel]     | Sets OVP Voltage                    | Both         |
| :SLEW         | —                                   | —            |
| :RISing       | Sets CV Slew Rate Rising            | Both         |
| :FALLing      | Sets CV Slew Rate Falling           | Both         |

### [SOURce]:CURRent[:LEVel][:IMMediate][:AMPLitude]

: Sets Output Current

Function: Sets the output current

Format: [SOURce]:CURRent[:LEVel][:IMMediate][:AMPLitude] <NRf>

Type: SET command, QUERY command

Parameters: Range varies on the model and the number of parallel connected devices

Response: Same as parameters

Output Current (A) Ranges

| Model (Type)<br>No. of<br>Parallel<br>Connected Devices | 400HN/HAN   | 800HN/HAN  | 1600HN/HAN |
|---------------------------------------------------------|-------------|------------|------------|
| 1 (Independent Operation)                               | 0.000~5.250 | 0.00~10.50 | 0.00~21.00 |
| 2                                                       | 0.00~10.50  | 0.00~21.00 | 0.00~42.00 |
| 3                                                       | 0.00~15.75  | 0.00~31.50 | 0.00~63.00 |
| 4                                                       | 0.00~21.00  | 0.00~42.00 | 0.00~84.00 |
| 5                                                       | 0.00~26.25  | 0.00~52.50 | 0.0~105.0  |
| 6                                                       | 0.00~31.50  | 0.00~63.00 | 0.0~126.0  |
| 7                                                       | 0.00~36.75  | 0.00~73.50 | 0.0~147.0  |
| 8                                                       | 0.0~42.00   | 0.00~84.00 | 0.0~168.0  |
| 9                                                       | 0.00~47.25  | 0.00~94.50 | 0.0~189.0  |
| 10                                                      | 0.00~52.50  | 0.0~105.0  | 0.0~210.0  |

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

ZX-S-400HN (Independent Operation)

CURR 5

CURR ?

5.000

# [SOURce] : CURRent : PROTection [ : LEVel] : Sets OCP Current

Function: Sets the OCP current

Format: [SOURce] : CURRent : PROTection [ : LEVel] <NRf>

Type: SET command, QUERY command

Parameters: Range varies on the model and the number of parallel connected devices

Response: Same as parameters

OCP Current(A) Ranges

| Model (Type)<br>No. of<br>Parallel<br>Connected Devices | 400HN/HAN  | 800HN/HAN   | 1600HN/HAN  |
|---------------------------------------------------------|------------|-------------|-------------|
| 1 (Independent Operation)                               | 0. 1~5. 5  | 0. 2~11. 0  | 0. 4~22. 0  |
| 2                                                       | 0. 2~11. 0 | 0. 4~22. 0  | 0. 8~44. 0  |
| 3                                                       | 0. 3~16. 5 | 0. 6~33. 0  | 1. 2~66. 0  |
| 4                                                       | 0. 4~22. 0 | 0. 8~44. 0  | 1. 6~88. 0  |
| 5                                                       | 0. 5~27. 5 | 1. 0~55. 0  | 2. 0~110. 0 |
| 6                                                       | 0. 6~33. 0 | 1. 2~66. 0  | 2. 4~132. 0 |
| 7                                                       | 0. 7~38. 5 | 1. 4~77. 0  | 2. 8~154. 0 |
| 8                                                       | 0. 8~44. 0 | 1. 6~88. 0  | 3. 2~176. 0 |
| 9                                                       | 0. 9~49. 5 | 1. 8~99. 0  | 3. 6~198. 0 |
| 10                                                      | 1. 0~55. 0 | 2. 0~110. 0 | 4. 0~220. 0 |

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

ZX-S-400HN (Independent Operation)

CURR:PROT 5.5

CURR:PROT ?

5.500

### [SOURce] : CURRent : SLEW : RISing : Sets the CC Slew Rate Rising

Function: Sets the CC slew rate for rising

Same settings as FUNCTION Settings Item 5

Format: [SOURce] : CURRent : SLEW : RISing <NRf>

Type: SET command, QUERY command

Parameters: Range varies on the model and the number of parallel connected devices.

Response: Same as parameters

CC Slew Rate (Unit: A/s) Ranges

| Model (Type)<br>No. of<br>Parallel<br>Connected Devices | 400HN/HAN  | 800HN/HAN  | 1600HN/HAN |
|---------------------------------------------------------|------------|------------|------------|
| 1 (Independent Operation)                               | 0.01~10.00 | 0.01~20.00 | 0.01~40.00 |
| 2                                                       | 0.01~20.00 | 0.01~40.00 | 0.01~80.00 |
| 3                                                       | 0.01~30.00 | 0.01~60.00 | 0.1~120.0  |
| 4                                                       | 0.01~40.00 | 0.01~80.00 | 0.1~160.0  |
| 5                                                       | 0.01~50.00 | 0.1~100.0  | 0.1~200.0  |
| 6                                                       | 0.01~60.00 | 0.1~120.0  | 0.1~240.0  |
| 7                                                       | 0.01~70.00 | 0.1~140.0  | 0.1~280.0  |
| 8                                                       | 0.01~80.00 | 0.1~160.0  | 0.1~320.0  |
| 9                                                       | 0.01~90.00 | 0.1~180.0  | 0.1~360.0  |
| 10                                                      | 0.1~100.0  | 0.1~200.0  | 0.1~400.0  |

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

ZX-S-400HN (Independent Operation)

CURR:SLEW:RIS 10

CURR:SLEW:RIS?

10.00

## [SOURce]: CURRent: SLEW: FALLing: Sets CC Slew Rate Falling

---

Function: Sets the CC slew rate for falling

Same settings as FUNCTION Settings Item 6

Format: [SOURce]: CURRent: SLEW: FALLing <NRf>

Type: SET command, QUERY command

Parameters: Range varies on the model and the number of parallel connected devices.

See CC Slew Rate Ranges for range settings.

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit

<Ex.>

ZX-S-400HN (Independent Operation)

CURR: SLEW: FALL 10

CURR: SLEW: FALL ?

10.00

## [SOURce]: MEMory: RECall: Loads from Panel Memory

---

Function: Loads from panel memory (A/B/C)

Format: [SOURce]: MEMory: RECall <String>

Type: SET command only

Parameters: A... Loads from panel memory A and overwrites current settings

B... Loads from panel memory B and overwrites current settings

C... Loads from panel memory C and overwrites current settings

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

MEM: REC A

### [SOURce]:MEMory:RECall:MODE: Sets Load Order for Panel Memory

---

Function: Sets the order of loading for panel memory (A/B/C)

Same settings as FUNCTION Settings Item 54

Format: [SOURce]:MEMory:RECall:MODE <NRf>

Type: SET command, QUERY command

Parameters: 0... Determines by Single-Action

1... Determines by Double-Action

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

MEM:REC:MODE 1

MEM:REC:MODE ?

1

### [SOURce]:MEMory:STORe: Saves to Panel Memory

---

Function: Saves to panel memory (A/B/C)

Format: [SOURce]:MEMory:STORe <String>

Type: SET command only

Parameters: A... Overwrites current settings to panel memory A

B... Overwrites current settings to panel memory B

C... Overwrites current settings to panel memory C

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

MEM:STOR A

# [SOURce]:RESistance[:LEVel][:IMMediate][:AMPLitude]

: Sets Internal Resistance

Function: Sets the internal resistance

Format: [SOURce]:RESistance[:LEVel][:IMMediate][:AMPLitude] <NRf>

Type: SET command, QUERY command

Parameters: Range varies on the model and the number of parallel connected devices

Response: Same as parameters

| Internal Resistance ( $\Omega$ ) Ranges                 |             |             |             |
|---------------------------------------------------------|-------------|-------------|-------------|
| Model (Type)<br>No. of<br>Parallel<br>Connected Devices | 400HAN      | 800HAN      | 1600HAN     |
| 1 (Independent Operation)                               | 0. 0~128. 0 | 0. 0~64. 0  | 0. 0~32. 0  |
| 2                                                       | 0. 0~64. 0  | 0. 0~32. 0  | 0. 0~16. 0  |
| 3                                                       | 0. 0~42. 7  | 0. 0~21. 3  | 0. 0~10. 7  |
| 4                                                       | 0. 0~32. 0  | 0. 0~16. 0  | 0. 0~8. 0   |
| 5                                                       | 0. 0~25. 6  | 0. 0~12. 8  | 0. 00~6. 40 |
| 6                                                       | 0. 0~21. 3  | 0. 0~10. 7  | 0. 00~5. 33 |
| 7                                                       | 0. 0~18. 3  | 0. 00~9. 14 | 0. 00~4. 57 |
| 8                                                       | 0. 0~16. 0  | 0. 00~8. 00 | 0. 00~4. 00 |
| 9                                                       | 0. 0~14. 2  | 0. 00~7. 11 | 0. 00~3. 56 |
| 10                                                      | 0. 0~12. 8  | 0. 00~6. 40 | 0. 00~3. 20 |

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- If analog option is not attached (Model which A is not attached to end of name)
- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

ZX-S-400HAN (Independent Operation)

RES 128

RES ?

128.0

### [SOURce]:VOLTage[:LEVel][:IMMediate][:AMPLitude]

: Sets Output Voltage

---

Function: Sets the output voltage

Format: [SOURce]:VOLTage[:LEVel][:IMMediate][:AMPLitude] <NRf>

Type: SET command, QUERY command

Parameters: 0.00~672.0

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

VOLT 640

VOLT?

640.0

### [SOURce]:VOLTage:PROTection[:LEVel]:Sets OVP Voltage

---

Function: Sets the OVP voltage

Format: [SOURce]:VOLTage:PROTection[:LEVel] <NRf>

Type: SET command, QUERY command

Parameters: 10~704

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

VOLT:PROT 704

VOLT:PROT?

704.0



## [SOURce]:VOLTage:SLEW:RISing: Sets CV Slew Rate Rising

---

Function: Sets the CV slew rate for rising

Same settings as FUNCTION Settings Item 3

Format: [SOURce]:VOLTage:SLEW:RISing <NRf>

Type: SET command, QUERY command

Parameters: 1. 0~1280. 0

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

VOLT:SLEW:RIS 1280

VOLT:SLEW:RIS ?

1280.0

## [SOURce]:VOLTage:SLEW:FALLing: Sets CV Slew Rate Falling

---

Function: Sets the CV slew rate for falling

Same settings as FUNCTION Settings Item 4

Format: [SOURce]:VOLTage:SLEW:FALLing <NRf>

Type: SET command, QUERY command

Parameters: 1. 0~1280. 0

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

VOLT:SLEW:FALL 1.0

VOLT:SLEW:FALL ?

1.0

## Using via Digital Data Communication

### STATus Level

STATus level command corresponds to retrieving status information.

| Command Name | Summary                                        | Command Type |
|--------------|------------------------------------------------|--------------|
| STATus       | —                                              | —            |
| :MEASure     | —                                              | —            |
| :CONDition   | Retrieves Power Supply Status                  | QUERY only   |
| :PARallel    | Retrieves Number of Parallel Connected Devices | QUERY only   |

### STATus:MEASure:CONDition:Retrives Power Supply Status

Function: Retrives the status of the power supply

Format: STATus:MEASure:CONDition?

Type: QUERY command only

Response: 3 byte 16-base data

Power Supply Bit List

| Bit | Status Name     | Summary                                        | 1                               | 0                                |
|-----|-----------------|------------------------------------------------|---------------------------------|----------------------------------|
| 23  | Not Used        | Always 0                                       | —                               | —                                |
| 22  | Not Used        | Always 0                                       | —                               | —                                |
| 21  | Not Used        | Always 0                                       | —                               | —                                |
| 20  | Not Used        | Always 0                                       | —                               | —                                |
| 19  | Not Used        | Always 0                                       | —                               | —                                |
| 18  | Not Used        | Always 0                                       | —                               | —                                |
| 17  | EXT_TRIP_LT_STS | External TRIP Latch Status                     | TRIP ON                         | Normal                           |
| 16  | EXT_TRIP_STS    | External TRIP Status                           | TRIP ON                         | Normal                           |
| 15  | OVP_STS         | OVP Adjustment Status *1                       | Above OVP level                 | Below OVP level                  |
| 14  | OCP_STS         | OCP Adjustment Status *1                       | Above OCP level                 | Below OCP level                  |
| 13  | CP_STS          | CP Operation Status                            | CP operating                    | Not CP                           |
| 12  | EXT_ON          | Output ON/OFF Input Status at External Contact | ON                              | OFF                              |
| 11  | SYS_ALM         | System error                                   | Error                           | Normal                           |
| 10  | DD_ON_STS       | DC/DC Output Status                            | ON                              | OFF                              |
| 9   | MST/BST_STS     | Master/Booster Status *2                       | Booster *2                      | Master                           |
| 8   | P-ON_B_STS      | P-ON(Booster) Status                           | Booster Main Power Supply ON *2 | Booster Main Power Supply OFF *2 |
| 7   | P-ON_M_STS      | P-ON(Master) Status                            | Main Power Supply ON            | Main Power Supply OFF            |
| 6   | AD-OV_ALM       | OVP Error for AC/DC                            | Error                           | Normal                           |
| 5   | OHP_ALM         | OHP (Over Heating Protection) Error            | Error                           | Normal                           |
| 4   | OCP_ALM         | OCP (Over Current Protection) Alarm            | Triggered                       | Not triggered                    |
| 3   | OVP_ALM         | OVP (Over Voltage Protection) Alarm            | Triggered                       | Not triggered                    |
| 2   | PL_STS          | Power Limit Operation Status                   | Power Limit running             | Power Limit not running          |
| 1   | CC_STS          | CC Operation Status                            | CC operating                    | Not CC                           |
| 0   | CV_STS          | CV Operation Status                            | CV operating                    | Not CV                           |

- \*1 Status for factory adjustments of OVP and OCP. In practice, the status for then OVP and OCP are running is outputed to Bit4 OCP\_ALM and Bit3 OVP\_ALM.
- \*2 Booster refers to a ZX-S Series power supply that is running as a slave unit under parallel operation.

<Ex.>

STAT:MEAS:COND?

000184

(P-ON\_B、P-ON\_M、PL\_STS represents state of 1.)

### STATus:MEASure:PARallel:Retrives No. of Parallel Connected Devices

---

Function:Retrives the number of device connected parallel (Total number of Parallel Operation Slave units connected to the Master)

Format:STATus:MEASure:PARallel?

Type:QUERY command only

Response: 1~10

<Ex.>

STAT:MEAS:PAR?

1

(1 only represents the Master unit.)

## Using via Digital Data Communication

---

### SYSTem Level

SYSTem level command corresponds to the settings of main FUNCTION items.

| Command Name  | Summary                                                    | Command Type |
|---------------|------------------------------------------------------------|--------------|
| SYSTem        | —                                                          | —            |
| : COMMunicate | —                                                          | —            |
| : SERial      | —                                                          | —            |
| [ : RECeive]  | —                                                          | —            |
| : BAUD        | Sets Bitrate                                               | Both         |
| : PACE        | Sets Acknowledge Response                                  | Both         |
| : PARity      | —                                                          | —            |
| [ : TYPE]     | Sets Parity                                                | Both         |
| : UNIT        | Sets Query Response Unit Load                              | Both         |
| : CONTrol     | —                                                          | —            |
| : CURRent     | —                                                          | —            |
| : MODE        | Sets mode for Current Settings Control Method              | Both         |
| : VOLTage     | —                                                          | —            |
| : MODE        | Sets mode for Voltage Settings Control Method              | Both         |
| : ERRor       | Reads Error Message                                        | QUERY only   |
| : KEYLock     |                                                            |              |
| : MODE        | Sets LOCK mode                                             | Both         |
| : MONitor     |                                                            |              |
| : MODE        | Sets Voltmeter/Ammeter Display when Output is OFF          | Both         |
| : PRESet      |                                                            |              |
| : MODE        | Sets method to determine PRESET contents                   | Both         |
| : SERies      | Sets Master and Slave for Series Operation                 | Both         |
| : SINK        | Sets SINK ON/OFF                                           | Both         |
| : TRIP        | Executes TRIP                                              | SET only     |
| : MODE        | Sets operation for stopping output during severe breakdown | Both         |

## SYSTem:COMMunicate:SERial[:RECeive]:BAUD:Sets Bitrate

Function: Sets the bitrate

Same settings as FUNCTION Settings Item 61

Format: SYSTem:COMMunicate:SERial[:RECeive]:BAUD <NRf>

Type: SET command, QUERY command

Parameters: 0...2400bps  
1...9600bps  
2...19200bps  
3...38400bps

Response: 2400, 9600, 19200, 38400

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress



### Caution

Setting changes via this command will take affect from next startup.

<Ex.>

SYST:COMM:SER:BAUD 3

SYST:COMM:SER:BAUD?

38400

## SYSTem:COMMunicate:SERial[:RECeive]:PACE

:Sets Acknowledge Response

Function: sets the Acknowledge Response

Format: SYSTem:COMMunicate:SERial[:RECeive]:PACE <String>

Type: SET command, QUERY command

Parameters: ACK...Returns OK when normal command is received (Default Setting)

OFF...Does not return OK when normal command is received

Response: ACK ON, ACK OFF



### Caution

Setting changes via this command will take affect from next command.

<Ex.>

SYST:COMM:SER:PACE ACK

SYST:COMM:SER:PACE?

ACK ON

### SYSTem: COMMunicate: SERial[: RECeive]: PARity[: TYPE]

: Sets Parity

Function: Sets the parity

Same settings as FUNCTION Settings Item 62

Format: SYSTem: COMMunicate: SERial[: RECeive]: PARity[: TYPE] <String>

Type: SET command, QUERY command

Parameters ODD ....Odd number  
EVEN...Even number  
NONE...None

Response: ODD、EVEN、NONE

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

SYST:COMM:SER:PAR ODD  
SYST:COMM:SER:PAR ?  
ODD



#### Caution

Setting changes via this command will take affect from next startup.

### SYSTem: COMMunicate: SERial: UNIT : Sets Query Response Unit Load

Function: Sets whether to add-on units to the Query Response.

Format: SYSTem: COMMunicate: SERial: UNIT <Nrf>

Type: SET command, QUERY command

Parameters: 0 ...Do not add units (Default Settings)  
1 ...Add-on units

Response Same as parameters

Explanation: If set to “Add-on unit”, the units shown below will be added-on to the response.

- V ..Added to responses for Output Voltage Settings, OVP Settings, Voltmeter Measurement Query commands
- A ..Added to responses for Output Current Settings, OCP Settings, Ammeter Mesurement Query commands
- W ..Added to reponses for Power Measurement Query Commands
- s ..Added to responses for Rising/Down Delay Time Setting Query Commands
- Ω ..Added to responses for Internal Resistance Setting Query Commands
- bps...Added to responses for Bitrate Setting Queary Commands

<Ex.>

SYST:COMM:SER:UNIT 1  
SYST:COMM:SER:UNIT ?  
1  
VOLT ?  
640.0V

## SYSTem:CONTrol:CURRent:MODE: Sets Mode for Current Setting Control Method

---

Function: Sets mode for the method on setting the current

Same settings as FUNCTION Settings Items 71

Format: SYSTem:CONTrol:CURRent:MODE <NRf>

Type: SET command, QUERY command

Parameters: 0 ...Front Panel, Digital Communication

1 ...External Voltage

2 ...External Resistance Type-A

3 ...External Resistance Type-B

4 ...External Resistance Type-C

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- If analog option is not attached (ZX-S Series which A is not attached to the end of name)
- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

SYST:CONT:CURR:MODE 1

SYST:CONT:CURR:MODE ?

1

## SYSTem:CONTrol:VOLTage:MODE: Sets Mode for Voltage Setting Control Method

---

Function: Sets mode for the method on setting the voltage

Same settings as FUNCTION Settings Item 70

Format: SYSTem:CONTrol:VOLTage:MODE <NRf>

Type: SET command, QUERY command

Parameters: 0 ...Front Panel, Digital Communication

1 ...External Voltage

2 ...External Resistance Type-A

3 ...External Resistance Type-B

4 ...External Resistance Type-C

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions.

- If analog option is not attached (ZX-S Series which A is not attached to the end of name)
- While operating as a series operation slave unit.
- While operating as a parallel operation slave unit.
- Sequence operation in progress

<Ex.>

SYST:CONT:VOLT:MODE 1

SYST:CONT:VOLT:MODE ?

1

### SYSTem:ERRor: Reads Error Message

Function: After an error response is received, send this command to retrieve the cause for the generated error

Format: SYSTem:ERRor?

Type: QUERY command only

Response: Error Code, Error Message

Table-Error Codes & Error Messages

| Error Code | Error Messages                 | Meaning                                                                                                                                     |
|------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 0          | None                           | Normal                                                                                                                                      |
| —100       | Command error                  | Command Error (Undefined Command, etc.)                                                                                                     |
| —101       | Invalid character              | Invalid character sent                                                                                                                      |
| —102       | Syntax error                   | Syntax error                                                                                                                                |
| —104       | Data type error                | Data type error<br>Character received instead of numeral in parameter, etc.                                                                 |
| —109       | Missing parameter              | Too few parameters                                                                                                                          |
| —120       | Numeric data error             | Numerical data error. Exceeds range, etc.                                                                                                   |
| —140       | Character data error           | Character data error                                                                                                                        |
| —150       | String data error              | String data error                                                                                                                           |
| —900       | Unmounted analog option board. | Cannot execute due to analog option board is unmounted                                                                                      |
| —901       | Unmounted CP option board.     | Cannot execute due to CP option board is unmounted                                                                                          |
| —902       | No permission Command.         | Command not permitted to execute.<br>(Attempted to execute a function which is only for 1600W models with slaves, with 400W or 800W models) |
| —903       | Receive time out.              | Receive time out                                                                                                                            |



#### Caution

Can only be used for the last generated error response (newest error).

<Ex.>

RES?

ERROR

SYST:ERR?

—900,Unmount analog option board.



## SYSTem:KEYLock:MODE: Sets LOCK Mode

---

Function: Sets the mode for the Key Lock on the front panel

Same settings as FUNCTION Settings Item 53

Format: SYSTem:KEYLock:MODE <NRf>

Type: SET command, QUERY command

Parameters: 0 ...Only LOCK key is usable

1 ...Only OUTPUT and LOCK keys are usable

2 ...VOLT/CURR dials are non-usable (Along with this, PRESET key, FUNC key, OVP key, and OCP key are also non-usable)

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

SYST:KEYL:MODE 1

SYST:KEYL:MODE ?

1

## SYSTem:MONitor:MODE: Sets Voltmeter/Ammeter Display when Output is OFF

---

Function: Sets the displays for the voltmeter and ammeter when output is turned OFF

Same settings as FUNCTION Settings Item 52

Format: SYSTem:MONitor:MODE <NRf>

Type: SET command, QUERY command

Parameters: 0 ...Displays Measurement Value

1 ...Displays Set Value

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

SYST:MON:MODE 0

SYST:MON:MODE ?

0

### SYSTem:PRESet:MODE: Sets Method to Determine PRESET Contents

---

Function: Sets the method in which the PRESET contents are determined

Same settings as FUNCTION Settings Item 50

Format: SYSTem:PRESet:MODE <NRf>

Type: SET command, QUERY command

Parameters: 0 ...Changes set values after PRESET mode is completed

1 ...Changes set values while PRESET mode is operating

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

SYST:PRESet:MODE 0

SYST:PRESet:MODE ?

0

### SYSTem:SERies: Sets Master and Slave for Series Operation

---

Function: Sets the Master and Slave for Series Operation

Same settings as FUNCTION Settings Item 73

Format: SYSTem:SERies <NRf>

Type: SET command, QUERY command

Parameters: 0 ...Master

1 ...Slave

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions.

- If analog option is not attached (ZX-S Series which A is not attached to the end of name)
- While operating as a series operation slave unit.
- While operating as a parallel operation slave unit.
- Sequence operation in progress



#### Caution

When changing from Master to Slave with this command, the device address will be forced to change from 1 to 2. From this, the device will be unable to directly communicate with the PC from that point.

<Ex.>

SYST:SER 0

SYST:SER ?

0

## SYSTem:SINK: Sets SINK ON/OFF

---

Function: Sets the SINK function ON/OFF

Same settings as FUNCTION Settings Item 1

Format: SYSTem:SINK <String>

Type: SET command, QUERY command

Parameters: ON ...SINK ON

OFF ...SINK OFF

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

SYST:SINK ON

SYST:SINK ?

ON

## SYSTem:TRIP: Executes TRIP

---

Function: Executes input power relay TRIP

Format: SYSTem:TRIP

Type: SET command only

Parameters: None



### Caution

This command can only be used for 1600W models.

This is valid for 400W and 800W models. However nothing will happen if executed.

<Ex.>

SYST:TRIP

### SYSTem:TRIP:MODE: Sets Operation for Stopping Output During Serious Failure

Function: Sets the operation for stopping the output during a serious failure

Same settings as FUNCTION Settings Item 10

Format: SYSTem:TRIP:MODE <NRf>

Type: SET command, QUERY command

Parameters: 0 ...Stop switching

1 ...Execute input power relay trip (When TRIP is detected or serious failure)

2 ...Execute input power relay trip

(When TRIP is detected, severe breakdown, OVP/OCP triggered).



#### Caution

- Serious failure is defined as when an alarm cannot be canceled via command or by panel reset (holding down the A and C key).  
(Restart device with power switch)
- Serious failure Error  
See page 32 for details on WDT, OHP, AD-OV, P\_ERR, BST ALM, Device Detection Failure, and Device No. Disagreement error codes..

Restrictions: Alarm response is returned for normal SET commands in the following conditions.

- All ZX Series power supplies excluding 1600W models. (SET command only)
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

SYST:TRIP:MODE 1

SYST:TRIP:MODE ?

1

## SEquence Level

SEquence level command corresponds to the settings of sequence operation and retrieving status information.

| コマンド名    | 処理概要                                                          | コマンド形態     |
|----------|---------------------------------------------------------------|------------|
| SEquence | —                                                             | —          |
| :MODE    | Sets Sequence Operating mode                                  | Both       |
| :COUNT   | Sets Sequence Operating Number of time                        | Both       |
| :MEMA    | Sets Memory A Operating Time                                  | Both       |
| :MEMB    | Sets Memory B Operating Time                                  | Both       |
| :MEMC    | Sets Memory C Operating Time                                  | Both       |
| :OFF     | Sets Sequence Operating OFF Time                              | Both       |
| :OUTPut  | Sequence Operating Execution Frequency Finished<br>OUTPUT OFF | Both       |
| :STATus  | Retrieving Sequence Operating Status                          | QUERY only |

## SEquence:MODE: Sets Sequence Operating mode

Function: Sets the sequence operating mode.

Same settings as FUNCTION Settings Item 100

Format: SEquence:MODE<NRf>

Type: SET command, QUERY command

Parameters: 0...Invalid

1...Vaild (Normal mode)

2...Vaild (Continue mode)

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

SEQ:MODE1

SEQ:MODE?

1

### SEQuence: COUNT: Sets Sequence Operating Number of time

---

Function: Sets the sequence operating number of time.

Same settings as FUNCTION Settings Item 101

Format: SEQuence: COUNT <NRf>

Type: SET command, QUERY command

Parameters: 0~9999

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

SEQ: COUNT 1

SEQ: COUNT?

1

### SEQuence: MEMA: Sets Memory A Operating Time

---

Function: Sets the memory A operating time

Same settings as FUNCTION Settings Item 102~104

Format: SEQuence: MEMA ※1, ※2, ※3

Type: SET command, QUERY command

Parameters: ※1 0~999(h)

※2 0~59(m)

※3 0. 0~59. 9(s)

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

SEQ: MEMA 100,10,10.0

SEQ: MEMA?

100,10,10.0

## SEquence:MEMB:Sets Memory B Operating Time

---

Function:Sets the memory B operating time

Same settings as FUNCTION Settings Item 105~107

Format:SEquence:MEMB□※1,※2,※3

Type:SET command, QUERY command

Parameters:※1 0~999(h)

※2 0~59(m)

※3 0. 0~59. 9(s)

Response:Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

SEQ:MEMB□100,10,10.0

SEQ:MEMB?

100,10,10.0

## SEquence:MEMC:Sets Memory C Operating Time

---

Function:Sets the memory C operating time

Same settings as FUNCTION Settings Item 108~110

Format:SEquence:MEMC□※1,※2,※3

Type:SET command, QUERY command

Parameters:※1 0~999(h)

※2 0~59(m)

※3 0. 0~59. 9(s)

Response:Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

SEQ:MEMC□100,10,10.0

SEQ:MEMC?

100,10,10.0

### SEquence: OFF : Sets Sequence Operating OFF Time

---

Function: Sets the sequence operating OFF time

Same settings as FUNCTION Settings Item 111~113

Format: SEquence: OFF ⌘ ⌘1, ⌘2, ⌘3

Type: SET command, QUERY command

Parameters: ⌘1 0~999 (h)

⌘2 0~59 (m)

⌘3 0. 0~59. 9 (s)

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

SEQ: OFF ⌘ 100, 10, 10.0

SEQ: OFF?

100, 10, 10.0

### SEquence: OUTPut: Sequence Operating Execution Frequency Finished OUTPUT OFF

---

Function: Sets the sequence operating execution frequency finished OUTPUT OFF

Same settings as FUNCTION Settings Item 114

Format: SEquence: OUTPut ⌘ <NRf>

Type: SET command, QUERY command

Parameters: 0...Invalid

1...valid

Response: Same as parameters

Restrictions: Alarm response is returned for normal SET commands in the following conditions

- While operating as a series operation slave unit
- While operating as a parallel operation slave unit
- Sequence operation in progress

<Ex.>

SEQ: OUTP ⌘ 1

SEQ: OUTP?

1



## SEQuence: STATus: Retrieving Sequence Operating Status

---

Function: Sets the retrieving sequence operating status

Format: SEQuence: STATus?

Type: QUERY only

Response: ※1,※2,※3

※1:: Sepuence main state

0... Stopped

1... In action

※2: Sepuence sub state

0... Waiting

1... Memory A operation

2... Memory A operation

3... Memory A operation

4... OUTPUT OFF

※3: Seqence operating number of times

0... Continues action

1~9999

<Ex.>

SEQ:STAT?

1,1,1000

## Using via Digital Data Communication

---

### EX Compatible Commands

EX compatible commands are commands which conform to Takasago EX Series communication command format. Remote control is possible for only EX and ZX-S series mutual functions due to Ex and command compatibility. EX commands are listed below. For details on each command, see the listed page number.

SET Command List

| Command Name | Control Command Functions | Page No. |
|--------------|---------------------------|----------|
| A            | Assigns device address    | Page 112 |
| AR           | Executes alarm reset      | Page 112 |
| CL           | Resets set parameters     | Page 112 |
| LC           | Sets OCP current          | Page 113 |
| LV           | Sets OVP voltage          | Page 113 |
| MC           | Sets output current       | Page 114 |
| MV           | Sets output voltage       | Page 114 |
| OT           | Sets output ON/OFF        | Page 115 |
| TP           | Executes breaker trip     | Page 115 |

Read-Back Command List

| Command Name | Read-Back Command Functions                  | Page No. |
|--------------|----------------------------------------------|----------|
| TK0          | Read-back set parameter                      | Page 116 |
| TK1          | Read-back measurement data (Voltage/Current) | Page 116 |
| TK3          | Read-back alarm information                  | Page 117 |
| TK4          | Read-back measured voltage                   | Page 118 |
| TK5          | Read-back measured current                   | Page 118 |

### Command Format

All commands and responses are ASCII strings.

“A~Z” characters are reconized as command strings. “+,-,.,0~9” characters are reconized as parameters.

### Command Group Sending

Multiple commands can be sent in a single string by seperating commands with “,”.

<Ex.>A1,MV10.00,MC2.00,OT1

However, a single string with multiple commands assigning addresses will error.

<Ex.>A1,OT1,A2,OT1 /\* Errored due to multiple address assignment commands \*/

### Alarm Response Trigger Factors

In the event that any of the following error conditions are met, the ZX-S power supply will promptly return an alarm response “ALM128”.

If an error is generated while inputing commands, recovery will not occur until delimiter is received.

To prevent this, make certain to send either “CR, LF, or CR+LF” when an alarm response is received.

- When undefined command is received
- When command parameters exceed the range
- When a character or symbol other than numerals 0~9, +, -, and decimal point is sent in parameters
- When sent with a single parameter containing more than 2 decimal points
- When sent with spaces between the command and parameter

<Ex.>MV\_35

Space

- When a command is sent in lowercase
- When a string received at one time (until delimiter is received) exceeds 128 characters

<Ex.>mv35

Setting examples that are not errors

- Throw away digits in parameters which exceed the maximum number of numerical places

<Ex.>MV10.999 → MV10.99

For ZX-S Series power supplies, if either OVP, OCP or OHP error is generated the alarm response will change to “ALM160”. During device errors, only “LV”, “LC”, “AR”, “TP”, and “TK” commands are valid. All other commands will return alarm responses.

### Delimiter

Please add a end character (delimiter) to the end of commands being sent to a ZX-S power supply.

Possible delimiters that can be used are listed below.

- CR Carriage Return
- LF Line Feed
- CR+LF

Use any of the above as a delimiter.

## SET Commands

This section explains the SET commands of EX based commands.

**A:** Assigns Device Address

Function: Assigns the device address for ZX-S power supplies

Format: A \*                      \* : Set value within range

Range: 0~50

Assigned Address 0 is a global address. Assign addresses to all multi-connected ZX-S Series power supplies.

Once the global address is assigned, only Output ON/OFF Toggle SET command “OT” is valid.

Further, no Acknowledge Responses will be sent only while the global address is assigned



### Caution

Do not set redundant ZX-S power supply addresses within the same system.

Further, only one address can be assigned per send. Assigning multiple addresses at once is not possible.

```
<Ex.>A1      /* Assigns address 1 to ZX power supply */
```

```
<Ex.>A1,OT1,A2,OT1 /* Errors due multiple address assignment commands */
```

**AR:**Executes Alarm Reset

Function: Executes alarm reset (cancels triggered OVP/OCP alarms)

Format: AR \*                      \* : Set value

Set value:

1 : Resets alarms

Values other than 0 and 1 result in parameter errors. (0 does nothing)



## Caution

Execute alarm reset only once cause has been resolved.

<Ex.> A1,AR1

## CL:Resets Set Parameters

Function: Resest the set parameters

Format: CL \*                      \* : Set value

Set Value:

1 : Resest to factory default settings

Values other than 0 and 1 result in parameter errors. (0 does nothing)

<Ex.>A1,CL1

## LC: Sets OCP Current

Function: Sets the OCP current

Format: OCP \* \* : Set value within range

Range: Values other than ranges result in parameter errors.

Range varies on the model and number of parallel connected devices.

OCP Current Range

| Model(Type)<br>No. of<br>Parallel<br>Connected Devices | 400HN/HAN  | 800HN/HAN   | 1600HN/HAN  |
|--------------------------------------------------------|------------|-------------|-------------|
| 1 (Independent Operation)                              | 0. 1~5. 5  | 0. 2~11. 0  | 0. 4~22. 0  |
| 2                                                      | 0. 2~11. 0 | 0. 4~22. 0  | 0. 8~44. 0  |
| 3                                                      | 0. 3~16. 5 | 0. 6~33. 0  | 1. 2~66. 0  |
| 4                                                      | 0. 4~22. 0 | 0. 8~44. 0  | 1. 6~88. 0  |
| 5                                                      | 0. 5~27. 5 | 1. 0~55. 0  | 2. 0~110. 0 |
| 6                                                      | 0. 6~33. 0 | 1. 2~66. 0  | 2. 4~132. 0 |
| 7                                                      | 0. 7~38. 5 | 1. 4~77. 0  | 2. 8~154. 0 |
| 8                                                      | 0. 8~44. 0 | 1. 6~88. 0  | 3. 2~176. 0 |
| 9                                                      | 0. 9~49. 5 | 1. 8~99. 0  | 3. 6~198. 0 |
| 10                                                     | 1. 0~55. 0 | 2. 0~110. 0 | 4. 0~220. 0 |

<Ex.>A1,LC5.5

## LV: Sets OVP Voltage

Function: Sets the OVP voltage

Format: OVP \* \* : Set value within range

Range: 10~704

Values other than ranges will result in parameter errors.

<Ex.>A1,LV704

### MC: Sets Output Current

Function: Sets the output current

Format: MC \*                      \* : Set value within range

Range: Values other than ranges result in parameter errors.

Range varies on the model and number of parallel connected devices.

| Output Current Range                                   |              |              |              |
|--------------------------------------------------------|--------------|--------------|--------------|
| Model(Type)<br>No. of<br>Parallel<br>Connected Devices | 400HN/HAN    | 800HN/HAN    | 1600HN/HAN   |
| 1 (Independent Operation)                              | 0. 00~5. 250 | 0. 00~10. 50 | 0. 00~21. 00 |
| 2                                                      | 0. 00~10. 50 | 0. 00~21. 00 | 0. 00~42. 00 |
| 3                                                      | 0. 00~15. 75 | 0. 00~31. 50 | 0. 00~63. 00 |
| 4                                                      | 0. 00~21. 00 | 0. 00~42. 00 | 0. 00~84. 00 |
| 5                                                      | 0. 00~26. 25 | 0. 00~52. 50 | 0. 0~105. 0  |
| 6                                                      | 0. 00~31. 50 | 0. 00~63. 00 | 0. 0~126. 0  |
| 7                                                      | 0. 00~36. 75 | 0. 00~73. 50 | 0. 0~147. 0  |
| 8                                                      | 0. 00~42. 00 | 0. 00~84. 00 | 0. 0~168. 0  |
| 9                                                      | 0. 00~47. 25 | 0. 00~94. 50 | 0. 0~189. 0  |
| 10                                                     | 0. 00~52. 50 | 0. 0~105. 0  | 0. 0~210. 0  |

<Ex.> A1,MC42.0

### MV: Sets Output Voltage

Function: Sets the output voltage

Format: MV \*                      \* : Set value within range

Range: 0. 0~672. 0

<Ex.> A1,OV10.5

**OT**: Sets Output ON/OFF

Function: Sets the output ON/OFF

Format: OT \*                      \* : Set value

Set Value:

0: OUTPUT "OFF"

1: OUTPUT "ON"

Values other than 0 or 1 result in parameter errors.

<Ex.> A1,OT0

**TP:**Executes Breaker Trip

Function: Executes breaker trip

Format: TP \*                      \* : Set values

Set Values:

0: Stop switching

1: Execute input power relay trip (When TRIP is detected or severe breakdown)

2: Execute input power relay trip (When TRIP is detected, severe breakdown, OVP/OCP triggered)

Values other than 0, 1, or 2 result in parameter errors.



### Caution

- Serious failure is defined as when an alarm can be canceled via command or by panel reset (holding down the A and C key).  
(Restart device with power switch)
- Serious failure Error  
See page 32 for details on WDT, OHP, AD-OV, P\_ERR, BST ALM, Device Detection Failure, and Device No. Disagreement error codes.
- This command can only be used for 1600W models.  
This is valid for 400W and 800W models. However nothing will happen if executed.

<Ex.>A1,TP1

## Read-Back Commands

This sections explains about the Ex based command Read-Back commands.

## TK0: Read-Back Set Paramters

Function: Retrives the output voltage, output current, OVP voltage, OCP current, and output ON/OFF status set in the ZX-S power supply with the specified device address.

Format:TKO

Read-Back Format: A \* 1, MV \* 2, MC \* 3, LV \* 4, LC \* 5, OT \* 6

\* 1 ~ \* 6 : Read-Back Value

Read-Back Value:

- \* 1: Device address of the responded ZX power supply
- \* 2: Output Voltage Set Value (Max. no. of decimal places is 2)
- \* 3: Output Current Set Value  
(See page 114 “Output Current Ranges” for Max no. of decimal places )
- \* 4: OVP Voltage Set Values (Max. no. of decimal places is 2)
- \* 5: OCP Current Set Value  
(See page 113 “OCP Current Ranges” for Max no. of decimal places )
- \* 6: Output ON/OFF Status

<Ex.>A1,TK0

A1,MV80.00,MC5.00,LV704.0,LC5.250,OT0

**TK1** : Read-Back Measurement Data (Voltage/Current)

Function: Retrives measured voltage/current values from the ZX power supply with the specified device address

Format: TK1

Read-Back Format: A \* 1, \* 2V, \* 3A

\* 1 ~ \* 2: Read-Back value

Read-Back Value:

- \* 1: Device address of the responded ZX power supply  
\* 2: Output Voltage Set Value (Max. no. of decimal places is 2)  
\* 3: Output Current Set Value  
(See page 105 “Output Current Ranges” for Max no. of decimal places )

<Ex.>A1,TK1

A1.0.00V.0.00A



## TK3 : Read-Back Status Information

Function: Retrieves the status information from the ZX-S power supply with the specified device address

Format: TK3

Read-Back Format: A \* 1, STAT \* 2

\* 1、\* 2: Read-Back Value

Read-Back Value:

\* 1: Device address of the responded ZX power supply

\* 2: Status is represents as 0 or 1

STAT \* \* \* \* \*

6

0

Retrieved Status Information List

| Bit | Status Name | Summary                                 | 1                          | 0                        |
|-----|-------------|-----------------------------------------|----------------------------|--------------------------|
| 0   | P-ON(M)_STS | P-ON (Master) Status                    | Main Power Supply<br>ON    | Main Power Supply<br>OFF |
| 1   | OHP_ALM     | OHP(Over Heating Protection)<br>Error   | Error                      | Normal                   |
| 2   | PL_STS      | Power Delimiter Operation<br>Status     | Power Delimiter<br>running | Normal                   |
| 3   | OCP_ALM     | OCP (Over Current<br>Protection ) Error | Error                      | Normal                   |
| 4   | OVP_ALM     | OVP (Over Voltage<br>Protection) Error  | Error                      | Normal                   |
| 5   | CC_STS      | CC Operation Status                     | CC operating               | Not CC                   |
| 6   | CV_STS      | CV Operation Status                     | CV operating               | Not CV                   |

<Ex.> A1,TK3

A1,STAT1000010

### TK4 : Read-Back Measured Voltage Data

---

Function: Retrieves the measured voltage data from the ZX-S power supply with the specified device address

Format: TK4

Read-Back Format: \* V

\* : Read-Back Value

Read-Back Value:

\* : Specified ZX-S power supply's Output Voltage Measurement Value

(Max. no. of decimal places is 2)

<Ex.> A1,TK4

10.00V

### TK5 : Read-Back Measured Current Data

---

Function: Retrieves the measured current data from the ZX power supply with the specified device address

Format: TK5

Read-Back Format: \* A

\* : Read-Back Value

Read-Back Value:

\* : Specified ZX-S power supply's Output Current Measurement Value

(See page 112 "Output Current Ranges" for Max no. of decimal places )

<Ex.> A1,TK5

0.00A

## Notes

Communication control functions using multi-connecting cables are only usable between ZX-S Series power supplies of the same model.

If wishing to connect other Takasago products which are capable of multi-connections, please contact our Sales Department for more information.

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# Using in Series/Parallel Operation

## Parallel Operation

A maximum total of 10 power supply outputs can be connected parallel to increase the output current. Further, Master-Slave Parallel Operation, the controlling of the overall output voltage and current with a single Master, is available.

Simply connect using a parallel control cable to enable automatic detection of the number of parallel devices. The measurement value, the total sum of the output current and output power, is displayed on the Master unit.



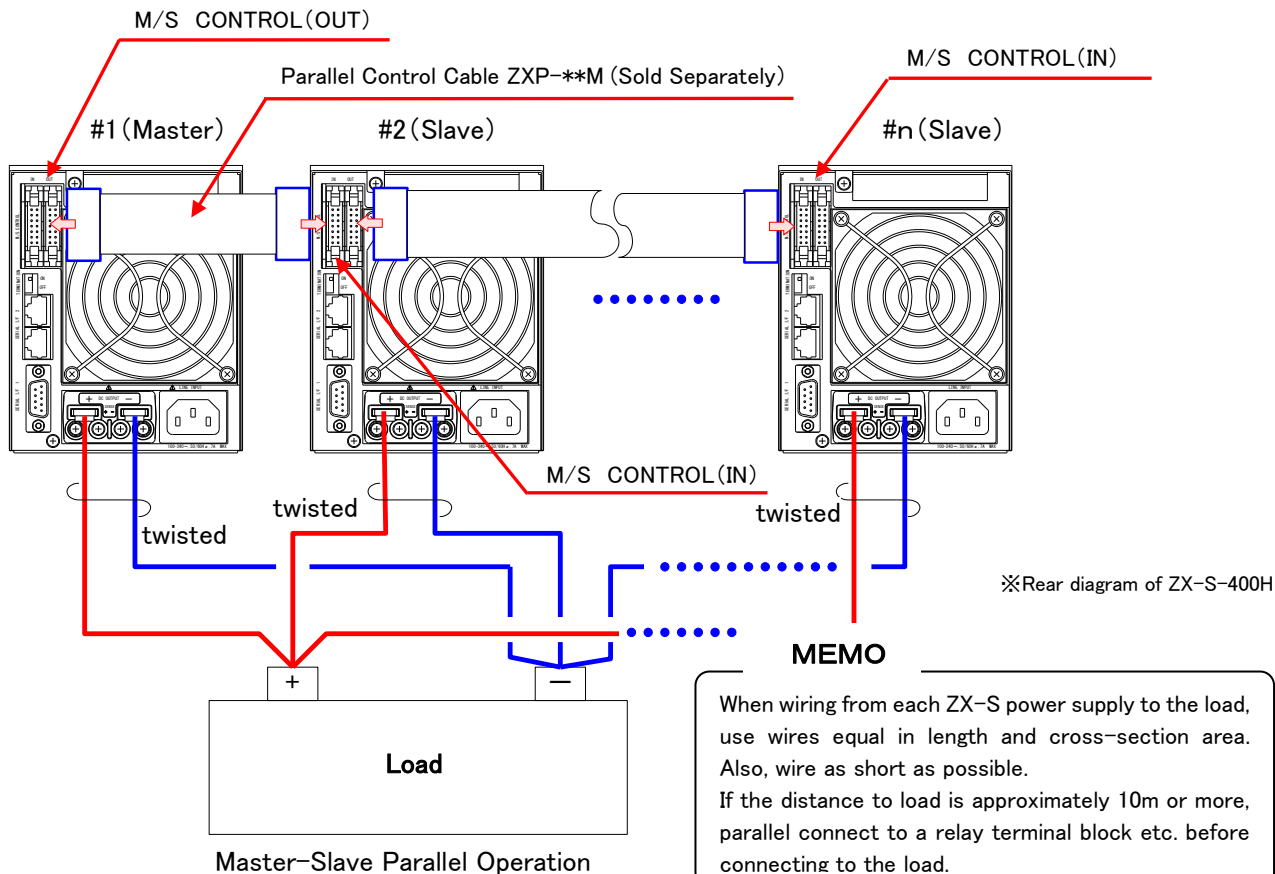
### Caution

- Parallel operation is only possible with devices of the same model.  
Connecting different device models will result in breakdown.
- FUNCTION items for when operating in Slave cannot be set by only references.
- When operating in Slave, the only valid keys during an alarm reset are the OVP + OCP (pushed simultaneously), FUNC. and LOCAL keys.
- Do not set to OPEN when wiring connections between power supplies with minus outputs.
- Turn all parallel connected ZX-S Series input power (POWER switch) ON.

## Connecting

Connect as shown in the below diagram.

Connect from the first unit's (Master) M/S CONTROL Connector OUT to the second unit's (Slave) M/S CONTROL Connector IN. Connect from the second unit's M/S CONTROL Connector OUT to the third unit (Slave).



## Operation

1. Turn on the POWER switches for all power supplies (#1 to #n).  
There is no set order to turn on power.
2. After all power is turned on, wait approximately 2 seconds before operating.
3. The ZX-S power supply which its M/S CONTROL Connector IN is not connected to another ZX-S Series power supply, is the Master unit (previous page labeled #1).
4. After the POWER switch has been turned ON, the model (top), and firmware version and number of parallel connected devices (bottom) will be displayed on the Master unit's Number Display.

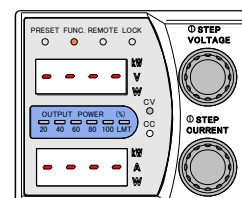
If there is a disagreement with the number of parallel connected devices (there is a difference between the previous number of parallel connected devices and current number), the error code "E011" will display on the top Number Display and the detected number of devices will appear blinking on the bottom Number Display.

After verifying the number of parallel devices, hold down the "FUNC." key for more than 2 seconds to confirm detected number and return to measurement display mode.

5. Voltage measurement is displayed in the top and current measurement is displayed in the bottom Number Display.  
Total current value is displayed in the bottom Number Display.

Select power display with the "Display" key to display total power values.

Slaves, when operating normally, will display bars as shown on the right.



## Error Codes

### 1. Error Codes & Display List for Master Unit

| Items                   | Place | No. Display Top | No. Display Bottom | Content                                                                  |
|-------------------------|-------|-----------------|--------------------|--------------------------------------------------------------------------|
| WDT                     |       | E001            | —                  | Malfunction of CPU                                                       |
| AD_OV                   |       | E002            | —                  | Input voltage error for DC/DC block                                      |
| OHP                     |       | E003            | OHP                | Over Heating Protection triggered                                        |
| OVP                     |       | E004            | OUP                | Over Voltage Protection triggered                                        |
| OCP                     |       | E005            | OCP                | Over Current Protection triggered                                        |
| BST                     |       | E006            | —                  | Slave error (Displayed only on the Master during Parallel Operation)     |
| P_ERR                   |       | E007            | —                  | Input voltage error                                                      |
| BST_NRDY                |       | E008            | —                  | Slave input voltage error                                                |
| Device Detection Error  |       | E009            | —                  | No. of parallel devices cannot be detected                               |
| Max. Device No. OVER    |       | E010            | —                  | 11 or more parallel connected devices                                    |
| Device No. Disagreement |       | E011            | —                  | Difference in the current and previous no. of connected parallel devices |
| TRIP (ZX-S-1600HN/HAN)  |       | E012            | Shdn               | TRIP function triggered                                                  |
| Communication Error     |       | E100            | —                  |                                                                          |
| E2P Error               |       | E110            | —                  | Initialization error during startup                                      |

### 2. Error Displays for Slave Units

In the event an alarm is triggered by a Slave while the Master is functioning normally;

- ① The Slave that detected the alarm will display the error code (top) and alarm type (bottom) in the Number Display.
- ② Error code "E006" is displayed on the top Number Display of the Master unit.

(When alarm is triggered by a Slave and Master is functioning normally)

## Using in Series/Parallel Operation

### Series Operation

A series connection of two ZX power supply outputs can be used to double the output voltage. Further, Master-Slave Series Operation, the controlling of the output with a single Master, is available.



#### Caution

- An LA type is necessary for the Slave unit. (Both the L and LA types can be used for the Master Unit.)
- Series operation is only possible with models that have the same number indicated in the xxx part of ZX-S-xx.
- Connecting different device models will result in breakdown.
- Turn all series connected ZX-S Series input power (POWER switch) ON.
- Please calibrate the output voltage for the Slave before use.
- FUNCTION Settings items, when operating in Slave, are restricted.
- When operating in Slave, the only valid keys during an alarm reset are the OVP + OCP (pushed simultaneously), "OCP", "FUNC.", and "LOCAL" keys.
- The indication on the front display during series operation shows the outputs of the Master unit and the Slave unit respectively. (When the output voltage is 160V, both the Master unit and the Slave unit will be 80.00V.)

### Connecting

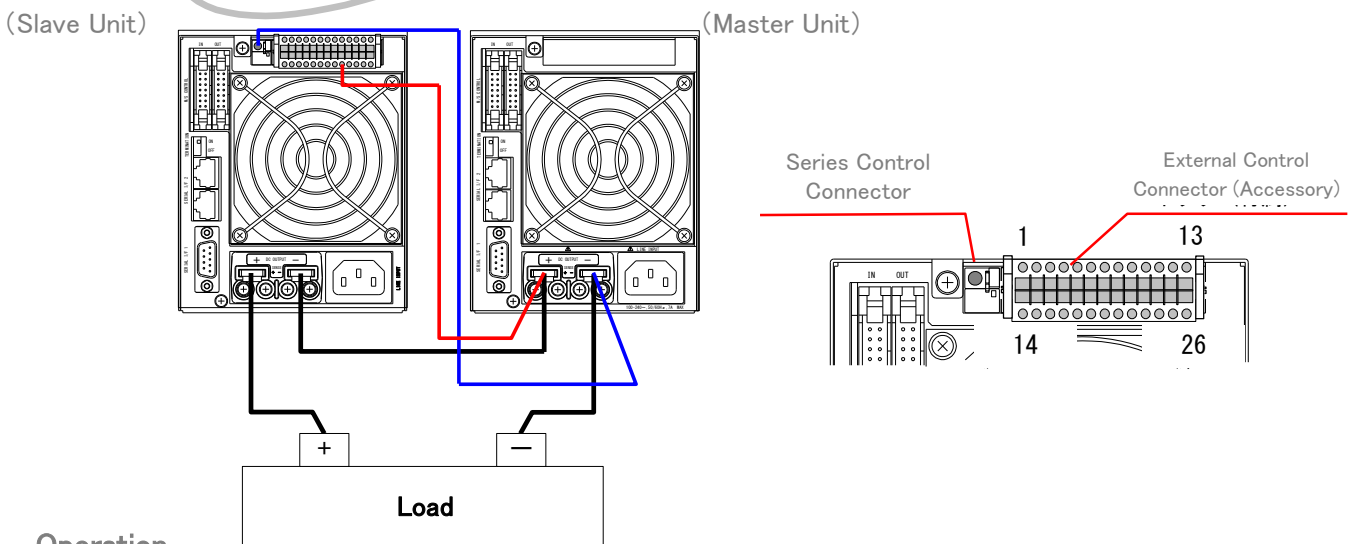
Connect as shown in the below diagram.

#### ◆ Load Wire Connection

- ① Connect wires from the Slave's minus terminal to the Master's plus terminal.
- ② Connect wires from the Slave's plus terminal to the Load's plus terminal.
- ③ Connect wires from the Master's minus terminal to the Load's minus terminal.

#### ◆ Control Terminal Wiring

- ① Connect wires from the Slave's external control connector No. 22 terminal to the Master's plus terminal.
- ② Connect wires from the Series control connector to the Master's minus terminal.



### Operation

#### 1. Setting Slave Unit

- ① Press the Function "FUNC." key.
- ② Select Item 73 with VOLTAGE dial.
- ③ Change the set value to 1 (Slave Mode) with CURRENT dial.
- ④ Press the FUNC. key again to finalize settings.

#### MEMO

When returning to Master, set FUNCTION Item 73 to 0, Item 51 to 0, and Item 60 to 1.

---

## Using in Series/Parallel Operation

⑤ Turn the POWER switch OFF.

※Device will operate as Slave unit when the POWER switch is turned ON again. In so doing, the “Output” lamp will light.

This feature is not applicable  
to H type.

## Using in Series/Parallel Operation

### 2. Calibrating Slave Unit Output Settings

Calibrate the Slave unit to match the Slave's output voltage with the Master's voltage when in Series Operation.

#### Preparation

The following measuring device is required for calibration.

**Voltage Measuring Digital Multimeter – 2 devices**

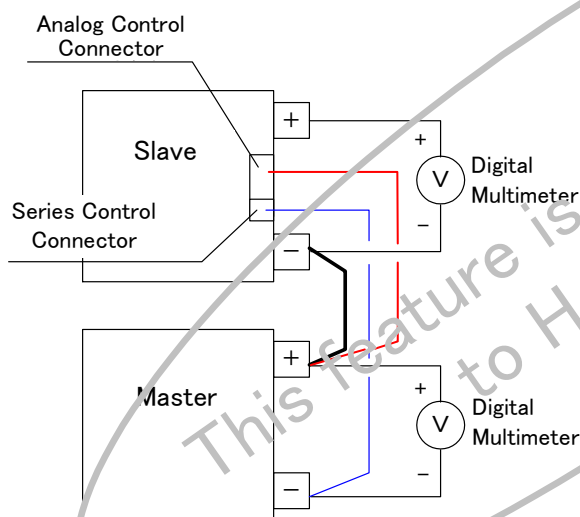
No. of Display Digits: 5 1/2 or more      Display Accuracy : 0.005% or more

※ (Equipped with a measuring range from 1mV~100V)

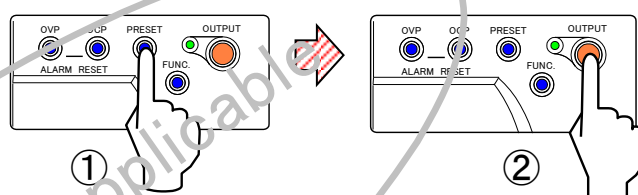
#### Offset/Full Scale Calibration of Slave Unit Output Voltage

1. Detach the Load Wires and the Remote Sensing Wires. Connect the Digital Multimeter to the output terminal.

Have the POWER switch turned ON and the output turned OFF.



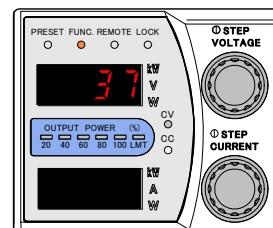
3. Press the PRESET key again and then the OUTPUT key and set the output to ON.



#### MEMO

The ON/OFF of the "OUTPUT" is only valid with the Master unit.

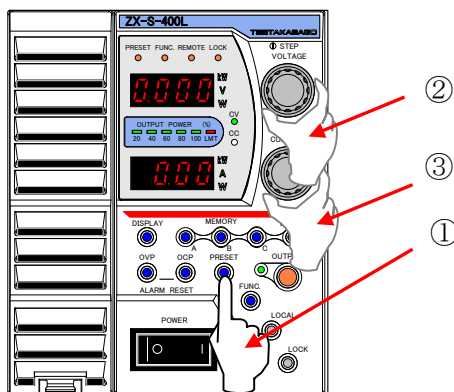
4. Press the FUNC. key and turn the VOLTAGE dial to display Settings Item 37 in the top Number Display.



#### MEMO

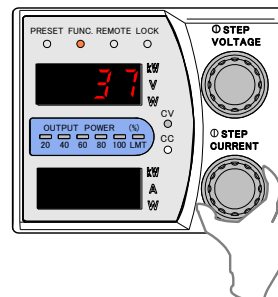
FUNC. lamp will light and the display in bottom Number Display will disappear.

2. Press the PRESET key ① of the Master unit and set to "0.01V" with the VOLTAGE dial ② and "1.00A" with the CURRENT dial ③.



(See "Using as Constant Voltage Power Supply" under "Basic Operations" on how to do this.)

5. Adjust the Slave unit's settings with the Current dial to match the measured Master Unit's output voltage displayed on the digital multimeter.

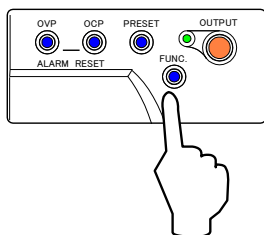


⇒Continued on next page

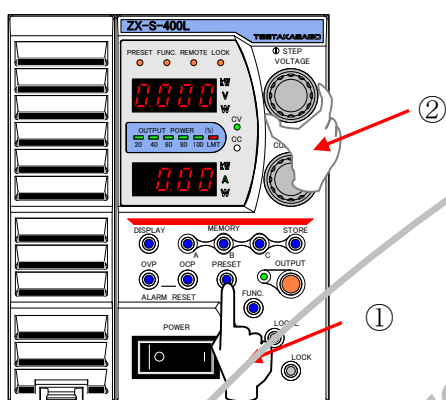


## Using in Series/Parallel Operation

6. Press the FUNC. Key of the Slave unit to complete output voltage offset calibration.

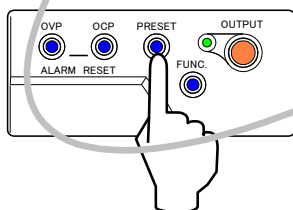


7. Press the PRESET key of the Master unit. Set to "80.00"V with the VOLTAGE dial.

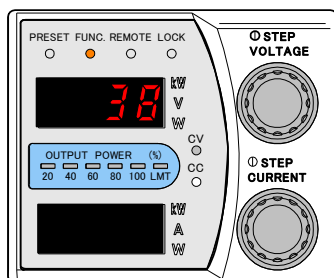


(See "Using as Constant Voltage Power Supply" under "Basic Operations" on how to do this.)

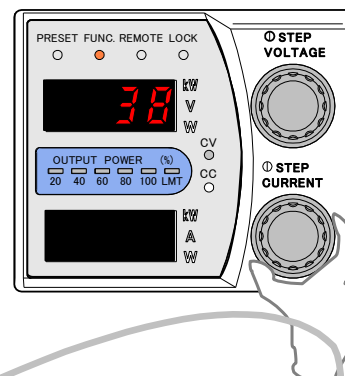
8. Press the PRESET key.



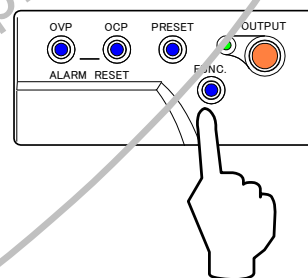
9. Press the FUNC. key of the Master unit and turn the VOLTAGE dial to display Settings Item 38 in the top Number Display.



10. Adjust the Slave unit's settings with the Current dial to match the measured Master Unit's output voltage displayed on the digital multimeter.



11. Press the FUNC. key of the Slave unit to complete output voltage full-scale calibration.



12. This completes offset /full-scale calibration for the output voltage.

Please return voltage set values back to normal before use.

### MEMO

The Slave unit is always in the state of Output ON.  
(Regardless of the output, the "OUTPUT" lamp is always lit.)

# Controlling with External Analog & Contact Signals

## Toggling Output ON/OFF with External Contacts

The output for ZX-S Series power supplies can be toggled ON/OFF using outputs from small capacity contact or photocoupler.

Use a photocoupler or a small signal relay or switch with a minimum contact capacity of 5V, 2.5mA.



### Caution

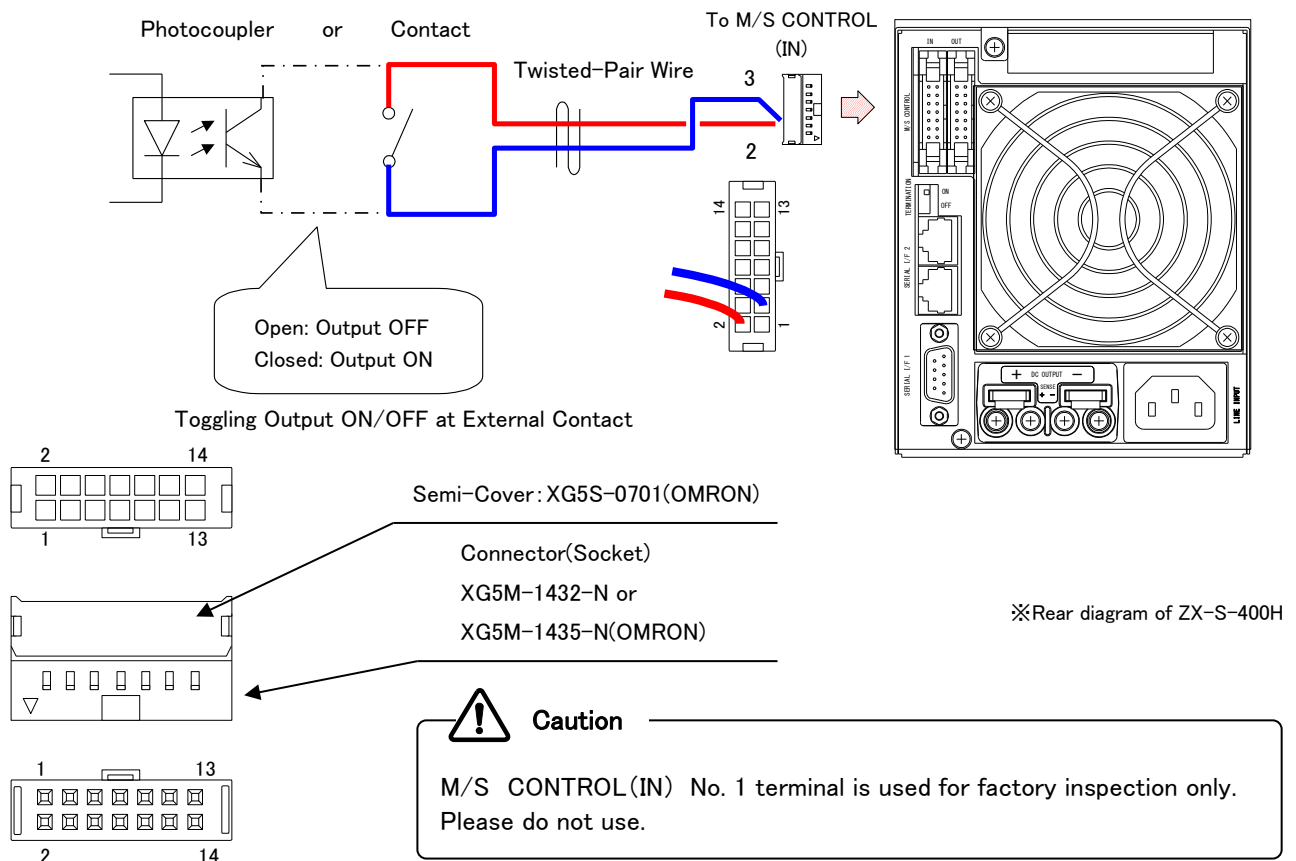
- Not suited for power contact such as main contact points for electromagnetic contactors or power relays etc.
- For output ON/OFF toggle contact, please use a insulated contact point or open collector.

FUNCTION settings must be changed to “Valid” for Output ON/OFF Control at External Contact to be used. Factory default settings are set to “Invalid”.

### Connecting

Wire the cables to connector (XG5M-1432-N or XG5M-1435-N (OMRON)) Pin No. 2 and 3, and connect it to M/S CONTROL (IN) as shown in the diagram below.

|                      |                                                                                  |
|----------------------|----------------------------------------------------------------------------------|
| Cable connector      | : XG5M-1432-N or XG5M-1435-N (OMRON)                                             |
| Connector Semi-Cover | : XG5S-0701 (OMRON)                                                              |
| Contact              | : XG5W-0031-N (for XG5M-1432-N) (OMRON)<br>XG5W-0034-N (for XG5M-1432-N) (OMRON) |
| Crimping             | : XY2B-7006 (OMRON)                                                              |
| Extracting Tool      | : XY2E-0001 (OMRON)                                                              |



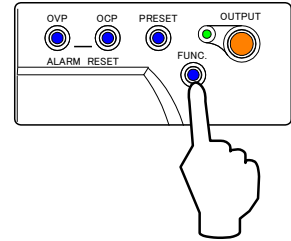
## Controlling with External Analog & Contact Signals

### Setting Procedures

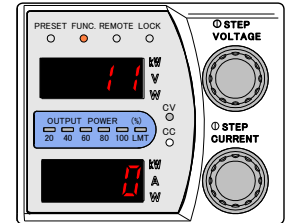
Press the Function “FUNC.” key.

FUNC. lamp will light.

Settings Item Number (top) and parameters (bottom) will appear in the Number Display.



Select Item number 11 with the VOLTAGE dial.

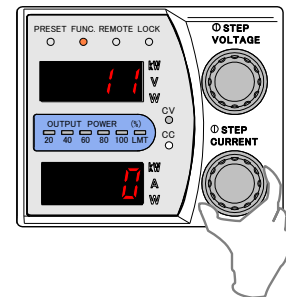


Change set value with the CURRENT dial.

**Parameter=0;**

**Turns off ON/OFF Toggle at external contact (invalid).**

Set if wishing to control by remote command or with the front panel's ON/OFF key.

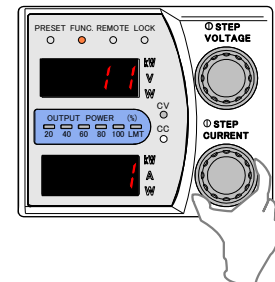


**Parameter=1;**

**Sets Output ON if the external contact is closed.**

**Sets Output OFF if the external contact is opened.**

Output can only be controlled by external contact points.  
Power cannot be controlled by remote command (commands)  
or by the front panel's ON/OFF key.



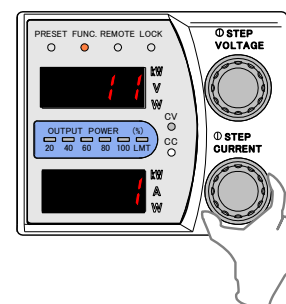
**Parameter=2;**

**Allows the output to be toggled from the panel when the external contacts are closed.**

**Also, sets the Output OFF if the external contact is opened.**

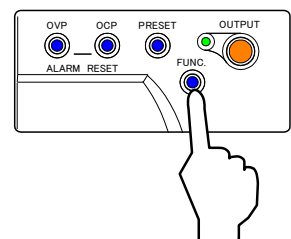
Output can be controlled by panel or remote command when external contacts are closed.

Sets output to OFF when contact signal is open regardless of remote command or panel operations.



Press the FUNC. key again to finalize settings.

Returns the Number Display to measurement display mode.



## Controlling with External Analog & Contact Signals

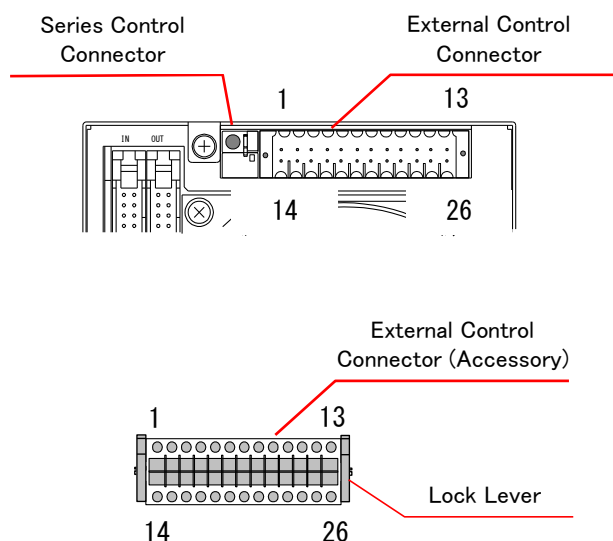
### Using External Control Terminals (ZX-S Series Type-HAN)

This section covers proper methods when operating the ZX-S-HAN Series Power Supply externally.

The External Control Terminal is located on the rear panel of the power supply.

(A connector is provided for the terminal. Combined with FUNCTION items, this terminal can be applied in various means.)

A specialized connector is attached to the ZX-S-HAN Series.

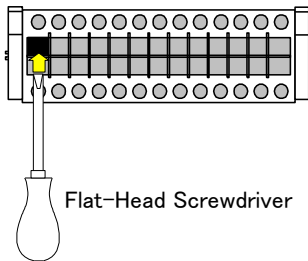


| Terminal No. | Signal Name                             |                                           |
|--------------|-----------------------------------------|-------------------------------------------|
| 1            | External ON/OFF Terminal                |                                           |
| 2            | External ON/OFF, Input Cut-Off COM      |                                           |
| 3            | Monitor Terminal                        | For Output Current                        |
| 4            | Analog COM                              |                                           |
| 5            | Output Voltage Control Terminal         | External Voltage Input Terminal (+)       |
| 6            | Output Voltage/Current Control Terminal | External Resistance Terminal (A Curve)    |
| 7            | Output Voltage Control Terminal         | External Resistance Terminal (B, C Curve) |
| 8            | Output Current Control Terminal         | External Resistance Terminal (A Curve)    |
| 9            | Output Current Control Terminal         | External Resistance Terminal (B, C Curve) |
| 10           | NC                                      |                                           |
| 11           | Status Output                           | LEVEL1_ALM                                |
| 12           | Status Output                           | CV                                        |
| 13           | Status Output                           | P-ON                                      |
| 14           | Input Cut-Off Terminal                  |                                           |
| 15           | Monitor Terminal                        | For Output Voltage                        |
| 16           | Analog COM                              |                                           |
| 17           | Analog COM                              |                                           |
| 18           | Output Voltage Control Terminal         | External Resistance Terminal (A Curve)    |
| 19           | Output Voltage Control Terminal         | External Resistance Terminal (B, C Curve) |
| 20           | Output Current Control Terminal         | External Voltage Input Terminal (+)       |
| 21           | Output Current Control Terminal         | External Resistance Terminal (B, C Curve) |
| 22           | Series Operation Control Terminal       |                                           |
| 23           | NC                                      | LEVEL2_ALM                                |
| 24           | Status Output                           | Level2_ALM                                |
| 25           | Status Output                           | CC                                        |
| 26           | Status COM                              |                                           |

### MEMO

#### How to Insert Wire into Connector

- ① Push a flat-head screwdriver into the square hole.

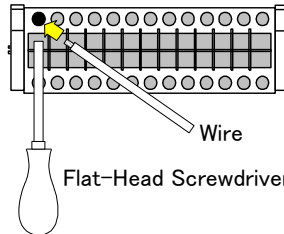


- ③ Extract Screwdriver

- ② Insert the stripped wire (as shown in the right diagram) in the hole while the screwdriver is inserted.

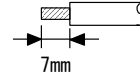
※Spring Connection

※No pin is required for connecting

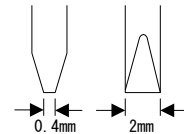


#### Wire Specifications

- Wire Size: AWG 28-18
- Stripped Length: 7mm



#### Flat-Head Screwdriver Dimensions



#### Uses of Terminals

- ① Toggling Output ON/OFF at External Contacts
- ② Cut off input with external contacts
- ③ Control output voltage/current with external voltage
- ④ Control output voltage/current with external resistance
- ⑤ Output monitor
- ⑥ Output status
- ⑦ Master-Slave Series Operation

### Toggling Output ON/OFF with External Contacts (ZX-S Series Type-HAN)

The ZX-S Series Type-HAN can toggle the output ON/OFF using external control connectors.

The output for ZX-S Series power supplies can be toggled ON/OFF using outputs from small capacity contact points or photocouplers.

Use a photocoupler or a small signal relay or switch with a minimum contact capacity of 5V, 2.5mA.



#### Caution

- Not suited for power contacts such as main contact points for electromagnetic contactors or power relays etc.
- For the output ON/OFF toggle contact point, please use an insulated contact point or open collector at the photocoupler.

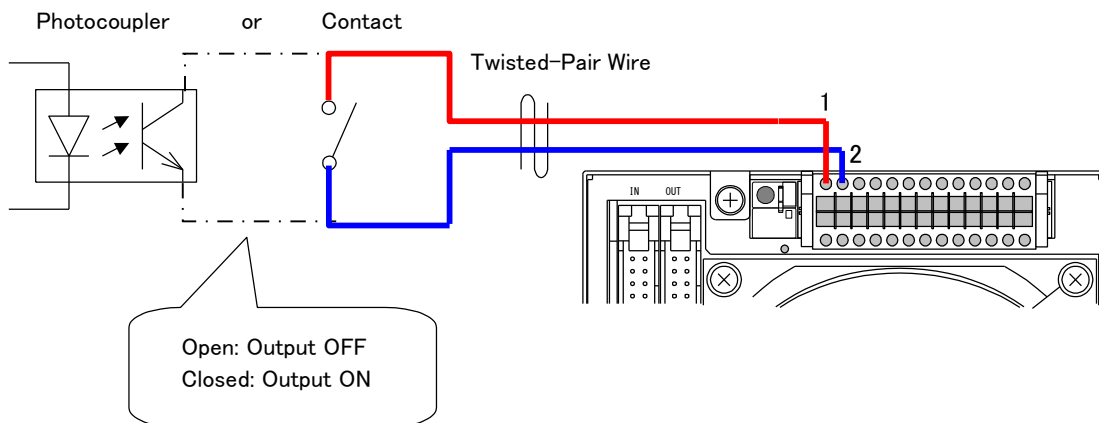
FUNCTION settings must be changed to “Valid” for Output ON/OFF Control at External Contact Points to be used.

Factory default settings are set to “Invalid”.

#### Connecting

Wire the cables to the external control connector (accessory) terminal's No. 1 and 2.

The external control connectors can be simply removed by pushing down the lock levers on both sides.



Toggling Output ON/OFF at External Contact Point

#### Setting Procedures

See page 125 for setting procedures.

### Input Cut-Off with External Contacts (ZX-S Series Type-HAN)

The input for ZX-S Series power supplies can be cut off (stop switching) using outputs from small capacity contacts or photocouplers.

Use a photocoupler or a small signal relay or switch with a minimum contact capacity of 5V, 2.5mA.

#### MEMO

Shutdowning with short circuit (make) of contact b is standard.

Shutdowning with opening (break) of contact a by option is also possible.

(Please contact TAKASAGO.)



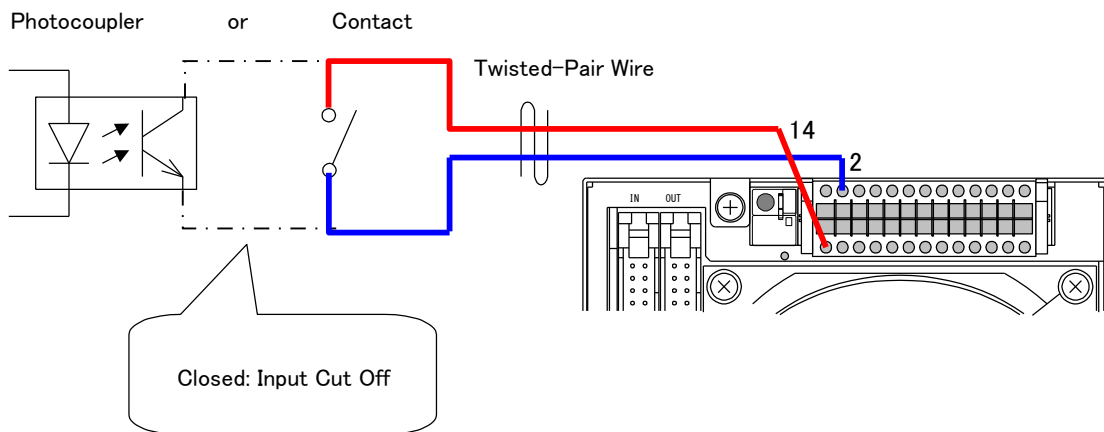
#### Caution

- Not suited for power contacts such as main contacts for electromagnetic contactors or power relays etc.
- For the output ON/OFF toggle contact point, please use an insulated contact point or open collector at the photocoupler.

#### Connecting

Wire the cables to the external control connector (accessory) terminal's No. 14 and 2.

The external control connectors can be simply removed by lowering the lock levers on both sides.



Input Cut-Off with External Contacts

### Output Voltage Control (ZX-S Series Type-HAN)

#### Output Voltage Control with External Resistance

##### 1. Output Voltage Control with External Resistance (A)

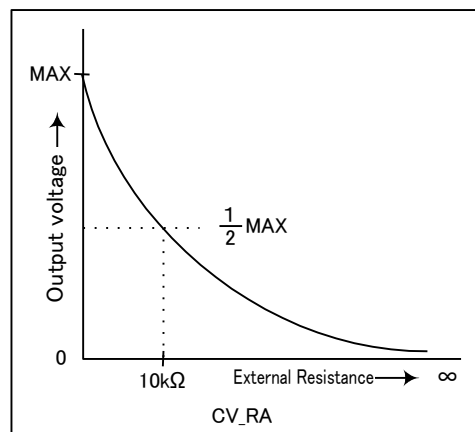
This section describes how to set the output voltage zero when the external resistance value is infinity.

The output voltage is derived from the following formula.

$$\text{Output Voltage[V]} = \text{Max. Output Voltage[V]} \times \frac{10}{\text{External Resistance[k}\Omega\text{]} + 10}$$

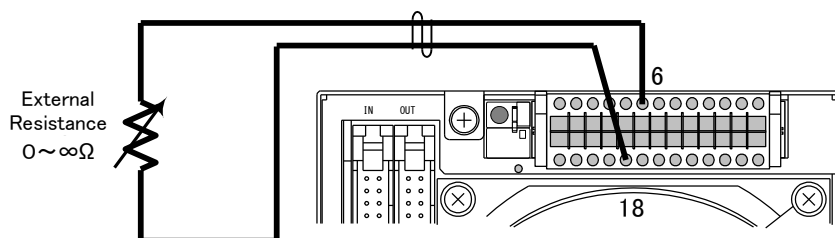
The output accuracy for the external resistance,

is the set voltage  $\pm(0.2\%$  of Rated Output Voltage) when  $10\text{k}\Omega$



#### Connecting

Connect the resistor to accessory connector terminals No. 6 and 18.



#### Caution

The External Resistance A, B, and C and the External Voltage cannot be used together to control the output.

#### Setting Procedures

Set to parameter 2 (External Resistance Type A) according to the procedure on page 133.

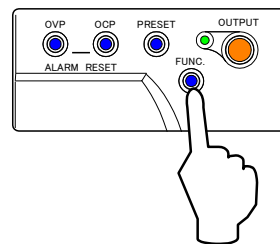


### Setting Procedures

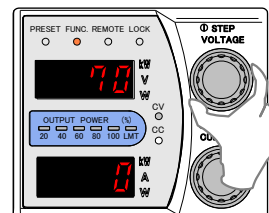
Press the Function “FUNC.” key.

FUNC. lamp will light.

Settings Item Number (top) and parameters (bottom) will appear in the Number Display.

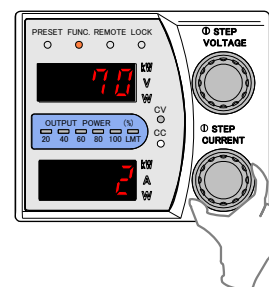


Select Item number 70 (Output Voltage Control) with the VOLTAGE dial.



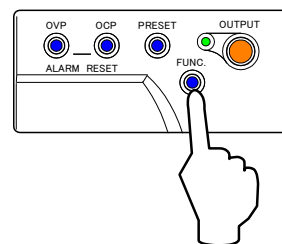
Change the parameter with the CURRENT dial.

- 1 = External Voltage ( $0 \sim 10V$ )
- 2 = External Resistance ( $0 \sim \infty \Omega$ : A)
- 3 = External Resistance ( $0 \sim \infty \Omega$ : B)
- 4 = External Resistance ( $0 \sim \infty \Omega$ : C)



Press the FUNC. key again to finish.

Returns Number Display back to measurement display mode.



### Canceling Output Voltage Control via External Voltage/Resistance

To cancel, select Item number 70 and set the parameter to 0 with the CURRENT dial.

## Controlling with External Analog & Contact Signals

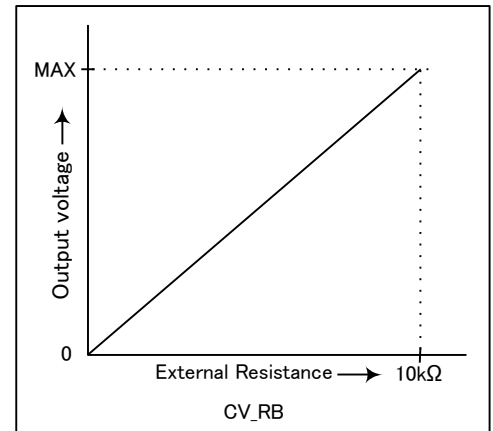
### 2. Output Voltage Control with External Resistance (B)

This section describes how to set the output voltage to zero when the external resistance value is zero (short).

The output voltage is derived from the following formula.

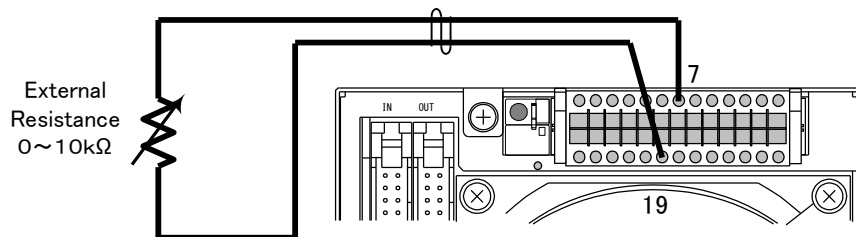
$$\text{Output Voltage[V]} = \text{Max. Output Voltage[V]} \times \frac{\text{External Resistance[k}\Omega\text{]}}{10}$$

The output accuracy for the external resistance, is the set voltage  $\pm(0.1\%$  of Rated Output Voltage).



### Connecting

Connect the resistor to accessory connector terminals No.7 and 19.



#### Caution

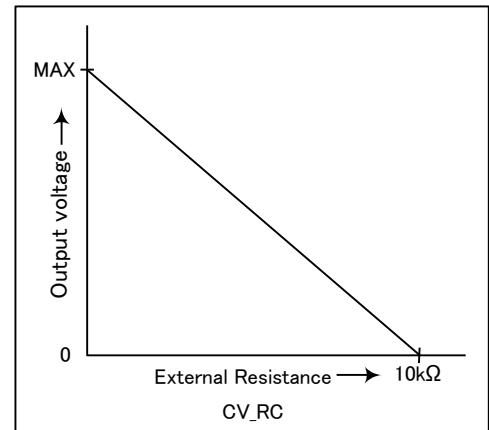
The External Resistance A, B, and C and the External Voltage cannot be used together to control the output. If the external resistance opens for even a second the output will generate an over voltage.

### Setting Procedures

Set to parameter 3 (External Resistance Type B) according to the procedure on page 133.

## 3. Output Voltage Control with External Resistance (C)

This section describes how to set the output voltage zero when the external resistance value is 10kΩ.



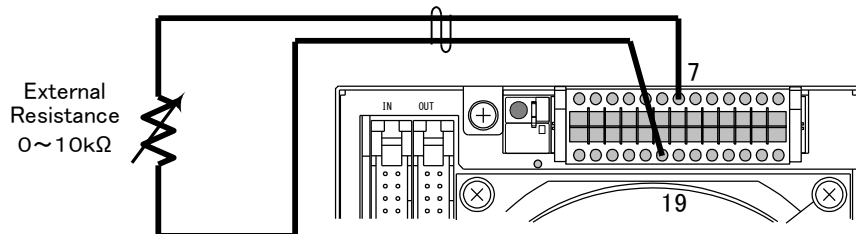
The output voltage is derived from the following formula.

$$\text{Output Voltage[V]} = \text{Max. Output Voltage[V]} - \left( \text{Max. Output Voltage[V]} \times \frac{\text{External Resistance[k}\Omega\text{]}}{10} \right)$$

The output accuracy for the external resistance, is the set voltage  $\pm(0.1\%$  of Rated Output Voltage).

## Connecting

Connect the resistor to accessory connector terminals No.7 and 19.



### Caution

The External Resistance A, B, and C and the External Voltage cannot be used together to control the output.

### MEMO

The system is a fail safe method and is such that if the External Resistance opens, the Output Voltage will become zero.

## Setting Procedures

Set to parameter 4 (External Resistance Type C) according to the procedure on page 133.

## Controlling with External Analog & Contact Signals

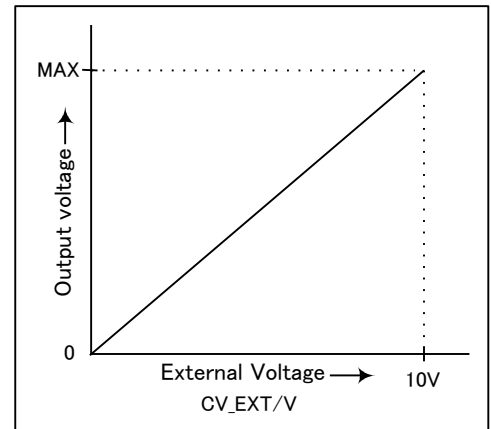
### Output Voltage Control with External Voltage

Output voltage is proportionate to the external DC voltage.  
Outputs from 0 to a maximum output voltage of 80V for external voltages 0 to 10V.  
The external voltage uses what can produce a 1mA current.

The output voltage is derived from the following formula.

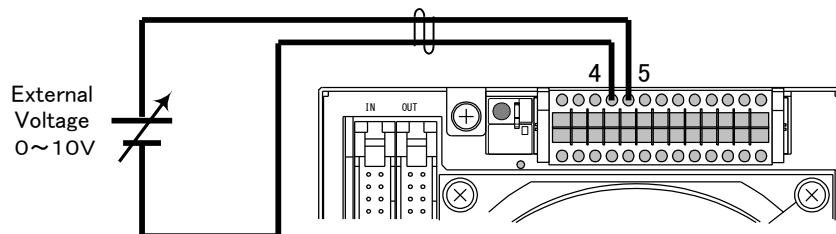
$$\text{Output Voltage[V]} = \text{Max. Output Voltage[V]} \times \frac{\text{External Voltage[V]}}{10}$$

The output accuracy for the external voltage,  
is the set voltage  $\pm$  (0.1% of Rated Output Voltage).



### Connecting

Connect the voltage source to accessory connector terminals No. 4 and 5



#### Caution

The External Resistance A, B, and C and the External Voltage cannot be used together to control the output.

### Setting Procedures

Set to parameter 1 (External Voltage) according to the procedure on page 133.

## Output Current Control (ZX-S Series Type-HA)

### Output Current Control via External Resistance

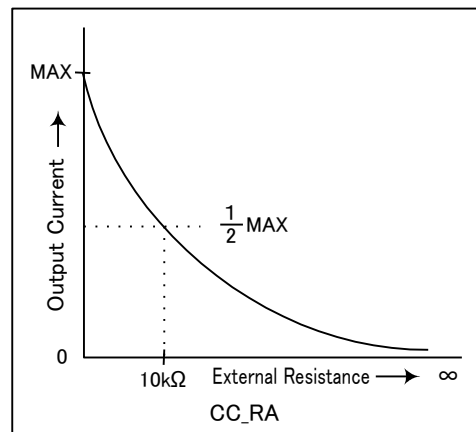
#### 1. Output Current Control via External Resistance (A)

This sections describes how to set the output current zero, when the external resistance value is infinite (open).

The output current is derived from the following formula.

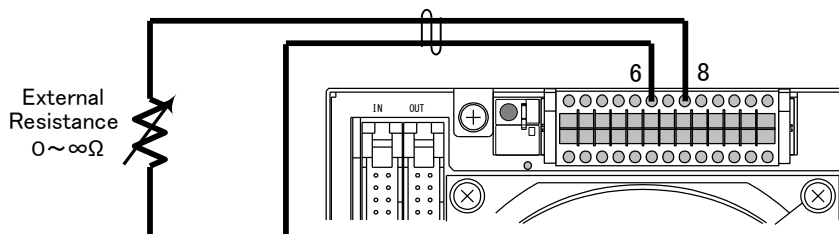
$$\text{Output Current[A]} = \text{Max. Output Current[A]} \times \frac{10}{\text{External Resistance[k}\Omega\text{]} + 10}$$

The output accuracy for the external resistance, is the set current  $\pm(1\%$  of Rated Output Current) when 10k $\Omega$



#### Connecting

Connect the resistor to accessory connector terminals No.6 and 18.



#### Caution

The External Resistance A, B, and C and the External Voltage cannot be used together to control the output.

#### Setting Procedures

Set to parameter 2 (External Resistance Type A) according to the procedure on page 138.

## Controlling with External Analog & Contact Signals

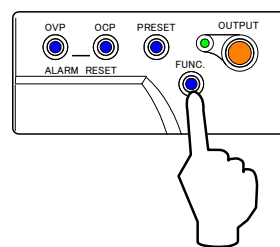
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### Setting Procedures

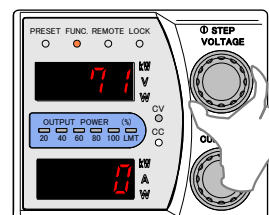
Press The Function “FUNC.” key.

FUNC. lamp will light.

Settings Item Number (top) and parameters (bottom) will appear in the Number Display

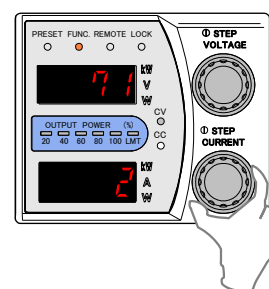


Select Item number 71 with the VOLTAGE dial.



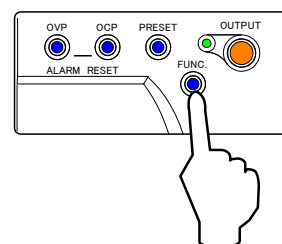
Change the parameters with the CURRENT dial.

- 1 = External Voltage ( $0 \sim 10V$ )
- 2 = External Resistance ( $0 \sim \infty \Omega$ : A)
- 3 = External Resistance ( $0 \sim 10k \Omega$ : B)
- 4 = External Resistance ( $0 \sim 10k \Omega$ : C)



Press the FUNC. key again to finish.

Returns the Number Display back to measurement display mode.



### Canceling Output Voltage Current via External Voltage/Resistance

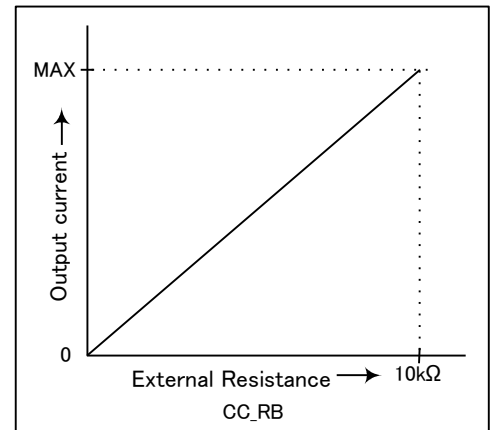
To cancel, select Item number 70 and set the parameter to 0 with the CURRENT dial.

## 2. Output Current Control via External Resistance (B)

This sections describes how to set the output current to zero when the external resistance value is zero (short).

The output current is derived from the following formula.

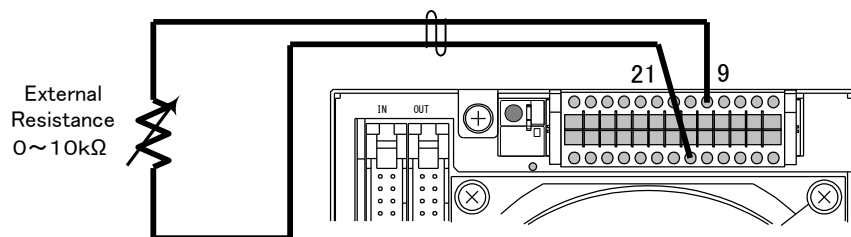
$$\text{Output Current[A]} = \text{Max. Output Current[A]} \times \frac{\text{External Resistance[k}\Omega\text{]}}{10}$$



The output accuracy for the external resistance,  
is the set current  $\pm$  (0.5% of Rated Output Current).

### Connecting

Connect the resistor to accessory connector terminals No.9 and 21.



### Caution

The External Resistance A, B, and C and the External Voltage cannot be used together to control the output.  
If the external resistance opens for even a second, the output will generate an over current.

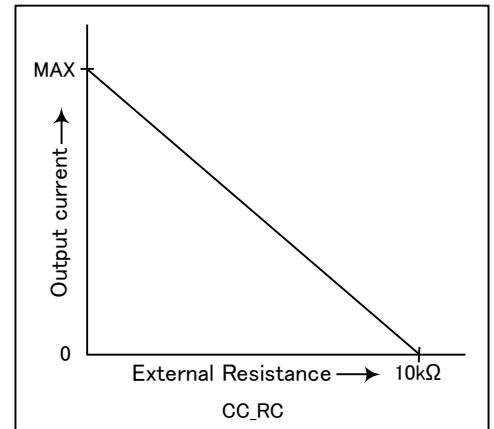
### Setting Procedures

Set to parameter 3 (External Resistance Type B) according to the procedure on page 138.

### 3. Output Current Control via External Resistance (C)

This sections describes how to set the output current zero when the external resistance value is 10kΩ

The output current is derived from the following formula.

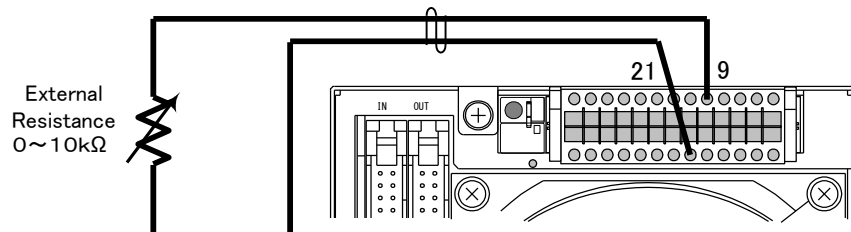


$$\text{Output Current[A]} = \text{Max. Output Current[A]} - \left( \text{Max. Output Current[A]} \times \frac{\text{External Resistance[k}\Omega\text{]}}{10} \right)$$

The output accuracy for the external resistance,  
is the set current  $\pm$ (0.5% of Rated Output Current).

### Connecting

Connect the resistor to accessory connector terminals No.9 and 21.



#### Caution

The External Resistance A, B, and C and the External Voltage cannot be used together to control the output.  
The system is a fail safe method and is such that if the External Resistance opens, the Output Current will become zero.

### Setting Procedures

Set to parameter 4 (External Resistance Type C) according to the procedure on page 138.



### Output Current Control via External Voltage

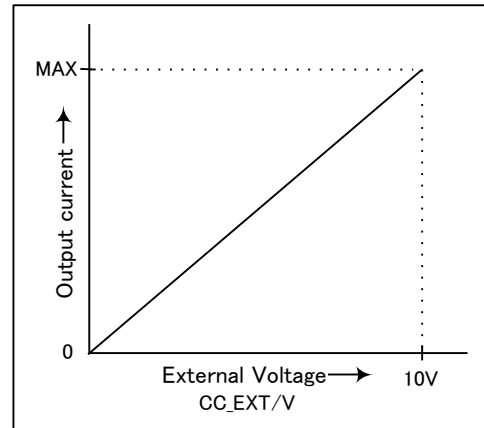
Outputs current, which is proportionate to the direct current voltage added from external voltage.

Outputs from 0 to a maximum output current of 40V for external voltages 0 to 10V.

The external voltage uses what can produce a 1mA current.

The output current is derived from the following formula.

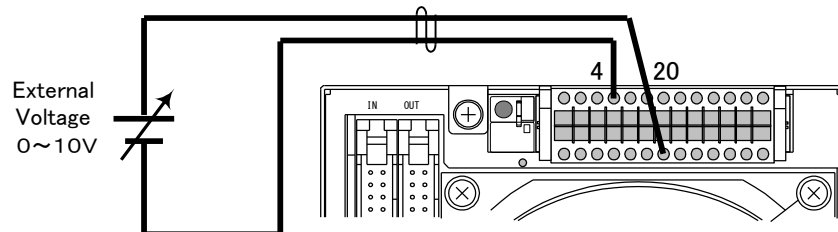
$$\text{Output Current[V]} = \text{Max. Output Current[V]} \times \frac{\text{External Voltage[V]}}{10}$$



The output accuracy for the external resistance, is the set current  $\pm$  (0.5% of Rated Output Current).

### Connecting

Connect the power supply to accessory connector terminals No.4 and 20.



### Setting Procedures

Set to parameter 1 (External Voltage) according to the procedure on page 138.

### Analog Output Monitor (ZX-S Series Type-HAN)

This can produce the DC voltage, which is proportional with the output voltage or output current.

Use when wishing to surveillance the output with an external meter or recorder.

Outputs a “0~10V” DC for output voltage/currents of “0 to rated output”.

Please use an input impedance of a 10k $\Omega$  or more for the external meter.

#### Output Voltage Monitor

The accuracy for the output voltage monitor is 0.2% $\pm$ 2mV

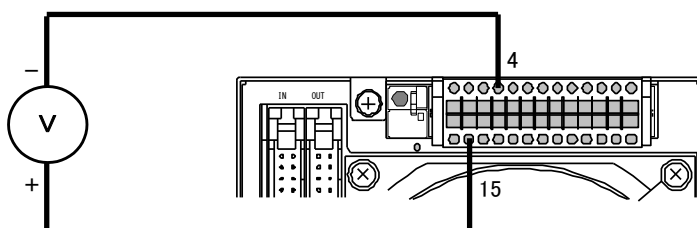


#### Caution

Control Common (No. 4 pin) is internally connected to the minus side of the output terminal.

#### Connecting

Connect the meter or recorder to accessory connector terminals No. 4 and 15.



#### Output Current Monitor

The accuracy for the output current monitor is 0.5% $\pm$ 2mV



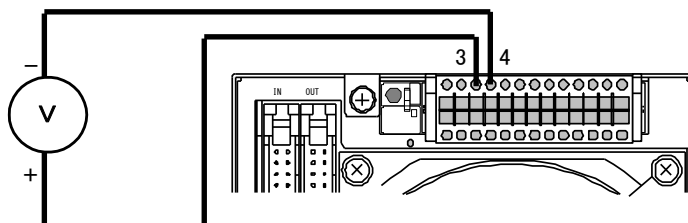
#### Caution

Output current wave forms cannot be observed by the current monitor.

Control Common (No. 4 pin) is internally connected to the minus side of the output terminal.

#### Connecting

Connect the meter or recorder to accessory connector terminals No. 3 and 4.

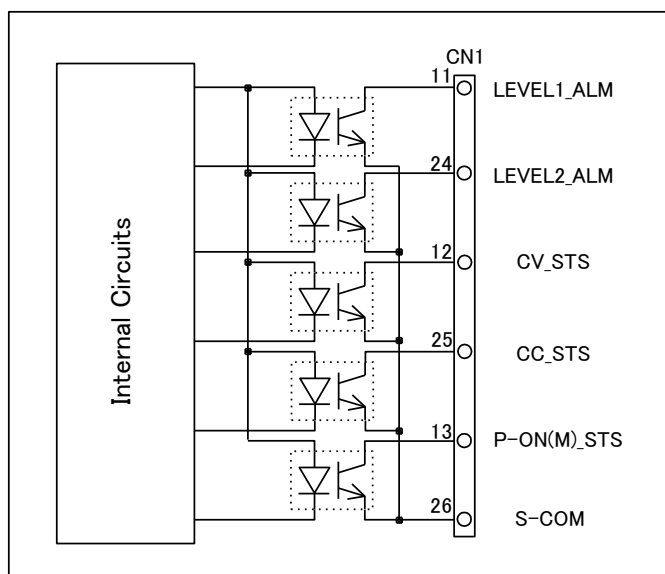


## Status Output (ZX-S Series Type-HAN)

This can externally output the operational status of the ZX-S Series power supply.

### Output Circuit

Output is given by an open collector insulated by a photocoupler.



### Status List

Output signal is negative logic. When output signal is ON between the collector and emitter, logic is 1.  
See the following for details on each terminal's signals.

| Terminal | Signal Name | Contents                                                                        |
|----------|-------------|---------------------------------------------------------------------------------|
| 11       | LEVEL1_ALM  | Light failure (OVP, OCP) has occurred.                                          |
| 24       | LEVEL2_ALM  | Alarm has occurred.<br>(Indude Several Alarms)                                  |
| 12       | CV_STS      | Running in Constant Voltage Mode. (※)                                           |
| 25       | CC_STS      | Running in Constant Current Mode. (※)                                           |
| 13       | P-ON(M)_STS | Internal rectification voltage and power supply for control circuits is normal. |
| 26       | S-COM       | Status Common.<br>Connected to emitters of each photocoupler.                   |

※ The CV\_STS signal and CC\_STS signal at the time of OUTPUT OFF are undefined.

### Status Output Electric Specifications

| Item                   | Specifications                               |
|------------------------|----------------------------------------------|
| Withstand Voltage      | DC500V (for DC output-Status Output-Chassis) |
| Max. Collector Voltage | 24V                                          |
| Max. Collector Current | 5mA                                          |

## Controlling with External Analog & Contact Signals

---

### LEVEL\_ALM1 Settings

This handles the operation mode's status signal as a LEVEL\_ALM1 (alarm status).

It can also be used for surveillance as an alarm when switching from constant voltage to constant current.

Status Signals that can be set in LEVEL1\_ALM

CV\_STS (Constant Voltage Operation)

CC\_STS (Constant Current Operation)

PL\_STS (Power Limiter Operation)

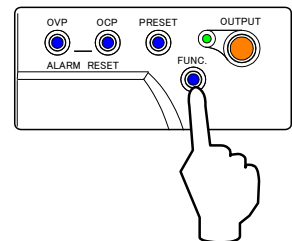
---

### Setting Procedures

**Press The Function "FUNC." key.**

FUNC. lamp will light.

Settings Item Number (top) and parameters (bottom) will appear in the Number Display.

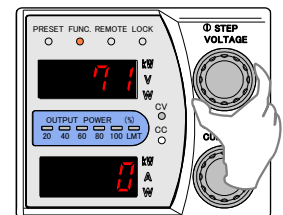


**Select the Item number with the VOLTAGE dial.**

Item 74 : CV\_STS

Item 75 : CC\_STS

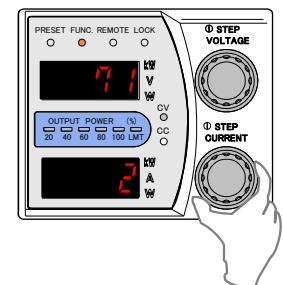
Item 76 : PL\_STS



**Change the parameters with the CURRENT dial.**

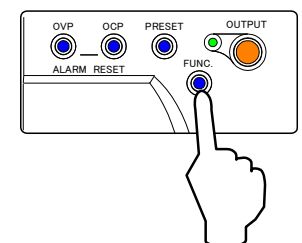
0=Not include in LEVEL\_ALM

1=Included in LEVEL\_ALM



**Press the FUNC. key again to finalize settings.**

Returns the Number Display to measurement display mode.



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# Special Loads

This section explains about charging and discharging of batteries, loads with reverse current, and pulse current loads as special loads.

## Battery Charging/Discharging

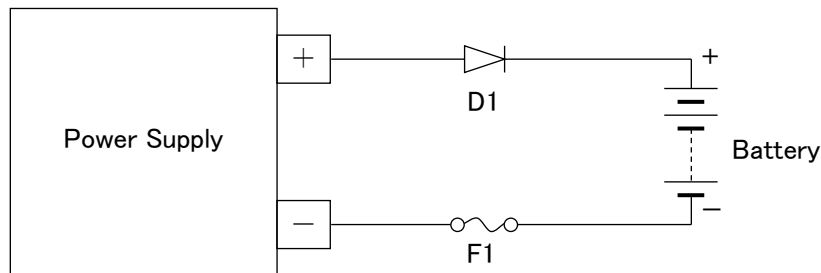
### Charging Battery

Batteries can be charged by constant-current automatically.  
Set the charge current and charge terminal voltage beforehand.

#### Connecting

Connect as shown in the below diagram. D1 acts as a reverse current blocking diode by preventing surge currents from flowing into the power supply's output capacitor when connecting the battery.

Note the reverse voltage and current capacity when selecting D1. In general, when charge current is above 2A, it is necessary to cool D1 by attaching an appropriate radiator to it.



Connection for Battery Charging



#### Caution

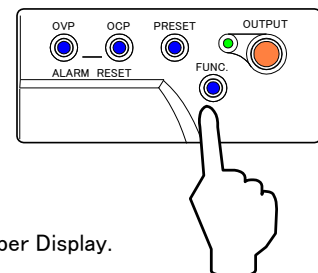
The power supply internals will burn out if the battery polarity is connected in reverse.  
To prevent this, it is recommended to use fuses (F1).

Set the OUTPUT key settings to TOGGLE when the input power switch is turned ON.  
(Factory default settings)

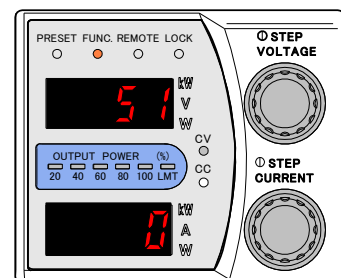
Press The Function "FUNC." key.

FUNC. lamp will light.

Settings Item Number (top) and parameters (bottom) will appear in the Number Display.

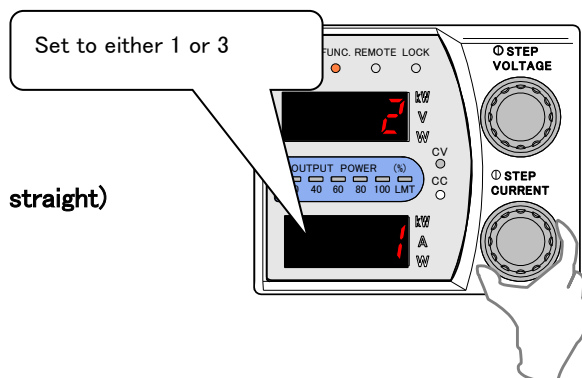


Select Item number 51 with the VOLTAGE dial and set the value to 0 with the CURRENT dial.

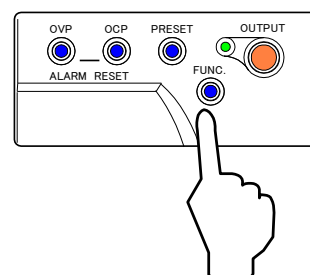


⇒Continued on next page

Select Item number 2 with the VOLTAGE dial and set the value to 1 (CC priority, speed) or 3 (CC priority, straight) with the CURRENT dial.



When finished, press the FUNC. key again to finalize settings.



Press the PRESET key and set the charge current with the CURRENT dial.

See “Operating as a Constant Current Power Supply” on how. ⇒page 20

Set the charge terminal voltage with the VOLTAGE dial.

Set only the forward voltage to D1, high (0.6V~0.8V).

When finished, press the FUNC. key again to finalize settings.

Press the OUTPUT key to begin testing.

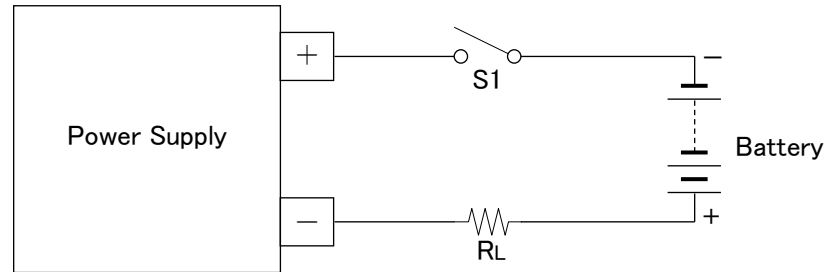
As charging with the constant-current progresses, switch to constant-voltage with the charge terminal voltage.

## Special Loads

---

### Discharging Battery

Batteries can be discharged by constant-current.  
An external resistive load and switch is required.



#### Constant-Current Discharging of Battery

The discharge resistance is derived from the following formula.

$$R_L = \frac{\text{Open-Circuit Voltage of Battery (V)}}{\text{Discharge Current (A)}} \quad (\Omega)$$

---

Open S1. Turn the power supply's POWER switch ON.

---

Press the PRESET key and set the discharge current with the CURRENT dial.

See "Operating as a Constant Current Power Supply" on how.

---

Set the maximum voltage with the VOLTAGE dial.

Deriving the maximum output voltage( $V_{MAX}$ ):

$$V_{MAX} = \text{open-circuit voltage of battery} - \text{discharge terminal voltage (V)}$$

---

When finished, press the FUNC. key again to finalize settings.

---

Close S1 and press the OUTPUT key to begin testing.

---

When the discharge terminal voltage is reached, open S1 to stop discharging.



#### Caution

As long as S1 is closed, the battery will continue to discharge regardless of the power supply's output ON-OFF status.



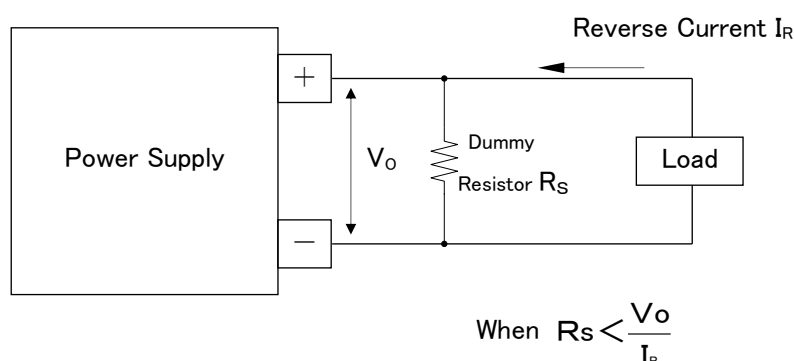
## Loads with Reverse Current



### Caution

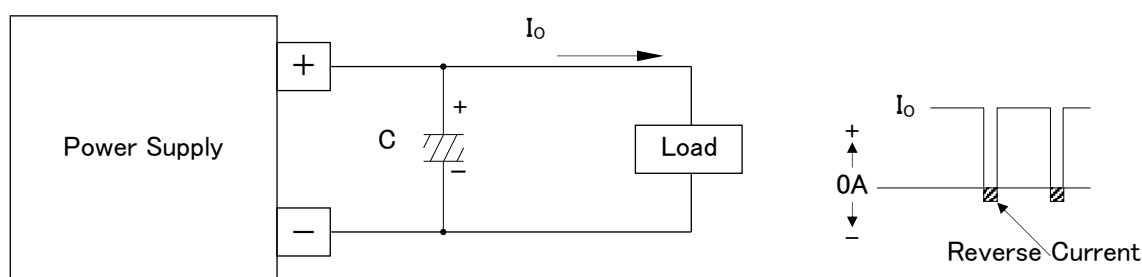
The ZX-S Series power supply does not possess any function which will stabilize the output voltage against the reverse current generated from the load. If the maximum sink current (0.4A) is exceeded, the output voltage will rise above the rated value and burn-out the internal circuits. Please do not apply voltages to the output terminal which exceed the power supply's rating.

The dummy resistor will shunt the reverse current and prevent the output voltage from rising.



Reverse-Current Absorption by Dummy Resistor

Also, for pulse reverse current, the average current value when the flow is in the supply direction, can be stabilized by connecting capacitor (1000MF~10000  $\mu$ F) in parallel.



For Pulse Reverse Current



### Caution

Please do not apply voltages to the output terminal which exceed the power supply's rated output voltage.

Please use specialized break units etc. to suppress the generation of over voltage when there is regenerative reverse current in the motor inverter load.

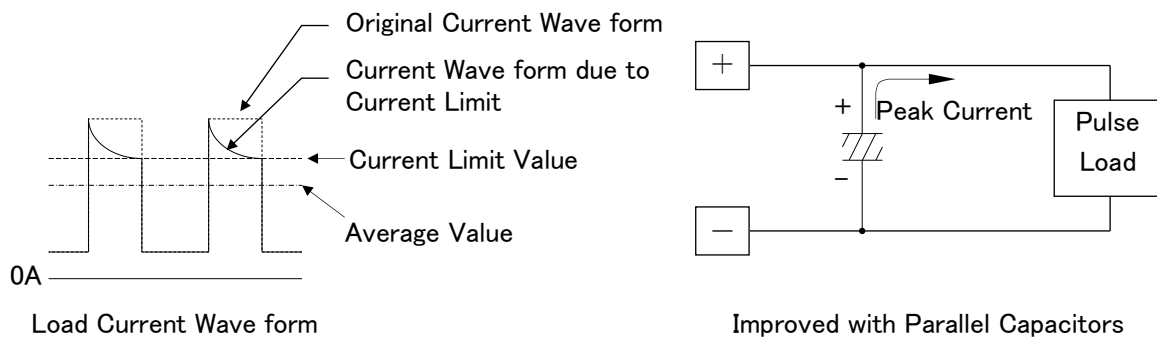
### Pulse Current Loads

If the load current exceeds the constant current (current limit) value for even a moment, the constant current circuits will trigger. Further, if the output power exceeds the rating even for a moment the power limit circuit will trigger. In these cases, the output voltage will become unstable.

Please take caution so that the peak current does not exceed the current limit value when the load current is in a pulsing state. This cannot be determined by this device's ammeter alone due that it only displays the average output current value.

If the constant current circuit (power limit circuit) is triggered intermittently by the peak current, the CC lamp or LIMIT lamp will appear dimly lit or blinking.

For this type of load, stability can be improved by connecting high-capacity capacitors to the load in parallel.



For Pulse Current Loads

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# Maintenance

This section covers warranty period, maintenance service, daily inspection, and troubleshooting.

## Warranty Period

The warranty period for the ZX-S Series power supply is 1 year from the day of purchase. During this period Takasago Co., Ltd will take full responsibility for any damages caused to the product due to manufacturing or degradation of parts, and shall repair free of charge. However, repairs for damages incurred to the product due to natural disasters, improper use, etc., or Takasago products, which have been modified by some other entity other than Takasago, shall impose a fee.

### Requests

When making repair requests, please include the device's product number (12 digit number at base of product) and firmware version number (See page 16).

## Daily Maintenance and Inspection

Please perform periodic inspections of the device to maintain product performance and prevent unforeseen accidents.

In particular, due to the easy accumulation of dust by the air filter, please clean the air filter before dust accumulation becomes serious.



### Danger

Some parts within the device will generate high voltages. Touching these parts will cause electric shock.

Do not allow anyone other than employees or directed servicemen of Takasago to remove the cover, disassemble, etc., the product.

## Cleaning Air Filter

Disconnect the power supply's power cable from the input power source.

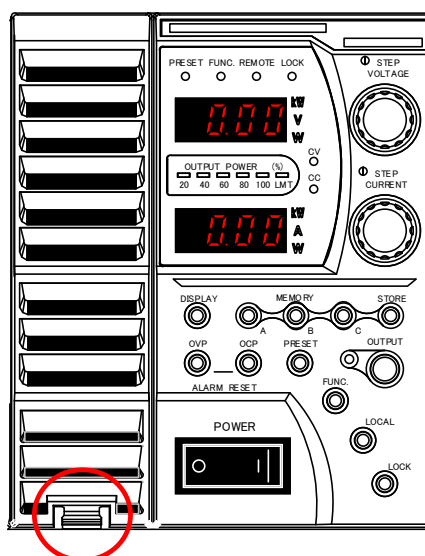
(Or, in the case of the ZX-S-400HN, 800HN types, remove the input power cable from the rear inlet connector.)

Remove the front ventilation panels.

Remove dust using an air gun or vacuum cleaner.

If accumulation is severe, wipe the area with a synthetic detergent diluted in water, and allow it to dry before attaching the panel.

### To remove the panel



Push up on the arrow area

※Example with ZX-S-400HN

## Cleaning Panels

Using a synthetic detergent diluted in water, wipe the panels lightly using a cloth and then wipe with a dry cloth.

Do not use solvents such as paint thinner or benzene.

## Inspecting Cables & Terminal Blocks

Please inspect for any scratches on the input power cable and for cracks and damages on the input and output terminal blocks.

## Welded Fuses

If fuses are welded there is problem with the power supply. Repairs are required. Do not exchange the fuses.

### Replacing Fan Motor

The lifespan of the fan motor when used at the rated output power is approximately 60,000 hours in a 25°C temperature environment. If air flow decreases, there may be trash or dust stuck. Please first clean the air filter. If air flow does not improve after cleaning or if noises are emitting from the fan, the fan motor should be replaced.



#### Caution

Only 400HN/HAN fan motors can be replaced.

Please contact the Takasago sales department to order the replacement of 800H/HA and 1600H/HA fan motors.

#### MEMO

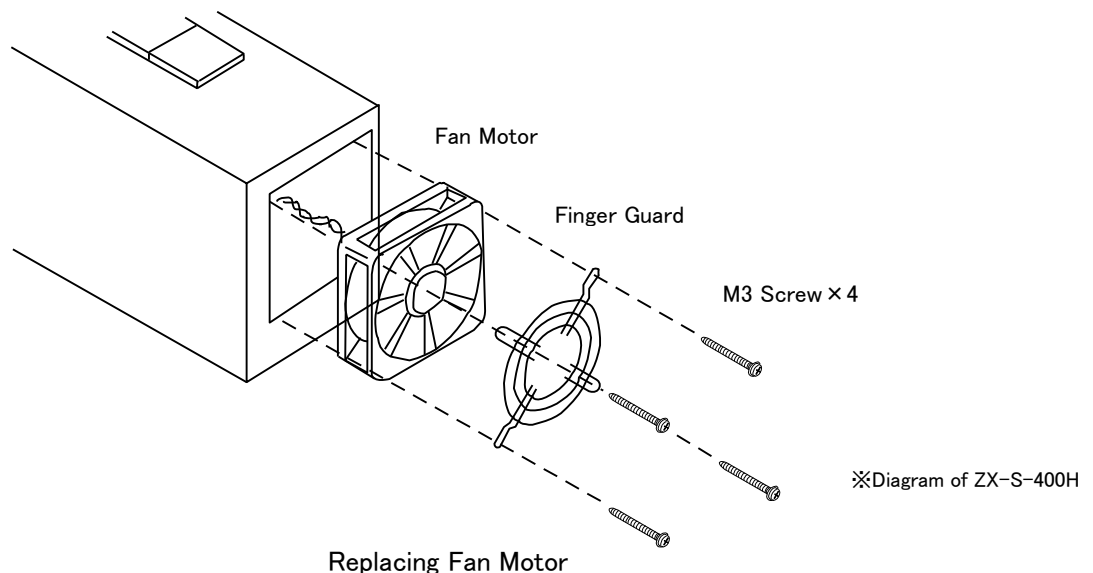
Fan revolution responds to and is controlled by the output power and output current.

Therefore, if the output power or output current is low, air flow will decrease.

(The fan will rotate at a low speed if no load is attached.)

Replacement can be done by the owner. For this, a plus screwdriver for a 3mm screw is required.

- 1) Ready the new fan motor (connectors attached).  
(Contact the Takasago sales department for place of purchase.)
- 2) Disconnect the power cable from the input power source.  
(Or, in the case of the ZX-S-400HN, 800HN types, remove the input power cable from the rear inlet connector.)
- 3) Wait for at least 3 minutes for the internal voltage to decrease.
- 4) Remove and replace the fan motor as shown below.



- ① Remove the four M3 screws attached to the fan motor. Pull out the fan motor.
- ② Disconnect the power wire connector (black) attached to the circuit board.
- ③ Connect the new fan motor's connector. Insert the fan motor while being careful not to pinch the wire between the fan motor and rear panel and screw in the four screws.
- ④ Connect to the input power supply and turn the POWER switch ON. Verify that the fan rotates.

## Lifespan of Parts

This product uses parts possessing lifespans as follows.

Differences in the lifespan may arise due to way of use. The reference table below is a general lifespan of parts. It is recommend changing parts after 5 and 10 years to ensure prolong use.

| Part \ Year                     | 0~1                 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Remarks |
|---------------------------------|---------------------|---|---|---|---|---|---|---|---|----|----|----|---------|
| Fan                             | Initial Malfunction |   |   |   |   |   |   |   |   |    |    |    |         |
| Relay                           |                     |   |   |   |   |   |   |   |   |    |    |    |         |
| Aluminum Electrolytic Capacitor |                     |   |   |   |   |   |   |   |   |    |    |    |         |



### Caution

Please be careful not to place this product in high temperature and humidity environments, areas with corrosive gases, dust or oils. Doing so will shorten the lifespan of parts.

# Calibration

## Calibrating Output Settings

### Preparation

The following measuring devices are required for calibration.

#### 1. Digital Multimeter for Voltage/Current

##### Measurement- 1 set

No. of Display Digits : 5 1/2 or more

Display Accuracy : 0.005% or more

(Possesses a measuring range from 1mV~1000V)

#### 2. Shunt Resistor for Current Measurement- 1 set

10A/50mV 0.1% accuracy (400HN/HAN)

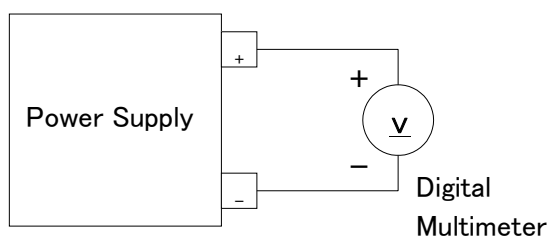
25A/50mV 0.1% accuracy (800HN/HAN)

50A/50mV 0.1% accuracy (1600HN/HAN)

## Offset/Full Scale Calibration of Output Voltage Settings

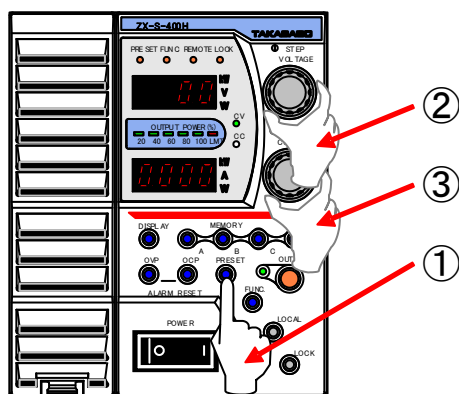
1. Disconnect the load wires and remote sensing wires.  
Connect the digital multimeter to the output terminal.

In advance, turn POWER switch ON and OUTPUT OFF.



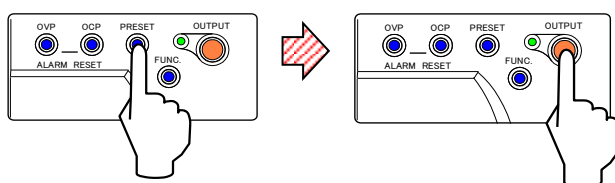
Calibration Circuit

2. Press the PRESET key ① and set to "0.1V" with the VOLTAGE dial ② and "1.00A" with the CURRENT dial ③.

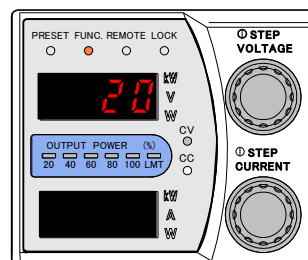


(See Operating as Constant Voltage Power Supply under Basic Operations on how.)

3. Press the PRESET key again and then press the OUTPUT key to set output to ON.



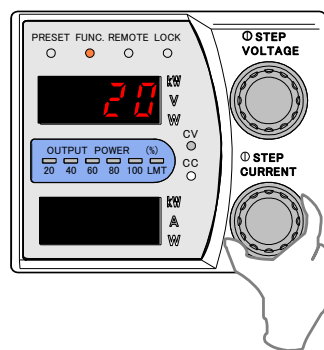
4. Press the FUNC. key and change the top Number Display to Settings Item 20 with the VOLTAGE dial.



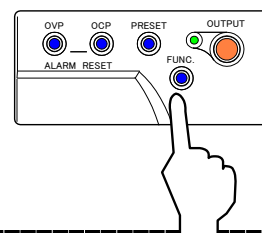
### MEMO

FUNC. lamp will light and the display at bottom Number Display will disappear.

5. Adjust so that the digital multimeter (used for output voltage measurement) displays "0.100V" with the CURRENT dial.

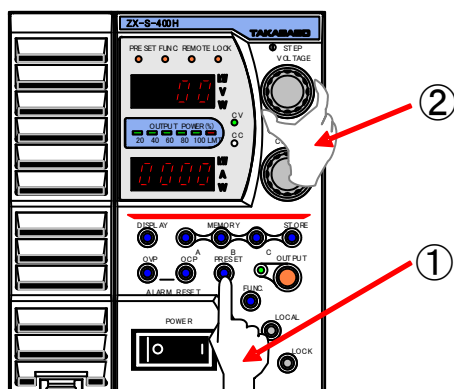


6. Press the FUNC. key to complete offset calibration of the output voltage settings.



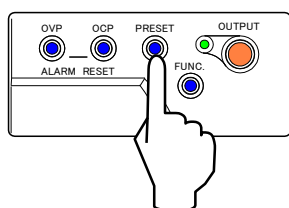


7. Press the PRESET key ①. Set to “640.0V” with the VOLTAGE dial ②.

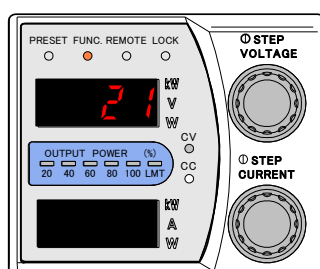


(See Operating as Constant Voltage Power Supply under Basic Operations on how.)

8. Press the PRESET key.



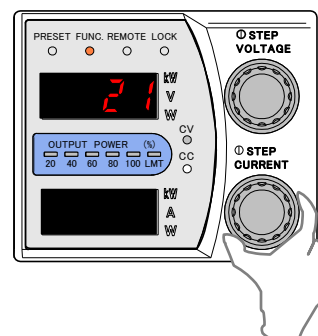
9. Press the FUNC. key and change the top Number Display to Settings Item 21 with the VOLTAGE dial.



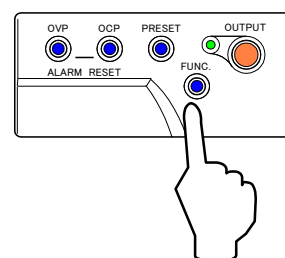
## MEMO

FUNC. lamp will light and the display on the bottom Number Display will light out.

10. Adjust so that the digital multimeter (used for output voltage measurement) displays “640.00V” with the CURRENT dial.



11. Press the FUNC. key to complete full-scale calibration of the output voltage settings.



12. This completes offset/full-scale calibration of Output Voltage Settings.

Please return the voltage/current set values back to normal before use.



## Caution

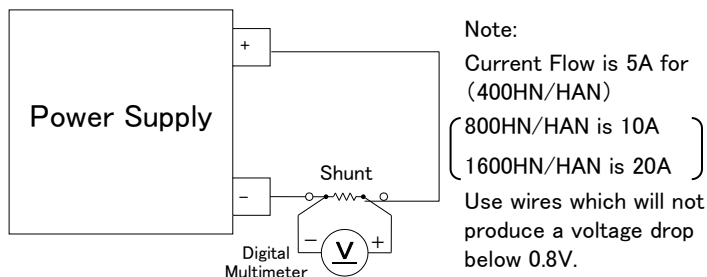
Be certain to perform this along with meter calibration (Offset/Full-Scale Calibration of Voltmeter.)

## Calibration

### Offset/Full-Scale Calibration of Output Current Settings

#### 1. Perform load with only the shunt resistor.

Disconnect the load wires and remote sensing wires.  
Connect the shunt to the output terminal.  
Connect the digital multimeter to the voltage terminal located on the shunt resistor.  
Turn the POWER switch ON and OUTPUT OFF in advance.

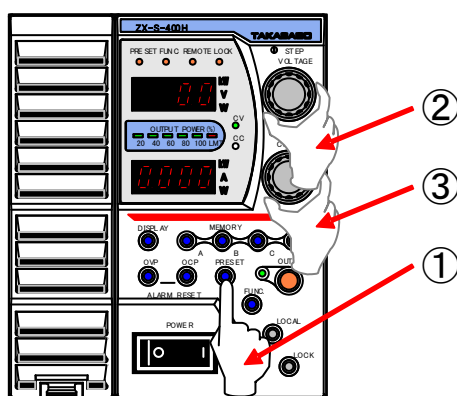


#### Caution

Set FUNCTION Settings Item 1, Sink Function, to 1 (1=ON) and Settings Item 13, Linearity compensation Function, to 0(0=OFF) beforehand.

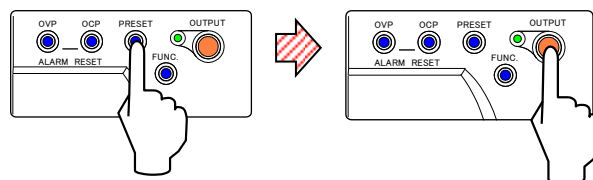
Calibration Circuit

#### 2. Press the PRESET key ①. Set the CC set value to "0.01A" (※) with the CURRENT dial ③ and set the CV set value to "1.00V" with the Voltage dial ②.

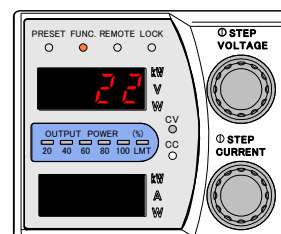


(See Operating as Constant Current Power Supply under Basic Operations on how.)

#### 3. Press the PRESET key again and then press the OUTPUT key to set output to ON.



#### 4. Press the FUNC. key and change the top Number Display to Settings Item 22 with the VOLTAGE dial.



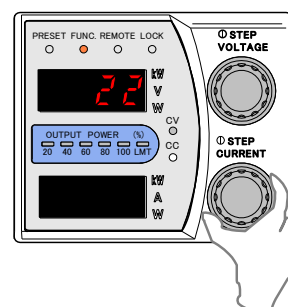
#### MEMO

FUNC. lamp will light and the display on the bottom Number Display will light out.

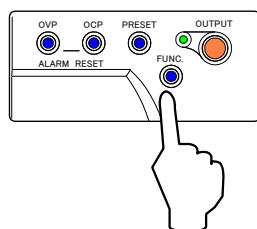
#### 5. Adjust so that the digital multimeter (used for current measurement) displays to "0.010mV" (For 400HN use 10mA) (※) with the CURRENT dial.

※For 800HN/HAN use "0.005mV" (equivalent to 10mA)

For 1600HN/HAN use "0.025mV" (equivalent to 100mA)



6. Press the FUNC. key to complete offset calibration of the output current settings.

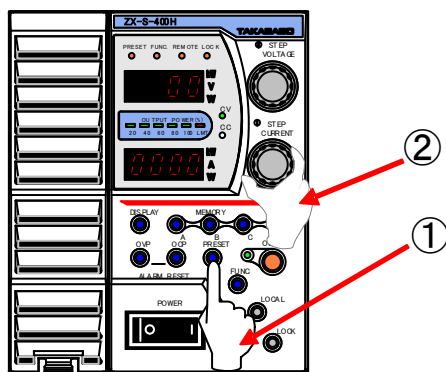


7. Press the PRESET key ① and set the CC set value to below(※) with the CURRENT dial ②.

※For 400HN/HAN set to “5.000A”

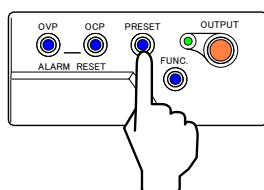
For 800HN/HAN set to “10.00A”

For 1600HN/HAN set to “20.00A”

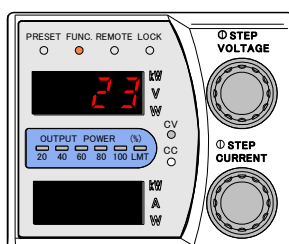


(See Operating as Constant Current Power Supply under Basic Operations on how.)

8. Press the PRESET key.



9. Press the FUNC. key and change the top Number Display to Settings Item 23 with the VOLTAGE dial.



#### MEMO

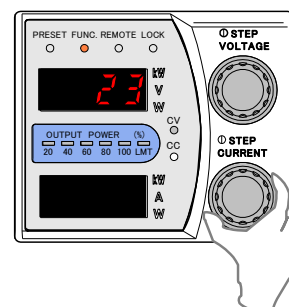
FUNC. lamp will light and the display on the bottom Number Display will light out.

10. Adjust so that the digital multimeter (used for output current measurement) displays “25.00mV” (※) with the CURRENT dial.

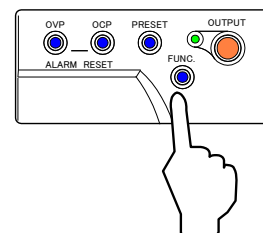
※For 400HN/HAN equivalent to 5A at 25.00mV

For 800HN/HAN equivalent to 10A at 20.00mV

For 1600HN/HAN equivalent to 20A at 20.00mV



11. Press the FUNC. key to complete full-scale calibration of the output current settings.



12. This completes offset/full-scale calibration of Output Current Settings.

Please return the voltage/current set values back to normal before use.



#### Caution

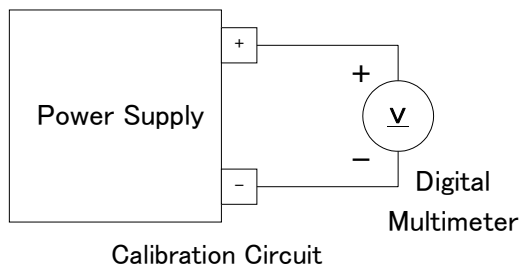
Be certain to perform this along with meter calibration (Offset/Full-Scale Ammeter Calibration.)

### Offset/Full-Scale Calibration of Output Voltage with External Analog Values

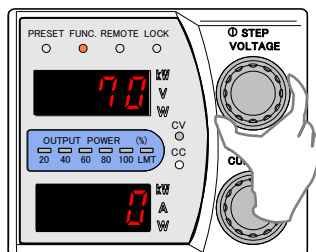
(ZX-S Type-HAN)

#### Output Voltage Control with External Voltage

1. Disconnect the load and remote sensing wires and connect the digital multimeter to the output terminal. Turn the POWER switch ON and OUTPUT OFF in advance.

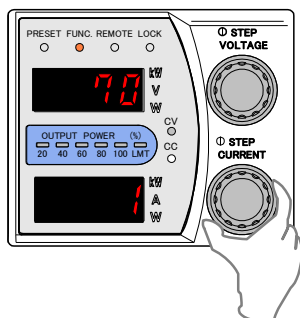


2. Change the top Number Display to Settings Item 70 with the VOLTAGE dial.

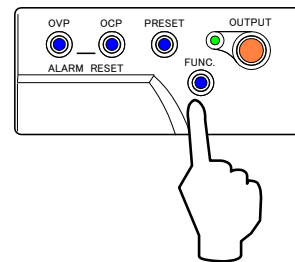


3. Change set value to 1 with the CURRENT dial.

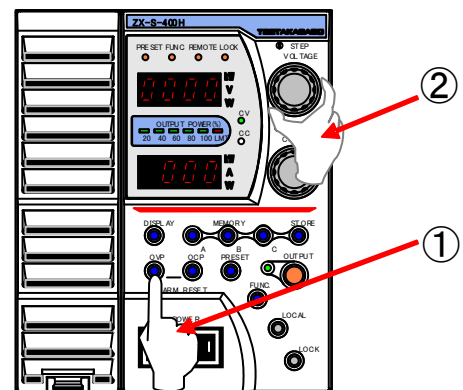
1: External Voltage (0~10V)



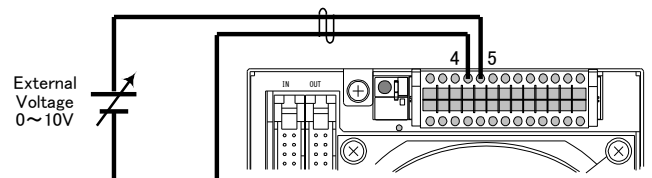
4. Press FUNC. key again to finalize settings.



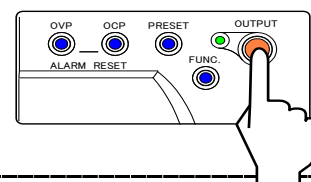
5. Press the OVP key ①. Set to "704.0V" with the VOLTAGE dial ②.



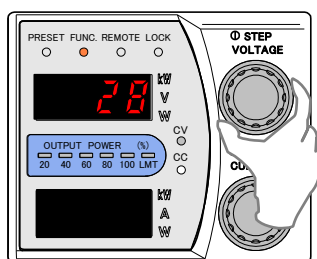
6. Input an external voltage of "0.00V".



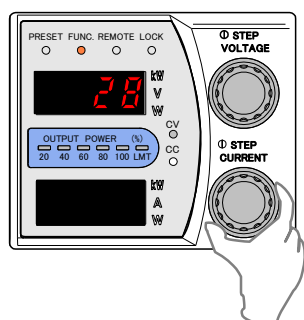
7. Press the OUTPUT key to set output to ON.



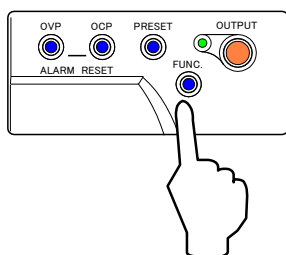
8. Press the FUNC. key and change the top Number Display to Settings Item 28 with the VOLTAGE dial.



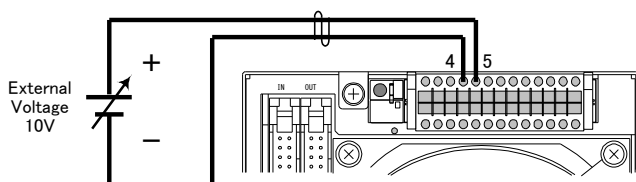
9. Adjust so that the digital multimeter (used for output voltage measurement) displays “0.00V” with the CURRENT dial.



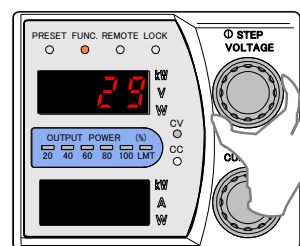
10. Press the FUNC. key to complete offset calibration of output voltage control with external voltage.



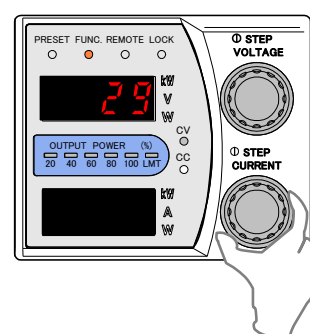
11. Set external voltage to “10.00V”.



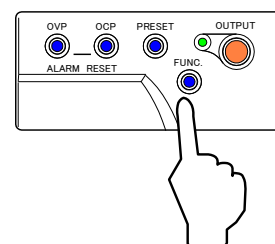
12. Press the FUNC. key and change the top Number Display to Settings Item 29 with the VOLTAGE dial.



13. Adjust so that the digital multimeter (used for output voltage measurement) displays to “640.0V” with the CURRENT dial.



14. Press the FUNC. key to complete full-scale calibration of output voltage control with external voltage.

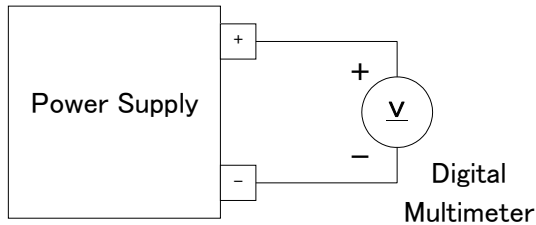


15. This completes offset/full-scale calibration of output voltage control with external voltage.

## Calibration

### Output Voltage Control with External Resistance (A)

1. Disconnect the load and remote sensing wires and connect the digital multimeter to the output terminal.  
Turn the POWER switch ON and OUTPUT OFF in advance.
4. Press the FUNC. key again to finalize settings.

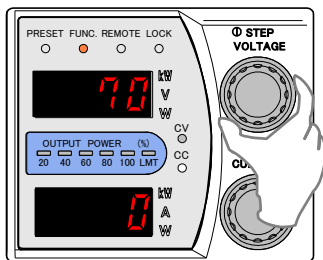


Calibration Circuit



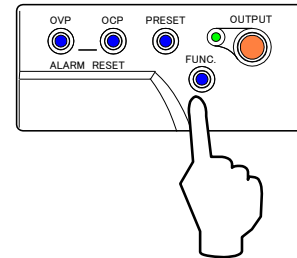
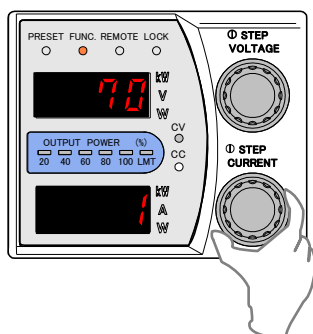
Set FUNCTION Settings Item 13, Linearity compensation Function, to 0 (0=OFF) beforehand.

2. Press the FUNC. key and change the top Number Display to Settings Item 70 with the VOLTAGE dial.

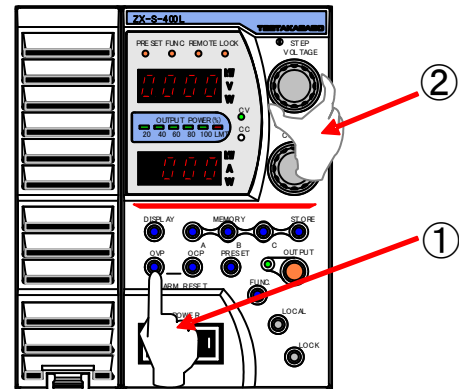


3. Change the set value to 2 with the CURRENT dial.

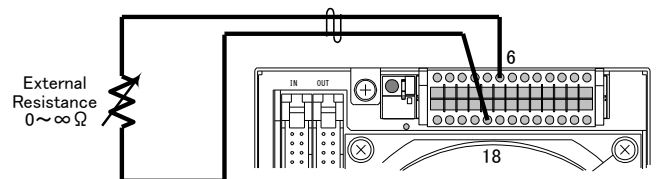
2: External Resistance ( $0 \sim \infty \Omega$  A)



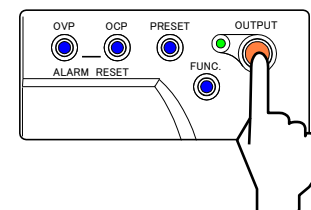
5. Press the OVP key ①. Set to "704.0V" with the VOLTAGE dial ②.



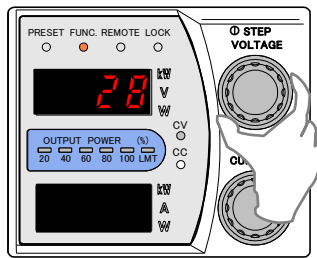
6. Set external resistance to infinity (open).



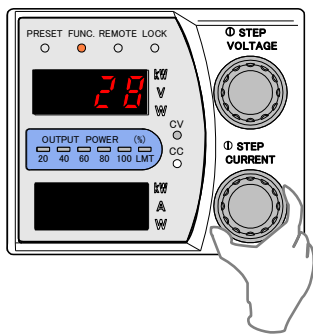
7. Press OUTPUT key to set the output to ON.



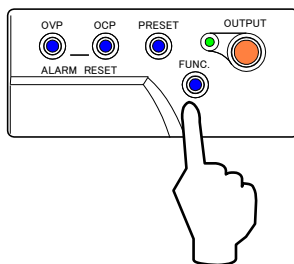
8. Press the FUNC. key and change the top Number Display to Settings Item 28 with the VOLTAGE dial.



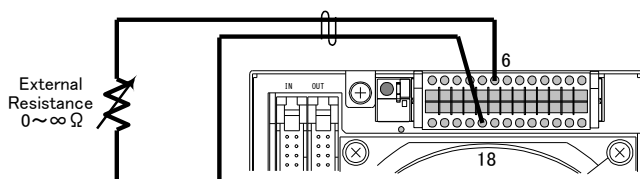
9. Adjust so that the digital multimeter (used for output voltage measurement) displays "0.00V" with the CURRENT dial.



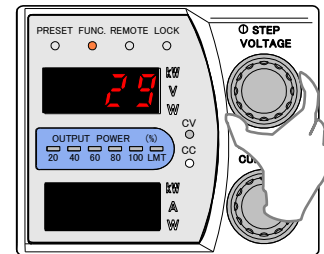
10. Press the FUNC. key to complete offset calibration of output voltage control with external resistance (A).



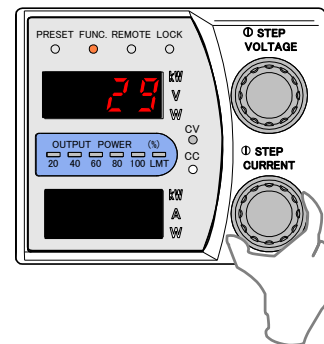
11. Set external resistance to 0  $\Omega$  (short).



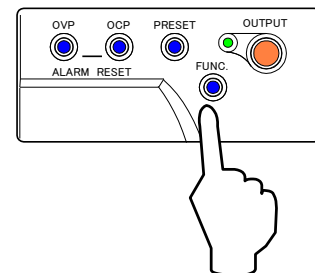
12. Press the FUNC. key and change the top Number Display to Settings Item 29 with the VOLTAGE dial.



13. Adjust so that the digital multimeter (used for output voltage measurement) displays to "640.0V" with the CURRENT dial.



14. Press the FUNC. key to complete full-scale calibration of output voltage control with external resistance (A).

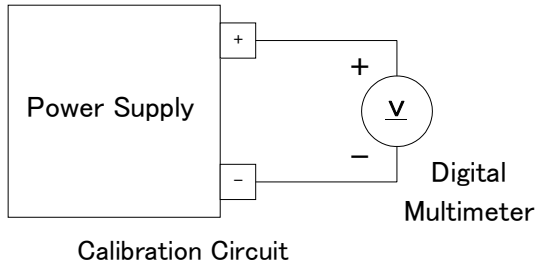


15. This completes offset/full-scale calibration of output voltage control with external resistance (A).

## Calibration

### Output Voltage Control with External Resistance (B)

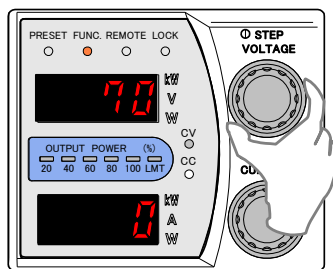
1. Disconnect the load and remote sensing wires and connect the digital multimeter to the output terminal.  
Turn the POWER switch ON and OUTPUT OFF in advance.



#### Caution

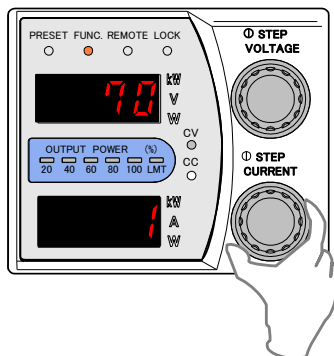
Set FUNCTION Settings Item 13, Linearity compensation Function, to 0 (0=OFF) beforehand.

2. Change the top Number Display to Settings Item 70 with the VOLTAGE dial.

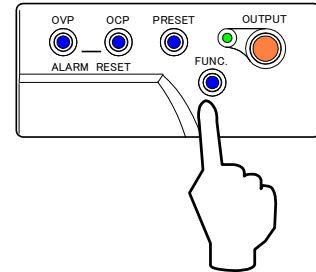


3. Change the set value to 3 (External Resistance B) with the CURRENT dial.

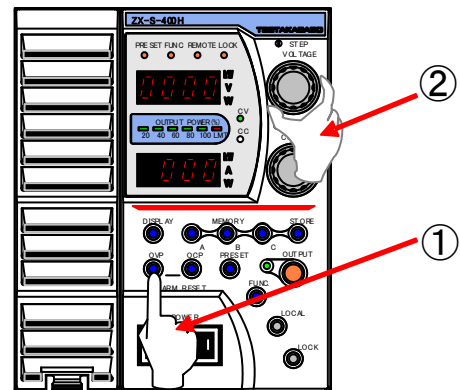
3: External Resistance (0~10kΩ B)



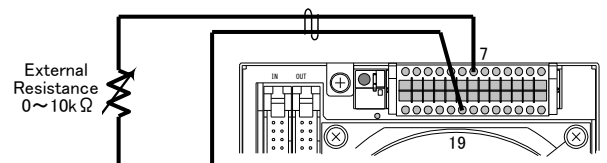
4. Press the FUNC. key again to finalize settings.



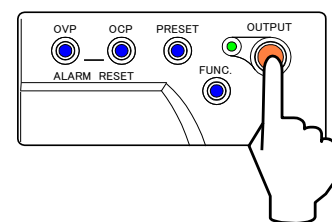
5. Press the OVP key ①. Set to "704.0V" with the VOLTAGE dial ②.



6. Set external resistance to 0Ω (short).

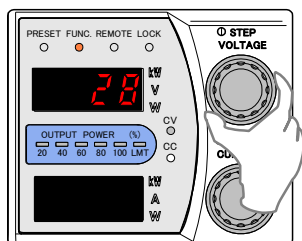


7. Press the PRESET key and then the OUTPUT key to set the output to ON.

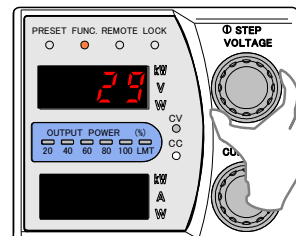




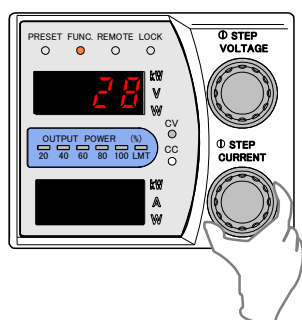
8. Press the FUNC. key and change the top Number Display to Settings Item 28 with the VOLTAGE dial.



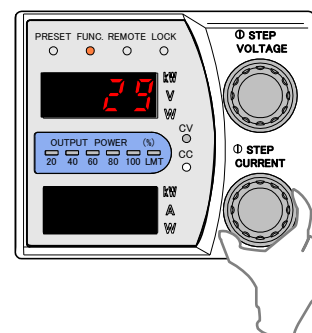
12. Press the FUNC. key and change the top Number Display to Settings Item 29 with the VOLTAGE dial.



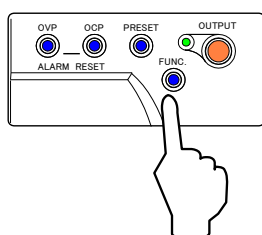
9. Adjust so that the digital multimeter (used for the output current measurement) displays "0.00V" with the CURRENT dial.



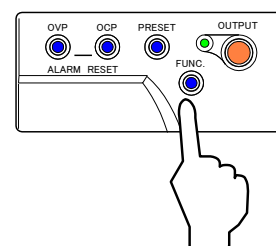
13. Adjust so that the digital multimeter (used for output voltage measurement) displays to "640.0V" with the CURRENT dial.



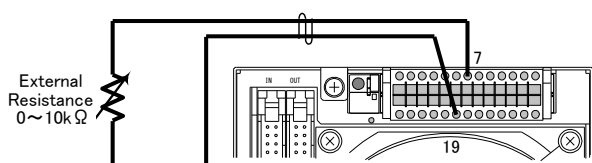
10. Press the FUNC. key to complete offset calibration of output voltage control via external resistance (B).



14. Press the FUNC. key to complete full-scale calibration of output voltage control with external resistance (B).



11. Set external resistance to 10k  $\Omega$

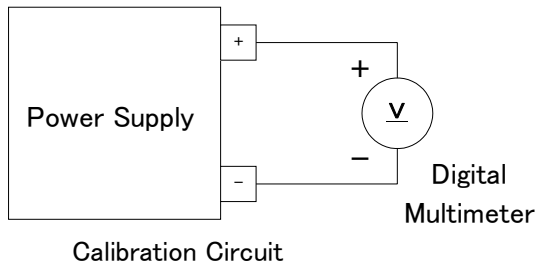


15. This completes offset/full-scale calibration of output voltage control with external resistance (B).

## Calibration

### Output Voltage Control via External Resistance (C)

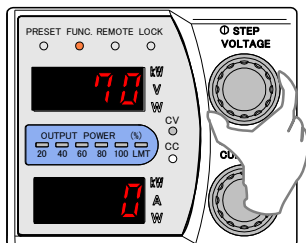
1. Disconnect the load and remote sensing wires and connect the digital multimeter to the output terminal. Turn the POWER switch ON and OUTPUT OFF in advance.



#### Caution

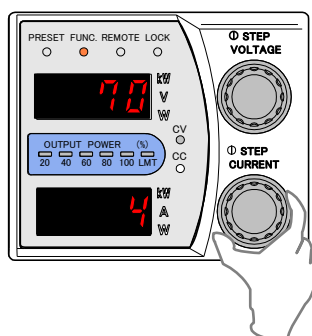
Set FUNCTION Settings Item 13, Linearity compensation Function, to 0 (0=OFF) beforehand.

2. Change the top Number Display to Settings Item 70 with the VOLTAGE dial.

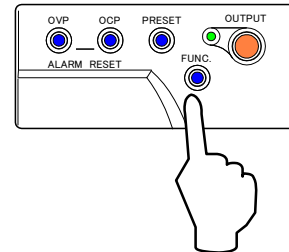


3. Change the set value to 4 (External Resistance C) with the CURRENT dial.

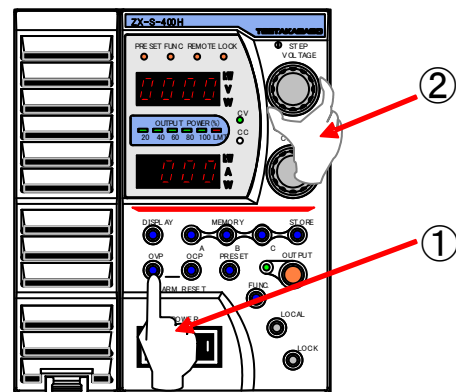
4: External Resistance (0~10k $\Omega$  C)



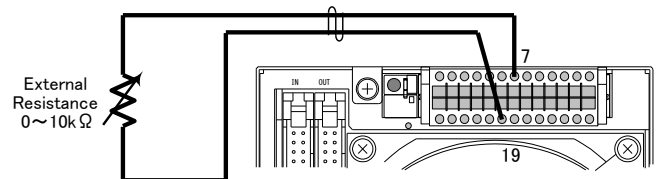
4. Press the FUNC. key again to finalize settings.



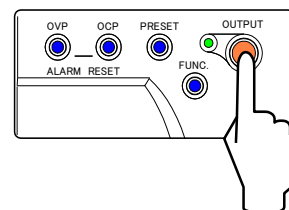
5. Press the OVP key ①. Set to "704.0V" with the VOLTAGE dial ②.



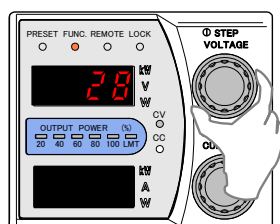
6. Set external resistance to 10k $\Omega$ .



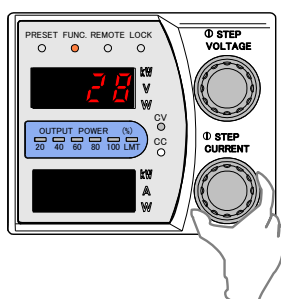
7. Press the OUTPUT key to set the output to ON.



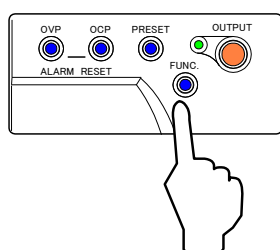
8. Press the FUNC. key and change the top Number Display to Settings Item 28 with the VOLTAGE dial.



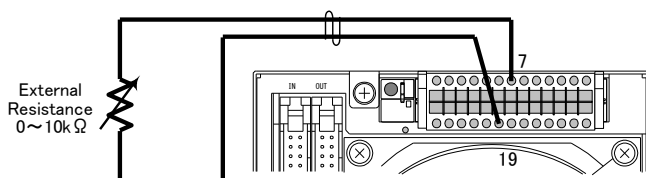
9. Adjust so that the digital multimeter (used for output voltage measurement) displays "0.00V" with the CURRENT dial.



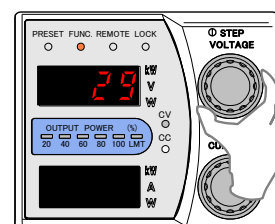
10. Press the FUNC. key to complete offset calibration of output voltage control with external resistance (C).



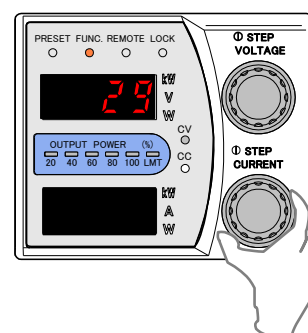
11. Set external resistance to 0Ω(short).



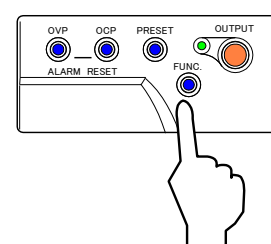
12. Press the FUNC. key and change the top Number Display to Settings Item 29 with the VOLTAGE dial.



13. Adjust so that the digital multimeter (used for output voltage measurement) displays to "640.0V" with the CURRENT dial.



14. Press the FUNC. key to complete full-scale calibration of output voltage control with external resistance (C).



15. This completes offset/full-scale calibration of output voltage control with external resistance (C).

## Calibration

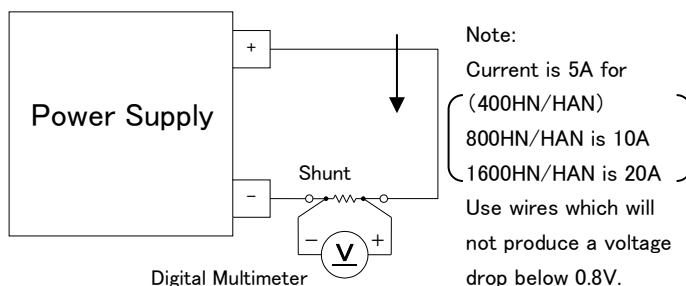
### Offset/Full-Scale Calibration of Output Current with External Analog Values (ZX-S Series Type-HAN)

#### Output Current Control with External Voltage

##### 1. Perform load with only the shunt resistor.

Disconnect the load wires and the remote sensing wires.  
Connect the shunt to the output terminal. Connect the digital multimeter to the voltage terminal located on the shunt.

Turn the POWER switch ON and OUTPUT OFF in advance.

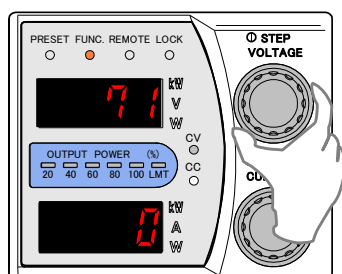


#### Caution

#### Calibration Circuit

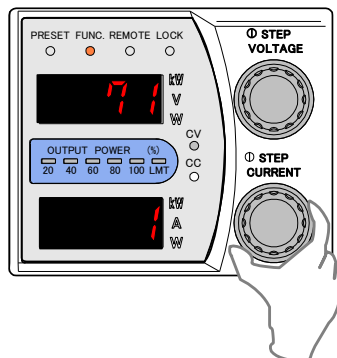
Set FUNCTION Settings Item 1, Sink Function, to 1 (1=ON) and Settings Item 13, Linearity compensation Function, to 0(0=OFF) beforehand.

##### 2. Change the top Number Display to Settings Item 71 with the VOLTAGE dial.

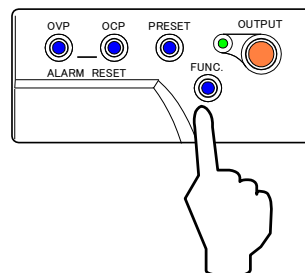


##### 3. Change the set value to 1 (External Voltage) with the CURRENT dial.

1: External Voltage (0~10V)



##### 4. Press the FUNC. key again to finalize settings.

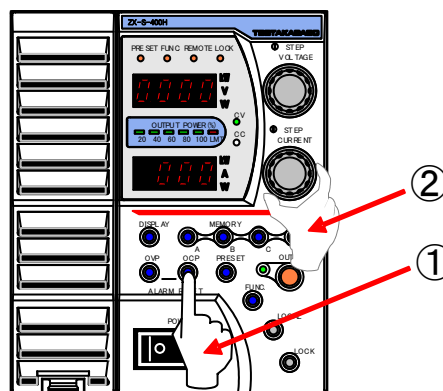


##### 5. Press the OCP key ①. Set to "44.00A" (※) with the CURRENT dial ②.

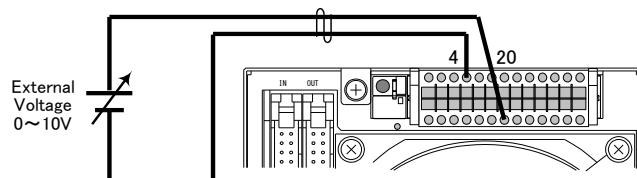
※For 400HN/HAN set to "5.50A"

For 800HN/HAN set to "11.00A"

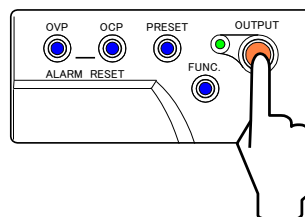
For 1600HN/HAN set to "22.00A"



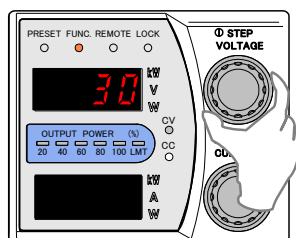
##### 6. Input an external voltage of "0.10V".



##### 7. Press the OUTPUT key ② to set the output to ON.

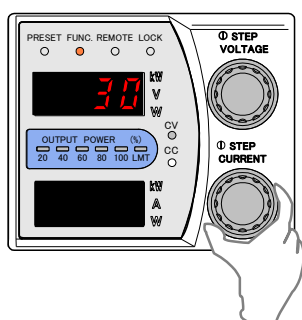


8. Press the FUNC. key and change the top Number Display to Settings Item 30 with the VOLTAGE dial.

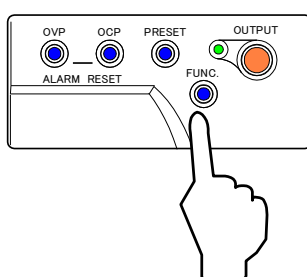


9. Adjust so that the digital multimeter (used for output voltage measurement) displays the set value with the CURRENT dial.

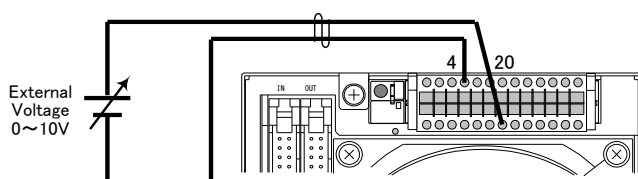
※ See “Output Current Control with External Voltage” on deriving the set value.



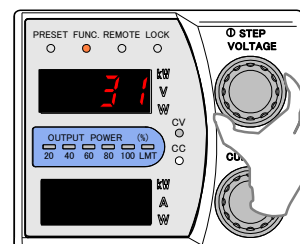
10. Press the FUNC. key to complete offset calibration of output current control with external voltage.



11. Set external voltage to “10.00V”.

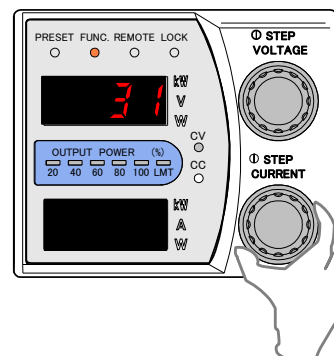


12. Press the FUNC. key and change the top Number Display to Settings Item 31 with the VOLTAGE dial.

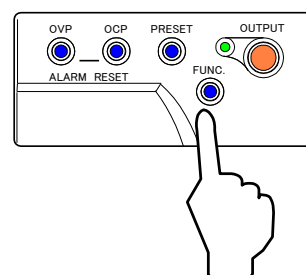


13. Adjust so that the digital multimeter (used for output current measurement) displays the set value with the CURRENT dial.

※ For deriving the set value see “Output Current Control with External Voltage”.



14. Press the FUNC. key to complete full-scale calibration of output current control with external voltage.



15. This completes offset/full-scale calibration of output current control with external voltage.

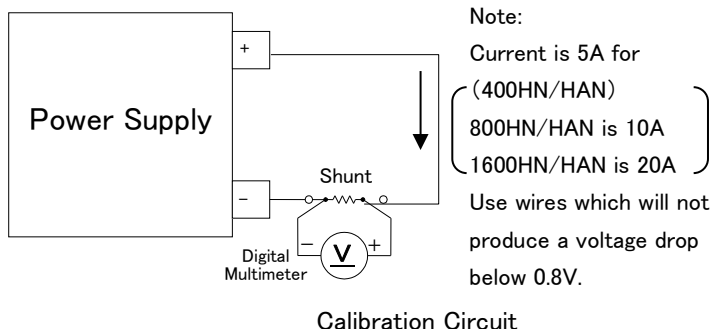
## Calibration

### Output Current Control with External Resistance (A)

#### 1. Perform load with only the shunt resistor.

Disconnect the load wires and the remote sensing wires. Connect the shunt to the output terminal. Connect the digital multimeter to the voltage terminal located on the shunt.

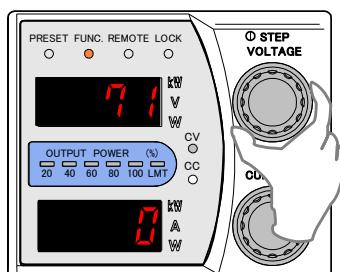
Turn the POWER switch ON and OUTPUT OFF in advance.



#### Caution

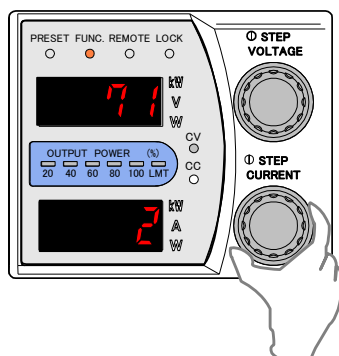
Set FUNCTION Settings Item 1, Sink Function, to 1 (1=ON) and Settings Item 13, Linearity compensation Function, to 0(0=OFF) beforehand.

#### 2. Change the top Number Display to Settings Item 71 with the VOLTAGE dial.

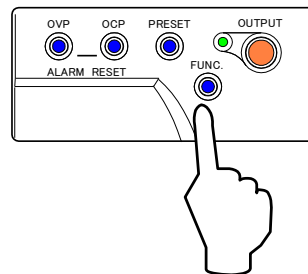


#### 3. Change the set value to 2 (External Resistance A) with the CURRENT dial.

2: External Resistance (0~∞ Ω A)

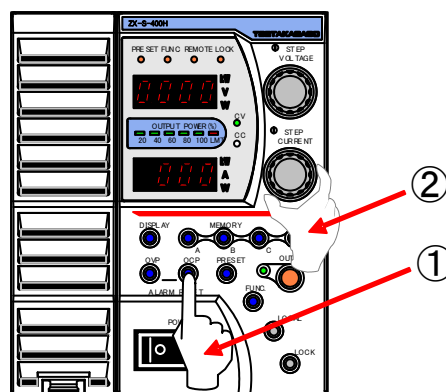


#### 4. Press the FUNC. key again to finalize settings.

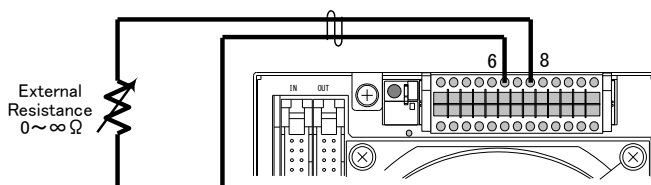


#### 5. Press the OCP key ①. Set to "44.00A" (※) with the CURRENT dial ②.

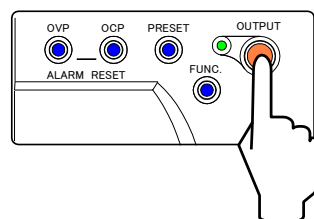
※For 400HN/HAN set to "5.50A"  
For 800HN/HAN set to "11.00A"  
For 1600HN/HAN set to "22.00A"



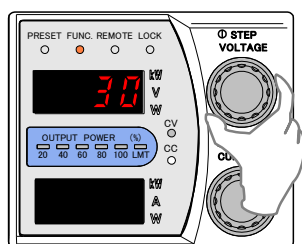
#### 6. Set external resistance to "500kΩ".



#### 7. Press the OUTPUT key to set the output to ON.

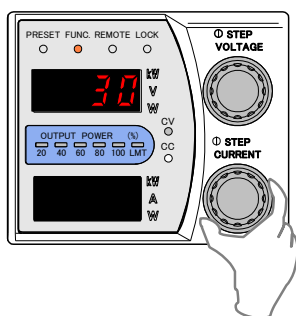


8. Press the FUNC. key and change the top Number Display to Settings Item 30 with the VOLTAGE dial.

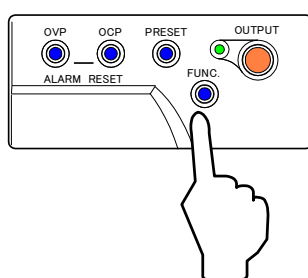


9. Adjust so that the digital multimeter (used for output current measurement) displays the set value with the CURRENT dial.

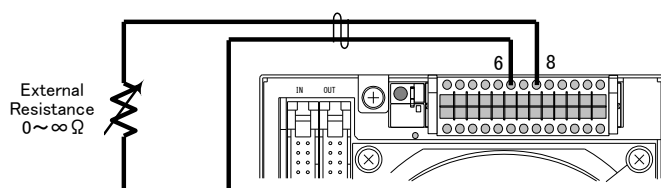
※See “Output Current Control with External Resistance” on deriving the set value.



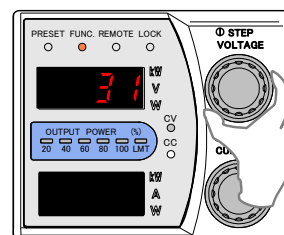
10. Press the FUNC. key to complete offset calibration of output current control with external resistance (A).



11. Set external resistance to “0Ω”(short).

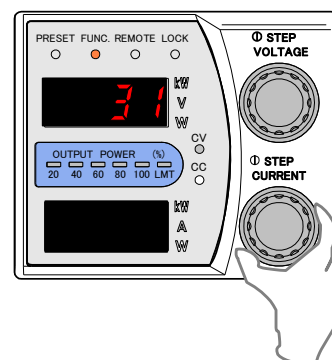


12. Press the FUNC. key and change the top Number Display to Settings Item 31 with the VOLTAGE dial.

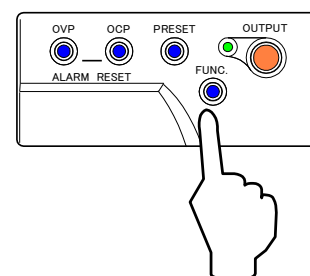


13. Adjust so that the digital multimeter (used for output current measurement) displays the set value with the CURRENT dial.

※For deriving the set value see “Output Current Control with External Resistance”.



14. Press the FUNC. key to complete full-scale calibration of output current control with external resistance (A).



15. This completes offset/full-scale calibration of output current control with external resistance (A).

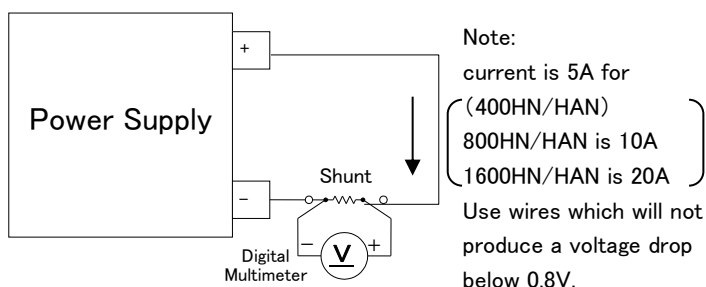
## Calibration

### Output Current Control with External Resistance (B)

1. Perform with only the shunt connected with the output.

Disconnect the load wires and the remote sensing wires. Connect the shunt to the output terminal. Connect the digital multimeter to the voltage terminal located on the shunt.

Turn the POWER switch ON and OUTPUT OFF in advance.

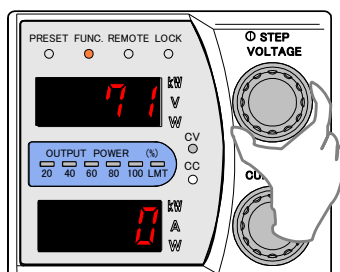


**Caution**

Calibration Circuit

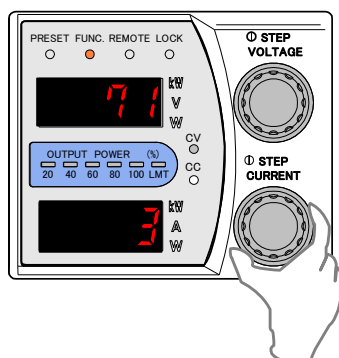
Set FUNCTION Settings Item 1, Sink Function, to 1 (1=ON) and Settings Item 13, Linearity compensation Function, to 0(0=OFF) beforehand.

2. Change the top Number Display to Settings Item 71 with the VOLTAGE dial.

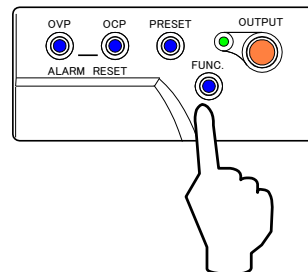


3. Change the set value to 2 (External Resistance B) with the CURRENT dial.

3: External Resistance (0~10kΩ B)



4. Press the FUNC. key again to finalize settings.

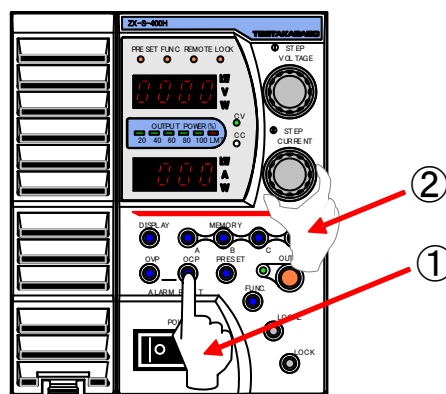


5. Press the OCP key ①. Set to "44.00A" (※) with the CURRENT dial ②.

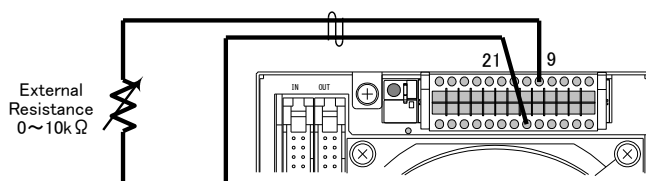
※For 400HN/HAN set to "5.50A"

For 800HN/HAN set to "11.00A"

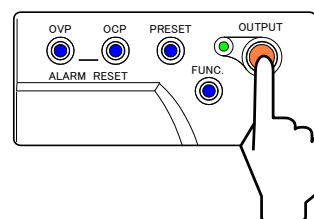
For 1600HN/HAN set to "22.00A"



6. Set external resistance to "100Ω".

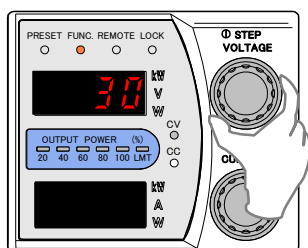


7. Press the OUTPUT key to set the output to ON.



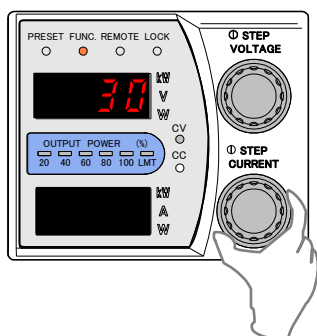


8. Press the FUNC. key and change the top Number Display to Settings Item 30 with the VOLTAGE dial.

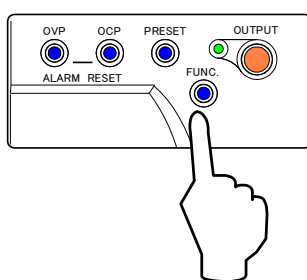


9. Adjust so that the digital multimeter (used for output current measurement) displays the set value with the CURRENT dial.

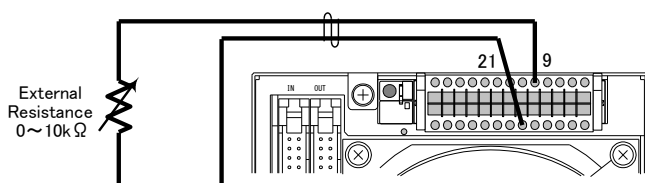
※See “Output Current Control with External Resistance” on deriving the set value.



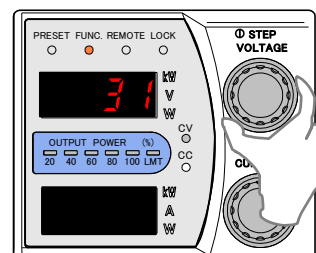
10. Press the FUNC. key to complete offset calibration of output current control with external resistance (B).



11. Set external resistance to “10k $\Omega$ ”.

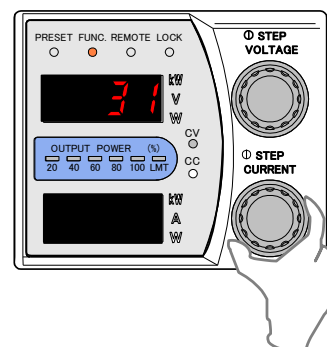


12. Press the FUNC. key and change the top Number Display to Settings Item 31 with the VOLTAGE dial.

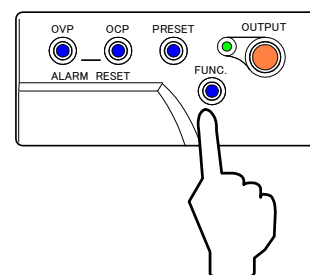


13. Adjust so that the digital multimeter (used for output current measurement) displays the set value with the CURRENT dial.

※For deriving the set value see “Output Current Control with External Resistance”.



14. Press the FUNC. key to complete full-scale calibration of output current control with external resistance (B).



15. This completes offset/full-scale calibration of output current control with external resistance (B).

## Calibration

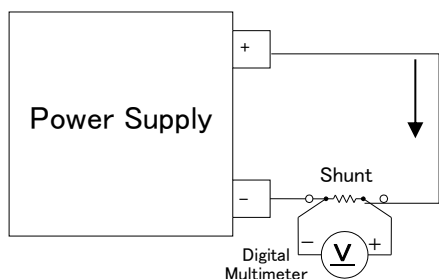
### Output Current Control with External Resistance(C)

#### 1. Perform load with only the shunt resistor.

Disconnect the load wires and the remote sensing wires.

Connect the shunt to the output terminal. Connect the digital multimeter to the voltage terminal located on the shunt.

Turn the POWER switch ON and OUTPUT OFF in advance.



Note:

current is 5A for  
(400HN/HAN)  
800HN/HAN is 10A  
1600HN/HAN is 20A

Use wires which will not produce a voltage drop below 0.8V.

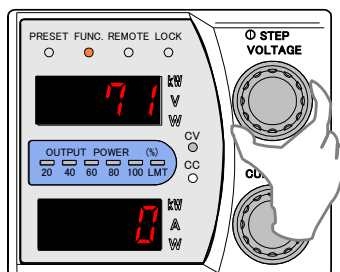


**Caution**

Calibration Circuit

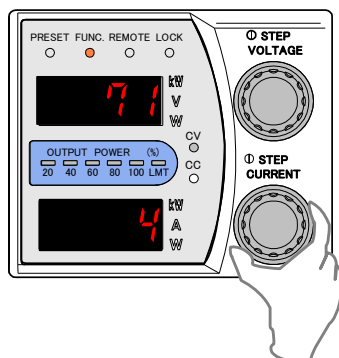
Set FUNCTION Settings Item 1, Sink Function, to 1 (1=ON) and Settings Item 13, Linearity compensation Function, to 0(0=OFF) beforehand.

#### 2. Change the top Number Display to Settings Item 71 with the VOLTAGE dial.

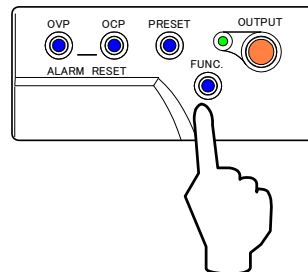


#### 3. Change the set value to 4 (External Resistance C) with the CURRENT dial.

4: External Resistance (0~10kΩ C)



#### 4. Press the FUNC. key again to finalize settings..

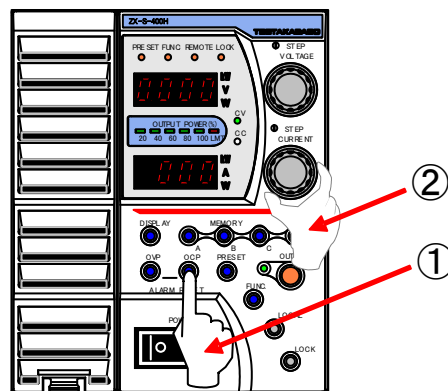


#### 5. Press the OCP key ①. Set to "44.00A" (※) with the CURRENT dial ②.

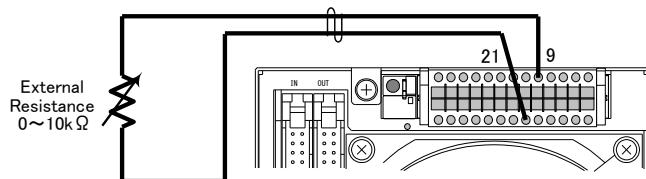
※For 400HN/HAN set to "5.50A"

For 800HN/HAN set to "11.00A"

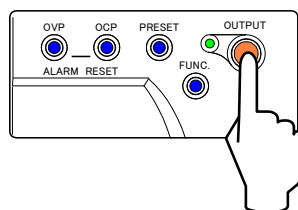
For 1600HN/HAN set to "22.00A"



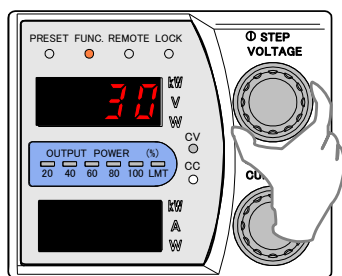
#### 6. Set an external resistance to "10kΩ".



#### 7. Press the OUTPUT key to set the output to ON.

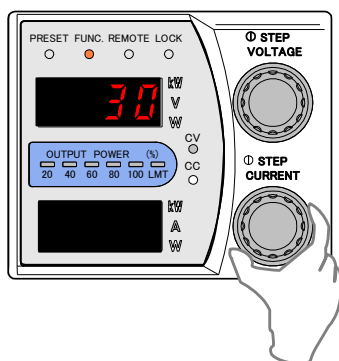


8. Press the FUNC. key and change the top Number Display to Settings Item 30 with the VOLTAGE dial.

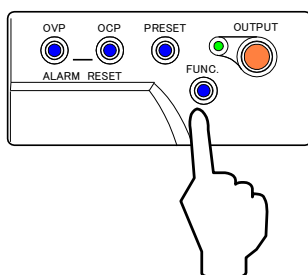


9. Adjust so that the digital multimeter (used for output current measurement) displays the set value with the CURRENT dial.

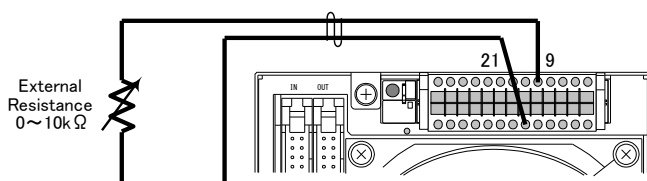
※See “Output Current Control with External Resistance” on deriving the set value.



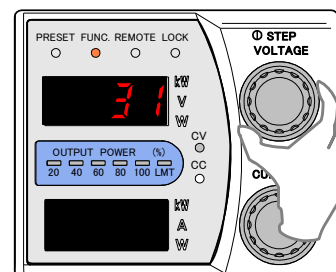
10. Press the FUNC. key to complete offset calibration of output current control with external resistance (C).



11. Set external resistance to “100Ω”.

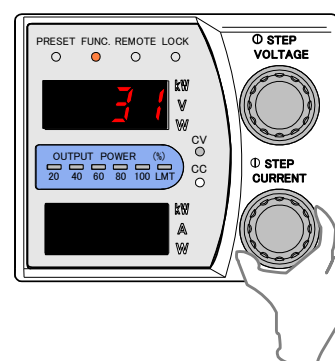


12. Press the FUNC. key and change the top Number Display to Settings Item 31 with the VOLTAGE dial.

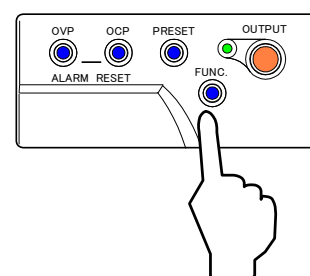


13. Adjust so that the digital multimeter (used for output current measurement) displays the set value with the CURRENT dial.

※For deriving the set value see “Output Current Control via External Resistance”.



14. Press the FUNC. key to complete full-scale calibration of output current control with external resistance (C).



15. This completes offset/full-scale calibration of output current control with external resistance (C).

## Calibration

### Calibrating Meters

#### Preparation

The following measuring devices are required for calibration.

##### 1. Digital Multimeter for Voltage/Current Measurement – 1 set

No. of Display Digits : 5 1/2 or more

Display Accuracy : 0.005% or more

(Possesses a measuring range from 1mV~1000V)

##### 2. Shunt for Current Measurement – 1 set

10A/50mV 0.1% accuracy (400HN/HAN)

25A/50mV 0.1% accuracy (800HN/HAN)

50A/50mV 0.1% accuracy (1600HN/HAN)

### Voltmeter Offset/Full-Scale Calibration

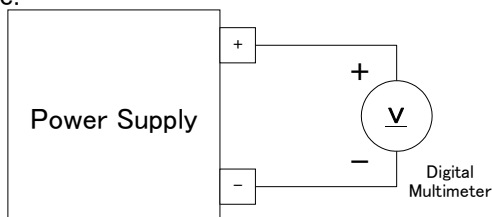


#### Caution

Before performing this operation, ensure “Output Voltage Setting Offset/Full-scale Calibration” is carried out.

1. Disconnect the load wires and the remote sensing wires. Connect the digital multimeter to the output terminal.

Turn the POWER switch ON and OUTPUT OFF in advance.

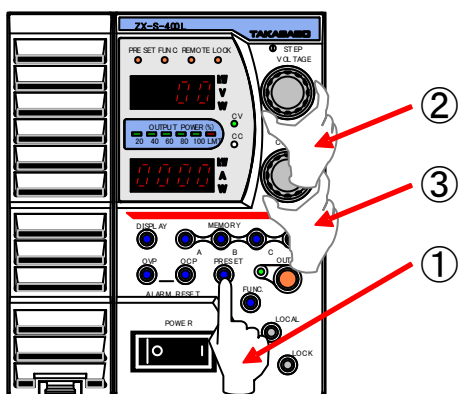


#### Caution

#### Calibration Circuit

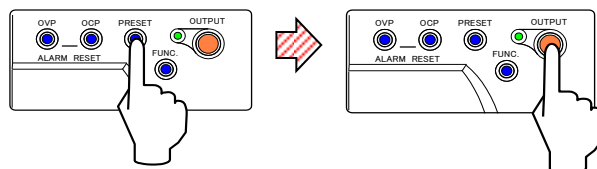
Set FUNCTION Settings Item 13, Linearity compensation Function. to 0 (0=OFF) beforehand.

2. Press the PRESET key ① and set to “0.1V” with the VOLTAGE dial ② and “1.00A” with the CURRENT dial ③.

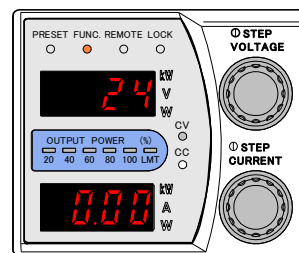


(See Operating as Constant Voltage Power Supply under Basic Operations on how.)

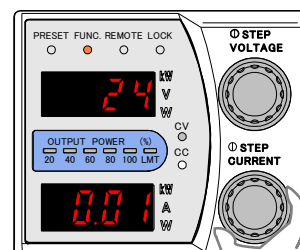
3. Press the PRESET key again and then the OUTPUT key to set the output to ON.



4. Press the FUNC. key and change the top Number Display to Settings Item 24 with the VOLTAGE dial to display the voltage measurement value at the bottom.

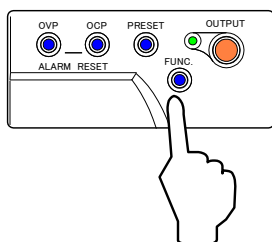


5. Adjust the measurement value displayed in the bottom Number Display to the same value as displayed on the digital multimeter (used for output voltage measurement) with the CURRENT dial.

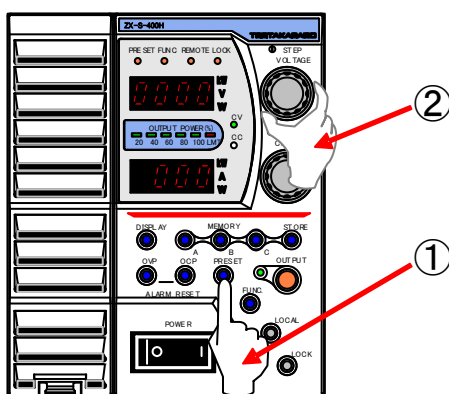


Note: Bottom Number Display is displayed in volts(V).

6. Press the FUNC. key to complete offset voltmeter calibration.

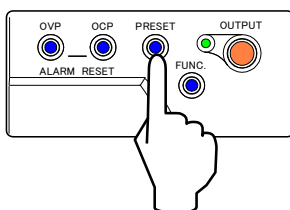


7. Press the PRESET key ① and set the CV set value to “640.0V” with the VOLTAGE dial ②.

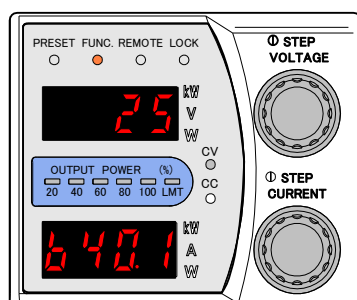


(See Operating as Constant Voltage Power Supply under Basic Operations on how. (P17))

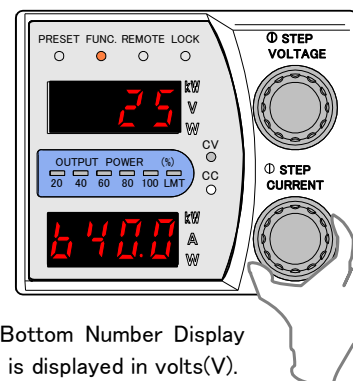
8. Press the PRESET key.



9. Press the FUNC. key and change the top Number Display to Settings Item 25 with the VOLTAGE dial to display the voltage measurement value at the bottom.

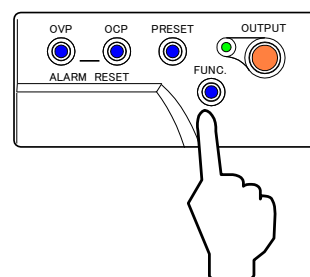


10. Adjust the measurement value displayed in the bottom Number Display to the same value as displayed on digital multimeter (used for output voltage measurement) with the CURRENT dial.



Note: Bottom Number Display is displayed in volts(V).

11. Press the FUNC. key to complete voltmeter full-scale calibration.



12. This completes voltmeter calibration. Please return the CV set values back to normal before use.

## Calibration

### Ammeter Offset/Full-Scale Calibration

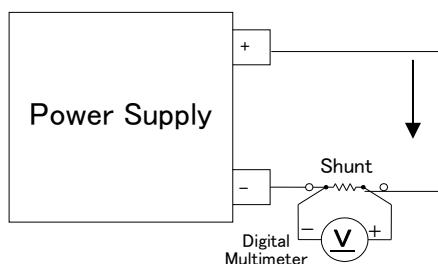


#### Caution

Before performing this operation, ensure “Output Current Setting Offset/Full-scale Calibration” is carried out.

#### 1. Perform load with only the shunt resistor.

Disconnect the load wires and the remote sensing wires. Connect the shunt to the output terminal. Connect the digital multimeter to the terminal located on the shunt. Turn the POWER switch ON and OUTPUT OFF in advance.



Calibration Circuit

Note:

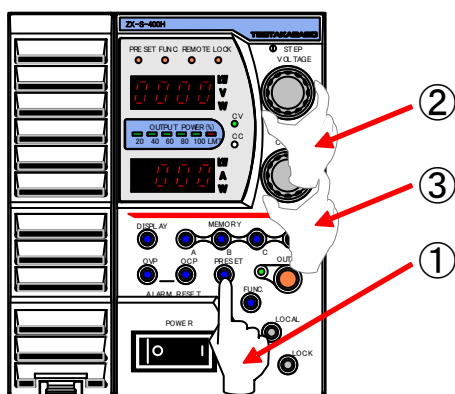
Current is 5A for (400HN/HAN)  
800HN/HAN is 10A  
1600HN/HAN is 20A  
Use wires which will not produce a voltage drop below 0.8V.



#### Caution

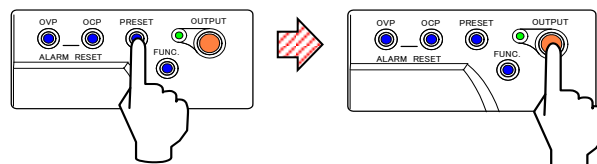
Set FUNCTION Settings Item 1, Sink Function, to 1 (1=ON) and Settings Item 13, Linearity compensation Function, to 0(0=OFF) beforehand.

- Press the PRESET key ① and set the CC set value to “0.01A” (※) with the CURRENT dial ③ and the CV set value to “1.00V” with the VOLTAGE dial ②.

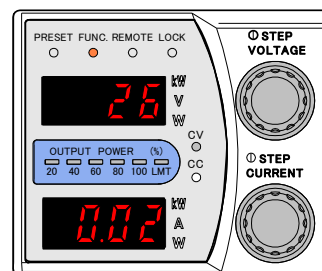


(See Operating as Constant Current Power Supply under Basic Operations on how.)

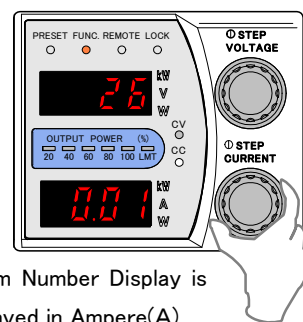
- Press the PRESET key again and then the OUTPUT key to set the output to ON.



- Press the FUNC. key and change the top Number Display to Settings Item 26 with the VOLTAGE dial to display the current value at the bottom.

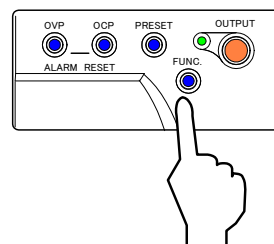


- Adjust the measurement value displayed in the bottom Number Display to the same value as displayed in the digital multimeter (used for output current measurement) with the CURRENT dial.



Note: Bottom Number Display is displayed in Ampere(A).

- Press the FUNC. key to complete full-scale calibration of the ammeter.



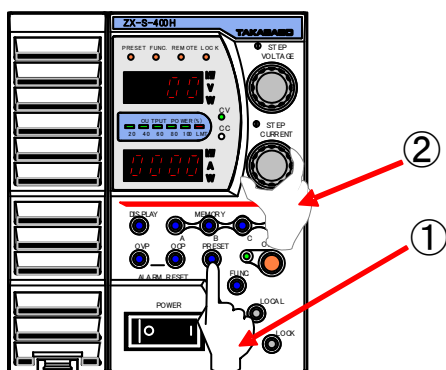
## Calibration

7. Press the PRESET key ① and set the CC set value to “40.00A” (※) with the CURRENT dial ② and the CV set value to “1.00V” with the VOLTAGE dial.

※For 400HN/HAN set to “5.000A”

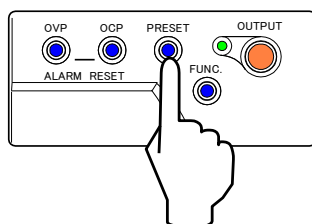
For 800HN/HAN set to “10.00A”

For 1600HN/HAN set to “20.00A”

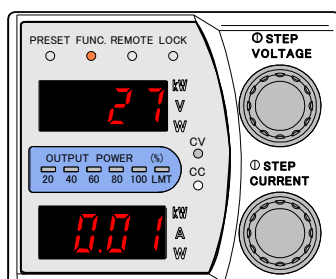


(See Operating as Constant Current Power Supply under Basic Operations on how.)

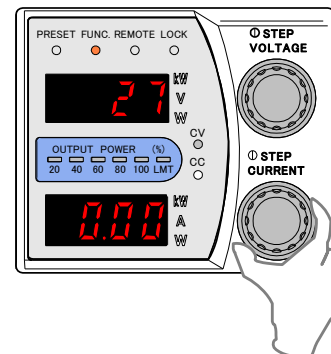
8. Press the PRESET key.



9. Press the FUNC. key and change the top Number Display to Settings Item 27 with the VOLTAGE dial to display the current measurement value at the bottom.

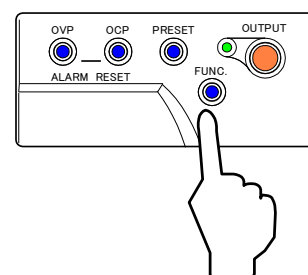


10. Adjust the measurement value displayed in the bottom Number Display to the same value as displayed in the digital multimeter (mV) (used for output current measurement) with the CURRENT dial.



Note: Bottom Number Display is displayed in Ampere(A).

11. Press the FUNC. key to complete ammeter full-scale calibration.



12. This completes ammeter calibration. Please return the CC and CV set values back to normal before use.

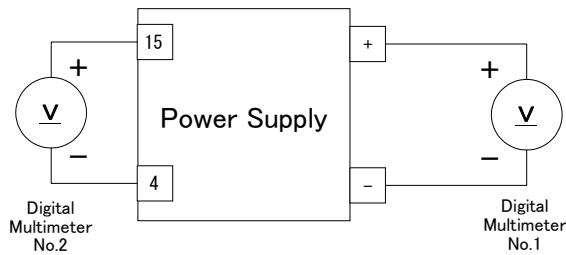
## Calibration

### Offset/Full-Scale Calibration of Output Voltage Monitor (ZX-S Series Type-HAN)

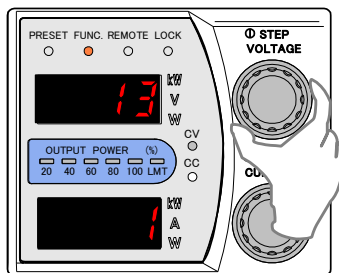
1. Disconnect the load wires and connect the digital multimeter No. 1 to the output terminal.

Connect the digital multimeter No. 2 to the external control terminals number 4 and 15. (Voltage Monitor Terminal)

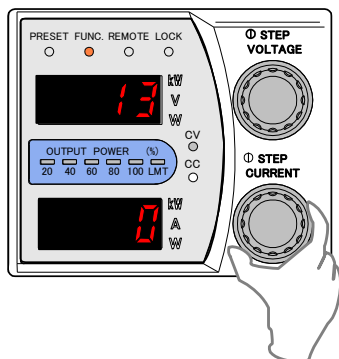
Turn the POWER switch ON and OUTPUT OFF in advance.



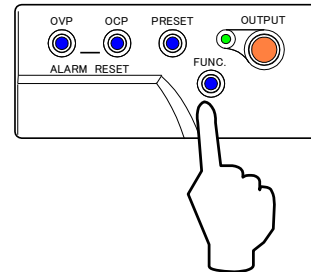
2. Press the FUNC. key and change the top Number Display to Settings Item 13 with the VOLTAGE dial.



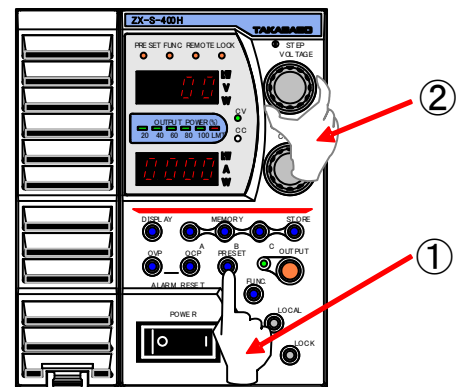
3. Turn the CURRENT dial and set the set value to 0 (Linearity Compensation: OFF).



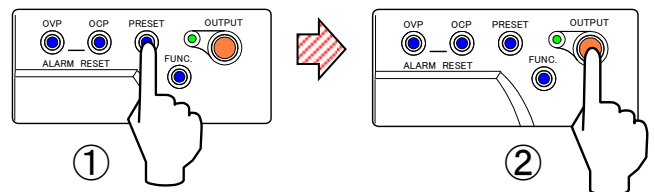
4. Press the FUNC. key again to finalize settings.



5. Press the PRESET key ① again and set to "0.00V" with the VOLTAGE dial ②.



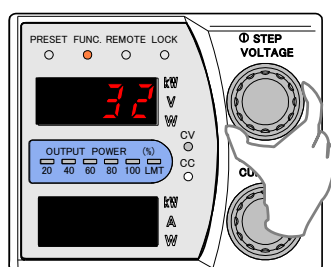
6. Press the PRESET key ① and then the OUTPUT key ② to set the output to ON.



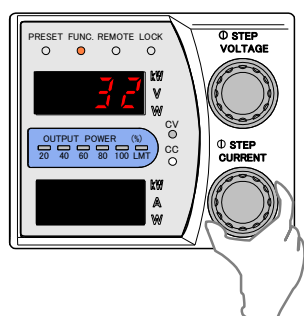


## Calibration

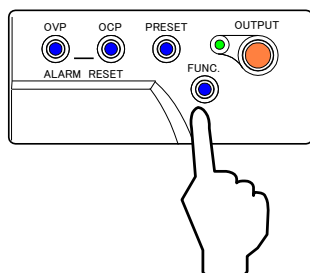
7. Press the FUNC. key and change the top Number Display to Settings Item 32 with the VOLTAGE dial.



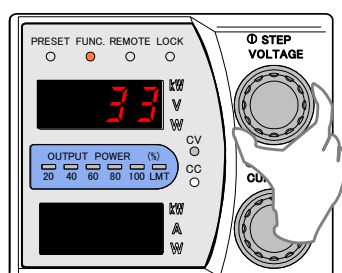
8. Adjust so that the digital multimeter No.2 (used for voltage monitor measurement) displays "0.00V" with the CURRENT dial.



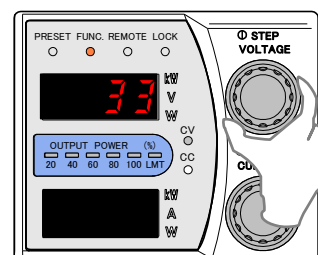
9. Press the FUNC. key to complete offset calibration of output voltage monitor.



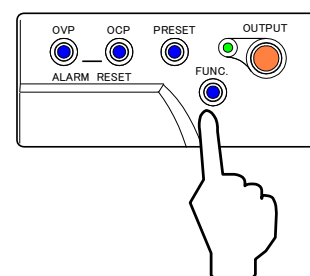
10. Press the FUNC. key and change the top Number Display to Settings Item 33 with the VOLTAGE dial.



11. Adjust so that the digital multimeter No. 2 (used for voltage monitor measurement) displays "Output Voltage Digital Multimeter No. 1/8" with the CURRENT dial.



12. Press the FUNC. key to complete full-scale calibration of output voltage monitor.



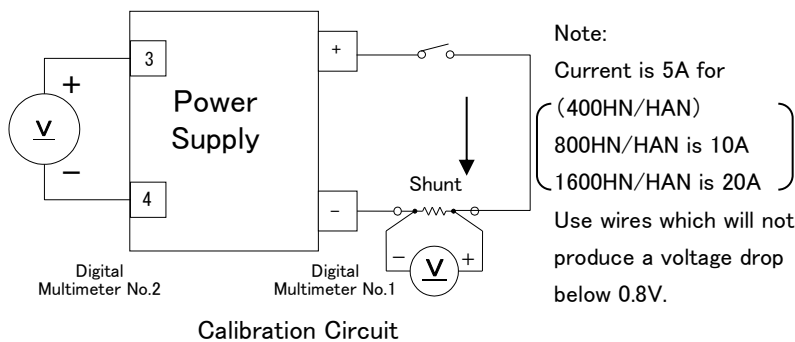
13. This completes offset/full-scale calibration of output voltage monitor.

## Offset/Full-Scale Calibration of Output Current Monitor (ZX-S Series Type-HAN)

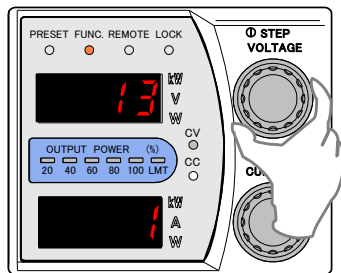
### 1. Perform load with only the shunt resistor.

Disconnect the load wires and the remote sensing wires. Connect the shunt to the output terminal. Connect the digital multimeter to the voltage terminal located on the shunt.

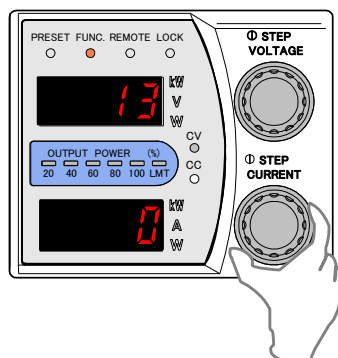
Connect the digital multimeter to the external control connectors number 3 and 4. (Current Monitor Terminal) Turn the POWER switch ON and OUTPUT OFF in advance.



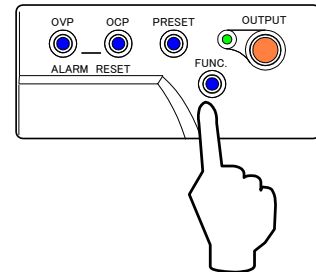
### 2. Press the FUNC. key and change the top Number Display to Settings Item 13 with the VOLTAGE dial.



### 3. Turn the CURRENT dial and set the current value to 0 (Linearity Compensation: OFF).

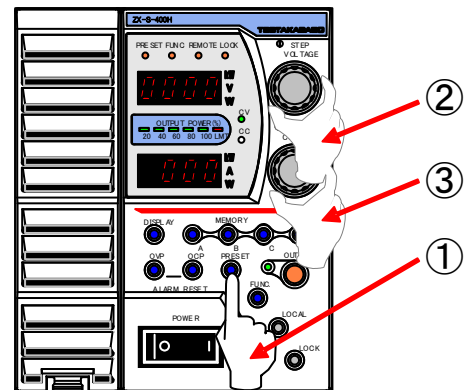


### 4. Press the FUNC. key again to finalize settings.

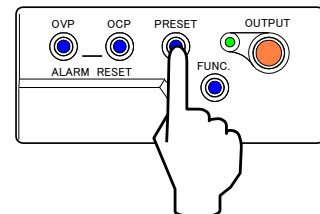


### 5. Press the PRESET key ① and set to "1.00V" with the VOLTAGE dial ② and "5.000A~20.0A" (※) with the CURRENT dial ③.

※For 400HN/HAN set to "5.000A"  
For 800HN/HAN set to "10.00A"  
For 1600HN/HAN set to "20.00A"

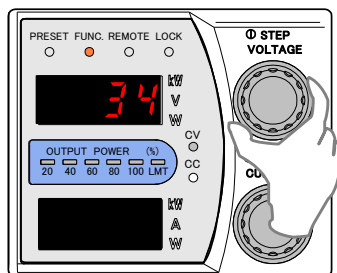


### 6. Press the PRESET key ①

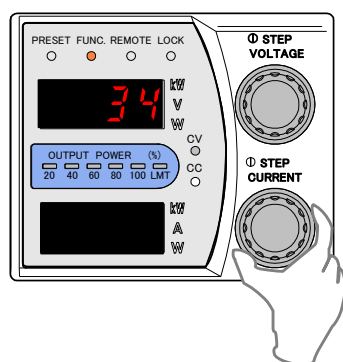


### 7. Set the load switch S1 to OPEN.

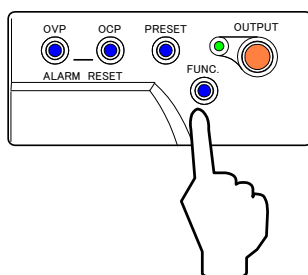
8. Press the FUNC. key and change the top Number Display to Settings Item 34 with the VOLTAGE dial.



9. Adjust so that the digital multimeter No.2 (use for current monitor measurement) displays a number within the range of “ $\pm 2\text{mV}$ ” with the CURRENT dial.



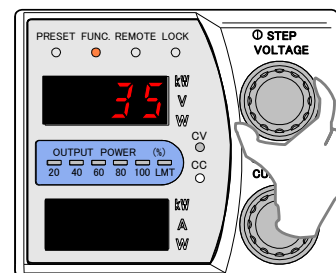
10. Press the FUNC. key to complete offset calibration of output voltage monitor.



11. Set the Load Switch S1 to CLOSE.

12. Press the OUTPUT key ② to set the output to ON.

13. Press the FUNC. key and change the top Number Display to Settings Item 35 with the VOLTAGE dial.

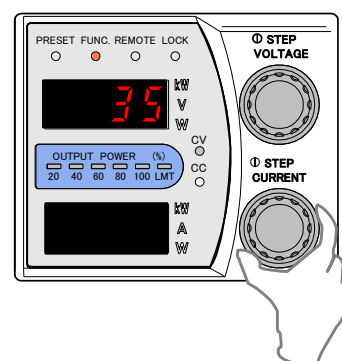


14. Adjust so that the digital multimeter No. 2 (use for current monitor measurement) displays “Output Current\*2” (※) with the CURRENT dial.

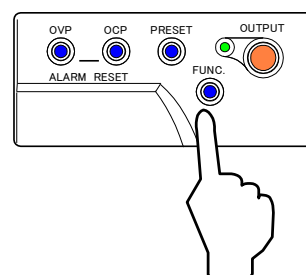
※For 400H/HA derives from “Output Current\*2”

For 800H/HA derives from “Output Current\*1”

For 1600H/HA derives from “Output Current/2”



15. Press the FUNC. key to complete full-scale calibration of output current monitor.



16. This completes offset/full-scale calibration of output current monitor.

# Specifications

## Output Specifications

| Specification/Models | 400HN | 400HAN | 800HN | 800HAN | 1600HN | 1600HAN |
|----------------------|-------|--------|-------|--------|--------|---------|
| Rated Output Voltage | 640V  |        | 640V  |        | 640V   |         |
| Rated Output Current | 5A    |        | 10A   |        | 20A    |         |
| Rated Output Power   | 400W  |        | 800W  |        | 1600W  |         |

## Input Specifications

| Specification/Models         |              | 400HN                               | 400HAN | 800HN | 800HAN | 1600HN | 1600HAN |
|------------------------------|--------------|-------------------------------------|--------|-------|--------|--------|---------|
| Power Source                 |              | AC85V～250V   Single Phase/45Hz～65Hz |        |       |        |        |         |
| Input Current<br>*1          | AC100V Input | 6A                                  |        | 12.5A |        | 24A    |         |
|                              | AC200V Input | 3A                                  |        | 6A    |        | 12A    |         |
| Input Power Factor   *2      |              | Above 0.99                          |        |       |        |        |         |
| Power Efficiency   *3        |              | 0.74                                |        |       |        |        |         |
| Rush Current<br>(Peak Value) | AC100V Input | 10A                                 |        | 20A   |        | 40A    |         |
|                              | AC200V Input | 20A                                 |        | 40A   |        | 80A    |         |
|                              | AC264V Input | 25A                                 |        | 50A   |        | 100A   |         |

Note: \*1 : With rated output power and rated output current

\*2 : With AC100V input, rated output power, and rated output current

\*3 : With AC100V input, rated output voltage, and rated output power

## Constant Voltage Characteristics

| Specification/Models                      |         | 400HN                                        | 400HAN | 800HN       | 800HAN | 1600HN      | 1600HAN |
|-------------------------------------------|---------|----------------------------------------------|--------|-------------|--------|-------------|---------|
| Range                                     |         | 0.0V~672.0V                                  |        |             |        |             |         |
| Accuracy *11                              |         | ± (0.1%+100mV) of set value                  |        |             |        |             |         |
| Resolution                                |         | 100mV                                        |        |             |        |             |         |
| Load Regulation *4                        |         | Below ± (0.01%+24mV of rated output voltage) |        |             |        |             |         |
| Line Regulation *5                        |         | Below ± (0.01%+16mV of rated output voltage) |        |             |        |             |         |
| Ripple(Effective Value) *6                |         | 20mV                                         |        |             |        |             |         |
| Noise (p-p value) (TYP) *7                |         | 100mV                                        |        | 150mV       |        | 150mV       |         |
| Temperature Coefficient (Typical Value)   |         | ±100ppm/°C                                   |        |             |        |             |         |
| Recovery Time *8                          |         | 1ms                                          |        |             |        |             |         |
| Programming Time *9                       | Rising  | 70ms±20% (full load) / 70ms±20% (no load)    |        |             |        |             |         |
|                                           | Falling | 250ms±30% (full load) / 1100ms±30% (no load) |        |             |        |             |         |
| Maximum Sink Current                      |         | 0.05A±0.01A                                  |        | 0.06A±0.02A |        | 0.12A±0.04A |         |
| Residual Voltage when OUTPUT is OFF (TYP) |         | 0mV~40mV                                     |        |             |        |             |         |

## Constant Current Characteristics

| Specification/Models                       | 400HN                                       | 400HAN | 800HN                     | 800HAN | 1600HN                     | 1600HAN |
|--------------------------------------------|---------------------------------------------|--------|---------------------------|--------|----------------------------|---------|
| Range                                      | 0.000A~5.250A                               |        | 0.00A~10.50A              |        | 0.00A~21.00A               |         |
| Accuracy *12                               | ± (0.5%+5mA) of set value                   |        | ± (0.5%+5mA) of set value |        | ± (0.5%+10mA) of set value |         |
| Resolution                                 | 1mA                                         |        | 10mA                      |        | 10mA                       |         |
| Load Regulation *10                        | Below ± (0.03%+3mA of rated output current) |        |                           |        |                            |         |
| Line Regulation *5                         | Below ± (0.03%+2mA of rated output current) |        |                           |        |                            |         |
| Ripple (Effective Value) *6                | 2.5mA                                       |        | 5mA                       |        | 10mA                       |         |
| Temperature Coefficient<br>(Typical Value) | ± 100ppm/°C                                 |        |                           |        |                            |         |

Note: \*4 : Measurement at sensing point for 0~100% change in rated load current (Static Load Change)

\*5 : For  $\pm 10\%$  change in input voltage (Static input Change)

\*6 : At measurement frequency band of 20Hz~1MHz

\*7 : Measured with oscilloscope at measurement frequency band of 20Hz~20MHz

\*8 : Recovery time within 0.1%+10mV of rated output voltage for 50%~100% abrupt change in rated load current (Dynamic Load Change)

\*9 : Time in which set voltage error is reached within 1% due to setting changes via panel operation or communication control or external analog control.

\*10 : Current change value at the rated output current when load resistance is changed until resistance value outputs 0~rated power (Static Load Change)

\*11 : At output open-circuit and environmental temperature 23°C $\pm 5^{\circ}\text{C}$

\*12 : At output short-circuit and environmental temperature 23°C $\pm 5^{\circ}\text{C}$

## Specifications

### Measures/Displays

| Specification/Models                           | 400HN                                                                                                                                                  | 400HAN | 800HN                                | 800HAN | 1600HN                               | 1600HAN |
|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------------------|--------|--------------------------------------|---------|
| Voltmeter                                      | 4-Digit Digital Meter                                                                                                                                  |        |                                      |        |                                      |         |
| Maximum Display                                | 999.9V                                                                                                                                                 |        |                                      |        |                                      |         |
| Measure Accuracy<br>*13                        | ± (0.1% of reading ±2digit(200mV))                                                                                                                     |        |                                      |        |                                      |         |
| Temperature Coefficient<br>(Typical Value)     | ±50ppm/°C                                                                                                                                              |        |                                      |        |                                      |         |
| Ammeter                                        | 4-Digit Digital Meter                                                                                                                                  |        |                                      |        |                                      |         |
| Maximum Display *21                            | 9.999A                                                                                                                                                 |        | 99.99A                               |        | 99.99A                               |         |
| Measure Accuracy<br>*13 *21                    | ± (0.5% of reading<br>±4digit(4mA))                                                                                                                    |        | ± (0.5% of reading<br>±1digit(10mA)) |        | ± (0.5% of reading<br>±1digit(10mA)) |         |
| Temperature Coefficient<br>(Typical Value) *21 | ±100ppm/°C                                                                                                                                             |        |                                      |        |                                      |         |
| Power Meter                                    | 4-Digit Digital Meter                                                                                                                                  |        |                                      |        |                                      |         |
| Maximum Display *21                            | 999.9W                                                                                                                                                 |        | 999.9W                               |        | 9999W                                |         |
| Accuracy *21                                   | Displays the multiplication value of the voltage measurement value and<br>current measurement value.<br>(Values under 0.1W are displayed rounded off.) |        |                                      |        |                                      |         |
| Power Display Bar Graph                        | Displays rough value of output power with 6-point LEDs                                                                                                 |        |                                      |        |                                      |         |

\*13 : At environmental temperature  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$

\*21 : At stand alone operation

## Communication

| Specification/Models |                     | 400HN                                | 400HAN | 800HN | 800HAN | 1600HN | 1600HAN |
|----------------------|---------------------|--------------------------------------|--------|-------|--------|--------|---------|
| LAN                  | Interface           | IEEE802.3(10BASE-T) RJ-45 connector  |        |       |        |        |         |
|                      | Protocol            | TCP/IP                               |        |       |        |        |         |
|                      | Display             | LINK/ACT                             |        |       |        |        |         |
|                      | Communication speed | 10Mbps                               |        |       |        |        |         |
|                      | duplex              | Half duplex                          |        |       |        |        |         |
|                      | AutoMD/MDI-X        | Incompatible                         |        |       |        |        |         |
| SERIAL<br>IF         | Interface           | RS-485                               |        |       |        |        |         |
|                      | Synchro system      | Start-Stop synchronous communication |        |       |        |        |         |
|                      | Bit rate            | 2400,9600,19200,38400bps             |        |       |        |        |         |
|                      | Data bit            | 8bit                                 |        |       |        |        |         |
|                      | Stop bit            | 1                                    |        |       |        |        |         |
|                      | Parity              | MOT,ODD,EVEN                         |        |       |        |        |         |

## Specifications

### Protection Functions

| Specification/Models               |           | 400HN                                                                                                                                                                                                                                              | 400HAN | 800HN       | 800HAN | 1600HN                        | 1600HAN |
|------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------|--------|-------------------------------|---------|
| Over Voltage Protection (OVP)      | Range     | 10V~704V                                                                                                                                                                                                                                           |        |             |        |                               |         |
|                                    | Accuracy  | ± (0.2% of set value ±5digit(0.5V)) *13                                                                                                                                                                                                            |        |             |        |                               |         |
|                                    | Operation | Shuts off output, stops switching, or cuts off input switch *14                                                                                                                                                                                    |        |             |        |                               |         |
| Over Current Protection (OCP)      | Range     | 0.1A~5.5A                                                                                                                                                                                                                                          |        | 0.2A~11.0A  |        | 0.4A~22.0A                    |         |
|                                    | Accuracy  | ± (0.6%of set value ±5digit(0.05A)) *13                                                                                                                                                                                                            |        |             |        |                               |         |
|                                    | Operation | Shuts off output, stops switching, or cuts off input switch *14                                                                                                                                                                                    |        |             |        |                               |         |
| Over Power Protection Circuit      |           | Restricts output voltage and output current if the output power exceeds the rated output and if the internal power loss exceeds the reference value.<br>Automatically recovers once values return within ratings.                                  |        |             |        |                               |         |
| Over Heating Protection Circuit    |           | ・Stops switching, shuts off output, and displays alarms if the temperature of the radiating section heat exceeds 85℃ (1600HN/HAN:95℃) due to stopped fan motor, etc.<br>・Welds temperature fuses, built in the Inrush Limiting Resistors, at 135℃. |        |             |        |                               |         |
| Excessive Input Current Protection |           | Fuse<br>10A                                                                                                                                                                                                                                        |        | Fuse<br>20A |        | Protected by<br>20A Fuse/unit |         |

\*14 : Input switch cut-off turns the power supply's internal input power relays OFF.

This can be selected for 1600HN/1600HAN.

### Remote Sensing

- Able to compensate a voltage drop, due to lead wire up to load, of up to 1V one-way.
- Restricts the rise in output voltage within 10mV if sensing lines are opened.
- During remote sensing, the output power can be set to a maximum of 642W at the power supply's output terminals.  
Also, the output power can be set within the rating.



# Other Functions

| Specification/Models              |             | 400HN                                                                                        | 400HAN | 800HN | 800HAN | 1600HN | 1600HAN |
|-----------------------------------|-------------|----------------------------------------------------------------------------------------------|--------|-------|--------|--------|---------|
| Operational Mode Displays         |             | All modes are displayed with LEDs                                                            |        |       |        |        |         |
|                                   |             | OUT ON ..... Green                                                                           |        |       |        |        |         |
|                                   |             | CV (Constant Voltage) ..... Green                                                            |        |       |        |        |         |
|                                   |             | CC (Constant Current) ..... Orange                                                           |        |       |        |        |         |
|                                   |             | LMT (Power Limit) ..... Red                                                                  |        |       |        |        |         |
|                                   |             | PRESET (PRESET) ..... Orange                                                                 |        |       |        |        |         |
|                                   |             | FUNC. (when setting Functions) ..... Orange                                                  |        |       |        |        |         |
|                                   |             | REMOTE (during Remote Operation) ..... Orange                                                |        |       |        |        |         |
|                                   |             | LOCK (in Key Lock state) ..... Orange                                                        |        |       |        |        |         |
|                                   |             | OUTPUT POWER (Power Display) ..... Green<br>20%、40%、60%、80%、100%                             |        |       |        |        |         |
| Master-Slave Parallel Operation   |             | Able to control a maximum of 10 parallel connected same model products with one master unit. |        |       |        |        |         |
| Master-Slave Series Operation *15 |             | —                                                                                            | —      | —     | —      | —      | —       |
| Output ON/OFF Toggle Control      |             | Can be controlled at external contact or photocoupler                                        |        |       |        |        |         |
| Monitor Output                    | Output *16  | —                                                                                            | ○      | —     | ○      | —      | ○       |
|                                   | Current *17 | —                                                                                            | ○      | —     | ○      | —      | ○       |

\*15 : Master-Slave Series Operation is not supported.

\*16 : DC10V Output (non-isolated) for rated output voltage Accuracy:  $0.2\% \pm 2\text{mV}$

\*17 : DC10V Output (non-isolated) for rated output current Accuracy:  $0.5\% \pm 2\text{mV}$

# External Control

| Specification/Models         |                     | 400HAN                                                                  | 800HAN | 1600HAN |
|------------------------------|---------------------|-------------------------------------------------------------------------|--------|---------|
| Output Voltage Control       | External Resistance | $0 \sim 10\text{k}\Omega$ (B, C Curve), $0 \sim \infty\Omega$ (A Curve) |        |         |
|                              | External Voltage    | DC $0 \sim 10\text{V}$                                                  |        |         |
| Output Current Control       | External Resistance | $0 \sim 10\text{k}\Omega$ (B, C Curve), $0 \sim \infty\Omega$ (A Curve) |        |         |
|                              | External Voltage    | DC $0 \sim 10\text{V}$                                                  |        |         |
| Output ON/OFF Toggle Control |                     | Can be controlled at external contact or photocoupler                   |        |         |

## Specifications

|                       |                                                                                                                                                                                                        |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Cut-Off Control | Can be controlled at external contact or photocoupler                                                                                                                                                  |
| Status Output         | The 5 points: CV (Constant Voltage), CC (Constant Current), P-ON (Input Voltage Normal), LEVEL1_ALM (OVP, OCP), and LEVEL2_ALM (Group Alarm) are outputted by a photocoupler insulated open collector. |

### Insulation/ Withstanding Voltage

| Specification/Models    | 400HN                                                                                                                   | 400HAN | 800HN | 800HAN | 1600HN | 1600HAN |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------|--------|-------|--------|--------|---------|
| Insulation              | At DC 1000V mega-ohm tester, above 20M $\Omega$<br>Between each input and output, input and chassis, output and chassis |        |       |        |        |         |
| Withstanding Voltage    | AC 1.5kV 1 minute<br>Between each input and output, input and chassis                                                   |        |       |        |        |         |
| Relative Ground Voltage | At peak voltage value, within $\pm 1000V$<br>between Output and Ground (Includes output voltage)                        |        |       |        |        |         |

### Cooling

| Specification/Models | 400HN                                          | 400HAN | 800HN | 800HAN | 1600HN | 1600HAN |
|----------------------|------------------------------------------------|--------|-------|--------|--------|---------|
| Cooling Method       | Cooling is regulated in response to the output |        |       |        |        |         |

### Operational Environment

| Specification/Models      |           | 400HN                                                                                                                 | 400HAN | 800HN | 800HAN | 1600HN | 1600HAN |
|---------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------|--------|-------|--------|--------|---------|
| Environmental Temperature | Operating | 0~50°C However, in areas above 40°C a 2.5% to 1°C ratio is required for derating the output power and output current. |        |       |        |        |         |
|                           | Saving    | -20°C~70°C                                                                                                            |        |       |        |        |         |
| Humidity                  | Operating | 20~80%RH                                                                                                              |        |       |        |        |         |
|                           | Saving    | 20~85%RH                                                                                                              |        |       |        |        |         |
| Other                     |           | Do not place in cold environments, and areas with condensation and corrosive gases                                    |        |       |        |        |         |

### Dimensions/Weight

| Specification/Models         | 400HN                    | 400HAN | 800HN                      | 800HAN | 1600HN                     | 1600HAN |
|------------------------------|--------------------------|--------|----------------------------|--------|----------------------------|---------|
| External Dimensions (mm) *18 | 107(W) × 130(H) × 405(D) |        | 214.5(W) × 130(H) × 405(D) |        | 429.5(W) × 130(H) × 405(D) |         |
| Max. Dimensions (mm) *19     | 107(W) × 147(H) × 505(D) |        | 214.5(W) × 147(H) × 513(D) |        | 436(W) × 139(H) × 543(D)   |         |
| Weight                       | 4.9kg                    | 5.0kg  | 7.9kg                      | 8.0kg  | 15.0kg                     | 15.1kg  |
| Output Terminal              | Bar Terminal (M5 Screws) |        |                            |        |                            |         |
| Input Terminal               | —                        |        | —                          |        | M4 Screw Terminal Block    |         |

Note:\*18 : Does not include protruding sections

\*19 : Includes dial, rubber legs, output terminal cover, and carrying belt

## Specifications

### Accessories

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 400HN/400HAN   | <ul style="list-style-type: none"> <li>① Input Power Cable (AC125V Rating) *20 .....1 Item</li> <li>② 2P-3P Conversion Adapter (AC125V Rating) .....1 Item</li> <li>③ Output Terminal Cover ..... 1 Package <ul style="list-style-type: none"> <li>● Output Terminal Cover × 2 Items (Identical Shape)</li> <li>● Supporter for attaching cover × 1 Item</li> <li>● M3 × 6mm screws × 2 Items</li> </ul> </li> <li>④ Output Terminal Screws <ul style="list-style-type: none"> <li>● M5 × 12mm bolts(includes flat washers, spring washers) × 2 Packages<br/>(Attached to power supply)</li> </ul> </li> <li>⑤ Dummy Connector (Attached to power supply) ..... 2 Items</li> <li>⑥ Instruction Manual .....1 Item</li> <li>⑦ External Control Connector (only for 400HAN) .....1 Item</li> </ul>                                      |
| 800HN/800HAN   | <ul style="list-style-type: none"> <li>① Input Power Cable (AC125V Rating) *20 .....1 Item</li> <li>② 2P-3P Adapter (AC125V Rating) .....1 Item</li> <li>③ Output Terminal Cover ..... 1 Package <ul style="list-style-type: none"> <li>● Output Terminal Cover × 2 Items (Identical Shape)</li> <li>● Supporter for attaching cover × 1 Item</li> <li>● M3 × 6mm screws × 2 Items</li> </ul> </li> <li>④ Output Terminal Screws <ul style="list-style-type: none"> <li>● M5 × 12mm bolts(includes flat washers, spring washers) × 2 Packages<br/>(Attached to power supply)</li> </ul> </li> <li>⑤ Front Terminal Cover ..... 1 Package</li> <li>⑥ Dummy Connector (Attached to power supply) ..... 2 Items</li> <li>⑦ Instruction Manual .....1 Item</li> <li>⑧ External Control Connector (only for 800HAN) .....1 Item</li> </ul> |
| 1600HN/1600HAN | <ul style="list-style-type: none"> <li>① Input Power Cable (3-core VCT cable 5.5mm<sup>2</sup>) .....1 Item</li> <li>② Output Terminal Cover ..... 1 Package <ul style="list-style-type: none"> <li>● Output Terminal Cover × 2 Items (Identical Shape)</li> <li>● Supporter for attaching cover × 1 Item</li> <li>● M3 × 6mm screws × 2 Items</li> </ul> </li> <li>③ Output Terminal Screws <ul style="list-style-type: none"> <li>● M5 × 12mm bolts(includes flat washers, spring washers) × 2 Packages<br/>(Attached to power supply)</li> </ul> </li> <li>④ Front Terminal Cover ..... 1 Package</li> <li>⑤ Dummy Connector (Attached to power supply) ..... 2 Items</li> <li>⑥ Instruction Manual .....1 Item</li> <li>⑦ External Control Connector (only for 1600HAN) .....1 Item</li> </ul>                                    |

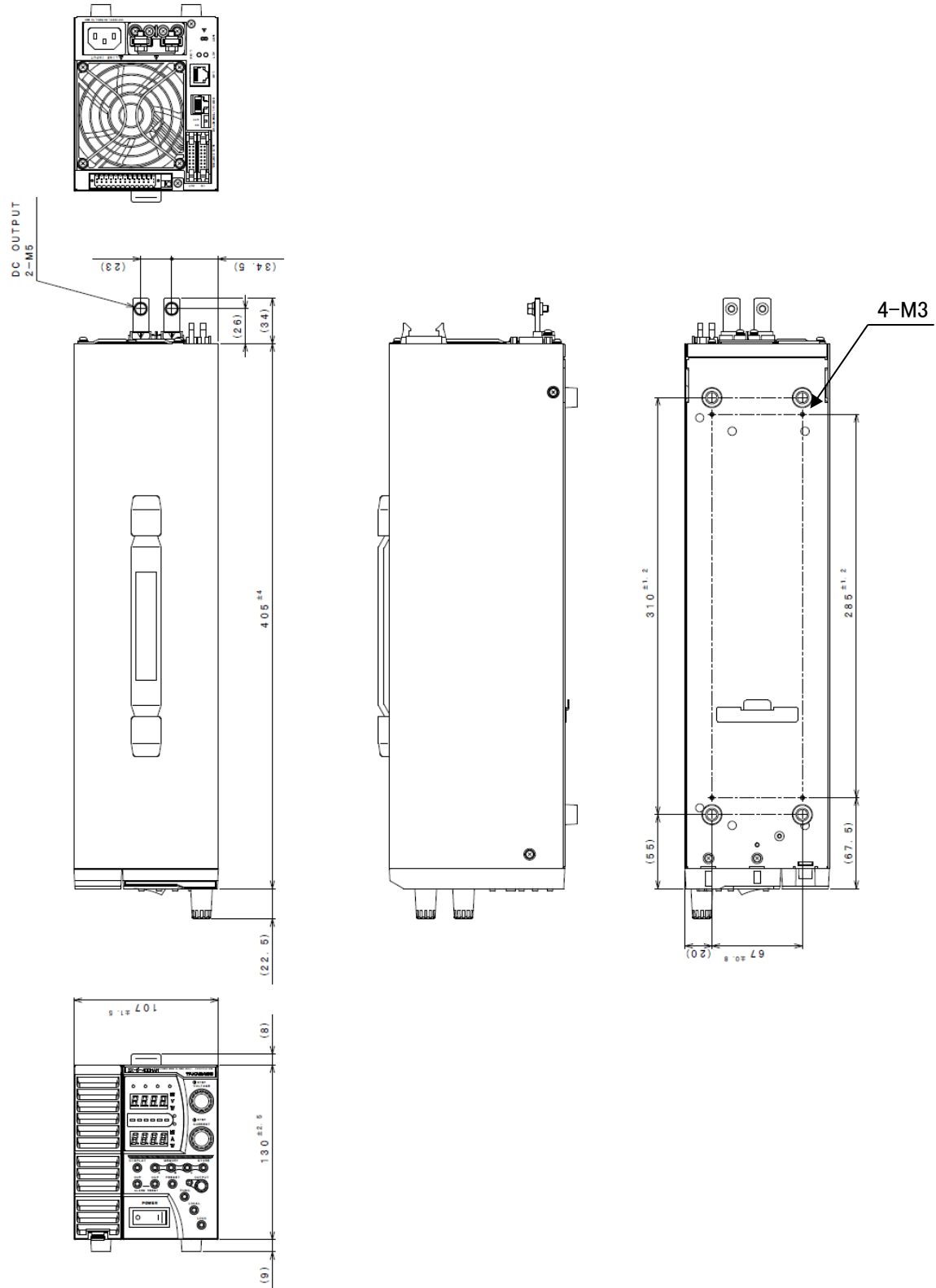
Note: \*20 : The included power cable cannot be used for AC200V inputs. Please contact Takasago Sales Department for the proper power cable.

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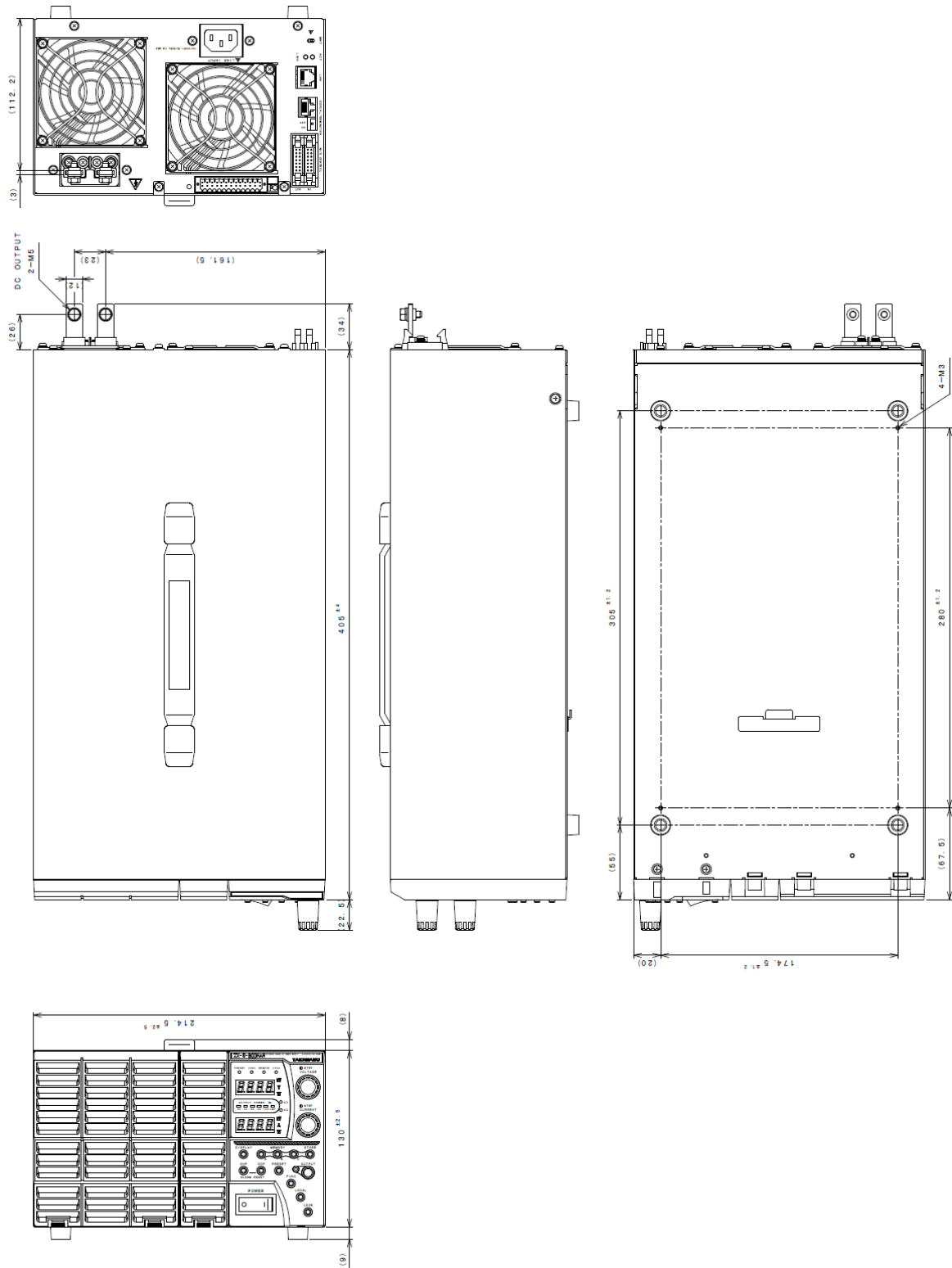
# Appendix

## External Diagrams

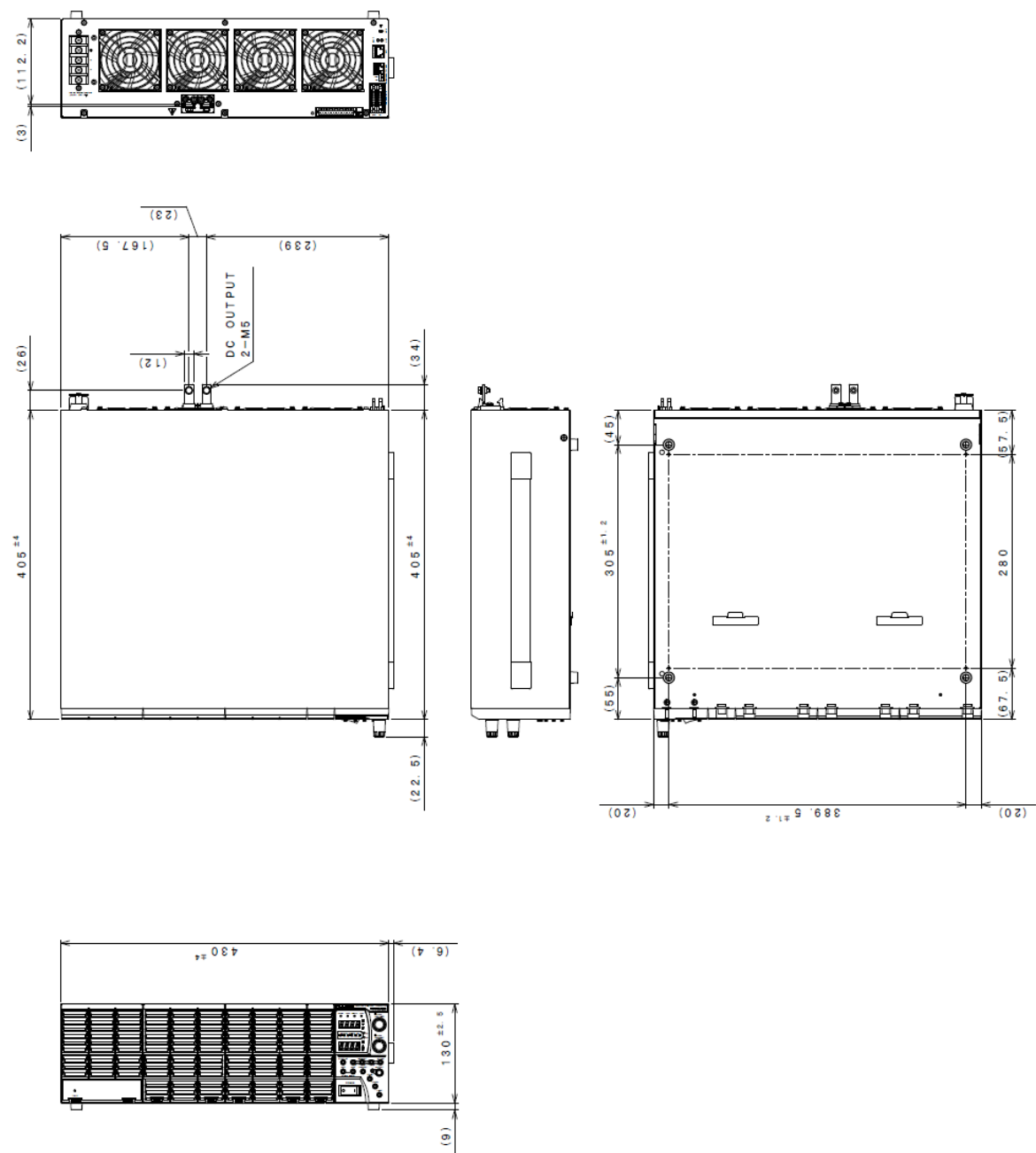
ZX-S-400HN/400HAN



ZX-S-800HN/800HAN

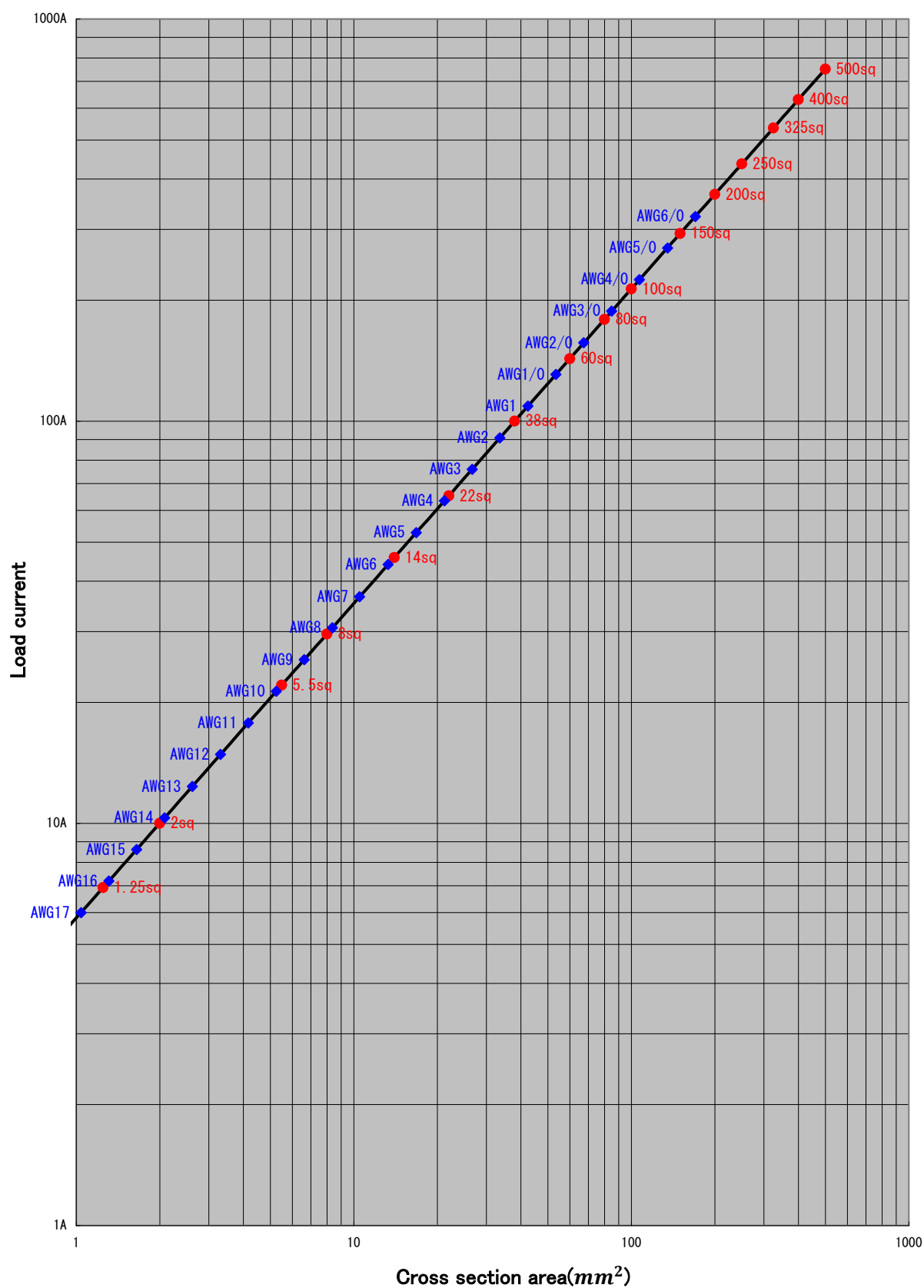


ZX-S-1600HN/1600HA





## Appendix Load current vs Cross section area





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ZX-S-HN/HANseries Instruction Manual 2018/5 Rev1.0 DOC-1940-01

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