TAKASAGO

Constant-Voltage／Constant-Current DC Power Supply

ZX-S-H/HAseries Instruction Manual

Table of Contents

Using in Series/Parallel Operation

Controlling with External Analog & Contact Signal

Special Loads

Maintenance

Calibration

Specifications

Appendix

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.

⚠ **Danger**	Failure to observe precautions indicated by this symbol and improper use or handling of the product will result in serious injury or death.
⚠ **Warning**	Failure to observe precautions indicated by this symbol and improper use or handling of the product may result in serious injury or death.
⚠ **Caution**	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 ■Continual use of the product if there are abnormal noises or smells ■Smoke appears ■Water or foreign objects enters the product may result in fire or electric shock.
	Dismantling or modifications to the product is prohibited. Do not open the cover. ■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 omitments 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

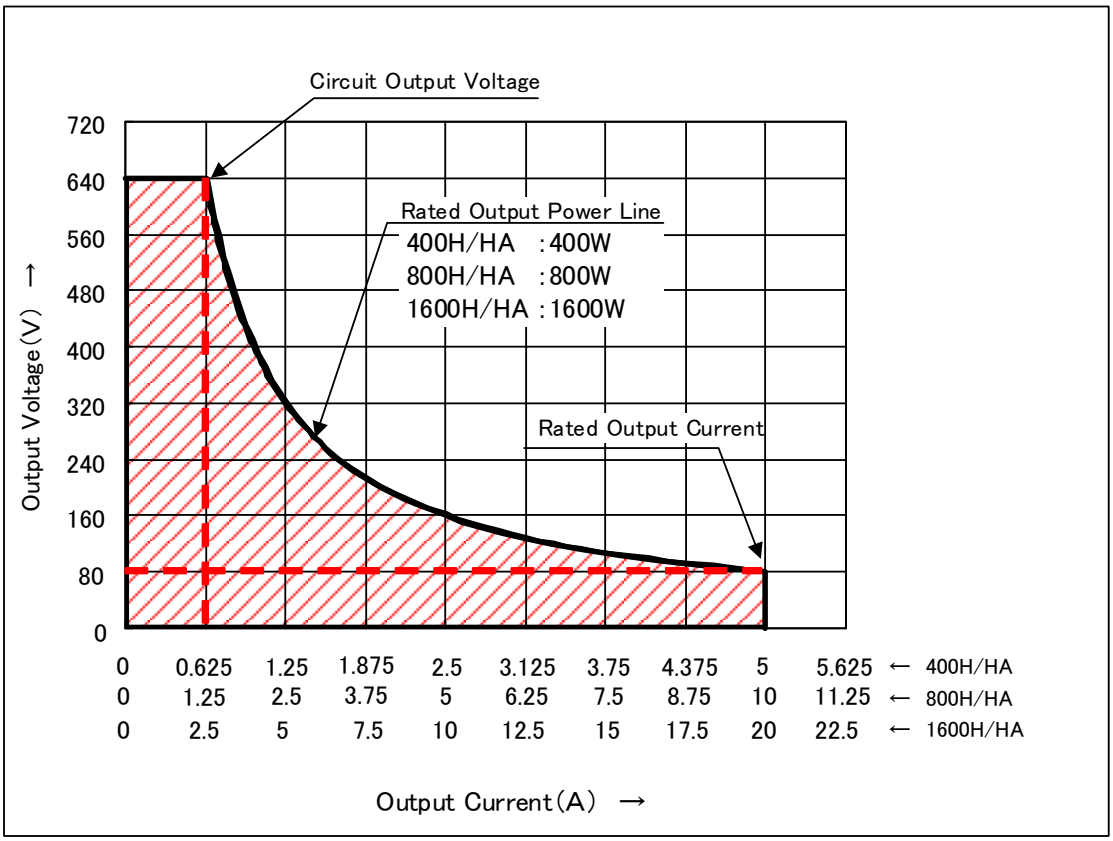
The ZX-S Series is the Switching DC Constant Voltage/Constant Current Power Supply capable of changing from zero-volt and zero-ampere.

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.**

Note1. 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 simultaneous.

✧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-HA）

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 0～10kΩ)

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

✧Analog Monitor （ZX-S Series Type-HA）

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-HA）

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

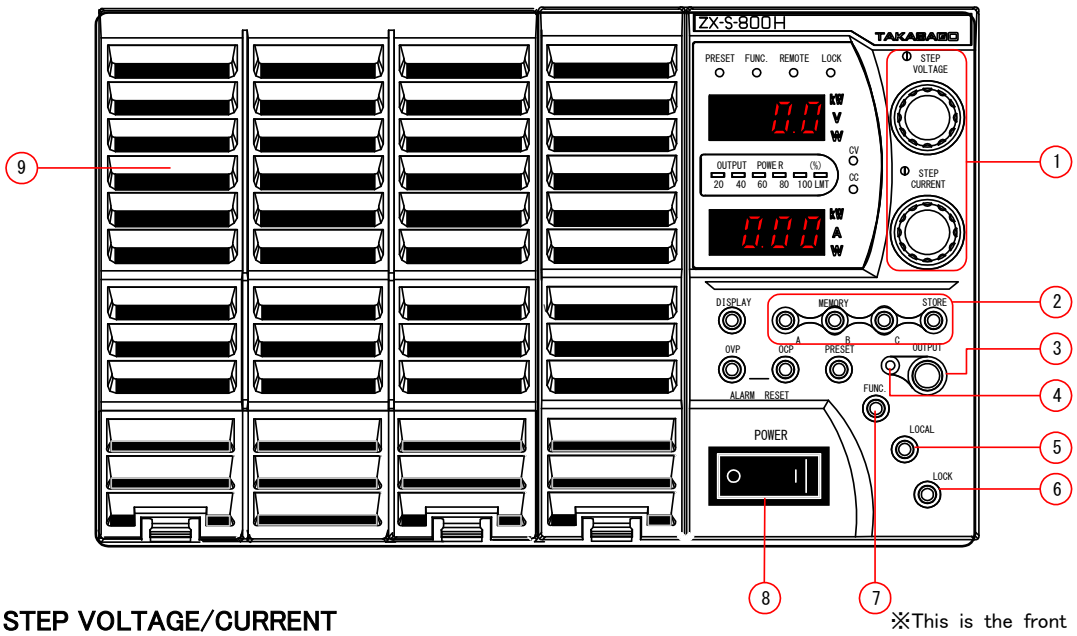
✧Variable Internal Resistance （ZX-S Series Type-HA）

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.

Part Names and Functions

Front Panel



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

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**

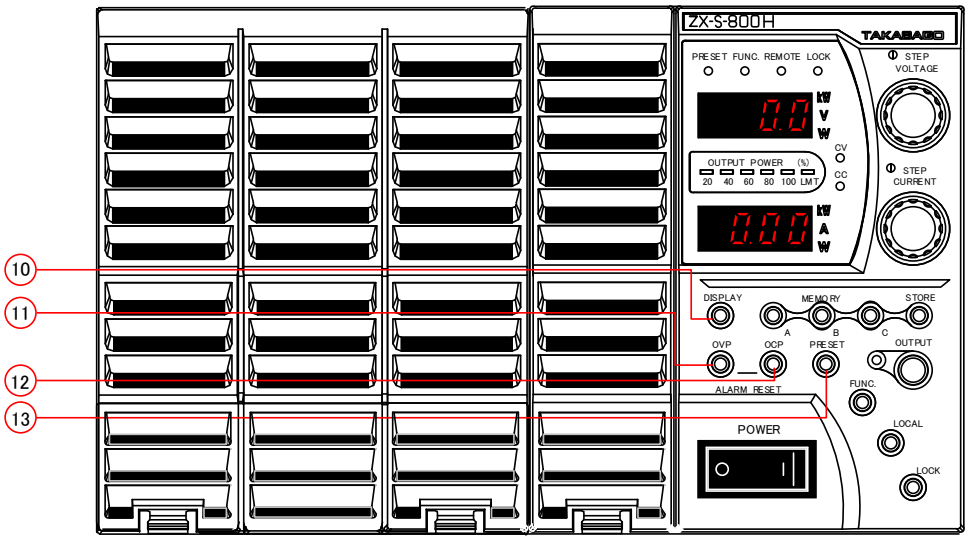
Input Power Switch

Toggles power ON/OFF

⑨ **Ventilation Panels**

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

Front Panel



※Front panel diagram of ZX-S-800H

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

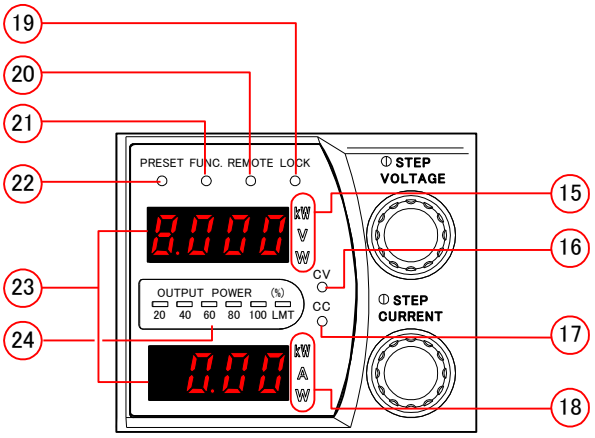
Sets the trigger point for the OCP circuit. Hold down together with ⑪ (OV) key for 1 second or more to cancel and OCP alarm.

⑬. PRESET

Preset Key

Used to set the output voltage and output current.

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.

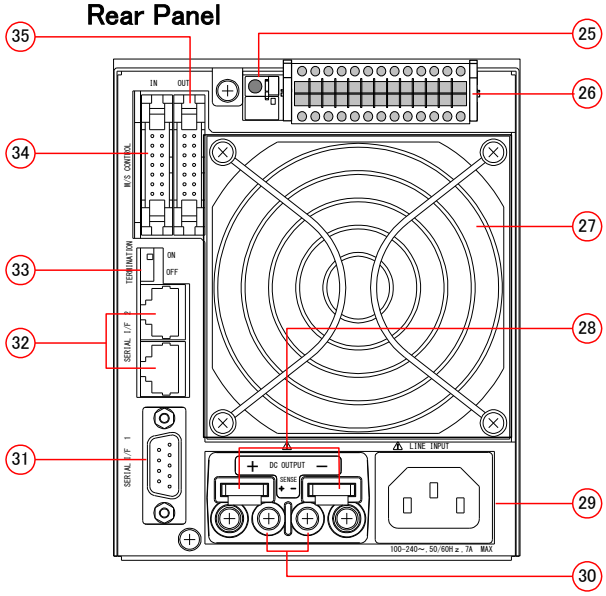
㉔. OUTPUT POWER

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.

Rear Panel



※ Rear panel diagram of ZX-S-400HA

㉕. Series Operation Control Connectors

(ZX-S Series Type-HA)

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-HA)

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. SERIAL I/F 1

Serial Port Connector

Connector for connecting computers etc. with serial cables (RS-232C).

㉜. SERIAL I/F 2

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.

㉝. TERMINATION

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-S series DC power supply units' termination resistor ON/OFF switch to ON. (For all other units, set to OFF)

㉞. 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.

㉟. M/S CONTROL (OUT)

Parallel Operation Control (Output)

Connector for parallel connections.

Outputs parallel operation control signals

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 (400H/HA,800H/HA)

※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 (400H/HA, 800H/HA)

③. Input Power Cable (3-conductors VCT cable 5.5mm^2) 1 item (1600H/HA)

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 (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-HA）

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.

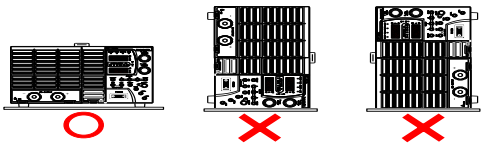
Prohibited Do not insert any metallic pins, wires, screws, etc. in the front ventilation panels and in the rear fan motor. Doing so may result in electric shock and/or fire.

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℃, humidity of 20～80%RH, and which is absent of any corrosive gases.
(However, in areas above 40℃ a 2.5% to 1℃ 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.

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.(※)

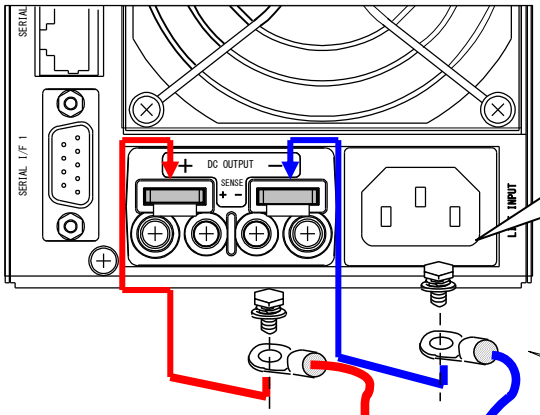
MEMO

- 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 μF

  C2 : Film Capacitor　1～10 μF

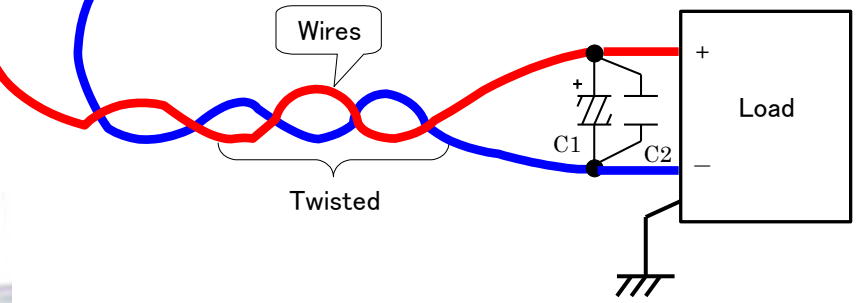


M5 Bolt
(includes spring and flat washers)

M5 Crimp-Style Terminal

Wires

Twisted



When grounding, use a load terminal

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.

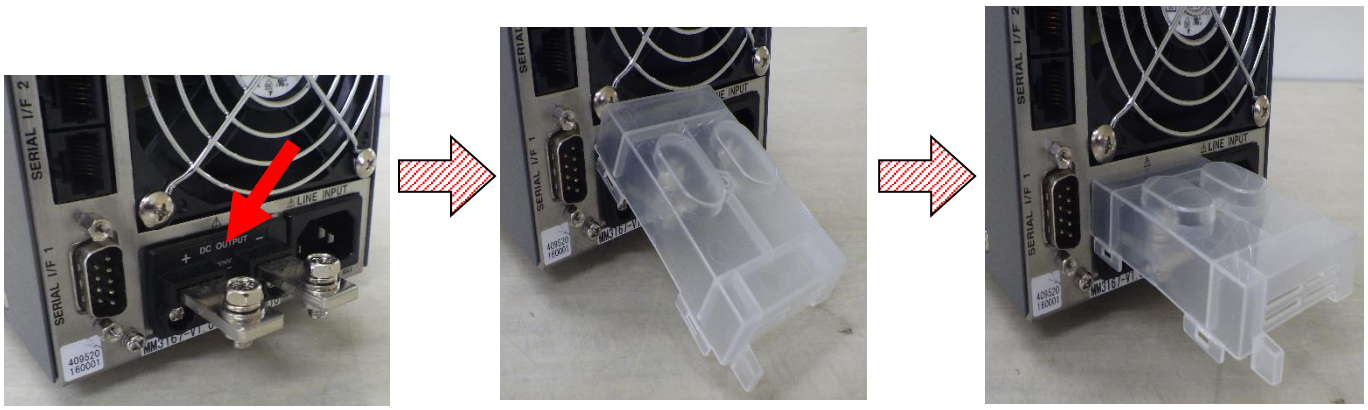
.

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.

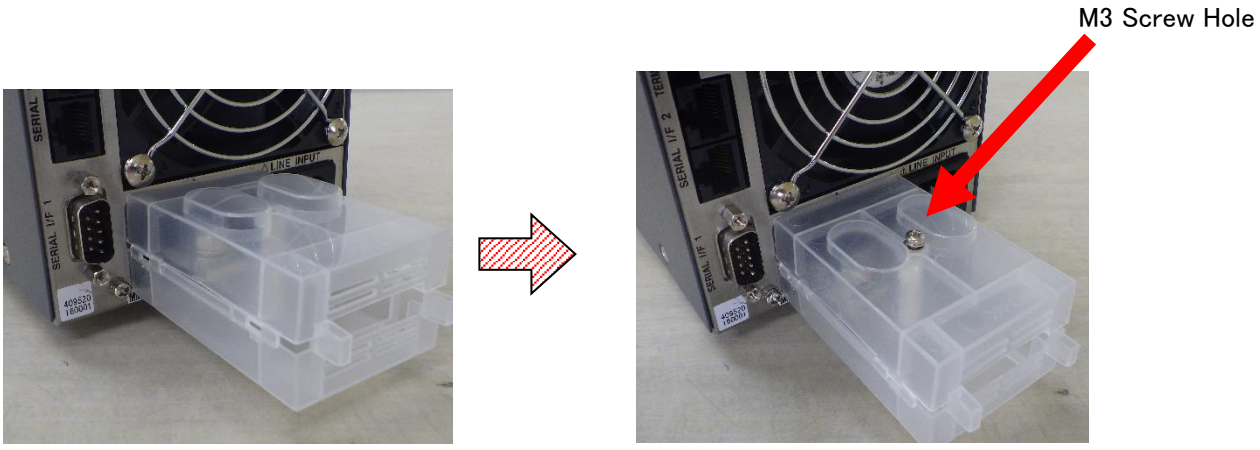
Attaching the Output Terminal Cover

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.

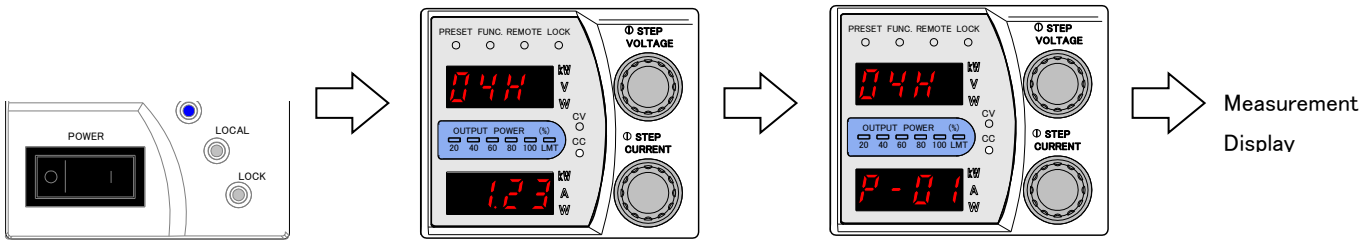


4. Fasten a M3 × 6mm screw from above.

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.



POWER switch ON

Top Number Display/Displays Model
Bottom Number Display/Displays Fireware Version

Top Number Display/Displays Model
Bottom Number Display/No. of Parallel Devices

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-400H:**04H** ●ZX-S-800H:**08H** ●ZX-S-1600H:**16H**

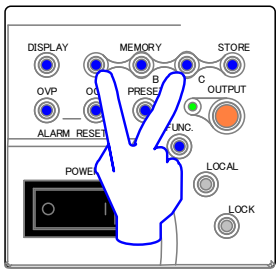
Displayed as: ●ZX-S-400HA:**04HA** ●ZX-S-800HA:**08HA** ●ZX-S-1600HA:**16HA**

Default Settings

Factory settings and settings after initialization are as followed:

Settings Item	400H/400HA	800H/800HA	1600H/1600HA
Constant Voltage Set Value	0.00V	0.00V	0.0V
Constant Current Set Value	5. 250A	10. 50A	21. 0A
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 23 on Default Values for Function Settings (excluding section 20～38 Calibration Values)		

Returning Factory Settings

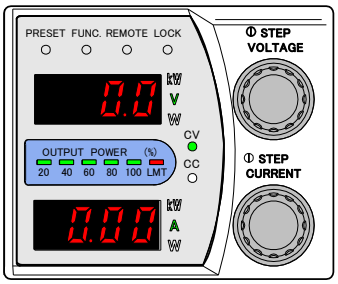


All power supply settings can be initialized.
To return settings to factory default settings, turn the POWER switch ON while holding down the MEMORY keys“A” and “C”. Release the keys once the Number Display lights up.

Backing-Up Settings

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

Operating as Constant Voltage Power Supply



Please verify that the settings for Over Voltage Protection (OVP) circuit (page 29) and Over Current Protection (OCP) circuit (page 31) 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

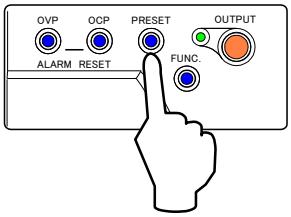
When POWER is turned OFF the top and bottom Number Displays will be displayed in the same manner when POWER is turned ON again.

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

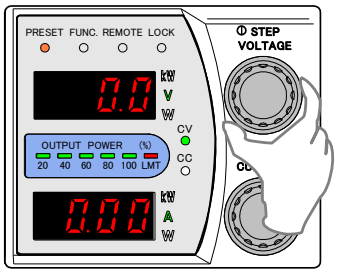


Turn the VOLTAGE dial to adjust the Constant Voltage Set Value

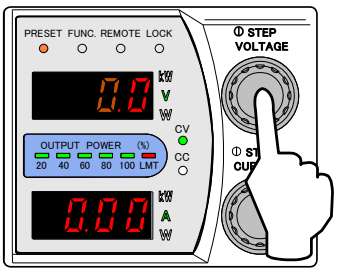
(Turn the dial right to raise or left to lower the set value.)

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.



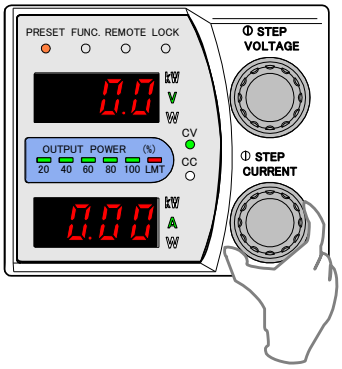
If the parameter for FUNCTION item 50 is set to 1, promptly change the set value using the VOLTAGE dial.

⇒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.)

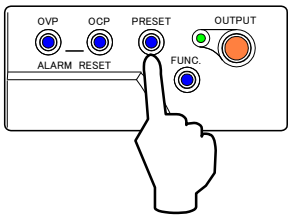


MEMO

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)

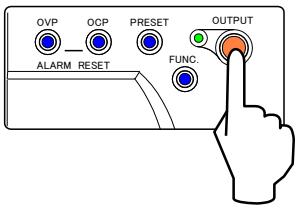
Press the PRESET key to finalize settings.

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.

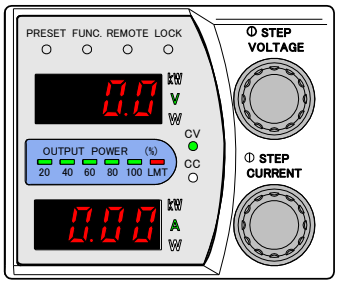


MEMO

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

Operating as Constant Current Power Supply

Please verify that the settings for Over Voltage Protection (OVP) circuit (page 29) and Over Current Protection (OCP) circuit (page 31) are in effect.



Turn the POWER switch ON to startup the power supply.

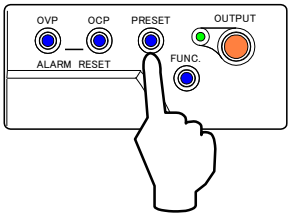
The voltage measurement value will display in the top Number Display, and the current measurement value will display in the bottom Number Display. Lamp "V" and "A" will light.
(If parameters for FUNCTION settings item 52 is set to 1, PRESET value will be displayed)

MEMO

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

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.

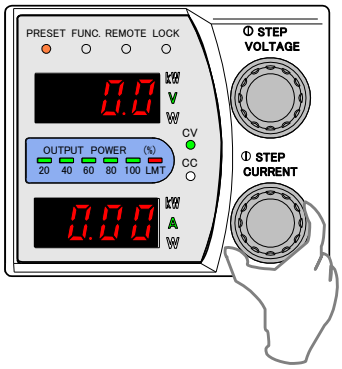


Turn the CURRENT dial to adjust the Constant Current Set Value.

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

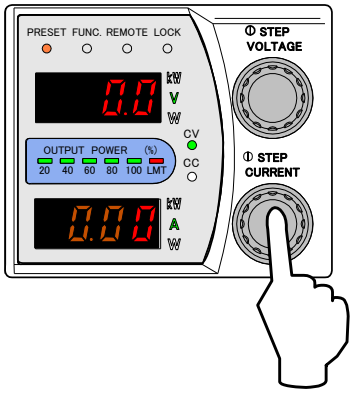
MEMO

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.



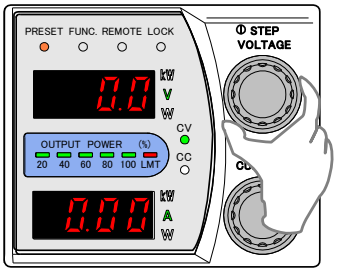
⇒Continued on next page

Turn the VOLTAGE dial to adjust the Voltage Limit Value

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

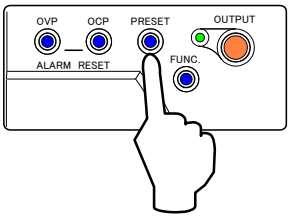
MEMO

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.

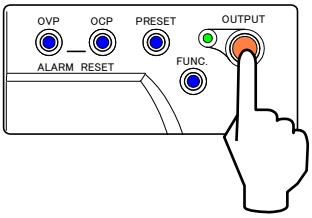


Press the OUTPUT key.

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

MEMO

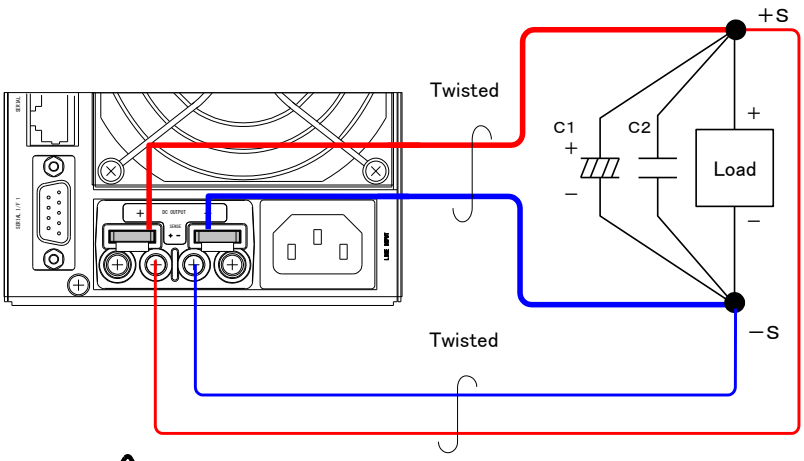
While the PRESET lamp is lit, all other keys not mentioned in the above setting procedures cannot be used. (OUTPUT key can be used)



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.



MEMO

C1 : Electrolytic Capacitor 100～1000 μF
(Low Impedance Item)

C2 : Film Capacitor 1～10 μF
[Connect when wishing to lower output ripple/noise from the load terminal]

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)

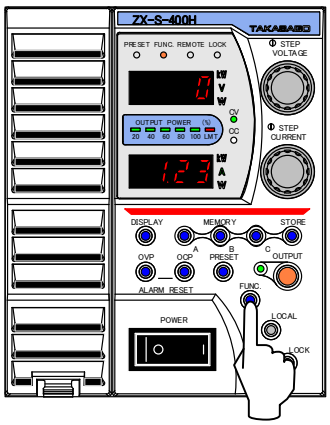
Setting Functions

Setting Procedures

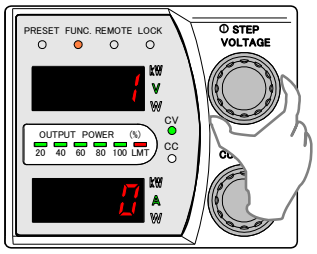
Press the Function "FUNC" key.

FUNC. lamp will light.

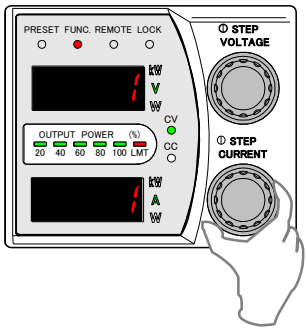
The Setting Item Number will display on the top Number Display and the parameter will be displayed in the bottom Number Display.



Select the Item Number with the VOLTAGE dial.



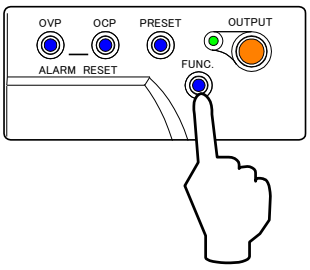
Change the Parameter with the CURRENT dial.



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.

Settings Items List

【FUNCTION Settings Items】

Item No.		Settings Item		Parameters and their Ranges	Default Value
0	General Functions	Firmware Version		Displays version only (cannot be changed)	
1		Current Sinking Functions ON/OFF		0＝OFF 1＝ON	1＝ON
2		Startup Mode Selection		0＝CV Priority, High Speed 1＝CC Priority, High Speed 2＝CV Priority, Slew Rate 3＝CC Priority, Slew Rate	0＝CV Priority, High Speed
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 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 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 Control (Remote Mode) 1＝Use for Sequential ON/OFF (Local Mode)	0＝Serial Data Communication Control (Remote 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 ※Can only select 1600H/HA parameters(0,1,2)		0＝ Stop switching 1＝ Input power relay TRIP (Only for serious failures) 2＝ Input power relay TRIP (Serious failures &OVP, OCP)	0＝ Stop switching ※For 400H/HA 800H/HA, 0＝Fixed
11		Output ON/OFF Toggle with External Contact		0＝Invalid 1＝When short Output ON, When open Output OFF 2＝ When short can be ON/OFF depending on panel control, When open Output OFF	0＝Invalid
12		Measurement Value Moving Average Processing		0＝No 1＝Yes	0=No

Settings Items List (Continued)

【FUNCTION Settings Items】

Item No.		Settings Items		Parameters and their Ranges	Default Value
13	General Functions	Linearity Compensation Function Operatation Mode		0＝Compensation Mode OFF 1 ＝ Operates when Output is turned ON/OFF or when 2＝Performs continuous compensation	1＝Operates when Output is turned ON/OFF or when settings are changed. Saves compensation value 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 Analog Input	Voltage Setting Offset	Not displayed	
29			Voltage Setting Full-Scale	Not displayed	
30			Current Setting Offset	Not displayed	
31			Current Setting 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 Operation	Methods for Determining PRESET Contents		0＝Determines PRESET contents after PRESET mode is complete 1＝Determines PRESET contents during PRESET mode	0＝Determines PRESET contents after PRESET mode is complete

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)(※)	
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＝only VOLTAGE/CURRENT are invalid	
54		Panel Memory Key Load Procedure	0＝Single-Action	1＝Double-Action
			1＝Double-Action	
60	Communication Functions	Device Address	1～50	1
61		Bitrate	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 EXT R/V, PANEL 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 EXT R/V, PANEL 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)	

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

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） 0.00～64.00 Ω（800HA） 0.00～32.00 Ω（1600HA）	0.00Ω
73		Series Operation		0＝Master	0＝Master
				1＝Slave	
74		LEVEL1_ ALM	CV_STS	0＝Is not included in LEVEL1_ALM	0＝Is not included in LEVEL1_ALM
				1＝Included in LEVEL1_ALM	
75			CC_STS	0＝Is not included in LEVEL1_ALM	0＝Is not included in LEVEL1_ALM
				1＝Included in LEVEL1_ALM	
76			PL_STS	0＝Is not included in LEVEL1_ALM	0＝Is not included in LEVEL1_ALM
				1＝Included in LEVEL1_ALM	
80		Software PL State		1= vaild (Can't change it only by indication.)	
100	Sequential Operation Function	Sequential Operaton Mode		0＝disable 1＝enable(Normal Mode) 2＝enable(Continue Mode)	0 = disable
101		Sequential Operating Number of repetition		0 to 9999times 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

Settings Items List （Continued）

【FUNCTION Settings Items】

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

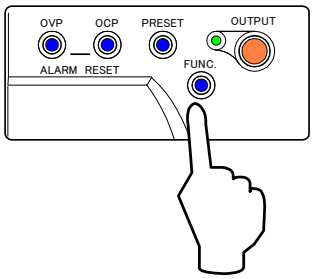
Setting Output ON/OFF Toggle Mode

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.

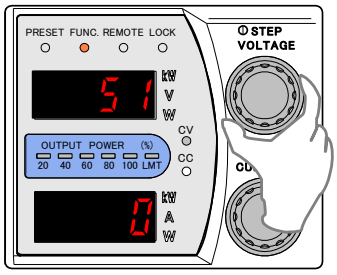
Setting Procedures

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.

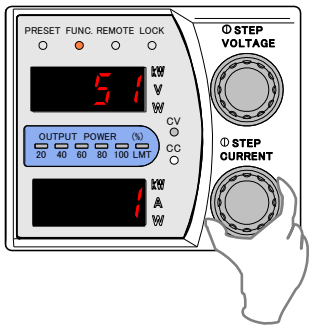


Select Item No. 51 with the VOLTAGE dial.

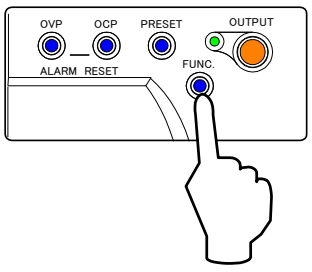


Set Parameter to 0 or 1 with the CURRENT dial.

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.

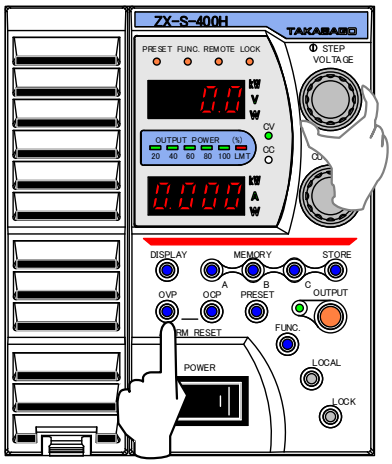


Over Voltage Protection (OVP) Circuit

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

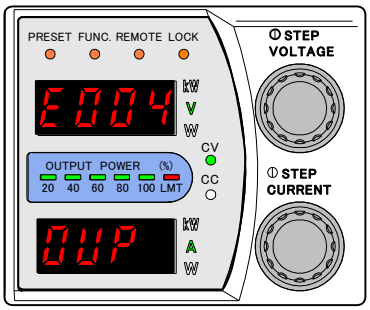
When Over Voltage Protection Circuit is triggered, the OUTPUT is set to OFF and an error code (top) and alarm message (bottom) will be displayed in the Number Display.

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.

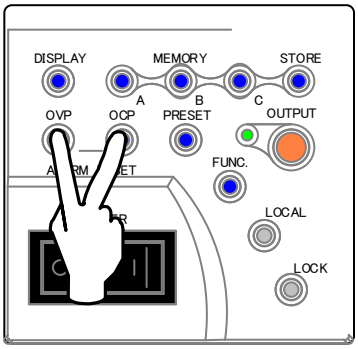
Press the OUTPUT key to start output.



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

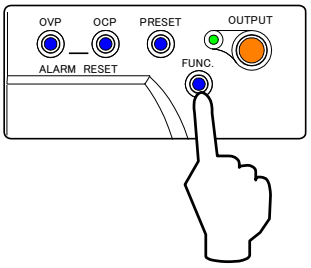
- During serial data communication, recovery from alarm status is possible using commands.
- During parallel operation where the Master unit is operating normal, if any Slave unit triggers an alarm, the error code "E006" will be displayed in the Master and functioning Slave units.

(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.

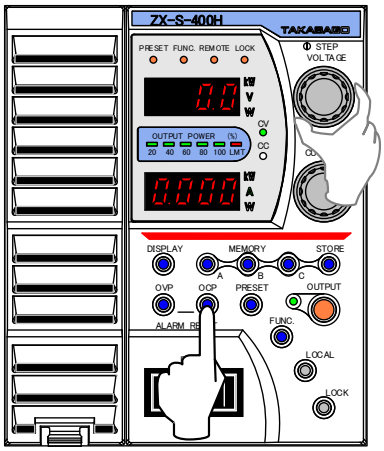


Over Current Protection (OCP) Circuit

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

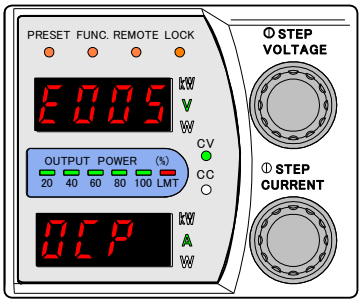
After settings are complete, please follow the procedures below to test verify operation.

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.

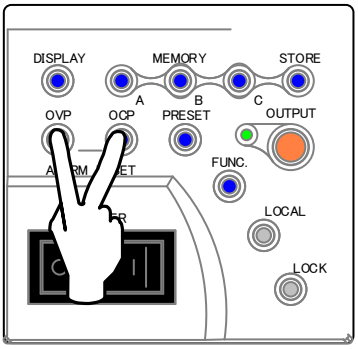
Error Code "E005" will be displayed in the top Number Display and OCP will be blinking in the bottom Number Display



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

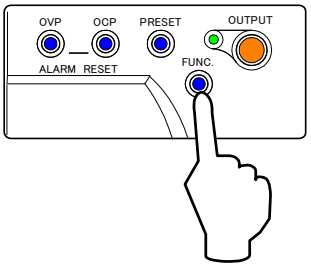
- During serial data communication, recovery from alarm status is possible using commands.
- During parallel operation where the Master unit is the operating normal, if any Slave unit triggers an alarm, the error code "E006" will be displayed in the Master and functioning Slave units.

(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.



Error Codes

Position / Item	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. Contact Takasago Sales Dept.
OHP	E003	OHP	Over heating protection is triggered.	●Turn power OFF. Leave device to cool down. Turn power ON ●Check environmental temperatures ● Verify Fan Motor rotates when power is turned on. (OUTPUT is OFF)
OVP	E004	OUP	Over voltage protection was triggered	Check OVP values. See page 29 to cancel alarm.
OCP	E005	OCP	Over current protection was triggered	Check OCP values See page 31 to cancel alarm
BST	E006	—	Slave unit malfunctioned. (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. 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 (1600H/HA) ※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. 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

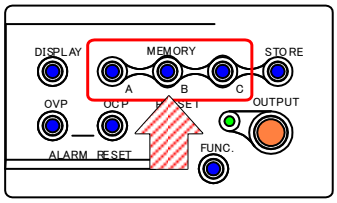
Saves and loads the set values of the voltage, current, and various functions in memories “A”, “B”, and “C”.

MEMO

Settings Items that can be saved in memory are listed on page 35, “Panel Memory Savable Settings”.

Saving in Memory

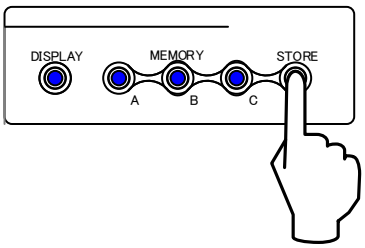
This function will save the current set values in memory “A”, “B”, and “C”.



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.

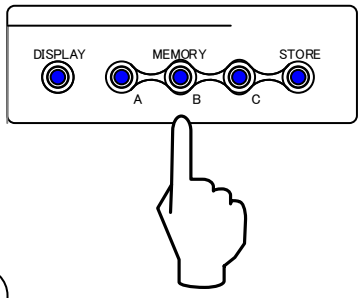
(Press the STORE key again to cancel.)



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.

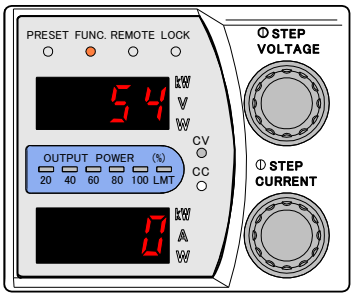
Values can be saved to memory regardless of OUTPUT ON/OFF status.

Loading from Memory

[Single-Action Loading]

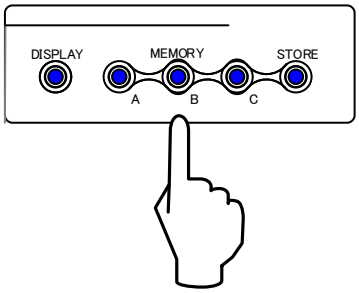
Set the parameter for FUNCTION settings item 54 to"0".

(See page 23 Function Settings on how.)



Press the memory key you wish to load from.

The settings stored in memory will take affect.



MEMO

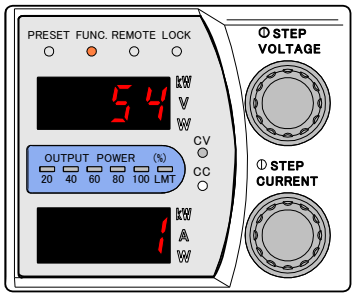
Only the OUTPUT ON/OFF and keys mentioned in the setting procedures can be used.

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 23 Function Settings on how.)

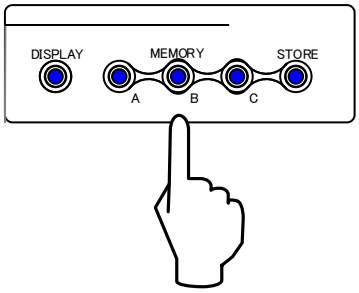


Press the A, B, or C memory key you wish to load from

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

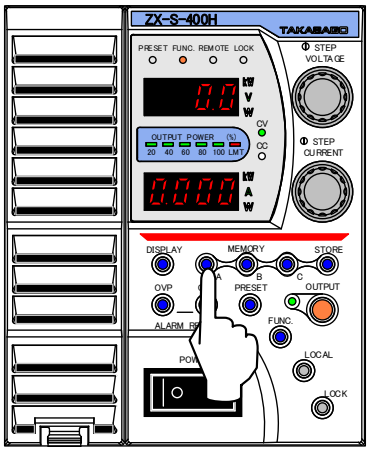
(Press the same memory key to cancel.)

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.

Panel Memory Savable Settings

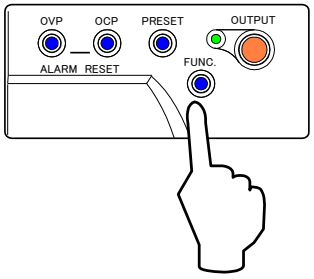
Keys used to set	Savable Parameters	
PRESET	CV Set Value	
	CC Set Value	
	OVP Set Value	
	OCP Set Value	
FUNC.	2	Selection of Startup Mode
	3	CV Slew Rate Rising
	4	CV Slew Rate Falling
	5	CC Slew Rate Rising
	6	CC Slew Rate Falling
	8	ON Delay Time
	9	OFF Delay Time
	72	Internal Resistance Settings

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

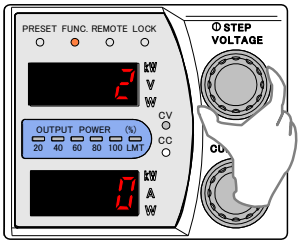


Press the Function "FUNC." key.

FUNC. lamp will light.

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

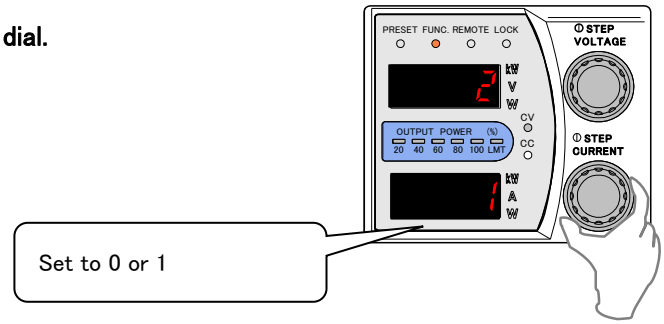
Select Item Number 2 with the VOLTAGE dial.



Select either 0 or 1 with the CURRENT dial.

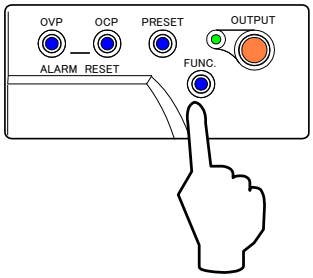
Set Value 0＝CV Priority Mode

Set Value 1＝CC Priority Mode



Press the FUNC. key again to finish.

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

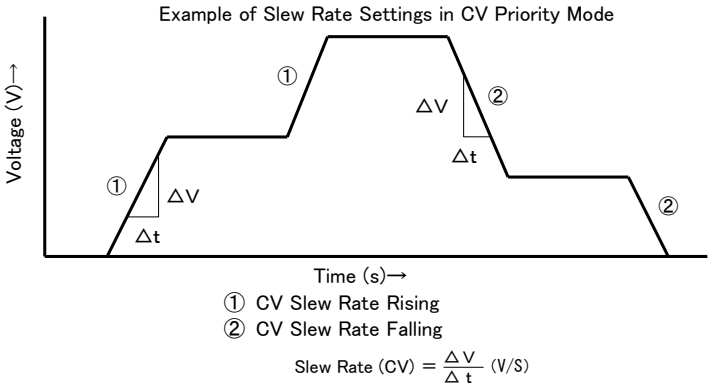


MEMO

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.

Variable Slew Rate

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



① CV Slew Rate Rising
② CV Slew Rate Falling

$$\text{Slew Rate (CV)} = \frac{\Delta V}{\Delta t}\ (V/S)$$

■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:

400H/HA : 0.01A/s ～ 10.00A/s
800H/HA : 0.01A/s ～ 20.00A/s
1600H/HA : 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 400H/HA

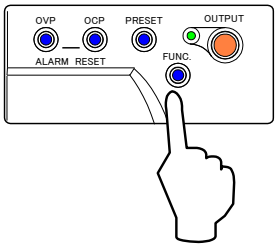
① 2 Devices : 0.01～20.00A/s
② 3 Devices : 0.01～30.00A/s
③ 4 Devices : 0.01～40.00A/s
④ 5 Devices : 0.01～50.00A/s
⑤ 6 Devices : 0.01～60.00A/s
⑥ 7 Devices : 0.01～70.00A/s
⑦ 8 Devices : 0.01～80.00A/s
⑧ 9 Devices : 0.01～90.00A/s
⑨ 10 Devices : 0.01～100.0A/s

Setting Procedures

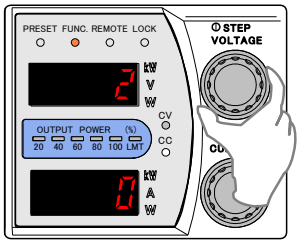
Press the Function "FUNC." key.

FUNC. lamp will light.

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

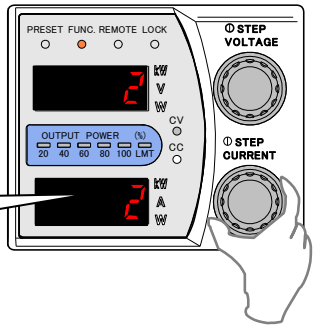


Select Item Number 2 with the VOLTAGE dial.



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

Set Value 2＝CV Priortiy, Variable Slew Rate
Set Value 3＝CC Priority, Varialbe Slew Rate

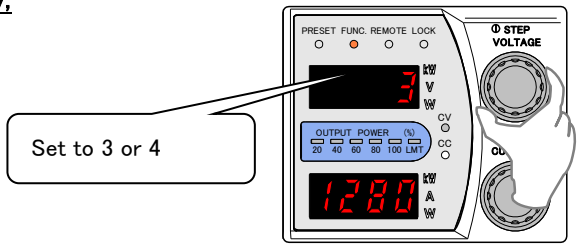


When selecting Constant Voltage (CV) Priority, Variable Slew Rate mode (Item 2 set to 2)

Set the Item Number to either 3 or 4 using the VOLTAGE dial.

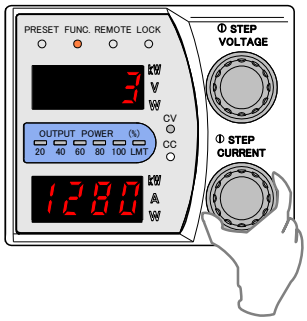
Set Value 3＝Rising Voltage Slew Rate

Set Value 4＝Falling Voltage Slew Rate



Assign the set value using the CURRENT dial.

Range: 1.0V/s～1280V/s

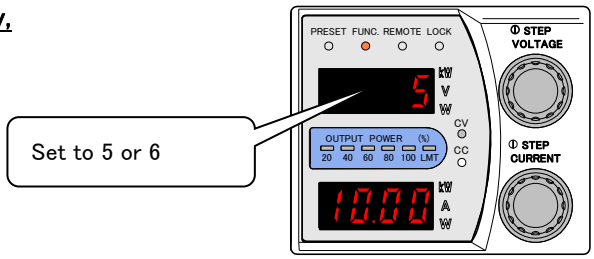


When selecting Constant Current (CC) Priority, Variable Slew Rate mode (Item 2 set to 3)

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



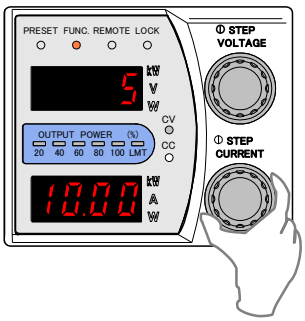
Assign the set value using the CURRENT dial.

Range:

400H/HA : 0.01A/s ～ 10.00A/s

800H/HA : 0.01A/s ～ 20.00A/s

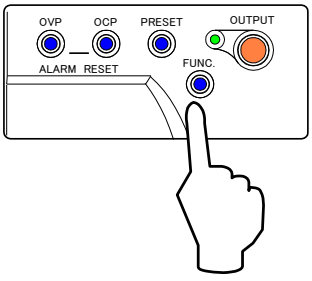
1600H/HA : 0.01A/s ～ 40.00A/s



If using with master slave parallel operation, see caution on page 113.

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

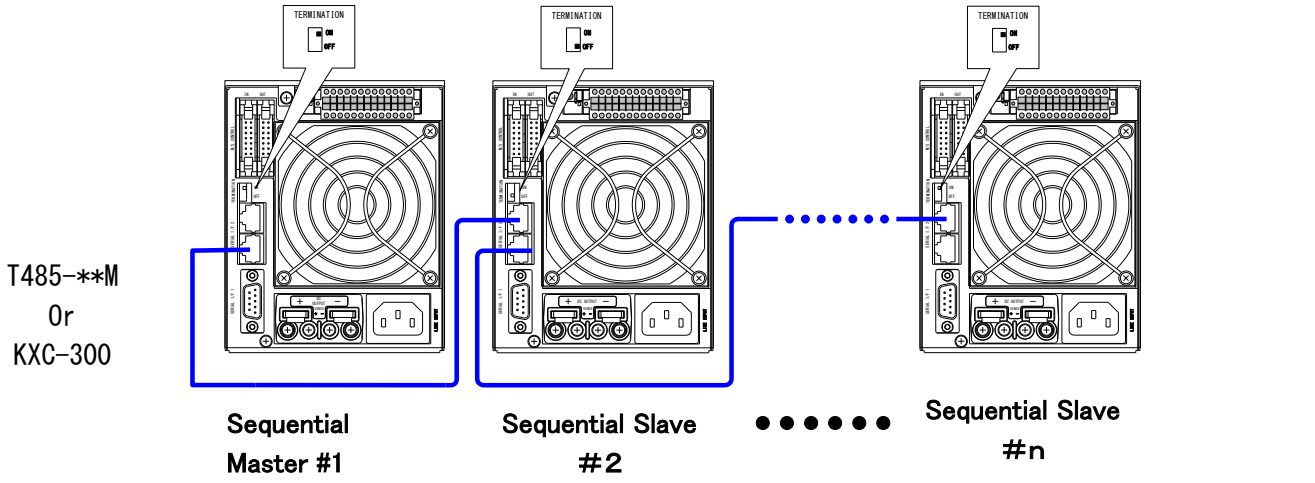
Toggles the Output ON/OFF for multiple ZX-S Series power supplies using time delays.

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

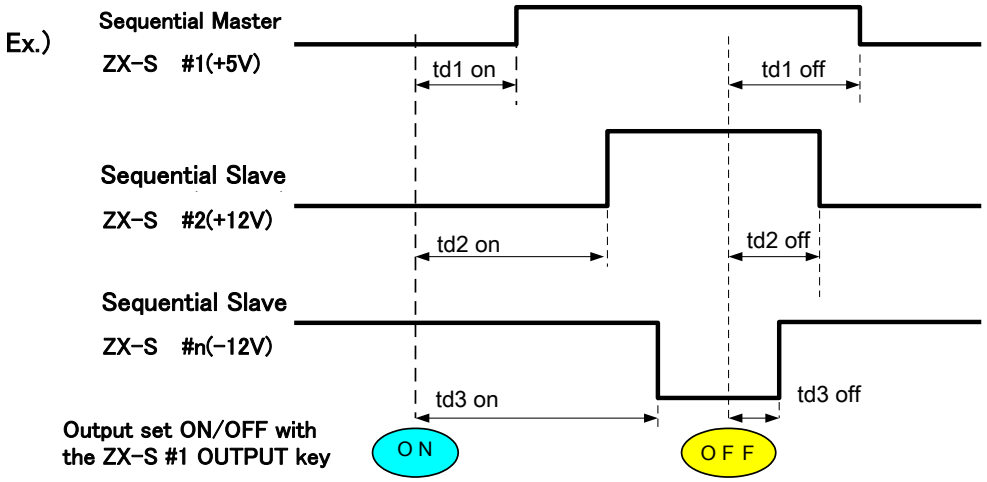
Sequential ON/OFF Connections

Using the Sequential Function

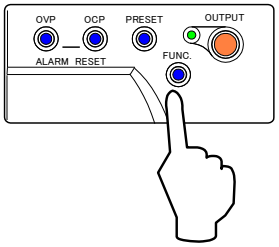
Toggles the output ON/OFF once the delay time, set as the trigger of each unit for the sequential Master unit's "OUTPUT ON" signal, has surpassed.

MEMO

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



Setting Procedures

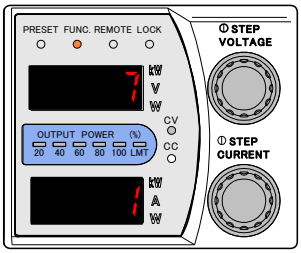


Set Sequential ON/OFF to ON for LOCAL

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.

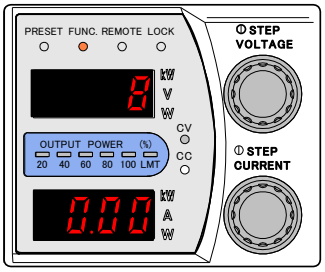


Select Item Number 7 with the VOLTAGE dial, then set the parameter to 1 with the CURRENT dial.

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.

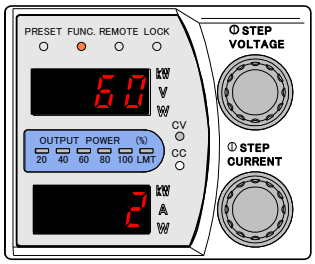
Set OFF-Delay Time with the CURRENT dial.

⇒Continued on next page

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.

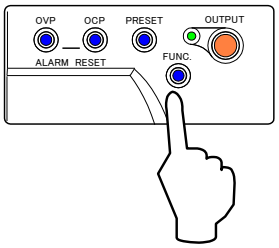


Master Unit is Address “1”.

Set the Slave Unit Address to any value except “1”.

Press the FUNC. key to finish.

Number Display will return to mesurement display mode.



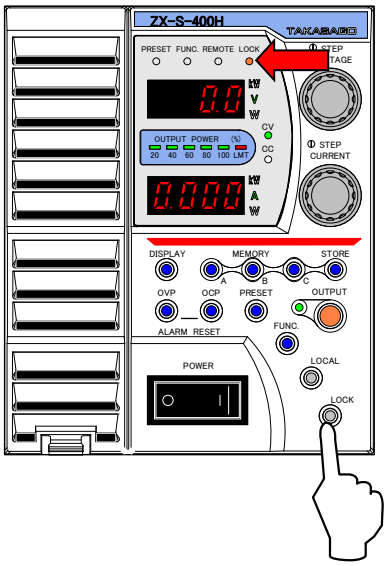
Key Lock

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.

Variable Internal Resistance (ZX－S Series Type-HA)

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.

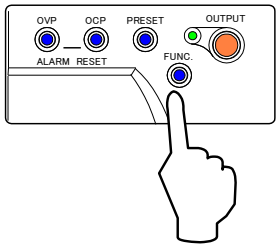
Not suited for approximating transient phenomenon.

Setting Procedures

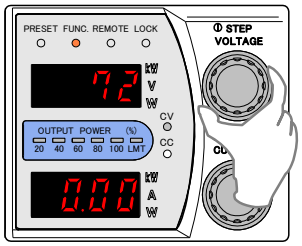
Press The Function "FUNC." key.

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.

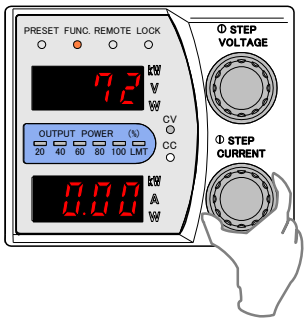
Range is 0.00Ω～128.0Ω

400H/HA : 0.00Ω ～ 128.0Ω

800H/HA : 0.00Ω ～ 64.0Ω

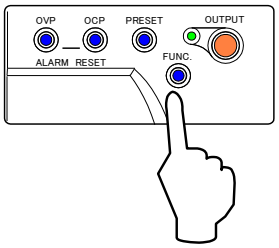
1600H/HA : 0.00Ω ～ 32.0Ω

Factory default is 0.00Ω (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

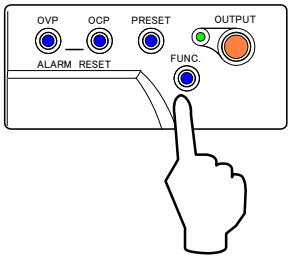
Use when wishing to stabilize displayed values when the load current is periodically fluctuating at high speeds. The displayed value will be the average value of data, including new data, measured within the past 2 seconds. This is renewed approximately every 200ms. (This method is known as the Moving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

Setting Procedures

Press the Function "FUNC." key.

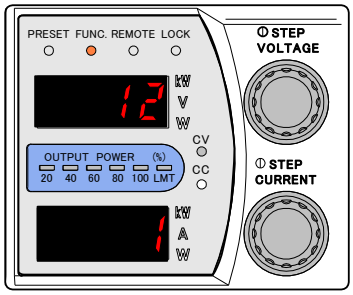
FUNC. lamp will light.

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



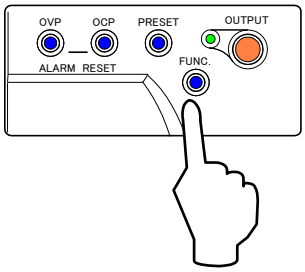
Select Item Number 12 with the VOLTAGE dial.

Set the parameter to 1 with the CURRENT dial.



Press the FUNC. to finish.

Returns Number Display to measurement display mode.



Linearity Compensation

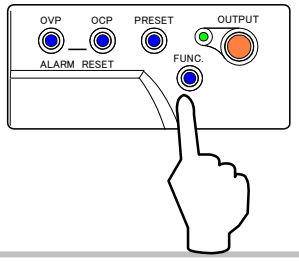
This function provides a high output setting accuracy by measuring and compensating the nonlinearity of the output caused by feedback systems or DA converters/Error Amplifiers used as a DC power supply voltage or current reference value. This is normally used when the compensation function is turned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

Setting Procedures

Press the Function "FUNC." key.

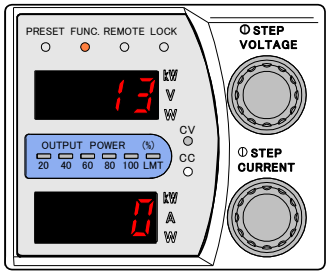
FUNC. lamp will light.

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



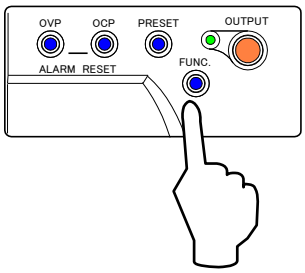
Select Item Number 13 with the VOLTAGE dial.
Set Compensation Mode with CURRENT dial.

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.

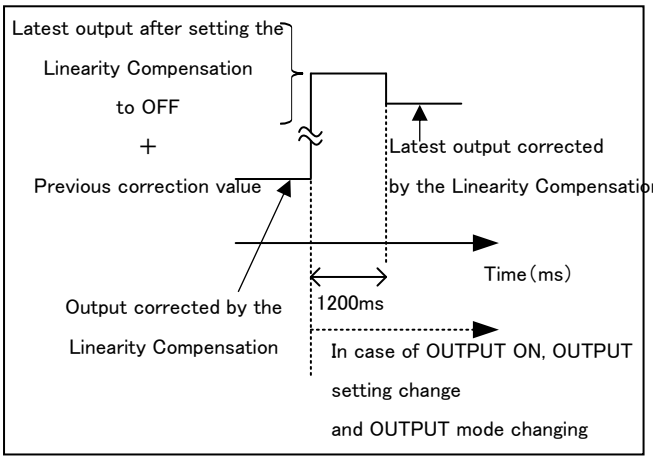
Returns Number Display to measurement display mode.



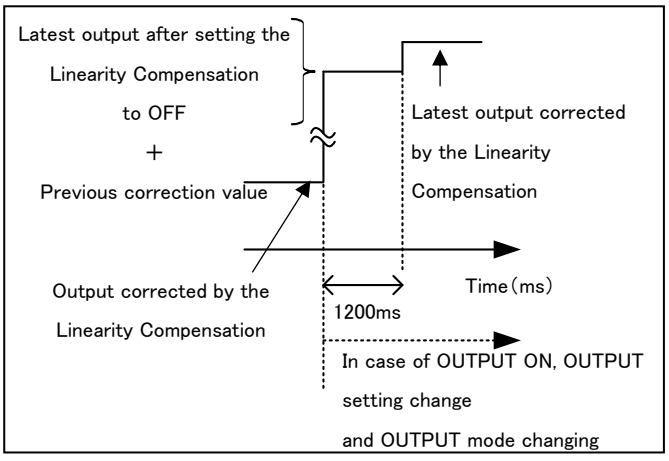
Supplementary Information

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.

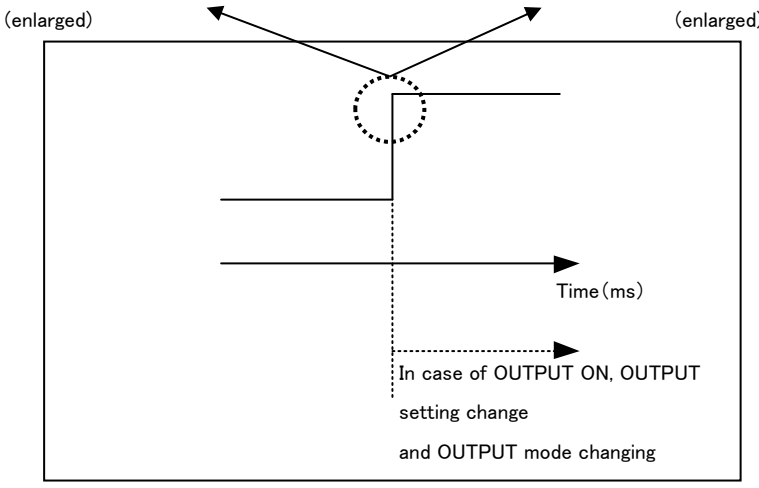
Variation by output mode
CV mode : ± (0.3%+300mV) for 400H/HA,800H/HA and 1600H/HA
CC mode : ± (1.5%+15mA) for 400H/HA
± (1.5%+15mA) for 800H/HA
± (1.5%+30mA) for 1600H/HA



In the event of the previous corrected value is positive

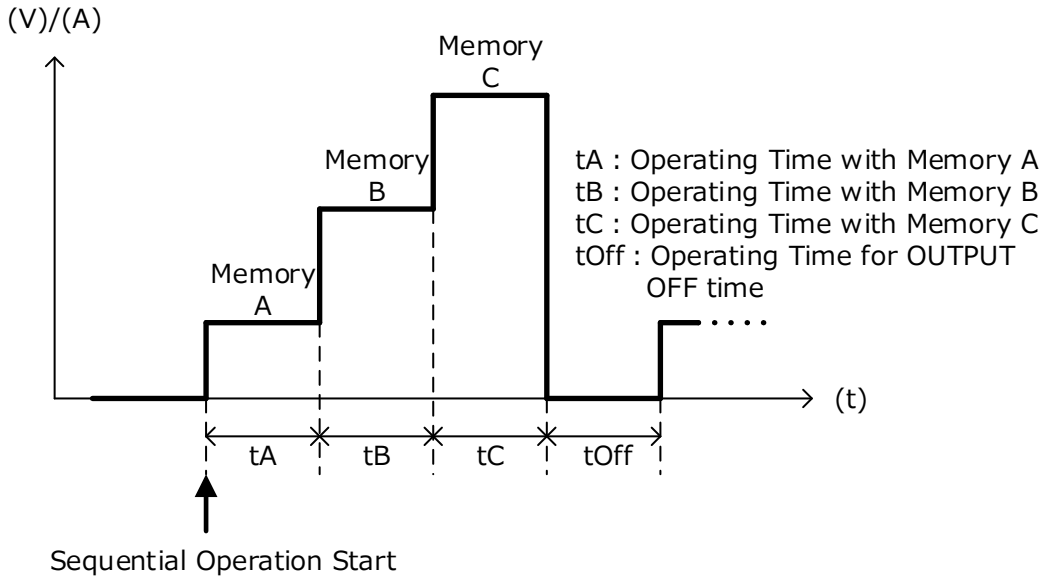


In the event of the previous corrected value is negative



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. ±0.5% and settable Min. resolution is 0.1 sec.However it may happened 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)

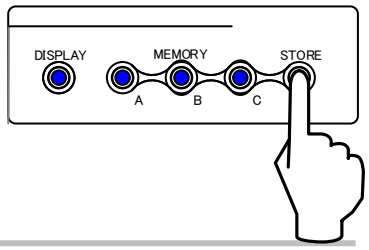
0: Priority on CV, 1: Priority on CC, 2: CV priority slew rate, and 3: CC priority slew rate

- 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 Resister Setting (Setting of FUNCTION 72) (※) Only for ZX-S series A type

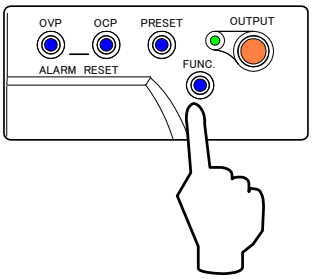
Note) Please refer to "Useful Function for Memory"in the Instruction Manual for the detail and how to set of the Memory Function.

How to use sequence operation function

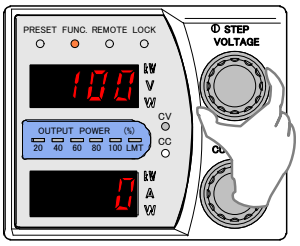
Set the desired value of voltage, current and various function to memory A, B and C, referencing "Useful Function –Memory Function" in the Instruction Manual.



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".

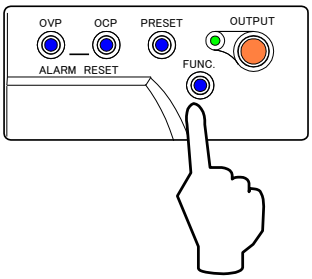


ZX-S series will be ready for sequence operation after setting "1"or "2" for item 100 and pressing "FUNC" button.

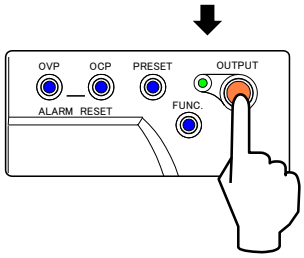
0 = Sequential Operation disable

1 = Sequential Operation enable (Normal Mode)

2 = Sequential Operation enable (Continue Mode)



The "OUTPUT" lamp is blinking during the sequential



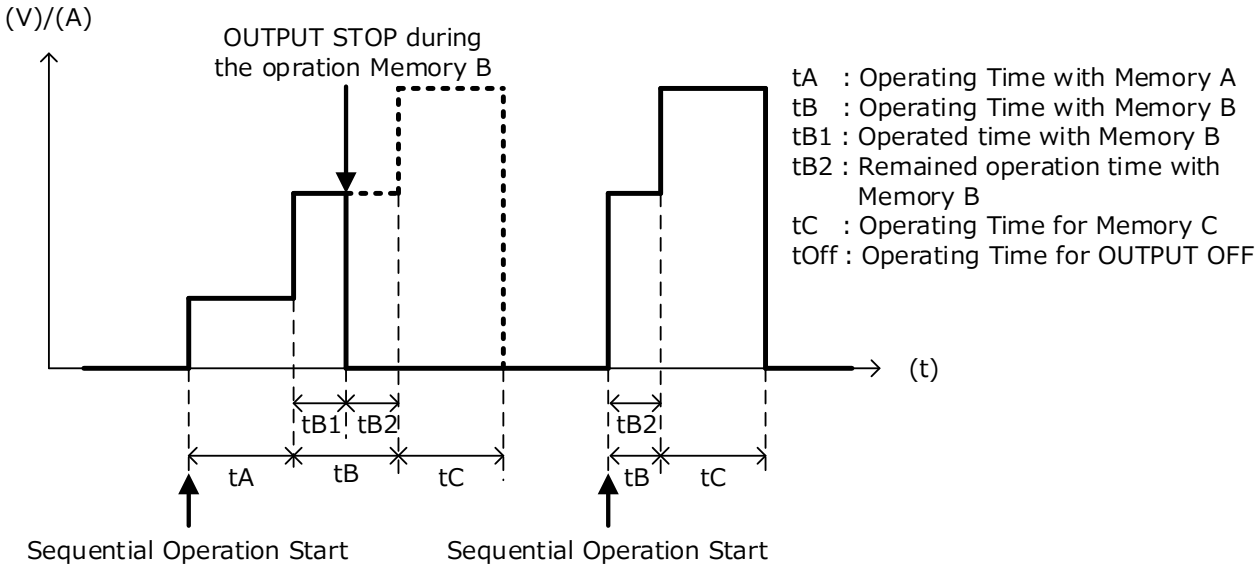
Sequential Operation will be started after pressing ″OUTPUT″ button.
″OUTPUT″ lamp will be blinking once the sequential operation is started.
The sequential operation will be stopped, if the ″OUTPUT″button is pressed during the operation.
Please take note that the sequential operation is able to start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

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.

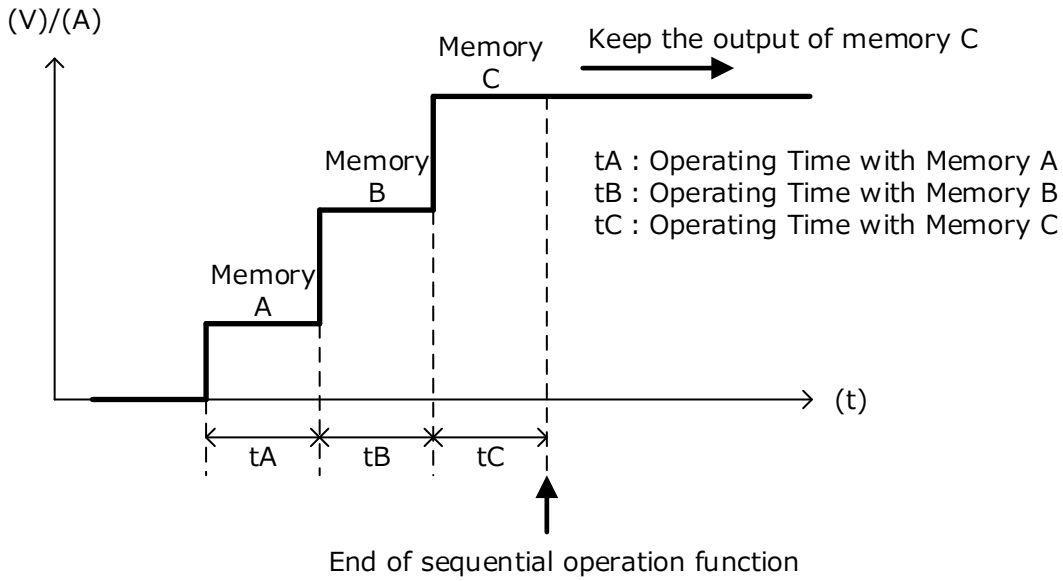
Continue Mode Function

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.

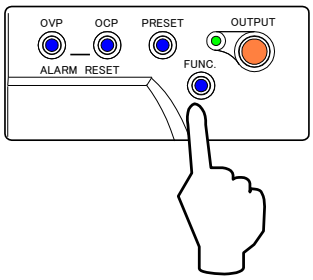


OUTPUT OFF at the end of the limited repetition of Sequential Operation

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.



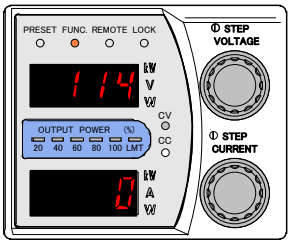
Press Function Key "FUNC.".



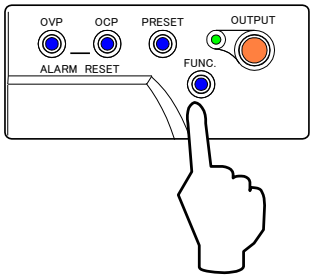
Set the required parameters for item 114.
For the items and parameters, please refer to "List of Setting Items (additional)" in page 2.

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.



Detail for Sequential Operation Function

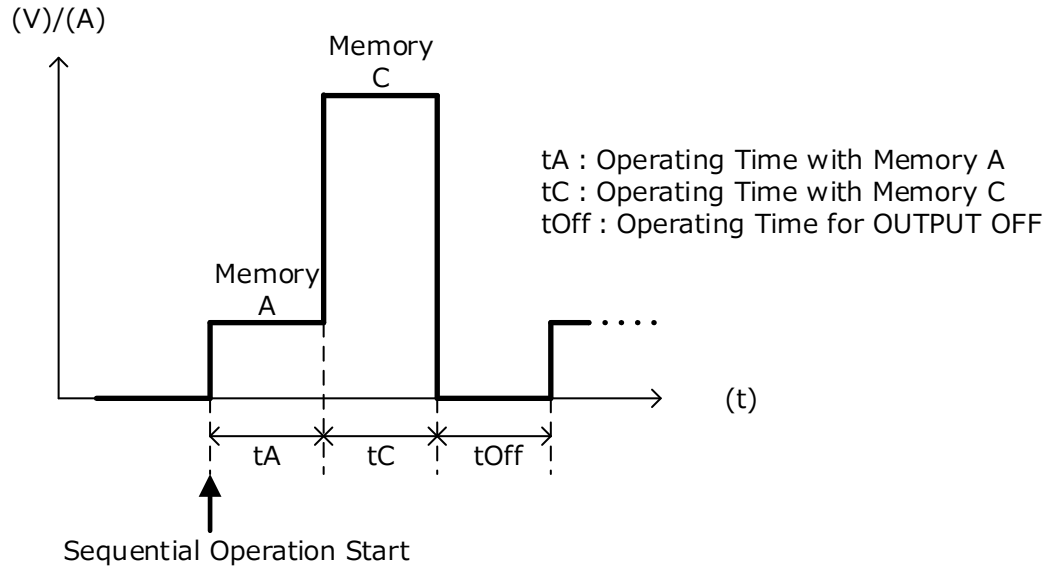
1. The sequential operation time is the sum of each operation time such as hrs., min. and sec. of Function Setting Item from 102 to 113.

e.g. The operation time for Memory A will be 1 hrs., 10 min. ned 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.

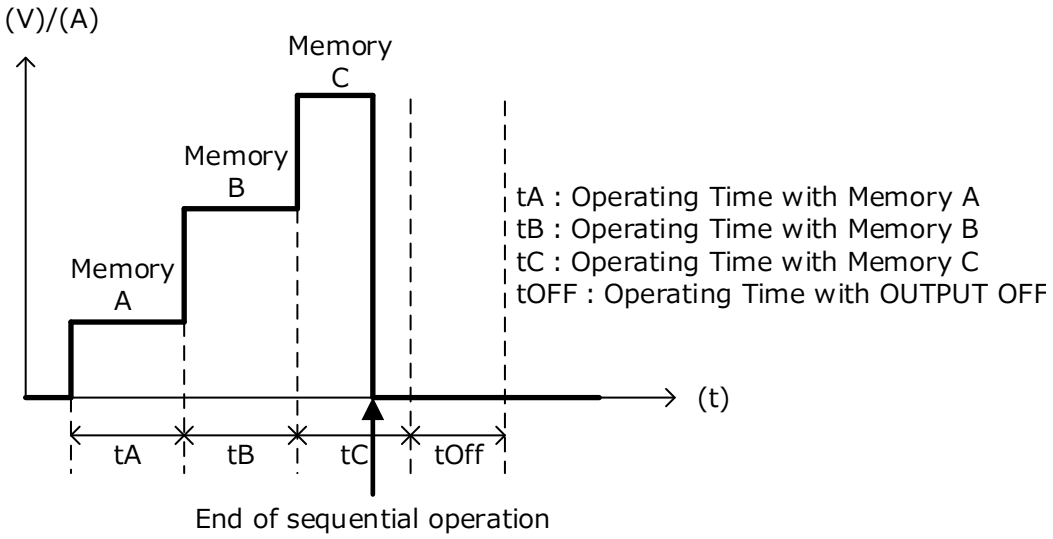
e.g. 1) There is no OUTPUT with the Memory B, if the operation time for the Memory B is set as ″0 hrs., 0 min. , 0.0 sec″.



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″.

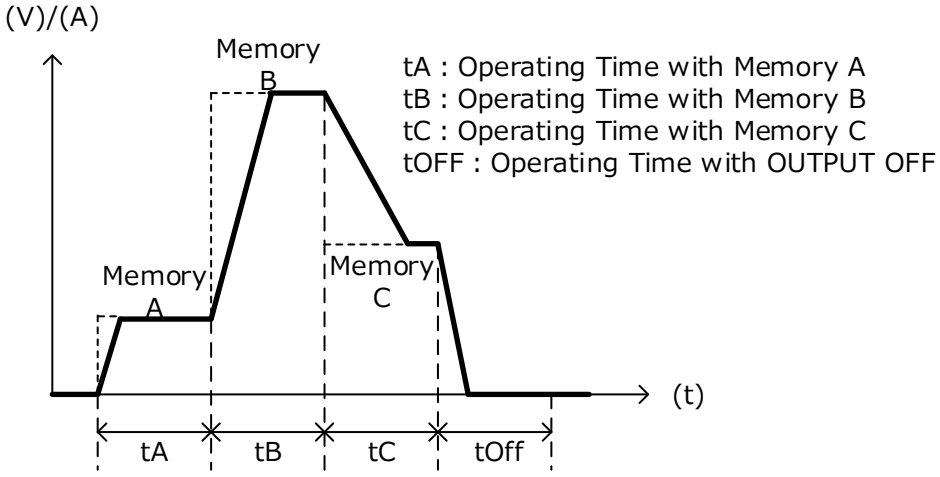
3. It is enable to stop the sequential operation forcibly by OUTPUT OFF during the sequential operation.

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.

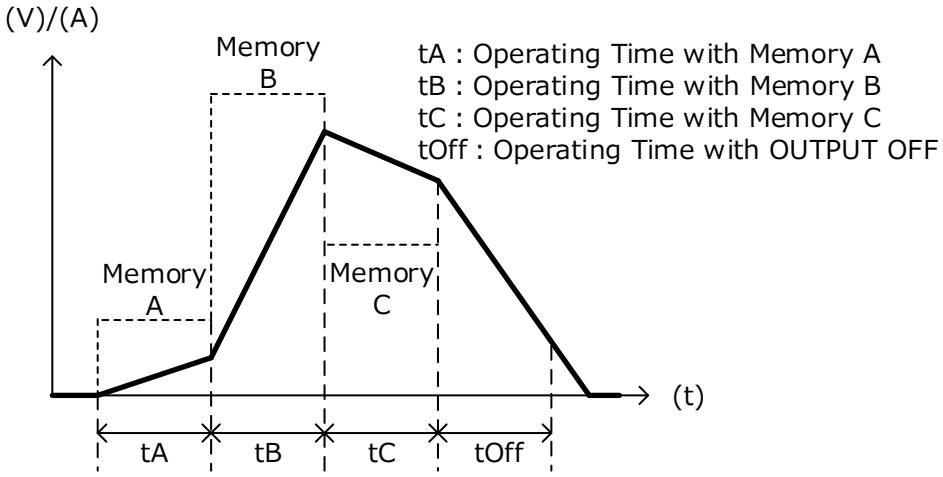


4. It is enable to use slew rate during the sequential operation. The time during the change of the slew rate will be considered as the sequential operation time.

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



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

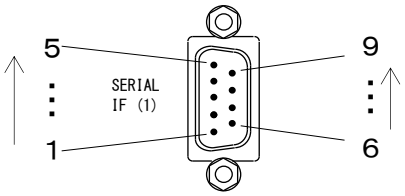
Remote control via communication commands can be obtained by connecting the SERIAL I/F 1 connector on the rear of the power supply to a communication terminal's COM port of a computer, sequencer, etc. with a RS-232C cross cable. Further, by connecting multiple power supplies with the SERIAL I/F 2 connector, remote control of multiple ZX-S Series power supplies can be obtained through one communication terminal. Command forms can be selected from 2 types; forms in conformance with IEEE488.2 Common Command and SCPI Protocol, or forms in conformance with Takasago EX Series Commands.

Caution

- Input the DSR signal for the power supply to be always ON.
- The DTR signal for the power supply will be outputted Always ON when power is turned on. Further, RTS signal will return CTS signal from the power supply.

External Control Connector SERIAL I/F Connector Types

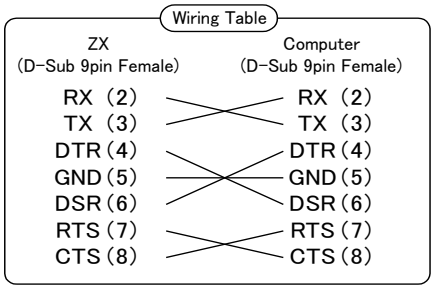
Power Supply: D-SUB 9 Pin (Male)

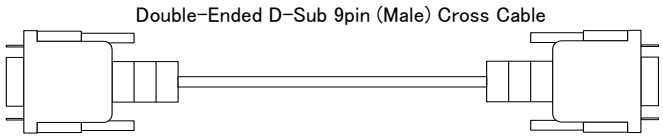


Pin No.	Name	IN/OUT	Pin No.	Name	IN/OUT
1	NC	-	2	RX	IN
3	TX	OUT	4	DTR	OUT
5	GND	-	6	DSR	-
7	RTS	OUT	8	CTS	IN
9	NC	-			

【If connecting with computers, sequencers, etc.】

Use computer serial interface cables (sold in markets) that are wired as shown below.

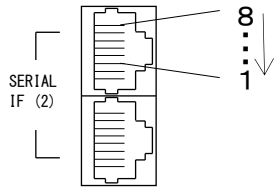




External Control Connector「SERIAL I/F 1」Pin Placement

When controlling multiple ZX power supplies, use the SERIAL I/F 2 for the second power supply and thereon. Pin placement for the external control connector SERIAL I/F 2 is shown in the diagram below.
SERIAL I/F 2 electrical specifications conform to RS 485 standards.

Power Supply: RJ-45 (Male)



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

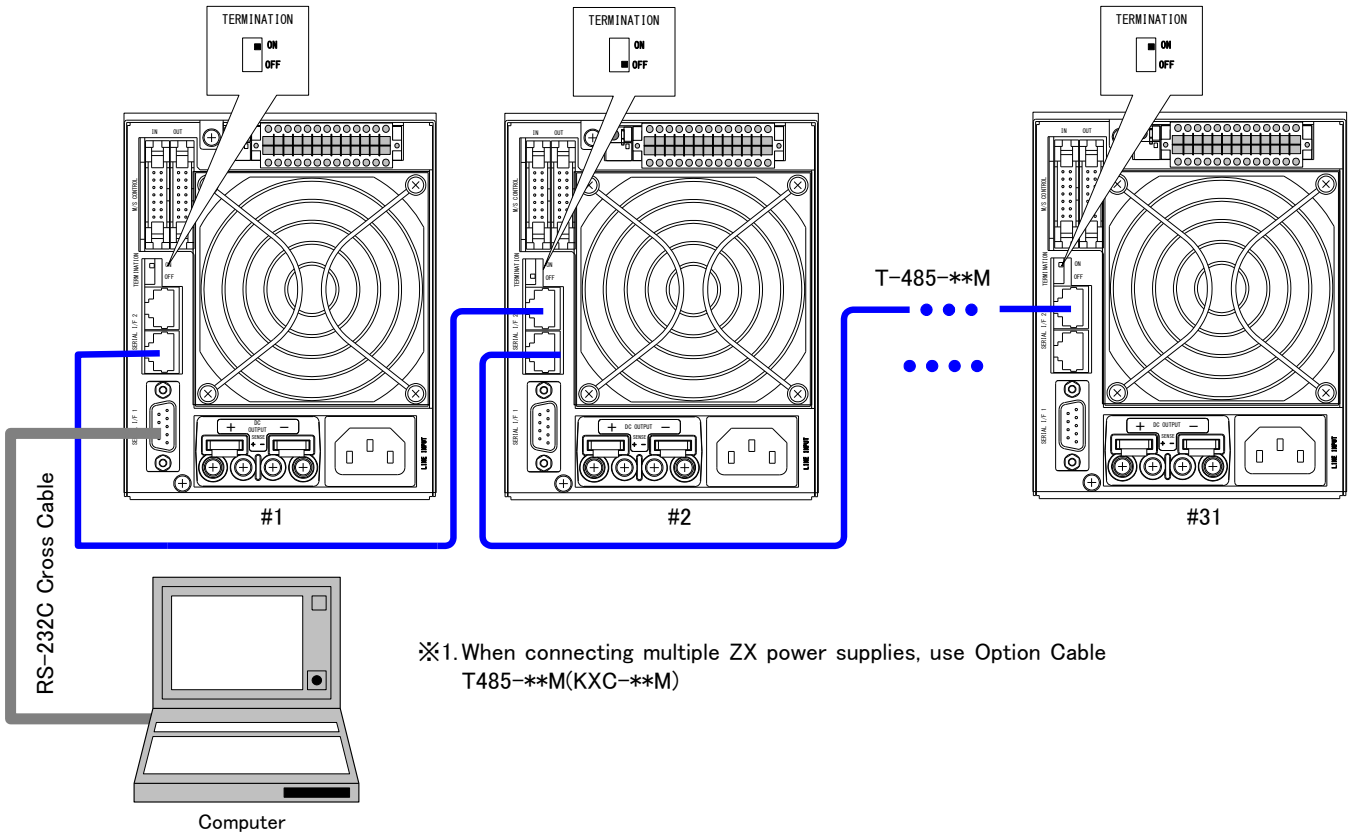
External Control Connector SERIAL I/F 2 Pin Placement

Multiple Connections

The diagram below shows the connections for controlling multiple ZX Series power supplies with one computer. By setting each individual address for the ZX 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 termianl 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.



※1. When connecting multiple ZX power supplies, use Option Cable T485-**M(KXC-**M)

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、9600、19200、38400bps
Data Length	8bit (fixed)
Parity	NOT、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

Accessing

Access Procedure

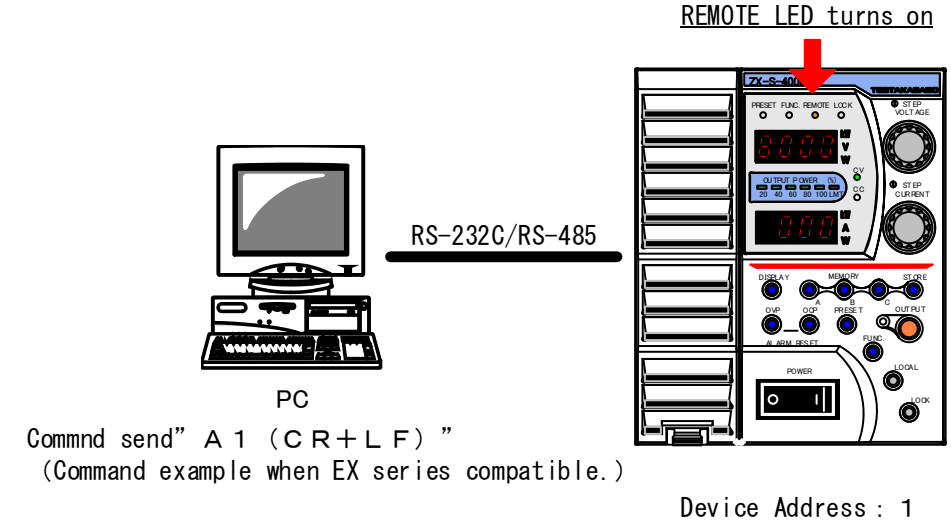
For controlling via communication commands, match the address assigned by the “Device Address Assign” command with the device address, set under FUNCTION Settings Item 60 “Device Address”.

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)

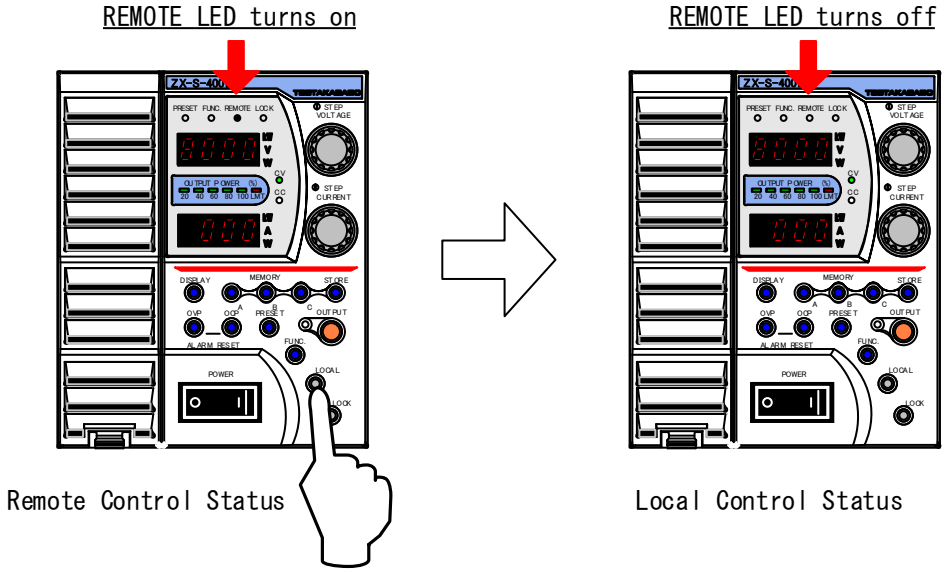
If the set device address differs with the address of the “Device Address Assign” command received, control via communication commands from that point will be released.

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

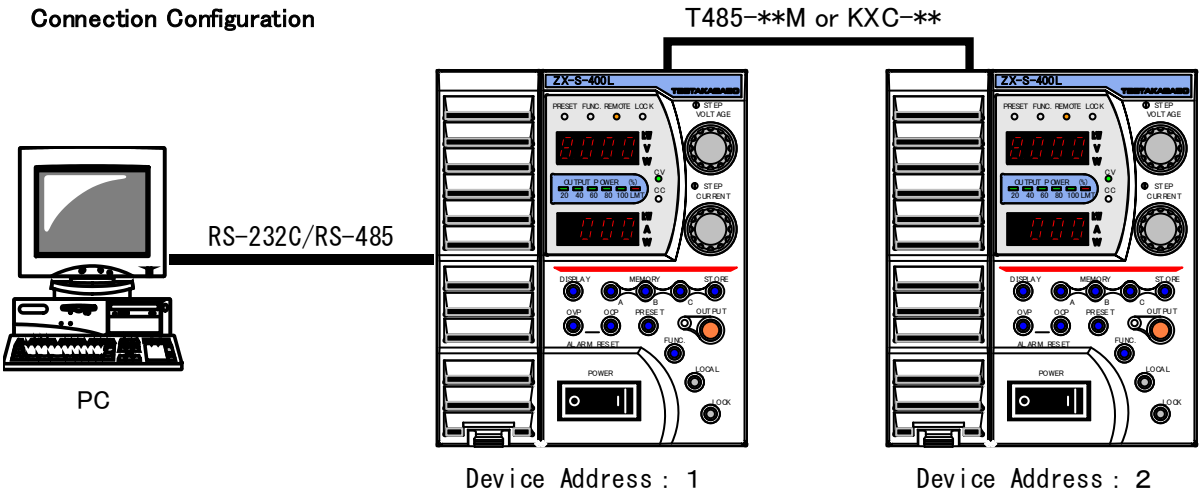


Returning to Local Control from Remote Control

Communication with Multiple Connections

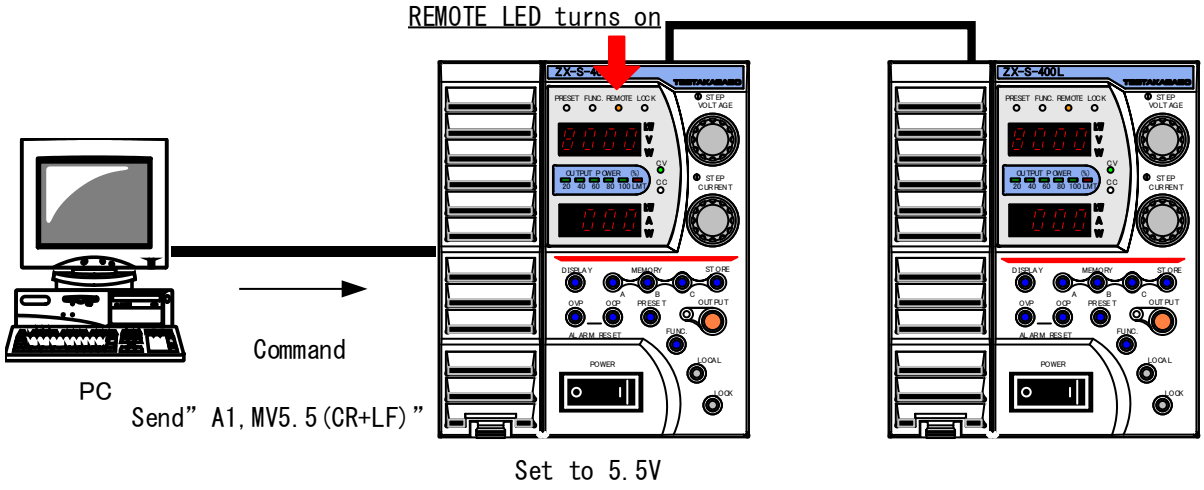
Below are Remote Control examples when connected to two ZX-S Series power supplies.

Connection Configuration

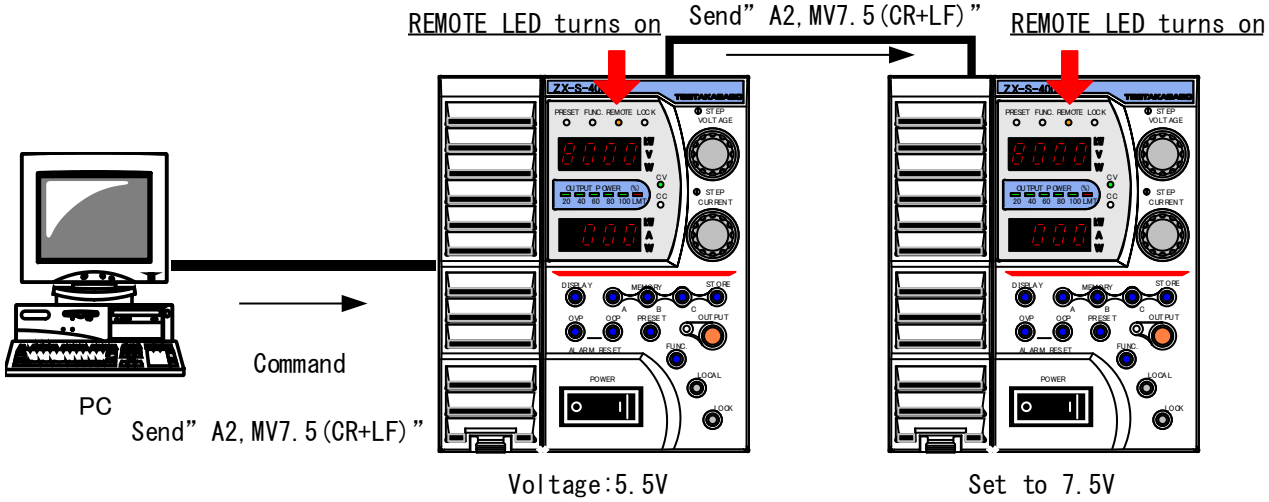


(Caution) For RS-485 control, set it to other than "1"

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 24).
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 respones are ASCII character strings.
One character space “ ” is required between command words and parameters.

＜Ex.＞
ADDRess 1

Within text, command word stands for command characters such as ADDRess, 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 discrimiated 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

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 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-400H,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 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-400H)
・While operating as a parallel operation slave unit
・ Sequence operation in progress

＜Ex.＞
ALM:CONT:PONB 0
ALM:CONT:PONB？
0

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
Paramters: 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 Contorl 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
Paramters: 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
Paramters: 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
Paramters: 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
Paramters: 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 parallle 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
Paramters: 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-400H(Idependent 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-400H(Idependent 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-400H(Idependent 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]

:Setes 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) / No. of Parallel Connected Devices	400H／HA	800H/HA	1600H/HA
1(Idependent 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-400H(Idependent 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) / No. of Parallel Connected Devices	400H／HA	800H/HA	1600H/HA
1(Idependent 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-400H(Idependent 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) / No. of Parallel Connected Devices	400H／HA	800H/HA	1600H/HA
1(Idependent 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-400H(Idependent 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-400H(Idependent 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 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 uni
・Sequence operation in progress

＜Ex.＞
MEM:REC:MODE 1
MEM:REC:MODE?
1

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

Function: Saves to panel memroy(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(Ω) Ranges

Model(Type) / No. of Parallel Connected Devices	400HA	800HA	1600HA
1(Idependent 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-400HA(Idependent 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

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 SupplyOFF *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.)

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 Setttings 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 retrive 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 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. (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:PRES:MODE 0
SYST:PRES: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 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・・・Invaild
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:MODE□1
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・・・Invaild
1・・・vaild
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

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 mutal functions due to Ex and command compatiblty. 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 103
AR	Executes alarm reset	Page 103
CL	Resets set parameters	Page 103
LC	Sets OCP current	Page 104
LV	Sets OVP voltage	Page 104
MC	Sets output current	Page 105
MV	Sets output voltage	Page 105
OT	Sets output ON/OFF	Page 106
TP	Executes breaker trip	Page 106

Read-Back Command List

Command Name	Read-Back Command Functions	Page No.
TK0	Read-back set parameter	Page 107
TK1	Read-back measurement data (Voltage/Current)	Page 107
TK3	Read-back alarm information	Page 108
TK4	Read-back measured voltage	Page 109
TK5	Read-back measured current	Page 109

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 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
  ＜Ex.＞mv35
- When a string received at one time (until delimiter is received) exceeds 128 characters

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 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 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 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 multple 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) / No. of Parallel Connected Devices	400H／HA	800H/HA	1600H/HA
1 (Idependent 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) / No. of Parallel Connected Devices	400H／HA	800H/HA	1600H/HA
1 (Idependent 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 power supply with the specified device addess.

Format : TK0

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 responed 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)

＊4 : OVP Voltage Set Values (Max. no. of decimal places is 2)

＊5 : OCP Current Set Value

(See page 104 “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 responed 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 : Retrives the status information from the ZX 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 responed ZX power supply

＊2 : Status is represents as 0 or 1

STAT＊＊＊＊＊＊＊

6 0

Retrived Status Information List

Bit	Status Name	Summary	1	0
0	P－ON(M)_STS	P-ON (Master) Status	Main Power Supply ON	Main Power Supply OFF
1	OHP_ALM	OHP(Over Heating Protection) Error	Error	Normal
2	PL_STS	Power Delimiter Operation Status	Power Delimiter running	Normal
3	OCP_ALM	OCP (Over Current Protection) Error	Error	Normal
4	OVP_ALM	OVP （Over Voltage 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 : Retrives the measured voltage data from the ZX power supply with the specified device address
Format : TK4
Read-Back Format : ＊V
＊ : Read-Back Value
Read-Back Value :
＊ : Specified ZX 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 : Retrives 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 power supply's Output Current Measurement Value
(See page 106 "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

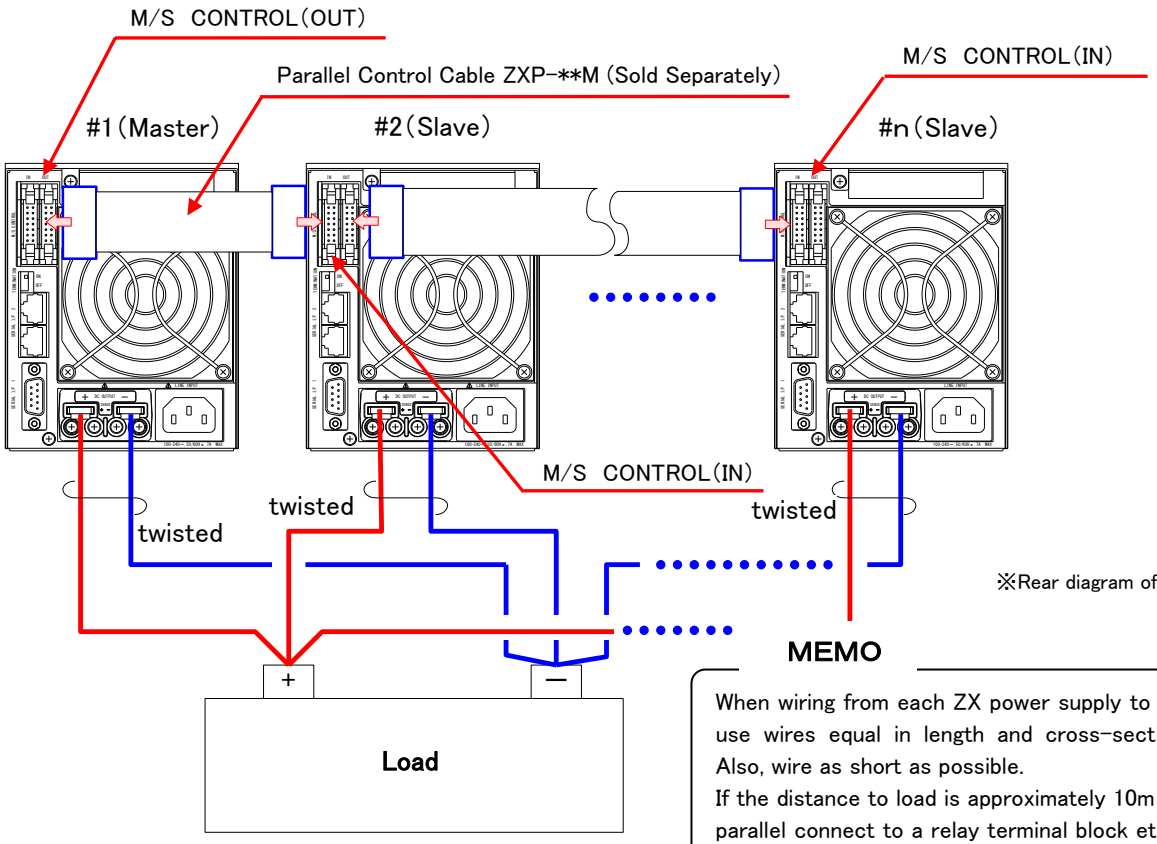
A maximum total of 10 power supply outputs can be connected parallel to increase the output current.
Further, Master-Slave Parallel Operation, the controlling of the overall output voltage and current with a single Master, is available.
Simply connect using a parallel control cable to enable automatic 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 simuletatously), 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).



※Rear diagram of ZX-S-400H

Master-Slave Parallel Operation

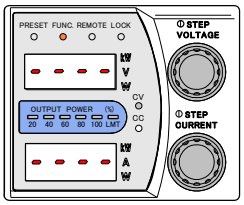
MEMO

When wiring from each ZX power supply to the load, use wires equal in length and cross-section area. Also, wire as short as possible.
If the distance to load is approximately 10m or more, parallel connect to a relay terminal block etc. before connecting to the load.

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 power supply which its M/S CONTROL Connector IN is not connected to another ZX-S Series power supply, is the Master unit (pervious 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

Place / Items	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-1600H/HA)	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;
①The Slave that detected the alarm will display the error code (top) and alarm type (bottom) in the Number Display.
②Error 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)

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-xxx.
- 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.

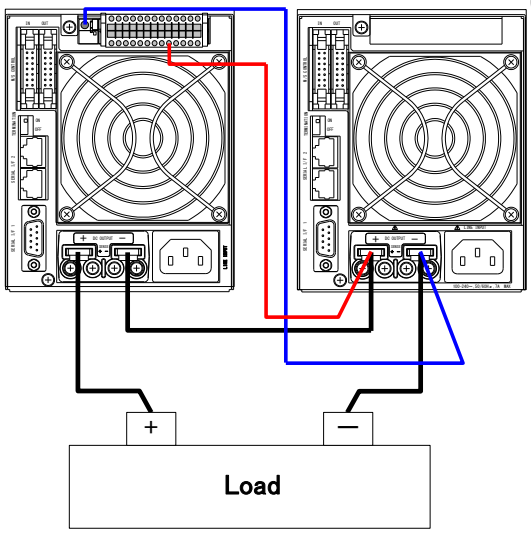
◆Load Wire Connection

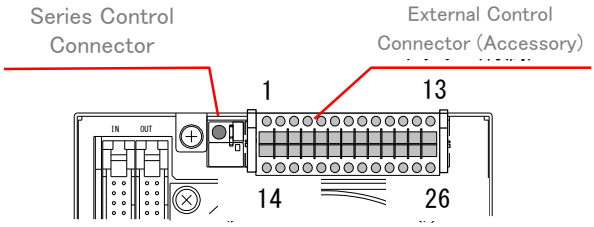
① Connect wires from the Slave's minus terminal to the Master's plus terminal.
② Connect wires from the Slave's plus terminal to the Load's plus terminal.
③ Connect wires from the Master's minus terminal to the Load's minus terminal.

◆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.

(Slave Unit) (Master Unit)





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.

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.

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

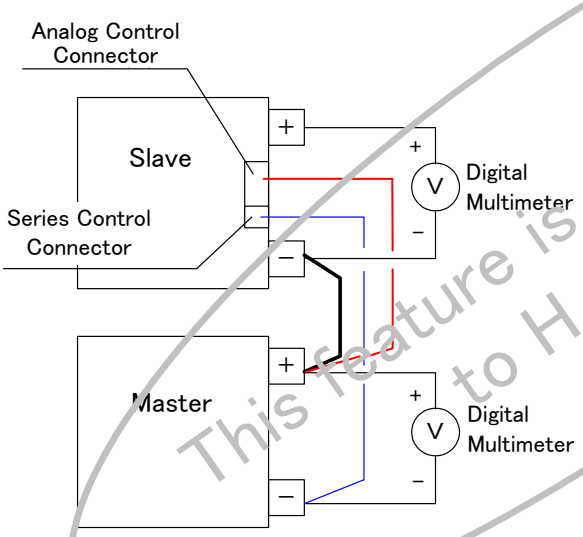
No. of Display Digits: 5 1/2 or more Display Accuracy : 0.005% or more

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

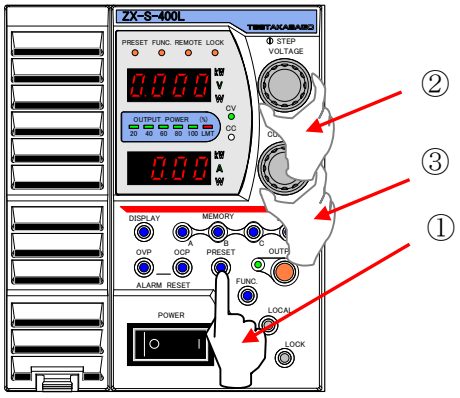
Offset/Full Scale Calibration of Slave Unit Output Voltage

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.

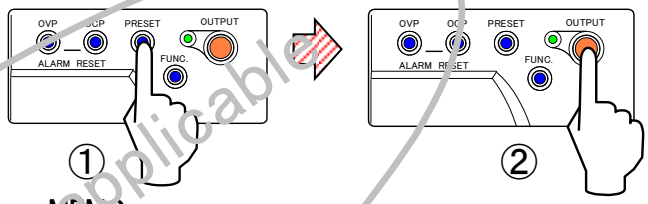


2. **Press the PRESET key ① of the Master unit and set to "0.01V" with the VOLTAGE dial ② and "1.00A" with the CURRENT dial ③.**



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

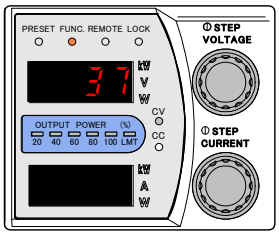
3. **Press the PRESET key again and then the OUTPUT key and set the output to ON.**



MEMO

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

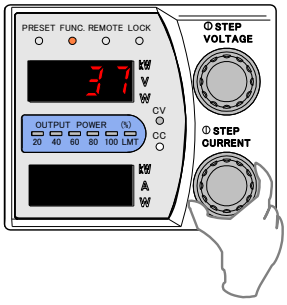
4. **Press the FUNC. key and turn the VOLTAGE dial to display Settings Item 37 in the top Number Display.**



MEMO

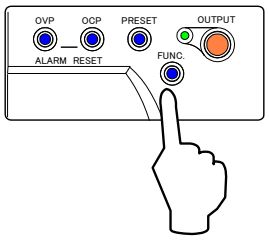
FUNC. lamp will light and the display in bottom Number Display will disappear.

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.**

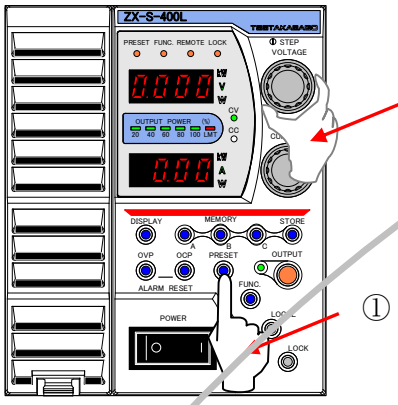


⇒Continued on next page

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

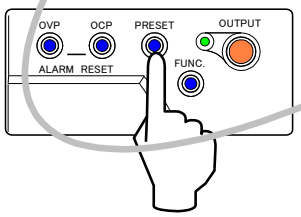


7. Press the PRESET key of the Master unit. Set to "80.00"V with the VOLTAGE dial.

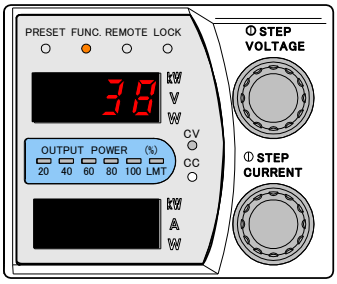


(See "Using as Constant Voltage Power Supply" under "Basic Operations" on how to do this.)

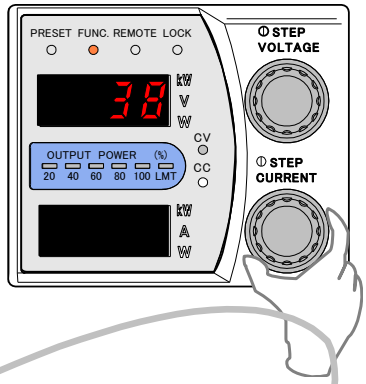
8. Press the PRESET key.



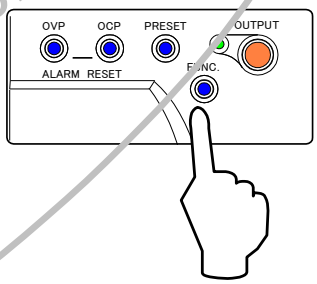
9. Press the FUNC. key of the Master unit and turn the VOLTAGE dial to display Settings Item 38 in the top Number Display.



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 Salve 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.)

Toggling Output ON/OFF with External Contacts

The output for ZX Series power supplies can be toggled ON/OFF using outputs from small capcity contact or photocoupler.
Use a photocoupler or a small signal relay or switch with a minimum contact capcity of 5V, 2.5mA.

Caution

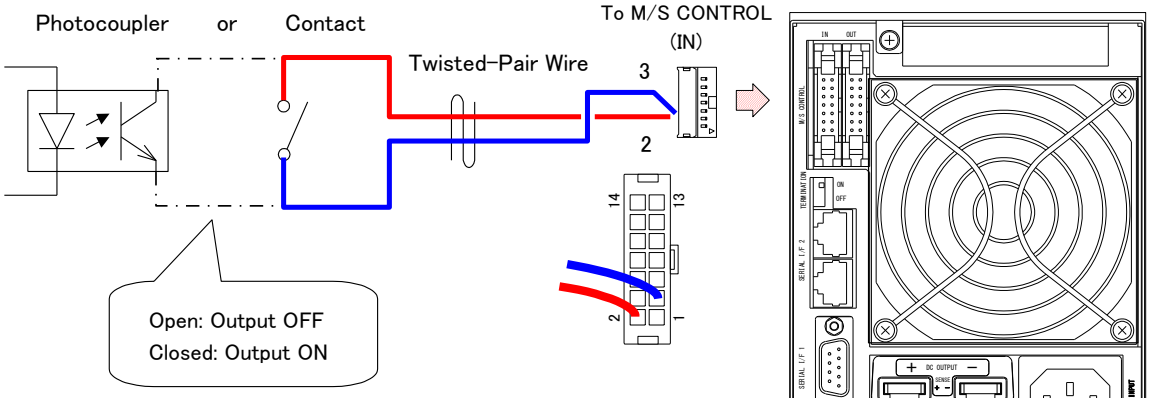
- Not suited for power contact such as main contact points for electromagnetic contactors or power relays etc.
- For output ON/OFF toggle contact, please use a insulated contact point or open collector.

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

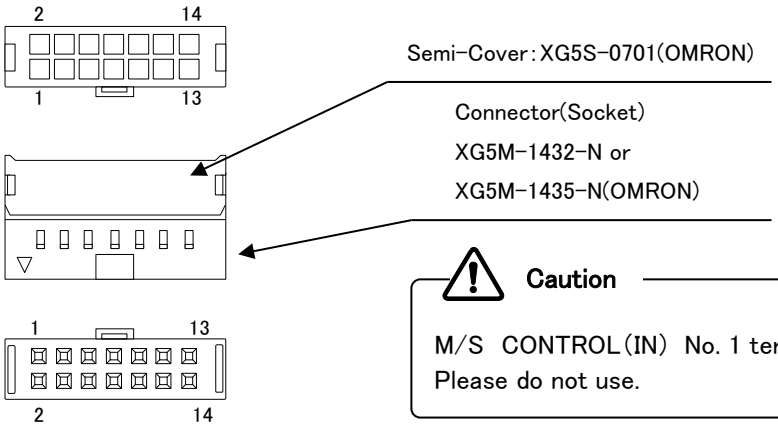
Connecting

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)
	XG5W-0034-N (for XG5M－1432－N)(OMRON)
Crimping	:XY2B-7006(OMRON)
Extracting Tool	:XY2E-0001(OMRON)



Toggling Output ON/OFF at External Contact

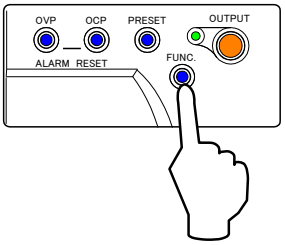


※Rear diagram of ZX-S-400H

Caution

M/S CONTROL(IN) No. 1 terminal is used for factory inspection only. Please do not use.

Setting Procedures

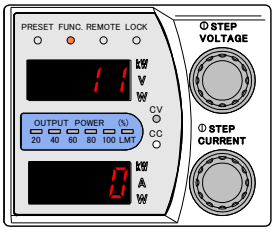


Press the Function "FUNC." key.

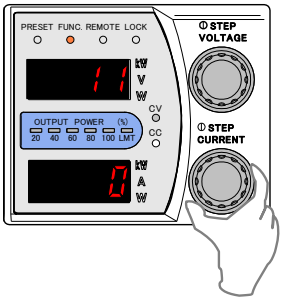
FUNC. lamp will light.

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;

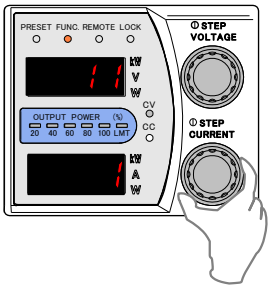
Turns off ON/OFF Toggle at external contact (invalid).

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.



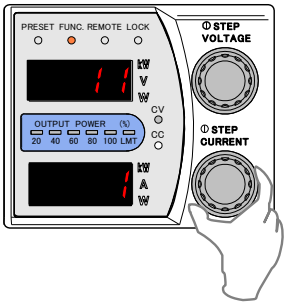
Output can only be controlled by external contact points.

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.

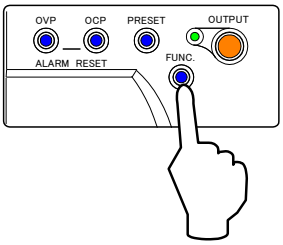
Also, sets the Output OFF if the external contact is opened.



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.

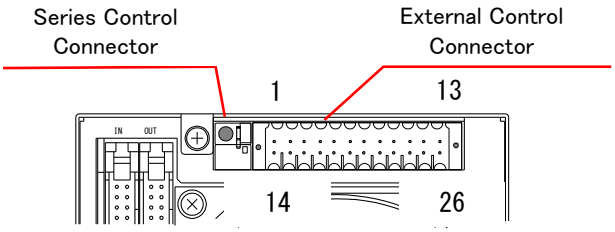
Press the FUNC. key again to finalize settings.

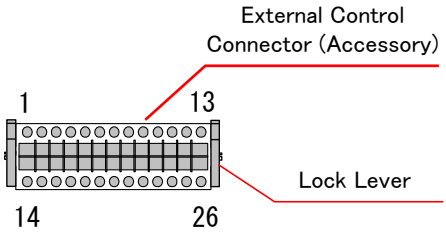


Returns the Number Display to measurement display mode.

Using External Control Terminals (ZX-S Series Type-HA)

This section covers proper methods when operating the ZX-S-HA 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-HA Series.



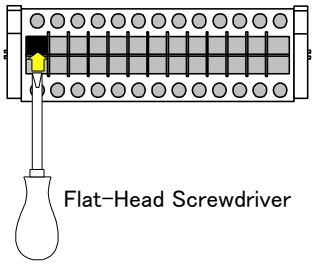


Terminal No.	Signal Name	
1	External ON/OFF Terminal	
2	External ON/OFF, Input Cut-0ff COM	
3	Monitor Terminal	For Output Current
4	Analog COM	
5	Output Voltage Control Terminal	External Voltage Input Terminal (+)
6	Output Voltage/Current Control Terminal	External Resistance Terminal (A Curve)
7	Output 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

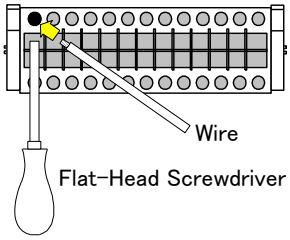
①Push a flat-head screwdriver into the square hole.



②Insert 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

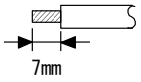


③Extract Screwdriver

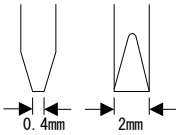
Wire Specifications

・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-HA)

The ZX-S Series Type-HA 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 capcity contact points or photocouplers.
Use a photocoupler or a small signal relay or switch with a minimum contact capcity of 5V, 2.5mA.

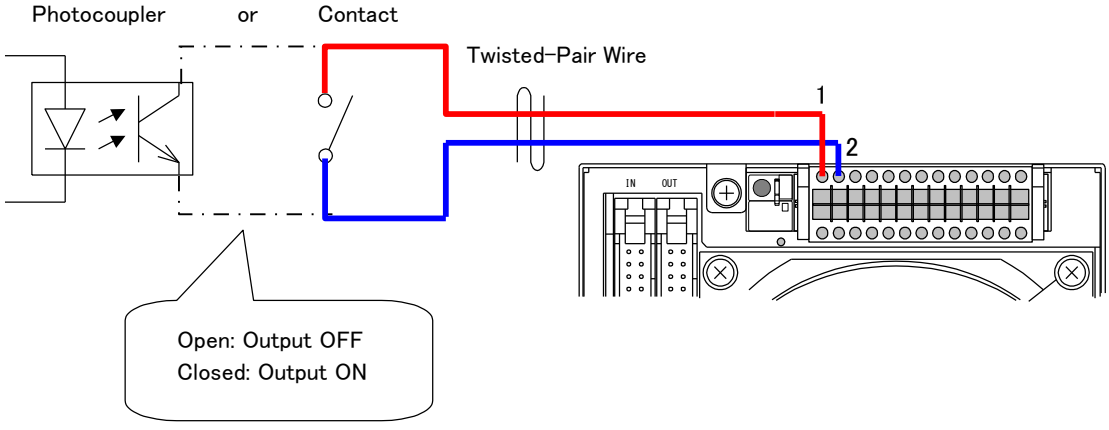
Caution

- 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 "Invailid".

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 119 for setting procedures.

Input Cut-Off with External Contacts (ZX-S Series Type-HA)

The input for ZX-S Series power supplies can be cut off (stop switching) using outputs from small capcity contacts or photocouplers.
Use a photocoupler or a small signal relay or switch with a minimum contact capcity of 5V, 2.5mA.

MEMO

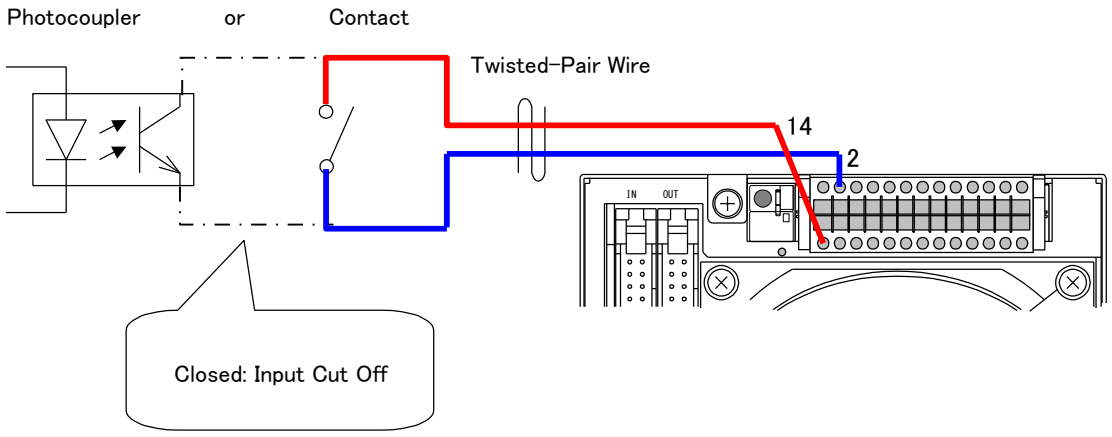
Shutdowning with short circuit (make) of contact b is standard.
Shutdowning with opening (break) of contact a by option is also possible.
(Please contact TAKASAGO.)

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.

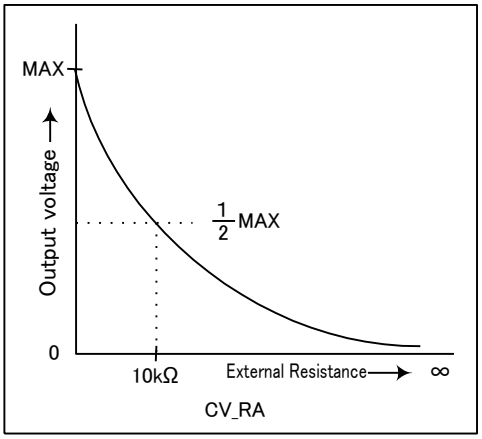


Input Cut-Off with External Contacts

Output Voltage Control (ZX-S Series Type-HA)

Output Voltage Control with External Resistance

1. Output Voltage Control with External Resistance (A)



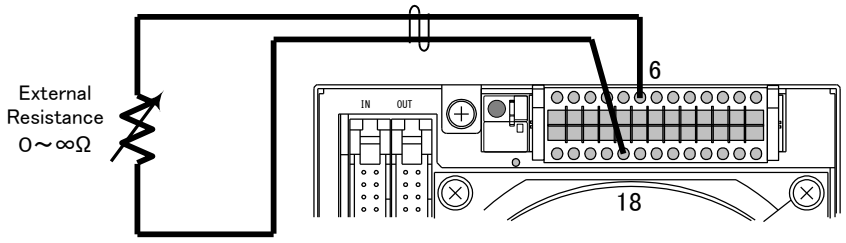
This sections describes how to set the output voltage zero when the external resistance value is infinity.
The output voltage is derived from the following formula.

$$\text{Output Voltage[V]} = \text{Max. Output Voltage[V]} \times \frac{10}{\text{External Resistance[k}\Omega\text{]} + 10}$$

The output accuracy for the external resistance,
is the set voltage±(0.2% of Rated Output Voltage) when 10kΩ

Connecting

Connect the resistor to accessory connector terminals No. 6 and 18.



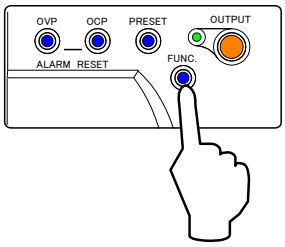
Caution

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 125.

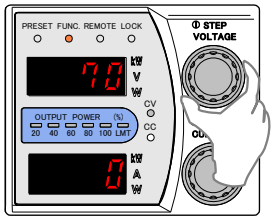
Setting Procedures



Press the Function "FUNC." key.

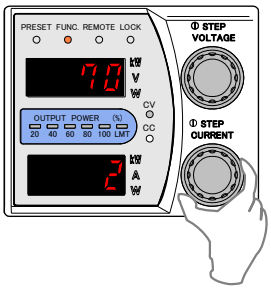
FUNC. lamp will light.
Settings Item Number (top) and parameters (bottom) will appear in the Number Display.

Select Item number 70 (Output Voltage Control) with the VOLTAGE dial.



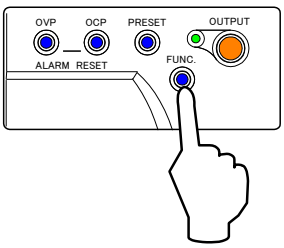
Change the parameter with the CURRENT dial.

1＝External Voltage (0～10V)
2＝External Resistance (0～∞Ω: A)
3＝External Resistance (0～∞Ω: B)
4＝External Resistance (0～∞Ω: C)



Press the FUNC. key again to finish.

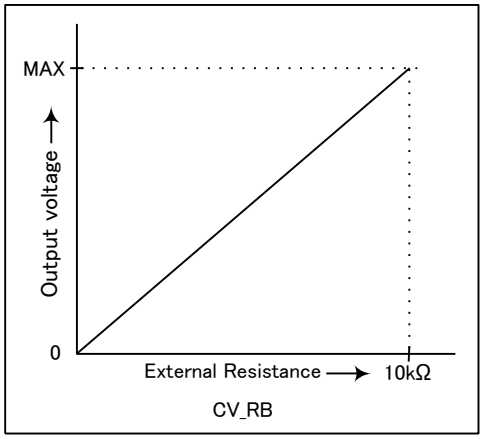
Returns Number Display back to measurement display mode.



Canceling Output Voltage Control via External Voltage/Resistance

To cancel, select Item number 70 and set the parameter to 0 with the CURRENT dial.

2. Output Voltage Control with External Resistance (B)



This sections describes how to set the output voltage to zero when the external resistance value is zero (short).

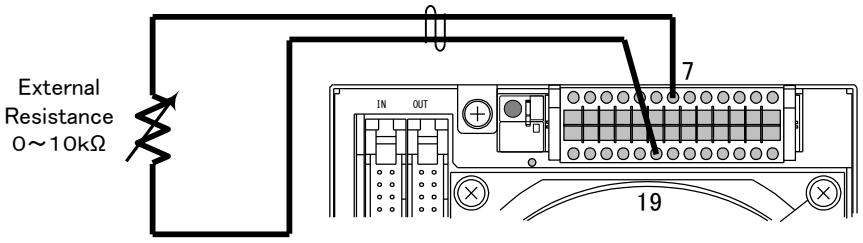
The output voltage is derived from the following formula.

$$\text{Output Voltage[V]} = \text{Max. Output Voltage[V]} \times \frac{\text{External Resistance[k}\Omega\text{]}}{10}$$

The output accuracy for the external resistance,
is the set voltage±(0.1% of Rated Output Voltage).

Connecting

Connect the resistor to accessory connector terminals No.7 and 19.



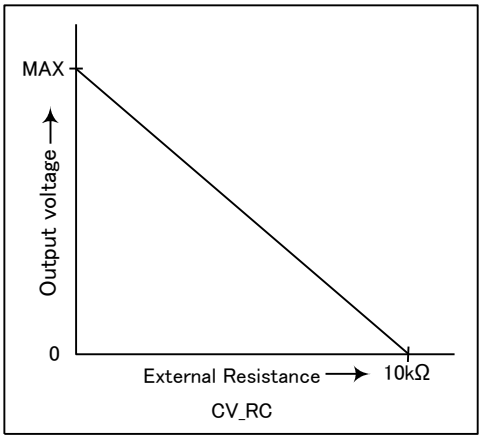
Caution

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 125.

3. Output Voltage Control with External Resistance (C)



This sections describes how to set the output voltage zero when the external resistance value is 10kΩ

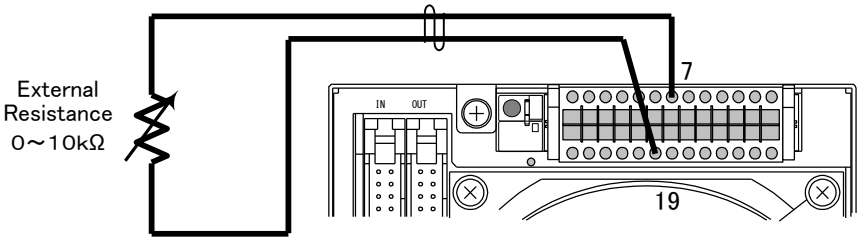
The output voltage is derived from the following formula.

$$\text{Output Voltage[V]} = \text{Max. Output Voltage[V]} - \left(\text{Max. Output Voltage[V]} \times \frac{\text{External Resistance[k}\Omega\text{]}}{10} \right)$$

The output accuracy for the external resistance,
is the set voltage±(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.

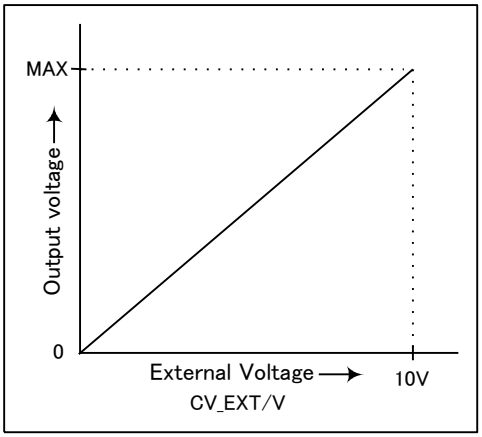
MEMO

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 125.

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.

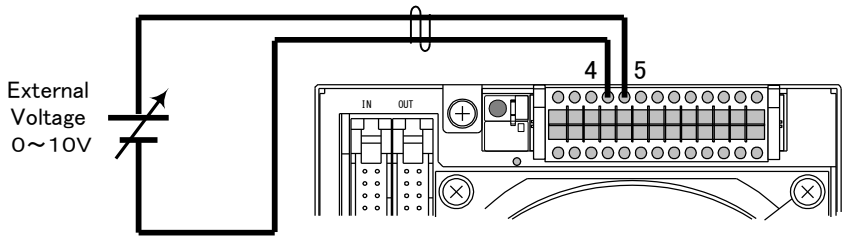
The output voltage is derived from the following formula.

$$\text{Output Voltage[V]} = \text{Max. Output Voltage[V]} \times \frac{\text{External Voltage[V]}}{10}$$

The output accuracy for the external voltage,
is the set voltage±(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

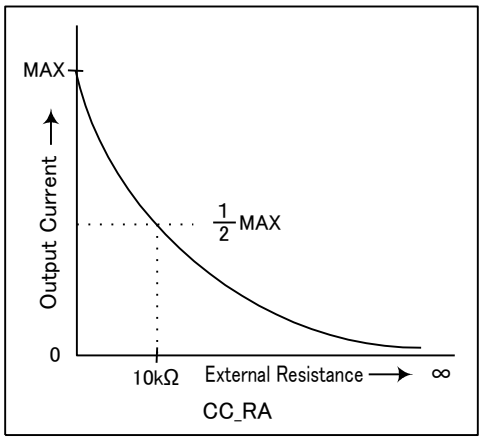
Set to parameter 1 (External Voltage) according to the procedure on page 125.

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).



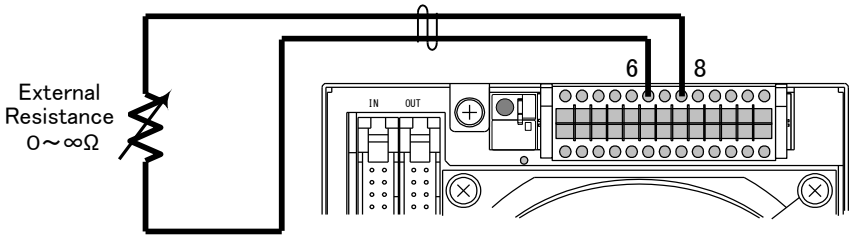
The output current is derived from the following formula.

$$\text{Output Current[A]} = \text{Max. Output Current[A]} \times \frac{10}{\text{External Resistance[k}\Omega\text{]} + 10}$$

The output accuracy for the external resistance,
is the set current±(1% of Rated Output Current) when 10kΩ

Connecting

Connect the resistor to accessory connector terminals No.6 and 18.



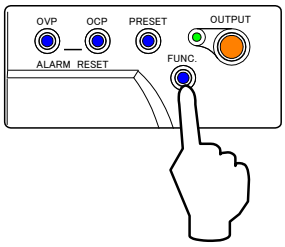
Caution

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 130.

Setting Procedures

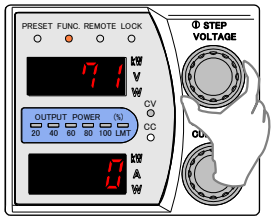


Press The Function "FUNC." key.

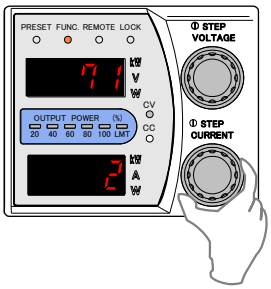
FUNC. lamp will light.
Settings Item Number (top) and parameters (bottom) will appear in the Number Display

---

Select Item number 71 with the VOLTAGE dial.



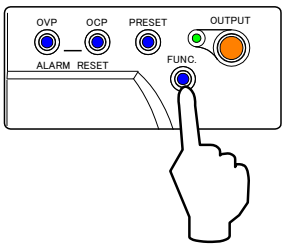
Change the parameters with the CURRENT dial.



1＝External Voltage (0～10V)
2＝External Resistance (0～∞Ω: A)
3＝External Resistance (0～10kΩ: B)
4＝External Resistance (0～10kΩ: C)

Press the FUNC. key again to finish.

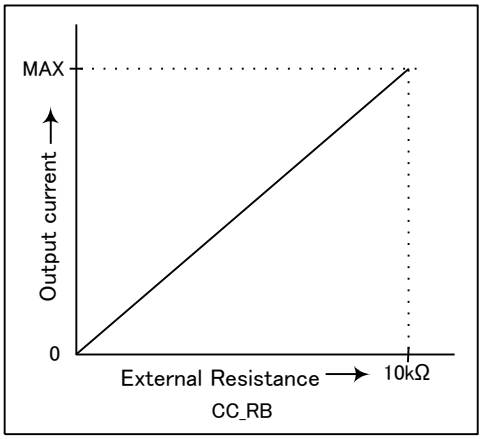
Returns the Number Display back to measurement display mode.



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).

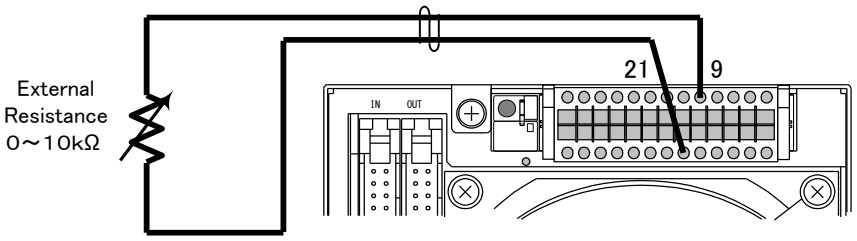
The output current is derived from the following formula.

$$\text{Output Current[A]} = \text{Max. Output Current[A]} \times \frac{\text{External Resistance[k}\Omega\text{]}}{10}$$

The output accuracy for the external resistance,
is the set current±(0.5% of Rated Output Current).

Connecting

Connect the resistor to accessory connector terminals No.9 and 21.



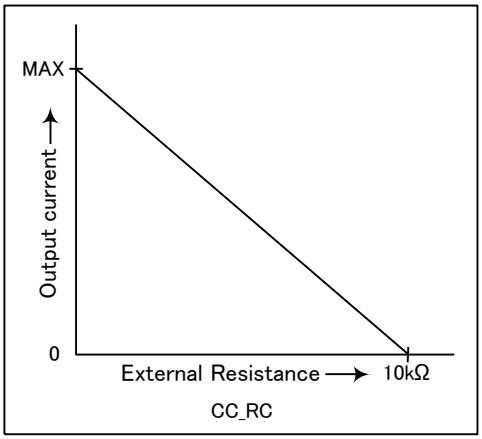
Caution

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 130.

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

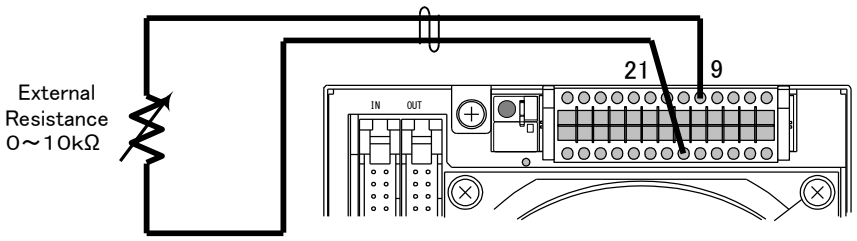
The output current is derived from the following formula.

$$\text{Output Current[A]} = \text{Max. Output Current[A]} - \left(\text{Max. Output Current[A]} \times \frac{\text{External Resistance[k}\Omega\text{]}}{10} \right)$$

The output accuracy for the external resistance,
is the set current±(0.5% of Rated Output Current).

Connecting

Connect the resistor to accessory connector terminals No.9 and 21.



Caution

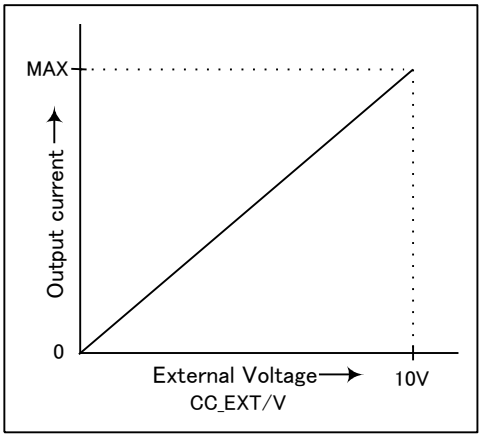
The External Resistance A, B, and C and the External Voltage cannot be used together to control the output.
The system is a fail safe method and is such that if the External Resistance opens, the Output Current will become zero.

Setting Procedures

Set to parameter 4 (External Resistance Type C) according to the procedure on page 130.

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.



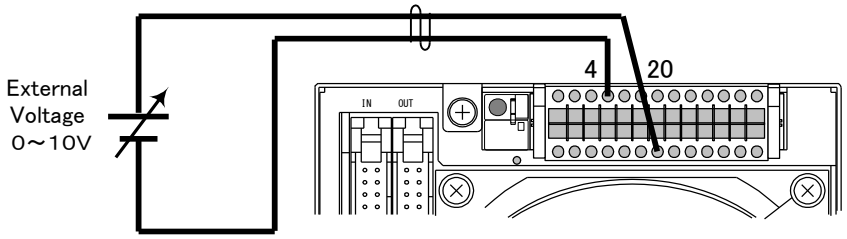
The output current is derived from the following formula.

$$\text{Output Current[V]} = \text{Max. Output Current[V]} \times \frac{\text{External Voltage[V]}}{10}$$

The output accuracy for the external resistance,
is the set current±(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 130.

Analog Output Monitor (ZX-S Series Type-HA)

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 10kΩ or more for the external meter.

Output Voltage Monitor

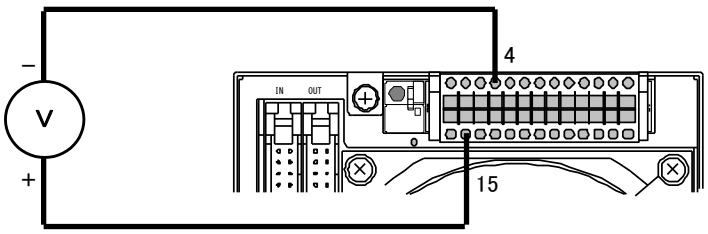
The accuracy for the output voltage monitor is 0.2%±2mV

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

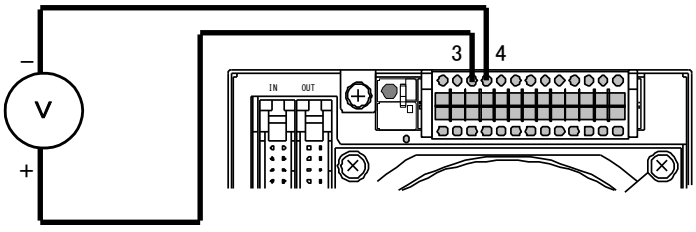
The accuracy for the output current monitor is 0.5%±2mV

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.

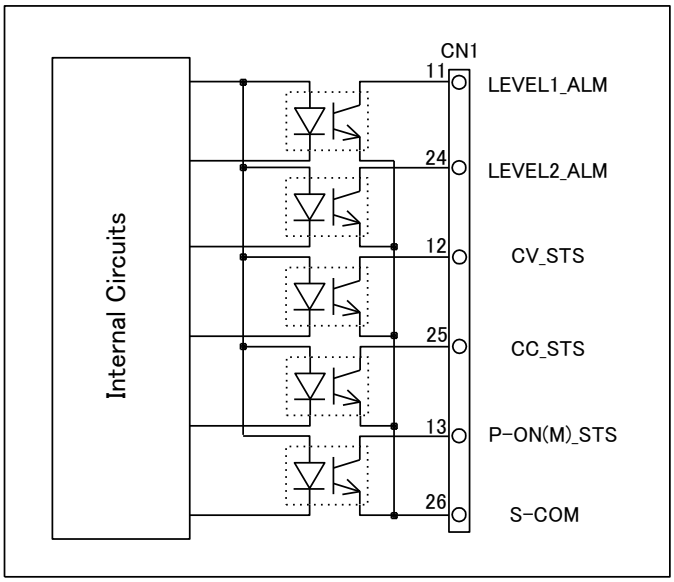


Status Output (ZX-S Series Type-HA)

This can externally output the operational status of the ZX-S Series power supply.

Output Circuit

Output is given by a open collector insullated 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. (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. Connected to emitters of each photocoupler.

Status Output Electric Specifications

Item	Specifications
Withstand Voltage	DC500V (for DC output-Status Output-Chassis)
Max. Collector Voltage	24V
Max. Collector Current	5mA

LEVEL_ALM1 Settings

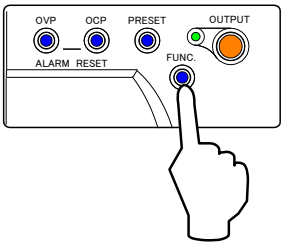
This handles the operation mode's status signal as a LEVEL_ALM1 (alarm status).
It can also be used for surveillance as an alarm when switching from constant voltage to constant current.

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

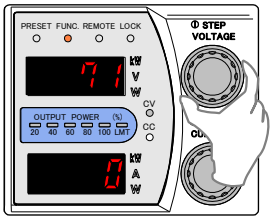
Press The Function "FUNC." key.

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



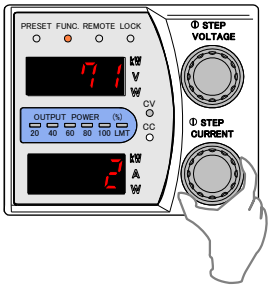
Select the Item number with the VOLTAGE dial.

Item 74 : CV_STS
Item 75 : CC_STS
Item 76 : PL_STS



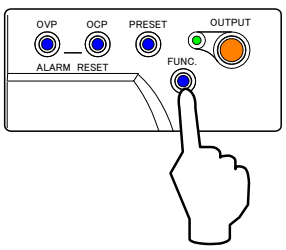
Change the parameters with the CURRENT dial.

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

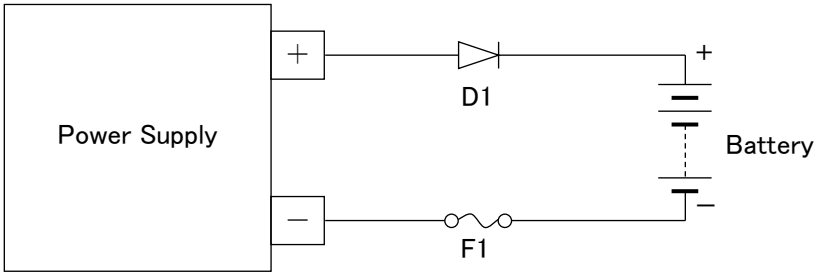
Charging Battery

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.

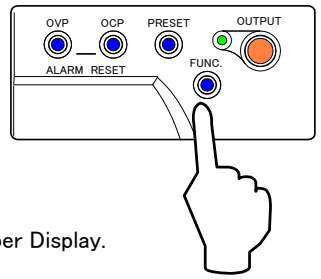


Connection for Battery Charging

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)

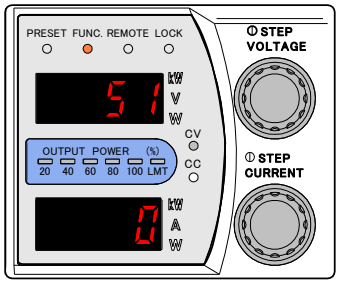


Press The Function "FUNC." key.

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.



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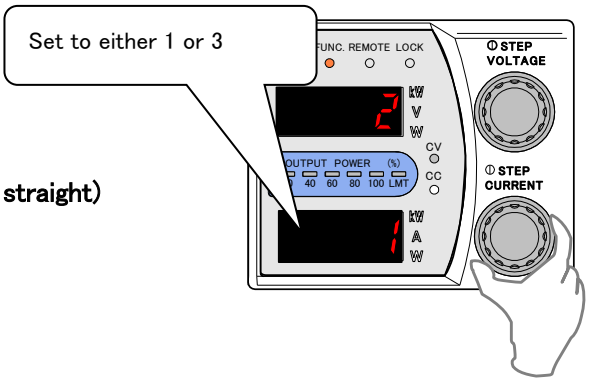
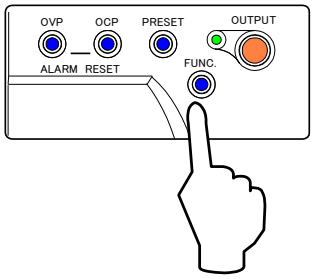


Select Item number 2 with the VOLTAGE dial and set the value to 1 (CC priority, speed) or 3 (CC priority, straight) with the CURRENT dial.



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 19

Set the charge terminal voltage with the VOLTAGE dial.

Set only the forward voltage to D1, high (0.6V～0.8V).

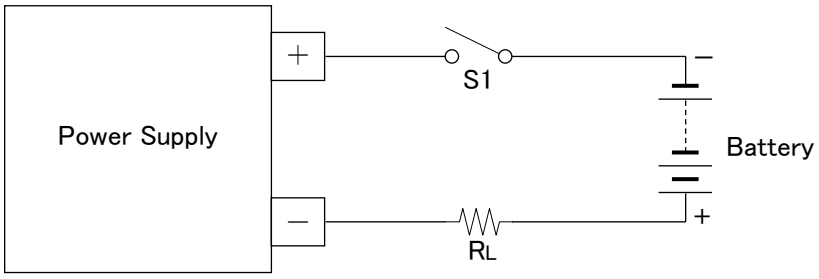
When finished, press the FUNC. key again to finalize settings.

Press the OUTPUT key to begin testing.

As charging with the constant-current progresses,
switch to constant-voltage with the charge terminal voltage.

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.

$$R_L = \frac{\text{Open-Circuit Voltage of Battery (V)}}{\text{Discharge Current (A)}} \ (\Omega)$$

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}=open-circuit voltage of battery-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

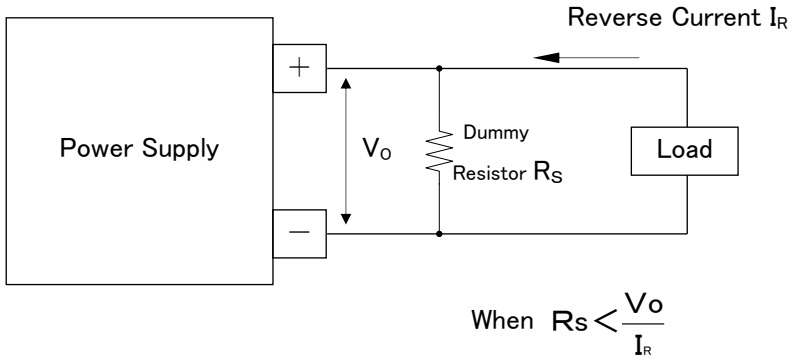
As long as S1 is closed, the battery will continue to discharge regardless of the power supply's output ON-OFF status.

Loads with Reverse Current

Caution

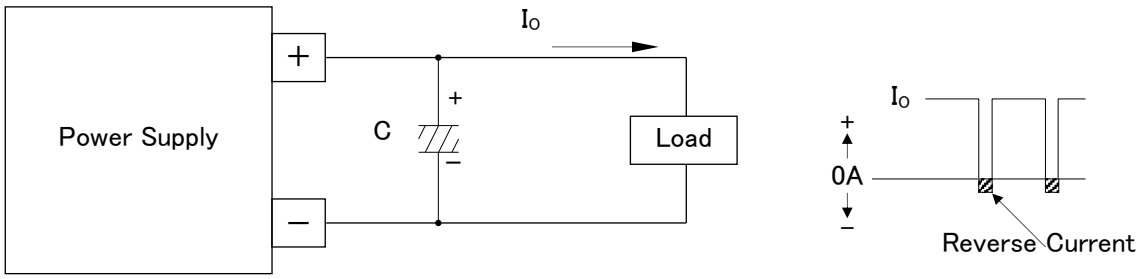
The ZX-S Series power supply does not possess any function which will stabilize the output voltage against the reverse current generated from the load. If the maximum sink current (0.4A) is exceeded, the output voltage will rise above the rated value and burn-out the internal circuits. Please do not 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 μF) 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.

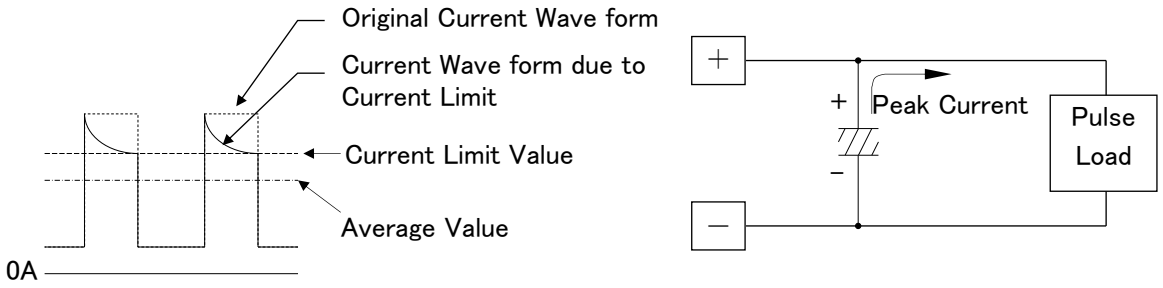
Pulse Current Loads

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.



Load Current Wave form　　Improved with Parallel Capacitors

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 sue 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 15).

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

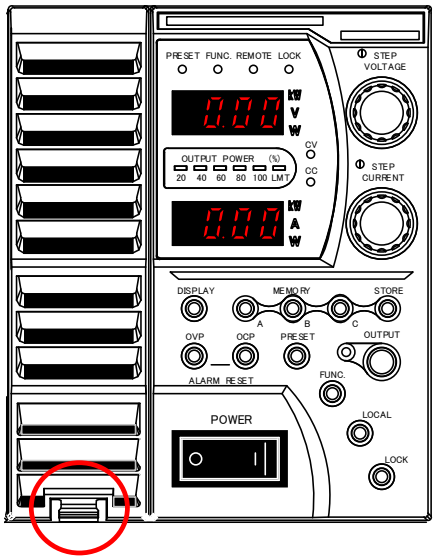
Some parts within the device will generate high voltages. Touching these parts will cause electric shock.

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-400H, 800H 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-400H

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 o 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℃ 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 replace.

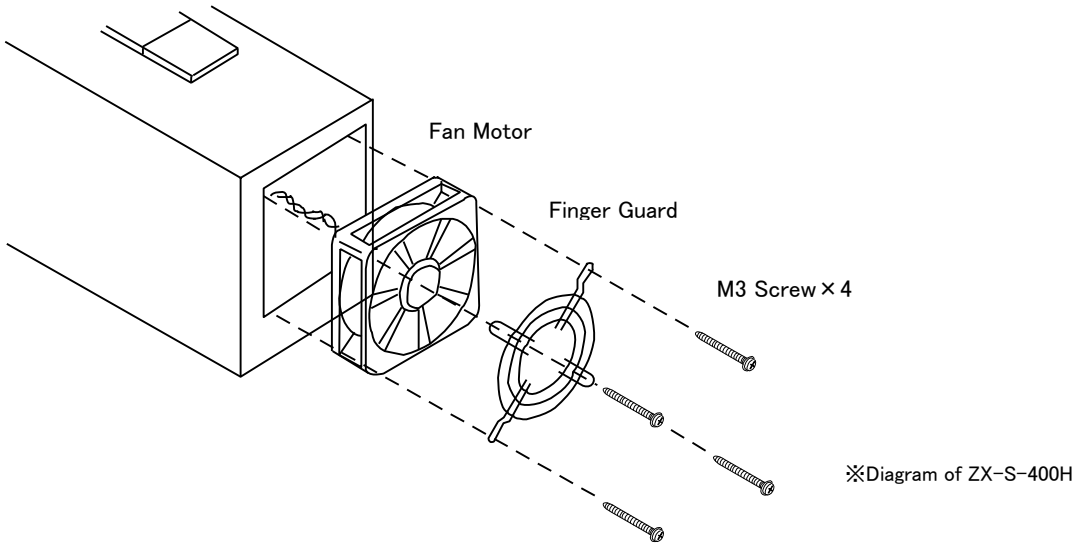
Caution

Only 400H／HA 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 responses 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-400H, 800H 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.

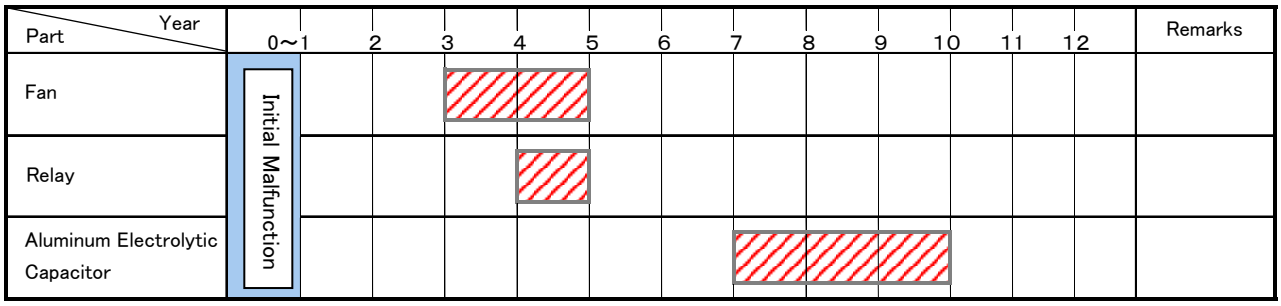


Replacing Fan Motor

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.



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)

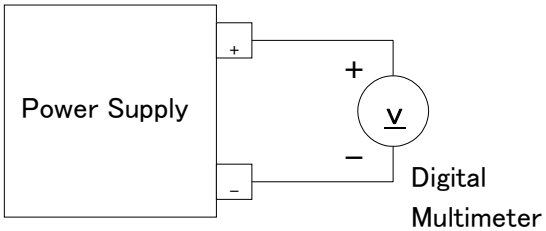
2. Shunt Resistor for Current Measurement– 1 set

10A/50mV 0.1% accuracy (400H/HA)
25A/50mV 0.1% accuracy (800H/HA)
50A/50mV 0.1% accuracy (1600H/HA)

Offset/Full Scale Calibration of Output Voltage Settings

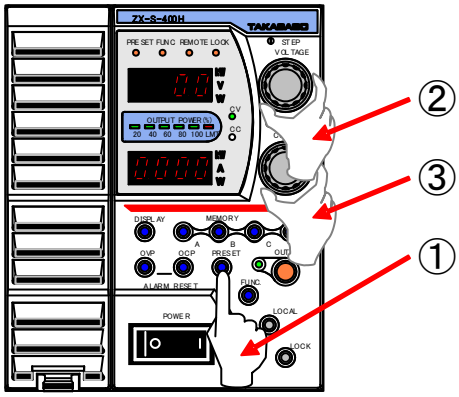
1. Disconnect the load wires and remote sensing wires. Connect the digital multimeter to the output terminal.

In advance, turn POWER switch ON and OUTPUT OFF.



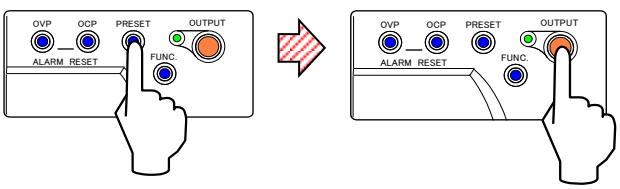
Calibration Circuit

2. Press the PRESET key ① and set to "0.1V" with the VOLTAGE dial ② and "1.00A" with the CURRENT dial ③.

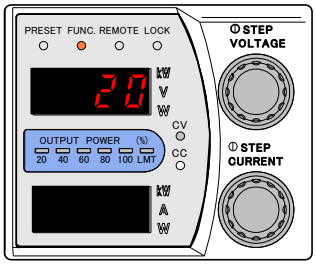


(See **Operating as Constant Voltage Power Supply** under **Basic Operations** on how.)

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



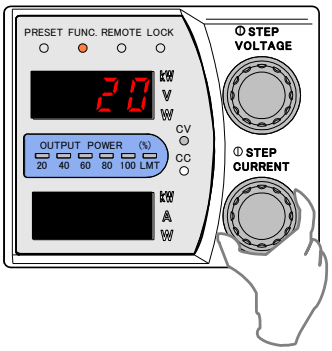
4. Press the FUNC. key and change the top Number Display to Settings Item 20 with the VOLTAGE dial.



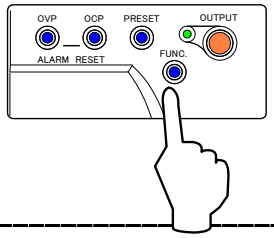
MEMO

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

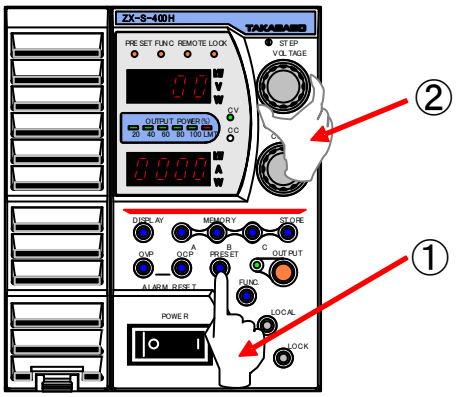
5. Adjust so that the digital multimeter (used for output voltage measurement) displays "0.100V" with the CURRENT dial.



6. Press the FUNC. key to complete offset calibration of the output voltage settings.

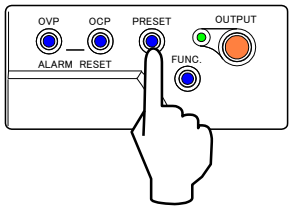


7. Press the PRESET key ①. Set to “640.0V” with the VOLTAGE dial ②.

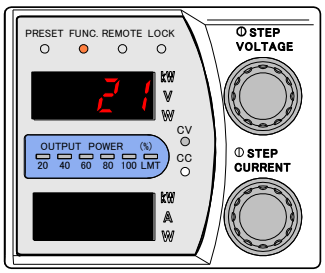


(See **Operating as Constant Voltage Power Supply** under **Basic Operations** on how.)

8. Press the PRESET key.



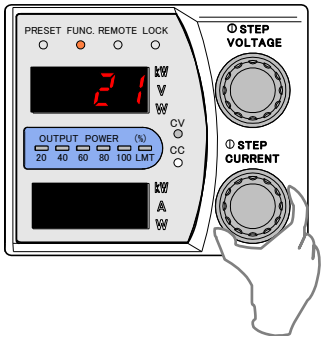
9. Press the FUNC. key and change the top Number Display to Settings Item 21 with the VOLTAGE dial.



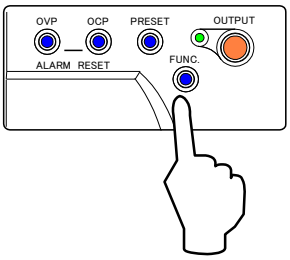
MEMO

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.

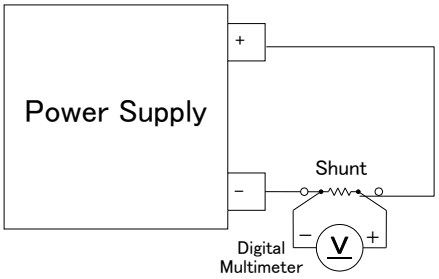
Caution

Be certain to perform this along with meter calibration (Offset/Full-Scale Calibration of Voltmeter.)

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.



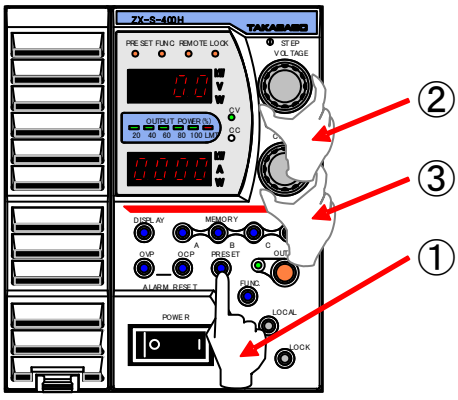
Calibration Circuit

Note:
Current Flow is 5A for (400H/HA)
800H/HA is 10A
1600H/HA is 20A
Use wires which will not produce a voltage drop below 0.8V.

Caution

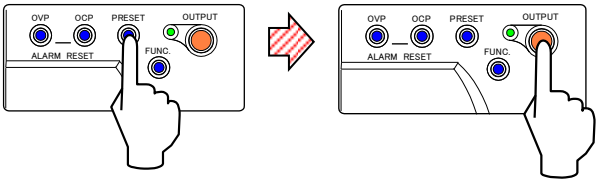
Set FUNCTION Settings Item 1, Sink Function, to 1 (1=ON) and Settings Item 13, Linearity compensation Function, to 0(0=OFF)beforehand.

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.

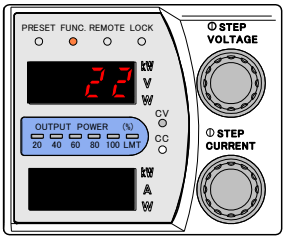


(See **Operating as Constant Current Power Supply** under **Basic Operations** on how.)

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.

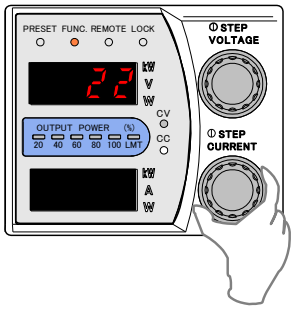


MEMO

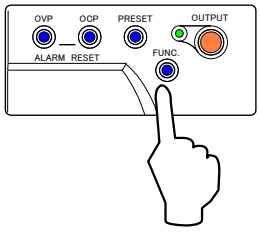
FUNC. lamp will light and the display on the bottom Number Display will light out.

5. Adjust so that the digital multimeter (used for current measurement) displays to "0.010mV" (For 400H use 10mA) (※) with the CURRENT dial.

※For 800H/HA use "0.005mV" (equivalent to 10mA)
For 1600H/HA use "0.025mV" (equivalent to 100mA)

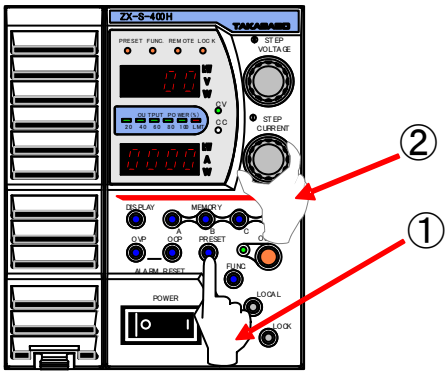


6. Press the FUNC. key to complete offset calibration of the output current settings.



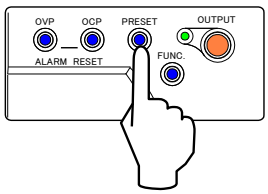
7. Press the PRESET key ① and set the CC set value to below(※) with the CURRENT dial ②.

※For 400H/HA set to "5.000A"
For 800H/HA set to "10.00A"
For 1600H/HA set to "20.00A"

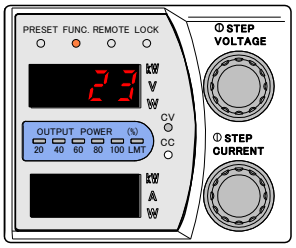


(See **Operating as Constant Current Power Supply** under **Basic Operations** on how.)

8. Press the PRESET key.



9. Press the FUNC. key and change the top Number Display to Settings Item 23 with the VOLTAGE dial.

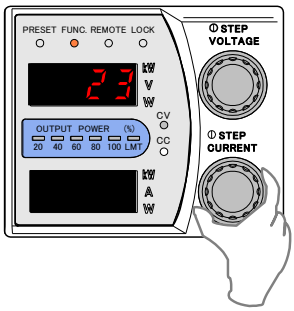


MEMO

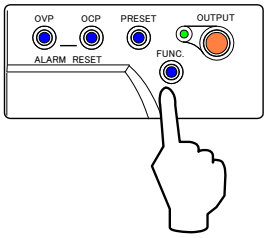
FUNC. lamp will light and the display on the bottom Number Display will light out.

10. Adjust so that the digital multimeter (used for output current measurement) displays "25.00mV"(※) with the CURRENT dial.

※For 400H/HA equivalent to 5A at 25.00mV
For 800H/HA equivalent to 10A at 20.00mV
For 1600H/HA 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.

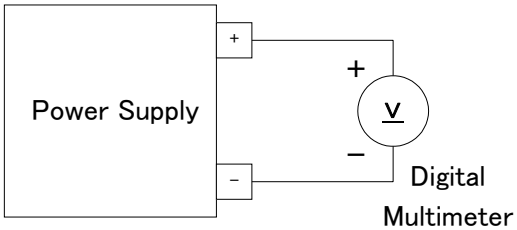
Caution

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-HA)

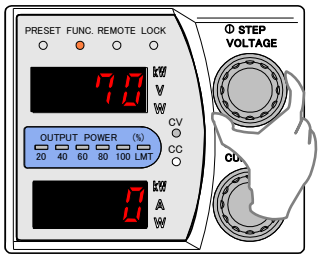
Output Voltage Control with External Voltage

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.



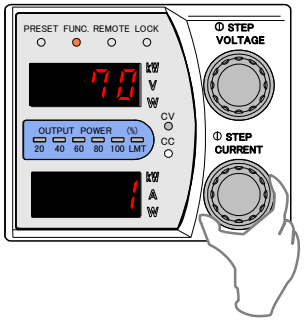
Calibration Circuit

2. **Change the top Number Display to Settings Item 70 with the VOLTAGE dial.**

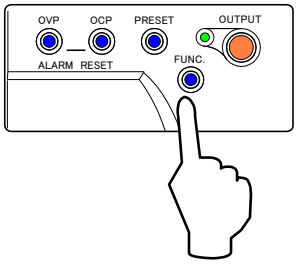


3. **Change set value to 1 with the CURRENT dial.**

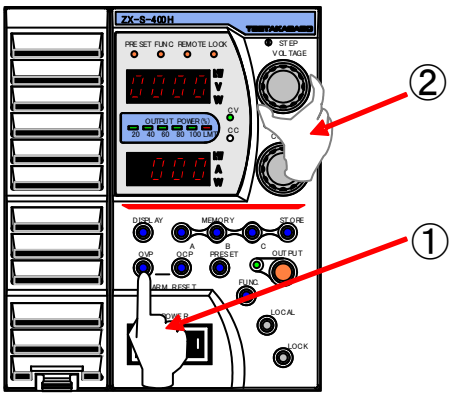
1： External Voltage（0～10V）



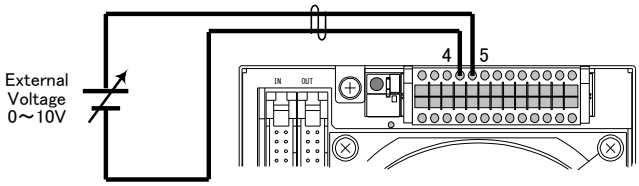
4. **Press FUNC. key again to finalize settings.**



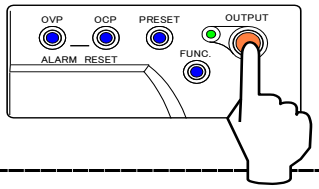
5. **Press the OVP key ①. Set to “704.0V” with the VOLTAGE dial ②.**



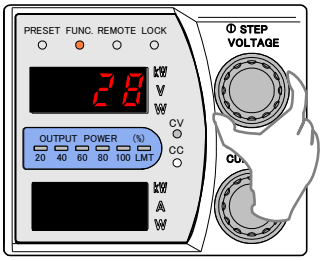
6. **Input an external voltage of “0.00V”.**



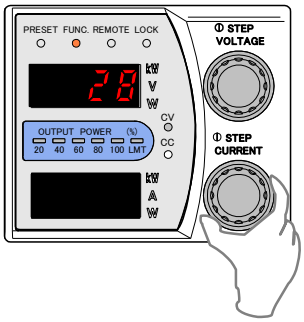
7. **Press the OUTPUT key to set output to ON.**



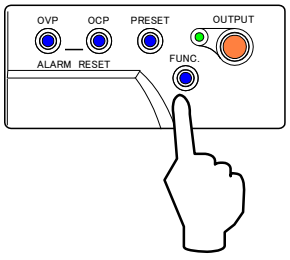
8. Press the FUNC. key and change the top Number Display to Settings Item 28 with the VOLTAGE dial.



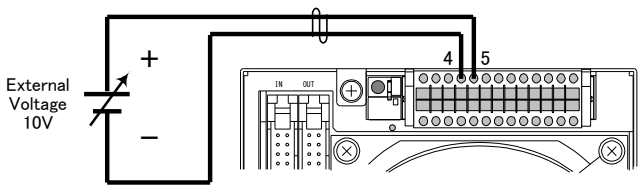
9. Adjust so that the digital multimeter (used for output voltage measurement) displays "0.00V" with the CURRENT dial.



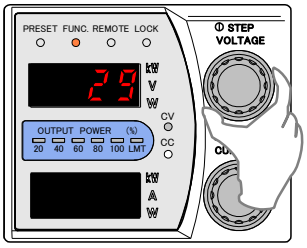
10. Press the FUNC. key to complete offset calibration of output voltage control with external voltage.



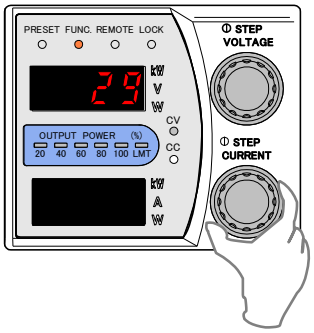
11. Set external voltage to "10.00V".



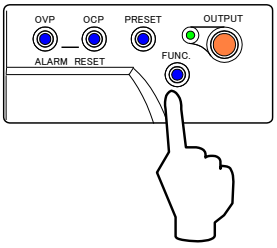
12. Press the FUNC. key and change the top Number Display to Settings Item 29 with the VOLTAGE dial.



13. Adjust so that the digital multimeter (used for output voltage measurement) displays to "640.0V" with the CURRENT dial.



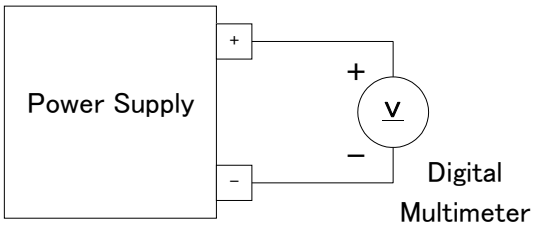
14. Press the FUNC. key to complete full-scale calibration of output voltage control with external voltage.



15. This completes offset/full-scale calibration of output voltage control with external voltage.

Output Voltage Control with External Resistance (A)

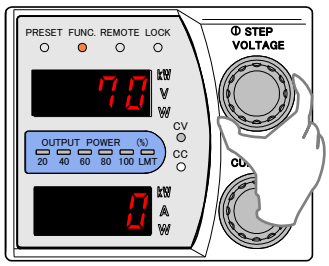
1. **Disconnect the load and remote sensing wires and connect the digital multimeter to the output terminal.**
   Turn the POWER switch ON and OUTPUT OFF in advance.



Calibration Circuit

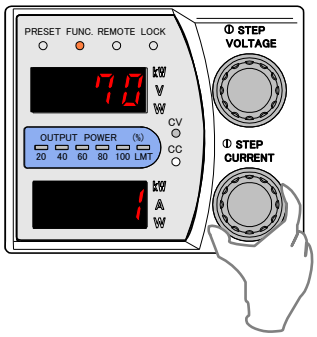
> Set FUNCTION Settings Item 13, Linearity compensation Function. to 0 (0=OFF) beforehand.

2. **Press the FUNC. key and change the top Number Display to Settings Item 70 with the VOLTAGE dial.**

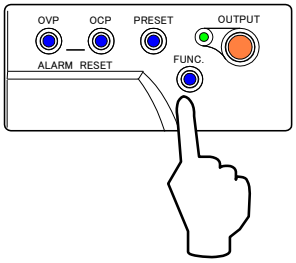


3. **Change the set value to 2 with the CURRENT dial.**

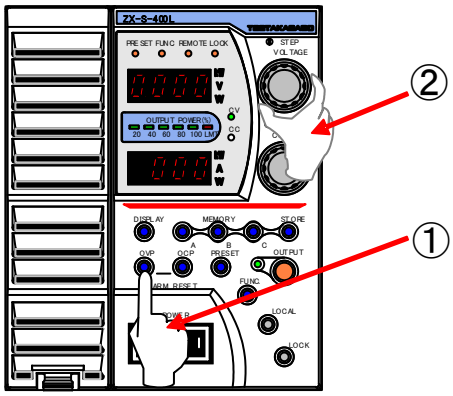
2: External Resistance (0～∞Ω A)



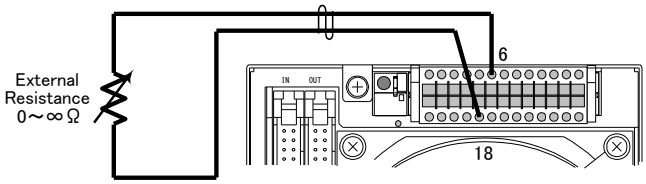
4. **Press the FUNC. key again to finalize settings.**



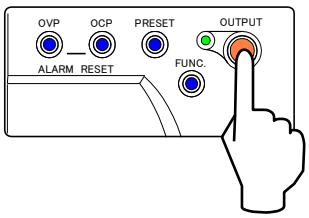
5. **Press the OVP key ①. Set to "704.0V" with the VOLTAGE dial ②.**



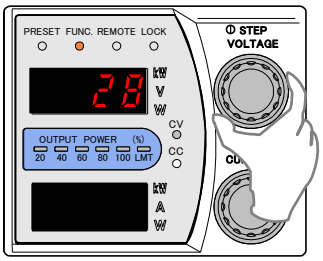
6. **Set external resistance to infinity (open).**



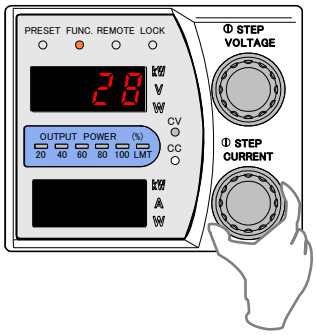
7. **Press OUTPUT key to set the output to ON.**



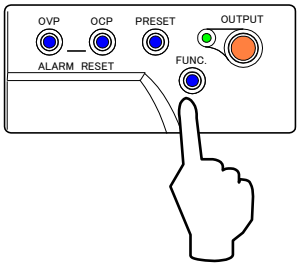
8. Press the FUNC. key and change the top Number Display to Settings Item 28 with the VOLTAGE dial.



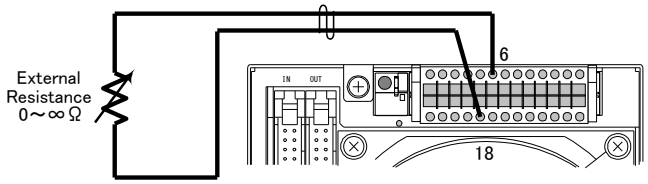
9. Adjust so that the digital multimeter (used for output voltage measurement) displays "0.00V" with the CURRENT dial.



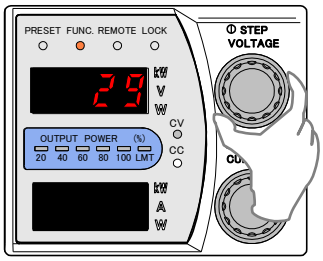
10. Press the FUNC. key to complete offset calibration of output voltage control with external resistance (A).



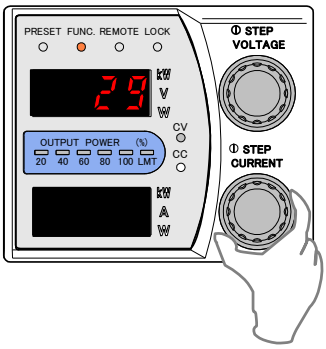
11. Set external resistance to 0Ω(short).



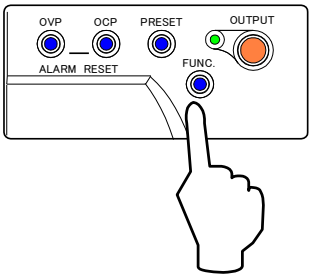
12. Press the FUNC. key and change the top Number Display to Settings Item 29 with the VOLTAGE dial.



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 (A).

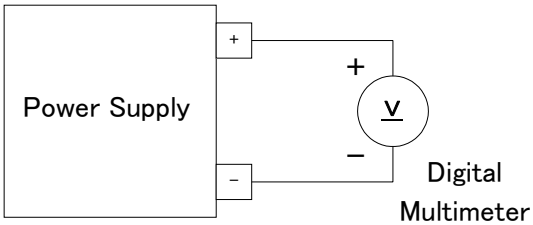


15. This completes offset/full-scale calibration of output voltage control with external resistance (A).

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.

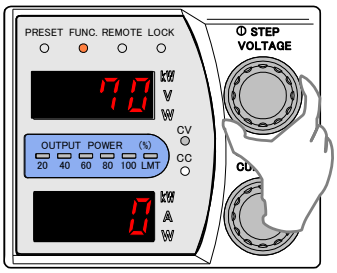


Calibration Circuit

Caution

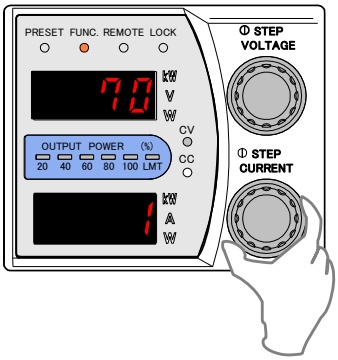
Set FUNCTION Settings Item 13, Linearity compensation Function. to 0 (0=OFF) beforehand.

2. Change the top Number Display to Settings Item 70 with the VOLTAGE dial.

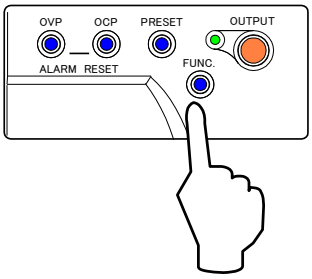


3. Change the set value to 3 (External Resistance B) with the CURRENT dial.

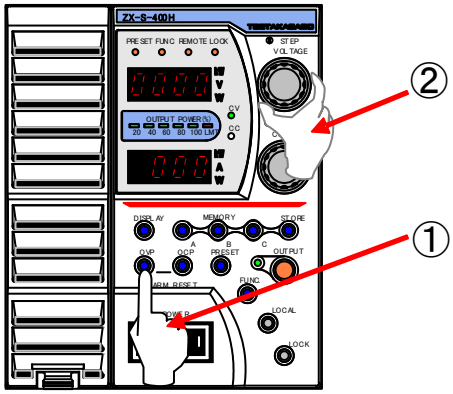
3: External Resistance (0～10kΩ B)



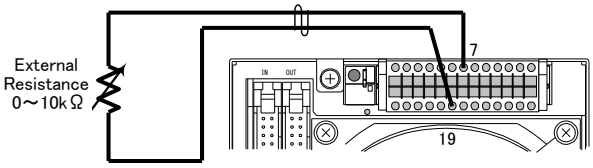
4. Press the FUNC. key again to finalize settings.



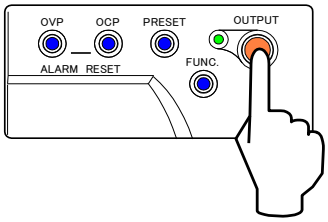
5. Press the OVP key ①. Set to "704.0V" with the VOLTAGE dial ②.



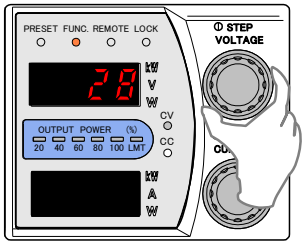
6. Set external resistance to 0Ω(short).



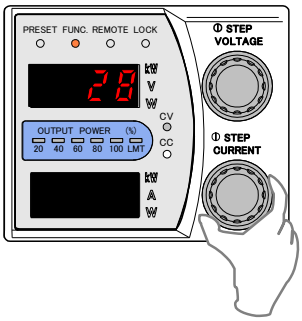
7. Press the PRESET key and then the OUTPUT key to set the output to ON.



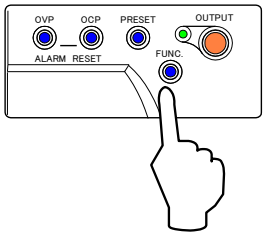
8. Press the FUNC. key and change the top Number Display to Settings Item 28 with the VOLTAGE dial.



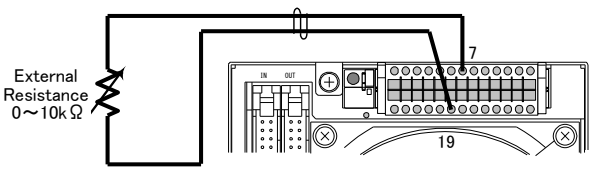
9. Adjust so that the digital multimeter (used for the output current measurement) displays "0.00V" with the CURRENT dial.



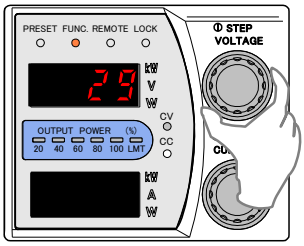
10. Press the FUNC. key to complete offset calibration of output voltage control via external resistance (B).



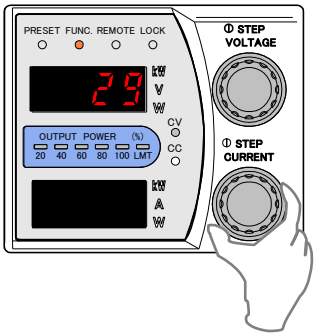
11. Set external resistance to 10kΩ.



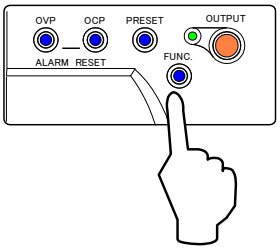
12. Press the FUNC. key and change the top Number Display to Settings Item 29 with the VOLTAGE dial.



13. Adjust so that the digital multimeter (used for output voltage measurement) displays to "640.0V" with the CURRENT dial.



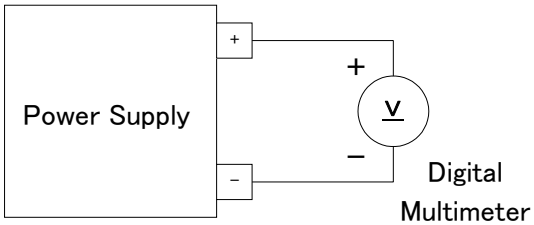
14. Press the FUNC. key to complete full-scale calibration of output voltage control with external resistance (B).



15. This completes offset/full-scale calibration of output voltage control with external resistance (B).

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.

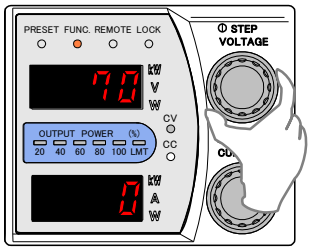


Calibration Circuit

Caution

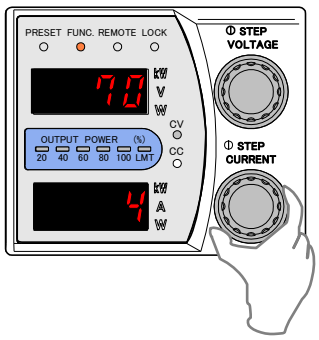
Set FUNCTION Settings Item 13, Linearity compensation Function, to 0 (0=OFF) beforehand.

2. **Change the top Number Display to Settings Item 70 with the VOLTAGE dial.**

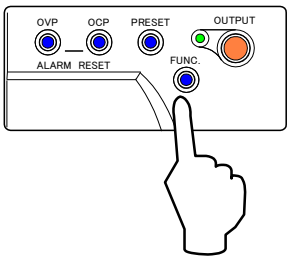


3. **Change the set value to 4 (External Resistance C) with the CURRENT dial.**

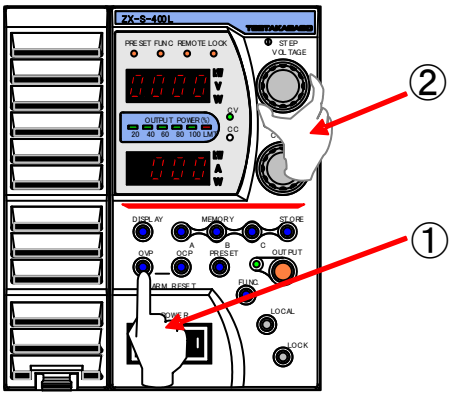
4： External Resistance (0～10kΩ C)



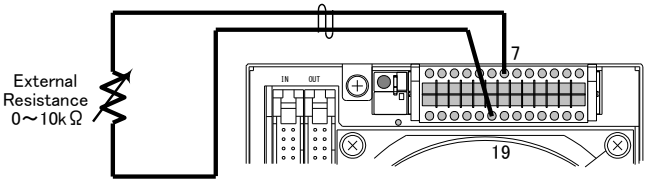
4. **Press the FUNC. key again to finalize settings.**



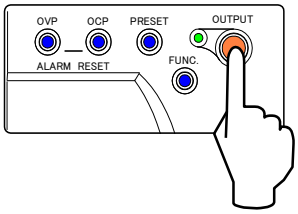
5. **Press the OVP key ①. Set to "704.0V" with the VOLTAGE dial ②.**



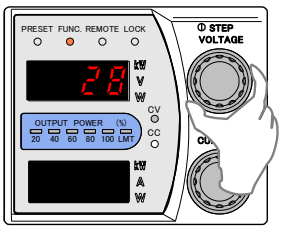
6. **Set external resistance to 10kΩ.**



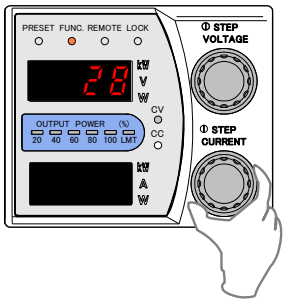
7. **Press the OUTPUT key to set the output to ON.**



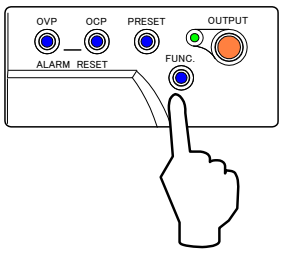
8. Press the FUNC. key and change the top Number Display to Settings Item 28 with the VOLTAGE dial.



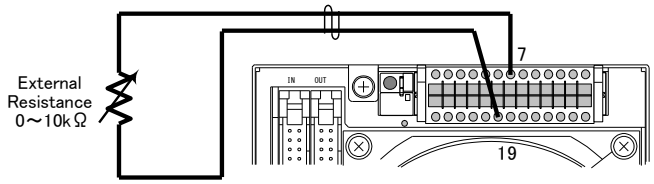
9. Adjust so that the digital multimeter (used for output voltage measurement) displays "0.00V" with the CURRENT dial.



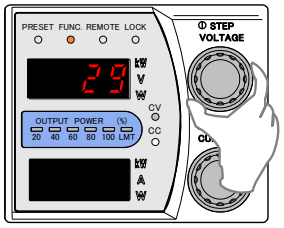
10. Press the FUNC. key to complete offset calibration of output voltage control with external resistance (C).



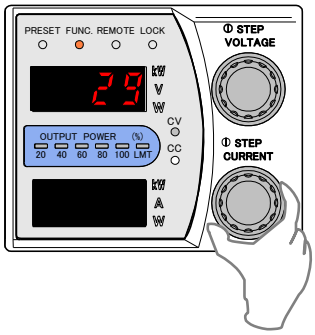
11. Set external resistance to 0Ω(short).



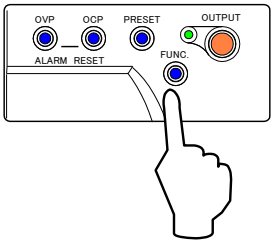
12. Press the FUNC. key and change the top Number Display to Settings Item 29 with the VOLTAGE dial.



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).

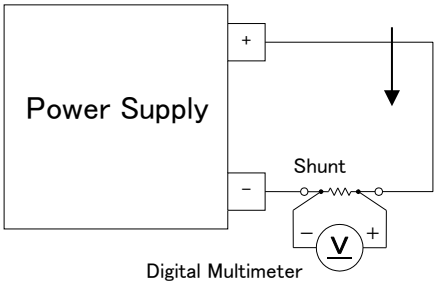
Offset/Full-Scale Calibration of Output Current with External Analog Values (ZX-S Series Type-HA)

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.



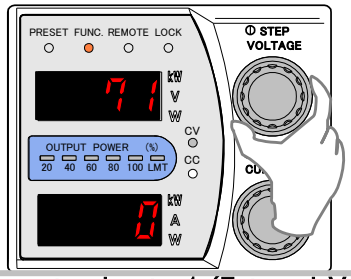
Note:
Current is 5A for (400H/HA)
800H/HA is 10A
1600H/HA is 20A
Use wires which will not produce a voltage drop below 0.8V.

Calibration Circuit

Caution

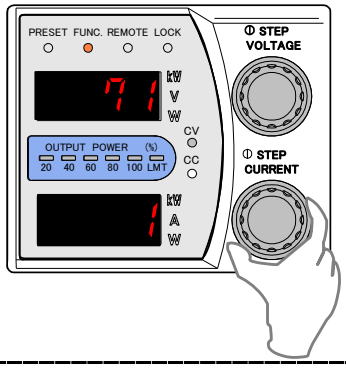
Set FUNCTION Settings Item 1, Sink Function, to 1 (1=ON) and Settings Item 13, Linearity compensation Function, to 0(0=OFF)beforehand.

2. Change the top Number Display to Settings Item 71 with the VOLTAGE dial.

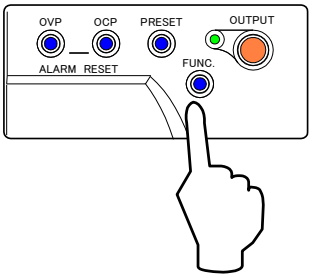


3. Change the set value to 1 (External Voltage) with the CURRENT dial.

1： External Voltage（0～10V）

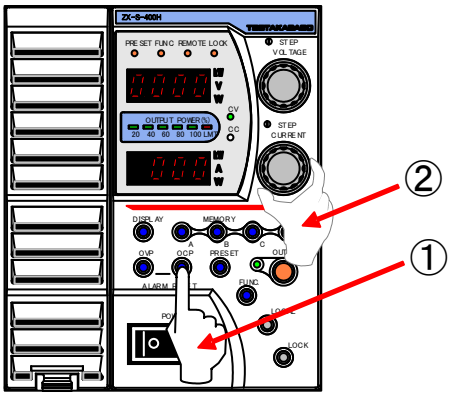


4. Press the FUNC. key again to finalize settings.

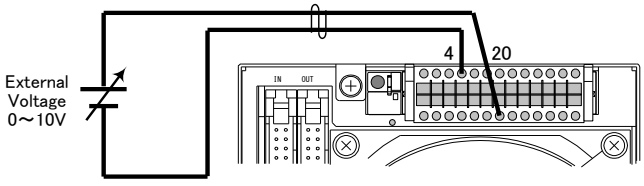


5. Press the OCP key ①. Set to “44.00A”(※) with the CURRENT dial ②.

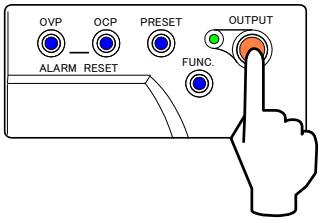
※For 400H/HA set to “5.50A”
For 800H/HA set to “11.00A”
For 1600H/HA set to “22.00A”



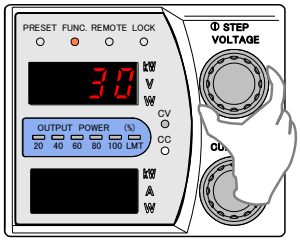
6. Input an external voltage of “0.10V”.



7. Press the OUTPUT key ② to set the output to ON.

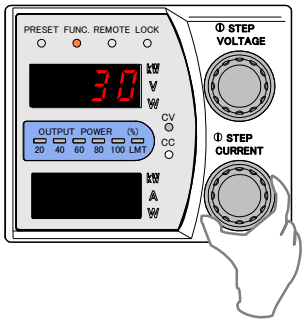


8. Press the FUNC. key and change the top Number Display to Settings Item 30 with the VOLTAGE dial.

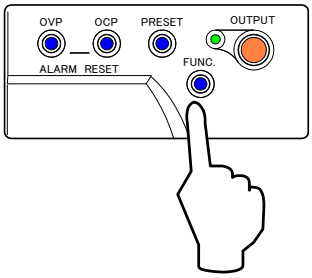


9. Adjust so that the digital multimeter (used for output voltage measurement) displays the set value with the CURRENT dial.

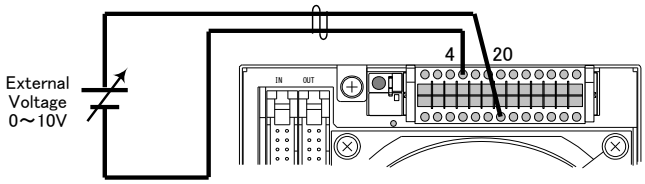
※See "Output Current Control with External Voltage" on deriving the set value.



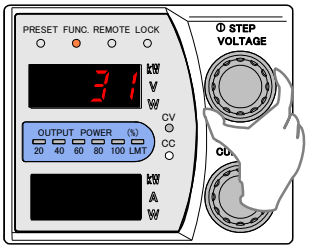
10. Press the FUNC. key to complete offset calibration of output current control with external voltage.



11. Set external voltage to "10.00V".

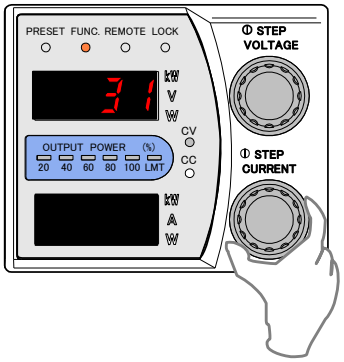


12. Press the FUNC. key and change the top Number Display to Settings Item 31 with the VOLTAGE dial.

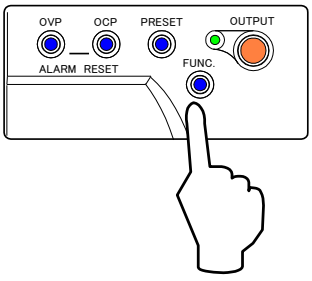


13. Adjust so that the digital multimeter (used for output current measurement) displays the set value with the CURRENT dial.

※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.



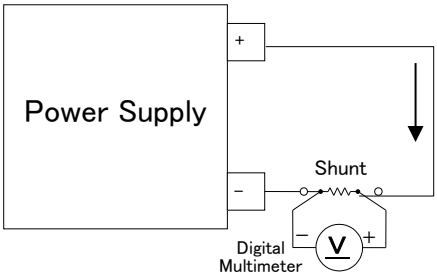
15. This completes offset/full-scale calibration of output current control with external voltage.

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.



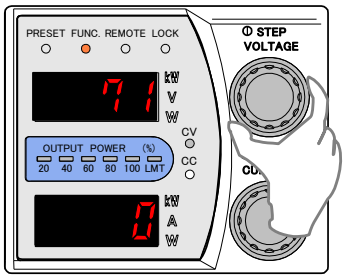
Note:
Current is 5A for (400H/HA)
800H/HA is 10A
1600H/HA is 20A
Use wires which will not produce a voltage drop below 0.8V.

Calibration Circuit

Caution

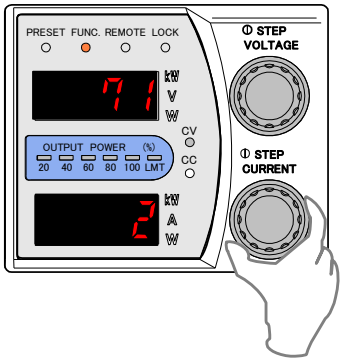
Set FUNCTION Settings Item 1, Sink Function, to 1 (1=ON) and Settings Item 13, Linearity compensation Function, to 0(0=OFF)beforehand.

2. Change the top Number Display to Settings Item 71 with the VOLTAGE dial.

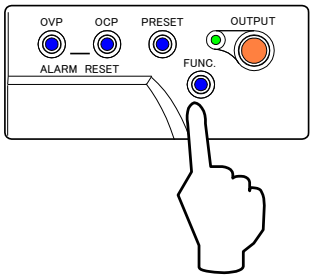


3. Change the set value to 2 (External Resistance A) with the CURRENT dial.

2: External Resistance (0～∞Ω A)

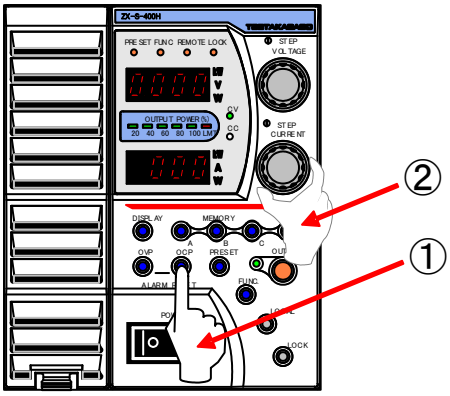


4. Press the FUNC. key again to finalize settings.

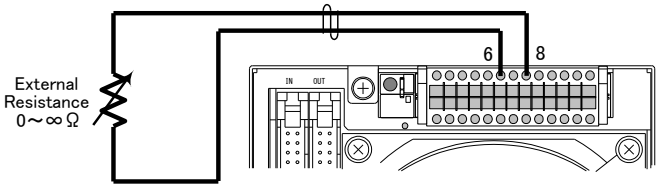


5. Press the OCP key ①. Set to "44.00A"(※) with the CURRENT dial ②.

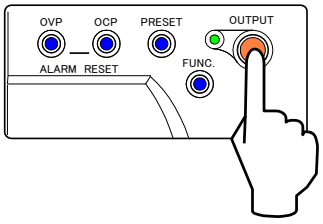
※For 400H/HA set to "5.50A"
For 800H/HA set to "11.00A"
For 1600H/HA set to "22.00A"



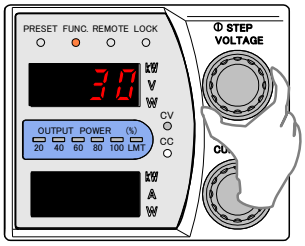
6. Set external resistance to "500kΩ".



7. Press t the OUTPUT key to set the output to ON.

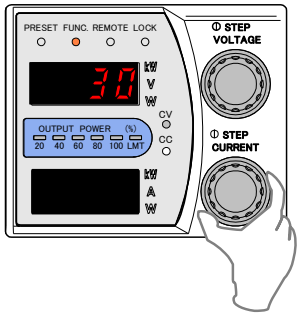


8. Press the FUNC. key and change the top Number Display to Settings Item 30 with the VOLTAGE dial.

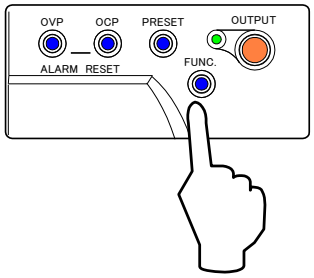


9. Adjust so that the digital multimeter (used for output current measurement) displays the set value with the CURRENT dial.

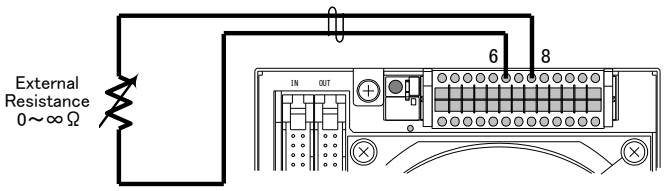
※See "Output Current Control with External Resistance" on deriving the set value.



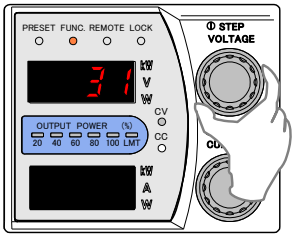
10. Press the FUNC. key to complete offset calibration of output current control with external resistance (A).



11. Set external resistance to "0Ω"(short).

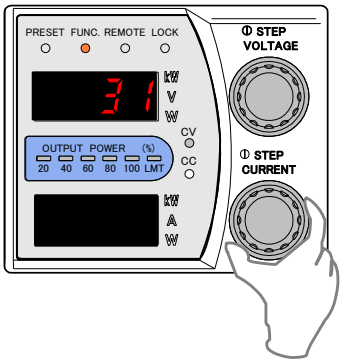


12. Press the FUNC. key and change the top Number Display to Settings Item 31 with the VOLTAGE dial.

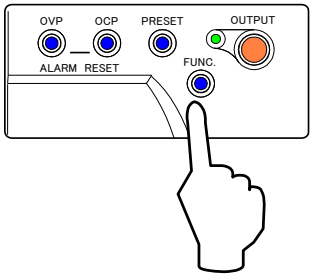


13. Adjust so that the digital multimeter (used for output current measurement) displays the set value with the CURRENT dial.

※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).



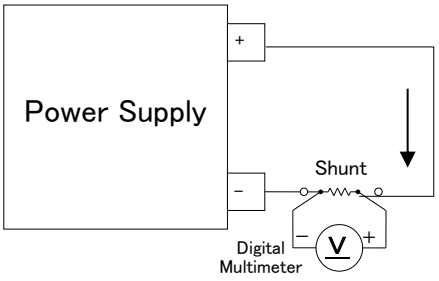
15. This completes offset/full-scale calibration of output current control with external resistance (A).

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.

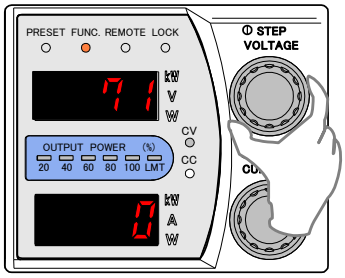


Note:
current is 5A for
(400H/HA)
800H/HA is 10A
1600H/HA is 20A
Use wires which will not produce a voltage drop below 0.8V.

Caution Calibration Circuit

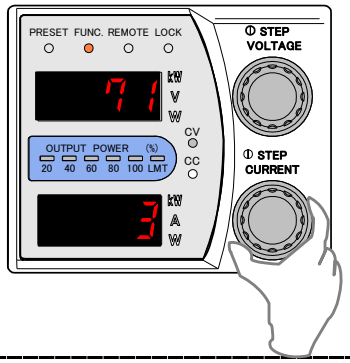
Set FUNCTION Settings Item 1, Sink Function, to 1 (1=ON) and Settings Item 13, Linearity compensation Function, to 0(0=OFF)beforehand.

2. Change the top Number Display to Settings Item 71 with the VOLTAGE dial.

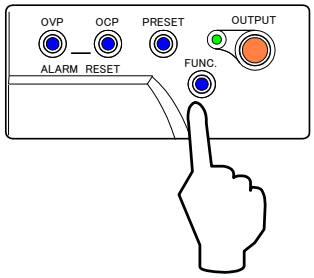


3. Change the set value to 2 (External Resistance B) with the CURRENT dial.

3: External Resistance (0～10kΩ B)

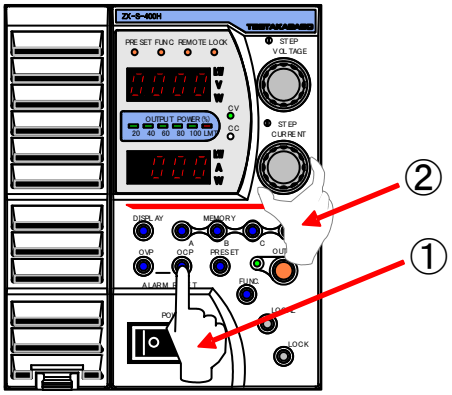


4. Press the FUNC. key again to finalize settings.

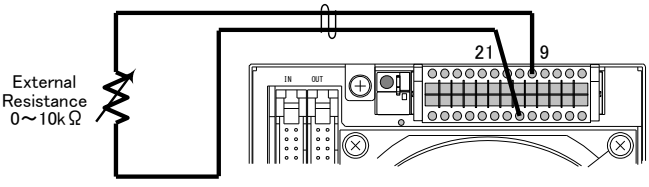


5. Press the OCP key ①. Set to "44.00A"(※) with the CURRENT dial ②.

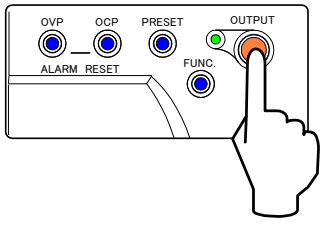
※For 400H/HA set to "5.50A"
For 800H/HA set to "11.00A"
For 1600H/HA set to "22.00A"



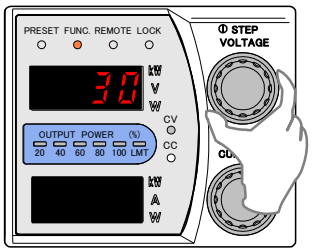
6. Set external resistance to "100Ω".



7. Press the OUTPUT key to set the output to ON.

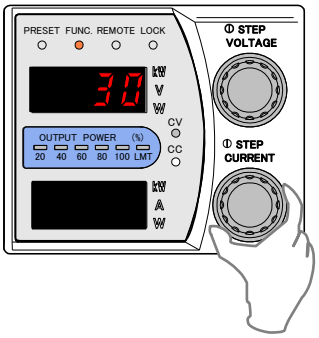


8. Press the FUNC. key and change the top Number Display to Settings Item 30 with the VOLTAGE dial.

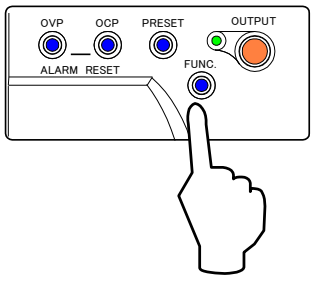


9. Adjust so that the digital multimeter (used for output current measurement) displays the set value with the CURRENT dial.

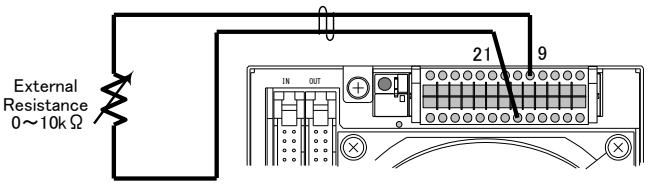
※See "Output Current Control with External Resistance" on deriving the set value.



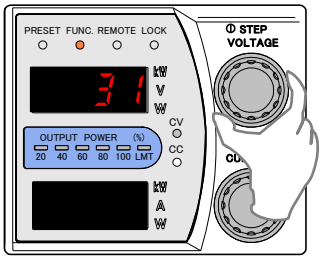
10. Press the FUNC. key to complete offset calibration of output current control with external resistance (B).



11. Set external resistance to "10kΩ".

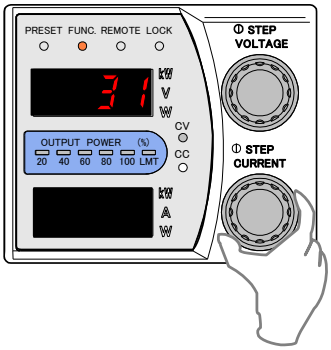


12. Press the FUNC. key and change the top Number Display to Settings Item 31 with the VOLTAGE dial.

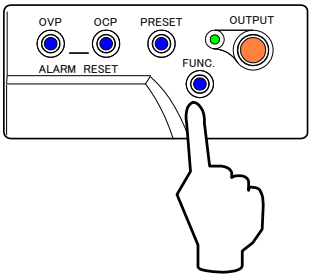


13. Adjust so that the digital multimeter (used for output current measurement) displays the set value with the CURRENT dial.

※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).



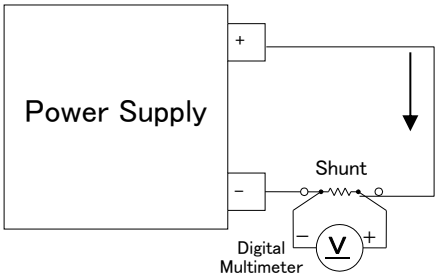
15. This completes offset/full-scale calibration of output current control with external resistance (B).

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.



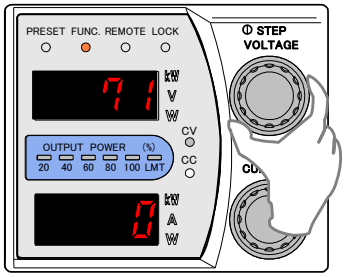
Calibration Circuit

Note:
current is 5A for
(400H/HA)
800H/HA is 10A
1600H/HA is 20A
Use wires which will not p
roduce a voltage drop belo
w 0.8V.

Caution

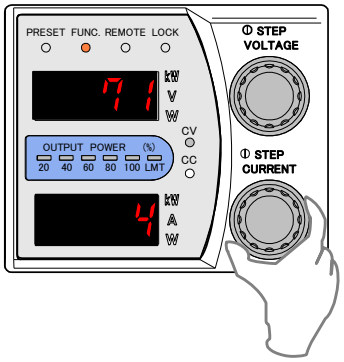
Set FUNCTION Settings Item 1, Sink Function, to 1 (1=ON) and Settings Item 13, Linearity compensation Function, to 0(0=OFF)beforehand.

2. Change the top Number Display to Settings Item 71 with the VOLTAGE dial.

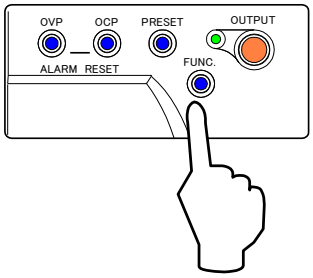


3. Change the set value to 4 (External Resistance C) with the CURRENT dial.

4： External Resistance（0～10kΩ C）

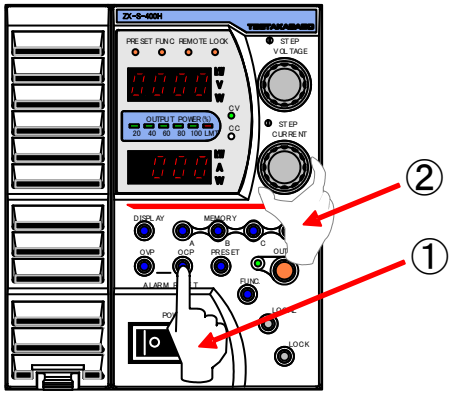


4. Press the FUNC. key again to finalize settings..

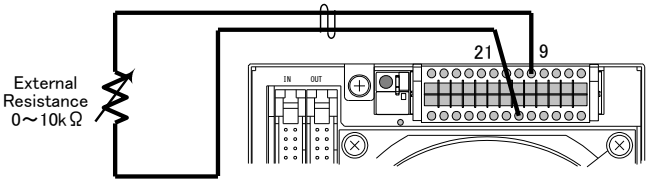


5. Press the OCP key ①. Set to “44.00A” (※) with the CURRENT dial ②.

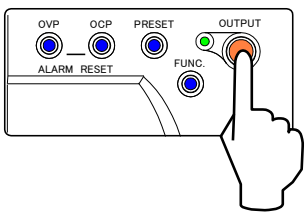
※For 400H/HA set to “5.50A”
For 800H/HA set to “11.00A”
For 1600H/HA set to “22.00A”



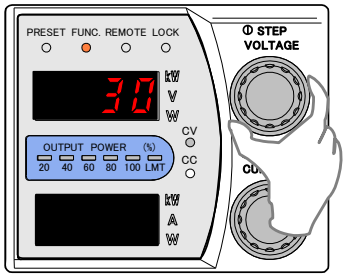
6. Set an external resistance to “10kΩ”.



7. Press the OUTPUT key to set the output to ON.

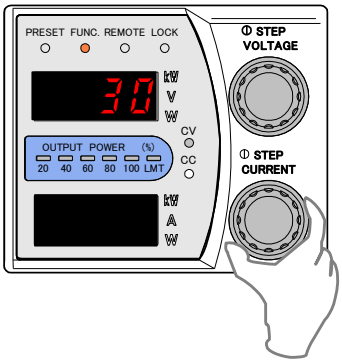


8. Press the FUNC. key and change the top Number Display to Settings Item 30 with the VOLTAGE dial.

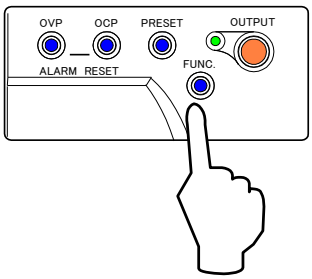


9. Adjust so that the digital multimeter (used for output current measurement) displays the set value with the CURRENT dial.

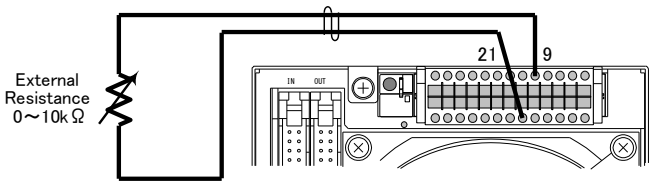
※See "Output Current Control with External Resistance" on deriving the set value.



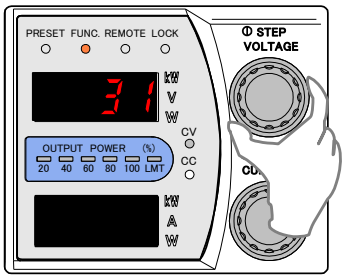
10. Press the FUNC. key to complete offset calibration of output current control with external resistance (C).



11. Set external resistance to "100Ω".

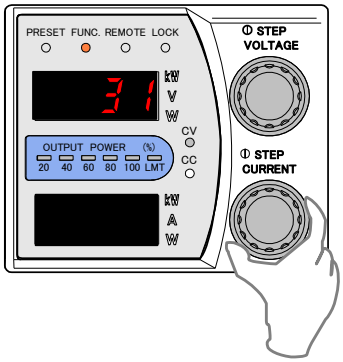


12. Press the FUNC. key and change the top Number Display to Settings Item 31 with the VOLTAGE dial.

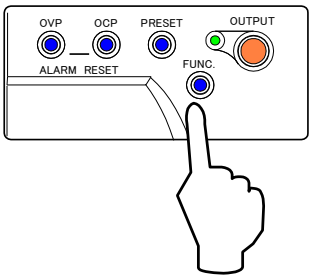


13. Adjust so that the digital multimeter (used for output current measurement) displays the set value with the CURRENT dial.

※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).

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 (400H/HA)
25A/50mV 0.1% accuracy (800H/HA)
50A/50mV 0.1% accuracy (1600H/HA)

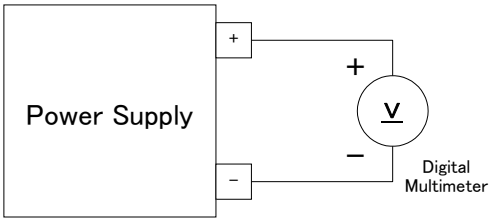
Voltmeter Offset/Full-Scale Calibration

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.

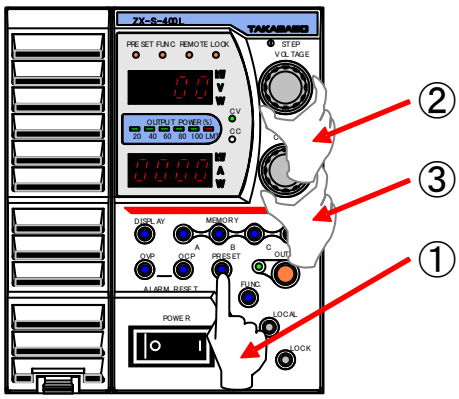


Calibration Circuit

Caution

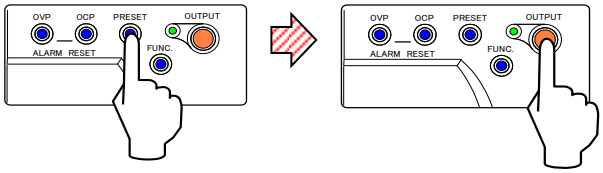
Set FUNCTION Settings Item 13, Linearity compensation Function. to 0 (0=OFF) beforehand.

2. Press the PRESET key ① and set to "0.1V" with the VOLTAGE dial ② and "1.00A" with the CURRENT dial ③.

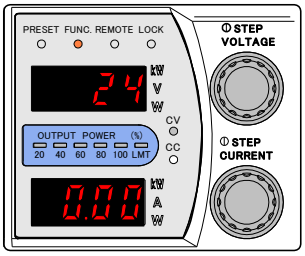


(See **Operating as Constant Voltage Power Supply** under **Basic Operations** on how.)

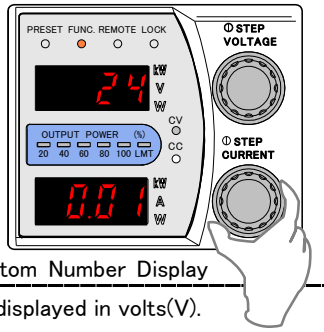
3. Press the PRESET key again and then the OUTPUT key to set the output to ON.



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.

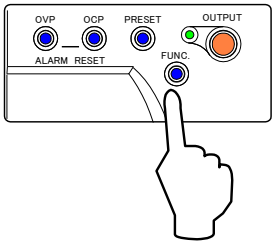


5. Adjust the measurement value displayed in the bottom Number Display to the same value as displayed on the digital multimeter (used for output voltage measurement) with the CURRENT dial.

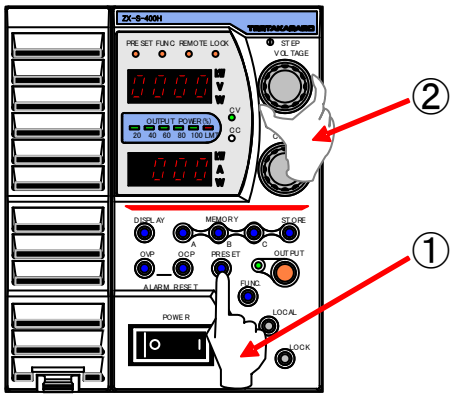


Note: Bottom Number Display is displayed in volts(V).

6. Press the FUNC. key to complete offset voltmeter calibration.

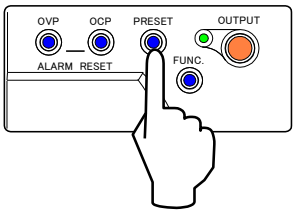


7. Press the PRESET key ① and set the CV set value to "640.0V" with the VOLTAGE dial ②.

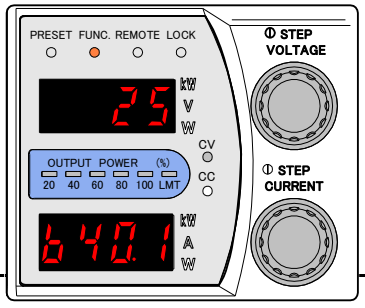


(See **Operating as Constant Voltage Power Supply** under **Basic Operations** on how. (P17))

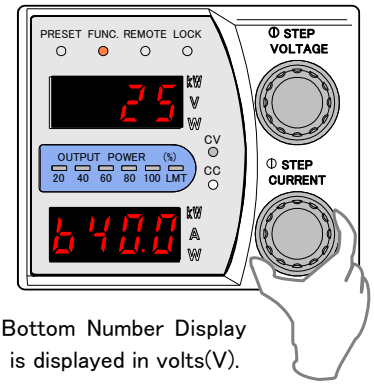
8. Press the PRESET key.



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.

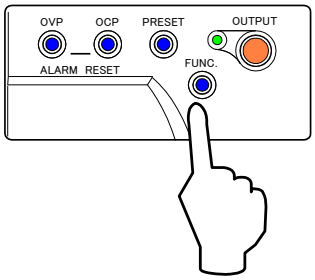


10. Adjust the measurement value displayed in the bottom Number Display to the same value as displayed on digital multimeter (used for output voltage measurement) with the CURRENT dial.



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.

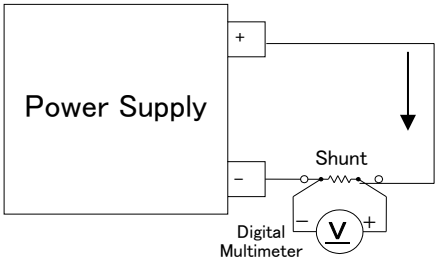
Ammeter Offset/Full-Scale Calibration

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.



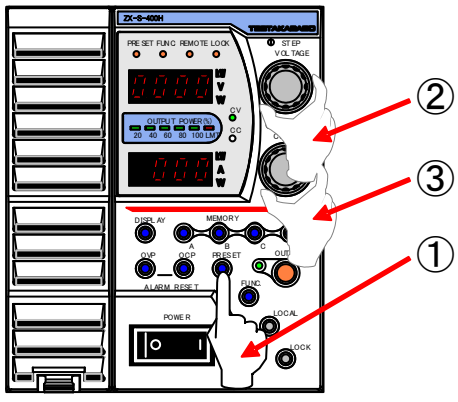
Calibration Circuit

Note:
Current is 54A for (400H/HA)
800H/HA is 10A
1600H/HA is 20A
Use wires which will not produce a voltage drop below 0.8V.

Caution

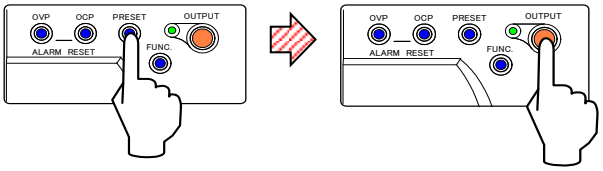
Set FUNCTION Settings Item 1, Sink Function, to 1 (1=ON) and Settings Item 13, Linearity compensation Function, to 0(0=OFF)beforehand.

2. 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.

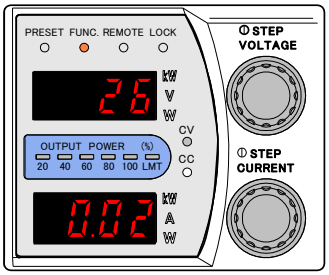


(See **Operating as Constant Current Power Supply** under **Basic Operations** on how.)

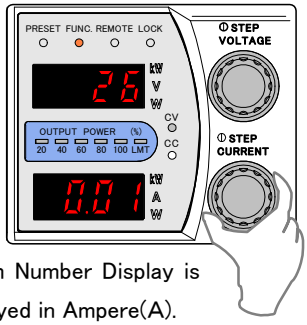
3. Press the PRESET key again and then the OUTPUT key to set the output to ON.



4. Press the FUNC. key and change the top Number Display to Settings Item 26 with the VOLTAGE dial to display the current value at the bottom.

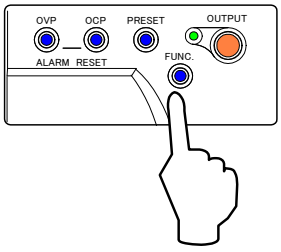


5. Adjust the measurement value displayed in the bottom Number Display to the same value as displayed in the digital multimeter (used for output current measurement) with the CURRENT dial.



Note: Bottom Number Display is displayed in Ampere(A).

6. Press the FUNC. key to complete full-scale calibration of the ammeter.

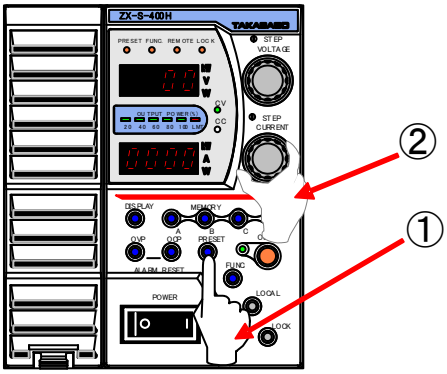


7. Press the PRESET key ① and set the CC set value to “40.00A”(※) with the CURRENT dial ② and the CV set value to “1.00V” with the VOLTAGE dial.

※For 400H/HA set to “5.000A”

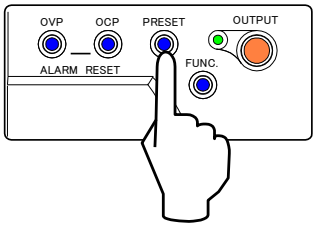
For 800H/HA set to “10.00A”

For 1600H/HA set to “20.00A”

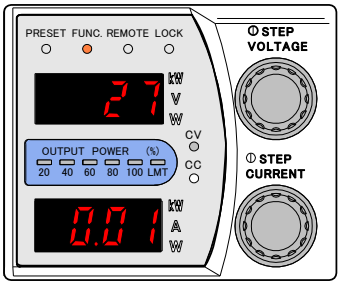


(See **Operating as Constant Current Power Supply** under **Basic Operations** on how.)

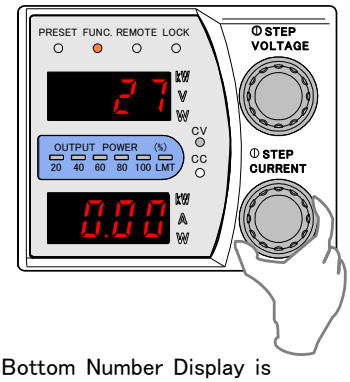
8. Press the PRESET key.



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.

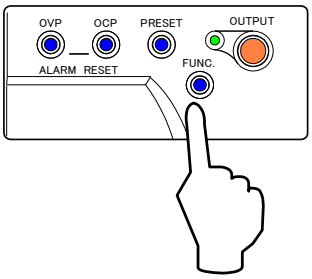


10. Adjust the measurement value displayed in the bottom Number Display to the same value as displayed in the digital multimeter (mV) (used for output current measurement) with the CURRENT dial.



Note: Bottom Number Display is displayed in Ampere(A).

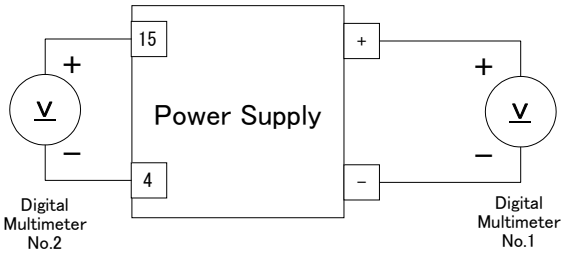
11. Press the FUNC. key to complete ammeter full-scale calibration.



12. This completes ammeter calibration.
Please return the CC and CV set values back to normal before use.

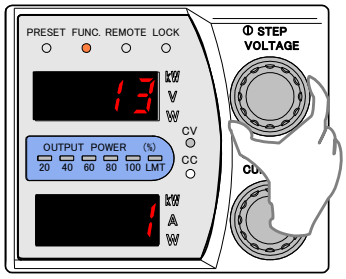
Offset/Full-Scale Calibration of Output Voltage Monitor (ZX-S Series Type-HA)

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.

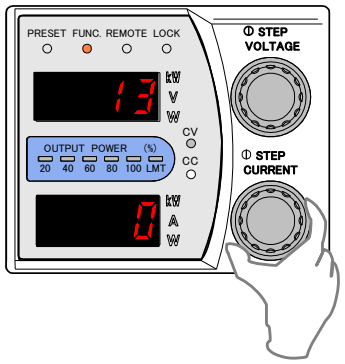


Calibration Circuit

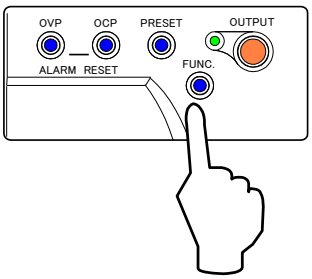
2. **Press the FUNC. key and change the top Number Display to Settings Item 13 with the VOLTAGE dial.**



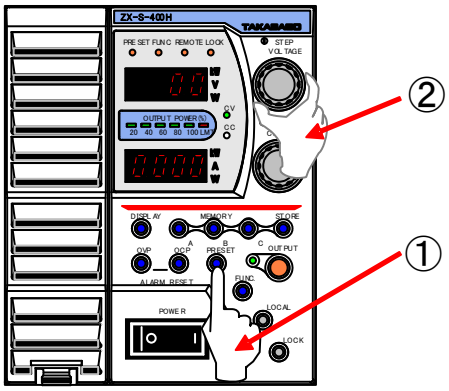
3. **Turn the CURRENT dial and set the set value to 0 (Linearity Compensation: OFF).**



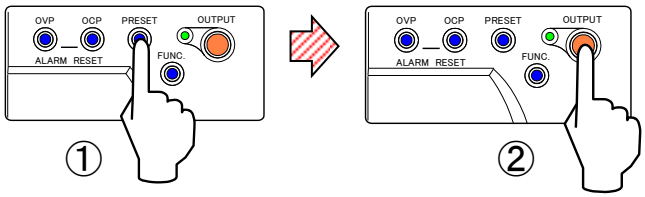
4. **Press the FUNC. key again to finalize settings.**



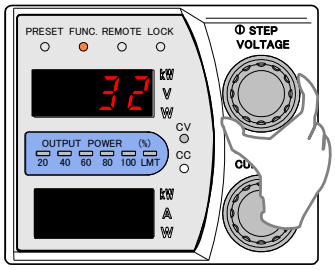
5. **Press the PRESET key ① again and set to "0.00V" with the VOLTAGE dial ②.**



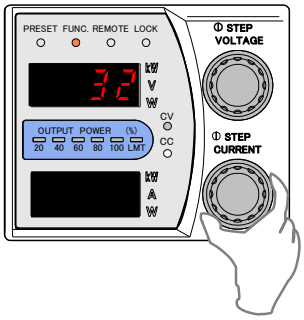
6. **Press the PRESET key ① and then the OUTPUT key ② to set the output to ON.**



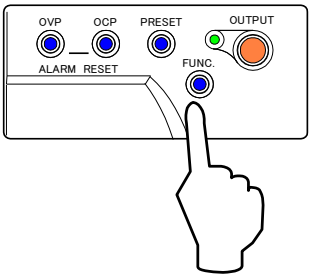
7. Press the FUNC. key and change the top Number Display to Settings Item 32 with the VOLTAGE dial.



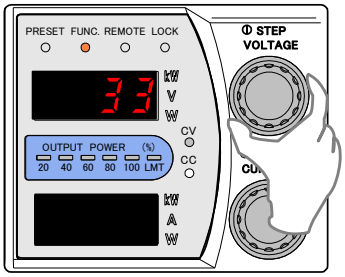
8. Adjust so that the digital multimeter No.2 (used for voltage monitor measurement) displays “0.00V” with the CURRENT dial.



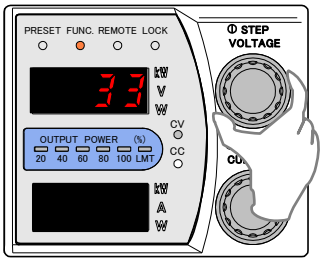
9. Press the FUNC. key to complete offset calibration of output voltage monitor.



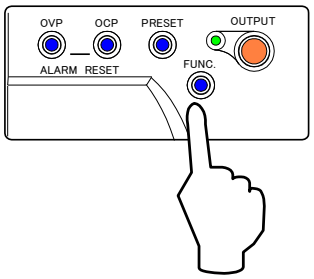
10. Press the FUNC. key and change the top Number Display to Settings Item 33 with the VOLTAGE dial.



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.

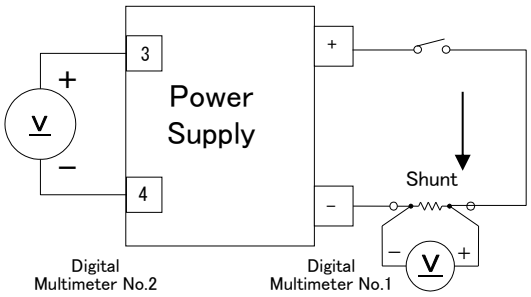
Offset/Full-Scale Calibration of Output Current Monitor (ZX-S Series Type-HA)

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)

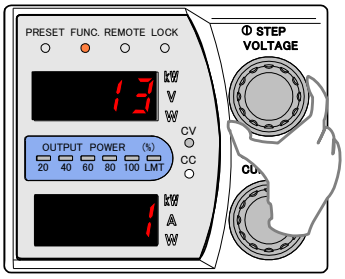
Turn the POWER switch ON and OUTPUT OFF in advance.



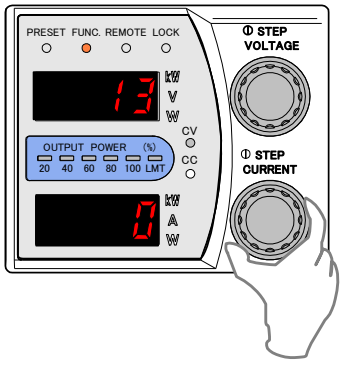
Calibration Circuit

Note:
Current is 5A for
(400H/HA)
800H/HA is 10A
1600H/HA is 20A
Use wires which will not produce a voltage drop below 0.8V.

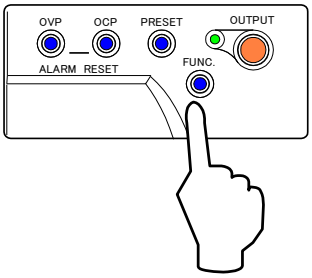
2. Press the FUNC. key and change the top Number Display to Settings Item 13 with the VOLTAGE dial.



3. Turn the CURRENT dial and set the current value to 0 (Linearity Compensation: OFF).

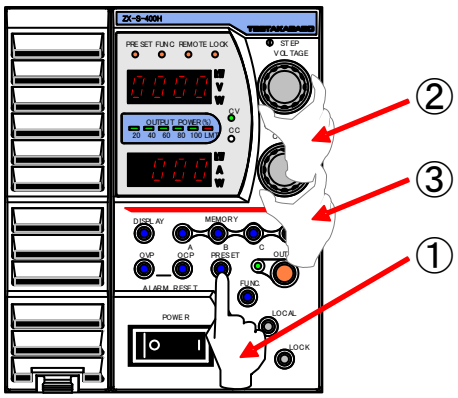


4. Press the FUNC. key again to finalize settings.

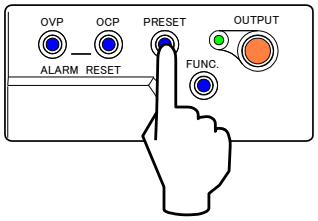


5. Press the PRESET key ① and set to "1.00V" with the VOLTAGE dial ② and "5.000A～20.0A" (※) with the CURRENT dial ③.

※For 400H/HA set to "5.000A"
For 800H/HA set to "10.00A"
For 1600H/HA set to "20.0A"

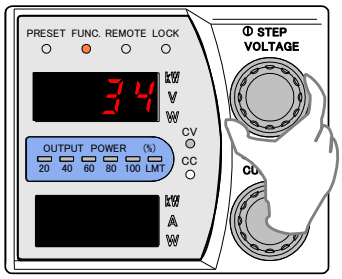


6. Press the PRESET key ①

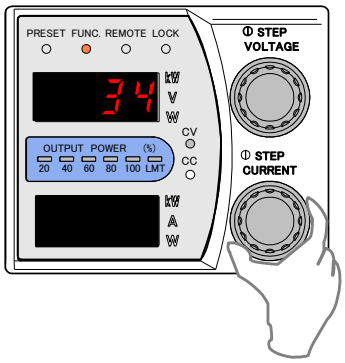


7. Set the load switch S1 to OPEN.

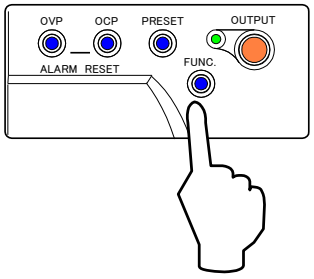
8. Press the FUNC. key and change the top Number Display to Settings Item 34 with the VOLTAGE dial.



9. Adjust so that the digital multimeter No.2 (use for current monitor measurement) displays a number within the range of "±2mV" with the CURRENT dial.



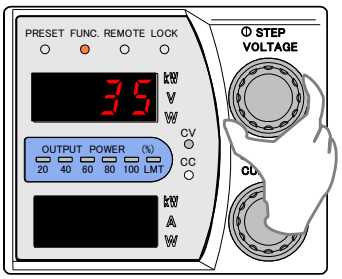
10. Press the FUNC. key to complete offset calibration of output voltage monitor.



11. Set the Load Switch S1 to CLOSE.

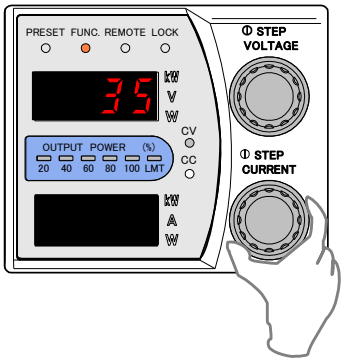
12. Press the OUTPUT key ② to set the output to ON.

13. Press the FUNC. key and change the top Number Display to Settings Item 35 with the VOLTAGE dial.

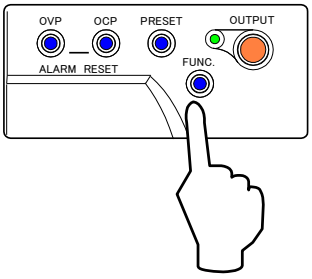


14. Adjust so that the digital multimeter No. 2 (use for current monitor measurement) displays "Output Current*2" (※) with the CURRENT dial.

※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	400H	400HA	800H	800HA	1600H	1600HA
Rated Output Voltage	640V		640V		640V	
Rated Output Current	5A		10A		20A	
Rated Output Power	400W		800W		1600W	

Input Specifications

Specification/Models		400H	400HA	800H	800HA	1600H	1600HA
Power Source		AC85V～250V Single Phase/45Hz～65Hz					
Input Current *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 (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		400H	400HA	800H	800HA	1600H	1600HA
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/℃					
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	400H	400HA	800H	800HA	1600H	1600HA
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 (Typical Value)	±100ppm/℃					

Note: *4 : Measurement at sensing point for 0～100% change in rated load current(Static Load Change)
*5 : For ±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℃±5℃
*12 : At output short-circuit and environmental temperature 23℃±5℃

Measures/Displays

Specification/Models		400H	400HA	800H	800HA	1600H	1600HA
Voltmeter		4-Digit Digital Meter					
	Maximum Display	999.9V					
	Measure Accuracy *13	±(0.1% of reading ±2digit(200mV))					
	Temperature Coefficient (Typical Value)	±50ppm/℃					
Ammeter		4-Digit Digital Meter					
	Maximum Display *21	9.999A		99.99A		99.99A	
	Measure Accuracy *13 *21	±(0.5% of reading ±4digit(4mA))		±(0.5% of reading ±1digit(10mA))		±(0.5% of reading ±1digit(10mA))	
	Temperature Coefficient (Typical Value) *21	±100ppm/℃					
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 current measurement value. (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℃±5℃

*21 : At stand alone operation

Protection Functions

Specification/Models		400H	400HA	800H	800HA	1600H	1600HA
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. 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℃ (1600L/LA:95℃) due to stopped fan motor, etc. ・Welds temperature fuses, built in the Inrush Limiting Resistors, at 135℃.					
Excessive Input Current Protection		Fuse 10A		Fuse 20A		Protected by 20A Fuse/unit	

*14 : Input switch cut-off turns the power supply's internal input power relays OFF.
This can be selected for 1600H/1600HA

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 642V at the power supply's output terminals. Also, the output power can be set within the rating.

Other Functions

Specification/Models		400H	400HA	800H	800HA	1600H	1600HA
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 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%±2mV

*17 : DC10V Output (non-isolated) for rated output current Accuracy: 0.5%±2mV

External Control

Specification/Models		400HA	800HA	1600HA
Output Voltage Control	External Resistance	0～10kΩ(B, C Curve)、0～∞Ω(A Curve)		
	External Voltage	DC0～10V		
Output Current Control	External Resistance	0～10kΩ(B, C Curve)、0～∞Ω(A Curve)		
	External Voltage	DC0～10V		
Output ON/OFF Toggle Control		Can be controlled at external contact or photocoupler		

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	400H	400HA	800H	800HA	1600H	1600HA
Insulation	At DC 1000Vmega-ohm tester, above 20MΩ Between each input and output, input and chassis, output and chassis					
Withstanding Voltage	AC 1.5kV 1 minute Between each input and output, input and chassis					
Relative Ground Voltage	At peak voltage value, within ±1000V between Output and Ground(Includes output voltage)					

Cooling

Specification/Models	400H	400HA	800H	800HA	1600H	1600HA
Cooling Method	Cooling is regulated in response to the output					

Operational Environment

Specification/Models		400H	400HA	800H	800HA	1600H	1600HA
Environmental Temperature	Operating	0～50℃ However, in areas above 40℃ a 2.5% to 1℃ ratio is required for derating the output power and output current.					
	Saving	-20℃～70℃					
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	400H	400HA	800H	800HA	1600H	1600HA
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

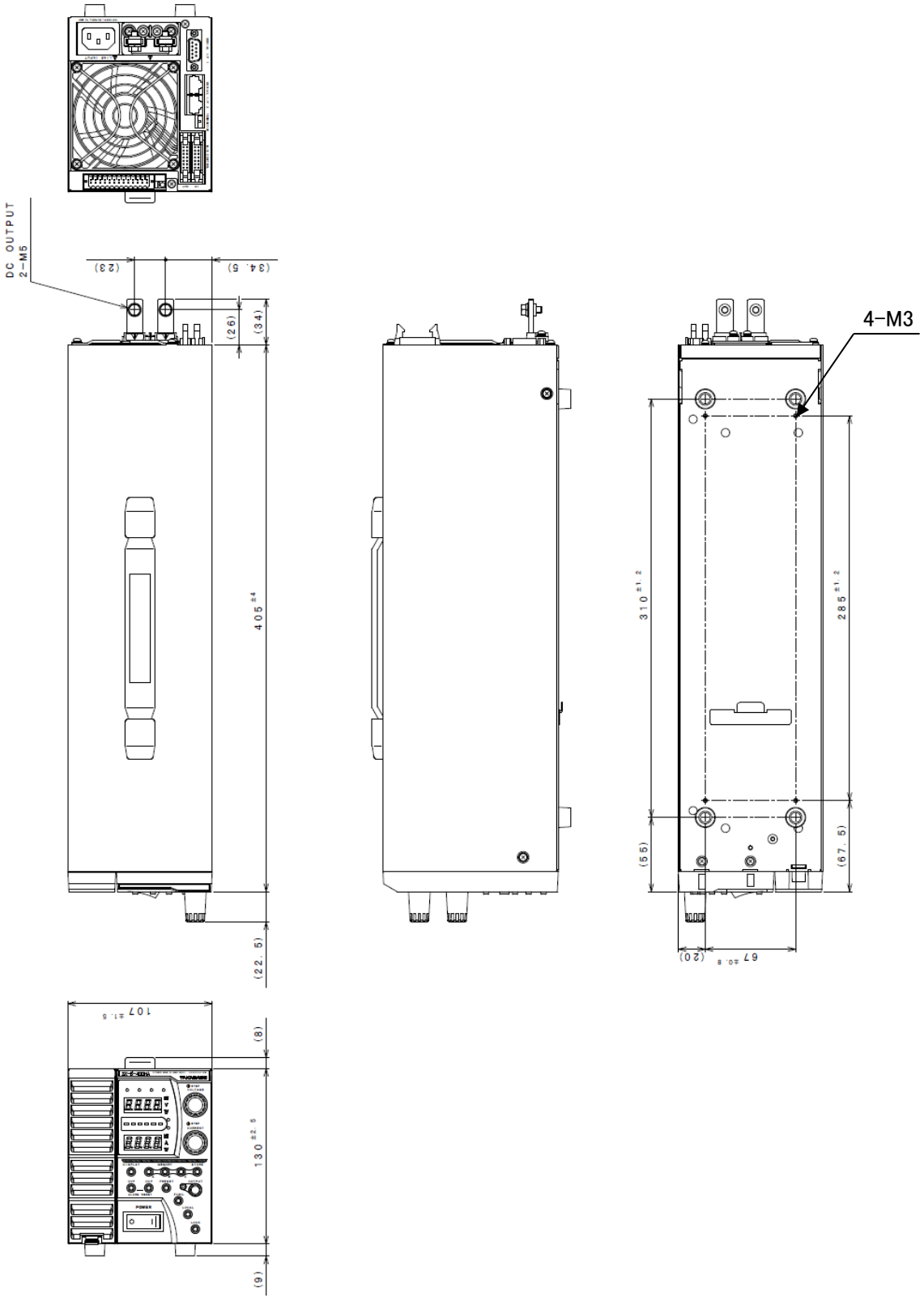
Accessories

400H/400HA	① Input Power Cable （AC125V Rating） *20 ……1 Item ② 2P-3P Conversion Adapter （AC125V Rating）……1 Item ③ Output Terminal Cover ……1 Package ● Output Terminal Cover ×2 Items （Identical Shape） ● Supporter for attaching cover ×1 Item ● M3×6mm screws×2 Items ④ Output Terminal Screws ● M5×12mm bolts(includes flat washers, spring wasters)×2 Packages (Attached to power supply) ⑤ Dummy Connector (Attached to power supply)……2 Items ⑥ Instruction Manual……1 Item ⑦ External Control Connector(only for 400HA)……1 Item
800H/800HA	① Input Power Cable （AC125V Rating） *20 ……1 Item ② 2P-3P Adapter （AC125V Rating）……1 Item ③ Output Terminal Cover ……1 Package ● Output Terminal Cover ×2 Items （Identical Shape） ● Supporter for attaching cover ×1 Item ● M3×6mm screws×2 Items ④ Output Terminal Screws ● M5×12mm bolts(includes flat washers, spring wasters)×2 Packages (Attached to power supply) ⑤ Front Terminal Cover……1 Package ⑥ Dummy Connector (Attached to power supply……2 Items ⑦ Instruction Manual……1 Item ⑧ External Control Connector(only for 800HA)……1 Item
1600H/1600HA	① Input Power Cable (3-core VCT cable 5.5mm^2)……1 Item ② Output Terminal Cover ……1 Package ● Output Terminal Cover ×2 Items （Identical Shape） ● Supporter for attaching cover ×1 Item ● M3×6mm screws×2 Items ③ Output Terminal Screws ● M5×12mm bolts(includes flat washers, spring wasters)×2 Packages (Attached to power supply) ④ Front Terminal Cover……1 Package ⑤ Dummy Connector (Attached to power supply……2 Items ⑥ Instruction Manual……1 Item ⑦ External Control Connector(only for 1600HA)……1 Item

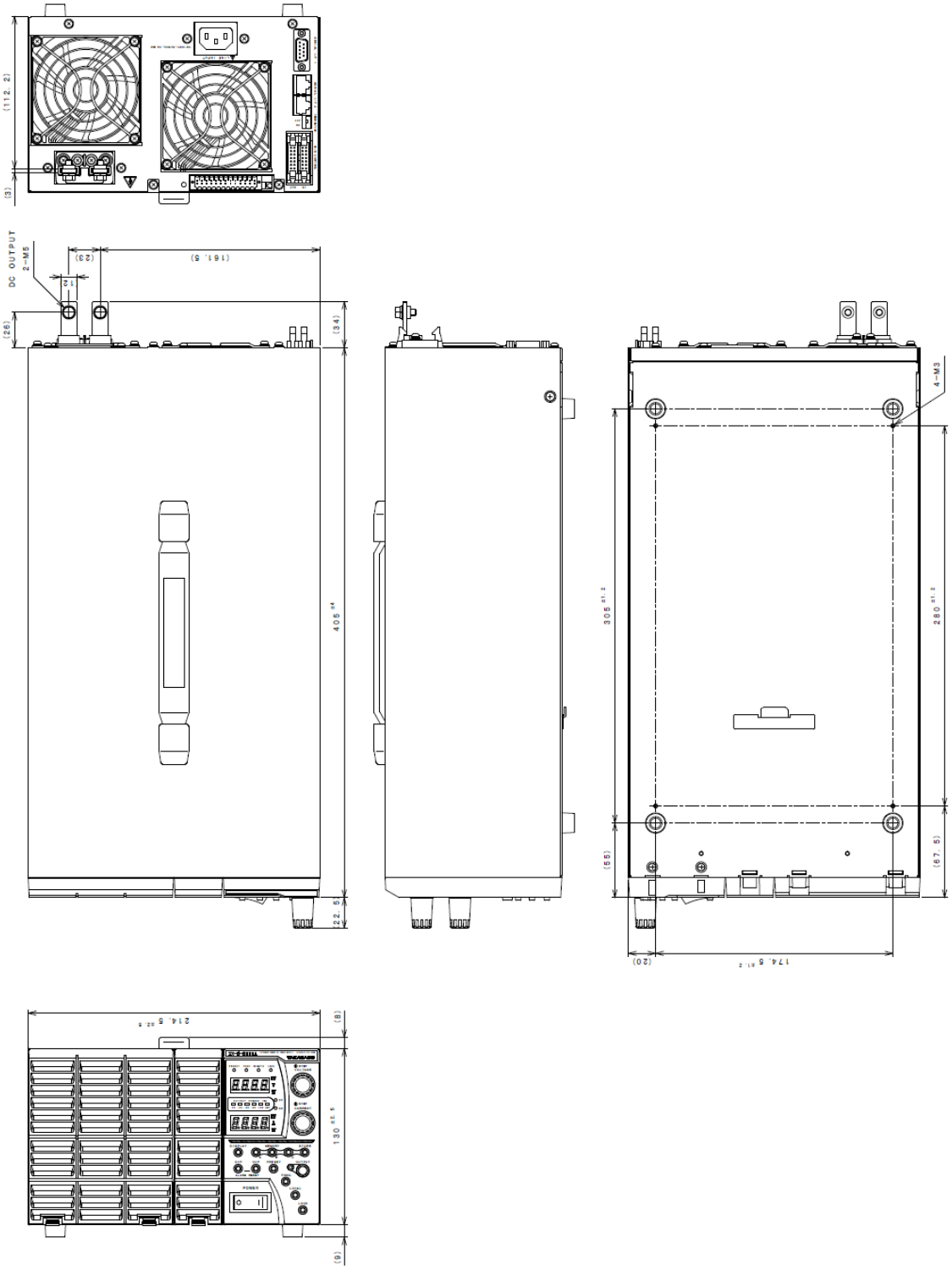
Note: *20 : The included power cable cannot be used for AC200V inputs. Please contact Takasago Sales Department for the proper power cable.

External Diagrams

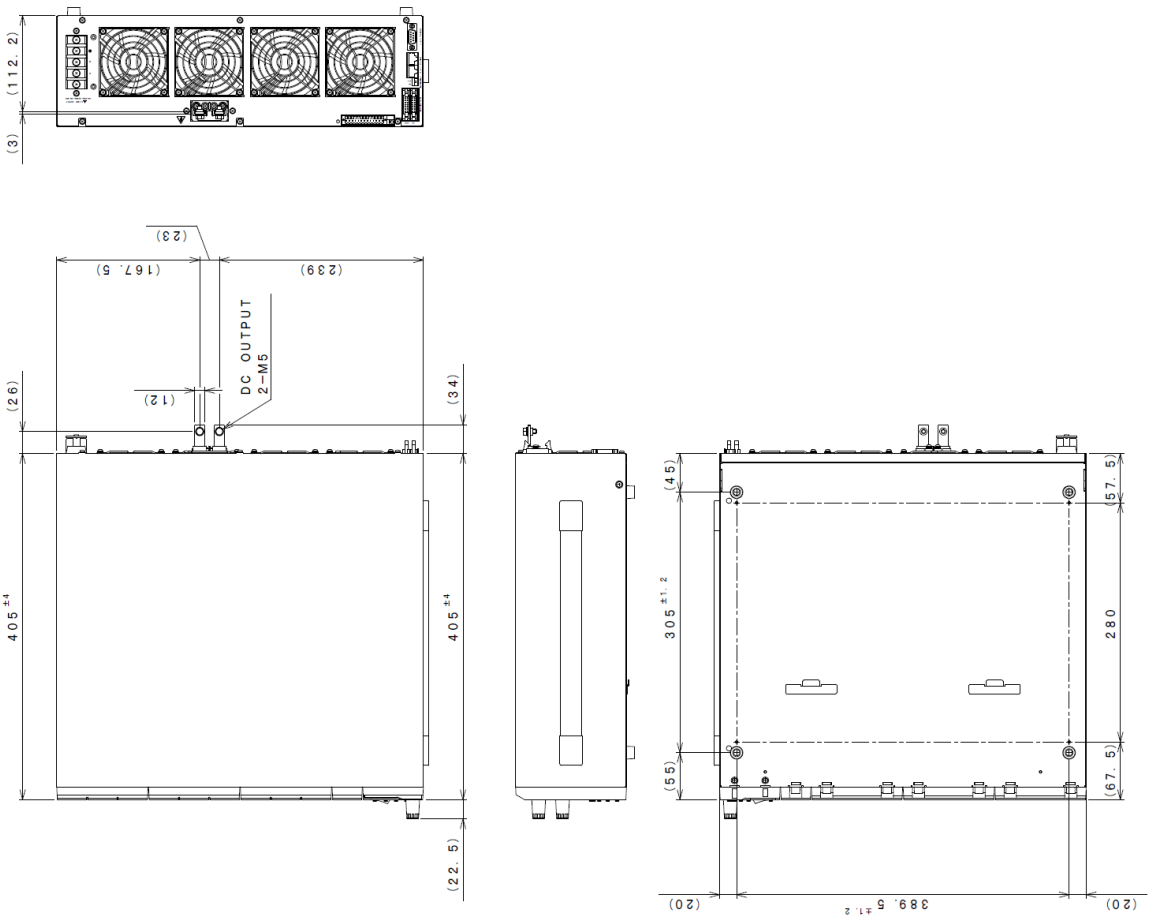
ZX-S-400H／400HA



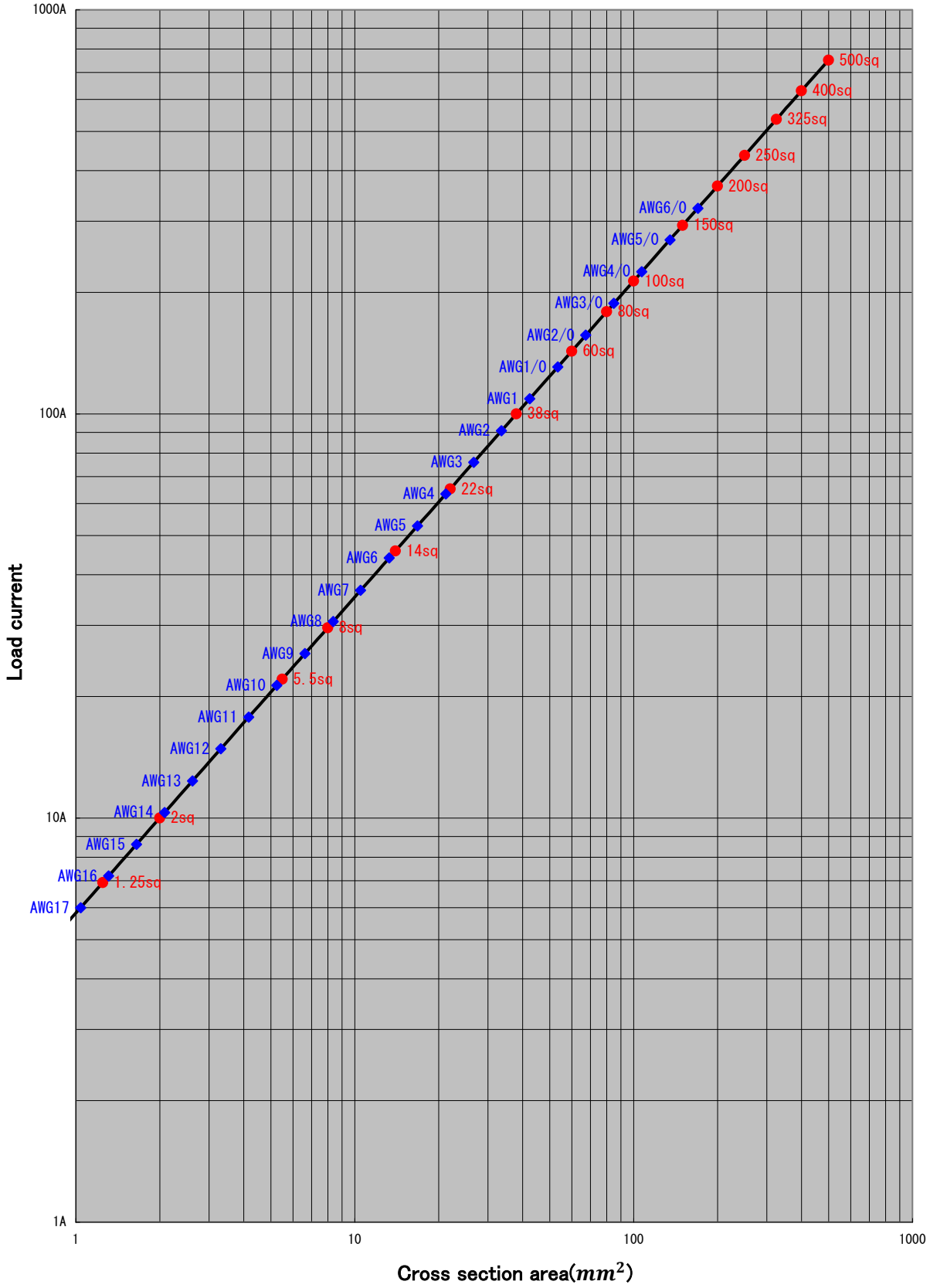
ZX-S-800H／800HA



ZX-S-1600H／1600HA



Appendix　Load current　vs　Cross section area



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