Europe Edition

KIKUSUI

Electronic Test &
Measurement Instruments, Power Supplies

KIKUSUI
PRODUCTS CATALOGUE
2021/2022

www.kikusui.co.jp/en/

ES France - Département Puissance Energie - 127 rue de Buzenval BP 26 - 92380 Garches
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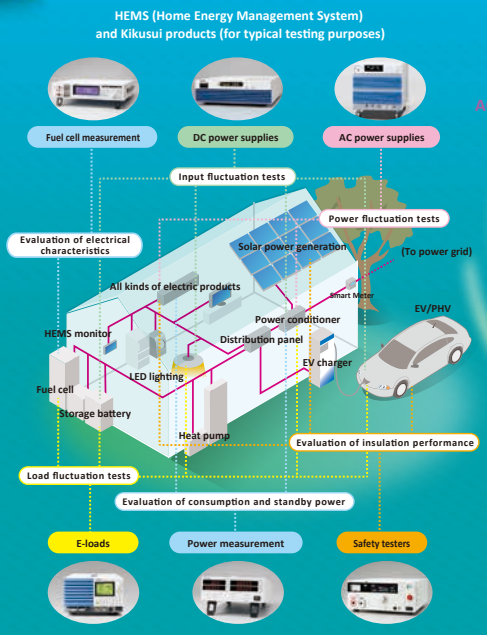
Kikusui Provides Solutions for Energy and The Infrastructure of Society.

Kikusui has identified three areas of solutions for Smart Cities – technologies in the environmental and energy saving fields. These are energy creation (power generation technologies), energy storage (power storage technologies), and energy saving (technologies for greater efficiency), and we are providing products for each of these purposes. Our primary products include DC power supplies, as well as electronic loads that absorb and consume electrical energy. In particular, our electronic loads are used as evaluation instruments that are essential for energy creation and energy storage, and large growth in sales of these products is expected. In the energy saving field, we provide AC power supplies that are key equipment for standard evaluations and grid connection (two-way connections for power supply and receiving) tests, as well as withstanding voltage testers for testing the safety of electrical and electronic devices and EMC testers for testing electromagnetic safety.



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Company Profile

Head Quarters

Kikusui Innovation Creation Center

Fuji-Katsuyama Factory

Corporate name	Kikusui Electronics Corp.
Founded and Incorporated	August 8, 1951
Capital	2,201 million yen
President & C.E.O	K. Kobayashi
Main activities	Manufacture, sale, and export & import of electronic test and measuring instruments, power supplies and software.
Headquarters	Southwood 4F, 6-1 Chigasaki-chuo, Tsuzuki-ku, Yokohama, Kanagawa, 224-0032, Japan
Affiliate companies	FujiTEK Corp. (Japan) Kikusui Trading (Shanghai) Co., Ltd. (China) Kikusui America, Inc. (U.S.A)
Main customers	Self-Defense Force Agency / Ministry of Education, Culture, Sports, Science and Technology / Japan Atomic Energy Research Institute / Nippon Telegraph and Telephone Corp. / Hitachi, Ltd. / Toshiba Corp. / Mitsubishi Electric Corp. / NEC Corp. / Fujitsu Ltd. / Panasonic Corp. / Sony Corp. / Pioneer Electric Corp. / Kyo-cera Corp. / ALPS Electric Co., Ltd. / Murata Manufacturing Co., Ltd. / Toyota Co., Ltd. / Denso Corp. / Nissan Motor Car Co., Ltd. / Honda Motor Co., Ltd.
Main products	Power Supplies, Electronic Loads, Telecommunication Measuring Instruments, Withstanding Voltage Testers, Insulation Testers, Earth Continuity Tester, Calibrators, Signal Generators

History

1950s

1960s

1970s

1951	Kikusui Denpa established.
1962	Corporate name changed to Kikusui Electronics Corporation
1983	Fuji Katsuyama Factory established.
1986	Fujitec Co., Ltd. established as an affiliated factory of the Fuji Katsuyama Factory.
1988	Concluded exclusive agent contract with Marconi Instruments Ltd. (presently Aeroflex Incorporated), U.K.
	COM3000 Series Oscilloscope becomes the first category winner of the Good Design Award by MITI (Ministry of International Trade and Industry)
1991	Capital increased to 2,201,250,000 yen. Stock listed on domestic stock exchanges (November 22)
1993	Head office moved to Yokohama.
1994	Construction of Engineering Centre completed.
1995	ISO9001 certified by JQA.
1997	Construction of Head office.
2000	ISO14001 certified by JQA.
2004	Kikusui Electronics (Suzhou) Co.,Ltd. established in China.
	Kikusui America, Inc. established in the United States.
2006	Kikusui Trading (Shanghai) Co.,Ltd.

1980s

1990s

2000s

KIKUSUI WEB
www.kikusui.co.jp/en/

We at the Kikusui Electronics Corporation would like to offer you information through our web site including about Company Profile of Kikusui, Full line of Kikusui products, Overseas distributors, services, new technologies, and an introduction of latest products. We also uploaded for your convenience some popular instrument drivers, which can be used with Lab VIEW or Visual Basic as Download Service.
Electronic catalogues in PDF format are also available for each product on our web site, including detailed specifications.

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NOTE:

* All products contained in this catalogue are equipment and devices that are premised on use under the supervision of qualified personnel, and are not designed or produced for home-use or use by general consumers.
* Specifications, design and so forth are subject to change without prior notice to improve the quality.
* Product names and prices are subject to change and production may be discontinued when necessary.
* Product names, company names and brand names contained in this catalogue represent the respective registered trade name or trade mark.
* Colors, textures and so forth of photographs shown in this catalogue may differ from actual products due to a limited fidelity in printing.
* Although every effort has been made to provide the information as accurate as possible for this catalogue, certain details have unavoidably been omitted due to limitations in space.
* If you find any misprints or errors in this catalogue, it would be appreciated if you would inform us.
* Please contact us to confirm specifications, price, accessories or anything that may be unclear when placing an order or concluding a purchasing agreement.

NOTE: Markings

NEW — Identifies new products appearing in this years catalog.

LAN USB GPIB RS232C RS485

Products equipped with these interfaces as standard.

LAN OPTION USB OPTION GPIB OPTION RS232C OPTION RS485 OPTION

Products optionally available with these interfaces.

DRIVERS — Products supporting instrument drivers for VisualBasic, LabVIEW, LabWindows/CVI and IVI-COM.
Refer to the down load service for drivers at Kikusui Web site.

CE — CE marked products

UKCA — UKCA marked products

LXI — LXI (LAN eXtention for Instrumentation)
LXI is a type of interface standard extended to an instrumentation platform based on industry standard Ethernet (LAN) technology.
The LXI Consortium is an industry consortium with over 50 of the top T&M companies such as Agilent Technology, VXI Technology sponsoring and developing this technology. (We, Kikusui Electronics Corp, are also a member of this consorthium)

INDEX

CE MARKING PRODUCT LIST

APPLICABLE MODELS FOR CE MARKING

DC Power Supply

Series	Model	Reference page	
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PWR Series	All models	16	*1
PAV Series	All models	18	*1
PWX Series	PWX750LF	24	*1
	PWX750MLF	24	*1
	PWX750MHF	24	*1
	PWX750HF	24	*1
	PWX1500L	24	*1
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	PWX1500MH	24	*1
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AC Power Supply

Series	Model	Reference page	
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PCR-MA Series	All models	48	*1
PCR-LE Series	All models	50	*1
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PLZ-5WH2 Series	All models	61	*1
PLZ-4WL Series	PLZ334WL	65	*1
PLZ-U Series	All models	67	*1

Battery Test System

Series	Model	Reference page	
PFX2500 Series	All models	71	*1

Safety Tester

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TOS Series	TOS9300	78	*1
	TOS9301	78	*1
	TOS9301PD	78	*1
	TOS9302	79	*1
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	TOS9320	80	*1
	TOS5300	90	*1
	TOS5301	90	*1
	TOS5302	90	*1
	TOS5200	95	*1
	TOS6210	99	*1
	TOS6200A	99	*1

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	BIM1100	103	*1

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OP02-PFX	71
OP03-PFX	71
SL01-PFX	71

ORDERING INFORMATION

*1 CE Marked model is available at all standard input voltage as specified in each specification.
*2 CE Marked model is available only for the unit equipped with Input voltage of 234 V.

* Please indicate 'CE Marked Products' when ordering or request for the quote.

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Selection

DC Power Supply

Compact Wide Range DC Power Supply (CV/CC)

PWR-01 Series

New flagship bench-top DC power supply

GPIB OPTION · USB · RS232C · LAN · LXI · DRIVERS

SWITCHING SYSTEM

P.10

Multi Range DC Power Supply (CV/CC)

PWR Series

Three types of wide-range power supplies covering 80 V to 650 V

GPIB/RS232C OPTION · USB OPTION

SWITCHING SYSTEM

P.16

Compact Variable Switching Regulated DC Power Supply

PAV Series

High power density up to 800 W in palm-size with high performance switching system.

USB · RS232C · RS485 · LAN OPTION

SWITCHING SYSTEM

P.18

DC Power Supply

1U Wide Range Programmable DC Power Supply

PWX Series

New standard of rack mount power supply

USB · RS232C · LAN · LXI · DRIVERS

SWITCHING SYSTEM

P.24

Compact DC Power Supply(CV/CC)

PMX-A Series

Network function equipped as standard for the standard test power supply.

GPIB OPTION · USB · RS232C · LAN · LXI · DRIVERS

LINEAR SYSTEM

P.29

Compact Multi-Output DC Power Supply (CV/CC)

PMX-Multi Series

Three models with 2, 3 and 4 outputs. Optimal for R&D as well as manufacturing lines.

USB · RS232C · LAN · LXI

LINEAR SYSTEM

P.33

DC Power Supply

Programmable Bipolar Power Supply (CV/CC)

PBZ Series

Superior output characteristic by adopting the power amp system

GPIB/RS232C · USB · LAN OPTION · LXI · DRIVERS

SWITCHING + LINEAR SYSTEM

P.37

Inteligent Bipolar Power Supply (CV/CC)

PBZ20-20A

Ideal for voltage variation testing of automotive electrical components, high power capacitor voltage fluctuation tests and motor evaluation tests!

GPIB/RS232C · USB · LAN OPTION · LXI · DRIVERS

SWITCHING + LINEAR SYSTEM

P.41

High Power Inteligent Bipolar Power Supply

PBZ SR Series

High-speed response with even higher power

GPIB/RS232C · USB · LAN · LXI · DRIVERS

SWITCHING + LINEAR SYSTEM

P.43

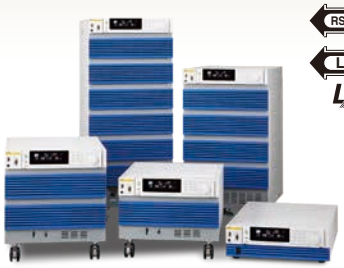
AC Power Supply

Ultra-Compact AC/DC Power Supply (CV/CF)

PCR-WEA/WEA2 Series NEW

The next generation of high-power programmable AC sources

GPIB OPTION · USB · RS232C · LAN · LXI



INVERTER SYSTEM

P.44

Compact AC Power Supply (CV/CF)

PCR-MA Series

Compact AC power supply using the PWM inverter method

GPIB OPTION · USB · LAN · LXI · DRIVERS

INVERTER SYSTEM

P.48

High-performance Multifunctional AC Power Supplies (CV/CF)

PCR-LE Series

New stage of AC power supply supporting new energy field

GPIB/USB OPTION · RS232C · LAN OPTION · LXI · DRIVERS

LINEAR SYSTEM

P.50

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Electronic Load

High-performance Multifunctional AC Power Supplies (CV/CF)

PCR-LE2 Series

New stage of AC power supply supporting new energy field

GPIB/USB OPTION, RS232C, LAN OPTION, LXI, DRIVERS

LINEAR SYSTEM

P.54

Multifunctional Electronic Load (CC/CV/CR/CP)

PLZ-5W Series

High-speed response, advanced communications, large-scale system capability

GPIB OPTION, USB, RS232C, LAN, LXI, DRIVERS

P.57

Multifunctional Electronic Load (CC/CV/CR/CP)

PLZ-5WH2 Series

Ideal for high capacity power supply and rechargeable battery evaluation! Testing with hyper-realistic load simulation made possible!

GPIB OPTION, USB, RS232C, LAN, LXI, DRIVERS

P.61

Multifunctional Electronic Load (CC/CV/CR/CP)

PLZ334WL

High speed-large current DC electronic load (50 A/μs)

GPIB/RS232C, USB, DRIVERS

P.65

Multifunctional Electronic Load (CC/CV/CR/CC+CV/CR+CV)

PLZ-U Series

Multi-channel load systems can be built easily! Operating multiple units in parallel offers large capacity!

GPIB/RS232C, DRIVERS

P.67

Battery Test System

Charge/Discharge System

PFX2500 Series

Fully support charge and discharge measurement from basic test to simulation test

LAN PFX2512 PFX2532, USB PFX2511

P.71

Safety Tester

Electrical Safety Multi-analyzer

TOS9300 Series

TOS9301PD NEW

Hipot, insulation resistance, ground bond, leakage or partial discharge, this analyzer covers it all!

USB, RS232C, LAN, LXI

P.78

Hipot Tester/Hipot Tester with Insulation Resistance Tester

TOS5300 Series

A new standard for hipot & insulation resistance testing applied to world-wide input voltage

USB, DRIVERS

P.90

Hipot Tester

TOS5200

A perfect AC hipot test solution, with 500 VA capacity and equipped PWM amplifier at very affordable investment

USB, RS232C

P.95

Measuring Instrument

Ground Bond Tester

TOS6210

Supports UL60950-1 - new standard for Information Technology Equipment (ITE)

GPIB/RS232C, DRIVERS

P.99

Ground Bond Tester

TOS6200A

Pursuing to maximize an easy operation, stylish design of ground bond tester

GPIB/RS232C, DRIVERS

P.99

Battery Impedance Meter

BIM1000 Series

Easy & reliable Battery measurements

USB, RS232C

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Compact Wide Range DC Power Supply (CV/CC)

PWR-01 Series

LAN (LXI) USB GPIB (OPTION) RS232C DRIVERS CE

Dimensions / Weight

400 W model: 71(2.80″)W×124(4.88″)H×350(13.78″)Dmm(inch)/ 3 kg(6.61 lb)
800 W model: 142.5(5.61″)W×124(4.88″)H×350(13.78″)Dmm(inch)/ 5.5 kg(12.13 lb)
1200 W model: 214(8.43″)W×124(4.88″)H×350(13.78″)Dmm(inch)/ 7.5 kg(16.53 lb)
2000 W model: 428.5(16.87″)W×128(5.04″)H×350(13.78″)Dmm(inch)/13 kg(28.66 lb)

Accessories

Chassis connection short bar, Output terminal M4 screws (2 pcs.), Output terminal bolt set (2 sets) *Only L type and ML type included., Output terminal cover, Packing list, Safety Information, Quick Reference (Japanese/English), CD-ROM
400 W/800 W model: Power cord *1 *2
1200 W model: Input terminal cover, Ferrite core set

*1 Power cord is not included for the 1200 W model. Please purchase the optional accessory separately (AC5.5-3P3M-M4C-VCTF). Not CE certified product.
*2 Power cord is not included for the 2000 W model. Please purchase the optional accessory separately (AC5.5-1P3M-M6C-3S).

New flagship bench-top DC power supply

The PWR-01 is a series of high-performance, multifunctional, compact, wide-range DC power supplies. It consists of 16 models in total with 4 maximum voltage outputs (L, ML, MH, and H) and 4 maximum power outputs (400 W, 800 W, 1200W and 2000 W). With the PWR-01 series you can set sequences with an embedded CPU as well as analog control. The series is equipped with LAN (LXI), USB, and RS232C as standard interfaces that are essential for system integration. The PWR-01 also features front-facing output terminals, variable internal resistance, bleeder ON/OFF functions, a CC/CV priority switching function, synchronized operation, various protections, and programmable internal memory.

Features

- Sequence function (supports triggered synchronization)
- Variable internal resistance function
- LAN (LXI compliant) /USB/RS232C as standard interface
- A virtual multi-channel bus (VMCB) function makes multi-channel operation more efficient
- A wide range of voltage and current settings can be combined within its output power rating (3 to 4 times)
- All models are equipped with front-facing output terminals as standard (maximum 10 A)
- Supporting universal input voltage (85 V to 265 V)
- CONFIG setting shortcut function and display (Up to three parameters can be registered.)
- Setting preset memory function (3 combinations of settings for voltage, current, OVP, OCP, and UVL)
- Bleeder (sink) can be turned ON/OFF, with an even stronger bleeder mode setting available
- Output ON/OFF delay function
- Soft start/stop function
- Operating temperature guaranteed up to 50 °C (122 °F). (Storage temperature is -25 °C to +60 °C (-13 °F to 140 °F).)

Options

■ AC power cord
for 1200 W model
AC5.5-3P3M-M4C-VCTF
*Not CE certified product


AC5.5-3P3M-M4C-VCTF

■ AC power cord
for 2000 W model
AC5.5-1P3M-M6C-3S

■ J1/ J2 connector plug kit
OP01-PWR-01
A plug kit for externally controlling the PWR-01 through the J1/J2 connector. 30 pin pieces, Housing for the J1 connector and J2 connector, 1 piece each

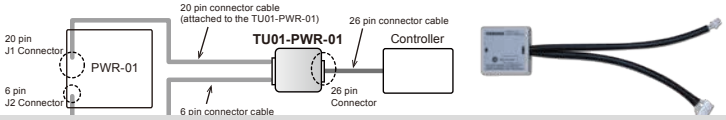
■ Parallel-operation cable
(for 2 units in parallel)
OP02-PWR-01

■ External-control cable and connector set
OP03-PWR-01
Cables 20 pcs., length: approx. 500 mm (Crimped on one end)
Housing for the J1 connector and J2 connector: 1 piece each,
Core: 1 piece

■ RS232C control-conversion cable
RD-8P/9P

■ Safety plugs
TL41 (screw connection type)
TL42 (solder connection type)

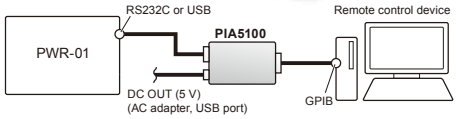
■ Terminal unit
TU01-PWR-01
A terminal unit for converting the J1 and J2 connectors of this product to the J1 connector of the Kikusui PWR Series Regulated DC Power Supplies.



■ GPIB Converter
PIA5100
This converter converts RS232C or USB of the PWR-01 to GPIB, enabling connection of a remote controller using GPIB.
[Accessories: Power cord set, Magnetic sheet]
*Not CE certified product

*DC 5 V (power supply with commercially-available universal AC adapter etc.) is required to operate the PIA5100.

[Connection example]



■ Sequence creation software
SD027-PWR-01 (Wavy for PWR-01)

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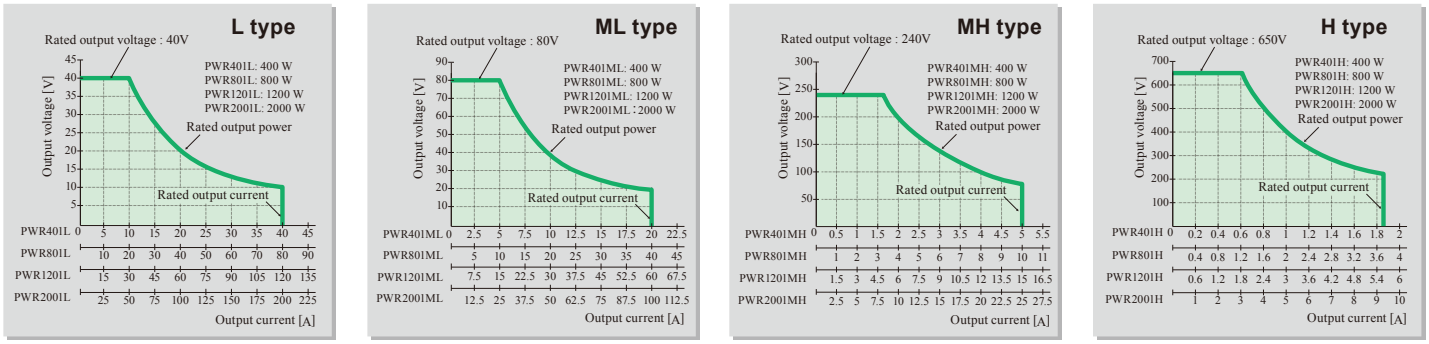
Operation Area

■ 3 to 4 times ratio-power operation

This operating range covers a wide variety of voltage and current-setting combinations. For example, the 1200 W model PWR1201ML is capable of seamless operation within ranges of 80 V/15 A to 20 V/60 A.

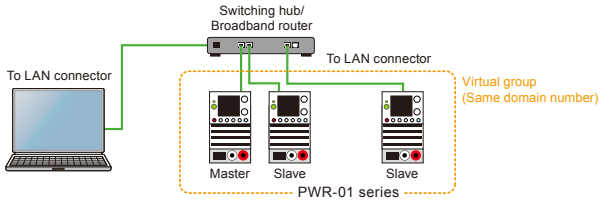


Equipped with standard LAN interface and VMCB function to support network-based remote control and monitoring

The PWR-01 series is equipped with LAN, USB, and RS232C interfaces as standard features. The virtual multi-channel bus (VMCB) feature allows for remoto control and monitoring for 1-to-N as well as N-to-M in large-scale networks. In particular, the LAN interface is LXI compliant, enabling you to easily control and monitor the power supply through a browser on a PC, smartphone, or tablet by accessing the web server built into the PWR-01 series .

● Basic configuration with LAN interface and VMCB (example)

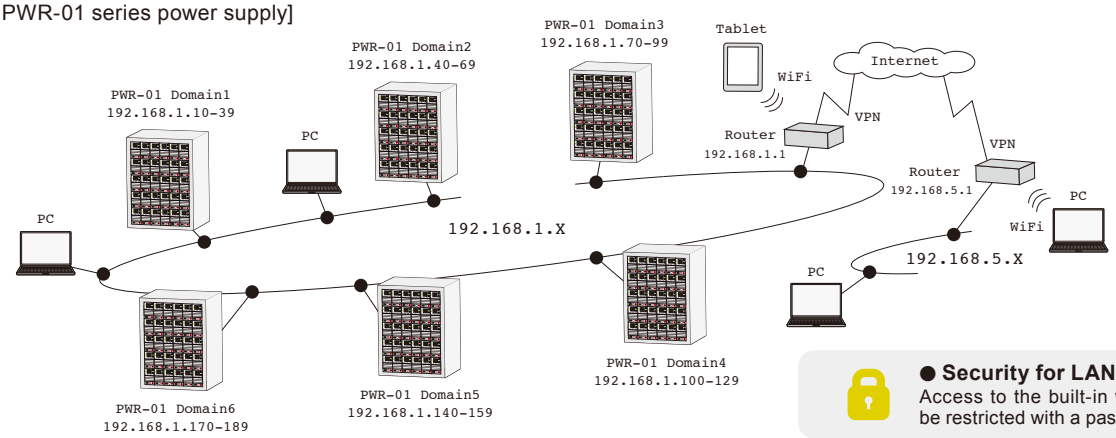
As shown in the figure below, it is possible to connect a PC and the PWR-01 series with a hub to create a virtual group using a LAN connection. A maximum of 254 virtual groups can be set, and the maximum number of units can be configured up to 31 units per group. A group can have a mixture of models.



Configuration	IP address	Domain number	Channel number
Master	192.168.1.1	1	0
Slave	192.168.1.2	1	1
	192.168.1.3	1	2

* A DHCP server can also establish settings automatically

[Schematic LAN network configuration with the PWR-01 series power supply]



● Security for LAN connections

Access to the built-in web server can be restricted with a password.

Easy access with a built-in web server

Use a browser from a PC, smartphone, or tablet to access the web server built into the PWR-01 series for convenient control and monitoring.

Use latest browser version.
(Recommended browsers: Internet Explore, Chrome, or Safari)

* Connecting with a smartphone, tablet, etc. requires a Wi-Fi environment (wireless LAN router etc.).

PWR-01 Series 400 W Type Specifications

Item/Model			PWR401L	PWR401ML	PWR401MH	PWR401H
AC input						
Nominal input rating			100 Vac to 240 Vac, 50 Hz to 60 Hz, single phase			
Input voltage range			85 Vac to 265 Vac			
Input frequency range			47 Hz to 63 Hz			
Current (TYP) *1		100 Vac	5.6 A			
		200 Vac	2.8 A			
Inrush current (MAX) *2			25 A or less			
Power (MAX) *3			560 VA			
Power factor (TYP) *1			0.99 (input voltage: 100 V), 0.97 (input voltage: 200 V)			
Efficiency (MIN) *1			75 % (TYP)			
Output hold time *3			20 ms or more			
Output						
Rating	Output voltage *4		40 V	80 V	240 V	650 V
	Output current *4		40 A	20 A	5 A	1.85 A
	Output power		400 W			
Voltage	Maximum settable voltage *5		42 V	84 V	252 V	682.5 V
	Setting accuracy		± (0.05 % of set +0.05 % of rating)			
	Resolution		200 mV	400 mV	1000 mV	2500 mV
		Using FINE, OUT OFF	10 mV	10 mV	100 mV	100 mV
		Using FINE, OUT ON	1 mV	1 mV	10 mV	10 mV
		When using a communication interface	0.1 mV	0.1 mV	0.1 mV	0.1 mV
	Line regulation *6		±6 mV	±10 mV	±26 mV	±67 mV
	Load regulation *7		±6 mV	±10 mV	±26 mV	±67 mV
	Transient response *8		1 ms or less	2 ms or less	2 ms or less	3 ms or less
	Ripple noise *9	p-p *10	50 mV	50 mV	100 mV	300 mV
		rms *11	5 mV	5 mV	20 mV	50 mV
	Rise time	At full load	50 ms or less		100 ms or less	
		No load	50 ms or less		100 ms or less	
	Fall time *12	At full load	50 ms or less		150 ms	250 ms
		No load	500 ms or less		1200 ms	2000 ms
	Maximum remote sensing compensation voltage (single line)		1.5 V	4 V	5 V	5 V
	Temperature coefficient *13		100 ppm/°C			

*1. At the rated output power for the rated output current.
*2. Excludes the charge current component that flows through the capacitor of the internal EMC filter circuit immediately after the POWER switch is turned on (for approximately 1 ms).
*3. 100 Vac, at the rated output power.

Item/Model			PWR401L	PWR401ML	PWR401MH	PWR401H
Output						
Current	Maximum settable current *5		42 A	21 A	5.25 A	1.9425 A
	Setting accuracy *14		± (0.5 % of set +0.1 % of rating)			
	Resolution		200 mA	100 mA	20 mA	10 mA
		Using FINE, OUT OFF	10 mA	10 mA	1 mA	1 mA
		Using FINE, OUT ON	1 mA	1 mA	0.1 mA	0.1 mA
		When using a communication interface	0.1 mA	0.1 mA	0.1 mA	0.1 mA
	Line regulation		±6 mA	±4 mA	±2.5 mA	±2.2 mA
	Load regulation		±13 mA	±9 mA	±6.0 mA	±5.4 mA
	Ripple noise*15	rms *11	80 mA	40 mA	12 mA	6 mA
	Rise time (TYP)	At full load	50 ms		100 ms	
	Fall time (TYP)	At full load	50 ms		100 ms	
	Temperature coefficient *13		100 ppm/°C			
Maximum internal resistance that can be set			1.000 Ω	4.000 Ω	36.00 Ω	263.5 Ω
Display function						
Voltage display	Maximum display		99.99		999.9	
	Display accuracy		± (0.2 % of reading + 5 digit)			
Current display	Maximum display		99.99		9.999	
	Display accuracy		± (0.5 % of reading + 8 digit)			
Power display			The PWR DSPL LED lights in red.			
	Maximum display		9999			
	Display accuracy		Displays the result of multiplying the current and voltage. The display is toggled with the voltage or current display.			

*4. The maximum output voltage and maximum output current are limited by the maximum output power.
*5. Can be limited to approximately 95 % of the OVP trip point or OCP trip point.
*6. 85 Vac to 135 Vac or 170 Vac to 265 Vac, fixed load
*7. The amount of change that occurs when the load is changed from no load to full load (rated output power/rated output voltage) with rated output voltage. The value is measured at the sensing point.
*8. The amount of time required for the output voltage to return to a value within "rated output voltage ± (0.1 % +10 mV)." The load current fluctuation is 50 % to 100 % of the maximum current with the set output voltage.
*9. Measured using an RC-9131C probe that conforms to the JEITA specifications. At the rated output current.
*10. When the measurement frequency bandwidth is 10 Hz to 20 MHz.
*11. When the measurement frequency bandwidth is 10 Hz to 1 MHz.
*12. When the bleeder circuit is set to bleeder normal.
*13. When the ambient temperature is within 0°C and 50 °C
*14. Applies to the range of 1 % to 100 % of the rated current. TYP (0.1 % of rating) for 0 % to 1 %.
*15. When the output voltage is 10 % to 100 % of the rating. At the rated output current.

PWR-01 Series 800 W Type Specifications

Item/Model			PWR801L	PWR801ML	PWR801MH	PWR801H
AC input						
Nominal input rating			100 Vac to 240 Vac, 50 Hz to 60 Hz, single phase			
Input voltage range			85 Vac to 265 Vac			
Input frequency range			47 Hz to 63 Hz			
Current (TYP) *1		100 Vac	11.2 A			
		200 Vac	5.6 A			
Inrush current (MAX) *2			50 A or less			
Power (MAX) *3			1120 VA			
Power factor (TYP) *1			0.99 (input voltage: 100 V), 0.97 (input voltage: 200 V)			
Efficiency (MIN) *1			75 % (TYP)			
Output hold time *3			20 ms or more			
Output						
Rating	Output voltage *4		40 V	80 V	240 V	650 V
	Output current *4		80 A	40 A	10 A	3.70 A
	Output power		800 W			
Voltage	Maximum settable voltage *5		42 V	84 V	252 V	682.5 V
	Setting accuracy		± (0.05 % of set +0.05 % of rating)			
	Resolution		200 mV	400 mV	1000 mV	2500 mV
		Using FINE, OUT OFF	10 mV	10 mV	100 mV	100 mV
		Using FINE, OUT ON	1 mV	1 mV	10 mV	10 mV
		When using a communication interface	0.1 mV	0.1 mV	0.1 mV	0.1 mV
	Line regulation *6		±6 mV	±10 mV	±26 mV	±67 mV
	Load regulation *7		±6 mV	±10 mV	±26 mV	±67 mV
	Transient response *8		1 ms or less	2 ms or less	2 ms or less	3 ms or less
	Ripple noise *9	p-p *10	50 mV	50 mV	100 mV	300 mV
		rms *11	5 mV	5 mV	20 mV	50 mV
	Rise time	At full load	50 ms or less		100 ms or less	
		No load	50 ms or less		100 ms or less	
	Fall time *12	At full load	50 ms or less		150 ms	250 ms
		No load	500 ms or less		1200 ms	2000 ms
	Maximum remote sensing compensation voltage (single line)		1.5 V	4 V	5 V	5 V
	Temperature coefficient *13		100 ppm/°C			

*1. At the rated output power for the rated output current.
*2. Excludes the charge current component that flows through the capacitor of the internal EMC filter circuit immediately after the POWER switch is turned on (for approximately 1 ms).

Item/Model			PWR801L	PWR801ML	PWR801MH	PWR801H
Output						
Current	Maximum settable current *5		84 A	42 A	10.5 A	3.885 A
	Setting accuracy *14		± (0.5 % of set +0.1 % of rating)			
	Resolution		400 mA	200 mA	40 mA	20 mA
		Using FINE, OUT OFF	10 mA	10 mA	10 mA	1 mA
		Using FINE, OUT ON	1 mA	1 mA	0.1 mA	0.1 mA
		When using a communication interface	0.1 mA	0.1 mA	0.1 mA	0.1 mA
	Line regulation		±10 mA	±6 mA	±3 mA	±2.4 mA
	Load regulation		±21 mA	±13 mA	±7 mA	±5.7 mA
	Ripple noise*15	rms *11	160 mA	80 mA	24 mA	12 mA
	Rise time (TYP)	At full load	50 ms		100 ms	
	Fall time (TYP)	At full load	50 ms		100 ms	
	Temperature coefficient *13		100 ppm/°C			
Maximum internal resistance that can be set			0.500 Ω	2.000 Ω	18.00 Ω	131.8 Ω
Display function						
Voltage display	Maximum display		99.99		999.9	
	Display accuracy		± (0.2 % of reading + 5 digit)			
Current display	Maximum display		99.99			9.999
	Display accuracy		± (0.5 % of reading + 8 digit)			
Power display			The PWR DSPL LED lights in red.			
	Maximum display		9999			
	Display accuracy		Displays the result of multiplying the current and voltage. The display is toggled with the voltage or current display.			

*4. The maximum output voltage and maximum output current are limited by the maximum output power.
*5. Can be limited to approximately 95 % of the OVP trip point or OCP trip point.
*6. 85 Vac to 135 Vac or 170 Vac to 265 Vac, fixed load
*7. The amount of change that occurs when the load is changed from no load to full load (rated output power/rated output voltage) with rated output voltage. The value is measured at the sensing point.
*8. The amount of time required for the output voltage to return to a value within "rated output voltage ± (0.1 % +10 mV)." The load current fluctuation is 50 % to 100 % of the maximum current with the set output voltage.
*9. Measured using an RC-9131C probe that conforms to the JEITA specifications. At the rated output current.
*10. When the measurement frequency bandwidth is 10 Hz to 20 MHz.
*11. When the measurement frequency bandwidth is 10 Hz to 1 MHz.
*12. When the bleeder circuit is set to bleeder normal.
*13. When the ambient temperature is within 0°C and 50 °C
*14. Applies to the range of 1 % to 100 % of the rated current. TYP (0.1 % of rating) for 0 % to 1 %.

PWR-01 Series 1200 W Type Specifications

Item/Model			PWR1201L	PWR1201ML	PWR1201MH	PWR1201H
AC input						
Nominal input rating			100 Vac to 240 Vac, 50 Hz to 60 Hz, single phase			
Input voltage range			85 Vac to 265 Vac			
Input frequency range			47 Hz to 63 Hz			
Current (TYP) *1		100 Vac	16.8 A			
		200 Vac	8.4 A			
Inrush current (MAX) *2			75 A or less			
Power (MAX) *3			1680 VA			
Power factor (TYP) *1			0.99 (input voltage: 100 V), 0.97 (input voltage: 200 V)			
Efficiency (MIN) *1			75 % (TYP)			
Output hold time *3			20 ms or more			
Output						
Rating	Output voltage *4		40 V	80 V	240 V	650 V
	Output current *4		120 A	60 A	15.0 A	5.55 A
	Output power		1200 W			
Voltage	Maximum settable voltage *5		42 V	84 V	252 V	682.5 V
	Setting accuracy		± (0.05 % of set +0.05 % of rating)			
	Resolution		200 mV	400 mV	1000 mV	2500 mV
		Using FINE, OUT OFF	10 mV	10 mV	100 mV	100 mV
		Using FINE, OUT ON	1 mV	1 mV	10 mV	10 mV
		When using a communication interface	0.1 mV	0.1 mV	0.1 mV	0.1 mV
	Line regulation *6		±6 mV	±10 mV	±26 mV	±67 mV
	Load regulation *7		±6 mV	±10 mV	±26 mV	±67 mV
	Transient response *8		1 ms or less	2 ms or less	2 ms or less	3 ms or less
	Ripple noise *9	p-p *10	50 mV	50 mV	100 mV	300 mV
		rms *11	5 mV	5 mV	20 mV	50 mV
	Rise time	At full load	50 ms or less		100 ms or less	
		No load	50 ms or less		100 ms or less	
	Fall time *12	At full load	50 ms or less		150 ms	250 ms
		No load	500 ms or less		1200 ms	2000 ms
	Maximum remote sensing compensation voltage (single line)		1.5 V	4 V	5 V	5 V
	Temperature coefficient *12		100 ppm/°C			

*1. At the rated output power for the rated output current.
*2. Excludes the charge current component that flows through the capacitor of the internal EMC filter circuit immediately after the POWER switch is turned on (for approximately 1 ms).
*3. 100 Vac, at the rated output power.

Item/Model			PWR1201L	PWR1201ML	PWR1201MH	PWR1201H
Output						
Current	Maximum settable current *5		126 A	63 A	15.75 A	5.8275 A
	Setting accuracy *14		± (0.5 % of set +0.1 % of rating)			
	Resolution		600 mA	300 mA	60 mA	30 mA
		Using FINE, OUT OFF	100 mA	10 mA	10 mA	1 mA
		Using FINE, OUT ON	10 mA	1 mA	1 mA	0.1 mA
		When using a communication interface	0.1 mA	0.1 mA	0.1 mA	0.1 mA
	Line regulation		±14 mA	±8 mA	±3.5 mA	±2.6 mA
	Load regulation		±29 mA	±17 mA	±8.0 mA	±6.1 mA
	Ripple noise*15	rms *11	240 mA	120 mA	36 mA	18 mA
	Rise time (TYP)	At full load	50 ms		100 ms	
	Fall time (TYP)	At full load	50 ms		100 ms	
	Temperature coefficient *13		100 ppm/°C			
Maximum internal resistance that can be set			0.333 Ω	1.333 Ω	12.00 Ω	87.84 Ω
Display function						
Voltage display	Maximum display		99.99		999.9	
	Display accuracy		± (0.2 % of reading + 5 digit)			
Current display	Maximum display		999.9	99.99		9.999
	Display accuracy		± (0.5 % of reading + 8 digit)			
Power display			The PWR DSPL LED lights in red.			
	Maximum display		9999			
	Display accuracy		Displays the result of multiplying the current and voltage. The display is toggled with the voltage or current display.			

*4. The maximum output voltage and maximum output current are limited by the maximum output power.
*5. Can be limited to approximately 95 % of the OVP trip point or OCP trip point.
*6. 85 Vac to 135 Vac or 170 Vac to 265 Vac, fixed load
*7. The amount of change that occurs when the load is changed from no load to full load (rated output power/rated output voltage) with rated output voltage. The value is measured at the sensing point.
*8. The amount of time required for the output voltage to return to a value within "rated output voltage ± (0.1 % +10 mV)." The load current fluctuation is 50 % to 100 % of the maximum current with the set output voltage.
*9. Measured using an RC-9131C probe that conforms to the JEITA specifications. At the rated output current.
*10. When the measurement frequency bandwidth is 10 Hz to 20 MHz.
*11. When the measurement frequency bandwidth is 10 Hz to 1 MHz.
*12. When the bleeder circuit is set to bleeder normal.
*13. When the ambient temperature is within 0°C and 50 °C
*14. Applies to the range of 1 % to 100 % of the rated current. TYP (0.1 % of rating) for 0 % to 1 %.
*15. When the output voltage is 10 % to 100 % of the rating. At the rated output current.

PWR-01 Series 2000 W Type Specifications

Item/Model			PWR2001L	PWR2001ML	PWR2001MH	PWR2001H
AC input						
Nominal input rating			100 Vac to 240 Vac, 50 Hz to 60 Hz, single phase			
Input voltage range			85 Vac to 265 Vac			
Input frequency range			47 Hz to 63 Hz			
Current (TYP) *1		100 Vac	28.0 A			
		200 Vac	14.0 A			
Inrush current (MAX)			125 A or less			
Power (MAX) *2			2800 VA			
Power factor (TYP) *1			0.99 (input voltage: 100 V), 0.97 (input voltage: 200 V)			
Efficiency (TYP) *1			75 %			
Output hold time *2			20 ms or more			
Output						
Rating	Output voltage *3		40 V	80 V	240 V	650 V
	Output current *3		200 A	100 A	25.0 A	9.25 A
	Output power		2000 W			
Voltage	Maximum settable voltage *4		42 V	84 V	252 V	682.5 V
	Setting accuracy		± (0.05 % of set +0.05 % of rating)			
	Resolution		200 mV	400 mV	1000 mV	2500 mV
		Using FINE, OUT OFF	10 mV	10 mV	100 mV	100 mV
		Using FINE, OUT ON	1 mV	1 mV	10 mV	10 mV
		When using a communication interface	0.1 mV	0.1 mV	0.1 mV	0.1 mV
	Line regulation *5		±6 mV	±10 mV	±26 mV	±67 mV
	Load regulation *6		±6 mV	±10 mV	±26 mV	±67 mV
	Transient response *7		1 ms or less	2 ms or less	2 ms or less	3 ms or less
	Ripple noise *8	p-p *9	50 mV	70 mV	120 mV	350 mV
		rms *10	5 mV	5 mV	20 mV	50 mV
	Rise time	At full load	50 ms or less		100 ms or less	
		No load	50 ms or less		100 ms or less	
	Fall time *11	At full load	50 ms or less		150 ms or less	250 ms or less
		No load	500 ms or less		1200 ms or less	2000 ms or less
	Maximum remote sensing compensation voltage (single line)		1.5 V	4 V	5 V	5 V
	Temperature coefficient *12		100 ppm/°C			

*1. At the rated output power for the rated output current.
*2. 100 Vac, at the rated output power.
*3. The maximum output voltage and maximum output current are limited by the maximum output power.

Item/Model			PWR2001L	PWR2001ML	PWR2001MH	PWR2001H
Output						
Current	Maximum settable current *4		210 A	105 A	26.25 A	9.7125 A
	Setting accuracy *13		± (0.5 % of set +0.1 % of rating)			
	Resolution		1000 mA	500 mA	100 mA	50 mA
		Using FINE, OUT OFF	100 mA	100 mA	10 mA	10 mA
		Using FINE, OUT ON	10 mA	10 mA	1 mA	1 mA
		When using a communication interface	0.1 mA	0.1 mA	0.1 mA	0.1 mA
	Line regulation		±22 mA	±12 mA	±4.5 mA	±2.9 mA
	Load regulation		±45 mA	±25 mA	±10.0 mA	±6.9 mA
	Ripple noise*14	rms *10	400 mA	200 mA	60 mA	30 mA
	Rise time (TYP)	At full load	50 ms		100 ms	
	Fall time (TYP)	At full load	50 ms		100 ms	
	Temperature coefficient *12		100 ppm/°C			
Maximum internal resistance that can be set			0.200 Ω	0.800 Ω	7.200 Ω	52.70 Ω
Display function						
Voltage display	Maximum display		99.99		999.9	
	Display accuracy		± (0.2 % of reading + 5 digit)			
Current display	Maximum display		999.9		99.99	
	Display accuracy		± (0.5 % of reading + 8 digit)			
Power display			The PWR DSPL LED lights in red.			
	Maximum display		9999			
	Display accuracy		Displays the result of multiplying the current and voltage. The display is toggled with the voltage or current display.			

*4. Can be limited to approximately 95 % of the OVP trip point or OCP trip point.
*5. 85 Vac to 135 Vac or 170 Vac to 265 Vac, fixed load
*6. The amount of change that occurs when the load is changed from no load to full load (rated output power/rated output voltage) with rated output voltage. The value is measured at the sensing point.
*7. The amount of time required for the output voltage to return to a value within "rated output voltage ± (0.1 % +10 mV)." The load current fluctuation is 50 % to 100 % of the maximum current with the set output voltage.
*8. Measured using an RC-9131C probe that conforms to the JEITA specifications. At the rated output current.
*9. When the measurement frequency bandwidth is 10 Hz to 20 MHz.
*10. When the measurement frequency bandwidth is 10 Hz to 1 MHz.
*11. When the bleeder circuit is set to bleeder normal.
*12. When the ambient temperature is within 0°C and 50 °C
*13. Applies to the range of 1 % to 100 % of the rated current. TYP (0.1 % of rating) for 0 % to 1 %.
*14. When the output voltage is 10 % to 100 % of the rating. At the rated output current.

PWR-01 Series Specifications

Item/Model		Common
Protection functions		
Overvoltage protection (OVP)		Turns the output off *1, displays OVP, and lights ALM
	Setting range	10 % to 112 % of the rated output voltage
	Setting accuracy	± (1.5 % of rating)
Overcurrent protection (OCP) *2		Turns the output off *1, displays OCP, and lights ALM
	Setting range	10 % to 112 % of the rated output current
	Setting accuracy	± (3 % of rating)
Front-panel output terminal overcurrent protection (FOCP) *3		Turns the output off *1, displays FOCP, and lights ALM
	Value (fixed)	11 A (TYP)
Undervoltage limit (UVL)		Cannot be set to a value less than or equal to the set voltage
	Setting range	0 % to 105 % of the rated output voltage
Overheat protection (OHP)		Turns the output off, displays OHP, and lights ALM
Incorrect sensing connection protection (SENSE)		Turns the output off, displays SENS, and lights ALM
Low AC input protection (AC-FAIL)		Turns the output off,*4 displays AC, and lights ALM
Shutdown (SD)		Turns the output off *1, displays SD, and lights ALM
Power limit (POWER LIMIT)		ALM blinking
	Value (fixed)	Approx. 105 % of the rated output power
Communication monitoring (watchdog)		Turns the output off, displays WDOG, and lights ALM
Master-slave parallel operation protection (PRL ALM)		Turns the output off *1, displays PRL, and lights ALM

*1. Output off or breaker trip on the 2000 W model.
*2. This does not protect against the discharge current peak that is generated from the capacitors inside the PWR-01 output section when the load is changed suddenly.
*3. Available on models with a maximum settable current of 11 A or more. If the OCP value is less than the FOCP value, the OCP value takes precedence.
*4. Auto recovery after eliminating the cause of the alarm is selectable.

Item/Model			Common
Signal output and input			
Monitor signal output	Voltage monitor (VMON)		Selectable monitor voltage range: 0 V to 5 V or 0 V to 10 V
		Setting accuracy	2.5 % of f.s. *5
	Current monitor (IMON)		Selectable monitor voltage range: 0 V to 5 V or 0 V to 10 V
		Setting accuracy	2.5 % of f.s. *5
Status signal output *6	OUTON STATUS		On when output is on.
	CV STATUS		Turns on during CV operation
	CC STATUS		Turns on during CC operation
	ALARM STATUS		Turns on when an alarm has been activated
	POWER ON STATUS		Turns on when the power is turned on
Trigger signal	Input (TRG IN)		Logic selectable: LOW (0 V to 1.5 V), HIGH (3.5 V to 5 V)
			Input impedance: 10 kΩ (TYP)
	Output (TRG OUT)		Logic selectable: LOW (0 V to 0.6 V), HIGH (4.2 V to 5 V)
			Pulse width: 100 µs (TYP)

*5. f.s. is the full scale at the selected range. It is 10 V for the 10 V range and 5 V for the 5 V range.
*6. Photocoupler open collector output;
maximum voltage 30 V, maximum current (sink) 8 mA; isolated from the output and control circuits; status commons are floating (withstand voltage of less than or equal to 60 V); and status signals are not mutually isolated.

Item/Model			Common
Control functions			
External control	Output voltage control (VPGM)		0 % to 100 % of the rated output voltage
			Selectable control voltage range: 0 V to 5 V or 0 V to 10 V
		Accuracy	5 % of rating
	Output current control (IPGM)		0 % to 100 % of the rated output current
			Selectable control voltage range: 0 V to 5 V or 0 V to 10 V
		Accuracy	5 % of rating
	Output on/ off control OUTPUT ON/OFF CONT		Logic selectable: Output on when set to LOW (0 V to 0.5 V) or shorted; output off when set to HIGH (4.5 V or 5 V) or open Output on when set to HIGH (4.5 V to 5 V) or open; output off when set to LOW (0 V or 0.5 V) or shorted
	Output shutdown control SHUT DOWN		Output on when set to LOW (0 V to 0.5 V) or shorted
	Alarm clear control ALM CLR		Alarm cleared when set to LOW (0 V to 0.5 V) or shorted

Item/Model			400 W model	800 W model	1200 W model	2000 W model
Other functions						
Output-on/ off delay			Setting range: 0.0 s, 0.5 s to 99.9 s *7 setting resolution: 0.1 s			
Soft start and soft stop			Setting range: 0.0 s, 0.5 s to 10.0 s *7 setting resolution: 0.1 s			
Overcurrent protection (OCP) activation delay			Setting range: 0.0 s to 2.0 s *7 setting resolution: 0.1 s			
Preset memory			Up to three sets of the following settings can be saved: the set voltage, the set current, the set OVP, the set OCP, and the set UVL.			
Key lock			Locks the operation of all keys other than the OUTPUT key.			
CONFIG shortcut			Up to three CONFIG parameters can be registered to the SC1, SC2, and SC3 keys			
Sequence			Number of programs: 1			
			Number of steps: 64			
			Repetition count: 1 to 99998, INFinity			
			Number of configurable interval loops: 16			
			Number of interval loops: 2 to 99998			
			Step time: 0.1 s to 100 h (common to step transition and ramp transition)			
Synchronized Operation			Synchronization of voltage and current settings, synchronization of the resumption of steps in a sequence program			
Master-slave parallel operation *8			Up to three units (same models) including the master unit		Up to two units (same models) including the master unit	
Series operation *9			Two units (the same model)			
Multi-channel (VMCB)	Connection bet-ween the master unit and PC		LAN, USB, RS232C			
	Connection with slave units		LAN			

*7. Factory default is 0.0 s.
*8. Current difference between the master and slaves is 5 % (TYP).
*9. H type is excluded

Item/Model		Common
Operation display		
OUTPUT ON/ OFF		OUTPUT LED lights green when the output is on.
Output-on/ off delay		"DLY" lights when it is set and blinks when it is in effect. OUTPUT LED blinks orange while output-on delay is in effect.
		OUTPUT LED blinks green while output-off delay is in effect.
Soft start and soft stop		"SS" lights when it is set and blinks when it is in effect. OUTPUT LED lights green when soft start is in effect. OUTPUT LED blinks green when soft stop is in effect.
CV operation		CV LED lights in green.
CC operation		CC LED lights in red.
Alarm operation		ALM LED lights in red when a protection function has been activated. ALM LED blinks red when the power limit (POWER LIMIT) is activated. OUTPUT LED blinks orange when a protection function is activated when the output is on.
Preset memory		PRESET A, B, or C LED lights green when a preset memory entry is being recalled or saved.
Key lock operation		LOCK LED lights green when the keys are locked.
Remote operation		REMOTE LED lights green during remote control.
	LAN operation	LAN LED lights or blinks depending on the status. No fault status: Lights green. Fault status: Lights red. Standby status: Lights orange. WEB identify status: Blinks green.
Bleeder circuit		"HB" lights when the hyper bleeder is set.
Variable internal resistance (VIR)		"VIR" lights when it is set.
Sequence		"SEQ" lights when a sequence is being executed and blinks the PWR-01 is waiting for a trigger.

PWR-01 Series Specifications

Item/Model		Common
Interface		
Common specifications	Software protocol	IEEE Std 488.2-1992
	Command language	Complies with SCPI Specification 1999.0
RS232C	Hardware	Complies with the EIA232D specifications (excluding the connector)
		RJ-45 connector (male) *10
		Baud rate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
		Data length: 8 bits, Stop bits: 1 bit, Parity bit: None
		No flow control
	Program message terminator	LF during reception, CR/LF during transmission
USB	Hardware	Complies with the USB 2.0 specifications; data rate: 480 Mbps (HighSpeed)
		Socket B type
	Program message terminator	LF or EOM during reception, LF + EOM during transmission
	Device class	Complies with the USBTMC-USB488 device class specifications
LAN	Hardware	IEEE 802.3 100Base-TX/10Base-T Ethernet
		Complies with LXI Specification2011 Ver.1.4, Complies with LXI HiSLIP Extended Function Rev.1.01
		IPv4, RJ-45 connector *11
	Communication protocol	VXI-11, SCPI-RAW, HiSLIP
	Program message terminator	VXI-11, HiSLIP: LF or END during reception, LF + END during transmission SCPI-RAW: LF during reception, LF during transmission.

*10. The RD-8P/9P adapter cable is an option.
*11. Category 5; use a straight cable.

Item/Model		400 W model	800 W model	1200 W model	2000 W model
General					
Weight (main unit only)		Approx. 3 kg (6.61 lb)	Approx. 5.5 kg (12.13 lb)	Approx. 7.5 kg (16.53 lb)	Approx. 13 kg (28.66 lb)
Dimensions		See the outline drawing.			
Environmental conditions	Operating environment	Indoor use, overvoltage category II			
	Operating temperature	0 °C to +50 °C (32 °F to +122 °F)			
	Operating humidity	20 %rh to 85 %rh (no condensation)			
	Storage temperature	-25 °C to +60 °C (-13 °F to 140 °F)			
	Storage humidity	90 %rh or less (no condensation)			
	Altitude	Up to 2000 m			
Cooling method		Forced air cooling using fan			
Grounding polarity		Negative grounding or positive grounding possible			
Isolation voltage		L/ ML/ MH type: ±500 Vmax, H type: ±800 Vmax			
Withstanding voltage	Across the primary circuit and chassis	No abnormalities when 1500 Vac is applied for 1 minute			
	Across the primary and secondary circuits	L/ ML/ MH type: No abnormalities when 1650 Vac is applied for 1 minute			
		H type: No abnormalities when 1900 Vac is applied for 1 minute			
	Across the secondary circuit and chassis	L/ ML/ MH type: No abnormalities when 2300 Vdc is applied for 1 minute			
		H type: No abnormalities when 2640 Vdc is applied for 1 minute			
Insulation resistance	Across the primary circuit and chassis	100 MΩ or more (70 % or less) at 500 Vdc			
	Across the primary and secondary circuits	LL/ ML/ MH type: 100 MΩ or more (70 % or less) at 500 Vdc			
		H type: 100 MΩ or more (70 % or less) at 1000 Vdc			
	Across the secondary circuit and chassis	L/ ML/ MH type: 40 MΩ or more (70 % or less) at 500 Vdc			
		H type: 40 MΩ or more (70 % or less) at 1000 Vdc			
Electromagnetic compatibility (EMC) *12 *13		Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU EN61326-1 (Class A *14), EN 55011 (Class A *14, Group 1 *15), EN 61000-3-2, EN 61000-3-3 Applicable under the following conditions The maximum length of all cabling and wiring connected to the product must be less than 3 m.			
Safety *12		Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU *13, EN 61010-1 (Class I *16 , Pollution Degree 2 *17)			

*12. Does not apply to specially ordered or modified products.
*13. Limited to products that have a CE mark. Does not apply unless a core is attached to the J1 connector cable.
*14. This is a Class A instrument. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.
*15. This is a Group 1 instrument. This product does not generate and/or use intentionally radio-frequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/analysis purpose.
*16. This is a Class I instrument. Be sure to ground this product's protective conductor terminal. The safety of this product is guaranteed only when the product is properly grounded.
*17. Pollution is addition of foreign matter (solid, liquid or gaseous) that may produce a reduction of dielectric strength or surface resistivity. Pollution Degree 2 assumes that only non-conductive pollution will occur except for an occasional temporary conductivity caused by condensation.

Unless specified otherwise, the specifications are for the following settings and conditions.
- Loads are pure resistive loads.
- The product is warmed up for at least 30 minutes (with current flowing).
- After warm-up, the product must be calibrated correctly in a 23 °C ± 5 °C environment according to the appropriate calibration procedure.
- Values indicated by “TYP” are typical values. They are not guaranteed performance values.
- Values indicated by “rating” are ratings.
- Values indicated by “reading” are readings.
- Values indicated by "f.s." are full scale values.
- The PWR-01 operates over a wide range of output voltage and output current within rated output power. However, the current that can be output with rated output voltage and the voltage that can be output with rated output current are limited by the rated output power.
- The current that can be output with rated output voltage and the voltage that can be output with rated output current are as follows.
  Maximum output current with rated output voltage = Rated output power/ rated output voltage. Maximum output voltage with rated output current = Rated output power/ rated output current.
- Rated load and no load are defined as follows:
  In constant-voltage mode (when the output current is set to a value greater than or equal to the maximum output current with rated output voltage)
  Rated load: Refers to a resistive load that, when the rated output voltage is applied,makes the flowing current 95 % to 100 % of the maximum output current with rated output voltage.
  No load: Refers to a load through which no output current flows. In other words,refers to an open load (no load being connected).
  In constant-current mode (when the output voltage is set to a value greater than or equal to the maximum output voltage with rated output current)
  Rated load: Refers to a resistive load that, when the rated output current flows, makes the voltage drop to 95 % to 100 % of the maximum output voltage with rated output current.
  Including the voltage drop in the load cables, the PWR-01 output voltage must not exceed the maximum output voltage with rated output current.
  No load: Refers to a resistive load that, when the rated output current flows, makes the voltage drop to 10 % of the maximum output voltage with rated output current or 1 V whichever is higher.

Wide Range DC Power Supply (CV/CC) * While Supplies Last

PWR Series

USB OPTION GPIB OPTION RS232C OPTION CE

TYPE II (800W TYPE)

TYPE III (1600W TYPE)

Dimensions / Weight

Type II : 214(8.43″)W × 124(4.88″)H × 400(15.75″)Dmm / 8kg(17.64 lbs.)
Type III : 428.5(16.87″)W × 128(5.04″)H × 400(15.75″)Dmm / 15kg(33.07 lbs.)

Accessories

Operation manual, TP-BUS connector, Output terminal screws (M4, M8), Output protection cover
Type II : 3 m power supply cable with 3-pin plug
Type III: 3 m power supply cable with no plug, Cable clamp

Three types of wide-range power supplies covering 80 V to 650 V

The PWR Series offers constant voltage (CV)/constant current (CC) automatic crossover DC power supplies that enable you to combine a wide range of voltages and currents within the output power rating. For example, the model that has an output power rating of 1600 W (PWR1600L) provides a seamless operation range from 80 V to 20 A to 16 V to 100 A. With a single PWR Series power supply alone, you can cover an extensive output range equivalent to what is provided by three to six conventional single range DC power supplies. L type can output up to 160 % of the output current rating (in the continuous and intermittent extended operation areas).
PWR1600L supports a maximum output of 10 V to 160 A.

Features

- Supports a digital communication function (TP-BUS) as standard.
- Analog external control functions are available, providing voltage and resistance-based output voltage and current controls.
- Comes standard with the remote monitoring function.
  External analog monitoring can be done with respect to the output voltage, output current, and operation mode.
- A built-in power factor correction circuit (with power factor 0.98) for harmonic current suppression, as well as a highly efficient switching circuit (efficiency 70 %).
- A four-digit display can display the voltage, current, and power (W).
- Front-side output terminals (up to 30 A) for desktop use.
- A universal AC input supports a range of voltages from 100 V to 240 V.

Functions

■ Seamless five times variable voltage/current range (Note: For H type, 3.25-time variable voltage/current range)

A single PWR Series power supply supports an extensive operation range, covering an output range equivalent to what is provided by several conventional single range DC power supplies. Also, the maximum output powers of the power supplies of this series are 800 W and 1600 W - slightly higher than those of their predecessors. You can conduct tests without worrying about power limits.

■ Best for testing a wide variety of high-voltage devices including margin tests

The maximum output voltage of L type is 80 V. For example, 150 % of 42 V (63 V) can be supplied for testing vehicular electrical components, or 150 % of 48 V (72 V) can be supplied for testing communication equipment. In addition, the M type (320 V) is suitable for checking designs of energy-saving circuits for flat display panels and the development of new materials, while the H type (650 V) can be used to test various components and devices that use high voltages such as automotive devices, photovoltaic inverters, and many more.

■ Two extended operation areas where up to 160 % of the output current rating can be output (L type only)

In the extended operation areas, the power supply can output up to 160 % of the output current rating. This feature is convenient when testing an automobile motor or other load device that requires high current at startup time. Since the power supply can output continuous current up to 120 % of the output current rating with the restricted ambient temperature range and current up to 160 % of the output current rating with the restricted output time tests can be conducted with a power capacity one rank lower. This feature also helps you cut equipment costs and save floor space.

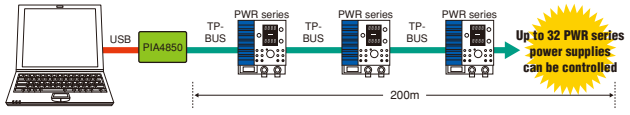
■ Parallel or serial operation

Parallel operation enables multiple power supplies of the same model to operate in parallel, offering a large capacity of up to 8 kW (when five 1600-watt models are connected in parallel). In a serial operation, the voltage can be increased up to 160 V.

(Note: • Parallel and serial operations cannot be done at the same time.
• Serial operations are not possible for the M and H types.)

■ Up to 32 PWR Series power supplies can be controlled with one GPIB address

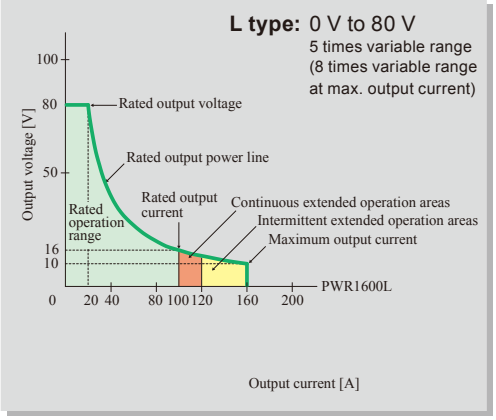
The PWR Series supports a digital communication function (TP-BUS) as its standard feature. When used with a power supply controller (PIA4850*) to be purchased separately, the function enables up to 32 PWR Series power supplies to be controlled using USB interface. In addition, the sequence generation software (Wavy for PAS & PWR), also to be purchased separately, allows even those users who have no knowledge of any programming language to exert output control over the PWR Series power supplies with sequence patterns of their choice and to read resultant data through the use of a PC.
*Not CE certified product

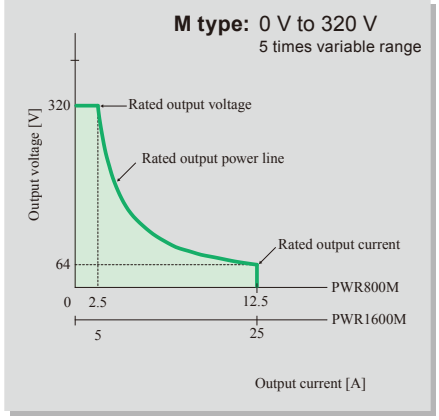


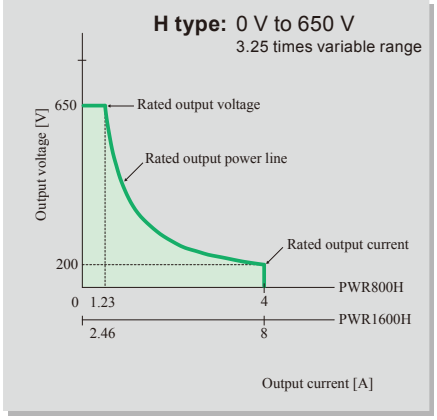
[NOTICE]
Because a noise filter is used for the primary input for the PWR Series, the leakage breaker, etc. may be activated, depending on the environment of the input power, when using multiple quantities of them at the same time. Therefore, we provide models for customers who are planning to use multiple devices at the same time. If you have any other questions, please contact our sales department for details.

Operation Area

Note: The ambient temperature and output time are restricted in the extended operation areas.







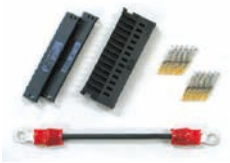
Options

■ Accessory kit

OP01-PAS

(used for the connection of J1 connector on the rear panel when operating by external control)

● Connector, Semi-cover, Pin 10 pcs., Ground cable



■ Carrying handle (for 400 W model)

CH01-PWR

■ Sequence creation software

Wavy for PAS & PWR

PWR Series Specifications

Model		Output			Constant voltage (CV) characteristics				Constant current (CC) characteristics			Power input/Miscellaneous		
		CV	CC	Rated power	Ripple	Line regulation	Load regulation	Transient response	Ripple	Line regulation	Load regulation	Input current	Inrush current	Weight
		V	A	W	mVrms	0.05 % + mV	0.05 % + mV	ms	mArms	0.1 % + mA	0.1 % + mA	AC (100/200 V) A	Apeak (Max)	kg/lb (approx.)
L type	PWR1600L	0 to 80	0 to 100 MAX 160*	1600	20	3	5	2	160	10	10	26.0/13.0	140	15/33.07
M type	PWR800M	0 to 320	0 to 12.5	800	20	3	5	8	35	10	10	12.5/6.25	70	817.64
	PWR1600M		0 to 25	1600	25	3	5	12	50	10	10	25.0/12.5	140	15/33.07
H type	PWR800H	0 to 650	0 to 4	800	30	3	5	7	20	10	10	12.0/6.0	70	8/17.64
	PWR1600H		0 to 8	1600	40	3	5	8	40	10	10	24.0/12.0	140	15/33.07

*The L type offers extended operation areas equivalent to up to 160 % of the output current rating. Some of the specifications may not be satisfied in the extended operation areas.
• Continuous extended operation area (up to 120 % of the output current rating): Continuous current output is enabled. However, derating occurs at an ambient temperature 30 ˚C or higher.
• Intermittent extended operation area (120 % to 160 % of the output current rating):
Continuous current output is enabled for 10 minutes or less. However, a nonoperating period more than twice the output period must be taken.

■ Input power ..... 100 to 240 VAC (85 to 250 VAC), single-phase/50 to 60 Hz (47 to 63 Hz)
■ Power factor ..... 0.98 standard
■ Efficiency ..... 70 % or greater
■ Temperature coefficient ..... 100 ppm/˚C for constant voltage output
200 ppm/˚C for constant current output
■ Measuring meters
● Voltmeter (23 ˚C ±5 ˚C) ..... Maximum display (fixed point): 99.99 (L type), 999.9 (M and H types)
Display error: ±(0.2 % of rdg* + 5 digits) *rdg = reading
● Ammeter (23 ˚C ±5 ˚C) ..... Maximum display (fixed point)

Maximum output current	Maximum display digits
Models supporting 10 A or less	9.999
Models supporting 10 to less than 100 A	99.99
Models supporting 100 A or greater	999.9

Display error: ±(0.5 % of rdg* + 5 digits) *rdg = reading

■ Protection function ....
● Over voltage protection (OVP):
Setting range (10 % to 110 % of the rated output voltage)
● Over current protection (OCP):
Setting range: (10 % to 110 % of the rated output current) for the M and H types
Setting range: (10 % to 176 % of the rated output current) for the L type
● Over power protection (OPP):
Approx. 110 % of the rated output power or greater
● Over heat protection (OHP):
Operates due to an internal temperature rise.
● Power limit (POWER LIMIT):
Power limit imposed at approx. 105 % of the rated output power.
■ Parallel operation ..... Up to 5 units including master (of same model)
■ Serial operation ..... Up to 2 units including master (of same model, for the L type only)
■ Digital control ..... TP-BUS (directly controllable from PIA4810/PIA4830)
■ Monitor signal output .. VMON (at rated voltage output),
IMON (at maximum current output): 10.00 ±0.25 V

■ Environmental conditions ..... Operating ambient temperature range: 0 ˚C to + 50 ˚C
Derating occurs on output current at 45 ˚C or higher for the L type and 40 ˚C or higher for the M/H types.
● Operating ambient humidity range: 20 % to 85 %rh (non-condensing)
● Storage temperature range: -25 ˚C to +70 ˚C
● Storage humidity range: 90 %rh or less (non-condensing)
■ Cooling system ..... Forced air cooling (thermal control: Fan control function attached)
■ Ground polarity ..... Negative or positive ground polarity possible.
■ Ground voltage ..... ±600 Vmax for the L and M types
±1000 Vmax for the H type
■ Electromagnetic compatibility ..... Complies with the requirements of the following directives and standards.
EMC Directive 2014/30/EU
EN61326-1: Class A, EN55011: Class A, Group 1
Immunity: Minimum immunity test requirements
EN61000-3-2, EN61000-3-3
*Not applicable to custom-made modified products.
*Only those models with CE marking provided on their panel.
■ Safety ..... Complies with the requirements of the following directives and standards.
Low Voltage Directive 2014/35/EU
EN61010-1: Class I, Pollution Degree 2
■ Dimensions ..... 800-watt type:
214(8.43") W × 124(4.88") (155(6.1")) H × 400(15.75") (470(18.5")) D
1600-watt type:
428.5(16.87") (450(17.72")) W × 128(5.04") (150(5.91")) H × 400(15.75") (470(18.5")) D
*Enclosed in parentheses are maximum dimensions.
■ Accessories (mm(inch)) (maximum) ..... ● Instruction manual
● Power cord
(800-watt type: Approx. 3 m in length, with a plug
1600-watt type: 3 m in length, without a plug)
● Rear side output terminal protection cover
● TP-BUS connector
● J1 dummy connector

Compact Variable Switching Regulated DC Power Supply

PAV Series

LAN (OPTION) USB RS232C RS485 CE

Dimensions

70(2.76″)W × 83(3.27″)H × 350(13.78″)Dmm(inch)

Accessories

Setup Guide, Quick Reference (1 English copy, 1 Japanese copy), Safety Information, Power cord, RS485 link cable, CD-ROM.
Models whose rated output voltage is 10 V to 100 V :
Bus bar screw set, Bus bar cover (top and bottom), PT screws, J1, J2, and J3 connector cover, Connector housing 12P, Connector housing 8P, Connector housing 4P, Contact pins.
Models whose rated output voltage is 160 V to 650 V :
Output terminal plug 4P, Output terminal cover (top and bottom), PT screws, Connector housing 12P, Connector housing 8P, Connector housing 5P, Contact pins.

High power density up to 800 W in palm-sized power supply with high performance switching system.

The PAV series is a compact, high power density, high performance constant voltage (CV) / constant current (CC) variable switching power supply. The PAV consists of 64 models total*1 with 4 types of maximum power outputs at 200 W, 400 W, 600 W and 800 W and output voltages from 10 V through 650 V. All models are standardized to the same size with 2U height (approximately 88 mm) and have high power density for bench-top use. The PAV series allows sequence settings with an embedded CPU as well as analog control. Parallel operation (up to 6 units)*2 and synchronized operation features are employed to allow extended output current. The PAV series is equipped standard with USB, RS232C and RS485*3 as communication interfaces which are essential for system upgrades. LAN*4 interface is also available as an option. A harmonic current control circuit is embedded with a power factor of 0.99 to take power environment into account.

*1 LAN model included (with LAN) *2 The PAV series with the same rating
*3 An RS232C to RS485 conversion cable (sold separately) is required. *4 Factory option

Features

- 2U bench-top type
- Palm-sized, portable power supply
- Output power: 200 W / 400 W / 600 W / 800 W 4 models
- Output voltage: 10 V to 650 V 8 models
- USB/RS232C/RS485 as standard interface *LAN is a factory option
- 64 models total (LAN model included)

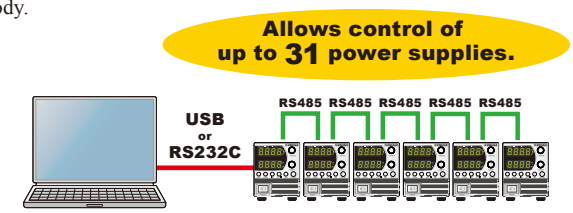
Options

- Sequence creation software
  SD024-PAV (Wavy for PAV)

Functions

■ USB/RS232C/RS485 Control

The PAV series employs USB/RS232C/RS485 interfaces as a standard.
Up to 31 PAV series power supplies can be connected and controlled.
The USB/RS232C/RS485 interfaces are integrated in the PAV series main body.



■ Control using serial communication (USB/RS232/RS485)

The following items can be controlled through the serial ports.

- Output voltage setting
- Output current setting
- Output voltage measurement
- Output current measurement
- Output on/off
- Foldback protection setting
- Overvoltage protection (OVP) setting and readout
- Undervoltage protection (UVP) setting and readout
- Undervoltage limit (UVL) setting and readout
- Start mode setting (auto or safe)

■ Control and monitoring using analog signals

The output voltage and current can be controlled by applying analog voltage or external resistance through the external control terminal on the rear panel. In addition, the output voltage and current can be monitored by monitoring the terminal voltage.
Further, the output on/off state can be controlled, and the operating status and constant voltage/constant current (CV/CC) operation mode can

■ Parallel operation/Synchronized operation

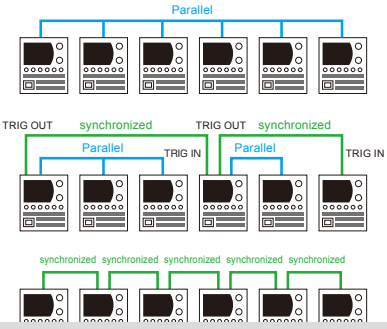
Parallel operation (PAV series with the same rating) and synchronized operation (trigger synchronization) are available. Use of optional rack-mount adapter KRA2-PAV (allows up to 6 units) and half-size integrated chassis cover CC01- PAV (allows up to 3 units) allows integration for smart rack mounting and transportation.

* Parallel operation and synchronized operation can be achieved without the optional KRA2-PAV and CC01-PAV.

Up to 4.8 kW (up to 6 units) can be mounted into a 19-inch general-purpose rack

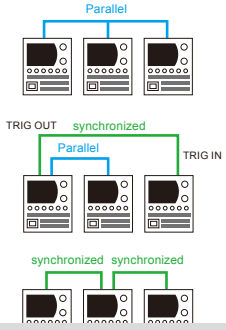
KRA2-PAV
(e.g. 6 units are mounted)

*Vacant slot without a power supply allows the mounting of an optional blank panel (KBP2-6-PAV).



Three-in-one on the bench top is available

CC01-PAV
(e.g. 3 units are mounted)



PAV Series 200 W Type Specifications

Item/Model		PAV10-20	PAV20-10	PAV36-6	PAV60-3.5	PAV100-2	PAV160-1.3	PAV320-0.65	PAV650-0.32
Output									
Rated output voltage *1		10 V	20 V	36 V	60 V	100 V	160 V	320 V	650 V
Rated output current *2		20 A	10 A	6 A	3.5 A	2 A	1.3 A	0.65 A	0.32 A
Rated output power		200 W	200 W	216 W	210 W	200 W	208 W	208 W	208 W
AC input									
Nominal input rating		100 Vac to 240 Vac continuous input, 50 Hz to 60 Hz, single phase							
Input voltage range		85 Vac to 265 Vac							
Input frequency range		47 Hz to 63 Hz							
Input current (typ) *3 (100 Vac/200 Vac)		2.65 A/1.31 A	2.62 A/1.29 A	2.76 A/1.37 A	2.69 A/1.33A	2.55 A/1.26 A	2.64 A/1.30 A		
Power factor (typ) (100 Vac/200 Vac, at the rated output power)		0.99 / 0.98							
Efficiency (typ) *3		76% / 77.5%	77% / 79%	79% / 80.5%	79% / 80.5%	79% / 81%	79% / 81%		
Inrush current (100 Vac/200 Vac) *4		15 A / 30 A or less					25 A / 25 A or less		
Constant voltage mode									
Maximum line regulation *5 (for the rated output voltage)		0.01% + 2 mV					0.01%		
Maximum load regulation *6 (for the rated output voltage)									
Ripple noise *7	20 MHz, p-p	50 mV	50 mV	50 mV	50 mV	80 mV	100 mV	150 mV	250 mV
	5 Hz to 1 MHz, rms	5 mV	6 mV	6 mV	7 mV	8 mV	10 mV	25 mV	60 mV
Temperature coefficient		30 PPM /°C (after a 30 minute warm-up, for the rated output voltage)							
Aging drift *8 (for the rated output voltage)		0.02%							
Initial drift *9 (for the rated output voltage)		0.05% + 2 mV					0.05%		
Maximum remote sensing compensation voltage (single line (positive or negative))		1 V	1 V	2 V	3 V	5 V	5 V		
Rise time *10		15 ms	30 ms	30 ms	50 ms	50 ms	110 ms	170 ms	170 ms
Fall time	At full load *10	12 ms	25 ms	30 ms	40 ms	50 ms	180 ms	270 ms	270 ms
	Td (typ) *11	210 ms	250 ms	320 ms	380 ms	1200 ms	---		
	No load a *12	40 ms	65 ms	85 ms	100 ms	250 ms	---		
	No load b *13	200 ms	200 ms	290 ms	310 ms	1100 ms	2000 ms	2500 ms	3000 ms
Transient response time *14		1 ms or less					2 ms or less		
Output hold time (typ) *15		15 ms	16 ms				16 ms	16 ms	15 ms
Constant current mode									
Maximum line regulation *5 (at the rated output current)		0.01% + 2 mA					0.02%		
Maximum load regulation *16 (at the rated output current)		0.01% + 5 mA					0.09%		0.15%
Change in the load due to the temperature drift of internal components (at the rated output current)		0.05% or less (for 30 minutes after the load conditions are changed)							
Ripple noise *17 (5 Hz to 1 MHz, rms)		25 mA	15 mA	8 mA	4 mA	3 mA	1.2 mA	0.8 mA	0.5 mA
Temperature coefficient		100 PPM /°C (after a 30 minute warm-up, at the rated output current)							
Aging drift *8 (at the rated output current)		0.05%							
Initial drift *9 (at the rated output current)		0.1%							
Protection functions									
Foldback protection		Turns off the output when the operation switches from constant voltage mode to constant current mode or vice versa. Can be set as necessary.							
Overvoltage protection (OVP)		Inverter shutoff system. Prevents the output voltage from being set higher than the OVP value. Also shuts off the output when an output overvoltage (exceeding the OVP value) occurs.							
Overvoltage protection voltage setting range		0.5 V to 12 V	1 V to 24 V	2 V to 40 V	5 V to 66 V	5 V to 110 V	5 V to 176 V	5 V to 353 V	5 V to 717 V
Undervoltage limit (UVL)		Prevents the output voltage from being set lower than the UVL value. Disabled during external control.							
Undervoltage protection (UVP)		Shuts off the output when the output voltage falls below the UVP value.							
Overheat protection		Shuts off the output before the temperature of the internal components exceeds the safe operation temperature.							
Setting and readback (USB, RS232, RS485, optional LAN interface)									
Output voltage setting	Accuracy	0.05% of the rated output voltage					0.05% of the output voltage + 0.05% of the rated output voltage		
	Number of decimal digits	3 digits				2 digits			
	Resolution	Approx. 1/60000 of rated output voltage							
Output current setting	Accuracy *18	0.1% of output current + 0.1% of the rated output current					0.2% of the rated output current		
	Number of decimal digits	3 digits	4 digits						
	Resolution	Approx. 1/60000 of rated output current							
Output voltage readback	Accuracy	0.05% of the rated output voltage					0.05% of the output voltage + 0.05% of the rated output voltage		
	Resolution	Approx. 1/60000 of rated output voltage							
Output current readback	Accuracy *18	0.1% of output current + 0.3% of the rated output current							
	Resolution	Approx. 1/60000 of rated output current							
Front panel									
Control function		● Separate knobs (encoders) for setting the output voltage and output current (setting resolution switchable). ● Knobs (encoders) for setting OVP,UVP,and UVL. ● Protection functions (OVP, UVP, UVL, foldback) ● Output shutoff function (output on/off control, shutdown) ● Communication functions: Standard equipped with USB, RS232, RS485. LAN optional. ● Baudrate, address setting ● External control: Configuration using external voltage (5 V or 10 V) or external resistance (5 kΩ or 10 kΩ), output voltage/current monitor output (5 V or 10 V), output on/off, front panel operation lock							
Output voltage display	Accuracy	0.5% of the rated output voltage ± 1 count							
	Number of decimal digits	2 digits				1 digit			
Output current display	Accuracy	0.5% of the rated output current ± 1 count							
	Number of decimal digits	2 digits	3 digits						
LED display		Green: FINE, MENU, SET, ALARM, REM, OUTPUT, CV, CC Red: ALARM (OVP, UVP, OTP, FOLD, AC FAIL)							

*1. The minimum voltage is 0.1 % of the rated output voltage.

*2. The minimum current is 0.2 % of the rated output current.

*3. Input voltage 100 Vac/200 Vac, at the rated output power, ambient temperature 25 °C If the LAN option is built in, the efficiency decreases by 0.5 % and the input current increases by 0.5 %.

*4. Excludes input surge current (duration 0.2 ms or less) applied to the built-in noise filter section.

*5. 85 Vac to 132 Vac or 170 Vac to 265 Vac, fixed load

*6. With the input voltage held constant, the sensing point was measured using remote sensing from no load to full load.

*7. Models with rated output voltages from 10 V to 100 V were measured using an RC-9131 A 1:1 probe that conforms to the JEITA specifications. Models with rated output voltage from 160 V to 650 V were measured using a 10:1 probe.

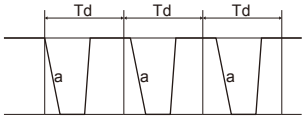
*8. When at least 8 hours has passed after a 30 minute warm-up with the input voltage, load, and ambient temperature held constant

*9. For 30 minutes after turning on the power with the input voltage, load, and ambient temperature held constant

*10. Between 10 % and 90 % of the rated resistive load and rated output voltage

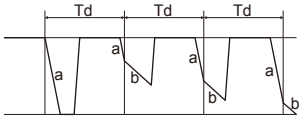
*11. If the output voltage is repeatedly decreased, Td is the minimum duration from a given voltage drop to the next voltage drop.

*12. Duration for the voltage to change from 90 % to 10 % of the rated output voltage when the output voltage is repeatedly decreased and the duration from a given voltage drop to the next voltage drop is longer than Td.



a: Slope of the fall time of a at no load

*13. Duration for the voltage to change from 90 % to 10 % of the rated output voltage when the output voltage is repeatedly decreased and the duration from a given voltage drop to the next voltage drop is shorter than Td.



a: Slope of the fall time of a at no load
b: Slope of the fall time of b at no load

*14. The amount of time required for the output voltage to return to a value within 0.5 % of the rated output voltage. The change in the load current is 10 % to 90 % of the rating. The output voltage is between 10 % and 100 % of the rating. During local sensing.

*15. At the rated output power

*16. The value when the output voltage is changed from the lower limit to the rated voltage in constant current mode with the input voltage held constant

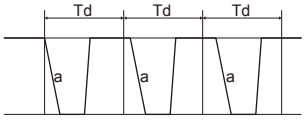
*17. For models with a 10 V rated output voltage, this is the value for when the output voltage is 2 V to 10 V at the rated output current. For other models, this is the value for when the output voltage is 10 % to 100 % of the rating at the rated output current. Models with rated output voltage from 160 V to 650 V were measured using a 10:1 probe.

*18. In output current control, the current, linearity, and monitor accuracies do not include the load variation caused by initial drift and temperature drift of internal components.

PAV Series 400 W Type Specifications

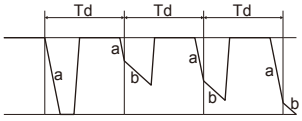
Item/Model		PAV10-40	PAV20-20	PAV36-12	PAV60-7	PAV100-4	PAV160-2.6	PAV320-1.3	PAV650-0.64
Output									
Rated output voltage *1		10 V	20 V	36 V	60 V	100 V	160 V	320 V	650 V
Rated output current *2		40 A	20 A	12 A	7 A	4 A	2.6 A	1.3 A	0.64 A
Rated output power		400 W	400 W	432 W	420 W	400 W	416 W	416 W	416 W
AC input									
Nominal input rating		100 Vac to 240 Vac continuous input, 50 Hz to 60 Hz, single phase							
Input voltage range		85 Vac to 265 Vac							
Input frequency range		47 Hz to 63 Hz							
Input current (typ) *3 (100 Vac/200 Vac)		5.05 A/2.47 A	4.98 A/2.45 A	5.25 A/2.57 A	5.10 A/2.50 A	4.80 A/2.37 A	5 A / 2.44 A		
Power factor (typ) (100 Vac/200 Vac, at the rated output power)		0.99							
Efficiency (typ) *3		80% / 82%	81% / 83%	83% / 85%	83% / 85%	84% / 88%	84% / 86%		
Inrush current (100 Vac/200 Vac) *4		25 A / 25 A or less					25 A / 25 A or less		
Constant voltage mode									
Maximum line regulation *5 (for the rated output voltage)		0.01% + 2mV					0.01%		
Maximum load regulation *6 (for the rated output voltage)									
Ripple noise *7	20 MHz, p-p	50 mV	50 mV	50 mV	50 mV	80 mV	100 mV	150 mV	250 mV
	5 Hz to 1 MHz, rms	5 mV	6 mV	6 mV	7 mV	8 mV	10 mV	25 mV	60 mV
Temperature coefficient		30 PPM /°C (after a 30 minute warm-up, for the rated output voltage)							
Aging drift *8 (for the rated output voltage)		0.02%							
Initial drift *9 (for the rated output voltage)		0.05% + 2 mV					0.05%		
Maximum remote sensing compensation voltage (single line (positive or negative))		1 V	1 V	2 V	3 V	5V	5 V		
Rise time *10		15 ms	30 ms	30 ms	50 ms	50 ms	80 ms	150 ms	150 ms
Fall time	At full load *10	10 ms	10 ms	15 ms	30 ms	50 ms	100 ms	150 ms	150 ms
	Td (typ) *11	210 ms	250 ms	320 ms	380 ms	1200 ms	---		
	No load a *12	40 ms	65 ms	85 ms	100 ms	250 ms	---		
	No load b *13	200 ms	200 ms	290 ms	310 ms	1100 ms	2000 ms	2500 ms	3000 ms
Transient response time *14		1 ms or less					2 ms or less		
Output hold time (typ) *15		15 ms	16 ms				16 ms		15 ms
Constant current mode									
Maximum line regulation *5 (at the rated output current)		0.01% + 2 mA					0.02%		
Maximum load regulation *16 (at the rated output current)		0.01% + 5 mA					0.09%		
Change in the load due to the temperature drift of internal components (at the rated output current)		0.05% or less (for 30 minutes after the load conditions are changed)							
Ripple noise *17 (5 Hz to 1 MHz, rms)		70 mA	40 mA	15 mA	8 mA	3 mA	1.5 mA	1 mA	0.6 mA
Temperature coefficient		100 PPM /°C (after a 30 minute warm-up, at the rated output current)							
Aging drift *8 (at the rated output current)		0.05%							
Initial drift *9 (at the rated output current)		0.1%							
Protection functions									
Foldback protection		Turns off the output when the operation switches from constant voltage mode to constant current mode or vice versa. Can be set as necessary.							
Overvoltage protection (OVP)		Inverter shutoff system. Prevents the output voltage from being set higher than the OVP value. Also shuts off the output when an output overvoltage (exceeding the OVP value) occurs.							
Overvoltage protection voltage setting range		0.5 V to 12 V	1 V to 24 V	2 V to 40 V	5 V to 66 V	5 V to 110 V	5 V to 176 V	5 V to 353 V	5 V to 717 V
Undervoltage limit (UVL)		Prevents the output voltage from being set lower than the UVL value. Disabled during external control.							
Undervoltage protection (UVP)		Shuts off the output when the output voltage falls below the UVP value.							
Overheat protection		Shuts off the output before the temperature of the internal components exceeds the safe operation temperature.							
Setting and readback (USB, RS232, RS485, optional LAN interface)									
Output voltage setting	Accuracy	0.05% of the rated output voltage					0.05% of the output voltage + 0.05% of the rated output voltage		
	Number of decimal digits	3 digits				2 digits			
	Resolution	Approx. 1/60000 of rated output voltage							
Output current setting	Accuracy *18	0.1% of output current + 0.1% of the rated output current					0.2% of the rated output current		
	Number of decimal digits	3 digits				4 digits			
	Resolution	Approx. 1/60000 of rated output current							
Output voltage readback	Accuracy	0.05% of the rated output voltage					0.05% of the output voltage + 0.05% of the rated output voltage		
	Resolution	Approx. 1/60000 of rated output voltage							
Output current readback	Accuracy *18	0.1% of output current + 0.3% of the rated output current							
	Resolution	Approx. 1/60000 of rated output current							
Front panel									
Control function		● Separate knobs (encoders) for setting the output voltage and output current (setting resolution switchable). ● Knobs (encoders) for setting OVP,UVP,and UVL. ● Protection functions (OVP, UVP, UVL, foldback) ● Output shutoff function (output on/off control, shutdown) ● Communication functions: Standard equipped with USB, RS232, RS485. LAN optional. ● Baudrate, address setting ● External control: Configuration using external voltage (5 V or 10 V) or external resistance (5 kΩ or 10 kΩ), output voltage/current monitor output (5 V or 10 V), output on/off, front panel operation lock							
Output voltage display	Accuracy	0.5% of the rated output voltage ± 1 count							
	Number of decimal digits	2 digits				1 digit			
Output current display	Accuracy	0.5% of the rated output current ± 1 count							
	Number of decimal digits	2 digits			3 digits				
LED display		Green: FINE, MENU, SET, ALARM, REM, OUTPUT, CV, CC Red: ALARM (OVP, UVP, OTP, FOLD, AC FAIL)							

*1. The minimum voltage is 0.1 % of the rated output voltage.
*2. The minimum current is 0.2 % of the rated output current.
*3. Input voltage 100 Vac/200 Vac, at the rated output power, ambient temperature 25 °C If the LAN option is built in, the efficiency decreases by 0.5 % and the input current increases by 0.5 %.
*4. Excludes input surge current (duration 0.2 ms or less) applied to the built-in noise filter section.
*5. 85 Vac to 132 Vac or 170 Vac to 265 Vac, fixed load
*6. With the input voltage held constant, the sensing point was measured using remote sensing from no load to full load.
*7. Models with rated output voltages from 10 V to 100 V were measured using an RC-9131 A 1:1 probe that conforms to the JEITA specifications. Models with rated output voltage from 160 V to 650 V were measured using a 10:1 probe.
*8. When at least 8 hours has passed after a 30 minute warm-up with the input voltage, load, and ambient temperature held constant
*9. For 30 minutes after turning on the power with the input voltage, load, and ambient temperature held constant
*10. Between 10 % and 90 % of the rated resistive load and rated output voltage
*11. If the output voltage is repeatedly decreased, Td is the minimum duration from a given voltage drop to the next voltage drop.
*12. Duration for the voltage to change from 90 % to 10 % of the rated output voltage when the output voltage is repeatedly decreased and the duration from a given voltage drop to the next voltage drop is longer than Td.



a: Slope of the fall time of a at no load

*13. Duration for the voltage to change from 90 % to 10 % of the rated output voltage when the output voltage is repeatedly decreased and the duration from a given voltage drop to the next voltage drop is shorter than Td.



a: Slope of the fall time of a at no load
b: Slope of the fall time of b at no load

*14. The amount of time required for the output voltage to return to a value within 0.5 % of the rated output voltage. The change in the load current is 10 % to 90 % of the rating. The output voltage is between 10 % and 100 % of the rating. During local sensing.
*15. At the rated output power
*16. The value when the output voltage is changed from the lower limit to the rated voltage in constant current mode with the input voltage held constant
*17. For models with a 10 V rated output voltage, this is the value for when the output voltage is 2 V to 10 V at the rated output current. For other models, this is the value for when the output voltage is 10 % to 100 % of the rating at the rated output current. Models with rated output voltage from 160 V to 650 V were measured using a 10:1 probe.
*18. In output current control, the current, linearity, and monitor accuracies do not include the load variation caused by initial drift and temperature drift of internal components.

PAV Series 600 W Type Specifications

Item/Model		PAV10-60	PAV20-30	PAV36-18	PAV60-10	PAV100-6	PAV160-4	PAV320-2	PAV650-1
Output									
Rated output voltage *1		10 V	20 V	36 V	60 V	100 V	160 V	320 V	650 V
Rated output current *2		60 A	30 A	18 A	10 A	6 A	4 A	2 A	1 A
Rated output power		600 W	600 W	648 W	600 W	600 W	640 W	640 W	650 W
AC input									
Nominal input rating		100 Vac to 240 Vac continuous input, 50 Hz to 60 Hz, single phase							
Input voltage range		85 Vac to 265 Vac							
Input frequency range		47 Hz to 63 Hz							
Input current (typ) *3 (100 Vac/200 Vac)		7.48 A/3.69 A	7.22 A/3.56 A	7.70 A/3.80 A	7.13 A/3.52 A	7.13 A/3.52 A	7.47 A / 3.69 A		7.59 A/3.75 A
Power factor (typ) (100 Vac/200 Vac, at the rated output power)		0.99 / 0.98							
Efficiency (typ) *3		81% / 83%	84% / 86%	85% / 87%	85% / 87%	85% / 87%	86.5% / 88.5%	87% / 88.5%	86.5% / 88.5%
Inrush current (100 Vac/200 Vac) *4		30 A / 30 A or less					30 A / 30 A or less		
Constant voltage mode									
Maximum line regulation *5 (for the rated output voltage)		0.01% + 2 mV					0.01%		
Maximum load regulation *6 (for the rated output voltage)									
Ripple noise *7	20 MHz, p-p	50 mV	50 mV	50 mV	50 mV	80 mV	100 mV	150 mV	250 mV
	5 Hz to 1 MHz, rms	5 mV	5 mV	5 mV	12 mV	15 mV	10 mV	30 mV	60 mV
Temperature coefficient		30 PPM /°C (after a 30 minute warm-up, for the rated output voltage)							
Aging drift *8 (for the rated output voltage)		0.05%					0.02%		
Initial drift *9 (for the rated output voltage)		0.05% + 2 mV					0.05%		
Maximum remote sensing compensation voltage (single line (positive or negative))		1 V	1 V	2 V	3 V	5 V	5 V		
Rise time *10		50 ms	50 ms	50 ms	50 ms	100 ms	55 ms	75 ms	75 ms
Fall time	At full load *10	25 ms	25 ms	25 ms	25 ms	80 ms	65 ms	85 ms	85 ms
	Td (typ) *11	285 ms	425 ms	450 ms	570 ms	1370 ms	---		
	No load a *12	65 ms	110 ms	155 ms	175 ms	375 ms	---		
	No load b *13	280 ms	470 ms	470 ms	500 ms	1200 ms	2000 ms	2500 ms	3000 ms
Transient response time *14		1 ms or less					2 ms or less		
Output hold time (typ) *15		15 ms		20 ms			16 ms		14 ms
Constant current mode									
Maximum line regulation *5 (at the rated output current)		0.01% + 2 mA					0.02%		
Maximum load regulation *16 (at the rated output current)		0.01% + 5 mA					0.09%		
Change in the load due to the temperature drift of internal components (at the rated output current)		0.15% or less (for 30 minutes after the load conditions are changed)					0.05% or less (for 30 minutes after the load conditions are changed)		
Ripple noise *17 (5 Hz to 1 MHz, rms)		150 mA	75 mA	25 mA	8 mA	5 mA	2 mA	1.5 mA	1 mA
Temperature coefficient		100 PPM /°C (after a 30 minute warm-up, at the rated output current)							
Aging drift *8 (at the rated output current)		0.05%							
Initial drift *9 (at the rated output current)		0.3%	0.15%		0.1%		0.1%		
Protection functions									
Foldback protection		Turns off the output when the operation switches from constant voltage mode to constant current mode or vice versa. Can be set as necessary.							
Overvoltage protection (OVP)		Inverter shutoff system. Prevents the output voltage from being set higher than the OVP value. Also shuts off the output when an output overvoltage (exceeding the OVP value) occurs.							
Overvoltage protection voltage setting range		0.5 V to 12 V	1 V to 24 V	2 V to 40 V	5 V to 66 V	5 V to 110 V	5 V to 176 V	5 V to 353 V	5 V to 717 V
Undervoltage limit (UVL)		Prevents the output voltage from being set lower than the UVL value. Disabled during external control.							
Undervoltage protection (UVP)		Shuts off the output when the output voltage falls below the UVP value.							
Overheat protection		Shuts off the output before the temperature of the internal components exceeds the safe operation temperature.							
Setting and readback (USB, RS232, RS485, optional LAN interface)									
Output voltage setting	Accuracy	0.05% of the rated output voltage					0.05% of the output voltage + 0.05% of the rated output voltage		
	Number of decimal digits	3 digits				2 digits			
	Resolution	Approx. 1/60000 of rated output voltage							
Output current setting	Accuracy *18	0.1% of output current + 0.1% of the rated output current					0.2% of the rated output current		
	Number of decimal digits	3 digits				4 digits			
	Resolution	Approx. 1/60000 of rated output current							
Output voltage readback	Accuracy	0.05% of the rated output voltage					0.05% of the output voltage + 0.05% of the rated output voltage		
	Resolution	Approx. 1/60000 of rated output voltage							
Output current readback	Accuracy *18	0.1% of output current + 0.3% of the rated output current							
	Resolution	Approx. 1/60000 of rated output current							
Front panel									
Control function		● Separate knobs (encoders) for setting the output voltage and output current (setting resolution switchable). ● Knobs (encoders) for setting OVP,UVP,and UVL. ● Protection functions (OVP, UVP, UVL, foldback) ● Output shutoff function (output on/off control, shutdown) ● Communication functions: Standard equipped with USB, RS232, RS485. LAN optional. ● Baudrate, address setting ● External control: Configuration using external voltage (5 V or 10 V) or external resistance (5 kΩ or 10 kΩ), output voltage/current monitor output (5 V or 10 V), output on/off, front panel operation lock							
Output voltage display	Accuracy	0.5% of the rated output voltage ± 1 count							
	Number of decimal digits	2 digits				1 digit			
Output current display	Accuracy	0.5% of the rated output current ± 1 count							
	Number of decimal digits	2 digits				3 digits			
LED display		Green: FINE, MENU, SET, ALARM, REM, OUTPUT, CV, CC Red: ALARM (OVP, UVP, OTP, FOLD, AC FAIL)							

*1. The minimum voltage is 0.1 % of the rated output voltage.

*2. The minimum current is 0.2 % of the rated output current.

*3. Input voltage 100 Vac/200 Vac, at the rated output power, ambient temperature 25 °C If the LAN option is built in, the efficiency decreases by 0.5 % and the input current increases by 0.5 %.

*4. Excludes input surge current (duration 0.2 ms or less) applied to the built-in noise filter section.

*5. 85 Vac to 132 Vac or 170 Vac to 265 Vac, fixed load

*6. With the input voltage held constant, the sensing point was measured using remote sensing from no load to full load.

*7. Models with rated output voltages from 10 V to 100 V were measured using an RC-9131 A 1:1 probe that conforms to the JEITA specifications. Models with rated output voltage from 160 V to 650 V were measured using a 10:1 probe.

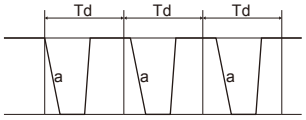
*8. When at least 8 hours has passed after a 30 minute warm-up with the input voltage, load, and ambient temperature held constant

*9. For 30 minutes after turning on the power with the input voltage, load, and ambient temperature held constant

*10. Between 10 % and 90 % of the rated resistive load and rated output voltage

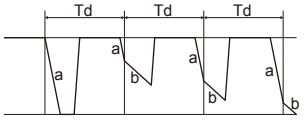
*11. If the output voltage is repeatedly decreased, Td is the minimum duration from a given voltage drop to the next voltage drop.

*12. Duration for the voltage to change from 90 % to 10 % of the rated output voltage when the output voltage is repeatedly decreased and the duration from a given voltage drop to the next voltage drop is longer than Td.



a: Slope of the fall time of a at no load

*13. Duration for the voltage to change from 90 % to 10 % of the rated output voltage when the output voltage is repeatedly decreased and the duration from a given voltage drop to the next voltage drop is shorter than Td.



a: Slope of the fall time of a at no load
b: Slope of the fall time of b at no load

*14. The amount of time required for the output voltage to return to a value within 0.5 % of the rated output voltage. The change in the load current is 10 % to 90 % of the rating. The output voltage is between 10 % and 100 % of the rating. During local sensing.

*15. At the rated output power

*16. The value when the output voltage is changed from the lower limit to the rated voltage in constant current mode with the input voltage held constant

*17. For models with a 10 V rated output voltage, this is the value for when the output voltage is 2 V to 10 V at the rated output current. For other models, this is the value for when the output voltage is 10 % to 100 % of the rating at the rated output current. Models with rated output voltage from 160 V to 650 V were measured using a 10:1 probe.

*18. In output current control, the current, linearity, and monitor accuracies do not include the load variation caused by initial drift and temperature drift of internal components.

PAV Series 800 W Type Specifications

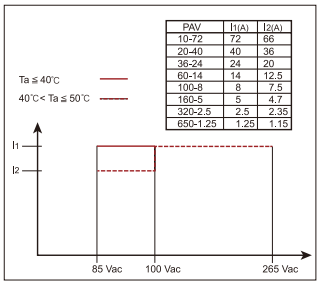
Item/Model		PAV10-72	PAV20-40	PAV36-24	PAV60-14	PAV100-8	PAV160-5	PAV320-2.5	PAV650-1.25
Output									
Rated output voltage *1		10 V	20 V	36 V	60 V	100 V	160 V	320 V	650 V
Rated output current *2	100 Vac ≤ Vin*3 Ta*4 ≤ 50°C	72 A	40 A	24 A	14 A	8 A	5 A	2.5 A	1.25 A
	Vin < 100 Vac Ta ≤ 40°C	72 A	40 A	24 A	14 A	8 A	5 A	2.5 A	1.25 A
	Vin < 100 Vac 40°C < Ta ≤ 50°C	66 A	36 A	20 A	12.5 A	7.5 A	4.7 A	2.35 A	1.15 A
Rated output power	100 Vac ≤ Vin Ta ≤ 50°C	720 W	800 W	864 W	840 W	800 W	800 W	800 W	812.5 W
	Vin < 100 Vac Ta ≤ 40°C	720 W	800 W	864 W	840 W	800 W	800 W	800 W	812.5 W
	Vin < 100 Vac 40°C < Ta ≤ 50°C	660 W	720 W	720 W	750 W	750 W	752 W	752 W	747.5 W
AC input									
Nominal input rating		100 Vac to 240 Vac continuous input, 50 Hz to 60 Hz, single phase							
Input voltage range		85 Vac to 265 Vac							
Input frequency range		47 Hz to 63 Hz							
Input current (typ) *5 (100 Vac/200 Vac)		9.00 A / 4.45 A	9.65 A / 4.75 A	10.30 A / 5.10 A	10.00 A / 4.95 A	9.50 A / 4.70 A	9.34 A / 4.61 A	9.34 A / 4.59 A	9.43 A / 4.66 A
Power factor (typ) (100 Vac/200 Vac, at the rated output power)		0.99 / 0.98							
Efficiency (typ) *5		81% / 83%	84% / 86%	85% / 87%	85% / 87%	85% / 87%	86.5% / 88.5%	86.5% / 89%	87% / 89%
Inrush current(100 Vac/200 Vac) *6		30 A / 30 A or less							
Constant voltage mode									
Maximum line regulation *7 (for the rated output voltage)		0.01% + 2 mV					0.01%		
Maximum load regulation *8 (for the rated output voltage)									
Ripple noise *9	20 MHz, p-p	50 mV	50 mV	50 mV	60 mV	80 mV	100 mV	150 mV	250 mV
	5 Hz to 1 MHz, rms	5 mV	5 mV	5 mV	12 mV	15 mV	10 mV	30 mV	60 mV
Temperature coefficient		30 PPM /°C (after a 30 minute warm-up, for the rated output voltage)							
Aging drift *10 (for the rated output voltage)		0.05%					0.02%		
Initial drift *11 (for the rated output voltage)		0.05% + 2 mV					0.05%		
Maximum remote sensing compensation voltage (single line (positive or negative))		1 V	1 V	2 V	3 V	5 V	5 V		
Rise time *12		50 ms	50 ms	50 ms	50 ms	100 ms	45 ms	55 ms	55 ms
Fall time	At full load *12	25 ms	25 ms	25 ms	25 ms	80 ms	55 ms	65 ms	65 ms
	Td (typ) *13	285 ms	425 ms	450 ms	570 ms	1370 ms	---		
	No load a *14	65 ms	110 ms	155 ms	175 ms	375 ms	---		
	No load b *15	280 ms	470 ms	470 ms	500 ms	1200 ms	2000 ms	2500 ms	3000 ms
Transient response time *16		1 ms or less					2 ms or less		
Output hold time (typ) *17		10 ms					13 ms	11.5 ms	
Constant current mode									
Maximum line regulation *7 (at the rated output current)		0.01% + 2 mA					0.02%		
Maximum load regulation *18 (at the rated output current)		0.01% + 5 mA					0.09%		
Change in the load due to the temperature drift of internal components (at the rated output current)		0.15% or less	0.1% or less				0.05% or less		
		(for 30 minutes after the load conditions are changed)							
Ripple noise *19 (5 Hz to 1 MHz, rms)		180 mA	100 mA	31 mA	28 mA	12 mA	2 mA	1.5 mA	1 mA
Temperature coefficient		100 PPM /°C (after a 30 minute warm-up, at the rated output current)							
Aging drift *10 (at the rated output current)		0.05%							
Initial drift *11 (at the rated output current)		0.3%					0.1%		
Protection functions									
Foldback protection		Turns off the output when the operation switches from constant voltage mode to constant current mode or vice versa. Can be set as necessary.							
Overvoltage protection (OVP)		Inverter shutoff system. Prevents the output voltage from being set higher than the OVP value. Also shuts off the output when an output overvoltage (exceeding the OVP value) occurs.							
Overvoltage protection voltage setting range		0.5 V to 12 V	1 V to 24 V	2 V to 40 V	5 V to 66 V	5 V to 110 V	5 V to 176 V	5 V to 353 V	5 V to 717 V
Undervoltage limit (UVL)		Prevents the output voltage from being set lower than the UVL value. Disabled during external control.							
Undervoltage protection (UVP)		Shuts off the output when the output voltage falls below the UVP value.							
Overheat protection		Shuts off the output before the temperature of the internal components exceeds the safe operation temperature.							
Setting and readback (USB, RS232, RS485, optional LAN interface)									
Output voltage setting	Accuracy	0.05% of the rated output voltage					0.05% of the output voltage + 0.05% of the rated output voltage		
	Number of decimal digits	3 digits				2 digits			
	Resolution	Approx. 1/60000 of rated output voltage							
Output current setting	Accuracy *20	0.1% of output current + 0.1% of the rated output current					0.2% of the rated output current		
	Number of decimal digits	2 digits	3 digits				4 digits		
	Resolution	Approx. 1/60000 of rated output current							
Output voltage readback	Accuracy	0.05% of the rated output voltage					0.05% of the output voltage + 0.05% of the rated output voltage		
	Resolution	Approx. 1/60000 of rated output voltage							
Output current readback	Accuracy *20	0.1% of output current + 0.3% of the rated output current							
	Resolution	Approx. 1/60000 of rated output current							
Front panel									
Control function		● Separate knobs (encoders) for setting the output voltage and output current (setting resolution switchable). ● Knobs (encoders) for setting OVP,UVP,and UVL. ● Protection functions (OVP, UVP, UVL, foldback) ● Output shutoff function (output on/off control, shutdown) ● Communication functions: Standard equipped with USB, RS232, RS485. LAN optional. ● Baudrate, address setting ● External control: Configuration using external voltage (5 V or 10 V) or external resistance (5 kΩ or 10 kΩ), output voltage/current monitor output (5 V or 10 V), output on/off, front panel operation lock							
Output voltage display	Accuracy	0.5% of the rated output voltage ± 1 count							
	Number of decimal digits	2 digits				1 digit			
Output current display	Accuracy	0.5% of the rated output current ± 1 count							
	Number of decimal digits	2 digits				3 digits			
LED display		Green: FINE, MENU, SET, ALARM, REM, OUTPUT, CV, CC Red: ALARM (OVP, UVP, OTP, FOLD, AC FAIL)							
Setting keys		FINE, MENU, SET, ALARM, REM, OUTPUT							

*1. The minimum voltage is 0.1% the rated output voltage.

*2. The minimum current is 0.2% of the rated output current.

*3. Vin: Input voltage

*4. Ta: Ambient temperature (performance depending on the input voltage versus rated output current and ambient tempera-ture shown below)



PAV	I1(A)	I2(A)
10-72	72	66
20-40	40	36
36-24	24	20
60-14	14	12.5
100-8	8	7.5
160-5	5	4.7
320-2.5	2.5	2.35
650-1.25	1.25	1.15

*5. Input voltage 100 Vac/200 Vac, at the rated output power, ambient temperature 25 °C If the LAN option is built in, the efficiency decreases by 0.5% and the input current increases by 0.5%.

*6. Excludes input surge current (duration 0.2 ms or less) applied to the built-in noise filter section.

*7. 85 Vac to 132 Vac or 170 Vac to 265 Vac, fixed load

*8. With the input voltage held constant, the sensing point was measured using remote sensing from no load to full load.

*9. Models with rated output voltages from 10 V to 100 V were measured using an RC-9131 A 1:1 probe that conforms to the JEITA specifications. Models with rated output voltage from 160 V to 650 V were measured using a 10:1 probe. At an ambient temperature of 0 °C, measurement was performed after at least 1 minute had passed after startup.

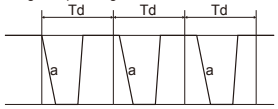
*10. When at least 8 hours has passed after a 30 minute warm-up with the input voltage, load, and ambient temperature held constant

*11. For 30 minutes after turning on the power with the input voltage, load, and ambient temperature held constant

*12. Between 10% and 90% of the rated resistive load and rated output voltage

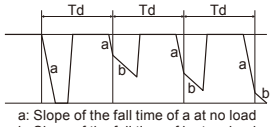
*13. If the output voltage is repeatedly decreased, Td is the minimum duration from a given voltage drop to the next voltage drop.

*14. Duration for the voltage to change from 90% to 10% of the rated output voltage when the output voltage is repeatedly decreased and the duration from a given voltage drop to the next voltage drop is longer than Td.



a: Slope of the fall time of a at no load

*15. Duration for the voltage to change from 90% to 10% of the rated output voltage when the output voltage is repeatedly decreased and the duration from a given voltage drop to the next voltage drop is shorter than Td.



a: Slope of the fall time of a at no load
b: Slope of the fall time of b at no load

*16. The amount of time required for the output voltage to return to a value within 0.5% of the rated output voltage. The change in the load current is 10% to 90% of the rating. The output voltage is between 10% and 100% of the rating. During local sensing.

*17. At the rated output power

*18. The value when the output voltage is changed from the lower limit to the rated voltage in constant current mode with the input voltage held constant

*19. For models with a 10 V rated output voltage, this is the value for when the output voltage is 2 V to 10 V at the rated output current. For other models, this is the value for when the output voltage is 10 % to 100 % of the rating at the rated output current. Models with rated output voltage from 160 V to 650 V were measured using a 10:1 probe.

*20. In output current control, the current, linearity, and monitor accuracies do not include the load variation caused by initial drift and temperature drift of internal components.

PAV Series All Type Specifications

External control	
Output voltage control using external voltage	0% to 100% of the rated output voltage (application voltage range selectable: 0 V to 5 V or 0 V to 10 V) Accuracy and linearity: ± 0.5% of the rated output voltage
Output current control using external voltage *1	0% to 100% of the rated output current (application voltage range selectable: 0 V to 5 V or 0 V to 10 V) Accuracy and linearity: ± 1% of the rated output current
Output voltage control using external resistance	0% to 100% of the rated output voltage (application resistance range selectable: 0 Ω to 5 kΩ or 0 Ω to 10 kΩ) Accuracy and linearity: ± 1% of the rated output voltage
Output current control using external resistance *1	0% to 100% of the rated output current (application resistance range selectable: 0 Ω to 5 kΩ or 0 Ω to 10 kΩ) Accuracy and linearity: ± 1.5% of the rated output current
Output shutoff (SO) control	External voltage application: 0 V to 0.6 V, 4 V to 15 V, or a contact switch. Positive or negative logic selectable.
Output current monitor *1	Monitor voltage range selectable: 0 V to 5 V or 0 V to 10 V, Accuracy: 1%
Output voltage monitor	Monitor voltage range selectable: 0 V to 5 V or 0 V to 10 V, Accuracy: 1%
Normal operation status signal	Normal (4 V to 5 V), abnormal (0 V), output resistance 500 Ω
Parallel operation *2 *3	Possible up to six power supplies. Master-slave operation with a current balance function.
Series operation *4	Possible up to two power supplies.
Constant voltage/constant current mode (CV/CC) signal	Open collector output (maximum application voltage 30 V, maximum sink current 10 mA) Low level (on) during constant current (CC) mode High level (off) during constant voltage (CV) mode
Output on / off control (ILC)	Output can be shut off using a contact switch or the like (maximum voltage between terminals: 5 V). When open: Output off When shorted: Output on
Local / remote	Output can be shut off using a contact switch or the like (maximum voltage between terminals: 5 V). When open: Output off When shorted: Output on
External control status signal	Open collector output (maximum application voltage 30 V, maximum sink current 10 mA) High level (off) during local mode Low level (on) during external control
Trigger output signal	Maximum low level output signal: 0.8 V, Minimum high level output signal: 3.8 V, maximum high level output signal: 5 V Maximum source current: 16 mA, output trigger signal span: 20 µs (typ)
Trigger input signal	Maximum low level input signal: 1.2 V, Minimum high level input signal: 3.5 V, maximum high level input signal: 5 V Maximum sink current: 16 mA, positive edge trigger span: 10 µs (min), Tr/Tf: 1 µs (max)
Program signal output 1 / Program signal output 2	Open collector output (maximum application voltage 25 V, maximum sink current 100 mA)
Environmental conditions	
Operating ambient temperature and humidity	0 °C to 50 °C (32 °F to 122 °F) 20%rh to 90%rh (no condensation)
Storage ambient temperature and humidity	-20 °C to 85 °C (-4 °F to 185 °F) 10%rh to 95%rh (no condensation)
Installation location	Indoor use, Overvoltage category II Altitude: Up to 3000 m (at 2000 m and above, the operating ambient temperature must be reduced), At 2000 m to 3000 m, the operating ambient temperature is 0 °C to 40 °C (32 °F to 104 °F).
Structure	
Cooling method	Forced air cooling using internal fan
Weight	1.9 kg (4.2 lb) or less: 200 W, 400 W types (models whose rated output voltage is 10 V to 100 V and 160 V to 650 V) 2.0 kg (4.4 lb) or less: 600 W, 800 W types (models whose rated output voltage is 160 V to 650 V) 2.1 kg (4.6 lb) or less: 600 W, 800 W types (models whose rated output voltage is 10 V to 100 V)
Vibration resistance	IEC60068-2-64
Shock resistance	196.1 m/s^2 (20 G) or less, half sine, 11 ms, when not packaged, when not operating (IEC 60068-2-27)

*1. In output current control, the current, linearity, and monitor accuracies do not include the load variation caused by initial drift and temperature drift of internal components. *2. For parallel operation of two or more PAV series power supplies with the same rating, the minimum load current is 5% of the rating or higher. For parallel operation of four or less models with rated output voltage of 160 V to 650 V, the minimum load current is 5% of the rating or higher. For parallel operation of more than four, the minimum load current is 20% of the rating or higher. *3. The ammeter's display accuracy when the total current is displayed on the master unit is 2% ± 1 count of the total of rated currents. *4. An external protection diode is necessary.

Safety / EMC	
Safety standards	Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU UL/EN/IEC 61010-1 (Class I *1, Pollution degree 2 *2) (Design to meet UL/EN 60950-1) ●Models whose rated output voltage is 10 V, 20 V, 36 V, or 60 V Output terminals and signal terminals produce non-hazardous voltage. ●Models whose rated output voltage is 100 V, 160 V, 320 V, or 650 V Output terminals and J1 and J2 terminals produce hazardous voltage (other signal terminals produce non-hazardous voltage).
EMC standards	Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU EN/IEC 61326-1 (Design to meet EN 55022/EN 55024)
Withstanding voltage *3	●Models whose rated output voltage is 10 V, 20 V, or 36 V. 4242 Vdc: Between input and output (including between signal terminals) 2828 Vdc: Between input and FG 707 Vdc: Between output (including between signal terminals) and FG ●Models whose rated output voltage is 60 V or 100 V 4242 Vdc: Between input and output (including between signal terminals) 2828 Vdc: Between input and FG 707 Vdc: Between signal terminals (excluding J1/J2) and FG 1910 Vdc: Between output as well as J1/J2 terminals and signal terminals (excluding J1/J2) 1380 Vdc: Between output as well as J1/J2 terminals and FG ●Models whose rated output voltage is 160 V or 320 V 2970 Vdc: Between input and output (including between signal terminals) 2828 Vdc: Between input and FG 707 Vdc: Between signal terminals (excluding J1/J2) and FG 4242 Vdc: Between input and signal terminals (excluding J1/J2) 3200 Vdc: Between output as well as J1/J2 terminals and signal terminals (excluding J1/J2) 2000 Vdc: Between output as well as J1/J2 terminals and FG ●Models whose rated output voltage is 650 V 3704 Vdc: Between input and output (including between signal terminals) 2828 Vdc: Between input and FG 707 Vdc: Between signal terminals (excluding J1/J2) and FG 4242 Vdc: Between input and signal terminals (excluding J1/J2) 4244 Vdc: Between output as well as J1/J2 terminals and signal terminals (excluding J1/J2) 2780 Vdc: Between output as well as J1/J2 terminals and FG
Insulation resistance	100 MΩ or higher (25 °C, 70%rh)
Conducted emission	IEC/EN 61326-1, Class B, FCC part15-B, VCCI-B
Radiated emission	IEC/EN 61326-1, Class A *4, FCC part15-A, VCCI-A

*1. This is a Class I equipment. Be sure to ground the product's protective conductor terminal. The safety of this product is only guaranteed when the product is properly grounded. *2. Pollution is addition of foreign matter (solid, liquid or gaseous) that may produce a reduction of dielectric strength or surface resistivity. Pollution Degree 2 assumes that only non-conductive pollution will occur except for an occasional temporary conductivity caused by condensation. *3. Test voltage application time: 1 minute *4. This is a Class A equipment. The product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.

1U Wide Range Programmable DC Power Supply

PWX Series

LAN LXI | USB | GPIB OPTION | RS232C | DRIVERS | CE

Dimensions / Weight

750 W type: 422.8(16.65″)W × 43(1.69″)H × 500(19.69″)Dmm/ 8 kg(17.64 lbs.)
1500 W type: 422.8(16.65″)W × 43(1.69″)H × 500(19.69″)Dmm/ 9.5 kg(20.94 lbs.)

Accessories

Output terminal cover: 1 pc., Input terminal cover set, Output terminal M8 bolt set ×2 sets Chassis connection wire: 1 wire, J1 connector plug kit: 1 set(Housing: 1 pc., Connector: 1 pc., Plug: 1 pc., Strain relief: 1 pc., Clips: 2 pcs., and two types of Screws: 2 pcs.,), Packing list: 1 copy, Quick reference (1 each for English and Japanese), Safety precautions: 1 copy, China RoHS sheet: 1 copy, CD-ROM: 1 disc

* Power cord is not included for the 1500 W type.
Please purchase the optional accessory separately(AC5.5-3P3M-M4C-VCTF).

Ideal for N-to-M network-based remote control and monitoring
A next-generation rack-mounted power supply

The PWX series is a CVCC programmable regulated DC power supply designed to optimize for a rack-mounted power supply. To increase its mounting efficiency, it has a 19-inch rack width with a thin shape and intakes and outtakes for cooling on only the front and back surfaces so that it can be mounted flush top and bottom.
The series is equipped standard with USB, RS232C, and LAN interfaces, which are essential for system upgrades. The series also has a virtual multi-channel bus (VMCB) function that allows it to be used efficiently for remote control and monitoring with 1-to-N and as well as with N-to-M in large-scale networks. Moreover, the PWX is an LXI (LAN eXtention for Instrumentation) compliant instrument, so it can be connected easier with the measurement system using LAN interface. You can also manage the power supply in a different building.
Two output power specifications are available: 750 W and 1500 W, and a wide range of voltage and current settings can be combined within its output power rating (3 times). For example, the output power of 1500 W model, the PWX1500ML is capable to operate seamlessly from the range of "80 V-18.75 A" to "26.8 V-56 A". The input voltage has a universal 85 V to 265 V input voltage range, and the unit also has an internal power factor correction (PFC) circuit to control the harmonic current. It also includes an analog external control/monitoring output, master-slave parallel operation function, various protective functions, and memory function.

Features

- A wide range of voltage and current settings can be combined within its output power rating (3 times)
- PFC circuit of 0.99 (with 100 V) or 0.97 (with 200 V) at full load *TYP value
- Supporting universal input voltage (85 V to 265 V)
- LAN (LXI compliant) /USB/RS232C as standard interface
- A virtual multi-channel bus (VMCB) function makes multi-channel operation more efficient
- Emulation setting, Command language setting function
- A thin and lightweight design with a 1U height for increased rack-mounting efficiency
- Expandable output capacity by parallel operation
- Expandable output voltage by series operation (up to 2 units by the same model)

*Excluding the PWX750HF and the PWX1500H.

- External analog control function (Output control based on voltage and resistance; ON/OFF based on contact signals)
- Analog monitor output (output voltage, output current, and operating mode can be monitored)
- Various protection functions: overvoltage protection, overcurrent protection, and overheat protection
- Memory function (3 combinations of settings for voltage, current, OVP, OCP, and UVL)
- Remote sensing function
- Bleeder circuit ON/OFF setting (to prevent over-discharging of batteries)
- CV, CC priority start function (prevents overshoot with output ON)

Options

- AC power cord for 1500 W model
  AC5.5-3P3M-M4C-VCTF
  * Not CE certified product
- Parallel operation cable
  PC01-PWX (for 2 units in parallel)
  PC02-PWX (for 3 units in parallel)
  PC03-PWX (for 4 units in parallel)

- Sequence creation software
  SD013-PWX (Wavy for PWX)
- RS232C control conversion cable
  RD-8P/9P
- Interface
  ISO PROGRAMING VOLT CONT factory option
  ISO PROGRAMING CURR CONT factory option

Note: Only one interface board can be installed.
The interface option can not be sold separately.

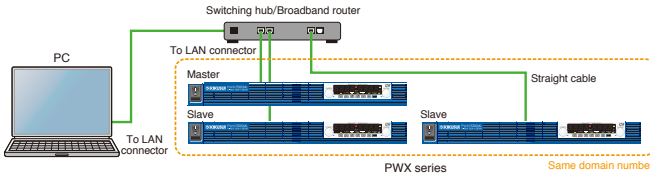
Equipped with standard LAN interface and optional VMCB function to support network-based remote control and monitoring

The PWX series is equipped with LAN, USB, and RS232C interfaces as standard features. By using the feature of virtual multi-channel bus (VMCB), it allows you to control remotely and monitoring for 1-to-N as well as N-to-M for large-scale networks. In particular, the LAN interface is LXI compliant, enabling you to easily control and monitor the power supply through a browser on a PC, smartphone, or tablet by accessing the web server built into the PWX series .
Additionally, the optional application software, Wavy for PWX (SD013-PWX), sequence creation and control software, allows you to change settings for specific channels (in individual) on VMCB-connected PWX series power supplies, and lets you perform batch control using global commands*. You can also turn the output ON and OFF on multiple units and adjust the output voltage and current.

* This is only enabled for “Direct control” on Wavy for PWX. Global commands that can be also used under control with VXI-11, HiSLIP, and SCPI-RAW.

● Basic configuration with LAN interface and VMCB (example)

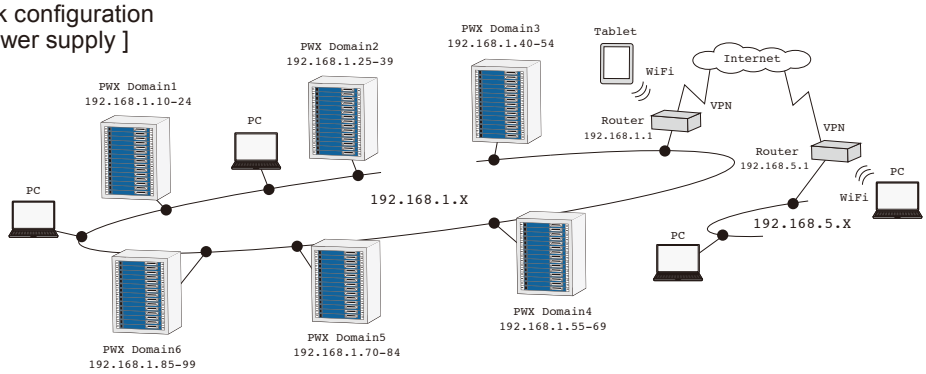
As shown in the figure below, it is possible to connect a PC and the PWX series with a hub to create a virtual group using a LAN connection. A maximum of 254 virtual groups can be set, and the maximum number of units can be configured up to 31 units per group. A group can have a mixture of models.



Configuration	IP address	Domain number	Channel number
Master	192.168.1.1	1	0
Slave	192.168.1.2	1	1
	192.168.1.3	1	2

* A DHCP server can also establish settings automatically

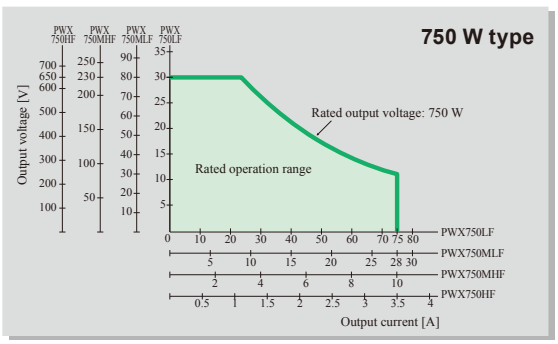
[Schematic LAN network configuration with the PWX series power supply]

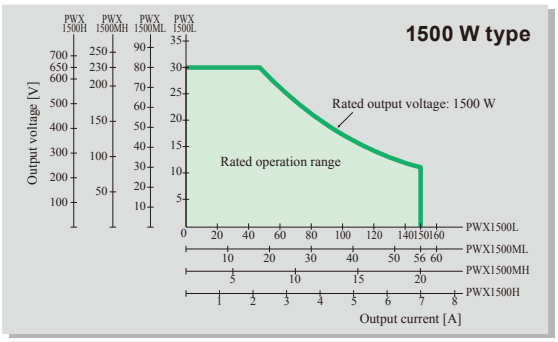


● Security for LAN connections

Access to the built-in web server can be restricted with a password. Also, when using VXI-11, HiSLIP, and SCPI-RAW for control, host restrictions can be set with the IP address. It is possible to prevent access from any terminal other than the ones registered as a host (up to 4 hosts can be registered).

Operation Area

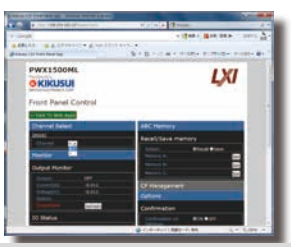




Easy access with a built-in web server

Use a browser from a PC, smartphone, or tablet to access the web server built into the PWX series for convenient control and monitoring.

[Recommended browser]
- Requires for the Internet Explorer version 9.0 or later
- Requires for the firefox 8.0 or later
- Requires for the safari/mobile Safari 5.1 or later
- Requires for the Chrome 15.0 or later
- Requires for the Opera 11.0 or later



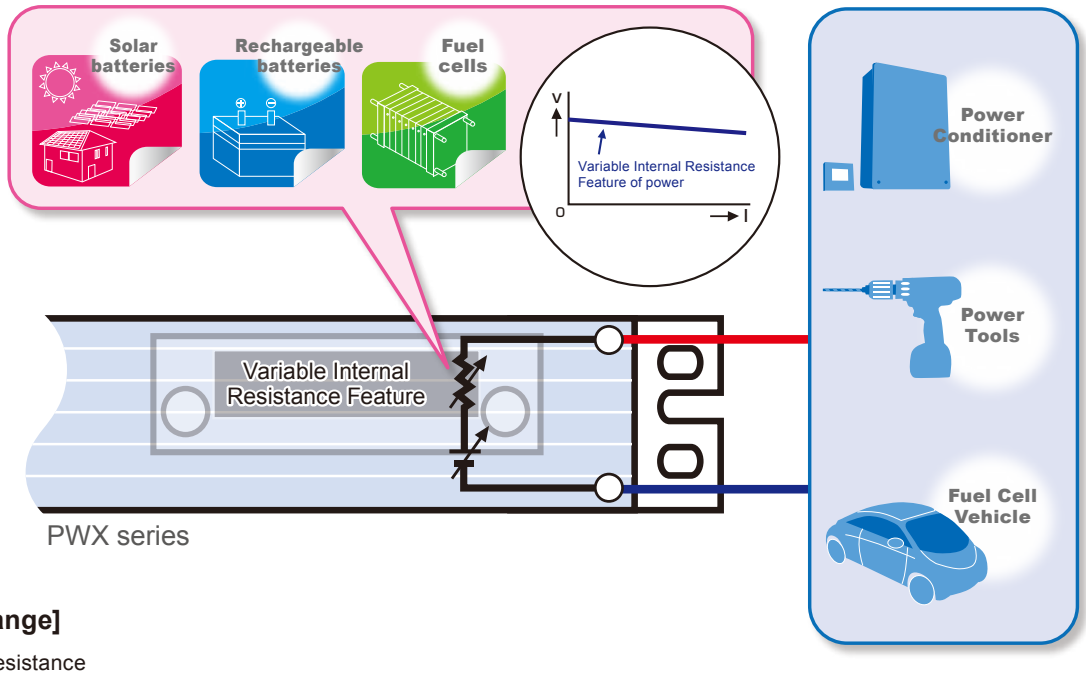
Variable Internal Resistance Feature

The variable internal resistance feature enables you to easily simulate the internal resistance of rechargeable batteries, solar batteries, fuel cells, and the like. By setting the internal resistance value in constant voltage (CV) mode, you can decrease the output voltage according to the output current.
You can use a CONFIG setting to set the internal resistance.

● Variable Internal Resistance Feature

model			
PWX750LF	PWX750MLF	PWX1500L	PWX1500ML
PWX750MHF	PWX750HF	PWX1500MH	PWX1500H

* Factory option



[Variable range]

Rint: Internal resistance
0 =<Rint =<Rint (max)

	PWX750LF	PWX750MLF	PWX750MHF	PWX750HF	PWX1500L	PWX1500ML	PWX1500MH	PWX1500H
Rint (min) [Ω]	0.0001 *1	0.001	0.01	0.1	0.0001 *1	0.001	0.01	0.1
Rint (max) [Ω]	0.4000 *1	2.857	23.00	185.7	0.2000 *1	1.429	11.50	92.9
Resolution [Ω]	0.0001 *1	0.001	0.01	0.1	0.0001 *1	0.001	0.01	0.1

*1 When the value is set from the front panel, the least significant digit is not shown on the panel display.
The value varies at a higher resolution than what is shown, and the least significant digit is rounded and shown in the next higher digit.

The maximum internal resistance that can be set from the front panel in parallel operation is the value obtained by dividing Rint (max) during standalone operation by the number of units in parallel operation.The resolution is the value obtained by dividing the resolution during standalone operation by the number of units in parallel operation.

[Specifications]

	PWX750LF	PWX750MLF	PWX750MHF	PWX750HF	PWX1500L	PWX1500ML	PWX1500MH	PWX1500H
Maximum internal resistance that can be set Rint (max) [Ω]	0.400	2.857	23.00	185.7	0.200	1.429	11.50	92.9

PWX Series 750 W Type Specifications

Item/Model			PWX750LF	PWX750MLF	PWX750MHF	PWX750HF
AC input						
Nominal input rating			100 Vac to 240 Vac, 50 Hz to 60 Hz, single phase			
Input voltage range			85 Vac to 265 Vac			
Input frequency range			47 Hz to 63 Hz			
Current (MAX) *1		100 Vac	10.5 A			
		200 Vac	5.25 A			
Inrush current (MAX) *2			70 Apeak or less			
Power (MAX) *3			1100 VA			
Power factor (TYP) *1			0.99 (input voltage 100 V), 0.97 (input voltage 200 V)			0.98 (input voltage 100 V), 0.96 (input voltage 200 V)
Efficiency (MIN) *1			74 % or more			
Hold-up time for power interruption (MIN) *3			20 ms or greater			
Output						
Rating	Output voltage *4		30 V	80 V	230 V	650 V
	Output current *4		75 A	28 A	10 A	3.5 A
	Output power		750 W			
Voltage	Setting range		0 V to 31.5 V	0 V to 84 V	0 V to 241.5 V	0 V to 682.5 V
	Setting accuracy		± (0.05 % of set +0.05 % of rating)			
	Line regulation *5		± 5 mV	± 10 mV	± 25 mV	± 67 mV
	Load regulation *6		± 5 mV	± 10 mV	± 25 mV	± 67 mV
	Transient response *7		1 ms or less		7 ms or less	
	Ripple noise *8	(p-p) *9	60 mV	80 mV	120 mV	330 mV
		(rms) *10	8 mV	8 mV	25 mV	60 mV
	Rise time	Rated load	100 ms			
		No load	100 ms			
	Fall time*11	Rated load	100 ms		150 ms	250 ms
		No load	450 ms	550 ms	1500 ms	3000 ms
	Maximum remote sensing compensation voltage (single line)		1.5 V	4 V	5 V	5 V
	Temperature coefficient (MAX) *12		100 ppm/°C (during external control)			
Current	Setting range		0 A to 78.75 A	0 A to 29.4 A	0 A to 10.5 A	0 A to 3.675 A
	Setting accuracy *13		±(0.5 % of set +0.1 % of rating)			
	Line regulation		± 9.5 mA	± 4.8 mA	± 3 mA	± 2.35 mA
	Load regulation		± 20 mA	± 10.6 mA	± 7 mA	± 5.7 mA
	Ripple noise *14	(rms) *10	150 mA	65 mA	30 mA	15 mA
	Temperature coefficient (TYP) *12		100 ppm/°C			

*1. With rated load.
*2. Excludes the charge current component that flows through the capacitor of the internal EMC filter circuit immediately after the POWER switch is turned on (for approximately 1 ms).
*3. 100 Vac with rated load.
*4. The maximum output voltage and current are limited by the maximum output power.
*5. 85 Vac to 135 Vac or 170 Vac to 265 Vac, fixed load.
*6. The amount of change that occurs when the load is changed from no load to rated load (rated output power/rated output voltage) with rated output voltage. The value is measured at the sensing point.
*7. The amount of time required for the output voltage to return to a value within "rated output voltage ± (0.1 % + 10 mV)." The load current fluctuation is 50 % to 100 % of the maximum current with the set output voltage.
*8. Measured using an RC-9131 1:1 probe that conforms to the JEITA specifications. At the rated output current.
*9. When the measurement frequency bandwidth is 10 Hz to 20 MHz.
*10. When the measurement frequency bandwidth is 5 Hz to 1 MHz.
*11. When the breeder circuit on/off setting is on.
*12. When the ambient temperature is within 0 °C and 50 °C.
*13. For the PWX750HF, in the range of 0.2 % to 100 % of the rated current.
*14. When the output voltage (Rated Power ÷ Rated Current) is 10 % to 100 % of the rating. At the rated output current.

Item/Model			PWX750LF	PWX750MLF	PWX750MHF	PWX750HF
Display function						
Voltage display		Maximum display	99.99 (fixed decimal point)		999.9 (fixed decimal point)	
		Display accuracy	± (0.2 % of reading +5 digits)			
Current display		Maximum display	99.99 (fixed decimal point)			9.999 (fixed decimal point)
		Display accuracy	± (0.5 % of reading +5 digits)			
Power display *1			The PWR DSPL key lights in red.			
		Maximum display	9999			
		Display accuracy	Displays the result of multiplying the current and voltage			
Operation display			OUTPUT ON/OFF, CV operation, CC operation, Alarm operation, Remote operation (LAN operation), Key lock operation, Preset memory			
Protection functions						
Overvoltage protection (OVP), Overvoltage protection 2 (OVP2), Overcurrent protection (OCP), Undervoltage limit (UVL), Overheat protection (OHP), Overheat protection 2 (OHP2), Fan failure protection (FAN), Incorrect sensing connection protection (SENSE), Low AC input protection (AC-FAIL), Shutdown (SD), Power limit (POWER LIMIT)						
Signal output						
Monitor signal output *2	Voltage monitor (VMON)		Selectable monitor voltage range: 0 V to 5 V or 0 V to 10 V			
		Setting accuracy	2.5 % of f.s.			
	Current monitor (IMON)		Selectable monitor voltage range: 0 V to 5 V or 0 V to 10 V			
		Setting accuracy	2.5 % of f.s.			
Status signal output *2 *3			OUTON STATUS, CV STATUS, CC STATUS,ALM STATUS, PWR ON STATUS			

*1. Press PWR DSPL to display the power on the ammeter. Each time you press this key, the display switches between power and current.
*2. J1 connector on the rear panel.
*3. Photocoupler open collector output; maximum voltage 30 V, maximum current (sink) 8 mA; isolated from the output and control circuits; status commons are floating (withstand voltage of less than or

Item/Model		PWX750LF	PWX750MLF	PWX750MHF	PWX750HF
Control features					
External control *1	Output voltage control (VPGM)	0 % to 100 % of the rated output voltage Selectable control voltage range: 0 V to 5 V or 0 V to 10 V			
	Accuracy	5 % of f.s.			
	Output current control (IPGM)	0 % to 100 % of the rated output current Selectable control voltage range: 0 V to 5 V or 0 V to 10 V			
	Accuracy	5 % of f.s.			
	Output on/off control [OUTPUT ON/OFF CONT]	Possible logic selections: turn the output on using a low TTL level signal or turn the output on using a high TTL level signal			
	Output shutdown control [SHUT DOWN]	Turns the output off with a low TTL level signal			
	Alarm clear control [ALM CLR]	Clears alarms with a low TTL level signal			
Other features					
Master-slave parallel operation		Including the master unit, up to four units(all the same model) can be connected.			
Series operation *2		Up to two units (all the same model) can be connected.			
Preset memory		Up to three sets of the following settings can be saved: the set voltage, the set current, the set OVP, the set OCP, and the set UVL.			
Key lock		Locks the operation of all keys other than the OUTPUT key.			
Interface					
Software protocol		IEEE Std 488.2-1992			
Command language		Complies with SCPI Specification 1999.0 Has a compatibility mode (switchable) *3 •Genesys Series made by TDK-Lambda •N5700/N8700 made by Agilent Technologies •PAG Series made by Kikusui			
RS232C, USB, LAN		USBTMC-USB488, LXI 1.3 Class C			

*1. J1 connector on the rear panel
*2. Excluding the PWX750HF
*3. This setting does not guarantee compatibility with all measuring instrument application software and drivers.

Item/Model		PWX750LF	PWX750MLF	PWX750MHF	PWX750HF
General					
Environmental conditions	Operating environment	Indoor use, overvoltage category II			
	Operating temperature/humidity	0 °C to +50 °C/20 %rh to 85 %rh (no condensation)			
	Storage temperature/humidity	-10 °C to +60 °C (ML only -20 °C to +70 °C)/90 %rh or less (no condensation)			
	Altitude	Up to 2000 m			
Cooling method		Forced air cooling using fan			
Grounding polarity		Negative grounding or positive grounding possible			
Isolation voltage		± 250 Vmax		± 500 Vmax	± 800 Vmax
	Isolated analog interface *1	± 60 Vmax			
Withstand voltage	Input-FG	No abnormalities at 1500 Vac for 1 minute			
	Input-Output	No abnormalities at 2000 Vac for 1 minute			No abnormalities at 2250 Vac for 1 minute
	Output-FG	No abnormalities at 1500 Vdc for 1 minute		No abnormalities at 1600 Vac for 1 minute	No abnormalities at 2000 Vac for 1 minute
	Input-Isolated analog interface *1	No abnormalities at 2650 Vac for 1 minute			
	Output-Isolated analog interface *1	No abnormalities at 2300 Vdc for 1 minute		No abnormalities at 2650 Vac for 1 minute	No abnormalities at 3300 Vac for 1 minute
Insulation resistance		500 Vdc, 100 MΩ or more(70 % or less)			1000 Vdc, 100 MΩ or more (70 % or less)
	Output-FG	500 Vdc, 40 MΩ or more(70 % or less)			1000 Vdc, 40 MΩ or more (70 % or less)
Safety *2		Complies with the requirements of the following directive and standard. Low Voltage Directive 2014/35/EU EN 61010-1 (Class I *4, Pollution degree 2)			
Electromagnetic compatibility (EMC) *2		Complies with the requirements of the following directive and standard. EMC Directive 2014/30/EU EN 61326-1 (Class A *4), EN 55011 (Class A *4, Group 1 *5), EN 61000-3-2, EN 61000-3-3 Applicable under the following conditions The maximum length of all cabling and wiring connected to the PWX series must be less than 3 m.			
Dimensions(mm(inch)) (maximum) /Weight		485(19.09") W × 43(1.69")(44(1.73")) H × 500(19.69")(580(22.83")) D /Approx. 8 kg(17.64 lbs)		485(19.09") W × 43(1.69")(44(1.73")) H × 500(19.69")(580(22.83")) D /Approx. 7.5 kg(16.53 lbs)	
Accessories		AC cable: 1 wire, Output terminal cover: 1 pc., Output terminal M8 bolt set: M8 bolts ×2 sets(Bolt, nut, spring washer, and washer for each bolt), Chassis connection wire: 1 wire, J1 connector plug kit: 1 set (Housing: 1 pc., Connector: 1 pc., Plug: 1 pc., Strain relief: 1 pc., Clips: 2 pcs., and two types of Screws: 2 pcs.,), Packing list: 1 copy, Quick reference (1 each for English and Japanese), Safety precautions: 1 copy, China RoHS sheet: 1 copy, CD-ROM: 1 disc			

*1. Option
*2. Only on models that have the CE marking on the panel. Does not apply to specially ordered or modified PWXs.
*3. This is a Class I equipment. Be sure to ground this product's protective conductor terminal. The safety of this product is only guaranteed when the product is properly grounded.
*4. This is a Class A equipment. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.
*5. This is a Group 1 equipment. This product does not generate and/or use intentionally radio-frequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/analysis purpose.

PWX Series 1500 W Type Specifications

Item/Model			PWX1500L	PWX1500ML	PWX1500MH	PWX1500H
AC input						
Nominal input rating			100 Vac to 240 Vac, 50 Hz to 60 Hz, single phase			
Input voltage range			85 Vac to 265 Vac			
Input frequency range			47 Hz to 63 Hz			
Current (MAX) *1		100 Vac	21 A			
		200 Vac	10.5 A			
Inrush current (MAX) *2			75 Apeak or less			
Power (MAX) *3			2200 VA			
Power factor (TYP) *1			0.99 (input voltage 100 V), 0.97 (input voltage 200 V)			0.98 (input voltage 100 V), 0.96 (input voltage 200 V)
Efficiency (MIN) *1			74 % or more			
Hold-up time for power interruption (MIN) *3			20 ms or greater			
Output						
Rating	Output voltage *4		30 V	80 V	230 V	650 V
	Output current *4		150 A	56 A	20 A	7 A
	Output power		1500 W			
Voltage	Setting range		0 V to 31.5 V	0 V to 84 V	0 V to 241.5 V	0 V to 682.5 V
	Setting accuracy		± (0.05 % of set +0.05 % of rating)			
	Line regulation *5		± 5 mV	± 10 mV	± 25 mV	± 67 mV
	Load regulation *6		± 5 mV	± 10 mV	± 25 mV	± 67 mV
	Transient response *7		1 ms or less		7 ms or less	
	Ripple noise *8	(p-p) *9	60 mV	80 mV	120 mV	330 mV
		(rms) *10	8 mV		25 mV	60 mV
	Rise time	Rated load	100 ms			
		No load	100 ms			
	Fall time *11	Rated load	100 ms		150 ms	250 ms
		No load	800 ms	1000 ms	1500 ms	3000 ms
	Maximum remote sensing compensation voltage (single line)		1.5 V	4 V	5 V	5 V
	Temperature coefficient (MAX) *12		100 ppm/°C (during external control)			
Current	Setting range		0 A to 157.5 A	0 A to 58.8 A	0 A to 21 A	0 A to 7.35 A
	Setting accuracy *13		± (0.5 % of set +0.1 % of rating)			
	Line regulation		± 17 mA	± 7.6 mA	± 4 mA	± 2.7 mA
	Load regulation		± 35 mA	± 16.2 mA	± 9 mA	± 6.4 mA
	Ripple noise *14	(rms) *10	300 mA	130 mA	60 mA	30 mA
	Temperature coefficient (TYP) *12		100 ppm/°C			

*1. With rated load.
*2. Excludes the charge current component that flows through the capacitor of the internal EMC filter circuit immediately after the POWER switch is turned on (for approximately 1 ms).
*3. 100 Vac with rated load.
*4. The maximum output voltage and current are limited by the maximum output power.
*5. 85 Vac to 135 Vac or 170 Vac to 265 Vac, fixed load.
*6. The amount of change that occurs when the load is changed from no load to rated load (rated output power/rated output voltage) with rated output voltage. The value is measured at the sensing point.
*7. The amount of time required for the output voltage to return to a value within "rated output voltage ± (0.1 % + 10 mV)." The load current fluctuation is 50 % to 100 % of the maximum current with the set output voltage.
*8. Measured using an RC-9131 1:1 probe that conforms to the JEITA specifications. At the rated output current.
*9. When the measurement frequency bandwidth is 10 Hz to 20 MHz.
*10. When the measurement frequency bandwidth is 5 Hz to 1 MHz.
*11. When the breeder circuit on/off setting is on.
*12. When the ambient temperature is within 0 °C and 50 °C.
*13. For the PWX1500H, in the range of 0.2 % to 100 % of the rated current.
*14. When the output voltage (Rated Power ÷ Rated Current) is 10 % to 100 % of the rating. At the rated output current.

Item/Model			PWX1500L	PWX1500ML	PWX1500MH	PWX1500H
Display function						
Voltage display		Maximum display	99.99 (fixed decimal point)		999.9 (fixed decimal point)	
		Display accuracy	± (0.2 % of reading +5 digits)			
Current display		Maximum display	999.9 (fixed decimal point)	99.99 (fixed decimal point)		9.999 (fixed decimal point)
		Display accuracy	± (0.5 % of reading +5 digits)			
Power display *1			The PWR DSPL key lights in red.			
		Maximum display	9999			
		Display accuracy	Displays the result of multiplying the current and voltage			
Operation display			OUTPUT ON/OFF, CV operation, CC operation,Alarm operation, Remote operation (LAN operation), Key lock operation, Preset memory			
Protection functions						
Overvoltage protection (OVP), Overvoltage protection 2 (OVP2), Overcurrent protection (OCP), Undervoltage limit (UVL), Overheat protection (OHP), Overheat protection 2 (OHP2), Fan failure protection (FAN), Incorrect sensing connection protection (SENSE), Low AC input protection (AC-FAIL), Shutdown (SD), Power limit (POWER LIMIT)						
Signal output						
Monitor signal output *2	Voltage monitor (VMON)		Selectable monitor voltage range: 0 V to 5 V or 0 V to 10 V			
		Setting accuracy	2.5 % of f.s.			
	Current monitor (IMON)		Selectable monitor voltage range: 0 V to 5 V or 0 V to 10 V			
		Setting accuracy	2.5 % of f.s.			
Status signal output *2 *3			OUTON STATUS, CV STATUS, CC STATUS, ALM STATUS, PWR ON STATUS			

*1. Press PWR DSPL to display the power on the ammeter. Each time you press this key, the display switches between power and current.
*2. J1 connector on the rear panel.
*3. Photocoupler open collector output; maximum voltage 30 V, maximum current (sink) 8 mA; isolated from the output and control circuits; status commons are floating (withstand voltage of less than or

Item/Model			PWX1500L	PWX1500ML	PWX1500MH	PWX1500H
Control features						
External control *1	Output voltage control (VPGM)		0 % to 100 % of the rated output voltage Selectable control voltage range: 0 V to 5 V or 0 V to 10 V			
		Accuracy	5 % of f.s.			
	Output current control (IPGM)		0 % to 100 % of the rated output current Selectable control voltage range: 0 V to 5 V or 0 V to 10 V			
		Accuracy	5 % of f.s.			
	Output on/off control [OUTPUT ON/OFF CONT]		Possible logic selections: turn the output on using a low TTL level signal or turn the output on using a high TTL level signal			
	Output shutdown control [SHUT DOWN]		Turns the output off with a low TTL level signal			
	Alarm clear control [ALM CLR]		Clears alarms with a low TTL level signal			
Other features						
Master-slave parallel operation			Including the master unit, up to four units(all the same model) can be connected.			
Series operation *2			Up to two units (all the same model) can be connected.			
Preset memory			Up to three sets of the following settings can be saved: the set voltage, the set current, the set OVP, the set OCP, and the set UVL.			
Key lock			Locks the operation of all keys other than the OUTPUT key.			
Interface						
Software protocol			IEEE Std 488.2-1992			
Command language			Complies with SCPI Specification 1999.0 Has a compatibility mode (switchable) *3 • Genesys Series made by TDK-Lambda • N5700/N8700 made by Agilent Technologies • PAG Series made by Kikusui			
RS232C, USB, LAN			USBTMC-USB488, LXI 1.3 Class C			

*1. J1 connector on the rear panel
*2. Excluding the PWX1500H
*3. This setting does not guarantee compatibility with all measuring instrument application software and drivers.

Item/Model			PWX1500L	PWX1500ML	PWX1500MH	PWX1500H
General						
Environmental conditions	Operating environment		Indoor use, overvoltage category II			
	Operating temperature/humidity		0 °C to +50 °C/20 %rh to 85 %rh (no condensation)			
	Storage temperature/humidity		-10 °C to +60 °C/90 %rh or less (no condensation)			
	Altitude		Up to 2000 m			
Cooling method			Forced air cooling using fan			
Grounding polarity			Negative grounding or positive grounding possible			
Isolation voltage			± 250 Vmax		± 500 Vmax	± 800 Vmax
	Isolated analog interface *1		± 60 Vmax			
Withstand voltage	Input-FG		No abnormalities at 1500 Vac for 1 minute			
	Input-Output		No abnormalities at 2000 Vac for 1 minute			No abnormalities at 2250 Vac for 1 minute
	Output-FG		No abnormalities at 1500 Vdc for 1 minute		No abnormalities at 1600 Vac for 1 minute	No abnormalities at 3300 Vac for 1 minute
	Input-Isolated analog interface *1		No abnormalities at 2650 Vac for 1 minute			
	Output-Isolated analog interface *1		No abnormalities at 2300 Vdc for 1 minute		No abnormalities at 2650 Vac for 1 minute	No abnormalities at 3300 Vac for 1 minute
Insulation resistance			500 Vdc, 100 MΩ or more(70 % or less)			1000 Vdc, 100 MΩ or more (70 % or less)
	Output-FG		500 Vdc, 40 MΩ or more(70 % or less)			1000 Vdc, 40 MΩ or more (70 % or less)
Safety *2			Complies with the requirements of the following directive and standard. Low Voltage Directive 2014/35/EU EN 61010-1 (Class I *3, Pollution degree 2)			
Electromagnetic compatibility (EMC) *2			Complies with the requirements of the following directive and standard. EMC Directive 2014/30/EU EN 61326-1 (Class A *4), EN 55011 (Class A *4, Group 1 *5), EN 61000-3-2, EN 61000-3-3 Applicable under the following conditions The maximum length of all cabling and wiring connected to the PWX Series must be less than 3 m.			
Dimensions (maximum) /Weight			485(19.09") W × 43(1.69")(44(1.73")) H × 500(19.69")(580(22.83")) D /Approx. 9.5 kg(20.94 lbs)		485(19.09") W × 43(1.69")(44(1.73")) H × 500(19.69")(580(22.83")) D /Approx. 9 kg(19.84 lbs)	
Accessories			Output terminal cover: 1 pc., Input terminal cover set, Output terminal M8 bolt set: M8 bolts ×2 sets(Bolt, nut, spring washer, and washer for each bolt), Chassis connection wire: 1 wire, J1 connector plug kit: 1 set (Housing: 1 pc., Connector: 1 pc., Plug: 1 pc., Strain relief: 1 pc., Clips: 2 pcs., and two types of Screws: 2 pcs.,), Packing list: 1 copy, Quick reference (1 each for English and Japanese), Safety precautions: 1 copy, China RoHS sheet: 1 copy, CD-ROM: 1 disc * A power cord is not included. Please purchase the optional accessory separately (AC5.5-3P3M-M4C-VCTF).			

*1. Option
*2. Only on models that have the CE marking on the panel. Does not apply to specially ordered or modified PWXs.
*3. This is a Class I equipment. Be sure to ground this product's protective conductor terminal. The safety of this product is only guaranteed when the product is properly grounded.
*4. This is a Class A equipment. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.
*5. This is a Group 1 equipment. This product does not generate and/or use intentionally radio-frequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for

Compact DC Power Supply(CV/CC)

PMX-A Series

LAN USB GPIB (OPTION) RS232C DRIVERS CE LXI

Dimensions

107(4.21″)W × 124(4.88″)H × 315(12.40″)Dmm(inch)

Network function equipped as standard for the standard test power supply.

The PMX-A series is a compact, high-performance DC power supply that provides constant voltage (CV) and constant current (CC). It is designed to improve working efficiency for benchtop uses. For this purpose, the output terminals are located on the front panel and are ergonomically designed so that wiring harnesses for electrical loads can be connected by moving your fingers naturally. Moreover, a forced air cooling system is used to intake and exhaust of the internal air, so the unit can be rack mounted without space. Furthermore, the PMX-A is equipped with LAN, USB, and RS232C interfaces as standard interfaces required for system operation. In particular, the LAN interface enables you to control and monitor the power supply from Web browsers on PCs, smartphones, tablets, and other terminal devices. Moreover, the PMX-A is LXI(LAN eXtention for Instrumentation) compliant instrument, so it can be connected easier with your measurement system using LAN interface. The PMX-A is also equipped with remote sensing (for 18V, 35V models only), analog external control/monitoring output, various protective functions, memory function, and other functions.

Accessories

Power cord: 1 pc (Approximately 2.5 m). Packing list: 1 copy. Quick reference: Japanese:1 copy, English: 1 copy, Chinese: 1 copy.Safety precautions: 1 copy. CD-ROM: 1 disc.

Options

■ Connector kit
OP01-PMX
■ Terminal unit(for use with the PMC-A series)
TU01-PMX
■ Sequence creation software
SD025-PMX(Wavy for PMX)

Features

- Series regulator system with excellent noise performance
- High setting resolution - Voltage: 1 mV, Current: 0.1 mA (PMX18-2A)
- Wide range of output variations (9 models are available)
- LAN (LXI compliant) / USB / RS232C as standard interface
- External analog remote control
- Monitoring and status signal output
- CV, CC priority start function (to prevent overshoot when the output is ON)
- Remote sensing function (18V, 35V models)
- Key lock, 3-point preset memory function

Easy access with a built-in web server

Use a browser from a PC, smartphone, or tablet to access the web server built into the PMX-A series for convenient control and monitoring.

[Recommended browser]
- Requires for the Internet Explorer version 9.0 or later
- Requires for the firefox 8.0 or later
- Requires for the safari / mobile Safari 5.1 or later
- Requires for the Chrome 15.0 or later
- Requires for the Opera 11.0 or later

* Connecting with a smartphone, tablet, etc. requires a Wi-Fi environment (wireless LAN router etc.).

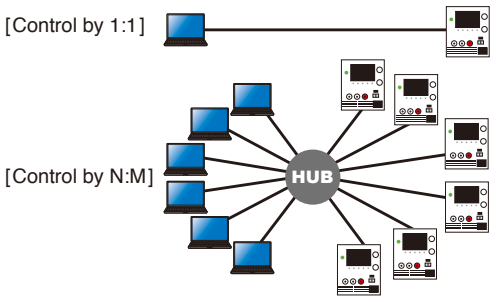
■ Digital, analog and other various external controls are supported. Remote control and monitoring can also be performed from Web browsers!

The PMX-A series is equipped with LAN, USB, and RS232C interfaces as standard communication interfaces. These interfaces enable remote control and monitoring to be performed efficiently in 1-to-N node configurations as well as in N-to-M node configurations even under large-scale networks. In particular, the LAN interface enables you to control and monitor the power supply through a browser on the PC, smartphone, tablet, or other terminal devices by accessing the built-in Web server of the PMX-A series.

■ LAN Interface

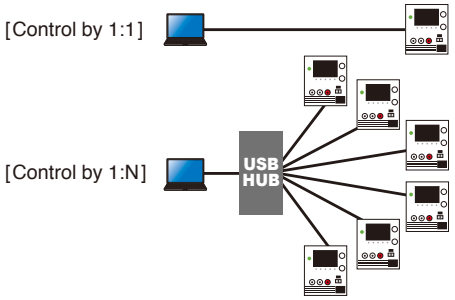
The LAN interface can control the number of devices with high speed, and it's theoretical controllable maximum number is to be calculated by approximately 4.2 billion. (The maximum transmission speed varies by the number of connected devices) In accordance with its applied standard, it is possible to combine the device that is to control or to be controlled, it is also the feature that it can be used with various applications. Also, in computers installed with Apple Bonjour, it is possible to access with a host name instead of the IP address.

● **AUTO MDIX function:** The PMX-A series can automatically identify the type of LAN cable whether straight or cross is connected and it connects using the appropriate method.



■ USB Interface

The USB interface has a feature with high versatility, and ease of a setup. The automatic recognition by the plug and play releases a user from the complex setting operation under the digital control, and it can be suitable interface when control by 1:1. In accordance with the standard, the maximum number of the connected devices can be configured up to 127 units. Moreover, the USB interface of the PWX series complies to USB2.0, and it has realized transmission speed of a maximum of 12 Mbps (es) (Full Speed).



Limited function edition *

Free downloads of "Wavy" sequence creation software

The limited function of the optional sequence creation and control software "SD025-PMX (Wavy for PMX)" is available to be downloaded free of charge. For details, please refer to the following information and our WEB.

* The number of steps is limited up to 5 steps.

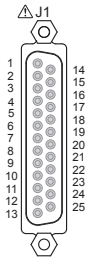
■ RS232C Interface

It can be used for communication with PCs and programmable logic controller.

■ Analog Interface

The PMX-A series is equipped with external voltage/resistance control, which are interfaces required for analog external control and monitoring applications for test power supply devices. The input external signal and the output status signal can be conducted through the J1 connector on the rear panel.

J1 connector pin arrangement



Pin number positions when you are facing the rear panel

Pin No.	Signal name	Description
1	VMON	Output voltage monitor; outputs 0 V to 10 V for 0 % to 100 % of the rated output voltage.
2	IMON	Output current monitor; outputs 0 V to 10 V for 0 % to 100 % of the rated output current.
3	ACOM	External signal common for pins 1, 2, 4, and 14. *1
4	EXT-V CV CONT	Output voltage control using external voltage; receives 0 V to 10 V to output 0 % to 100 % of the rated voltage.
5	ACOM	External signal common for pins 1, 2, 4, and 14. *1
6	EXT-R CV CONT	Output voltage control using external resistance; uses 0 Ω to 10 kΩ to output 0 % to 100 % of the rated voltage.
7	EXT-R CV CONT COM	Common for output voltage control using external resistance.
8	N.C.	Not connected.
9	N.C.	Not connected.
10	N.C.	Not connected.
11	CV STATUS	On when the PMX series is in CV mode (open-collector output from a photocoupler).*2
12	CC STATUS	On when the PMX series is in CC mode (open-collector output from a photocoupler).*2
13	ALM STATUS	On when a protection function (OVP, OCP, or OHP) is activated (open-collector output from a photocoupler).*2
14	EXT-V CC CONT	Output current control using external voltage; receives 0 V to 10 V to output 0 % to 100 % of the rated current.
15	ACOM	External signal common for pins 1, 2, 4, and 14.1 *1
16	EXT-R CC CONT	Output current control using external resistance; uses 0 Ω to 10 kΩto output 0 % to 100 % of therated current.
17	EXT-R CC CONT COM	Common for output current control using external resistance.
18	OUT ON/OFF CONT	Output on/off control using external contact input.
19	DCOM	External signal common for pin 18.*1
20	N.C.	Not connected.
21	N.C.	Not connected.
22	N.C.	Not connected.
23	OUT ON STATUS	On when output is on (output through an open-collector photocoupler).*2
24	PWR ON STATUS	On when the power is on (output through an open-collector photocoupler).*2
25	STATUS COM	Status signal common for pins 11, 12, 13, 23, and 24.

*1. During remote sensing, this is the negative electrode (-S) of sensing input. When remote sensing is not being performed, this isconnected to the negative output.
*2. Open collector output: maximum voltage 30 V, maximum current (sink) 8 mA; the status common is floating (isolation voltage or less), it is isolated from the control circuit.

PMX-A Series Specifications

Item/Model			PMX18-2A	PMX18-5A	PMX35-1A	PMX35-3A	PMX70-1A	PMX110-0.6A	PMX250-0.25A	PMX350-0.2A	PMX500-0.1A
AC input											
Nominal input rating			100 Vac *1, 50 Hz / 60 Hz, single phase								
Input voltage range			± 10 %								
Input frequency range			47 Hz to 63 Hz								
Inrush current (MAX) *2			50 Amax or less	60 Amax or less	45 Amax or less	60 Amax or less	65 Amax or less	55 Amax or less	40 Amax or less	55 Amax or less	40 Amax or less
Power (MAX) *3			150 VA	310 VA	150 VA	310 VA	230 VA	210 VA	210 VA	230 VA	170 VA
Output											
Rating	Output voltage		18.00 V	18.00 V	35.00 V	35.00 V	70.00 V	110.0 V	250.0 V	350.0 V	500.0 V
	Output current		2.000 A	5.000 A	1.000 A	3.000 A	1.000 A	0.600 A	0.250 A	0.200A	0.100 A
	Output power		36 W	90 W	35 W	105 W	70 W	66 W	62.5 W	70 W	50 W
Voltage	Setting range		0 V to 18.90 V	0 V to 18.90 V	0 V to 36.75 V	0 V to 36.75 V	0 V to 73.5 V	0 V to 115.5 V	0 V to 262.5 V	0 V to 367.5 V	0 V to 525.0 V
	Setting resolution *4		1 mV				2 mV		10 mV		
	Setting accuracy		± (0.2 % of setting +0.1 % of rating)								
	Line regulation *5		±1 mV	±1 mV	±3 mV	±3 mV	±5 mV	±7 mV	±15 mV	±25 mV	±30 mV
	Load regulation *6		±2 mV	±5 mV	±3 mV	±4 mV	±5 mV	±7 mV	±15 mV	±25 mV	±30 mV
	Transient response *7		50 µs				100 µs				
	Ripple noise (rms) *8		0.5 mV				1 mV	2 mV	3 mV	5 mV	10 mV
	Rise time *9	Rated load	120 ms or less				150 ms or less	120 ms or less	120 ms or less	150 ms or less	120 ms or less
		No load	120 ms or less				150 ms or less	120 ms or less	120 ms or less	150 ms or less	120 ms or less
	Fall time *10	Rated load	50 ms or less				50 ms or less	50 ms or less	50 ms or less	80 ms or less	50 ms or less
		No load	270 ms or less	320 ms or less	270 ms or less	270 ms or less	270 ms or less	120 ms or less	120 ms or less	220 ms or less	60 ms or less
	Maximum remote sensing compensation voltage(single line)		0.6 V				---				
	Temperature coefficient (TYP)		100 ppm / °C								
Current	Setting range		0 A to 2.1 A	0 A to 5.25 A	0 A to 1.05 A	0 A to 3.15 A	0 A to 1.050 A	0 A to 0.630 A	0 A to 0.262 A	0 A to 0.210 A	0 A to 0.105 A
	Setting resolution *4		0.1 mA								
	Setting accuracy		± (0.3 % of setting +0.1 % of rating)								
	Line regulation		±5 mA				±2 mA	±2 mA	±1 mA	±1 mA	±1 mA
	Load regulation		±5 mA				±5 mA	±5 mA	±5 mA	±5 mA	±3 mA
	Ripple noise (rms) *8		1 mA	2 mA	1 mA	1 mA	1 mA				
	Temperature coefficient (TYP)		200 ppm / °C								
Display function											
Voltage display	Maximum display		99.99 (fixed decimal point)					999.9 (fixed decimal point)			
	Display accuracy *11		± (0.5 % of reading +2 digits)								
Current display	Maximum display		9.999 (fixed decimal point)								
	Display accuracy *11		± (1 % of reading +5 digits)								
Operation display	OUTPUT ON / OFF		Output on: OUTPUT LED lights in green. Output off: OUTPUT LED turns off.								
	CV operation		CV LED lights in green.								
	CC operation		CC LED lights in red.								
	Alarm operation		ALARM LED lights in red when a protection function has been activated.								
	Remote operation		REMOTE LED lights in green during remote control.								
		LAN operation	LAN LED lights or blinks depending on the LAN communication status. No fault status: Lights in green.Fault status: Lights in red.Standby status: Lights in orange.WEB identify status: Blinks green.								
	Key lock operation		LOCK LED lights in green when the keys are locked.								
	Preset memory		When a preset memory entry is being used, the PRESET A, B, or C LED lights in green.								
Protection functions											
Overvoltage protection (OVP)		Operation	Turns the output off, displays OVP, and lights ALARM								
		Setting range	1.8 V to 19.8 V	1.8 V to 19.8 V	3.5 V to 38.5 V	3.5 V to 38.5 V	7 V to 77.00 V	11 V to 121.0 V	25 V to 275.0 V	35 V to 385.0 V	50 V to 550.0 V
			10 % to 110 % of the rated output voltage								
		Setting accuracy	± (1 % of rating)								
Overcurrent protection (OCP)		Operation *12	Turns the output off, displays OCP, and lights ALARM								
		Setting range	0.2 A to 2.2 A	0.5 A to 5.5 A	0.1 A to 1.1 A	0.3 A to 3.3 A	0.100 A to 1.100 A	0.060 A to 0.660 A	0.025 A to 0.275 A	0.020 A to 0.220 A	0.010 A to 0.110 A
			10 % to 110 % of the rated output current								
		Setting range	± (1 % of rating)								
Overheat protection (OHP)		Operation	Turns the output off, displays OHP, and lights ALARM								
External Control • Signal output											
Monitor signal output *13, *14	Voltage monitor (VMON)	At rated voltage output	10.00 V ±0.1 V								
		At 0 V output	0.00 V ±0.1 V								
	Current monitor (IMON)	At rated current output	10.00 V ±0.1 V								
		At 0 A output	0.00 V ±0.1 V								
Status signal output *14, *15	OUTON STATUS		Turns on when the output is on								
	CV STATUS		Turns on during CV operation								
	CC STATUS		Turns on during CC operation								
	ALM STATUS		Turns on when an alarm has been activated								
	PWR ON STATUS		Turns on when the power is turned on								
External control *16	EXT-V CV CONT (CV external voltage control)		0 % to 100 % of the rated output voltage in the range of 0 V to 10 V.								
		Accuracy	1 % of rating +10 mV				1 % of rating				
	EXT-R CV CONT (CV external resistance control)		0 % to 100 % of the rated output voltage in the range of 0 Ω to 10 kΩ.								
		Accuracy	1 % of rating +10 mV				1 % of rating				
	EXT-V CC CONT (CV external voltage control)		0 % to 100 % of the rated output current in the range of 0 V to 10 V.								
		Accuracy	1 % of rating +5 mV				1 % of rating				
	EXT-R CC CONT (CV external resistance control)		0 % to 100 % of the rated output current in the range of 0 Ω to 10 kΩ.								
		Accuracy	1 % of rating +5 mV				1 % of rating				
	OUTPUT ON/OFF CONT (Output on/off control)		Possible logic selections: Turn the output on using a LOW (0 V to 0.5 V) or short-circuit, turn the output off using a HIGH (4.5 V to 5 V) or open-circuit. Turn the output on using a HIGH (4.5 V to 5 V) or open-circuit, turn the output off using a LOW (0 V to 0.5 V) or shortcircuit.								

PMX-A Series Specifications

Item/Model		PMX18-2A	PMX18-5A	PMX35-1A	PMX35-3A	PMX70-1A	PMX110-0.6A	PMX250-0.25A	PMX350-0.2A	PMX500-0.1A
Other features										
Preset memory		Save up to 3 combinations of the voltage and current setting value.								
Key lock		Select from the following three modes. Loc1: Locks the operation of all keys except the OUTPUT key and the preset memory A, B, and C keys. Loc2: Locks the operation of all keys except than the OUTPUT key. Loc3: Locks the operation of all keys and the rotary knob.								
Interface										
Common specifications	Software protocol	IEEE Std 488.2-1992								
	Command language	Complies with SCPI Specification 1999.0								
RS232C	Hardware	Complies with the EIA232D specifications D-SUB9 pin connector (male) *17 Baud rate: 19200 bps fixed, Data length: 8 bits, Stop bits: 1 bit, Parity bit: None, No flow control.								
	Program message terminator	LF during reception, LF during transmission								
USB	Hardware	Complies with the USB 2.0 specifications. Baud rate:12 Mbps (full speed). Standard Type B socket								
	Program message terminator	LF or EOM during reception, LF + EOM during transmission								
	Device class	Complies with the USBTMC-USB488 device class specifications								
LAN	Hardware	IEEE 802.3 100Base-TX / 10Base-T Ethernet Complies with LXI Device Core Specification 2011 Rev 1.4								
		IPv4, RJ-45 connector *18								
	Communication protocol	VXI-11, HiSLIP, or SCPI-RAW								
	Program message terminator	VXI-11 and HiSLIP: LF or END during reception, LF + END during transmission SCPI-RAW: LF during reception, LF during transmission								
General specifications										
Weight (main unit only)		Approximately 5 kg (11.02 lbs)	Approximately 6 kg (13.23 lbs)	Approximately 5 kg (11.02 lbs)	Approximately 6 kg (13.23 lbs)	Approximately 6 kg (13.23 lbs)	Approximately 6 kg (13.23 lbs)	Approximately 6 kg (13.23 lbs)	Approximately 6 kg (13.23 lbs)	Approximately 6 kg (13.23 lbs)
Dimensions (mm(inch))(maximum dimensions)		107 (4.21") W×124 (4.88")(150 (5.91")) H×315 (12.40")(355 (13.98")) Dmm								
Environmental conditions	Operating environment	Indoor use, overvoltage category II								
	Operating temperature / Operating humidity	0 °C to +40 °C / 20 %rh to 85 %rh (no condensation) (32 °F to +104 °F)								
	Storage temperature / Storage humidity	−25 °C to +70 °C / 90 %rh or less (no condensation) (-13 °F to +158 °F)								
	Altitude	Up to 2000 m								
Cooling method		Forced air cooling using fan								
Grounding polarity		Negative grounding or positive grounding possible								
Isolation voltage		±70 Vdc				±550 Vdc				
Withstand voltage	Between input and FG	No abnormalities at 1500 Vac for 1 minute								
	Between input and output	No abnormalities at 2100 Vac for 1 minute								
	Between output and FG	No abnormalities at 1600 Vac for 1 minute				No abnormalities at 2000 Vac for 1 minute				
Insulation resistance	Between input and FG	500 Vdc, 30 MΩ or more				1000 Vdc, 30 MΩ or more				
	Between input and output									
	Between output and FG									
Safety *19		Complies with the requirements of the following directive and standard. Low Voltage Directive 2014/35/EU EN 61010-1 (Class I *20, Pollution degree 2)								
Electromagnetic compatibility *19		Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU EN 61326-1 (Class A *21) , EN 55011 (Class A *21, Group 1 *22) , EN 61000-3-2, EN 61000-3-3 Applicable under the following conditions The maximum length of all cabling and wiring connected to the PMX-A must be less than 3 m.								
Accessories		Power cord: 1 pc (Approximately 2.5 m). Packing list: 1 copy. Quick reference: Japanese:1 copy, English: 1 copy, Chinese: 1 copy. Safety precautions: 1 copy. CD-ROM: 1 disc.								

Unless specified otherwise, the specifications are for the following settings and conditions.

- Loads are pure resistive loads.
- The warm-up time is 30 minutes (with current flowing).
- Negative output is connected to the chassis terminal using the short bar.
- Values indicated by “TYP” are typical values. They are not guaranteed performance values.
- Values indicated by “rating” are rated values.
- Values indicated by “setting” are setting values.
- Values indicated by “reading” are readout values.
- Rated load and no load are defined as follows:

In constant-voltage mode (when the output current is set to a value greater than or equal to the maximum output current with rated output voltage)

Rated load: Refers to a resistive load that, when the rated output voltage is applied, makes the flowing current 95 % to 100 % of the maximum output current with rated output voltage.

No load: Refers to a load through which no output current flows. In other words, refers to an open load (no load being connected).

In constant-current mode (when the output voltage is set to a value greater than or equal to the maximum output voltage with rated output current)

Rated load: Refers to a resistive load that, when the rated output current flows, makes the voltage drop to 95 % to 100 % of the maximum output voltage with rated output current.
Including the voltage drop in the load cables, the PMX-A output voltage must not exceed the maximum output voltage with rated output current.

No load: Refers to a resistive load that, when the rated output current flows, makes the voltage drop to 10 % of the maximum output voltage with rated output current or 1 V whichever is higher.

*1. 117 Vac, 200 Vac, 217 Vac and 234 Vac are factory options.
*2. Excludes the charge current component that flows through the capacitor of the internal EMC filter circuit immediately after the POWER switch is turned on (for approximately 1 ms).
*3. With the rated load.
*4. When the output is on, hold down SHIFT and turn the VOLTAGE or CURRENT knob to change the value at 1/10th the resolution of the minimum digit. When the output is off, hold down SHIFT and turn the VOLTAGE or CURRENT knob to change the value at increments of 1 in the minimum digit. If you are setting the value through the communication interface, you can set the value at 1/10th the resolution of the minimum digit, regardless of whether the output is on.
*5. 100 Vac to 90 Vac or 100 Vac to 110 Vac, rated load.
*6. The amount of change that occurs when the load is changed from no load to rated load with rated output voltage.The value is measured at the sensing point.
*7. The amount of time required for the output voltage to return to a value within “rated output voltage ±(0.05 % + 10mV).” When the load current is changed from 10 % to 100 % of the rated output current
*8. When the measurement frequency bandwidth is 5 Hz to 1 MHz.
*9. The time it takes for the output voltage to rise from 10 % to 90 % of the rating when the output is turned on.
*10. The time it takes for the output voltage to fall from 90 % to 10 % of the rating when the output is turned off.
*11. Ambient temperature at 23 °C ±5 °C.
*12. This does not protect against the discharge current peak that is generated from the capacitors inside the PMX-A output section when the load is changed suddenly.
*13. When remote sensing is used, connect the monitor signal's common line to the negative S terminal of the sensing terminal. When remote sensing is not used, connect it to the negative output terminal.
*14. J1 connector on the rear panel.
*15. Photocoupler open collector output; maximum voltage 30 V, maximum current (sink) 8 mA; isolated from the output and control circuits;status commons are floating (isolation voltage or less); and status signals are not mutually isolated.
*16. J1 connector on the rear panel.
*17. Use a cross cable (null modem cable).
*18. Category 5; use a straight cable.
*19. Limited to products that have the CE mark on their panels. Does not apply to specially ordered or modified PMX-As.
*20. This is a Class I equipment. Be sure to ground this product's protective conductor terminal. The safety of this product is only guaranteed when the product is properly grounded.
*21. This is a Class A equipment. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.
*22. This is a Group 1 equipment. This product does not generate and/or use intentionally radio-frequency energy, in the from of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment

Compact Multi-Output DC Power Supply (CV/CC)

PMX-Multi Series

LAN USB RS232C CE LXI

Three models with 2, 3 and 4 outputs. Optimal for R&D as well as manufacturing lines.

The PMX-Multi series is a multi-channel DC power supply with isolated outputs on each channel. The PMX32-3DU (2ch), PMX32-3TR (3ch), and PMX32-2QU (4ch) are all capable of simultaneous output in all channels and come with an output tracking feature. Also, channels 1 & 2 of each model can be easily connected in either series or parallel to increase the output voltage/current at the press of a button. LAN (LXI Compliant), USB, and RS232C are included as standard digital interfaces for easy system integration. The PMX-Multi benefits from a low noise, series regulator design that makes this series the perfect choice for experiments involving transistors, IC circuits, and op amp circuits as well as R&D and production line applications.

Dimensions / Weight

214(8.42″)W×124(4.88″)H×400(15.74″)Dmm(inch) / 13kg(28.66 lbs.)

Accessories

Power cord: 1 pc. Output terminal cover set: 1 set. Packing list: 1 copy. Safety Information: 1 copy. CD-ROM: 1 disc.

Application

- Power supply for tests involving transistors, IC circuits and operational amplifiers
- Integration into semiconductor evaluation test systems
- Power supply for research and development and manufacturing line integration

Features

- All channels with isolated outputs for maximum safety
  High level of safety due to each output being completely isolated
- High setting resolution (Voltage: 1 mV, Current: 0.1 mA)
- Independent ON/OFF configuration for all channels
- Simple series/parallel connection between channels (CH1 & CH2)
- Tracking control in all channels
- ON/OFF delay feature in all channels
- Key lock, Preset memory function (3 slots)
- Simultaneous display of all channels
- Remote sensing function
- High quality LCD panel for improved visibility
- LAN (LXI Compliant)/USB/RS232C standard interface

Easy access with a built-in web server

Use a browser from a PC, smartphone, or tablet to access the web server built into the PMX-Multi series for convenient control and monitoring.

[Recommended browser]

- Requires for the Internet Explorer version 9.0 or later
- Requires for the firefox 8.0 or later
- Requires for the safari / mobile Safari 5.1 or later
- Requires for the Chrome 15.0 or later
- Requires for the Opera 11.0 or later

* Connecting with a smartphone, tablet, etc. requires a Wi-Fi environment (wireless LAN router etc.).

Functions

■ Tracking feature

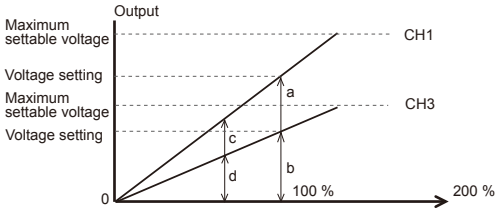
The tracking feature allows the operator to control the ratio for increase/ decrease of output among multiple channels within the power rating. This feature can be used freely among all channels with two ratio options: absolute value variation and variation ratio.

Absolute Value Variation(TRACKING 1)
This mode allows for voltage/current settings in all specified channels to change at the same rate as a selected channel.

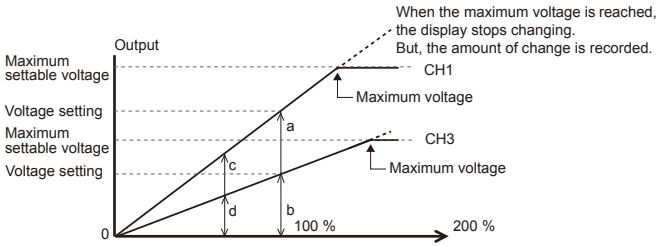
Variation Ratio(TRACKING 2)
This mode allows for voltage/current settings in all specified channels to change in equal proportion to a selected voltage or current rating.
*The variable range is from 0.0% to 200.0%

Example: Here we will use TRACKING 2 on CH1 and CH2 of a PMX32-2QU.
When you turn the rotary knob during tracking operation, the outputs change at the same percentage as the preset output percentage (b/a).
b/a = d/c
This proportional expression is satisfied.

Example when the voltage is changed within the rated output

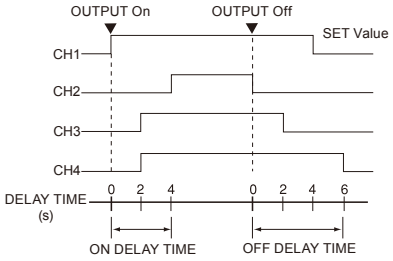


Example when the voltage is changed above the maximum settable output



■ Delay function

The optional setting creates a programmable delay between the OUTPUT switch being activated and the actual output being released. The setting range for DELAY TIME is from 0.1 - 99.9 seconds.



Item	ON DELAY SET value	OFF DELAY SET value
CH1	0 s	4 s
CH2	4 s	0 s
CH3	2 s	2 s
CH4	2 s	6 s

Timing chart of delay function

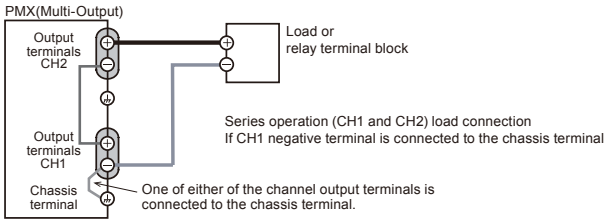
* The actual rise/fall time with output off will vary depending on the output and load conditions. Note that the timing chart above ignores rise and fall time. There are cases where the actual delay time varies by a few tens of milliseconds even when the delay time is set to 0 seconds.

When power supplies are not activated properly, there is the slight risk of damage being caused to the overall system. For this reason ON delay control is a very important feature that is required for power source output. This feature is also necessary when turning output OFF, and is highly convenient for operating circuits.

■ Series and parallel connection at the press of a button

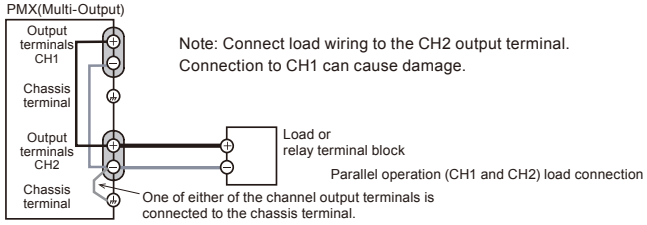
● Series Operation

CH1 and CH2 can be connected in series to increase the overall voltage output range. CH2 operates as master and CH1 as slave. The total output voltage will be the sum of CH1 and CH2.



● Parallel Operation

CH1 and CH2 can beconnected in parallel to increase the overall current range. CH2 operates as master and CH1 as slave.
The total output current will be the sum of CH1 and CH2.



PMX-Multi Series Specifications

Unless specified otherwise, the specifications are for the following settings and conditions.

- Loads are purely resistive loads.
- The product is warmed up for at least 30 minutes.
- The negative output is connected to the chassis terminal with a short bar.
- Values indicated by "TYP" are typical values. These values do not guarantee the performance of the PMX seres (multiple-output).
- rating: Indicates the rated. ● set: Indicates a setting. ● reading: Indicates the readout value.
- Rated load and no load are defined as follows:

In constant-voltage mode (when the output current is set to a value greater than or equal to the maximum output current with rated output voltage)

Rated load: Refers to a resistive load that, when the rated output voltage is applied, makes the flowing current 95 % to 100 % of the maximum output current with rated output voltage.

No load: Refers to a load through which no output current flows. In other words, refers to an open load (no load being connected).

In constant-current mode (when the output voltage is set to a value greater than or equal to the maximum output voltage with rated output current)

Rated load: Refers to a resistive load that, when the rated output current flows, makes the voltage drop to 95 % to 100 % of the maximum output voltage with rated output current. Including the voltage drop in the load cables, the product's output voltage must not exceed the maximum output voltage with rated output current.

No load: Refers to a resistive load that, when the rated output current flows, makes the voltage drop to 10 % of the maximum output voltage with rated output current or 1 V whichever is higher.

Item/Model			PMX32-3DU	PMX32-3TR	PMX32-2QU
AC input					
Nominal input rating			234 Vac *1, 50 Hz/ 60 Hz, single phase		
Input voltage range			± 10 %		
Input frequency range			47 Hz to 63 Hz		
Inrush current (MAX) *2			150 A	150 A	150 A
Power (MAX)			700 VA	900 VA	800 VA
Output					
Rating	Output voltage	CH1	32.000 V	32.000 V	32.000 V
		CH2	32.000 V	32.000 V	32.000 V
		CH3	—	6.000 V	18.000 V
		CH4	—	—	18.000 V
	Output current	CH1	3.000 A	3.000 A	2.000 A
		CH2	3.000 A	3.000 A	2.000 A
		CH3	—	5.000 A	2.500 A
		CH4	—	—	2.500 A
Constant voltage	Maximum voltage setting	CH1	33.600 V	33.600 V	33.600 V
		CH2	33.600 V	33.600 V	33.600 V
		CH3	—	6.300 V	18.900 V
		CH4	—	—	18.900 V
	Resolution		1 mV		
	Voltage setting accuracy *3		±(0.03 % set +5 mV)		
	Input line regulation *4	CH1	3 mV	3 mV	3 mV
		CH2	3 mV	3 mV	3 mV
		CH3	—	1 mV	1 mV
		CH4	—	—	1 mV
	Load regulation *5	CH1	4 mV	4 mV	2 mV
		CH2	4 mV	4 mV	2 mV
		CH3	—	5 mV	3 mV
		CH4	—	—	3 mV
	Transient response *6		50 µs		
	Ripple noise (rms) *7		500 µV		
	Command delay		80 ms		
	Rise time (at rated load) *8		10 ms ±30 %		
	Fall time (at no load) *9	CH1	350 ms ±30 %	350 ms ±30 %	350 ms ±30 %
		CH2	350 ms ±30 %	350 ms ±30 %	350 ms ±30 %
		CH3	—	220 ms ±30 %	240 ms ±30 %
		CH4	—	—	240 ms ±30 %
	Temperature coefficient (TYP)		100 ppm/ °C		
Constant current	Maximum current setting	CH1	3.150 A	3.150 A	2.100 A
		CH2	3.150 A	3.150 A	2.100 A
		CH3	—	5.250 A	2.625 A
		CH4	—	—	2.625 A
	Resolution		0.1 mA		
	Current setting accuracy *3		±(0.3 % set +0.1 % rating)		
	Input line regulation *4		0.01 % + 0.25 mA		
	Load regulation *10		5 mA		
	Ripple noise (rms) *7	CH1	1 mA	1 mA	1 mA
		CH2	1 mA	1 mA	1 mA
		CH3	—	2 mA	1 mA
		CH4	—	—	1 mA
	Temperature coefficient (TYP)		200 ppm/ °C		

*1. 100 Vac, 117 Vac, 200 Vac, and 217 Vac are factory options. (Not CE certified product.)
*2. Excludes the charge current component that flows through the capacitor of the internal EMC filter circuit immediately after the POWER switch is turned on (for approximately 1 ms).
*3. At an ambient temperature of 23 °C±5 °C.
*4. 90 % to 100 % or 100 % to 110 % of the nominal input voltage rating, rated load.
*5. The amount of change that occurs when the load is changed from no load to rated load at the rated output voltage. The value is measured at the sensing point.
*6. The amount of time required for the output voltage to return to a value within "rated output voltage ± (0.05 % + 10 mV)." When the load current is changed from 10 % to 100 % of the rated output current. The value is measured at the sensing point.
*7. When the measurement frequency bandwidth is 5 Hz to 1 MHz.
*8. The time for the output voltage to rise from 10 % to 90 % of the rating when the output is turned on.
*9. The time for the output voltage to fall from 90 % to 10 % of the rating when the output is turned off.
*10. The amount of current change when the load is changed from 10 % of the rated voltage or 1 V,

Item/Model			PMX32-3DU	PMX32-3TR	PMX32-2QU
Display function					
Voltmeter	Maximum display		99.999 (fixed decimal point)		
	Display accuracy *1		±(0.1 % of reading +10 mV)		
Ammeter	Maximum display		9.999 (fixed decimal point)		
	Display accuracy *1		±(0.2 % of reading +5 mA)		
Operation display	OUTPUT ON/OFF		Output on: "ON" display (green) Output off: "OFF" display		
	Output-on delay/ off dela		Displays "DELAY SET" when set. "DELAY" blinks during output-on delay/ off delay. "DELAY" is displayed after the output-on delay/off delay has passed.		
	CV operation		"CV" display (green)		
	CC operation		"CC" display (red)		
	Alarm operation		Displays "ALARM" (red) when a protection function is activated.		
	Memory		Displays "PRESET A," "PRESET B," or "PRESET C" when a memory area is in use.		
	Key lock		Displays "LOCK" when the keys are locked.		
	Tracking		Displays "TRACKING 1" or "TRACKING 2" when tracking is in operation.		
	Remote operation		Displays "REMOTE" during remote control.		
		LAN operation	Displays or blinks "LAN" (depending on the status). • No fault status: Lights green. • Fault status: Lights red. • Standby status: Blinks red. • WEB identify status: Blinks green.		
Protection function					
Overvoltage protection (OVP)	Action		Turns the output off, displays "OVP," and displays "ALARM" (red).		
	Setting range		10 % to 110 % of the rated output voltage		
	Setting accuracy		±(1 % of rating)		
	Resolution		1 mV		
Overcurrent protection (OCP)	Action *2		Turns the output off, displays "OCP," and displays "ALARM" (red).		
	Setting range		10 % to 110 % of the rated output current		
	Setting accuracy		±(1 % of rating)		
	Resolution		0.1 mA		
Overheat protection (OHP)	Action		Turns the output off, displays "OHP," and displays "ALARM" (red).		
Communication monitorring (WATCHDOG)	Action		Turns the output off, displays "WDOG," and displays "ALARM" (red).		
Alarm signal input (ALARM IN)	Action		Turns the output off, displays "IN," and displays "ALARM" (red).		
Signal output					
Status Signal output *3	OUTPUT ON STATUS		On when output is on.		
	ALARM STATUS		On when an alarm is activated (OVP, OCP, OHP, WATCHDOG, ALARM IN).		
	POWER ON STATUS		Turns on when the power is turned on		
Control functions					
External control	Output on/off control (OUTPUT ON/OFF CONT)		Logic selectable: • Negative logic Output on when set to LOW (0 V to 0.5 V) or shorted; output off when set to HIGH (4.5 V or 5 V) or open • Positive logic Output on when set to HIGH (4.5 V to 5 V) or open; output off when set to LOW (0 V or 0.5 V) or shorted		
	Alarm input (ALARM IN)		The output turns off with an alarm signal input (the contact switch shorted for at least 0.5 s).		
Sensing			0.6 V for a single line (but the output terminals are controlled at the rated voltage)		

*1. At an ambient temperature of 23 °C±5 °C.
*2. This does not protect against the discharge current peak that is generated from the capacitors inside the product's output section when the load is changed suddenly.
*3. Photocoupler open collector output; Maximum voltage 30 V, maximum current (sink) 8 mA. Isolated from the output and control circuits. The status common is floating (within the isolation voltage).

PMX-Multi Series Specifications

Item/Model		PMX32-3DU	PMX32-3TR	PMX32-2QU
Parallel operation				
Applicable channels		Master: CH2, slave: CH1		
Constant voltage	Operating range	0 V to 32 V		
	Setting range	0 V to 33.6 V		
	Setting accuracy *1	0.3 % set + 0.1 % rating		
	Resolution	1 mV		
Constant current	Operating range	0 A to 6 A		0 A to 4 A
	Setting range	0 A to 6.3 A		0 A to 4.2 A
	Setting accuracy *1	0.4 % set + 0.1 % rating		
	Resolution	0.2 mA		
Voltmeter	Maximum display	99.999 (fixed decimal point)		
	Display accuracy *1	±(0.5 % of reading + 10 digit)		
Ammeter	Maximum display	9.999 (fixed decimal point)		
	Display accuracy *1	±(1 % of reading + 10 digit)		
Series operation				
Applicable channels		Master: CH2, slave: CH1		
Constant voltage	Operating range	0 V to 64 V		
	Setting range	0 V to 67.2 V		
	Setting accuracy *1 *2	0.3 % set + 0.1 % rating		
	Resolution	2 mV		
Constant current	Operating range	0 A to 3 A		0 A to 2 A
	Setting range	0 A to 3.15 A		0 A to 2.1 A
	Setting accuracy *1	0.4 % set + 0.1 % rating		
	Resolution	0.1 mA		
Voltmeter	Maximum display	99.999 (fixed decimal point)		
	Display accuracy *1 *2	±(0.5 % of reading + 20 digit)		
Ammeter	Maximum display	9.999 (fixed decimal point)		
	Display accuracy *1	±(1 % of reading + 5 digit)		

*1. At an ambient temperature of 23 °C±5 °C.
*2. The value is measured at the sensing point.

Item/Model			PMX32-3DU	PMX32-3TR	PMX32-2QU
Other functions					
Output-on delay/ off delay					
	Applicable channels		All channels		
	Setup		Set the output on/off delay time.		
	Setting range		0.1 s to 99.9 s		
	Resolution		0.1 s		
	Setting accuracy *1		±50 ms		
Memory			Saves three combinations of voltage, current, OVP, OCP, and output-on delay/ off delay settings.		
Key lock			Selectable from the following three modes. • Loc1: Lock all keys except the OUTPUT and memory A, B, and C keys. • Loc2: Lock all keys except the OUTPUT key. • Loc3: Lock all keys and the rotary knob.		
Tracking					
	Applicable channels		All channels		
	Operation mode	Tracking function 1 *2	Absolute value change		
		Tracking function 2 *3	Percentage change		
	Setting accuracy	CV setting accuracy	0.4 % of rating + 40 mV		
		CC setting accuracy	0.7 % of rating + 10 mA		

*1. The difference between the time from when the reference output reaches 5 % of the setting to when the target output reaches 5 % of the setting and the delay time setting.
*2. In tracking function 1, the output can be varied within the output range of the reference channel voltage or current.
*3. In tracking function 2, the output can be varied at the same percentage as the reference output in reference to the output at the start of the tracking function.

Item/Model		PMX32-3DU	PMX32-3TR	PMX32-2QU
Interface				
Common specifications	Software protocol	IEEE Std 488.2-1992		
	Command language	Complies with SCPI Specification 1990.0		
RS232C	Hardware	Complies with the EIA232D specifications (excluding the terminal block) D-sub 9-pin terminal block (male) Baudrate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps Data length: 8 bits, Stop bits: 1 bit, Parity bit: None, Flow control: No		
	Program message terminator	LF during reception, LF during transmission.		
USB	Hardware	Standard type B socket. Complies with the USB 2.0 specifications; data rate: 12 Mbps (full speed)		
	Program message terminator	LF or EOM during reception, LF + EOM during transmission.		
	Device class	Complies with the USBTMC-USB488 device class specifications.		
LAN	Hardware	IEEE 802.3 100Base-TX/10Base-T Ethernet, IPv4, RJ-45 terminal block		
	Compliant standards	LXI Device Specification 2016, LXI HiSLIP Extended Function Rev. 1.0, LXI VXI-11 Extended Function Rev. 1.0		
	Communication protocol	VXI-11, HiSLIP, SCPI-RAW, SCPI-Telnet		
	Message terminator	VXI-11, HiSLIP: LF or END during reception, LF + END during transmission. SCPI-RAW: LF during reception, LF during transmission.		
General specifications				
Environmental conditions	Operating temperature range	0 °C to 40 °C (32 °F to 104 °F)		
	Operating humidity range	20 %rh to 85 %rh (no condensation)		
	Storage temperature range:	-25°C to 70°C (13°F to 158°F)		
	Storage humidity range:	90 %rh or less (no condensation)		
	Installation location	Indoor use, altitude of up to 2 000 m, overvoltage category II		
Isolation voltage	Between channels	±70 Vdc		
	Between the output and chassis	±70 Vdc		
Withstanding voltage	Between the primary circuit and chassis	No abnormalities at 1500 Vac for 1 minute.		
	Between the primary and secondary circuits	No abnormalities at 2600 Vac for 1 minute.		
	Between the secondary circuit and chassis	No abnormalities at 1500 Vdc for 1 minute.		
Insulation resistance	Between the primary circuit and chassis	500 Vdc, 30 MΩ or greater		
	Between the primary and secondary circuits			
	Between the secondary circuit and chassis			
	Between channels			
Cooling method		Forced air cooling using a fan motor		
Common		All channels are independent.		
Grounding polarity		Negative grounding or positive grounding possible		
Electromagnetic compatibility *1 *2		Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU, EN 61326-1(Class A*3), EN 55011(Class A*3, Group 1*4), EN 61000-3-2, EN 61000-3-3 Applicable under the following conditions. The maximum length of all cabling and wiring connected to the product must be less than 3 m.		
Safety *1		Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU*2, EN 61010-1(Class I*5, Pollution Degree 2*6)		

*1. Does not apply to specially ordered or modified products.
*2. Only on models that have the CE marking on the panel.
*3. This product confirms to Class A. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.
*4. This is a Group 1 instrument. This product does not generate and/or use intentionally radio-frequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/analysis purpose.
*5. This product confirms to Class I. Be sure to ground the protective conductor terminal of this product. If not grounded properly, safety is not guaranteed.
*6. Pollution is addition of foreign matter (solid, liquid or gaseous) that may produce a reduction of dielectric strength or surface resistivity. Pollution Degree 2 assumes that only non-conductive pollution will occur

Programmable Bipolar Power Supply (CV/CC)

PBZ Series

LAN OPTION USB GPIB RS232C DRIVERS CE LXI

Dimensions / Weight

429.5(16.91″)W × 128(5.0″)H × 550(21.65″)Dmm / 22kg(48.5 lbs)

Accessories

Power cord: 1 pc., J1 connector (Socket: 1 pc., Protection covers: 2 pairs, Pins: 30 pc.), Heavy object warning label: 1 pc., CD-ROM: 1 pc., Operation manual (Setup guide: 1 pc., Safety information 1pc., Quick reference English 1pc., Japanese 1pc.)

Superior output characteristic by adopting the power amp system

The PBZ series is a bipolar type DC regulated power source that can continuously change both positive and negative polarities passing through 0 without changing the output terminal.
By adopting a "Switching + Linear" system, the PBZ is able to realize 40 % lighter than PBX series while achieving high speed operation with low ripple noise. Since operation covers 4 quadrants, power can be both supplied (source) and absorbed (sink). The PBZ can also drive inductive or capacitive loads. The unit also equips a signal generator function which enables waveform and sequence creation. The PBZ is also capable of synchronized operation which is required for voltage variation tests, and it can also be expanded for large current applications through master-slave parallel operation.

Features

- Waveform generation function
- Low ripple noise
- Synchronized operation function(Trigger-based, Clock-based)
- Sequence function
- Unipolar mode
- Parallel operation function
- High-speed response 100kHz (CV)

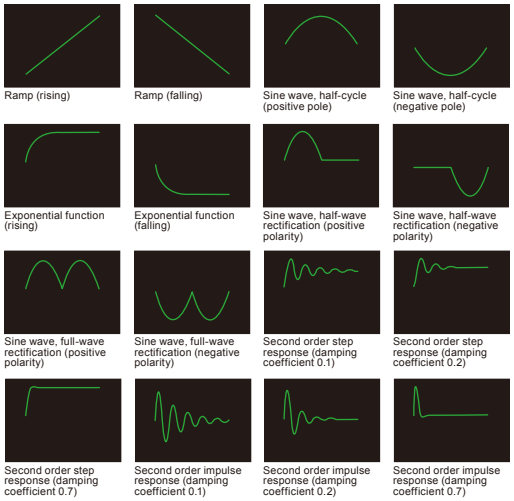
Functions

■ Waveform generation function

In addition to the basic sine, square and triangular waveforms, the PBZ series is equipped with a user-defined waveform generating function that can register up to 16 waveforms. It allows the amplitude, frequency, start phase, frequency sweep and square wave duty to be set as needed.
The 16 user-defined waveforms can be freely edited, and the original created and edited waveforms can be registered and easily recalled for use.
The sequence function allows each waveform to be set as a single step, and a maximum of 1024 steps can be set in the 16 programs.

● 3 basic waveforms

● 16 user-defined waveforms (The waveforms below are registered as defaults.)



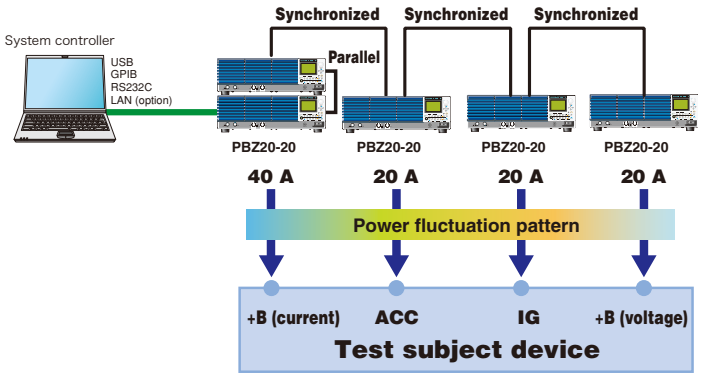
■ Low ripple and noise (in CV mode)

For the Ripple 2 mVrms, Noise 20 mVp-p (PBZ20-20)
4 mVrms, Noise 20 mVp-p (PBZ40-10)
4 mVrms, Noise 30 mVp-p (PBZ60-6.7)
4 mVrms, Noise 30 mVp-p (PBZ80-5)

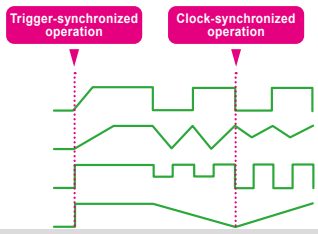
■ Synchronized operation function (Trigger synchronized, Clock synchronization)

This function synchronizes the power output when a sequence is executed using multiple PBZ. It prevents time deviations from occurring even when a long sequence is executed. *A delay of up to 1μs occurs at the start.

● Sample configuration of a voltage fluctuation test system



● Example of combined trigger- and clock-synchronized operation



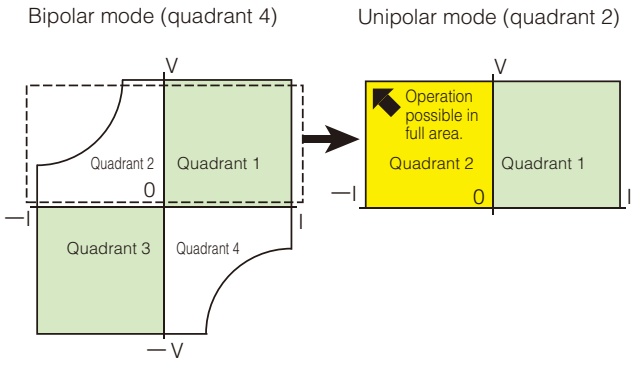
Functions

■ Sequence function

The basic sine, triangular and square waveforms, as well as the 16 user-defined waveforms, can each be set as a sequence step, allowing even complex sequences to be created easily. Sequences are composed of up to 1024 steps. This combination of steps forms a program, and the 1024 steps can be allocated and set in a maximum of 16 programs. When executing sequences, in addition to executing a single program, the script function also allows multiple programs to be combined and executed as needed.
A script is a function that specifies the sequence and number of repetitions for the set programs. A maximum of 50 lines can be set in 1 script for each CV and CC mode.

■ Unipolar mode

This is a function unique to this product. Because the voltage is unipolar, this function is called “unipolar mode”. With unipolar power, although the current flows in a single direction, in unipolar mode it is still possible to apply current in both directions (source and sink). As shown in the diagram, on a graph with perpendicular axes of voltage (vertical) and current (horizontal), operation is possible in quadrant 1 and quadrant 2 (2 quadrants). In bipolar mode, there are power restriction areas (PBZ20-20: 100 W, PBZ40-10: 180 W, PBZ60-6.7, PBZ80-5: 200 W) in quadrants 2 and 4. However in unipolar mode, operation is possible in the full area of quadrant 2.



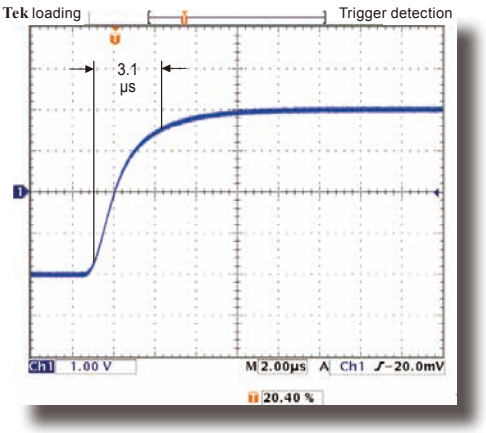
■ Parallel operation function

This function expands the output current. It allows multiple units to be connected in parallel according to the required current. With 2 units of the same model and the optional parallel operation kit, the user can easily complete the setup. Although up to 5 units can be operated in parallel, if 3 or more units will be used, please consult with us.

■ High-speed response

100 kHz frequency characteristic (CV)

The superior waveform quality with rise and fall with times of 3.5 µs which makes it possible to reproduce a variety of waveforms with high precision.



▲ Sample of rising waveform
When response of 3.5 µs is set

Options

■ Vertical stand

VS01

■ Parallel operation kit

PK01-PBZ
PK02-PBZ(EIA)
PK03-PBZ(JIS)

■ M8 terminal connection kit

OP01-PBZ-A

■ Interface board

LAN Interface factory option

It applies to control and monitor the power supply from a browser.

■ Sequence creation software

Wavy for PBZ

ES France - Département Puissance Energie - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 45 - Fax. 01 47 01 16 22 - e-mail: tem@es-france.com - Site Web: www.es-france.com

PBZ Series Specifications

Unless specified otherwise, the specifications are for the following settings and conditions.

- The warm-up time is 30 minutes (with current flowing).
- TYP value: These are typical values that are representative of situations where the PBZ operates in an environment with an ambient temperature of 23 °C. These values do not guarantee the performance of the PBZ.
- rating/CF: The rated voltage or rated current divided by CF (crest factor).
- The polarity of the output voltage and current is defined as follows.
  - Voltage: Using the output's COM terminal as a reference, the voltage is positive (+) when the OUT terminal is positive and negative (-) when the OUT terminal is negative.
  - Current: Positive (+) when current flows out from the OUT terminal and negative (-) when current flows into the OUT terminal.
- The output specifications apply to the rear panel output terminals under the following conditions:
  The short bar is used to connect the output's COM terminal and chassis terminal.
  Remote sensing is not being performed.
  The auxiliary output terminals may not meet the specifications.
- Loads are purely resistive loads.
- Rated loads are defined as follows:
  When the PBZ is generating its rated voltage, the load causes the rated current to flow.
  Or, when the PBZ is generating its rated current, the load makes the voltage drop to the PBZ's rated voltage.

AC input, rated output		PBZ20-20	PBZ40-10	PBZ60-6.7	PBZ80-5
AC input	Nominal input voltage	100 V to 240 V AC, 50/60 Hz			
	Voltage and frequency range	90 V to 250 V AC, 47 Hz to 63 Hz			
	Current	10 A AC or less (at rated load)			
	Inrush current	40 Apeak or less			
	Power	900 VA or less (at rated load)			
	Power factor	0.95 (at input voltage 100 V, rated load) (TYP. value)			
Rated output	Output power	400 W		402 W	400 W
	Output voltage	±20 V	±40 V	±60 V	±80 V
	Output current	±20 A	±10 A	±6.7 A	±5 A
	Voltage to ground	DC 500 V, grounding permitted at COM terminal only			

Constant voltage (CV mode)			PBZ20-20	PBZ40-10	PBZ60-6.7	PBZ80-5
DC voltage	Setting range *1	Bipolar mode	0.000 V to ±21.000 V	0.000 V to ±42.000 V	0.000 V to ±63.000 V	0.000 V to ±84.000 V
		Unipolar mode	0.000 V to 21.000 V	0.000 V to 42.000 V	0.000 V to 63.000 V	0.000 V to 84.000 V
		Fine function	±5 % of rating			
	Setting resolution		0.001 V (Fine function setting resolution 0.0001 V)		0.002 V (Fine function setting resolution 0.0002 V)	
	Setting accuracy *2		±(0.05 % of setting + 0.05 % of rating)			
	Temp. coefficient		±(100 ppm/°C of rating) (TYP. value)			
AC voltage	Setting range *1		0.00 Vpp to 42.00 Vpp	0.0 Vpp to 84.0 Vpp	0.0 Vpp to 126.0 Vpp	0.0 Vpp to 168.0 Vpp
	Setting resolution		0.01 V	0.1 V		
	Setting accuracy *3		±0.5 % of rating			
AC frequency	Setting range		0.01 Hz to 100.00 kHz			
	Setting resolution		0.01 Hz			
	Setting accuracy		±200 ppm			
	Sweep		Linear, log			
	Sweep time		100 µs to 1000 s (resolution 100 µs)			
AC waveform	Type		Sine wave, square wave, triangular wave, user-defined waves (16 waves)			
	Start phase		0 ° to 359 °			
	Square wave duty		0.1 % to 99.9 % (f < 100 Hz), 1 % to 99 % (100 Hz ≤ f < 1 kHz) 10 % to 90 % (1 kHz ≤ f < 10 kHz), 50 % fixed (10 kHz ≤ f)			
Constant voltage characteristic	Frequency characteristic *4		DC to 100 kHz (TYP. value)			
	Response *5, *6		3.5 µs, 10 µs, 35 µs, 100 µs (TYP. value)			
	Overshoot		5 % or less (TYP. value)			
	Ripple Noise	(p-p) *7	20 mV (TYP. value)		30 mV (TYP. value)	
		(rms) *8	2 mV (TYP. value)	4 mV (TYP. value)		
	Load effect *9		±(0.005 % of setting + 1 mV)			
	Source effect *10		±(0.005 % of setting + 1 mV)			

*1. The combination of the DC voltage and AC voltage peak values is limited to within the DC voltage setting range.
*2. At ambient temperature of 18 °C to 28 °C
*3. At ambient temp. 18 °C to 28 °C, 1 kHz sine wave, response 3.5 µs, no load
*4. Frequency at which the amplitude ratio of the output voltage relative to the external signal input voltage is -3 dB (at standard frequency 1 kHz, response 3.5 µs, rated load)
*5. Rise time / fall time (at rated load, excepting output ON/OFF) Frequency characteristic determined by the set response (frequency band = 0.35 / Rise time).
*6. Rise time: When the output voltage is changed from 0 V to the rated voltage, the rise time is the time during which output voltage changes from 10 % to 90 % of the rated voltage.
Fall time: When the output voltage is changed from the rated voltage to 0 V, the fall time is the time during which output voltage changes from 90 % to 10 % of the rated voltage.
*7. Measurement frequency band is 10 Hz to 20 MHz (at the output terminal).
*8. Measurement frequency band is 10 Hz to 1 MHz (at the output terminal).
*9. Change in output voltage (at sensing terminal using remote sensing) in response to a change from 0 % to 100 % of the rated output current
*10. Change in output voltage (at sensing terminal using remote sensing) in response to a ±10 % change from the nominal input voltage

Constant current (CC mode)			PBZ20-20	PBZ40-10	PBZ60-6.7	PBZ80-5
DC current	Setting range *1	Bipolar mode	0.000 A to ±21.000 A	0.000 A to ±10.500 A	0.000 A to ±7.035 A	0.000 A to ±5.250 A
		Unipolar mode				
		Fine function	±5 % of rating			
	Setting resolution		0.001 A (Fine function setting resolution 0.0001 A)			
	Setting accuracy *2		±(0.3 % of rating)			
	Temp. coefficient		±(100 ppm/°C of rating) (TYP. value)			
AC current	Setting range *1		0.00 App to 42.00 App	0.00 App to 21.00 App	0.00 App to 14.07 App	0.00 App to 10.50 App
	Setting resolution		0.01 A			
	Setting accuracy *3		±0.5 % of rating			
AC frequency	Setting range		0.01 Hz to 100.00 kHz			
	Setting resolution		0.01 Hz			
	Setting accuracy		±200 ppm			
	Sweep		Linear, log			
	Sweep time		100 µs to 1000 s (resolution 100 µs)			
AC waveform	Type		Sine wave, square wave, triangular wave, user-defined waves (16 waves)			
	Start phase		0 ° to 359 °			
	Square wave duty		0.1 % to 99.0 % (f < 100 Hz), 1 % to 99 % (100 Hz ≤ f < 1 kHz) 10 % to 90 % (1 kHz ≤ f < 10 kHz), 50 % fixed (10 kHz ≤ f)			
Constant current characteristic	Frequency characteristic *4		DC to 10 kHz (TYP. value)	DC to 5 kHz (TYP. value)	DC to 10 kHz (TYP. value)	
	Response		35 µs, 100 µs, 350 µs, 1 ms (TYP. value)	70 µs, 100 µs, 350 µs, 1 ms (TYP. value)	35 µs, 100 µs, 350 µs, 1 ms (TYP. value)	
	Overshoot		5 % or less (TYP. value)			
	Ripple noise (rms) *7		3 mA (TYP. value)			
	Load effect *8		±(0.01 % of setting + 1 mA)			
	Source effect *9		±(0.01 % of setting + 1 mA)			

*1. The combination of the DC current and AC current peak values is limited to within the DC current setting range.
*2. At ambient temperature of 18 °C to 28 °C
*3. At ambient temp. 18 °C to 28 °C, 100 Hz sine wave, response 35 µs, output short circuited
*4. Frequency at which the ratio of the external signal input amplitude and output current amplitude is -3 dB (at standard frequency 100 Hz, response 35µs, rated load)
The frequency characteristic varies depending on the load impedance.When the load impedance increases, the frequency characteristic declines.
*5. Rise time / fall time (at rated load, excepting output ON/OFF) Rise/fall time varies depending on the load impedance.
*6. Rise time: When the output current is changed from 0 A to the rated current, this is the rise time is the time during which the output current changes from 10 % to 90 % of the rated current.
Fall time: When the output current is changed from the rated current to 0 A, the fall time is the time during which the output current changes from 90 % to 10 % of the rated current.
*7. The measurement frequency band is 10 Hz to 1 MHz (at 10% to 100% of rated output voltage).
*8. Change in the output current in response to a voltage change from 10 % to 100 % of the rated output voltage

Measurement display function			PBZ20-20	PBZ40-10	PBZ60-6.7	PBZ80-5
Voltage measurement	DC	Measurement range (resolution)	120 % of rating (0.001 V)			
		Accuracy *1	±(0.05 % of reading + 0.05 % of rating)			
		Temp. coefficient	±(100 ppm/°C of rating) (TYP. value)			
	AC	Measurement range (resolution)	120 % of rating/CF (0.001 V)			
	DC + AC	Measurement range (resolution)	120 % of rating (0.001 V)			
	AC, DC + AC	Accuracy *1, *2	±(0.5 % of reading + 0.1 % of rating) (5 Hz to 10 kHz)			
			±(1 % of reading + 0.2 % of rating) (10 kHz to 50 kHz)			
			±(2% of reading + 0.2 % of rating) (50 kHz to 100 kHz)			
	PEAK	Measurement range (resolution)	120 % of rating (0.01 V)			
	PEAK	Accuracy *1, *3	±(0.5 % of rating)			
Current measurement	DC	Measurement range (resolution)	120 % of rating (0.001 A)			
		Accuracy *1	±(0.3 % of reading + 0.1 % of rating)			
		Temp. coefficient	±(150 ppm/°C of rating) (TYP. value)			
	AC	Measurement range (resolution)	120 % of rating/CF (0.001 A)			
	DC + AC	Measurement range (resolution)	120 % of rating (0.001 A)			
	AC, DC + AC	Accuracy *1, *2	±(3 % of reading + 0.1 % of rating) (5 Hz to 10 kHz)			
			±(10 % of reading + 1 % of rating) (10 kHz to 100 kHz)			
	PEAK	Measurement range (resolution)	120 % of rating (0.01 A)			
	PEAK	Accuracy *1, *3	±(0.5 % of rating)			
Measurement time			100 µs to 3600 s			

*1. At ambient temperature of 18 °C to 28 °C
*2. When the input signal is a sine wave with a crest factor of 3 or less within the prescribed frequency range and the measurement time is the no more than 10 times the period of the input signal
*3. Peak value of a 1 kHz sine wave

PBZ Series Specifications

Protection functions		PBZ20-20	PBZ40-10	PBZ60-6.7	PBZ80-5
Overvoltage protection	Protection trip *1, *2	OVP or V-LIMIT (output restriction) For OVP, select either output OFF or POWER switch OFF.			
	Setting range (Bipolar mode)	Select whether (-110 % of rtg ≤ -V.LIM ≤ +V.LIM ≤ +110 % of rtg) or (-110 % of rtg ≤ -OVP ≤ -1 % of rtg, +1 % of rtg ≤ +OVP ≤ +110 % of rtg)			
	Setting range (Unipolar mode)	Select whether -1 % of rtg ≤ -V.LIM ≤ +V.LIM ≤ +110 % of rtg or +1 % of rtg ≤ +OVP ≤ +110 % of rtg			
	Setting resolution	0.01 V			
	Setting accuracy	±1 % of rating			
Overcurrent protection	Protection trip *1, *2	OCP or I-LIMIT (output limit). Select whether output or the POWER switch turns off when OCP is activated.			
	Setting range	Select wheter (-110 % of rtg ≤ -I.LIM ≤ -1 % of rtg ≤+1 % of rtg ≤ +I.LIM ≤ +110 % of rtg) or (-110 % of rtg ≤ -OCP ≤ -1 % of rtg ≤+1 % of rtg ≤ +OCP ≤ +110 % of rtg)			
	Setting resolution	0.01 A			
	Setting accuracy	±1 % of rating			
Overheating protection	Protection trip	Turns output off when overheating is detected.			
Power restriction (Sink power)	Bipolar mode	100 W (TYP. value)	180 W (TYP. value)	200 W (TYP. value)	
	Unipolar mode	400 W (TYP. value)		402 W (TYP. value)	400 W (TYP. value)

Control functions		PBZ20-20	PBZ40-10	PBZ60-6.7	PBZ80-5
Internal signal source DC signal control	Control voltage input	Approx 0 V to Approx. ±10.0 V, 0 % to ±100 % of rated output			
	Control voltage ratio input	0 % to ±108 % of rated voltage by changing the voltage ratio of the internal standard voltage, using 10 kΩ external resistance			
Output ON/OFF control input		External contact input for output ON/OFF			
Shutdown input		External contact input for POWER switch OFF			
Status output		CV mode, CC mode, output ON, alarm active			

*1. Voltage is detected at the output terminal.
*2. OVP is enabled even when V-LIMIT (voltage restriction) is selected. OVP operation point is approx. ±(120 % of rtg).

Signal I/O			PBZ20-20	PBZ40-10	PBZ60-6.7	PBZ80-5
External signal input	Amplifier gain	CV mode	-20.00 to +20.00	-40.0 to +40.0	-60.0 to +60.0	-80.0 to +80.0
		CC mode	-20.00 S to +20.00 S	-10.00 S to +10.00 S	-6.70 S to +6.70 S	-5.00 S to +5.00 S
		Setting resolution	0.01 V (CV mode), 0.01 S (CC mode)	0.1 V (CV mode), 0.01 S (CC mode)		
		Setting accuracy *1	±5 % of rating			
	Max. allowable input voltage		±12 Vpeak			
	Input impedance		10 kΩ (TYP. value)			
	Terminal		BNC Safety Socket (Common connects to output COM terminal.)			
Current monitor Output	Output voltage		2 V at rated current			
	Output voltage accuracy		±1 % of rating (TYP. value)			
	Output voltage frequency characteristic		DC to 20 kHz			
	Terminal		BNC Safety Socket (Common connects to output COM terminal.)			
Clock input	Input voltage		0.5 Vpp to 5 Vpp			
	Input impedance		1 kΩ (AC coupled) (TYP. value)			
	Lock frequency range		10 MHz ± 200 Hz			
	Lock time		2 s or less			
	Terminal		Insulated BNC (Common is insulated from chassis: Voltage to ground Max. 42 V peak)			
Clock output	Output voltage		1 Vpp (with 50 Ω terminal) (TYP. value)			
	Output impedance		50 Ω (AC coupled) (TYP. value)			
	Output frequency		10 MHz ± 200 Hz			
	Terminal		BNC (Common connected to chassis.)			
Trigger input	Input level		H level: 2 V to 5 V, L level: 0 V to 0.8 V (TTL compatible)			
	Polarity		H level, L level			
	Pulse width		1 µs or more			
	Delay		1 µs or less			
	Input impedance		10 kΩ (TYP value) (DC coupled)			
	Terminal		BNC (Common connected to chassis.)			
Trigger output	Output level		H level: 2.7 V to 5 V, L level: 0 V to 0.4 V (TTL compatible)			
	Polarity		H level, L level			
	Pulse width		10 µs (TYP. value)			
	Rise/fall time		100 ns or less			
	Fan-out		5 PBZ series units			
	Terminal		BNC (Common connected to chassis.)			

*1. With DC and amplifier gain at maximum

Interface		PBZ20-20	PBZ40-10	PBZ60-6.7	PBZ80-5
Common specifications	Software protocol	IEEEStd 488.2-1992			
	Command language	Conforms to SCPI Specification 1999.0			
RS232C	Hardware	Conforms to EIA232D specifications. D-SUB 9-pin connector (male) *1 Baud rate: 1200, 2400, 4800, 9600, 19200, 38400 bps Data length: 7 bits or 8 bits, Stop bit: 1 bit or 2 bits, No parity Flow control: X-Flow/None			
	Program message terminator	LF when receiving, CR/LF when sending			
GPIB	Hardware	Conforms to IEEEStd 488.2-1987 specifications. SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E1 24-pin connector (receptacle)			
	Program message terminator	LF or EOI when receiving, LF + EOI when sending			
	Primary address	1 to 30			
USB	Hardware	Conforms to USB 2.0 specifications. Communications speed: 12 Mbps (full speed) Socket B type			
	Program message terminator	LF or EOM when receiving, LF + EOM when sending			
	Device class	Conforms to USBTMC-USB488 device class specifications.			
LAN (factory option)	Hardware	IEEE802.3 100Base-TX/10Base-T Ethernet, IPv4, RJ-45 connector *2			
		Complies with the LXI 1.4 Core 2011			
	Communication protocol	VXI-11			
	Program message terminator	LF or END when receiving, LF + END when sending			

*1. For the cable, use a crossing cable (null modem cable).
*2. Use a category 5 straight type.

Other functions		PBZ20-20	PBZ40-10	PBZ60-6.7	PBZ80-5
Sequence function	No. of programs	16			
	No. of steps	Total 1024			
	Step time	100 µs to 1000 H (100 µs step) *1			
Preset memory		3 memories			
Setup memory		10 memories			
Key lock		Select from 1 of 3 levels.			
Remote sensing		Function ON/OFF, used in CV mode			
Operation setting at power ON		Output ON, start sequence function execution			
Soft start / soft stop		Function ON/OFF Soft start/stop time 0.1 ms to 1000 s			
Parallel operation		Max. 2 units of same model (using optional parallel operation kit)			

*1. Step time for DC rump, AC amplitude sweep, or Frequency sweep stops at 1000 s. To set a step time longer than 1000 s for those items,compose several steps every 1000 s.

General specifications		PBZ20-20	PBZ40-10	PBZ60-6.7	PBZ80-5
Environment	Operating environment	Indoor use, overvoltage category II			
	Operating temp./ humidity range	0 to +40 °C / 20 to 85 % RH (no condensation)			
	Storage temp./ humidity range	-25 to +70 °C / Max. 90 % RH (no condensation)			
Grounding polarity		Only the output COM terminal can be grounded.			
Voltage to ground		DC 500 V Max.			
Withstand voltage	Between primary side and chassis	1500 V AC, no abnormalities at 1 minute			
	Between primary side and output terminal				
Insulation resistance	Between primary side and chassis	500 V DC, 30 MΩ or more (at humidity 70 % RH or less)			
	Between primary side and output terminal				
	Between output terminal and chassis	500 V DC, 1 MΩ or less (at humidity 70 % RH or less)			
Ground continuity	Between power cord connector, grounding pin <-> chassis	25 A AC, 0.1 Ω or less			
Cooling method		Forced air cooling by a temperature-sensitive variable-speed fan			
Safety *1		Complies with the requirements of the following directive and standard. Low Voltage Directive 2014/35/EU EN 61010-1 (Class I *2, Pollution degree 2)			
Electromagnetic compatibility (EMC) *1		Complies with the requirements of the following directive and standard. EMC Directive 2014/30/EU EN 61326-1 (Class A *3), EN 55011 (Class A *3, Group 1 *4) EN 61000-3-2, EN 61000-3-3 Applicable under the following conditions The maximum length of all cabling and wiring connected to the PBZ Series must be less than 3 m.			
Dimensions (mm(inch)(muximum)		429.5 (16.91") W × 128 (5.0") (145 (5.7")) H × 550 (21.65") (595(23.4")) D mm			
Weight		Approx. 22 kg (48.50 lbs)			
Accessories		Power cord: 1, J1 connector (Socket: 1, Protective covers: 2, Terminals: 30), Heavy object warning label: 1, Instruction manual: 1			

*1. Cannot be used for special-order or modified products.
*2. This is a Class I equipment. Be sure to ground this product's protective conductor terminal. The safety of this product is only guaranteed when the product is properly grounded.
*3. This is a Class A equipment. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.
*4. This is a Group 1 equipment. This product does not generate and/or use intentionally radio-frequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/analysis purpose.

Inteligent Bipolar Power Supply (CV/CC)

PBZ20-20A

LAN OPTION LXI | USB | GPIB | RS232C | DRIVERS | CE

Ideal for voltage variation testing of automotive electrical components, high power capacitor voltage fluctuation tests and motor evaluation tests!

The PBZ20-20A Intelligent Bipolar Power Supply takes a fresh new look at bipolar power supply design, allowing for peak current up to 6 times that of the rated output. As a result, peak currents exceeding the 20A rating can be easily compensated with a single unit, eliminating the need to connect multiple units in parallel, and greatly cutting costs.

Dimensions / Weight

429.5(16.91″)W × 128(5.0″)H × 550(21.65″)Dmm (inch)/ 22kg(48.5lbs)

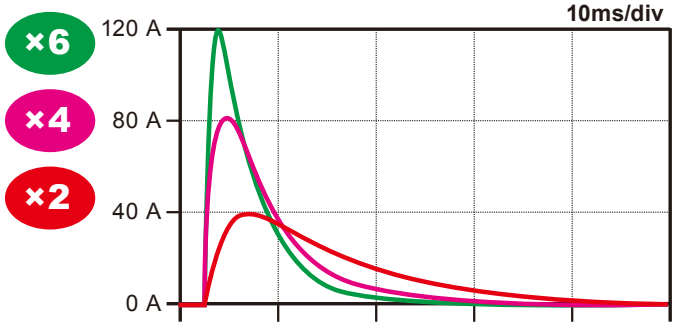
Accessories

Power cord: 1 pc., J1 connector (Socket: 1 pc., Protection covers: 2 pairs, Pins: 30 pc.), Heavy object warning label: 1 pc., CD-ROM: 1 pc., Operation manual (Setup guide: 1 pc., Safety information: 1pc., Quick reference English: 1pc., Japanese: 1pc)

Features

- Peak Current 6x Rating (±120 Apk CV)
- Parallel Operation up to 10 Units (Max 1200 Apk)
  *Please consult if using 11 units or more.
- CV Frequency: 150 kHz DC
- Waveform generation function
- Sequence function
- Synchronized operation function(Trigger-based, Clock-based)
- Unipolar mode
- Low ripple noise(CV mode)

Functions



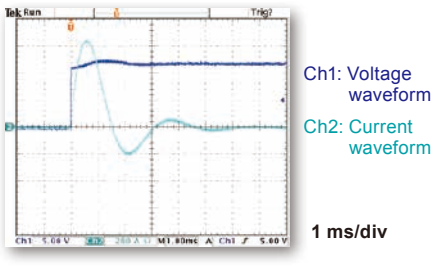
[PBZ20-20A Peak Current]

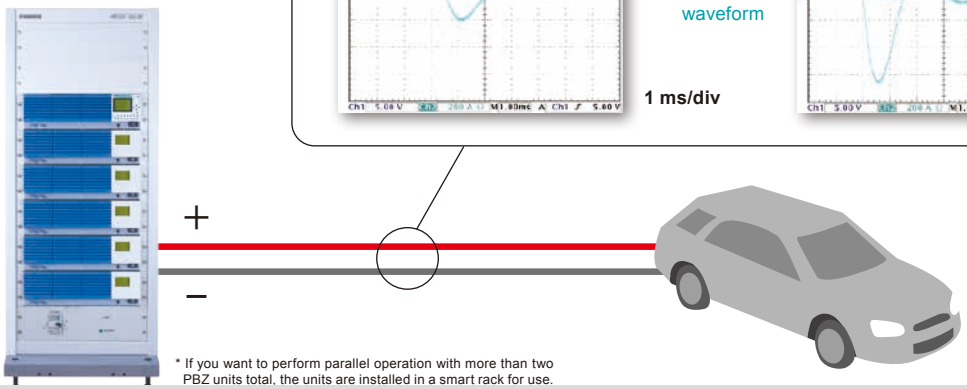
PBZ20-20A
Output Rating: 400 W, ±20 V, ±20 A

The car battery is the primary source of energy for modern-day vehicular components, but factors such as electronic circuit chatter as well as inrush caused by the engine can present various difficulties. Power source disturbances caused by these factors make programming and evaluating power supply fluctuation waveforms an absolute must. The PBZ20-20A Intelligent Bipolar Power Supply has the high speed response to meet the demands of voltage fluctuation tests (Pulse2b, Pulse4, etc.) for international standards such as the ISO16750-2 and ISO7637-2 as well as for the increasingly complicated fluctuation waveform tests requried by automotive manufacturers. The PBZ20-20A is also equipped to easily comply with the steady increase of electronic components per vehicle (high power capacitors, etc.) and total current (esp. peak current) required in modern-day automotive testing.

■ Power variation test

PBZ20-20A 6 parallel
720 A peak compatible
Voltage rising edge/falling edge waveform
Ch1 5 V/div
Ch2 200 A/div





* If you want to perform parallel operation with more than two PBZ units total, the units are installed in a smart rack for use.

ES France - Département Puissance Energie - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 45 - Fax. 01 47 01 16 22 - e-mail: tem@es-france.com - Site Web: www.es-france.com

PBZ20-20A Series Specifications

AC Input			
Nominal input rating			100 Vac to 240 Vac, 50 Hz to 60 Hz
Input voltage range			90 Vac to 250 Vac
Input frequency range			47 Hz to 63 Hz
Current			10 Aac or less (when connected to a rated load)
Inrush current *1			40 Apeak or less
Power			900 VA or less (when connected to a rated load)
Power factor			0.95 TYP (when the input voltage is 100 V and when connected to a rated load)
Leakage current *2			1.75 mA or less (input 100 V 60 Hz)/ 3.5 mA or less (input 200 V 60 Hz)
Rated Output			
Rating	Output power		400 W
	Output voltage		±20 V
	Output current		±20 A
		Peak current *3	±120 Apeak (-17 V < Output terminal voltage < +17 V) (TYP) ±100 Apeak (-20 V ≤ Output terminal voltage ≤ +20 V) (TYP)
	Isolation voltage *4		500 Vdc

*1. 1 ms or more
*2. Leakage current flowing through the protective conductor terminal
*3. Set the peak current output time to 10 ms or more, the repetition interval to 1 s or mode, and the CV or CC mode current responseto 1 ms.
*4. Only the output's COM terminal can be grounded.

CV Mode Output			
DC voltage	Settable range *1	Bipolar mode	0.000 V to ±21.000 V
		Unipolar mode	0.000 V to 21.000 V
		Fine feature	±5 % of rtg
	Resolution		0.001 V (0.0001 V for the fine feature)
	Accuracy *2		± (0.05 % of setting + 0.05 % of rtg)
	Temperature coefficient		±100 ppm/°C of rtg (TYP)
AC voltage	Settable range *1		0.00 Vpp to 42.00 Vpp
	Resolution		0.01 V
	Accuracy *3		±0.5 % of rtg
AC frequency	Settable range		0.01 Hz to 200.00 kHz
	Resolution		0.01 Hz
	Accuracy		±200 ppm
	Sweep		Linear and logarithmic
	Sweep time		100 µs to 1000 s (resolution of 100 µs)
AC waveform	Type		Sine wave, square wave, triangle wave, and 16 user-defined arbitrary waveforms
	Start phase		0 ° to 359 °
	Square wave duty cycle		0.1 % to 99.9 % (f < 100 Hz), 1 % to 99 % (100 Hz ≤ f < 1 kHz), 10 % to 90 % (1 kHz ≤ f < 10 kHz), and fixed to 50 % (10 kHz < f)
Constant voltage characteristics	Frequency response *4		DC to 150 kHz (TYP)
	Response *5 *6		2.3 µs (TYP)/ 3.5 µs max, 6.7 µs (TYP)/ 10 µs max, 23 µs (TYP)/ 35 µs max, 67 µs (TYP)/ 100 µs max
	Overshoot		5 % or less (TYP)
	Ripple noise	(p-p) *7	20 mV (TYP)
		(rms) *8	2 mV (TYP)
	Load effect *9		±(0.005 % of setting + 1 mV)
	Source effect *10		±(0.005 % of setting + 1 mV)

*1. The peak value of the sum of the DC voltage and AC voltage is limited by the DC voltage's settable range.
*2. At an ambient temperature between 18 °C and 28 °C.
*3. At an ambient temperature between 18 °C and 28 °C, with a 1 kHz sine wave, 3.5 µs response, and no load.
*4. A frequency where the amplitude ratio of the output voltage to the external signal input voltage is -3 dB (when the reference frequency is 1 kHz, the response is 3.5 µs, and when a rated load is connected).
*5. The rise or fall time (at rated load; excluding when output is turned on and off). The frequency response is based on the specified response setting (frequency bandwidth = 0.35/the rise time).
*6. Rise time: The time it takes for the output voltage to rise from 10 % to 90 % of the rating when the output voltage is changed from 0 V to the rated voltage.
Fall time: The time it takes for the output voltage to fall from 90 % to 10 % of the rating when the output voltage is changed from the rated voltage to 0 V.
*7. The measurement frequency bandwidth is 10 Hz to 20 MHz (at the output terminals).
*8. The measurement frequency bandwidth is 10 Hz to 1 MHz (at the output terminals).
*9. The change in the output voltage in response to a change in the output current from 0 % to 100 % of the current rating (measured at the sensing terminals when remote sensing is used).
*10. The change in the output voltage in response to a ±10% change in the input voltage in reference to the nominal input voltage (measured at the sensing terminals when remote sensing is used).

CC Mode Output			
DC current	Settable range *1	Bipolar mode and unipolar mode	0.000 A to ±21.000 A
		Fine feature	±5 % of rtg
	Resolution		0.001 A (0.0001 A for the fine feature)
	Accuracy *2		±0.3 % of rtg
	Temperature coefficient		±100 ppm/°C of rtg (TYP)
AC current	Settable range *1		0.00 App to 42.00 App
	Resolution		0.01 A
	Accuracy *3		±0.5 % of rtg
AC frequency	Settable range		0.01 Hz to 200.00 kHz
	Resolution		0.01 Hz
	Accuracy		±200 ppm
	Sweep		Linear and logarithmic
	Sweep time		100 µs to 1000 s (resolution of 100 µs)

CC Mode Output			
AC waveform	Type		Sine wave, square wave, triangle wave, and 16 user-defined arbitrary waveforms
	Start phase		0 ° to 359 °
	Square wave duty cycle		0.1 % to 99.9 % (f < 100 Hz), 1 % to 99 % (100 Hz ≤ f < 1 kHz), 10 % to 90 % (1 kHz ≤ f < 10 kHz), and fixed to 50 % (10 kHz < f)
Constant current characteristics	Frequency response *4		DC to 15 kHz (TYP)
	Response *5 *6		23 µs (TYP)/ 35 µs max, 67 µs (TYP)/ 100 µs max, 230 µs (TYP)/ 350 µs max, 0.67 ms (TYP)/ 1 ms max
	Overshoot		5 % or less (TYP)
	Ripple noise	(rms) *7	3 mA (TYP)
	Load effect *8		±(0.01 % of setting + 1 mA)
	Source effect *9		±(0.01 % of setting + 1 mA)

*1. The peak value of the sum of the DC current and AC current is limited by the DC current's settable range.
*2. At an ambient temperature between 18 °C and 28 °C.
*3. At an ambient temperature between 18 °C and 28 °C, with a 100 Hz sine wave, 35 µs response, and shorted output.
*4. A frequency where the amplitude ratio of the output current to the external signal input voltage is -3 dB (when the reference frequency is 100 Hz, the response is 35 µs, and a rated load is connected). The frequency response changes according to the load impedance. When the load impedance increases, the frequency response decreases.
*5. The rise or fall time (at rated load; excluding when output is turned on and off). The rise and fall times change according to the load impedance.
*6. Rise time: The time it takes for the output current to rise from 10 % to 90 % of the rating when the output current is changed from 0 A to the rated current.
Fall time: The time it takes for the output current to fall from 90 % to 10 % of the rating when the output current is changed from the rated current to 0 A.
*7. The measurement frequency bandwidth is 10 Hz to 1 MHz (when the output voltage is in the range of 10 % to 100 % of the rated output voltage).
*8. The change in the output current in response to a change in the output voltage from 10 % to 100 % of the voltage rating.
*9. The change in the output current in response to a ±10% change in the input voltage in reference to the nominal input voltage (when the output voltage is in the range of 10 % to 100 % of the voltage rating).

Interface	
RS232C	Complies with the EIA232D specifications. D-SUB 9-pin connector (male)*1 Baud rate: 1200, 2400, 4800, 9600, 19200, and 38400 bps Data length: 7 bits or 8 bits. Stop bit: 1 bit or 2 bits. Parity bit: None. Flow control: X-flow or none.
GPIB	Complies with IEEE Std 488.1-1987 SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, and E1. 24-pin connector (receptacle)
USB	Complies with the USB 2.0 specifications. Data rate: 12 Mbps(full speed). Socket B type
LAN (factory option)	IEEE 802.3 100Base-TX/10Base-T Ethernet. Complies with the LXI 1.4 Core 2011 IPv4, RJ-45 connector *2

*1. Use a cross cable (null modem cable).
*2. Category 5; use a straight cable.

General		
Weight		Approx. 22 kg (48.50 lb; just the PBZ)
Dimensions (mm(inch)(muximum))		429.5 (16.91")W × 128 (5.04") (145 (5.71"))H × 550 (21.65") (595 (23.43"))D
Environmental conditions	Operating environment	Indoor use, overvoltage category II
	Operating temperature	0 °C to +40 °C (+32 °F to +104 °F)
	Operating humidity	20 %rh to 85 %rh (no condensation)
	Storage temperature	-25 °C to +70 °C(-13 °F to +158 °F)
	Storage humidity	90 %rh or less (no condensation)
	Altitude	Up to 2000 m
Grounding polarity		Only the output's COM terminal can be grounded.
Isolation voltage		500 Vdc max
Withstand voltage	Across the primary circuit and chassis	No abnormalities at 1500 Vac for 1 minute
	Across the primary circuit and the output terminals	
Insulation resistance	Across the primary circuit and chassis	500 Vdc, 30 MΩ or greater (at 70 %rh humidity or less)
	Across the primary circuit and the output terminals	
	Across the output terminals and chassis	500 Vdc, 1 MΩ or greater (at 70 %rh humidity or less)
Earth continuity	Power cord inlet, across the earth pin and chassis	25 Aac, 0.1 Ω or less
Cooling method		Forced air cooling using variable-speed, heat-sensitive fan
Safety *1		Complies with the requirements of the following standards. Low Voltage Directive 2014/35/EU EN 61010-1 (Class I*2, Pollution degree 2*3)
Electromagnetic compatibility (EMC) *1		Complies with the requirements of the following standard. EMC Directive 2014/30/EU EN 61326-1 (Class A*4) EN 55011 (Class A*3, Group 1*5) EN 61000-3-2 EN 61000-3-3 Applicable condition All of the cables and wires connected to the PBZ are less than 3 m in length.

*1. Does not apply to specially made or modified PBZs.
*2. This is a Class I equipment. Be sure to ground this product's protective conductor terminal. The safety of this product is only guaranteed when the product is properly grounded.
*3. Pollution is addition of foreign matter (solid, liquid or gaseous) that may produce a reduction of dielectric strength or surface resistivity. Pollution Degree 2 assumes that only non-conductive pollution will occur except for an occasional temporary conductivity caused by condensation.
*4. This is a Class A equipment. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.
*5. This is a Group I equipment. This product does not generate and/or use intentionally radio-frequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment

High Power Intelligent Bipolar Power Supply

PBZ SR Series

LAN USB GPIB RS232C DRIVERS CE LXI

High-speed response with even higher power

The PBZ SR series is a series of high-power bipolar DC stabilized power supplies. Based on the PBZ Intelligent Bipolar power supply series, this model supports large currents (up to ±100 A) and is assembled with exclusive rack parts (Smart Rack). 4-quadrant oper ation allows power to be supplied (source) or absorbed (sink), making this series suitable for driving inductive loads or capacitive loads.
Also, LAN, USB, GPIB, and RS232C are provided (standard) as communication interfaces.

Dimensions / Weight

Three parallel: 432.6(17.03″)W × 579.4(22.81″)H × 700(27.56″)Dmm(inch)/ 110kg(242.5lbs)
Four parallel: 432.6(17.03″)W × 712.1(28.04″)H × 700(27.56″)Dmm(inch)/ 130kg(286.6lbs)
Five parallel: 432.6(17.03″)W × 844.8(33.26″)H × 700(27.56″)Dmm(inch)/ 160kg(352.7lbs)

Accessories

J1 connector kit (Socket: 1 pc., Protection covers: 2 pairs, Pins: 30 pc.), Heavy object warning label: 1 pc., CD-ROM: 1 pc., Setup Guide: 1 pc., Quick Reference (Japanese/English): 1 pc., Safety Information: 1 pc.

Features

- User-defined waveform generation function
- Sequence function
- Synchronized operation function
- Central control with master unit utilizing master and slave operation
- Master unit display of total output current of all units (display of combined value) *1
- Safety design that switches all units off when alarm is generated for 1 unit *2
- Guarantee of specifications with Smart Rack (test data standardly included)
- LAN (Capable of LXI), USB, GPIB, and RS232C provided (standard)
- 100 kHz frequency characteristic (CV)

*1 Slave unit displays its own output current.
*2 If the alarm for the master unit is cleared, alarms for all units are cleared.

Three parallel type

Model	Output		Ripple • Noise		Line Regulation		Load Regulation		Input (AC)	
	CV	CC	CV	CC	CV	CC	CV	CC	nominal voltage	Current
	V	A	rms/p-p	rms	mV	mA	mV	mA	V	A
PBZ20-60 SR	±20	±60	3 mV/30 mV(TYP)	5 mA (TYP)	±0.005 %+1	±0.01 %+1	±0.005 %+1	±0.01 %+1	200 to 240, single phase	15 A (max)
PBZ40-30 SR	±40	±30	6 mV/30 mV(TYP)							
PBZ60-20.1 SR	±60	±20.1	6 mV/40 mV(TYP)							
PBZ80-15 SR	±80	±15								

Four parallel type

Model	Output		Ripple • Noise		Line Regulation		Load Regulation		Input (AC)	
	CV	CC	CV	CC	CV	CC	CV	CC	nominal voltage	Current
	V	A	rms/p-p	rms	mV	mA	mV	mA	V	A
PBZ20-80 SR	±20	±80	3 mV/30 mV(TYP)	5 mA (TYP)	±0.005 %+1	±0.01 %+1	±0.005 %+1	±0.01 %+1	200 to 240, single phase	20 A (max)
PBZ40-40 SR	±40	±40	6 mV/30 mV(TYP)							
PBZ60-26.8 SR	±60	±26.8	6 mV/40 mV(TYP)							
PBZ80-20 SR	±80	±20								

Five parallel type

Model	Output		Ripple • Noise		Line Regulation		Load Regulation		Input (AC)	
	CV	CC	CV	CC	CV	CC	CV	CC	nominal voltage	Current
	V	A	rms/p-p	rms	mV	mA	mV	mA	V	A
PBZ20-100 SR	±20	±100	3 mV/30 mV(TYP)	5 mA (TYP)	±0.005 %+1	±0.01 %+1	±0.005 %+1	±0.01 %+1	200 to 240, single phase	25 A (max)
PBZ40-50 SR	±40	±50	6 mV/30 mV(TYP)							
PBZ60-33.5 SR	±60	±33.5	6 mV/40 mV(TYP)							
PBZ80-25 SR	±80	±25								

Ultra-compact AC/DC Power Supply (CV/CF)

PCR-WEA/WEA2 Series

LAN LXI | USB | GPIB OPTION | RS232C | CE | UK CA

NEW

Dimensions / Weight

PCR1000WEA:	430(16.93″)W X 129.2(5.09″)H X 655(25.79″)Dmm/ 16kg(35.27lbs)
PCR2000WEA:	430(16.93″)W X 129.2(5.09″)H X 655(25.79″)Dmm/ 20kg(44.09lbs)
PCR3000WEA2:	430(16.93″)W X 129.2(5.09″)H X 655(25.79″)Dmm/ 23kg(50.71lbs)
PCR6000WEA2R:	430(16.93″)W X 262(10.32″)H X 550(21.65″)Dmm/ 42kg(92.59lbs)
PCR6000WEA2:	430(16.93″)W X 262(10.32″)H X 550(21.65″)Dmm/ 43kg(94.80lbs)
PCR12000WEA2R:	430(16.93″)W X 389(15.32″)H X 550(21.65″)Dmm/ 66kg(145.51lbs)
PCR12000WEA2:	430(16.93″)W X 389(15.32″)H X 550(21.65″)Dmm/ 65kg(143.3lbs)
PCR18000WEA2R:	430(16.93″)W X 690(27.17″)H X 550(21.65″)Dmm/120kg(264.56lbs)
PCR18000WEA2:	430(16.93″)W X 690(27.17″)H X 550(21.65″)Dmm/120kg(264.56lbs)
PCR24000WEA2R:	430(16.93″)W X 690(27.17″)H X 550(21.65″)Dmm/130kg(286.60lbs)
PCR24000WEA2:	430(16.93″)W X 690(27.17″)H X 550(21.65″)Dmm/130kg(286.60lbs)
PCR30000WEA2R:	430(16.93″)W X 944(37.17″)H X 550(21.65″)Dmm/160kg(352.74lbs)
PCR30000WEA2:	430(16.93″)W X 944(37.17″)H X 550(21.65″)Dmm/160kg(352.74lbs)
PCR36000WEA2R:	430(16.93″)W X 944(37.17″)H X 550(21.65″)Dmm/180kg(396.83lbs)
PCR36000WEA2:	430(16.93″)W X 944(37.17″)H X 550(21.65″)Dmm/170kg(374.79lbs)

A new generation of regulated AC-DC power supplies with multiple functions and large capacity in high-density packaging.

The PCR-WEA/WEA2 series is an ultra-compact, high-power density, high-performance PWM inverter type large capacity AC/DC stabilized power supply. The new PCR-WEA/WEA2 Series is the result of specification changes to the PCR-WE/WE2 Series. We've powered-up our products in key areas including output voltage and transient response/response speed to meet our customers' wishes. Automobiles, airplanes, and anechoic chambers... Bringing the high-capacity test environment to a new stage.

Features

- Compact size: 6 kVA in 6U (PCR6000WEA2/PCR6000WEA2R)
- Up to 36 kVA in a single unit
- AC output *1: Single-phase/Single-phase three-wire/Three-phase
- DC output: +/-, 100% of rated power
- Mix-and-match parallel operation up to 144 kVA . Same model set up is not required.*2
- Flexible digital interface: LAN (LXI), USB, RS232C, GPIB (factory option)
- Power line disturbance simulation features
- Sequence function for advanced simulation
- External analog, digital control function (standard)
- Power-saving function
- Output frequency up to 5 kHz
- Output rating: AC 0 to 320 Vrms, DC 0 to ±452 V

*1 For 3kVA or more, the multi-type can switch between single-phase, single-phase 3-wire, and three-phase output (PCR-WEA2).
*2 Parallel operation is possible with a maximum of four units of 6kVA or higher models, and different models can be combined as long as they have the same input voltage.

Accessories

Cable tie, external control (DIGITAL I/O) connector, heavy object warning label, read this first!, quick reference, CD-ROM, safety Information

*Power cord is not included for the PCR-WEA/WEA2 Series. Please purchase the optional accessory separately.

[NOTICE] To users of the PCR-L/LA/LE Series
The PCR-WEA/WEA2 Series is not compatible with the previous product, the PCR-L/LA/LE Series. Consequently, it is not possible to upgrade a system if it includes a prior PCR-L/LA/LE Series in the system. Furthermore, along with this, in principle options cannot be used, with some exceptions. Please be aware of this notice when planning your future system. If you have any other questions, please contact our sales department for details.

Functions

■ Low ripple noise
Low ripple noise performance achieved despite switching inverter.

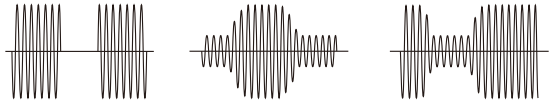
■ Eco function (energy-saving function)
The series is equipped with a sleep mode that reduces overall power consumption after a certain amount of time with no output, as well as an energy saving mode that only draws power from necessary modules resulting in reduced power consumption and cost of operation.

■ Various communication interface options
LAN, USB and RS232C standard digital interface.
GPIB is available as an optional interface board.

■ DC output – 100% of rated power
In addition to AC output, DC output as well as AC+DC output are available for a wide range of industries including R&D in the fields

■ Various measurement functions
Output effective value voltage/current, peak voltage/current, effective power/apparent power and power factor can be measured. Harmonic analysis (up to the 50 th harmonic) of output voltage/current is possible.

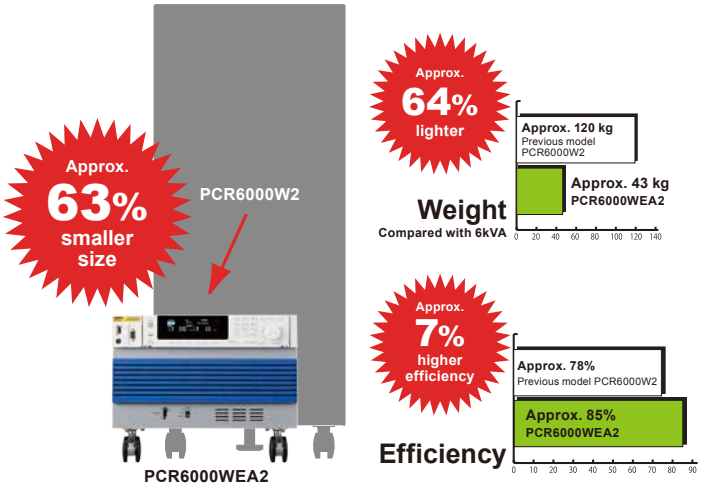
■ Power line abnormality simulation
This feature allows the PCR-WEA/WEA2 series to simulate power line abnormalities simulation including power outtages, voltage dips, and voltage pops. This can be used to test switching power supplies and other electronic equipment.



Functions

■ Compact Size!

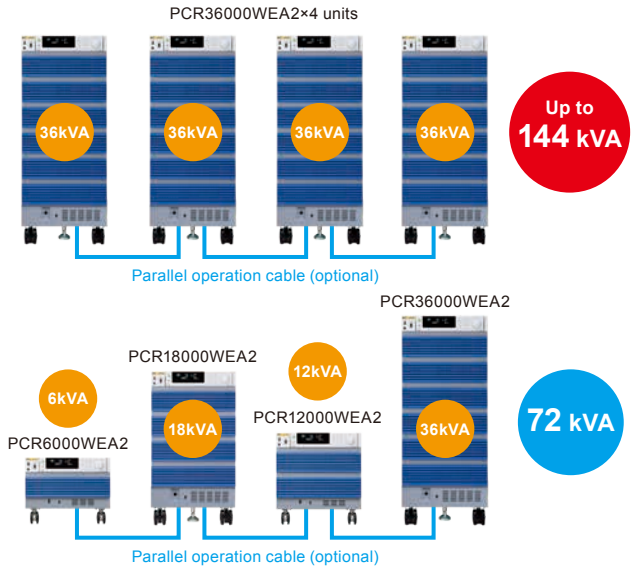
Compared to our previous PWM models, the size of the PCR-WEA has been drastically reduced by 60%. Efficiency has also been increased by approximately 7%, for an overall high efficiency of approximately 85%.



■ Parallel operation function

Parallel operation among all models available up to 144 kVA (maximum 4 units).

*Input voltage must be the same for models 6 kVA and higher



Options

■ Input power cable

AC5.5-1P3M-M6C-3S (For PCR1000WEA/2000WEA(1P2W input))
AC14-1P3M-M6C-3S (For PCR3000WEA2(1P2W input))
AC5.5-1P3M-M5C-4S (For PCR6000WEA2R(3P3W input))
AC5.5-1P3M-M5C-5S (For PCR6000WEA2/PCR12000WEA2(3P4W input))
AC14-1P3M-M5C-4S (For PCR12000WEA2R(3P3W input))
AC22-1P3M-M8C-4S (For PCR18000WEA2R(3P3W input))
AC8-1P3M-M5C-5S (For PCR18000WEA2(3P4W input))
AC38-1P3M-M8C-4S (For PCR24000WEA2R(3P3W input))
AC14-1P3M-M5C-5S (For PCR24000WEA2(3P4W input))
AC60-1P3M-M8C-4S (For PCR30000WEA2R/36000WEA2R(3P3W input))
AC22-1P3M-M5C-5S (For PCR30000WEA2/36000WEA2(3P4W input))

■ Parallel operation cable

PC01-PCR-WE(1 m)

■ Power linkage cable

LC01-PCR-LE(1 m)

■ GPIB interface board

IB07-PCR-WE

■ Base hold angle

OP03-KRC

■ External control connector

OP01-PCR-WE(DIGITAL I/O)
OP02-PCR-WE(ANALOG I/O)

■ Sequence creation software

SD032-PCR-WE(Wavy for PCR-WE)

■ Software for avionics norms

SD012-PCR-LE/WE

■ Quick immunity sequencer

SD009-PCR-LE/WE

■ Rack mount brackets

For PCR1000WEA/2000WEA/3000WEA2
KRB3-TOS (EIA inch rack)
KRB150-TOS (JIS millimeter rack)
For PCR6000WEA2(R)
KRB6 (EIA inch rack)
KRB300 (JIS millimeter rack)
For PCR12000WEA2(R)
KRB9 (EIA inch rack)
KRB400-PCR-LE (JIS millimeter rack)

PCR-WEA/WEA2 Series Specifications

Unless specified otherwise, the specifications are for the following settings and conditions.
● The product is warmed up for at least 30 minutes (with current flowing).
● TYP: These are typical values that are representative of situations where the product operates in an environment with an ambient temperature of 23 °C. They are not guaranteed performance values.
● setting: Indicates a setting. ● reading: Indicates a reading. ● f.s: Indicates full scale.

Item/Model		Single-phase output model			Single-phase/three-phase switchable model					
		PCR 1000WEA	PCR 2000WEA	PCR 3000WEA2	PCR 6000WEA2 / PCR 6000WEA2R	PCR 12000WEA2 / PCR 12000WEA2R	PCR 18000WEA2 / PCR 18000WEA2R	PCR 24000WEA2 / PCR 24000WEA2R	PCR 30000WEA2 / PCR 30000WEA2R	PCR 36000WEA2 / PCR 36000WEA2R
Input (AC rms)										
Voltage (nominal)	1P2W input model	100 Vrms to 120 Vrms, 200 Vrms to 240 Vrms *1			-					
	3P3W input model	-			200 Vrms to 240 Vrms (3 phase line voltage) *PCR-WEA2R models					
	3P4W input model	-			380 Vrms to 480 Vrms (3 phase line voltage) *PCR-WEA2 models					
Voltage (allowable varation range)	1P2W input model	85 Vrms to 132 Vrms, 170 Vrms to 250 Vrms *1			-					
	3P3W input model	-			170 Vrms to 250 Vrms (3 phase line voltage) *PCR-WEA2R models					
	3P4W input model	-			323 Vrms to 519 Vrms (3 phase line voltage) *PCR-WEA2 models					
Nominal input Frequency		50 Hz to 60 Hz								
Input frequency range		45 Hz to 65 Hz								
Apparent power		1.4 kVA or less	2.7 kVA or less	4 kVA or less	7.8 kVA or less	15.6 kVA or less	23.4 kVA or less	31.2 kVA or less	39 kVA or less	46.8 kVA or less
Power factor *2		0.95 (TYP)			0.97 (TYP) 3P3W input model / 0.95 (TYP) 3P4W input model					
Max. current *3	1P2W input model	17 A / 8.5 A	32 A / 16 A	48 A / 24 A	-					
	3P3W input model	-			27 A	53 A	80 A	106 A	133 A	159 A
	3P4W input model	-			14 A	28 A	42 A	56 A	70 A	84 A
Hold-up time for power interruption *2		10 ms								

*1 100 V/200 V input system (auto select) *2 At output voltage 100 V/200 V, rated output current, sine wave, load power factor 1, output frequency 40 Hz to 1 kHz

PCR-WEA/WEA2 Series Specifications

Item/Model		Single-phase output model		Single-phase/three-phase switchable model						
		PCR 1000WEA	PCR 2000WEA	PCR 3000WEA2	PCR 6000WEA2 PCR 6000WEA2R	PCR 12000WEA2 PCR 12000WEA2R	PCR 18000WEA2 PCR 18000WEA2R	PCR 24000WEA2 PCR 24000WEA2R	PCR 30000WEA2 PCR 30000WEA2R	PCR 36000WEA2 PCR 36000WEA2R
Output										
Maximum peak current *11		Maximum current x 4								
Inrush current capacity *3		Maximum current x 3 (0.07 s) *24 Maximum current x 1.4 (0.5 s)			Maximum current x 1.4 (0.5 s)					
Efficiency *10		82 %(TYP)			85 %(TYP)					
AC voltage *1	Rating	160 V / 320V *2								
	Setting range	0 V to 161.0 V / 0 V to 322.0 V								
	Resolution	0.1 V								
	Accuracy *3 *4 (phase voltage)	±(0.3 % of setting + 0.3 V) / ±(0.3 % of setting + 0.6 V)								
	Accuracy *3 *4 (line voltage)	±(0.3 % of setting + 0.3 V) / ±(0.3 % of setting + 0.6 V) *5								
Maximum current *1 *6	Single-phase output	10 A / 5 A	20 A / 10 A	30 A / 15 A	60 A / 30 A	120 A / 60 A	180 A / 90 A	240 A / 120 A	300 A / 150 A	360 A / 180 A
	Single-phase three-wire output, Three-phase output	-		10 A / 5 A	20 A / 10 A	40 A / 20 A	60 A / 30 A	80 A / 40 A	100 A / 50 A	120 A / 60 A
Phase		Single-phase		Single-phase Two-wire, Single-phase Three-wire, and Three-phase Four-wire						
Power capacity	Single-phase output	1 kVA	2 kVA	3 kVA	6 kVA	12 kVA	18 kVA	24 kVA	30 kVA	36 kVA
	Three-phase output	-								
	Single-phase three-wire output			2 kVA	4 kVA	8 kVA	12 kVA	16 kVA	20 kVA	24 kVA
Load power factor		0 to 1 (leading or lagging)								
Frequency	Setting range	1 Hz to 5 kHz *7 (5 kHz -3dB, <40 Hz derating)								
	Resolution	0.01 Hz (1.00 Hz to 100.0 Hz), 0.1 Hz (100.0 Hz to 1000 Hz), 1 Hz (1000 Hz to 5000 Hz)								
	Accuracy *3	±0.01 % , Temperature coefficient : ±0.005 %/°C								
Phase	Resolution	-		0.01°, 0.1° *25 (1 Hz to 500 Hz), 1°(500 Hz to 4 kHz), 2°(4 kHz or more)						
	Accuracy *3	-		Within ±(0.4°+ fo×0.9) *8 fo: frequency [kHz]						
DC voltage	Rating *1	-226 V to +226 V, -452 V to +452 V *2								
	Setting range *1	-227.5 V to +227.5 V, -455.0 V to +455.0 V								
	Resolution	0.1 V								
	Accuracy *9	±(0.05 % of setting + 0.1 V)								
	DC Maximum current *6	10 A / 5 A	20 A / 10 A	30 A / 15 A	60 A / 30 A	120 A / 60 A	180 A / 90 A	240 A / 120 A	300 A / 150 A	360 A / 180 A
	Power capacity	1 kW	2 kW	3 kW	6 kW	12 kW	18 kW	24 kW	30 kW	36 kW
Output voltage stability (phase voltage)										
Line regulation *12		Within ±0.1 %								
Load regulation *13		Within ±0.1 V/±0.2 V (1 Hz to 100 Hz) Within ±0.3 V/±0.6 V (100.1 Hz to 500 Hz) Within ±1 V/±2 V (500.1 Hz to 1 kHz)					Within ±0.2 V/±0.4 V (1 Hz to 100 Hz) Within ±0.3 V/±0.6 V (100.1 Hz to 500 Hz) Within ±1 V/±2 V (500.1 Hz to 1 kHz)			
Variation according to output frequency *14		When the output voltage correction function is enabled: within ±0.3 % (1 Hz to 1 kHz), within ±10 % (1001 Hz to 5 kHz) When the output voltage correction function is disabled: 5 kHz-3dB								
Ripple noise *15		≤ 0.25 Vrms								
Temperature coefficient *16		100ppm/°C (TYP)								
Total harmonic distortion *17		0.3 % or less (1 Hz to 100 Hz), 0.5 % or less (100.1 Hz to 330 Hz), 1.5 %/kHz or less (330.1 Hz to 5 kHz)								
Transient response *18		Response FAST: 40 µs (TYP)								
Response speed Tr/Tf *19		Response FAST: 40 µs (TYP), Response MEDIUM: 100 µs (TYP), Response SLOW: 300 µs (TYP)								
Measurement										
Voltage Rms value	Resolution	0.1 V								
	Accuracy *20	DC, 40 Hz to 999.9 Hz: ±(0.3 % of reading +1 V) 1 kHz to 5 kHz: ±(0.5 % of reading +1 V)								
Current Rms value	Resolution	0.01 A			0.1 A					
	Accuracy *20 *21	45 Hz to 65 Hz: ±(0.3 % of reading + 0.3 % of f.s) DC, 40 Hz to 999.9 Hz: ±(0.6 % of reading + 0.6 % of f.s) 1 kHz to 5 kHz: ±(1.2 % of reading + 1.2 % of f.s)									
Current Peak value	Resolution	0.01 A			0.1 A			1 A		
	Accuracy *20 *22	4 % of f.s								
Active power	Resolution	1 W			10 W					
	Accuracy *20 *21 *23	45 Hz to 65 Hz: ±(0.3 % of reading + 0.3 % of f.s)								
Apparent power	Resolution	1 VA			10 VA					
power factor	Resolution	0.01								
Phase difference	Resolution	0.1°								
Harmonic measurement	Frequency range (fundamental wave)	10 Hz to 1 kHz								
	Upper limit of harmonic analysis	5th to 50th								
	FFT data length	4096								
	Measurement items	Rms voltage and current, phase angle, THD								
Recommended calibration period		1 year								

*1 Output L range, H range
*2 The spec guaranteed voltage range is 1 V to 160 V and 2 V to 320 V(AC).
The spec guaranteed voltage range is 1.4 Vdc to 226 Vdc, 2.8 Vdc to 452 Vdc(DC).
*3 At an ambient temperature of 23 °C±5 °C.
*4 At no load, output frequency 45 Hz to 65 Hz.
*5 At the phase angle of 120° of each phase.
*6 When the output voltage is between 100 Vac and 160 Vac or 200 Vac and 320 Vac, the output current is reduced by the output voltage. When the output frequency is between 1 Hz and 40 Hz, the output current is reduced by the output frequency. The output current is 70 % at 1 Hz.
*7 On the 500 Hz limit model, the frequency is limited to 1 Hz to 500.0 Hz for three-phase output.
*8 Within ±(0.4° + 2.5 µs×360°×fo×103) Example in which angle conversion is performed at a given frequency, within ± 0.5° (at 60 Hz output), within ± 0.8° (at 400 Hz output)
*9 At no load, 23 °C±5 °C.
*10 At output voltage 100 V/200 V, rated output current, sine wave, load power factor 1, output frequency 40 Hz to 1 kHz.
*11 Repeated output is possible when the crest factor is 4.
*12 For input voltage changes within the rated range.
*13 For output current changes within 0 to 100 % of the rating. When the output voltage is between 80 V and 160 V (L range) or 160 V and 320 V (H range) and the load power factor is 1. When the response mode is set to FAST. At the output terminal block. When the compensation function is not used.
*14 Voltage variation over 40 Hz to 5 kHz in AC mode with 55 Hz as the reference. When the output voltage is between 80 V and 160 V (L range) or 160 V and 320 V (H range) and the load power factor is 1. When the response mode is set to FAST. At the output terminal block.
*15 5 Hz to 1 MHz components in DC mode.
*16 For changes within the operating temperature range. At output phase voltage 100 V/200 V, no load.
*17 When the output phase voltage is between 80 V and 160 V or 160 V and 320 V, the load power factor is 1. When the response mode is set to FAST. At the output terminal block.
*18 When the output voltage is 100 V or 200 V, the load power factor is 1, and the output current changes from 0 A to the rated value and from the rated value to 0 A.
*19 At 10 % to 90 % of the output voltage.
*20 At an ambient temperature of 23 °C±5 °C.
*21 At 10 % to 100 % of maximum rated current, sine wave.
*22 Pulse height of sine wave.
*23 At a power factor of 1.
*24 125 Vac/ 250 Vac (output L range/ H range) .
*25 Waveform bank 0 at 1 Hz to 500 Hz

PCR-WEA/WEA2 Series Specifications

Item/Model			Single-phase output model		Single-phase/three-phase switchable model						
			PCR 1000WEA	PCR 2000WEA	PCR 3000WEA2	PCR 6000WEA2 PCR 6000WEA2R	PCR 12000WEA2 PCR 12000WEA2R	PCR 18000WEA2 PCR 18000WEA2R	PCR 24000WEA2 PCR 24000WEA2R	PCR 30000WEA2 PCR 30000WEA2R	PCR 36000WEA2 PCR 36000WEA2R
Output impedance setting											
Resistance component											
L Range		1P	0 Ω to 2000 mΩ	0 Ω to 1000 mΩ	0 Ω to 667 mΩ	0 Ω to 333 mΩ	0 Ω to 167 mΩ	0 Ω to 111 mΩ	0 Ω to 83 mΩ	0 Ω to 67 mΩ	0 Ω to 56 mΩ
		1P3W 3P	-	-	0 Ω to 2000 mΩ	0 Ω to 1000 mΩ	0 Ω to 500 mΩ	0 Ω to 333 mΩ	0 Ω to 250 mΩ	0 Ω to 200 mΩ	0 Ω to 167 mΩ
H Range		1P	0 Ω to 8000 mΩ	0 Ω to 4000 mΩ	0 Ω to 2667 mΩ	0 Ω to 1333 mΩ	0 Ω to 667 mΩ	0 Ω to 444 mΩ	0 Ω to 333 mΩ	0 Ω to 267 mΩ	0 Ω to 222 mΩ
		1P3W 3P	-	-	0 Ω to 8000 mΩ	0 Ω to 4000 mΩ	0 Ω to 2000 mΩ	0 Ω to 1333 mΩ	0 Ω to 1000 mΩ	0 Ω to 800 mΩ	0 Ω to 667 mΩ
Reactance component											
Response: FAST	L Range	1P	40 µH to 2000 µH	20 µH to 1000 µH	13 µH to 667 µH	7 µH to 333 µH	3 µH to 167 µH	2 µH to 111 µH	2 µH to 83 µH	1 µH to 67 µH	1 µH to 56 µH
		1P3W 3P	-	-	40 µH to 2000 µH	20 µH to 1000 µH	10 µH to 500 µH	7 µH to 333 µH	5 µH to 250 µH	4 µH to 200 µH	3 µH to 167 µH
	H Range	1P	160 µH to 8000 µH	80 µH to 4000 µH	53 µH to 2667 µH	27 µH to 1333 µH	13 µH to 667 µH	9 µH to 444 µH	7 µH to 333 µH	5 µH to 267 µH	4 µH to 222 µH
		1P3W 3P	-	-	160 µH to 8000 µH	80 µH to 4000 µH	40 µH to 2000 µH	27 µH to 1333 µH	20 µH to 1000 µH	16 µH to 800 µH	13 µH to 667 µH
Response: MED	L Range	1P	80 µH to 2000 µH	40 µH to 1000 µH	27 µH to 667 µH	13 µH to 333 µH	7 µH to 167 µH	4 µH to 111 µH	3 µH to 83 µH	3 µH to 67 µH	2 µH to 56 µH
		1P3W 3P	-	-	80 µH to 2000 µH	40 µH to 1000 µH	20 µH to 500 µH	13 µH to 333 µH	10 µH to 250 µH	8 µH to 200 µH	7 µH to 167 µH
	H Range	1P	320 µH to 8000 µH	160 µH to 4000 µH	107 µH to 2667 µH	53 µH to 1333 µH	27 µH to 667 µH	18 µH to 444 µH	13 µH to 333 µH	11 µH to 267 µH	9 µH to 222 µH
		1P3W 3P	-	-	320 µH to 8000 µH	160 µH to 4000 µH	80 µH to 2000 µH	53 µH to 1333 µH	40 µH to 1000 µH	32 µH to 800 µH	27 µH to 667 µH
Response: SLOW	L Range	1P	240 µH to 2000 µH	120 µH to 1000 µH	80 µH to 667 µH	40 µH to 333 µH	20 µH to 167 µH	13 µH to 111 µH	10 µH to 83 µH	8 µH to 67 µH	7 µH to 56 µH
		1P3W 3P	-	-	240 µH to 2000 µH	120 µH to 1000 µH	60 µH to 500 µH	40 µH to 333 µH	30 µH to 250 µH	24 µH to 200 µH	20 µH to 167 µH
	H Range	1P	960 µH to 8000 µH	480 µH to 4000 µH	320 µH to 2667 µH	160 µH to 1333 µH	80 µH to 667 µH	53 µH to 444 µH	40 µH to 333 µH	32 µH to 267 µH	27 µH to 222 µH
		1P3W 3P	-	-	960 µH to 8000 µH	480 µH to 4000 µH	240 µH to 2000 µH	160 µH to 1333 µH	120 µH to 1000 µH	96 µH to 800 µH	80 µH to 667 µH
General											
Insulation resistance	Between input and chassis, output and chassis, and input and output		500 Vdc, 10 MΩ or more								
Withstand voltage	Between input and chassis, output and chassis, and input and output		1.5 kVac, 2.15 kVdc for 1 minute								
Electromagnetic compatibility (EMC) *1 *2			Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU, EN 61326-1 (Class A*3), EN 55011 (Class A*3, Group 1*4), EN 61000-3-2*5, EN 61000-3-3*5 Applicable under the following conditions. The maximum length of all cabling and wiring connected to the product must be less than 3 m.			Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU EN 61326-1 (Class A*3), EN 55011 (Class A*3, Group 1*4) Applicable under the following conditions. The maximum length of all cabling and wiring connected to the product must be less than 3 m.				
Safety *1			Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU*2 EN 61010-1 (Class I*6 , Pollution Degree 2*7)								
Environ-mental conditions	Operating environment		Indoor use, overvoltage category II								
	Operating temperature range		0 °C to +50 °C (32 °F to +122 °F)								
	Storage temperature range		-10 °C to +60 °C (14 °F to +140 °F)								
	Operating humidity range		20 %rh to 80 %rh (no condensation).								
	Storage humidity range		90 %rh or less (no condensation).								
	Altitude		Up to 2000 m								
Input terminal			M6			M5		200 V input model: M8	400 V input model: M5		
Output terminals			M6			M5		M6	M8		

*1 Does not apply to specially ordered or modified products.
*2 Only on models that have the CE/UKCA marking on the panel.
*3 This is a Class A instrument. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emis-sions to prevent interference to the reception of radio and television broadcasts.
*4 This is a Group 1 instrument. This product does not generate and/or use intentionally radio-frequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/analysis purpose.
*5 This does not apply to the PCR6000WEA2R.
*6 This product confirms to Class I. Be sure to ground the protective conductor terminal of this product. If not grounded properly, safety is not guaranteed.
*7 Pollution is addition of foreign matter (solid, liquid or gaseous) that may produce a reduction of dielectric strength or surface resistivity. Pollution Degree 2 assumes that only non-conductive pollution will occur except for an occasional temporary con-ductivity caused by condensation.

Limit values and protection functions

			Setting range	Resolution
Voltage protection	Upper AC voltage limit Lower AC voltage limit		0.0 V to 322.0 V	0.1 V
	Upper DC voltage limit Lower DC voltage limit		-455.5 V to 455.5 V	0.1 V
	Output overvoltage protection(OVP)	Rms value	14.0 V to 500.5 V	0.1 V
		Positive peak value	14.0 V to 500.5 V	0.1 V
		Negative peak value	-500.5 V to -14.0 V	0.1 V
	Power module overvoltage protection		Fixed	-
	Output undervoltage protection (UVP)		0.0 V to 500.5 V	0.1 V
Frequency protection	Upper frequency limit Lower frequency limit		1 Hz to 5000 Hz 1 Hz to 500 Hz on the 500Hz LMT model (for three-phase output)	0.01 Hz (1.00 Hz to 100.0 Hz), 0.1 Hz (100.0 Hz to 1000 Hz), 1 Hz (1000 Hz to 5000 Hz)
Current protection	Current limit *1		Maximum output current × 0.1 to maximum output current × 1.1	0.01 A (0.35 A to 100.0 A), 0.1 A (100.0 A to 1000 A)
	Positive peak current limit Negative peak current limit *2		Maximum output current × 0.1 to maximum output current × 4.2	
Overheat protection	Power module overheat protection		Fixed	-
	Fan error		Fixed	-
Overload protection			Rated current or current limit	Current limit resolution
Independent operation detection			Fixed	-
Sensing error detection			±(10 % +10 V) with respect to the output terminal voltage	-

*1 The current that can actually be supplied is 1.1 times the rated current or the current limit, whichever is less.
*2 The current that can actually be supplied is the maximum peak current or the peak current limit, whichever is less.

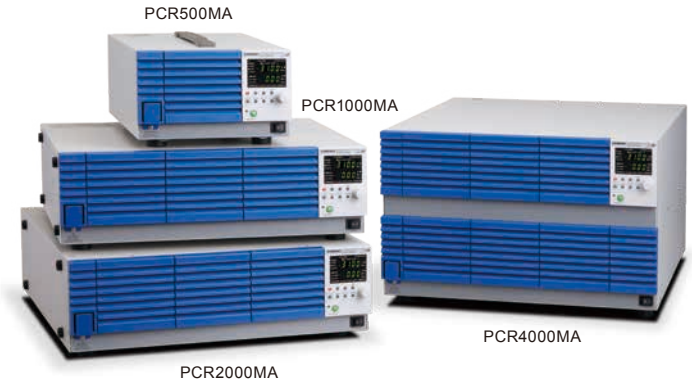
Specifications of the communication interface

USB	Complies with the USB 2.0 specifications; data rate: 480 Mbps (high speed), socket B type, self-powered, Complies with the USBTMC-USB488 device class specifications
LAN	IEEE802.3, 100Base-TX Ethernet LXI 1.4 Core 2011 (Extended Functions: HiSLIP, IPv6), data rate: 100 Mbps (auto negotiation, Full Speed) AUTO MDIX function, IPv4, RJ45 connector, category 5, straight cable
RS232C	Complies with the EIA232D specifications, asynchronous full duplex, D-SUB 9-pin connector (male), crossover cable (null modem) 9600 bps/ 19200 bps/ 38400 bps/ 57600 bps/ 115200 bps

Compact AC Power Supply (CV/CF)

PCR-MA Series

LAN LXI USB GPIB OPTION DRIVERS CE



Compact AC power supply using the PWM inverter method

The PCR-MA AC power supply series is a PWM inverter type (switching) power supply that builds on the success of our conventional model, the PCR-M. Maximum output voltage has been increased to 310Vrms AC while maintaining a compact, portable design. The digital interface now includes LAN (LXI) and USB as standard, with GPIB as a factory option for easy integration into any test system. The LXI compliant LAN interface allows the operator to easily monitor and control the instrument via virtual interface wherever they are. Various features including a remote sensing function have been introduced to ensure precise voltage and current measurements. Other features including DC mode, memory functions, and various protections make the PCR-MA the most accessible AC power supply on the market.

Dimensions / Weight

PCR500MA: 214(8.43″)W×124(4.88″)H×350(13.78″)Dmm(inch)/ 6.5 kg(14.33 lbs)
PCR1000MA: 429(16.89″)W×128(5.04″)H×350(13.78″)Dmm(inch)/ 11 kg(24.25 lbs)
PCR2000MA: 429(16.89″)W×128(5.04″)H×450(17.72″)Dmm(inch)/ 16 kg(35.27 lbs)
PCR4000MA: 429(16.89″)W×262(10.31″)H×520(20.47″)Dmm(inch)/ 32 kg(70.54 lbs)

Accessories

Power cord, Cable tie(1 pc.), Core(1 pc.), Packing List(1 pc.), Quick Reference(Japanese 1 sheet, English 1 sheet), Safety Information(1 copy), CD-ROM(1 disc), Heavy object warning label(1 pc.)(Included only with the PCR4000MA)

Features

■ Compact design (PCR500MA)

Small enough to fit on your work desk!
Only 214 W × 124 H × 350 D mm!
Weighs only 6.5 kg and easy to carry!

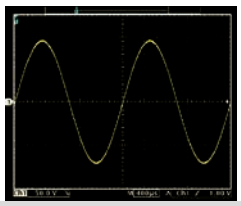
Small and light. Only **6.5** kg (PCR500MA)

Neatly fits on your desk!
(Picture) Left: PCR500MA Right: Electronic Load PLZ164W

Easy to carry with only one hand

■ High-quality output waveform

Output voltage available in two ranges: 0-155 V / 0-310 V. The maximum current is 5 A (155 V range) or 2.5 A (310 V range) with a peak current that can triple the maximum rated current for capacitor input type rectifier loads. The distortion rate of the output waveform is below 0.5% (PCR500MA)



Options

■ GPIB interface board
IB22

■ Analog interface board
EX08-PCR-MA

■ Sequence creation software
Wavy for PCR-M
*Use the PCR-M series compatible mode switching function. (Restrictions apply)

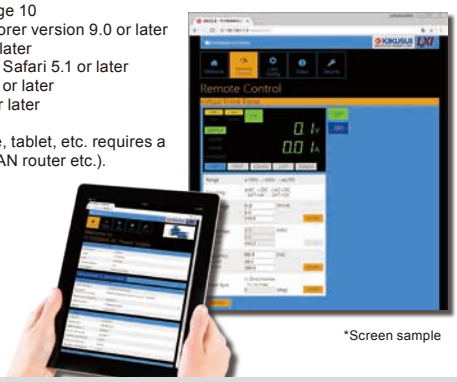
■ Rack-mount frames and brackets
For the PCR500MA
KRA150 (for JIS metric size)
KRA3 (for EIA inch size)
KBP3-2 (Blank panel)
For the PCR1000MA and PCR2000MA
KRB150-TOS (for JIS metric size)
KRB3-TOS (for EIA inch size)
For the PCR4000MA
KRB300 (for JIS metric size)
KRB6 (for EIA inch size)

Easy access with a built-in web server

Use a browser from a PC, smartphone, or tablet to access the web server built into the PCR-MA series for convenient control and monitoring.

[Recommended browser]
- Requires for the Microsoft Edge 10
- Requires for the Internet Explorer version 9.0 or later
- Requires for the firefox 8.0 or later
- Requires for the safari/mobile Safari 5.1 or later
- Requires for the Chrome 15.0 or later
- Requires for the Opera 11.0 or later

* Connecting with a smartphone, tablet, etc. requires a Wi-Fi environment (wireless LAN router etc.).



*Screen sample

Features

■ Versatile output modes

Three modes (AC, DC, AC+DC) are available. *1

The frequency range is up to 500 Hz (setting resolution: 0.1 Hz).

■ Memory feature

Three combinations of setting, voltage, and frequency can be stored and recalled on the front panel. By recalling memory during output, you can test sudden changes in voltage and frequency. Additionally, when using communication commands, the internal memory can store up to 11 settings.

■ Measurement features

Voltage, current, power, apparent power, reactive power, power factor, crest factor and current peak hold can all be measured. *2

■ Various communication interface options

LAN and USB digital interfaces included as standard.

GPIB optional interface board also available.

■ Analog interface

Analog control is also available with an optional analog interface (EX08-PCR-MA). Input DC signals can be used to change output AC voltage and boost the input waveform.

*1: AC+DC mode is only valid with communication command.
*2: You can use the communications interface to measure apparent power (VA), reactive power (VAR), power factor (PF), crest factor (CF), and held current peak.

PCR-MA Series Specifications

■ Specifications of the main unit

Note: “TYP value” indicates a typical value and does not guarantee the performance. "rdng" indicates a reading on the device.

		PCR500MA	PCR1000MA	PCR2000MA	PCR4000MA
Input voltage		Nominal input rating: 100 Vac to 120 Vac/200 Vac to 240 Vac, 50 Hz/60 Hz, single phase			
		Voltage range: 90Vac to 132Vac/180Vac to 264Vac (auto detection at power-on), Single phase, 47 Hz to 63 Hz			
Input current	Input 90 V to 115 V	8 A/6.3 A or less	16 A/12.5 A or less	32 A/25 A or less	64 A/50 A or less
	Input 180 V to 230 V	4 A/3.2 A or less	8 A/6.3 A or less	16 A/12.5 A or less	32 A/25 A or less
Input power factor *1		0.9 (standard value)			
Efficiency		≥ 70 %			
Output voltage		0 V to 155 V/0 V to 310V AC (output 155 V/310 V range)			
		-219 V to +219 V/-438 V to +438 V DC (output 155 V/310 V range)			
Setting Resolution		0.1 V			
Output capacity		AC mode: 500 VA at maximum	AC mode: 1000 VA at maximum	AC mode: 2000 VA at maximum	AC mode: 4000 VA at maximum
		DC mode: 400 W at maximum	DC mode: 800 W at maximum	DC mode: 1600 W at maximum	DC mode: 3200 W at maximum
Maximum current		AC mode: 5 A/2.5 A *2	AC mode: 10 A/5 A *2	AC mode: 20 A/10 A *2	AC mode: 40 A/20 A *2
		DC mode: 4 A/2 A *3	DC mode: 8 A/4 A *3	DC mode: 16 A/8 A *3	DC mode: 32 A/16 A *3
Output frequency		Range: 40.0 Hz to 500.0 Hz, setting: 0.1 Hz, accuracy: ≤ ±2 × 10^{-4}			
Output waveform distortion ratio		≤ 0.5 % (At output voltage 50 V to 155 V/100 V to 310 V, load power factor 1, in AC mode)			
Accuracy of voltmeter		±(0.5 % of reading +0.3 V/0.6 V) (Output voltage greater than 13.5 V/27 V and output frequency 45 Hz to 65 Hz/DC at 23 ± 5 °C)			
Accuracy of ammeter (RMS)		±(0.5 % of reading + 0.02 A/0.01 A)	±(0.5 % of reading + 0.04 A/0.02 A)	±(0.5 % of reading + 0.08 A/0.04 A)	±(0.5 % of reading + 0.16 A/0.08 A)
		(5 % to 100 % of the maximum output current and output frequency 45 Hz to 65 Hz or DC at 23 ± 5 °C)			
Operating temperature and humidity range		0°C to 40°C, 20 % to 80 %rh (no condensation)			
Storage temperature and humidity range		-10°C to 60°C, 0 % to 90 %rh (no condensation)			

*1 At output voltage 100 V/200 V (output 155 V/310 V range), maximum current, load power factor 1.hen the output voltage is 100 V/200 V (in the 135 V/270 V range), the current is maximum, and the load power factor is 1.
*2 At output voltage 1 V to 100 V/2 V to 200 V. Limited by the power capacity at output voltage 100 V to 155 V/200 V to 310 V.
*3 At output voltage 1.4 V to 100 V/2.8 V to 200 V. Limited by the power capacity at output voltage 100 V to 219 V/200 V to 438 V.

■ Specifications of the communication interface

LAN	Complies with IEEE 802.3 100base-TX/10Base-T Ethernet 1.5 LXI Device Specification 2016 RJ-45 connector
USB	Complies with the USB 2.0 specifications; data rate: 480 Mbps (HighSpeed), TypeB socket
GPIB (IB22: optional)	Complies with IEEE Std 488.1-1978 SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E1
Common	Software protocol: IEEE 488.2 STD 1992 Command language: SCPI Specification 1999.0

■ Analog interface specifications (EX08-PCR-MA: optional)

Input terminal	Maximum allowable input voltage		±15 V
	Type		BNC
	Input impedance		10 kΩ ±5 % (unbalanced)
	Isolation voltage		42 Vpk
EXT-AC mode *1	Input voltage range		-10 V to +10 V (DC)
	Voltage amplification rate (155 V/310 V range)		15.5 times, 31 times
	Frequency setting range		40 Hz to 500 Hz
EXT-DC mode	Input voltage range*2	ATT OFF	-2.19 V to +2.19 Vpeak (0 V to 155 Vrms sine wave)
		ATT ON	-10V to +10V (DC)
	Input frequency range	ATT OFF	40 Hz to 500 Hz (sine wave), 40 Hz to 100 Hz (square wave), DC
	Frequency characteristics	ATT OFF	500 Hz -0.3 dB (TYP) 55 Hz as the reference
	Voltage amplification rate (155 V/310 V range)	ATT OFF	100 times, 200 times
		ATT ON	21.9 times, 43.8 times
Waveform distortion ratio*3			≤ main unit specifications +0.5 %

*1 ATT ON at all times *2 Measurable ranges of voltage, current, and power are DC and 40 Hz to 500 Hz. Set the frequency according to the input waveform period.
*3 For DC input in EXT-AC mode and sine wave with 0.1% or less distortion in EXT-DC mode.

■General specifications

Safety *1	Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU*2 EN 61010-1 (Class I*5, Pollution Degree 2*6)
Electromagnetic compatibility *1, *2	Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU EN 61326-1 (Class A*3) EN 55011 (Class A*3, Group 1*4) EN 61000-3-2 EN 61000-3-3 Applicable under the following conditions Load cables are less than 30 m. Other cables connected to the product are all less than 3 m.

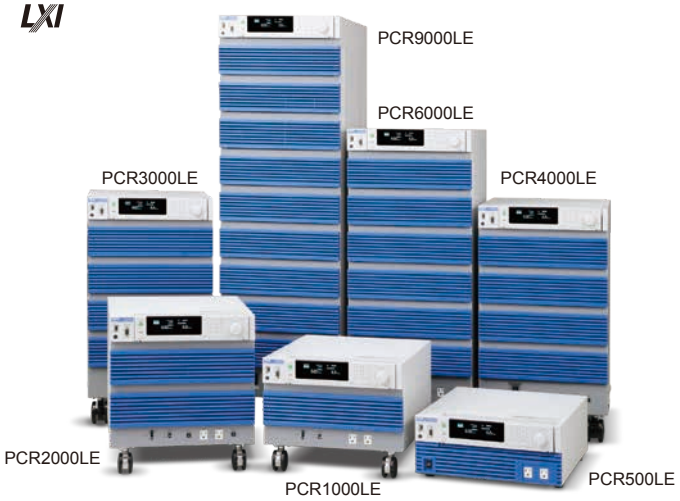
*1 Does not apply to specially ordered or modified products. *2 Only on models that have the CE marking on the panel. *3 This product confirms to Class A. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts. *4 This is a Group 1 instrument. This product does not generate and/or use intentionally radio-frequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/anal-ysis purpose. *5 This product confirms to Class I. Be sure to ground the protective conductor terminal of this product. If not grounded properly, safety is not guaranteed. *6 Pollution is addition of foreign matter (solid, liquid or gaseous) that may produce a reduction of dielectric strength or surface resistivity. Pollution Degree 2 assumes that only

High-performance Multifunctional AC Power Supplies

PCR-LE Series

LAN OPTION USB OPTION GPIB OPTION RS232C DRIVERS CE

LXI



New stage of AC power supply supporting new energy field

The PCR-LE Series is a new line of advanced multifunctional AC power supply that has been developed from the former PCR-L/LA Series (linear amplifier type).
The PCR-LE Series provides high reliability and to support various applications, by taking advantage of the features that can control broadband waveform freely. Moreover, the PCR-LE Series can be configured as a core device of a test system combined with Electonic Loads and Power Analyzers for "Grid Connection Testing" in regard to dispersed power generation, such as Solar Power, Wind Power, Fuel Cell, and Gas Engine referred to as "New Energy Field". With various options, the low frequency immunity test and various power environment tests are supported. The options for parallel operation and three-phase operation enable you to expand a single-phase system up to 27 kVA, single-phase three wires system up to 54 kVA, and a three-phase system up to 81 kVA. The system can be applied to a large-scale EMC site for testing of industrial high-capacity air conditioners.

Dimensions / Weight

PCR500LE : 430(16.93″)W X 173(6.81″)H X 550(21.65″)Dmm / 17kg(37.48 lbs)
PCR1000LE: 430(16.93″)W X 262(10.31″)H X 550(21.65″)Dmm / 35kg(77.16 lbs)
PCR2000LE: 430(16.93″)W X 389(15.31″)H X 550(21.65″)Dmm / 55kg(121.25 lbs)
PCR3000LE: 430(16.93″)W X 690(27.17″)H X 550(21.65″)Dmm / 82kg(180.78 lbs)
PCR4000LE: 430(16.93″)W X 690(27.17″)H X 550(21.65″)Dmm / 96kg(211.64 lbs)
PCR6000LE: 430(16.93″)W X 944(37.17″)H X 550(21.65″)Dmm/140kg(308.65 lbs)
PCR9000LE: 430(16.93″)W X 1325(52.17″)H X 550(21.65″)Dmm /190kg(418.88 lbs)

Accessories

Setup Guide, Quick Reference (1 each for English and Japanese), CD-R(Contains the User's Manual and the Communication Interface Manual), Safety information
PCR500LE : Power cord (with plug, length: 3 m)

[NOTICE] To users of the PCR-L/LA Series

The PCR-LE Series is not compatible with the previous product, the PCR-L/LA Series. Consequently, it is not possible to upgrade a system if it includes a prior PCR-L/LA Series in the system. Further, along with this, in principle options cannot be used, with some exceptions. Please be considered of this notice for your planning of future system.
If you have any other questions, please contact our sales department for details.

Features

- High-quality/high-stability output with a high-speed linear amp
- Capable of various power line abnormality simulations and the sequence operation
- Single phase 500 VA to 9 kVA, supporting the system for the single-phase, and expandable with optional drivers for the single-phase three-wire, and three-phase operation
- Expandable capacity up to 27 kVA (single-phase), 54 kVA (single-phase three-wires), and 81 kVA (three-phase)
- Equipped with various measuring functions
- Features a full range of measuring functions and supports AC, DC, and AC + DC Outputs
- Detachable front panel
- Eco-friendly function equipped

Functions

● Wide range of output. DC output is also supported.

Item	Range
Voltage (AC) *1	1 V to 150 V (L range), 2 V to 300 V (H range)
Frequency	1 Hz to 999.9 Hz *2
Voltage (DC/AC+DC) *1	±1.4 V to ±212 V (L range), ±2.8 V to ±424 V (H range)

*1 : Settings available from 0 V.
*2 : The frequency is limited to the range from 1 Hz to 500.0 Hz when the 3P05-PCR-LE (500 Hz LMT) is installed in the PCR-LE series.

In addition, the system supports a DC output mode and AC + DC output mode. The system can be useful in a wider range of fields such as chemistry- and physics-related areas.

● Selectable response mode

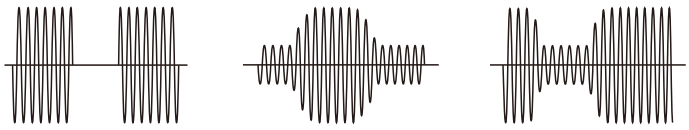
Allows to select a response mode for the internal amplifier system depending on the load condition and application.

Item	Application
High-speed response (FAST) *3	for requesting a rate of power rise/fall
Normal response (MEDIUM)	for testing various power supply environments
Highly stable response (SLOW)	for power supply for EMC testing sites

*3 : Excluding PCR6000LE, PCR9000LE, PCR6000LE2, PCR9000LE2, three phase operation, single phase 3-wire operation and parallel operation

● Power line abnormality simulation

In AC mode, it is possible to simulate the power line abnormalities by setting the output of the PCR-LE series system to the state of a power outage, voltage drop (dip), or voltage increase (pop). This allows the ability to test switching power supplies and electronic equipments.



power outage　voltage increase (pop)　voltage drop (dip)

● Various measuring functions

Output voltage/current RMS values, peak voltage/current, effective power/apparent power, average voltage/current, and power factor can be measured.
It is possible to analyze harmonics (up to 40 th order) of the output current.

PCR-LE/LE2 Series Options

■ Interface
IB05-PCR-LE (GPIB)
LN05-PCR-LE (LAN/LXI)
EX06-PCR-LE (Analog)*2
US05-PCR-LE (USB)
EX05-PCR-LE (Analog)*1

■ Extension cable for control panel(2 m)
EC05-PCR

■ Sequence creation software
SD011-PCR-LE(Wavy for PCR-LE)

■ Software for avionics norms
SD012-PCR-LE/WE

PCR-LE Series Options

■ Input power cable
AC5.5-3P3M-M4C(For PCR1000LE)
AC8-1P3M-M5C-3S(For PCR2000LE)
AC14-1P3M-M8C-3S
(For PCR3000LE/PCR6000LE(1P2W input))
AC22-1P3M-M8C-3S(For PCR4000LE)
AC14-1P3M-M5C-4S
(For PCR6000LE(3P3W input)/PCR9000LE(3P3W input))
AC5.5-1P3M-M5C-5S
(For PCR6000LE(3P4W input)/PCR9000LE(3P4W input))

■ Extension cable for PD05S-PCR-LE
PC01-PCR-LE(130 cm)
(For parallel operation)

■ Connecting cable (for 2P05,3P05)
CC01-PCR-LE (150 cm)
CC02-PCR-LE (280 cm)

■ Power signal cable
CC11-PCR-LE(100 cm)(for parallel operation)

■ Parallel operation driver*3
PD05M-PCR-LE
(For master unit operated in parallel)
PD05S-PCR-LE
(For slave unit operated in parallel)

■ Three-phase output driver
3P05-PCR-LE
3P05-PCR-LE (500 Hz LMT)

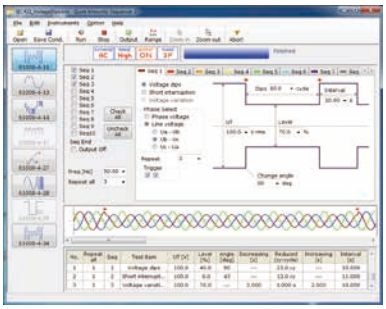
■ Single-phase
Three-wire Output Driver
2P05-PCR-LE

■ Power linkage cable (1 m)
LC01-PCR-LE

■ Quick immunity sequencer
SD009-PCR-LE/WE

"Quick Immunity Sequencer 2" (model name: SD009-PCR-LE/WE)is an application software for immunity testing with the AC power supply PCR-LE series system, based on the power line disturbance standard (IEC61000-4 Series) for the immunity testing of the EMC standard.
Not only can it be used for compliance testing based on the latest standards or for some types of preliminary testing, but the software can be also employed for advance checking in development phases and for immunity margin tests, because it allows extended testing conditions to be set as needed.

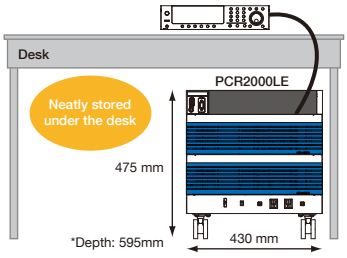
The latest standards for IEC61000-4 supported!



● Front panel serving as a remote control

The front panel is detachable. With the optional extension cable, the panel functions as a remote control.
You can operate the PCR-LE unit installed under your work desk/work bench remotely from the front panel connected with the optional extension cable (EC05-PCR).

[Practical example]



*1 The input waveform is directly amplified and output.
*2 The voltage of the output alternating current can be changed based on the level input DC signal.
*3 PCR500LE and PCR1000LE and PCR6000LE2 and PCR9000LE2 can not be operated in parallel.

PCR-LE Series Specifications

Item/Model		PCR500LE	PCR1000LE	PCR2000LE	PCR3000LE	PCR4000LE	PCR6000LE			PCR9000LE	
Input ratings (AC rms)		1P2W						3P3W 200V	3P4W 400V	3P3W 200V	3P4W 400V
Voltage		85 V to 132 V/170 V to 250 V *1					170 V to 250 V		Line voltage 324 V to 440 V (Phase voltage 187 V to 254 V)	170 V to 250 V	Line voltage 324 V to 440 V (Phase voltage 187 V to 254 V)
Phases		Single phase						Three phase 3-wires	Three phase 4-wires	Three phase 3-wires	Three phase 4-wires
Frequency		47 Hz to 63 Hz									
Apparent power		Approx. 0.93 kVA	Approx. 1.8 kVA	Approx. 3.6 kVA	Approx. 5.5 kVA	Approx. 7.3 kVA	Approx. 10.6 kVA			Approx. 15.7 kVA	
Power factor *2		0.97 (TYP)									
Max. current *1		11.3 A, 5.5 A	22 A, 10.8 A	44 A, 21.5 A	66 A, 32 A	88 A, 43 A	64 A	38 A	21 A	55 A	30 A
AC mode output ratings (AC rms)											
Voltage (output L range, output H range)*3		1 V to 150 V / 2 V to 300 V									
	Resolution	0.1V									
Voltage setting range		0 V to 152.5 V / 0 V to 305.0 V									
Voltage setting accuracy (output L range, output H range) *4		± (0.3 % of set + 0.6V)									
Max. current (output L range, output H range) *5		5 A, 2.5 A	10 A, 5 A	20 A, 10 A	30 A, 15 A	40 A, 20 A	60 A, 30 A			90 A, 45 A	
Phase		Single phase									
Power capacity		500 VA	1 kVA	2 kVA	3 kVA	4 kVA	6 kVA			9 kVA	
Maximum peak current *6		Max. current (rms) × 4 (TYP)									
Max. reverse current *7		30 % of the max. current (rms)									
Load power factor		0 to 1 (leading or lagging) *5									
Frequency *5		1 Hz to 999.9 Hz									
	Resolution	0.01 Hz (1.00 Hz to 100.0 Hz), 0.1 Hz (100.0 Hz to 999.9 Hz)									
DC mode output ratings											
Voltage (output L range, output H range)*3		±1.4 V to ±212 V/±2.8 V to ±424 V									
	Resolution	0.1 V									
Voltage setting range		-215.5 V to +215.5 V / -431.0 V to +431.0 V									
Voltage setting accuracy (output L range, output H range) *8		±(0.05 % of set + 0.05/0.1 V)									
Max. current (output L range, output H range) *9		3.5 A, 1.75 A	7 A, 3.5 A	14 A, 7 A	21 A, 10.5 A	28 A, 14 A	42 A, 21 A			63 A, 31.5 A	
Max. instantaneous current *10		Max. current (rms) × 3.6									
Power capacity		350 W	700 W	1.4 kW	2.1 kW	2.8 kW	4.2 kW			6.3 kW	
Output voltage stability											
Line regulation *11		Within ±0.1 %									
Load regulation (output L range, output H range)*12		Within ±0.1 V, within ±0.2 V									
Output frequency variation *13	FAST	Within ±0.2 %					–				
	MEDIUM	Within ±0.3 %									
Ripple noise in DC mode (5 Hz to 1 MHz components)		0.15 Vrms or less			0.2 Vrms or less		0.25 Vrms or less				
Ambient temperature variation *14		100 ppm/°C (TYP)									
Output frequency stability, output voltage waveform distortion ratio, output voltage response speed, efficiency											
Output frequency stability *15		Within $\pm5\times10^{-5}$									
	Setting accuracy	$\pm1\times10^{-4}$									
Output voltage waveform distortion ratio *16	FAST	±0.2 % or less					–				
	MEDIUM	±0.3 % or less									
Output voltage response speed *17	FAST	20 µs (TYP)					–				
	MEDIUM	30 µs (TYP)									
Efficiency *18		54 % or more, 56 % or more	55 % or more, 57 % or more				58 % or more				
Meters (fluorescent display)											
Voltmeter *19	Resolution	0.1V									
	Accuracy	± (1 % of rdng + 2 digits) (10 V to 424 V and at room temperature)									
Ammeter *19	Resolution	0.01 A				0.1 A					
	Accuracy	± (1 % of rdng + 2 digits) (5 % of the max. rated current to max. rated current and at room temperature)									
Wattmeter *20	Resolution	0.1 W/1 W				1 W					
	Accuracy	± (1 % of rdng +3 digits) (10 % of the rated power capacity to the rated power capacity, when the load power factor is 1, and at room temperature.)									
BNC terminals											
SEQ TRIG OUT *21		Pulse width approx. 10µs, open collector output, pullup at +5 V and approx. 10 kΩ serial resistance approx. 220 Ω, maximum sink current 10 mA, BNC connector									
SEQ STAT OUT *21		Step time output, open collector output, pullup at +5 V and approx. 10 kΩ serial resistance approx. 220 Ω, maximum sink current 10 mA, BNC connector									
SEQ TRIG IN *21		Operating pulse width 10µs or greater, photo-coupler input, driving voltage 5 V, serial resistance approx. 470 Ω, active with 7 mA source, BNC connector									

*1 100 V input type or 200 V input type
*2 When the input voltage is 100 V or 200 V, the output voltage is 100 V or 200 V, the output current is the rated value, the load power factor is 1, and the output frequency is between 40 Hz and 999.9 Hz.
*3 L/H range can be changed by means of a switch on the front panel.
*4 When the output frequency is between 45 Hz and 65 Hz, with no load, and at room temperature.
*5 When the maximum voltage is between 1 V and 100 V (L range) or 2 V and 200 V (H range) and the load power factor is between 0.8 and 1.
When the output voltage is between 100 V and 150 V (L range) or 200 V and 300 V (H range), the output current is reduced by the output voltage.
When the load power factor is between 0 and 0.8, the output current is reduced by the load power factor.
When the output frequency is between 1 Hz and 40 Hz, the output current is reduced by the output frequency.
*6 For capacitor-input rectifier loads (however, this is limited by the rated output current's rms value).
*7 When the output voltage is 100 V or 200 V and the output frequency is between 40 Hz and 999.9 Hz (reverse current is -180 deg out of phase with the output voltage).
*8 With no load at room temperature
*9 When the output voltage is between 100 V and 212 V (L range) or 200 V and 424 V (H range), the output current is reduced by the output voltage.
*10 Limited by the rated output current's rms value
*12 With respect to 0 % to 100 % changes in the rating
When the output voltage is between 80 V and 150 V (L range) or 160 V and 300 V (H range) and the load power factor is 1. At the output terminal block. When the response mode is set to FAST or MEDIUM.
*13 Between 40 Hz and 999.9 Hz.
When the output voltage is between 80 V and 150 V (L range) or 160 V and 300 V (H range) and the load power factor is 1. This is the output line regulation with 200 Hz as the reference.
*14 With respect to changes in the rated range
When the output voltage range is 100 V or 200 V and the output current is 0 A.
*15 With respect to changes in all rated ranges
*16 When the output voltage is between 80 V and 150 V (L range) or 160 V and 300 V (H range) and the load power factor is 1.
*17 When the output voltage is 100 V or 200 V, the load power factor is 1, and the output current changes from 0 A to the rated value and from the rated value to 0 A.
*18 When the input voltage is 100 V or 200 V, the output voltage is 100 V or 200 V, the output current is the rated value, the load power factor is 1, and the output frequency is between 40 Hz and 999.9 Hz.
*19 With the true rms display, a waveform with a crest factor of 3 or less, DC, output frequency between 40 Hz and 999.9 Hz, RMS, and AVE.
*20 When the output frequency is between 45 Hz and 65 Hz.
*21 Although signals are insulated with output terminals, each signal is common. Logic setting is also

PCR-LE Series Specifications

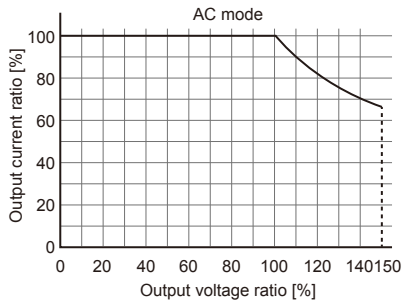
Item/Model		PCR500LE	PCR1000LE	PCR2000LE	PCR3000LE	PCR4000LE	PCR6000LE			PCR9000LE	
General		1P2W					3P3W 200V		3P4W 400V	3P3W 200V	3P4W 400V
Insulation resistance	Between input and chassis, output and chassis, and input and output	500 Vdc, 30 MΩ or more			500 Vdc, 10 MΩ or more						
Withstand voltage	Between input and chassis, output and chassis, and input and output	1.5 kVAC for 1 minute									
Circuit method		Linear amplifier system									
Environmental conditions	Operating environment	Indoor use, overvoltage category II									
	Operating temperature range	0 °C to +50 °C									
	Storage temperature range	-10 °C to +60 °C									
	Operating humidity range	20 % rh to 80 % rh (no condensation)									
	Storage humidity range	90 % rh or less (no condensation)									
	Altitude	Up to 2000 m									
Weight		Approx.17 kg (37.48 lbs)	Approx. 35 kg (77.16 lbs)	Approx. 55 kg (121.25 lbs)	Approx. 82 kg (180.78 lbs)	Approx. 96 kg (211.64 lbs)	Approx. 140 kg (308.65 lbs)			Approx. 190 kg (418.88 lbs)	
Input terminal		Inlet	M4	M5	M8	M8	M8	M5	M5	M5	M5
Output terminal		M4	M4	M4	M5	M5	M8	M8	M8	M8	M8
Accessories	Power cord	1 pc. With plug Length: 3 m	–								
	Setup guide	1 copy									
	CD-ROM (User's manual)	1 disc									
	Quick Reference	1 each for English and Japanese									
	Safety information	1 copy									
Electromagnetic compatibility (EMC) *1, 2		Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU EN 61326-1 (Class A *3), EN 55011 (Class A *3, Group 1 *4), EN 61000-3-2 *5, EN61000-3-3 *5 The maximum length of all cables and wires connected to the PCR-LE Series must be less than 3 m.									
Safety		Complies with the requirements of the following directive and standard. Low Voltage Directive 2014/35/EU *2 EN 61010-1 Class I *6, Pollution Degree 2									

*1 Does not apply to specially ordered or modified PCR-LEs.
*2 Only on models that have the CE marking on the panel.
*3 This is a Class A equipment. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.
*4 This is a Group 1 equipment. This product does not generate and/or use intentionally radio-frequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/analysis purpose.
*5 Excluding PCR3000LE, PCR4000LE, PCR6000LE and PCR9000LE.
*6 This is a Class I equipment. Be sure to ground this product's protective conductor terminal. The safety of this product is only guaranteed when the product is properly grounded.

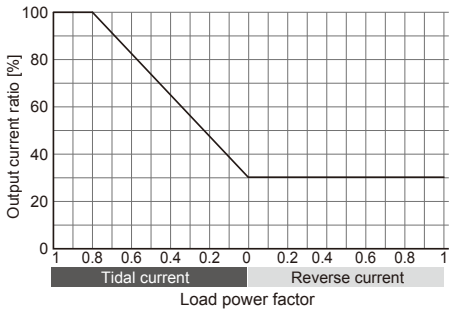
■ Output voltage ratio versus rated output current characteristics

The output voltage ratio is a percentage where 100 % represents an output voltage of 100 V (output L range) or 200 V (output H range) in AC mode or DC mode.
The output current ratio is a percentage where 100 % represents the maximum rated output current in AC mode or DC mode.

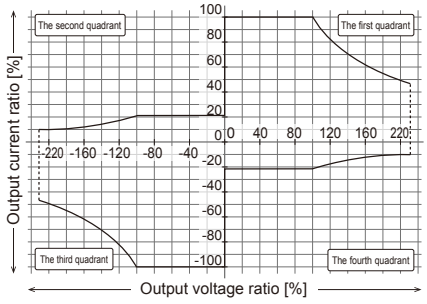
■ Output voltage ratio versus rated output current characteristics (AC mode)



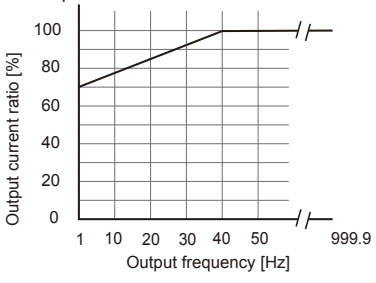
■ Load power factor versus rated output current characteristics



■ Output voltage ratio versus rated output current characteristics (DC mode)



■ Output frequency versus rated output current characteristics



For the "Output voltage ratio versus rated output current characteristics (AC mode)" and "Load power factor versus rated output current characteristics" graphs, the rated output current is the product of the output current ratios shown in both graphs. The output current ratio shown in the "Output frequency versus rated output current characteristics" graph is given priority if it is less than the product of the output current ratios described above. (This only applies to AC mode.)

High-performance Multifunctional AC Power Supplies

PCR-LE2 Series

LAN OPTION USB OPTION GPIB OPTION RS232C DRIVERS CE LXI

PCR6000LE2 PCR9000LE2

Capable of single-phase, single-phase three-wire,and three-phase output with a single unit. Convenient multiple output supports a versatile range of industrial devices.

The PCR-LE2 Series are designed based on the PCR-LE Series which can switch between single-phase output, single-phase three-wire output, and three-phase output by a switching from the front panel operation. It contains the same basic features and performance of the PCR-LE Series, and uses the same power unit as the PCR-LE Series. Use of this series is much easier than installing individual single-phase, single-phase three-wire, and three-phase systems, and allows more effective use of space. The PCR-LE2 Series 2 models: 6 kVA, and 9 kVA.

Dimensions / Weight

PCR6000LE2: 430(16.93″)W × 944(37.17″)H × 550(21.65″)Dmm / 140kg(308.65 lbs)

PCR9000LE2: 430(16.93″)W × 1325(52.17″)H × 550(21.65″)Dmm / 190kg(418.88 lbs)

Features

- High-quality/high-stability output with a high-speed linear amp
- Capable of various power line abnormality simulations and the sequence operation
- Single-phase 6 kVA to 9 kVA, Capable of the Single-phase output, Single-phase 3-wire output, and Three-phase output.
- Equipped with various measuring functions
- Features a full range of measuring functions and supports AC, DC, and AC + DC Outputs
- Detachable front panel
- Eco-friendly function equipped

Accessories

Setup Guide, Quick Reference (1 each for English and Japanese), CD-R(Contains the User's Manual and the Communication Interface Manual), Safety information

Options

■ Input power cable

AC5.5-1P3M-M5C-5S
(For PCR6000LE2(3P4W input)/PCR9000LE2(3P4W input))

AC14-1P3M-M8C-3S(For PCR6000LE2(1P2W input))

AC14-1P3M-M5C-4S
(For PCR6000LE2(3P3W input)/PCR9000LE2(3P3W input))

■ Other options

- Please refer to PCR-LE/LE option section at previous page.
- Fixing PCR6000LE2/PCR9000LE2 to the floor by L-shaped brackets is required.

PCR-LE2 Series Specifications

Item/Model			PCR6000LE2			PCR9000LE2	
Input ratings (AC rms)			1P2W	3P3W 200V	3P4W 400V	3P3W 200V	3P4W 400V
Voltage			Line voltage 170 V to 250 V		Line voltage 324 V to 440 V (Phase voltage 187 V to 254 V)	Line voltage 170V to 250V	Line voltage 324 V to 440 V (Phase voltage 187 V to 254 V)
Phases			Single phase	Three phase 3-wire	Three phase 4-wire	Three phase 3-wire	Three phase 4-wire
Frequency			47 Hz to 63 Hz				
Apparent power			Approx. 10.6 kVA			Approx. 15.7 kVA	
Power factor *1			0.97 (TYP)				
Max. current			64 A or less	38 A or less	21 A or less	55 A or less	30 A or less
AC mode output ratings (AC rms)							
Voltage (output L range, output H range) *2			1 V to 150 V, 2 V to 300 V				
Voltage setting range			0 V to 152.5 V / 0 V to 305.0 V				
Voltage setting accuracy (output L range, output H range) *3			±(0.3 % of set + 0.6 V)				
Max. current *4	Single phase, poly phase, L range, H range		60 A, 30 A · 20 A, 10 A			90 A, 45 A · 30 A, 15 A	
Phase *5			Single phase · Single phase 3-wire · Three-phase 4-wire				
Power capacity	Single phase, Three-phase 4-wire, Single phase 3-wire		6 kVA · 4 kVA			9 kVA · 6 kVA	
Maximum peak current *6			Max. current (rms) × 4 (TYP)				
Max. reverse current *7			30 % of the max. current (rms)				
Load power factor *4			0 to 1 (leading or lagging)				
Frequency *4 *8			1 Hz to 999.9 Hz ★				
DC mode output ratings (for Single-phase and Single-phase Three-wire output only)							
Voltage (output L range, output H range) *2			±1.4 V to ±212 V/±2.8 V to ±424 V				
Voltage setting range			-215.5 V to +215.5 V / -431.0 V to +431.0 V				
Voltage setting accuracy (output L range, output H range) *9			± (0.05% of set + 0.05V/0.1V)				
Max. current *4	Single phase, poly phase, L range, H range		42 A, 21 A · 14 A, 7 A			63 A, 31.5 A · 21 A, 10.5 A	
Max. instantaneous current *10			Max. current (rms) × 3.6				
Power capacity	Single phase, Single phase 3-wire		4.2 kW · 2.8 kW			6.3 kW · 4.2 kW	
Output voltage stability							
Line regulation(With respect to changes in the rated range)			Within ±0.1 %				
Load regulation(With respect to 0 % to 100 % changes in the rating) *11			±0.3 V				
Output frequency variation in AC mode(Between 40 Hz and 999.9 Hz) *12			Within ±0.5 %				
Ripple noise in DC mode(5 Hz to 1 MHz components)			0.25 Vrms or less				
Ambient temperature variation(With respect to changes in the rated range) *13			100 ppm/ °C (TYP)				
Output frequency stability, output voltage waveform distortion ratio, output voltage response speed, efficiency							
Output frequency stability(With respect to changes in all rated ranges)			Within $\pm 5\times10^{-5}$, Setting accuracy : Within $\pm 1\times10^{-4}$				
Output voltage waveform distortion ratio *14			0.3 % or less				
Output voltage response speed *15			30 µs (TYP)				
Efficiency *1			58 % or more				
Phase difference of the output phase voltage *16	Accuracy		Within $\pm(0.4°+fo\times1.8\times10^{-3}°)$, where the output frequency is fo. *17				
Meters (fluorescent display)							
Voltmeter *18 *19	Resolution	RMS,AVE Display mode	0.1 V				
	Accuracy	RMS,AVE Display mode	Within ± (1 % of rdng + 2 digits) (10 V to 848 V and at room temperature)				
Ammeter *18 *19	Resolution	RMS,AVE Display mode Single phase · Poly phase	0.1 A · 0.01 A			0.1 A	
	Accuracy	RMS Display mode	Within ± (1% of reading + 2digits) (5 % of the max. rated current to max. rated current and at room temperature)				
Wattmeter *19	Resolution	Single phase · Poly phase	1 W · 0.1 W/1 W			1 W	
	Accuracy		Within ± (1% of reading + 3digits) (10 % of the rated power capacity to the rated power capacity, when the load power factor is 1, and at room temperature.)				
Frequency meter *20	Resolution		0.01 Hz/0.1 Hz				
General							
Insulation resistance	Between input and chassis, output and chassis, and input and output		500 V, 10 MΩ or more				
Withstand voltage			1.5 kVAC for 1 minute				
Circuit method			Linear amplifier system				
Environmental conditions	Operating temperature range / Storage temperature range		0 °C to +50 °C / -10 °C to +60 °C				
	Operating humidity range / Storage humidity range		20 % rh to 80 % rh (no condensation) / 90 % rh or less (no condensation)				
Weight			Approx.140 kg (308.65 lbs)			Approx.190 kg (418.88 lbs)	
Input terminal	Input terminal board [3φ]		M8	M5		M5	
Output terminal	Output terminal board Single phase · Single phase 3-wire,Three-phase 4-wire		M8 · M5				
Input power cord [Sold separately option]	Shape		Single-core cable				
	The number		3 pc	4 pc	5 pc	4 pc	5 pc
	Conductor cross section/Length		14 mm^2/3 m	8 mm^2/3m	5.5 mm^2/3 m	14 mm^2/3 m	5.5 mm^2/3 m
Accessories	User's manual (Setup guide)		1 copy				
	CD-ROM (User's manual)		1 disc				
	Quick Reference		1 each for English and Japanese				
	Safety information		1 copy				
Other	Electromagnetic compatibility (EMC)		EMC Directive 2014/30/EU. EN61326-1. The maximum length of all cables and wires connected to the PCR-LE Series must be less than 3 m.				
	Safety		Low Voltage Directive 2014/35/EU, EN61010-1Class I Pollution Degree2				
	Output voltage ratio versus rated output current characteristics		Same as PCR-LE series. (Refer to P 53)				

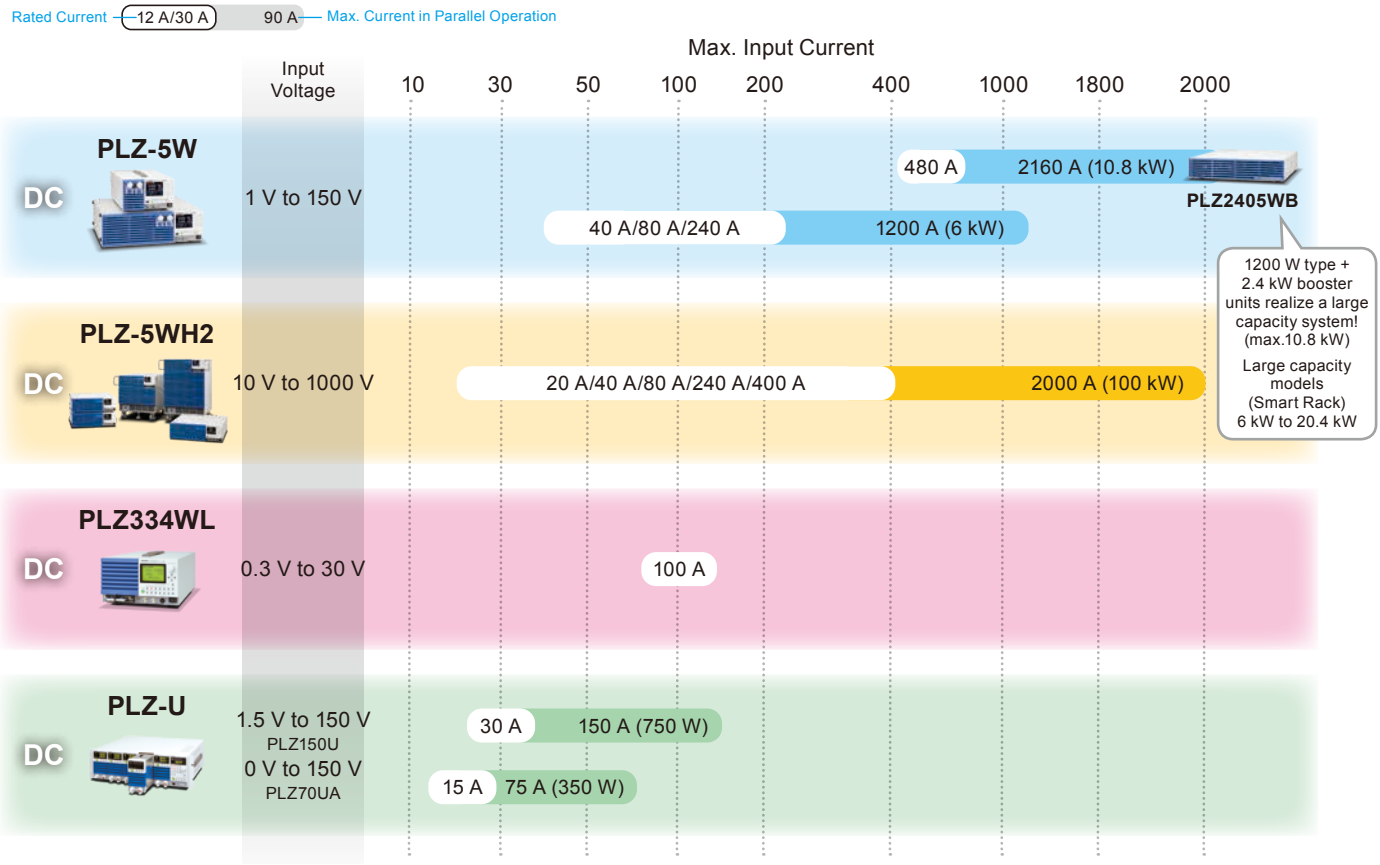
*1 When the output phase voltage is 100 V or 200 V, the output current is the rated value, the load power factor is 1, and the output frequency is between 40 Hz and 999.9 Hz.
*2 L/H range can be changed by means of a switch on the front panel. Resolution: 0.1V
*3 When the output frequency is between 45 Hz and 65 Hz, with no load, and at room temperature.
*4 When the maximum voltage is between 1 V and 100 V (L range) or 2 V and 200 V (H range) and the load power factor is between 0.8 and 1.When the output phase voltage is between 100 V and 150 V or 200 V and 300 V (AC mode) or 100 V and 212 V or 200 V and 424 V (DC mode), the output current is reduced by the output phase voltage. When the load power factor is between 0 and 0.8, the output current is reduced by the load power factor. (AC mode) When the output frequency is between 1 Hz and 40 Hz, the output current is reduced by the output frequency.(AC mode)
*5 The output phase mode can be changed by means of a key on the operation panel. "Multi-phase" in the table indicates single-phase three-wire mode and three-phase four-wire mode.
*6 When the output phase voltage is in the vicinity of the peak (±15 deg) (However, this is limited by the rated output current's rms value).
*7 When the output phase voltage is 100 V or 200 V and the output frequency is between 40 Hz and 999.9 Hz (reverse current is −180 deg out of phase with the output voltage).
*8 Resolution : 0.01Hz (1.00Hz to 100.0Hz), 0.1Hz (100.0Hz to 999.9Hz)
*9 With no load at room temperature
*10 Limited by the rated output current's rms value
*11 When the output phase voltage is between 80 V and 150 V (L range) or 160 V and 300 V (H range) and the load
*12 When the output phase voltage is between 80 V and 150 V (L range) or 160 V and 300 V (H range) and the load power factor is 1. This is the output line regulation with 200 Hz as the reference. When the response mode is set to MEDIUM.(There is no F mode)
*13 When the output phase voltage is 100 V or 200 V and the output current is 0 A.
*14 When the output phase voltage is between 80 V and 150 V (L range) or 160 V and 300 V (H range) and the load power factor is 1. When the response mode is set to MEDIUM.(There is no F mode)
*15 When the output phase voltage is 100 V or 200 V, the load power factor is 1, and the output current changes from 0 A to the rated value and from the rated value to 0 A.
*16 Phase difference between output voltages (phase voltages) when each phase is considered along with the neutral point.
*17 The following show the angles obtained by calculating the expression with the specified frequency.
Within ±0.5° (when generating 60 Hz output)
Within ±1.2° (when generating 400 Hz output)
*18 With the true rms display, a waveform with a crest factor of 3 or less.
*19 When the output frequency is between 45 Hz and 65 Hz.
*20 Displays the output frequency setting (frequency of the internal reference voltage).

★ PCR-LE2 Series 500Hz Limit Model
The PCR-LE Series offers the type on each model that limits the maximum output frequency to 500 Hz.

ELECTRONIC LOAD SELECTION GUIDE

Series		PLZ-5W	PLZ-5WH2	PLZ-4WL	PLZ-U
Line up		4 models	5 models	1 model	4 models
Features		Multi Functional	High Voltage	High Speed	Multi Channel
Input		DC	DC	DC	DC
Mode	CC	✔	✔	✔	✔
	CC+CV	✔	✔	✔	✔
	CR	✔	✔	✔	✔
	CR+CV	✔	✔	✔	✔
	CV	✔	✔	✔	✔
	CP	✔	✔	✔	–
	ARB*	✔	✔	–	–
Input rating (Max.)		200 W/ 400 W/ 1.2 kW	1 kW/ 2 kW/ 4 kW/ 12 kW/ 20 kW	330 W	75 W/ 150 W
		150 V	1000 V	30 V	150 V
		240 A	400 A	100 A	30 A
Zero Voltage Input		–	–	–	Available
GPIB		Option	Option	Standard	Standard
RS232C		Standard	Standard	Standard	Standard
USB		Standard	Standard	Standard	–
LAN		Standard	Standard	–	–

*Arbitrary I-V characteristics



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Multifunctional Electronic Load (CC/CV/CR/CP)

PLZ-5W Series

LAN LXI | USB | GPIB OPTION | RS232C | DRIVERS | CE

Dimensions

PLZ205W/405W: 214.5(8.45″)W × 124(4.88″)H × 400(15.75″)Dmm(inch)
PLZ1205W: 429.5(16.91″)W × 128(5.04″)H × 400(15.75″)Dmm(inch)

Accessories

Power cord (Cord length: Approx. 2.5 m), Rear-panel load input terminal cover, Load input terminal screw set (2 sets), Screws for the rear-panel load input terminal cover (2 pcs.), Front-panel load input terminal cover, Front-panel load input knob set, External control connector kit, Setup Guide, CD-ROM, Quick Reference(Japanese 1 sheet, English 1 sheet), Safety Information

High-speed response, advanced communications, large-scale system capability

The PLZ-5W Series high performance electronic load is the successor to the highly respected PLZ-4W series, whilst still retaining the same high specification and build quality. Advances include a high visibility color display, low voltage operation from a minimum of 1 V to a maximum of 150 V. Programmable profiles of voltage/current can be applied (using the new ARB function, as used in LED/solar testing) in addition to the inherited 6 modes of operation: Constant Current, Constant Resistance, Constant Voltage, Constant Power, Constant Current + Constant Voltage, Constant Resistance + Constant Voltage. Equipped with a high-speed response feature boasting a maximum slew rate of 60 A/µs (PLZ1205W) and a minimum setting resolution of 10 µA (PLZ205W). Additional features of the PLZ-5W series include: Soft-start function, variable slew rate, selectable response (CV/CR mode), switching function, ABC preset memory, 20 user-defined set-up configurations, and a sequence operation function. The advanced high-speed response makes the PLZ-5W ideal for the development and testing of today's modern power supplies that require variable high-speed current changes. This advantage extends to the testing of current clamps/transducers. The PLZ-5W Series is available in 4 standard models which can be incrementally extended by adding additional booster units (PLZ2405WB) to achieve a maximum of 10.8 kW/2160 A DC electronic load.

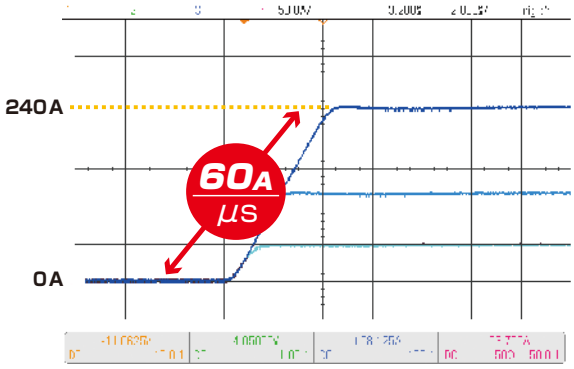
Features

- Operation voltage: 1 V to 150 V (from 0.05 V)
- High speed slew rate: 60 A/µs
- Arbitrary I-V characteristics: Installed “ARB mode”
- Parallel operation feature: The total current and power capacities can be increased to the maximum of 10.8 kW (2160 A) by connecting the booster units.
- New high visibilty color display.
- LAN(LXI compliant)/RS232C/USB are standard interface. External analog control. *GPIB is factory option.
- Improved sequence feature (Maximum 10000 steps)
- Setup memory can be saved to or loaded from a USB flash drive.

Functions

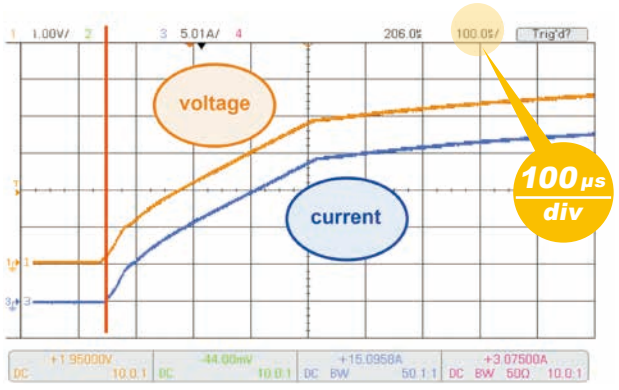
■ Maximum slew rate of 60 A/µs

Achieving a rise time of 4 µs to reach the rated current of the electronic load. Power supply evaluation demands a fast transient response which the PLZ-5W series achieves with ease.



■ High speed voltage tracking characteristics

High speed voltage tracking characteristic in CR mode is perfect for applications such as startup tests for power supplies.



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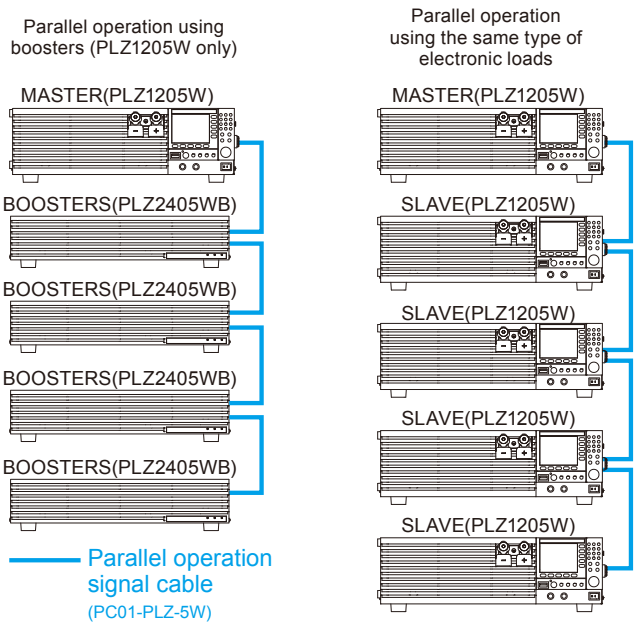
Functions

■ Parallel operation

Without using boosters, you can connect up to five units of the same model in parallel, including the master unit (max. 6 kW, 1200 A).
In the parallel connection configuration, one control master operates with one or more slave units, enabling you to control the entire system and view the sum of the combined data on the master unit's panel.
To connect the units requires the use of as many optional parallel cables (PC01-PLZ-5W) as the number of units to be connected.

*The PLZ2405WB (Booster) comes with 1 pc. of parallel operation cable (PC01-PLZ-5W).



* Do not stack three or more loads on top of each other.
You can stack loads (booster and master unit), but for safety reasons, only stack up to two units. If you want to use two or more boosters, we recommend you to rack mount them.

■ Booster unit PLZ2405WB*

Connecting up to 4 booster (PLZ2405WB) units with the master (PLZ1205W) increases the maximum system capability to 10.8 kW, 2160 A.
The optional parallel cable (PC01-PLZ-5W) is required to connect between the master and slave/booster units.

■ Specifications
Operating voltage .....1 Vdc to 150 Vdc
Current .....480 A
Power .....2400 W
Input voltage.....100 Vac to 240 Vac (90 Vac to 250 Vac), single-phase
Power consumption .....95 VAmax
Dimensions .....430(16.93″)W×86(3.39″)H×450(17.72″)Dmm (inch)
Weight .....approx. 15 kg (33.07 lb)

*PLZ2405WB is a dedicated booster for PLZ1205W.
It cannot be used with any other model.

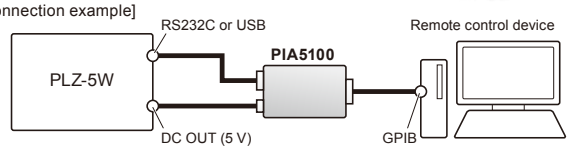
Options

■ GPIB converter

PIA5100

This converter converts RS232C or USB of the PLZ-5W to GPIB, enabling connection of a remote controller using GPIB.
[Accessories: Power cord set, Magnetic sheet]
*Not CE certified product

[Connection example]



■ Parallel operation signal cable kit

PC01-PLZ-5W (Cable length: Approx. 30 cm)

■ Sequence creation software

SD023-PLZ-5W (Wavy for PLZ-5W)

PLZ2405WB Specifications

Model		PLZ2405WB
Rating		
Operating voltage		1 Vdc to 150 Vdc
Power		2400 W
Current		480 A
Current range		
H range		0 A to 480 A
M range		0 A to 48 A
L range		0 A to 4.8 A
Setting accuracy		
CC mode	H, M range	±(0.4% of set + 0.8% of range)
	L range	±(0.4% of set + 5% of range)
CR mode	H, M range	±(0.5% of set + 1.5% of range)
	L range	±(0.5% of set + 5% of range)
CV mode		±(0.2% of set + 0.2% of range)
CP mode *1	H, M range	±(2% of range + 0.4% current range × Vin)
	L range	±(2% of range + 2.5% current range × Vin)

*1 Vin: Load input terminal voltage or sensing terminal voltage.

Measurement accuracy		
Voltmeter accuracy		±(0.1% of reading + 0.1% of range)
Ammeter accuracy	H, M range	±(0.4% of set + 0.8% of range)
	L range	±(0.4% of set + 5% of range)
Protection functions		
Protection functions other than those below are detected and activated on the PLZ1205W. For details, see the PLZ-5W user's manual.		
Over temperature protection (OTP)		Turns off the load when the heatsink temperature reaches 100 °C
General specifications		
Input power supply voltage range		100 Vac to 240 Vac (90 Vac to 250 Vac) single-phase, continuous
Input frequency range		47 Hz to 63 Hz
Power consumption		95 VAmax
Inrush current (peak value)		45 Apeak

Model		PLZ2405WB
General specifications		
Environment	Operating temperature range	0 °C to 40 °C (32 °F to 104 °F)
	Operating humidity range	20%rh to 85%rh (no condensation)
	Storage temperature range	-20°C to 70°C (-4 °F to 158 °F)
	Storage humidity range	90%rh or less (no condensation)
	Installation location	Indoor use, altitude of up to 2000 m, overvoltage category II
Isolation voltage		±500 V
Insulation resistance	Between primary and input terminals, between primary and chassis, between input terminals and chassis	500 Vdc 30 MΩ or greater (at 70%rh humidity or less)
Withstanding voltage	Between primary and input terminals	No abnormalities at 1500 Vac for 1 minute
	Between primary and chassis	No abnormalities at 1500 Vac for 1 minute
	Between input terminals and chassis	No abnormalities at 750 Vdc for 1 minute
Electromagnetic compatibility (EMC) *1 *2		Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU, EN 61326-1 (Class A *3), EN 55011 (Class A *3, Group1 *4) EN 61000-3-2, EN 61000-3-3 Applicable under the following conditions. The maximum length of all cabling and wiring connected to the product must be less than 3 m.
Safety *1		Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU *2 EN 61010-1 (Class I *5, Pollution Degree 2 *6)

*1 Does not apply to specially made or modified products. *2 Limited to products that have the CE mark on their panel. *3 This is a Class A equipment. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts. *4 This is a Group 1 equipment. This product does not generate and/or use intentionally radio-frequency energy, in the from of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/analysis purpose. *5 This is a Class I equipment. Be sure to ground the this product protective conductor terminal. The safety of this product is only guaranteed when the product is properly grounded. *6 Pollution is addition of foreign matter (solid, liquid or gaseous) that may produce a reduction of dielectric strength or surface resistivity. Pollution Degree 2 assumes that only non-

PLZ-5W Series Specifications

Unless specified otherwise, the specifications are for the following settings and conditions.
- The product is warmed up for at least 30 minutes (with current flowing).
- TYP: These are typical values that are representative of situations where the product operates in an environment with an ambient temperature of 23 °C. They are not guaranteed performance values.
- set: Indicates a setting. ● range: Indicates the rated value of each range. ● reading: Indicates a reading.
- The specifications of the PLZ-5W are for the load input terminals on the rear panel.

Model	PLZ205W	PLZ405W	PLZ1205W
Rating			
Operating voltage (DC) *1	1 V to 150 V *2		
Current	40 A	80 A	240 A (80 A *3 for the load input terminals on the front panel)
Power	200 W	400 W	1200 W
Input resistance when the load is off	Approx. 660 kΩ *4		
Load input terminal's isolation voltage	±500 V		

*1 The minimum operating voltage at which current begins to flow through the PLZ-5W is approximately 0.05 V. At the load input terminals on the rear panel.
*2 In switching mode, for every slew rate setting of 1 A/µs, the minimum operating voltage (including the voltage drop due to the wiring inductance component) increases by approximately 150 mV for the PLZ205W, 125 mV for the PLZ405W, and 75 mV for the PLZ1205W.
*3 The specifications of the PLZ-5W are for the load input terminals on the rear panel and the load input terminals on the front panel may not meet the specifications.
*4 In the case of parallel operation using the same models, approx. 660/number of units kΩ.

Model		PLZ205W	PLZ405W	PLZ1205W
CC mode				
Operating range	H range	0 A to 40 A	0 A to 80 A	0 A to 240 A
	M range	0 A to 4 A	0 A to 8 A	0 A to 24 A
	L range	0 A to 0.4 A	0 A to 0.8 A	0 A to 2.4 A
Setting range	H range	0 A to 42 A	0 A to 84 A	0 A to 252 A
	M range	0 A to 4.2 A	0 A to 8.4 A	0 A to 25.2 A
	L range	0 A to 0.42 A	0 A to 0.84 A	0 A to 2.52 A
Resolution	H range	1 mA	2 mA	5 mA
	M range	0.1 mA	0.2 mA	0.5 mA
	L range	0.01 mA	0.02 mA	0.05 mA
Setting accuracy	H range	±(0.2% of set + 0.1% of range)		
	M range	±(0.2% of set + 0.3% of range)		
	L range	±(0.2% of set + 1% of range)		
Parallel operation	H, M range	±(0.4% of set + 0.8% of range)		
	L range	±(0.4% of set + 5% of range)		
Input line regulation *1		4 mA	8 mA	24 mA
Ripple	rms *2	4 mA	8 mA	24 mA
	p-p *3	40 mA	80 mA	200 mA

*1 When the input voltage is changed from 1 V to 150 V at a current of rated power/150 V.
*2 Measurement frequency bandwidth: 10 Hz to 1 MHz
*3 Measurement frequency bandwidth: 10 Hz to 20 MHz

Model		PLZ205W	PLZ405W	PLZ1205W
CR mode				
Operating range *1	H range	40 S to 0.002 S (0.025 Ω to 500 Ω)	80 S to 0.004 S (0.0125 Ω to 250 Ω)	240 S to 0.012 S (0.042 Ω to 83.333 Ω)
	M range	4 S to 0.0002 S (0.25 Ω to 5000 Ω)	8 S to 0.0004 S (0.125 Ω to 2500 Ω)	24 S to 0.0012 S (0.042 Ω to 833.33Ω)
	L range	400 mS to 0.02 mS (2.5 Ω to 50000 Ω)	800 mS to 0.04 mS (1.25 Ω to 25000 Ω)	2400 mS to 0.12 mS (0.42 Ω to 8333.3Ω)
Setting range	H range	42 S to 0 S (0.0238 Ω to Open)	84 S to 0 S (0.0119 Ω to Open)	252 S to 0 S (0.00397 Ω to Open)
	M range	4.2 S to 0 S (0.238 Ω to Open)	8.4 S to 0 S (0.119 Ω to Open)	25.2 S to 0 S (0.0397 Ω to Open)
	L range	420 mS to 0 S (2.38 Ω to Open)	840 mS to 0 S (1.19 Ω to Open)	2520 mS to 0 S (0.397 Ω to Open)
Resolution	H range	1 mS	2 mS	5 mS
	M range	0.1 mS	0.2 mS	0.5 mS
	L range	0.01 mS	0.02 mS	0.05 mS
Setting accuracy *2	H, M range	±(0.5% of set + 0.5% of range)		
	L range	±(0.5% of set + 1.5% of range)		
Parallel operation	H, M range	±(0.5% of set + 1.5% of range)		
	L range	±(0.5% of set + 5% of range)		

*1 Conductance [S] = input current [A]/input voltage [V] = 1/resistance [Ω]
*2 Converted value at the input current. At the connectors.

Model		PLZ205W	PLZ405W	PLZ1205W
CV mode				
Operating range	H range	1 V to 150 V		
	L range	1 V to 15 V		
Setting range	H range	0 V to 157.5 V		
	L range	0 V to 15.75 V		
Resolution	H range	5 mV		
	L range	0.5 mV		
Setting accuracy *1		±(0.1 % of set + 0.1% of range)		
	Parallel operation	±(0.2 % of set + 0.2% of range)		
Input current variation *2		12 mV		

*1 With the input voltage within the operating range, and at the connector during remote sensing.
*2 For a current change in the range of 10% to 100% of the rating at an input voltage of 5 V (during remote sensing).

Model		PLZ205W	PLZ405W	PLZ1205W
CP mode				
Operating range	H range	20 W to 200 W	40 W to 400 W	120 W to 1200 W
	M range	2 W to 20 W	4 W to 40 W	12 W to 120 W
	L range	0.2 W to 2 W	0.4 W to 4 W	1.2 W to 12 W
Setting range	H range	0 W to 210 W	0 W to 420 W	0 W to 1260 W
	M range	0 W to 21 W	0 W to 42 W	0 W to 126 W
	L range	0 W to 2.1 W	0 W to 4.2 W	0 W to 12.6 W
Resolution	H range	0.005 W	0.01 W	0.05 W
	M range	0.0005 W	0.001 W	0.005 W
	L range	0.00005 W	0.0001 W	0.0005 W
Setting accuracy *1	H range	±(0.5% of range + 0.04 A × Vin)	±(0.5% of range + 0.08 A × Vin)	±(0.5% of range + 0.24 A × Vin)
	M range	±(0.5% of range + 0.008 A × Vin)	±(0.5% of range + 0.016 A × Vin)	±(0.5% of range + 0.048 A × Vin)
	L range	±(1% of range + 0.004 A × Vin)	±(1% of range + 0.008 A × Vin)	±(1% of range + 0.024 A × Vin)
Parallel operation	H, M range	±(2% of range + 0.4% current range × Vin)		
	L range	±(2% of range + 2.5% current range × Vin)		

*1 Vin: The voltage at the load input terminals on the rear panel or sensing connectors.

Model		PLZ205W	PLZ405W	PLZ1205W
ARB mode				
Operating range		Three to 100 points of current values can be set for the input voltage. The space between two points is linearly interpolated.		
Response speed		Response for input voltage max 50 us.		
Voltmeter				
Display	H range	0.00 V to 150.00 V		
	L range	0.000 V to 15.000 V		
Accuracy		±(0.1% of reading + 0.1% of range)		
	Parallel operation (TYP)	±(0.1% of reading + 0.1% of range)		
Ammeter				
Display	H range	0.000 A to 40.000 A	0.000 A to 80.000 A	0.00 A to 240.00 A
	M range	0.0000 A to 4.0000 A	0.0000 A to 8.0000 A	0.000 A to 24.000 A
	L range	0.00 mA to 400.00 mA	0.00 mA to 800.00 mA	0.0000 A to 2.4000 A
Accuracy	H, M range	±(0.2% of reading + 0.3% of range)		
	L range	±(0.2% of reading + 1% of range)		
Parallel operation (TYP)	H, M range	±(0.4% of reading + 0.8% of range)		
	L range	±(0.4% of reading + 5% of range)		
Power display				
Display		Displays the product of the voltmeter reading and ammeter reading.		
Switching function				
Operation mode		CC and CR		
Frequency setting range		1.0 Hz to 100.0 kHz		
Frequency setting resolution	1 Hz to 10 Hz	0.1 Hz		
	11 Hz to 100 Hz	1 Hz		
	110 Hz to 1000 Hz	10 Hz		
	1.1 kHz to 10.0 kHz	0.1 kHz		
	10 kHz to 100 kHz	20 kHz, 50 kHz, 100 kHz		
Frequency setting accuracy		±(0.5% of set)		
Duty cycle setting range, step *1	1 Hz to 10 Hz	5.0% to 95.0%, 0.1% steps		
	11 Hz to 100 Hz			
	110 Hz to 1000 Hz			
	1.1 kHz to 10.0 kHz	5% to 95%, 1% steps		
	10 kHz to 100 kHz	10% to 90%, 10% steps		

*1 The minimum time span is 5us. The minimum duty cycle is limited by the minimum time span.

Model		PLZ205W	PLZ405W	PLZ1205W
Slew rate				
Operation mode		CC		
Setting range	H range	0.01 A/µs to 10 A/µs	0.02 A/µs to 20 A/µs	0.06 A/µs to 60 A/µs
	M range	0.001 A/µs to 1 A/µs	0.002 A/µs to 2 A/µs	0.006 A/µs to 6 A/µs
	L range	0.1 mA/µs to 100 mA/µs	0.2 mA/µs to 200 mA/µs	0.6 mA/µs to 600 mA/µs
Resolution	H range	0.01 A/µs	0.02 A/µs	0.06 A/µs
	M range	0.001 A/µs	0.002 A/µs	0.006 A/µs
	L range	0.1 mA/µs	0.2 mA/µs	0.6 mA/µs
Setting accuracy *1	H, M range	±(10% of set +1.25 µs)		
	L range	±(12% of set +5 µs)		

*1 The time it takes to shift from 10% to 90% when the current is varied from 0% to 100% of the rated current.

Model	PLZ205W	PLZ405W	PLZ1205W
Soft start			
Operation mode	CC		
Time setting range	100 µs, 200 µs, 500 µs, 1 ms, 2 ms, 5 ms, 10 ms, 20 ms, or off		

PLZ-5W Series Specifications

Model		PLZ205W	PLZ405W	PLZ1205W
Possible remote sensing compensation voltage		approx. 7 V (Total potential difference between the input terminals and sensing connectors)		
Protective function				
Overcurrent protection (OCP)	Setting range	0.0 A to 44.0 A	0.0 A to 88.0 A	0.0 A to 264.0 A
	Resolution	10 mA	10 mA	10 mA
	Protection operation	Either load off or limitation can be selected.		
Overpower protection (OPP)	Setting range	0 W to 220 W	0 W to 440 W	0 W to 1320 W
	Resolution	0.1 W	0.1 W	0.1 W
	Protection operation	Either load off or limitation can be selected.		
Undervoltage protection (UVP)	Setting range	0.00 V to 150.00 V, or off		
	Resolution	0.01 V		
	Protection operation	Load off		
Watchdog protection (WDP)	Setting range	1 s to 3600 s or off		
	Protection operation	Load off		

Model		PLZ205W	PLZ405W	PLZ1205W
Sequence function				
Operation mode		CC, CR, CV, CP		
Maximum number of programs		30		
Maximum number of steps		10000		
Step execution time		25 µs to 1000 h		
Time resolution		25 µs		
Other functions				
Elapsed time display		Displays the time from load on to load off.		
	Range	1s to 999h 59min 59s.		
Integrated current display		Displays integrated current from load on to load off.		
Integrated power display		Displays integrated power from load on to load off.		
Auto load off timer		Automatically turns off the load after the specified time elapses.		
	Setting range	1s to 3599999s, or off		

Model		PLZ205W	PLZ405W	PLZ1205W
EXT CONT connector				
Load on/off control input		Logic level switchable. Pulled up to 5 V by a 10 kΩ resistor. The thresholds are HIGH: 3.5 V to 5 V, LOW: 0 V to 1.5 V.		
Range control input		The range can be switched between L, M, and H using a 2 bit signal. Pulled up to 5 V by a 10 kΩ resistor. The thresholds are HIGH: 3.5 V to 5 V, LOW: 0 V to 1.5 V.		
Alarm input		An alarm is activated with a voltage between 0 V and 1.5 V. Pulled up to 5 V by a 10 kΩ resistor. The thresholds are HIGH: 3.5 V to 5 V, LOW: 0 V to 1.5 V.		
Alarm clearing input		After an alarm occurs, eliminate the root cause of the alarm, and change the input to pin 5 of the EXT CONT connector from a low level signal to a high level signal. The alarm will be cleared on the rising edge of this signal. Pulled up to 5 V by a 10 kΩ resistor. The thresholds are HIGH: 3.5 V to 5.0 V, LOW: 0 V to 1.5 V.		
Trigger input		Paused sequence operation resumes when a voltage between 0 V and 0.8 V is received. Pulled up to 5 V by a 10 kΩ resistor. The thresholds are HIGH: 2 V to 5 V, LOW: 0 V to 0.8 V.		
External voltage control input (CC, CR, CP mode)		Controls the load settings of CC, CR, CP mode through external voltage input. The input impedance is approx. 10 kΩ. CC: The setting can be controlled in the range of 0% to 100% of the rated current through external voltage input of 0 V to 10 V. CR: The setting can be controlled in the range of 0% to 100% of the conductance setting through external voltage input of 0 V to 10 V. CP: The setting can be controlled in the range of 0% to 100% of the rated power through external voltage input of 0 V to 10 V.		
	Setting accuracy	±(1% of range) (TYP value of H range in CC mode)		
External voltage control input (CV mode)		The load setting of CV mode can be controlled through external voltage input. The rated voltage can be controlled in the range of 0% to 100% with 0 V to 10 V. The input impedance is approx. 10 kΩ.		
	Setting accuracy	±(1% of range) (TYP value)		
External voltage control input (superimposing in CC mode)		Controls the load setting of CC mode by adding current through external voltage input. Adds current in the range of -100% to 100% of the rated current for -10 V to 10 V. The input impedance is approx. 10 kΩ.		
	Setting accuracy	±(1% of range) (TYP value of H range)		
Load-on status output		On when load is on. Open-collector output from a photocoupler. *1		
Range status output		Outputs current range state L, M, and H using 2 bits. Open-collector output from a photocoupler. *1		
ALARM 1 output		ON when overvoltage detection, reverse-connection detection, overheat detection, alarm input detection, front-panel load terminal overcurrent detection or parallel operation anomaly detection is activated. Open-collector output from a photocoupler. *1		
ALARM 2 output		On when OCP, OPP, UVP, or WDP is operating.		
DIGITAL 0 / DIGITAL 1 output		Logic signal output during a step of a sequence. Output impedance: approx. 330 Ω, output voltage: approx. 3.3 VEMF		
DIGITAL 2 output		Can be switched between input and output. Output: Logic signal output during a step of a sequence. The output impedance is 330 Ω. Input: This signal is the trigger input signal for the sequence and the measurement functions. The thresholds are HIGH: 2 V to 5 V, LOW: 0 V to 0.8 V.		
Current monitor output		Outputs 0 V to 10 V for 0% to 100% of the rated current of each range.		
	Accuracy	±(1% of range) (TYP value of H range)		
Short signal output		Relay contact on when the short function is turned on (30 Vdc/1 A).		
Front-panel BNC terminal				
Trigger output		Transmits 10 µs pulses when trigger output is ON during sequence operation and during step execution. Transmits 1 µs pulses during switching operation. Output impedance: 200 Ω, output voltage: approx. 5 VEMF		
Current monitor output		Outputs 0 V to 2 V for 0% to 100% of the rated current of each range.		
	Accuracy	±(1% of range) (TYP value of H range)		
Isolation voltage		±30 V		
Communication function				
RS232C		D-SUB 9-pin connector Baud rate: 9600, 19200, 38400, 115200 bps Data length: 8 bits, Stop bits: 1 bit, Parity bit: None, Flow control: None, CTS-RTS		
USB		Complies with the USB 2.0 specification. Data rate: 480 Mbps (High speed) Complies with the USBTMC-USB488 device class specifications.		
LAN		IEEE 802,3 100Base-TX/10Base-T Ethernet IPv4, RJ-45 connector		
General specifications				
Input voltage range / Input frequency range		100 Vac to 240 Vac (90 Vac to 250 Vac) single phase, continuous / 47 Hz to 63 Hz		
Power consumption		50 VAmax	50 VAmax	85 VAmax
Inrush current (peak value)		45 A		
Environ-mental conditions	Operating temperature range	0 °C to 40 °C (32 °F to 104°F)		
	Operating humidity range	20%rh to 85%rh (no condensation)		
	Storage temperature range	-20 °C to 70 °C (-4 °F to 158°F)		
	Storage humidity range	90%rh or less (no condensation)		
	Installation location	Indoor use, altitude of up to 2000 m, overvoltage category II.		
Insulation resistance	Between primary and input terminals	500 Vdc, 30 MΩ or more (70%rh or less)		
	Between primary and chassis			
	Between input terminals and chassis			
Withstanding voltage	Between primary and input terminals	No abnormalities at 1500 Vac for 1 minute.		
	Between primary and chassis	No abnormalities at 1500 Vac for 1 minute.		
	Between input terminals and chassis	No abnormalities at 750 Vac for 1 minute.		
Weight		Approx. 7 kg (15.4 lb.)	Approx. 7.5 kg (16.5 lb.)	Approx. 14 kg (30.9 lb.)
Electromagnetic compatibility (EMC) *2 *3		Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU, EN 61326-1 (Class A *4), EN 55011 (Class A *4, Group 1 *5) EN 61000-3-2, EN 61000-3-3 Applicable under the following conditions. The maximum length of all cabling and wiring connected to the PLZ-5W must be less than 3 m.		
Safety *2		Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU *3, EN 61010-1 (Class I *6, Pollution Degree 2 *7)		

*1 The maximum voltage that can be applied to the photocoupler is 30 V. The maximum current is 4 mA. *2 Does not apply to specially ordered or modified PLZ-5Ws. *3 Limited to products that have the CE mark on their panels. *4 This is a Class A equipment. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts. *5 This is a Group 1 equipment. This product does not generate and/or use intentionally radiofrequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/analysis purpose. *6 This is a Class I equipment. Be sure to ground this product's protective conductor terminal. The safety of this product is only guaranteed when the product is properly grounded. *7 Pollution is addition of foreign matter (solid, liquid or gaseous) that may produce a reduction of dielectric strength or surface resistivity. Pollution Degree 2 assumes that only non-conductive pollution will occur except for an occasional temporary

Multifunctional Electronic Load (CC/CV/CR/CP)

PLZ-5WH2 Series

LAN LXI USB GPIB OPTION RS232C DRIVERS CE

Ideal for high-capacity power supply and rechargeable battery evaluation! Testing with hyper-realistic load simulation made possible!

The PLZ-5WH2 high-power DC electronic load series is where durable, reliable ingenuity meets multifunctional, high-power design. Providing 5 variety of power range line-ups, from a 1 kW bench-top style model, to a high-power model that can sink up to 20 kW of power in a single unit. You can easily select the applicable power range according to the load. Load simulation can be achieved faster than ever before thanks to the reliable, high-speed design of the PLZ-5WH2 current control circuits. Accurate current measures can be made with extremely high-setting resolution. A color LCD display allows for highly visible, user-friendly front-panel operation. RS232C, USB, and LAN digital inter faces are included as standard for simple integration into any system.

Dimensions

PLZ1005WH2: 429.5(16.91″)W×128(5.04″)H×400(15.75″)Dmm(inch)
PLZ2005WH2: 429.5(16.91″)W×128(5.04″)H×400(15.75″)Dmm(inch)
PLZ4005WH2: 429.5(16.91″)W×128(5.04″)H×500(19.69″)Dmm(inch)
PLZ12005WH2: 430(16.93″)W×396.2(15.6″)H×550(21.65)″Dmm(inch)
PLZ20005WH2: 430(16.93″)W×573.5(22.58″)H×550(21.65)″Dmm(inch)

Accessories

Common to all models: Power cord, Safety terminal adapter TL41 (red, black), External control connector kit, Safety Information, Setup Guide, Quick Reference (Japanese, English), CD-ROM
PLZ1005WH2, PLZ2005WH2, PLZ4005WH2: Rear-panel DC INPUT terminal cover, Screw set for rear-panel DC INPUT terminals, Screws for the rear-panel DC INPUT terminal cover, Front-panel DC INPUT terminal cover, Screws for the front-panel DC INPUT terminals, Heavy object warning label (PLZ4005WH2 only)
PLZ12005WH2, PLZ20005WH2: Rear-panel DC INPUT terminals cover, Screw set for rear-panel DC INPUT terminals, Rear-panel DC INPUT terminals cover screws, Heavy object warning label, Parallel operation signal cable kit [PC02-PLZ-5W]

Features

- Operating voltage: 10 V to 1000 V (Min. 1.5 V)
- 20 kW capacity in a single, compact unit (PLZ20005WH2)
- 100 kW/ 2000 A with parallel operation (Max. 5 units)
  *Connectable with different models.
- Synchronized operation
- Sequence function
- Arbitrary IV characteristic (ARB) mode
- User-friendly color LCD display
- Data-logging function: voltage/current/power/elapsed time/ integrated current/integrated power measurements. (Measurement display, programmable internal memory, stored as CSV format onto a USB.)
- Superposition of sinusoidal current (sine function, 1 Hz to 10 kHz)
- Cutoff function: The load can be turned off when the elapsed time, the voltage drop, the integrated current, or the integrated power reaches the specified value.
- LAN (LXI Compliant)/USB/RS232C standard interface
  *GPIB optional

Options

■ GPIB converter
PIA5100
This converter converts RS232C or USB connection into GPIB, enabling remote control connection using GPIB as seen below.
[Accessories: Power cord set, Magnetic sheet]
*Not CE certified product

■ Parallel operation signal cable kit
PC01-PLZ-5W (approx. 30 cm)
PC02-PLZ-5W*(approx. 1 m)
*Supplied with PLZ12005WH2 and PLZ20005WH2.

■ High-voltage load cable
HV22-2P3M-M12M8
This load cable supports high voltage. Up to 80 A (Kikusui-recommended current) is supported.

■ Sequence creation and control software
SD033-PLZ-5WH2 (Wavy for PLZ-5WH2)

■ Easy access with the built-in web server

Use a browser from a PC, smartphone, or tablet to access the web server built into the PLZ-5WH2 series for convenient control and monitoring.

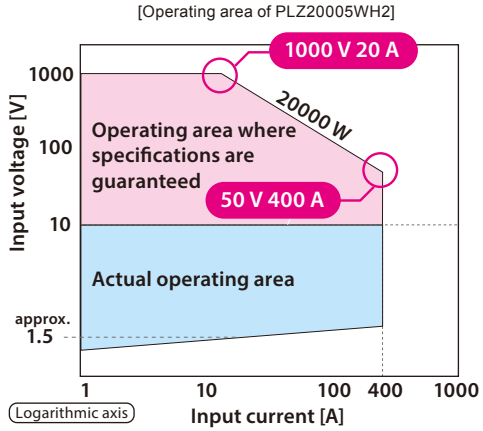
Use latest browser version
(Recommended browser: Internet Explorer11, Chrome, Safari).

* Connecting with a smartphone, tablet, etc. requires a Wi-Fi environment (wireless LAN router etc.).

Functions

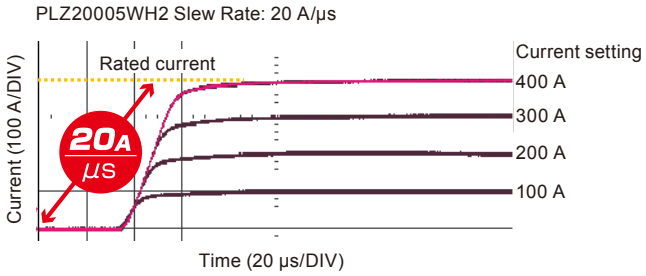
■ Wide ranging operation voltage up to 1000 V

Operating voltage ranges from 10 V to 1000 V.
Minimum operating voltage required to sink current is 1.5 V.



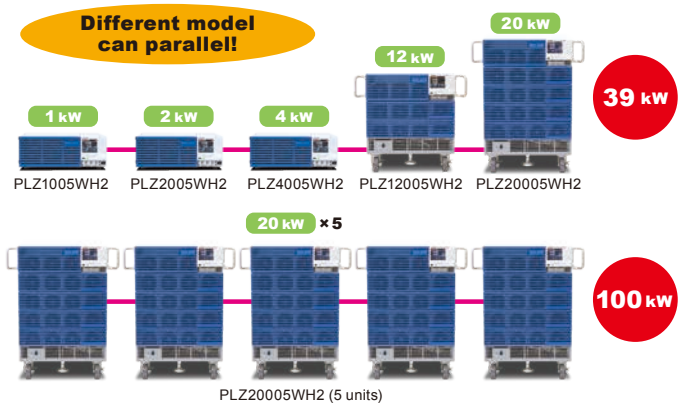
■ Maximum slew rate of 20 A/μs

For the PLZ20005WH2, a slew rate of 20 A/μs is achieved for current changes up to the rated current.



■ Parallel operation

Parallel operation (max. 5 units) is available on all models by simply connecting an optional parallel-operation cable. This feature is available even among different models for a wide range of high power.
(up to 100 kW / 2000 A)
*A parallel cable needed to connect with each unit. A parallel cable is included with 12 kW and 20 kW models. A parallel-operation cable is not included with 1 kW, 2 kW or 4 kW models.



PLZ20005WH2 (5 units)

Maximum current and power during parallel operation using the same model

Model	Parallel operation number	Maximum current	Maximum power
PLZ20005WH2	2	800 A	40 kW
	3	1200 A	60 kW
	4	1600 A	80 kW
	5	2000 A	100 kW

● Parallel connection with PLZ-5WH series*
Must be PLZ-5WH as a Master with updated firmware to newest version.
*When parallel operation between 5WH and 5WH2, only same capacity model is available.

PLZ-5WH2 Series Specifications

Model		PLZ1005WH2	PLZ2005WH2	PLZ4005WH2	PLZ12005WH2	PLZ20005WH2
Rating						
Operating voltage (DC)		10 V to 1000 V				
Current		20 A	40 A	80 A	240 A	400 A
Power		1000 W	2000 W	4000 W	12000 W	20000 W
DC INPUT terminal's isolation voltage		Positive pin: ±1 000 V, Negative pin: ±900 V				
Minimum operating voltage	At the rated current	10 V				
	When the current begins to flow	1.5 V or less				
Constant current (CC) mode						
Operating range		0 A to 20 A	0 A to 40 A	0 A to 80 A	0 A to 240 A	0 A to 400 A
Setting range		0.0000 A to 20.2000 A	0.000 A to 40.400 A	0.000 A to 80.800 A	0.00 A to 242.40 A	0.00 A to 404.00 A
Resolution		0.0005 A	0.001 A	0.002 A	0.005 A	0.01 A
Setting accuracy		±(0.2 % of setting + 0.1 % of rating)				
Parallel operation		±(0.4 % of setting + 0.2 % of rating)				
Constant resistance (CR) mode						
Operating range *1	H range	500 mS to 0 S	1 S to 0 S	2 S to 0 S	6 S to 0 S	10 S to 0 S
	L range	5 mS to 0 S	10 mS to 0 S	20 mS to 0 S	60 mS to 0 S	100 mS to 0 S
Setting range	H range	505.00 mS to 0.00 S	1.01000 S to 0.00000 S	2.02000 S to 0.00000 S	6.0600 S to 0.00000 S	10.1000 S to 0.0000 S
	L range	5.05000 mS to 0.00000 S	10.1000 mS to 0.0000 S	20.2000 mS to 0.0000 S	60.600 mS to 0.000 S	101.000 mS to 0.000 S
Resolution	H range	0.01 mS	0.00002 S	0.00005 S	0.0002 S	0.0002 S
	L range	0.0001 mS	0.0002 mS	0.0005 mS	0.002 mS	0.002 mS
Setting accuracy *2	H range	±(0.5 % of setting + 0.5 % of rating*3)				
	L range	±(0.5 % of setting + 0.2 % of rating*3)				
Parallel operation	H range	±(1.0 % of setting + 1.0 % of rating*3)				
	L range	±(1.0 % of setting + 0.4 % of rating*3)				

Model	PLZ1005WH2	PLZ2005WH2	PLZ4005WH2	PLZ12005WH2	PLZ20005WH2
Constant voltage (CV) mode					
Operating range	10 V to 1000 V				
Setting range	0.00 V to 1010.00 V				
Resolution	0.02 V				
Setting accuracy *4	±(0.05 % of setting + 0.05 % of rating)				
Parallel operation	±(0.1 % of setting + 0.1 % of rating)				
Response speed	NORM/FAST				
Constant power (CP) mode					
Operating range	0 W to 1000 W	0 W to 2000 W	0 W to 4000 W	0 W to 12000 W	0 W to 20000 W
Setting range	0.00 W to 1010.00 W	0.00 W to 2020.00 W	0.0 W to 4040.0 W	0.0000 kW to 12.1200 kW	0.0000 kW to 20.2000 kW
Resolution	0.02 W	0.05 W	0.1 W	0.0005 kW	
Setting accuracy	±(0.5 % of rating*5 + 0.02 A × Vin*6)	±(0.5 % of rating*5 + 0.04 A × Vin*6)	±(0.5 % of rating*5 + 0.08 A × Vin*6)	±(0.5 % of rating*5 + 0.2 A × Vin*6)	±(0.5 % of rating*5 + 0.4 A × Vin*6)
Parallel operation	±(1 % of power rating + 0.1 % current rating × Vin*6)			±(1 % of power rating + 0.1 % current rating × Vin*6)	
Arbitrary I-V characteristics (ARB) mode					
Operating range	Three to 100 points of current values can be specified for the input voltage.Linear interpolation is applied between specified points.				
Response speed	500 μs, 1 ms, 2 ms, 5 ms, 10 ms, 20 ms, 50 ms, 100 ms, or off				

*1 Conductance [S] = input current [A]/input voltage [V] = 1/resistance [Ω]
*2 Converted value at the input current. At the sensing point during remote sensing.
*3 Rated current
*4 With the input voltage within the operating range, and at the sensing point during remote sensing.
*5 Rated power
*6 DC INPUT terminal voltage or SENSING terminal voltage.

PLZ-5WH2 Series Specifications

Model			PLZ1005WH2	PLZ2005WH2	PLZ4005WH2	PLZ12005WH2	PLZ20005WH2
Measurement function							
Voltmeter	Display		0.00 V to 1000.00 V				
	Resolution		10 mV				
	Accuracy		±(0.05 % of reading + 0.05 % of rating)				
		Parallel operation	±(0.1 % of reading + 0.1 % of rating) (TYP)				
Ammeter	Display		0.000 A to 20.000 A	0.000 A to 40.000 A	0.000 A to 80.000 A	0.00 A to 240.00 A	0.00 A to 400.00 A
	Resolution		0.001 A	0.001 A	0.001 A	0.01 A	0.01 A
	Accuracy		±(0.2 % of reading + 0.1 % of rating)				
		Parallel operation	±(0.4 % of reading + 0.2 % of rating) (TYP)				
Power display	Display		Displays the product of the voltmeter reading and ammeter reading				
Measure-ment trigger	Trigger Source		Immediate, BUS, DIGITAL2, MSync, TALink, LoadOff				
	Trigger Count		1 to 65536				
	Trigger Delay		0.00000 s to 100.00000 s				
	Interval		Disable/Enable				
	Interval Time		0.00001 s to 3600 s				
	Sense Aperture		0.00001 s to 1.00000 s				
Pulse function							
Operation mode			CC and CR				
Frequency setting range			1.0 Hz to 10.0 kHz				
Frequency setting resolution *1	1 Hz to 10 Hz		0.1 Hz				
	11 Hz to 100 Hz		1 Hz				
	110 Hz to 1000 Hz		10 Hz				
	1.1 kHz to 10.0 kHz		0.1 kHz				
Frequency setting accuracy	1 Hz to 5.0 kHz		±(0.5 % of setting)				
	5.1 Hz to 10.0 kHz		±(1.0 % of setting)				
Duty cycle setting range, step	1 Hz to 10 Hz		5.0 % to 95.0 %, 0.1 % steps				
	11 Hz to 100 Hz						
	110 Hz to 1000 Hz						
	1.1 kHz to 10.0 kHz		5 % to 95 % *2, 1 % steps				
Switch value (Depth) *3	CC mode		0.000 0 A to 20.2000 A	0.000 A to 40.400 A	0.000 A to 80.800 A	0.000 A to 242.40 A	0.00 A to 404.00 A
	CR mode H range		505.00 mS to 0.00 S	1010.00 mS to 0.00 S	2020.00 mS to 0.00 S	6.06000 S to 0.00000 S	10.1000 S to 0.0000 S
	CR mode L range		5.0500 mS to 0.0000 S	10.1000 mS to 0.0000 S	20.2000 mS to 0.0000 S	60.600 mS to 0.000 S	101.000 mS to 0.000 S
Slew rate							
Operation mode			CC				
Operating range			0.001 A/µs to 1 A/µs	0.002 A/µs to 2 A/µs	0.004 A/µs to 4 A/µs	0.01 A/µs to 12 A/µs	0.02 A/µs to 20 A/µs
Resolution			0.00002 A/µs	0.00005 A/µs	0.0001 A/µs	0.0002 A/µs	0.0005 A/µs
Setting accuracy *4			±(10 % of setting +20 µs)				
Sine function							
Operation mode			CC				
Frequency setting range			1 Hz to 1000 Hz, 2000 Hz, 5000 Hz, 10000 Hz				
Frequency setting resolution *5	1 Hz to 10 Hz		1 Hz				
	20 Hz to 100 Hz		10 Hz				
	200 Hz to 1000 Hz		100 Hz				
Frequency setting accuracy	300 Hz to 900 Hz		±(1.0 % of setting)				
	Other than the frequencies above		±(0.5 % of setting)				
Soft start							
Operation mode			CC				
Time setting range			500 µs, 1 ms, 2 ms, 5 ms, 10 ms, 20 ms, 50 ms, 100 ms, or off				
Alarm function Alarm 1							
Overvoltage detection			Turns off the load when a voltage that is 110 % of the rating or higher is applied.				
Reverse-connection detection			Turns off the load when approximately -1 % of the rated current flows through the DC INPUT terminals.				
Overheat detection, over-current detection of the front-panel DC INPUT terminals			Turns off the load when the heatsink temperature reaches 100 °C. Or, turns off the load when a current of 30 A or higher is flowing through the front-panel DC INPUT terminals.				
Alarm input detection			Turns off the load when a voltage between 0 V and 1.5 V is applied to ALARM INPUT (pin 6) of the EXT CONT connector.				
Parallel operation anomaly detection			Turns off the load when any of the following errors occurs. • An error occurred in the communication between the master unit and slave unit during parallel operation. • A slave unit's power supply was interrupted. • An overheating was detected on the master or slave unit.				

Model		PLZ1005WH2	PLZ2005WH2	PLZ4005WH2	PLZ12005WH2	PLZ20005WH2
Alarm function Alarm 2						
Overcurrent protection (OCP)	Setting range	0.000 A to 22.000 A	0.00 A to 44.00 A	0.00 A to 88.00 A	0.00 A to 264.00 A	0.0 A to 440.0 A
	Resolution	0.001 A	0.01 A	0.01 A	0.01 A	0.1 A
	Protection operation	Select load off or limit.				
Overpower protection (OPP)	Setting range	0.0 W to 1100.0 W	0.0 W to 2200.0 W	0 W to 4400 W	0.000 W to 13.200 kW	0.000 W to 22.000 kW
	Resolution	0.1 W	0.1 W	1 W	0.001 kW	0.001 kW
	Protection operation	Select load off or limit.				
Under-voltage protection (UVP)	Setting range	0.00 V to 1000.00 V, or off.				
	Resolution	0.02 V				
	Protection operation	Select load off or limit.				
Watchdog protection (WDP)	Setting range	1 s to 3600 s or off				
	Protection operation	Load off				
Sequence function						
Operation mode		CC, CR, CV, CP				
Maximum number of programs		30				
Maximum number of steps		10000				
Step execution time		0.000050 s to 3600000 s (50 µs to 1000 h)				
Time resolution		1 µs				
Integration display						
Elapsed time display		Displays the time from load on to load off.				
	Range	0 s to 3600 000 s (1000 h 0 min 0 s)				
Ampere-hour meter display		Displays integrated current				
	Range	0 Ah to 70000 Ah	0 Ah to 140000 Ah	0 Ah to 280000 Ah	0 Ah to 800000 Ah	0 Ah to 1400000 Ah
Watt-hour meter display		Displays integrated power				
	Range	0 Wh to 40000000 Wh	0 Wh to 80000000 Wh	0 Wh to 160000000 Wh	0 Wh to 500000000 Wh	0 Wh to 800000000 Wh
Cutoff function						
Elapsed time		The load turns off when the elapsed time value reaches the specified value.				
	Range	0 s to 3600000 s (1000 h 0 min 0 s)				
	Resolution	1 s				
Integrated current		The load turns off when the ampere-hour meter value reaches the specified value.				
	Range	0 Ah to 70000 Ah	0 Ah to 140000 Ah	0 Ah to 280000 Ah	0 Ah to 800000 Ah	0 Ah to 1400000 Ah
	Resolution	0.001 mAh (0.000 mAh to 1000.000 mAh), 0.001 Ah (1.001 Ah to 1000.000 Ah), 0.001 kAh (1.001 kAh to 1000.000 kAh), 0.001 MAh (1.001 MAh to 1.400 MAh)				
Integrated power		The load turns off when the watt-hour meter value reaches the specified value.				
	Range	0 Wh to 40000000 Wh	0 Wh to 80000000 Wh	0 Wh to 160000000 Wh	0 Wh to 500000000 Wh	0 Wh to 800000000 Wh
	Resolution	0.001 Wh (0.000 Wh to 1000.000 Wh), 0.001 kWh (1.001 kWh to 1000.000 kWh), 0.001 MWh (1.001 MWh to 800.000 MWh)				
Voltage drop		The load turns off when the voltmeter value becomes less than or equal to the specified value.				
	Range	0.00 V to 1000.00 V				
	Resolution	0.02 V				
Other functions						
Remote sensing	Input voltage rating *6	1000 V *7				
	Isolation voltage	±1000 V				
Number of units in parallel operation		5 units				
Mutual synchronized operation *8		Synchronizes load on/off. Synchronization of sequence execution, and sequence resumption. Synchronizing the recording timing of measured values.				

*1 (Reference) The resolution actually set in the device is period resolution ⊿T = 1 µs, as shown in the equation below. For example, if you specify 9300 Hz, the period set in the device will be n × ⊿T = 108 × 1 µs = 108 µs (where n is a number set in the device). Converted to frequency, this becomes 1/108 µs = 9259 Hz.
*2 The minimum time span is 20 µs. The minimum duty cycle is limited by the minimum time span.
*3 The switch value is limited to the set current or set conductance or less.
*4 Time to change from 10 % to 90 % when the current is changed from 0 % to 100 % of the rated current
*5 (Reference) The resolution actually set in the device is period resolution ⊿T= 20 µs, as shown in the equation below. For example, if you specify 900 Hz, the period set in the device will be n × ⊿T = 56 × 20 µs = 1120µs (where n is a number set in the device). Converted to frequency, this becomes 1/1120 µs ≈ 893 Hz.
*6 There are limitations depending on the actual power that the load consumes.
*7 Total potential difference between the DC INPUT terminals and SENSING terminals
*8 The terminals for mutual synchronized operation are isolated from the DC INPUT terminals and operate at the chassis potential.

PLZ-5WH2 Series Specifications

Model		PLZ1005WH2	PLZ2005WH2	PLZ4005WH2	PLZ12005WH2	PLZ20005WH2
EXT CONT connector *1						
Load on/off control input		Logic level switchable. Pulled up to 5 V by a 10 kΩ resistor. The thresholds are HIGH: 3.5 V to 5 V, LOW: 0 V to 1.5 V.				
Alarm input		An alarm is activated with a voltage between 0 V and 1.5 V. Pulled up to 5 V by a 10 kΩresistor. The thresholds are HIGH: 3.5 V to 5 V, LOW: 0 V to 1.5 V.				
Alarm clearing input		After an alarm occurs, eliminate the root cause of the alarm, and change the input to pin 5 of the EXT CONT connector from a low level signal to a high level signal. The alarm will be cleared on the rising edge of this signal. Pulled up to 5 V by a 10 kΩ resistor. The thresholds are HIGH: 3.5 V to 5.0 V, LOW: 0 V to 1.5 V.				
Trigger input		Paused sequence operation resumes when a voltage between 0 V and 0.66 V is received. Pulled up to 5 V by a 10 kΩ resistor. The thresholds are HIGH: 2.31 V to 3.3 V, LOW: 0 V to 0.66 V.				
External voltage control input (CC, CR, CP mode)		Controls the load settings of CC, CR, CP mode through external voltage input. Input impedance: Approx. 10 kΩ. CC: The setting can be controlled in the range of 0 % to 100 % of the rated current through external voltage input of 0 V to 10 V. CR: The setting can be controlled in the range of 0 % to 100 % of the conductance setting through external voltage input of 0 V to 10 V. CP: The setting can be controlled in the range of 0 % to 100 % of the rated power through external voltage input of 0 V to 10 V.				
	Setting accuracy	±(1 % of rating) (TYP value in CC mode)				
External voltage control input (CV mode)		The load setting of CV mode can be controlled through external voltage input. The rated voltage can be controlled in the range of 0 % to 100 % with 0 V to 10 V. Input impedance: Approx. 10 kΩ.				
	Setting accuracy	±(1 % of rating) (TYP)				
External voltage control input (superimposing in CC mode)		Controls the load setting of CC mode by adding current through external voltage input. Adds current in the range of -100 % to 100 % of the rated current for -10 V to 10 V. Input impedance: Approx. 10 kΩ.				
	Setting accuracy	±(1 % of rating) (TYP)				
Load-on status output		On when load is on. Open-collector output from a photocoupler.*2				
ALARM 1 output		ON when overvoltage detection, reverse-connection detection, overheat detection, front-panel DC INPUT overcurrent detection, alarm input detection, or parallel operation anomaly detection is activated. Open-collector output from a photocoupler.*2				
ALARM 2 output		Turns on when OCP, OPP, UVP, or WDP is activated. Open-collector output from a photocoupler.*2				
DIGITAL 0 output/DIGITAL 1 output		Can be controlled through sequences. Output impedance: Approx. 330 Ω. The thresholds are HIGH: 2.5 V to 3.3 V, LOW: 0 V to 0.4 V.				
DIGITAL 2 input/output		Input/output switchable. Output: Sequence trigger output. The output impedance is 330 Ω. The thresholds are HIGH: 2.5 V to 3.3 V, LOW: 0 V to 0.4 V. Input: Trigger input signal for the sequence and the measurement functions. The thresholds are HIGH: 2.31 V to 3.3 V, LOW: 0 V to 0.66 V.				
Current monitor output		Outputs 0 V to 10 V for 0 % to 100 % of the rated current Output impedance: 1 kΩ (TYP).				
	Accuracy	±(1 % of rating) (TYP)				
BNC connector						
Trigger output		Transmits 10 µs pulses during step execution when trigger output is set in a sequence. Transmits 10 µs pulses during pulse operation and sine operation. Output impedance: 200 Ω, output voltage HIGH: 4.2 V to 5.0 V, LOW: 0 V to 0.4 V.				
Current monitor output	Output voltage	Outputs 0 V to 10 V for 0 % to 100 % of the rated current				
	Output impedance	50 Ω (TYP)				
	Accuracy	±(1 % of rating)				
Voltage monitor output	Output voltage	Outputs the measured voltage with 1/100 magnification from 0 V to 10 V.				
	Output impedance	50 Ω (TYP)				
	Accuracy	±(1 % of rating)				
Isolation voltage		±30 V				
Communication function						
RS232C		D-SUB 9-pin connector. Baud rate: 9600, 19200, 38400, 115 200 bps. Data length: 8 bits, Stop bits: 1 bit, Parity bit: None, Flow control: No, CTS/RTS				
USB (device)		Standard type B socket.Complies with the USB 2.0 specification. Data rate: 480 Mbps (High Speed). Complies with the USBTMC-USB488 device class specifications.				
USB (host)		Standard type A socket. Complies with the USB 2.0 specification. Data rate: 480 Mbps (High Speed).				
LAN		IEEE 802,3 100Base-TX/10Base-T Ethernet, IPv4, RJ-45 connector.				
General specifications						
Input voltage range		100 Vac to 240 Vac (90 Vac to 250 Vac) single phase				
Input frequency range		47 Hz to 63 Hz				
Power consumption		70 VAmax	90 VAmax	150 VAmax	360 VAmax	590 VAmax
Inrush current (peak value)	100 Vac	30 Amax	30 Amax	30 Amax	40 Amax	40 Amax
	230 Vac	80 Amax	80 Amax	80 Amax	160 Amax	160 Amax
Leakage current *3		0.5 mA or less	0.6 mA or less	0.8 mA or less	1.6 mA or less	2.4 mA or less
Environmental conditions	Operating temperature range	0 °C to 40 °C (32 °F to 104 °F)				
	Operating humidity range	20 %rh to 85 %rh (no condensation)				
	Storage temperature range	-25 °C to 60 °C (-13 °F to 140 °F)				
	Storage humidity range	90 %rh or less (no condensation)				
	Installation location	Indoor use, altitude of up to 2000 m, overvoltage category II				
Insulation resistance	Between primary and chassis, input, monitor terminals	1000 Vdc, 30 MΩ or more (70 %rh or less)				
	Between input terminals and chassis, monitor terminal	1000 Vdc, 3 MΩ or more (70 %rh or less)				
Withstanding voltage	Between primary and chassis, input, monitor terminals	No abnormalities at 1500 Vac for 2 s				
	Between input terminals and chassis, monitor terminal	No abnormalities at 1500 Vac for 2 s				
Electromagnetic compatibility *4 *5		Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU, EN 61326-1 (Class A*6), EN 55011 (Class A*6, Group 1*7), EN 61000-3-2, EN 61000-3-3 Applicable under the following conditions, The maximum length of all cabling and wiring connected to the product must be less than 3 m.				
Safety *4		Complies with the requirements of the following directive and standards. EMC Directive 2014/35/EU*5 ,EN 61010-1 (Class I*8, Pollution Degree 2*9)				

*1 1000 V reinforced insulation between each terminal and the DC INPUT terminal
*2 The maximum voltage that can be applied to the photocoupler is 30 V. The maximum current is 4 mA.
*3 Leakage current between the positive and negative terminals of the rear-panel DC INPUT. At 1000 Vdc.
*4 Does not apply to specially ordered or modified products.
*5 Limited to models that have a CE mark on their panels.
*6 This is a Class A instrument. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.
*7 This is a Group 1 instrument. This product does not generate and/or use intentionally radio-frequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/analysis purpose.
*8 This is a Class I instrument. Be sure to ground this product's protective conductor terminal. The safety of this product is guaranteed only when the product is properly grounded.
*9 Pollution is addition of foreign matter (solid, liquid or gaseous) that may produce a reduction of dielectric strength or surface resistivity. Pollution Degree 2 assumes that only non-conductive pollution will occur

Multifunctional Electronic Load (CC/CV/CR/CP)

PLZ334WL

GPIB RS232C USB DRIVERS CE

Dimensions

214.5(8.44")W × 124(4.88")H × 400(15.75")Dmm

Accessories

Setup guide, Quick reference (1 each for English and Japanese), CD-R (Contains the user's manual and the communication interface manual), Power cord, Set of screws for the load input terminal (2 sets.), Load input terminal cover, Screws for the Input terminal cover (2 pcs.), Protection dummy plug for J1 terminal, Connecting cable to the chassis

Options

■ Low inductance cable

TL01-PLZ (50 cm)	TL02-PLZ (1 m)	TL03-PLZ (2 m)
		
Inductance value(Typ value)		
140 nH	150 nH	200 nH

■ Sequence creation software
Wavy for PLZ-4W

Large current DC electronic load with fast slew rate(50 A/μs)

While the PLZ334WL succeeds to the superior operability of our conventional model of the PLZ-4W series, the PLZ-4WL series realizes the fast rise and fall time (slew rate of 50 A/μs.) in the range of low voltage with large current. The PLZ-4WL offers six operation modes, and equips with various features such as sequence operation, switching operation, soft-start function, and time and voltage measurement. The PLZ-4WL applies not only for the conventional load test of the CPU power supply, but also it can be applied to even faster current response test. In addition, the PLZ-4WL is a space-saving design (about 50 % less volume of the conventional model) that can save the facility space of the testing site, and it can be applied for single cell testing of large scale rechargeable batteries.

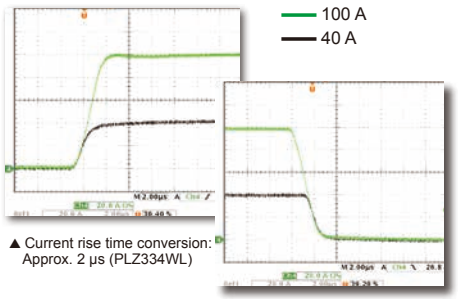
Features

- Full-load current of 100 A at 0.3 V!
  Possible to operate as low as 50 mV of the input voltage
- Realize the fast slew rate of 50 A/μs at 2.3 V of the load input terminal voltage. (Rise/Fall time conversion: Approx. 2 μs)
- Current setting resolution: 50 μA (L range)
- 6 operation modes (CC, CR, CV, CP, CC+CV, CR + CV)
- Equipped with sequence function and switching function
- Elapsed time display function and auto load-off timer function are convenient for the discharge tests of batteries.
- GPIB/RS232C/USB are standard interface
- Available for input voltage range AC100 V to 120 V/200 V to 240 V
- Equipped with various protection functions
  (OVP, OCP, OPP, OHP, UVP, REV)
- Optional low inductance cables are available exclusively for PLZ-4WL series.
- Optional sequence creation software (Wavy for PLZ-4W) is available

Functions

■ Fast slew rate

Realize the slew rate of 50 A/μs at 2.3 V of the load input terminal voltage.

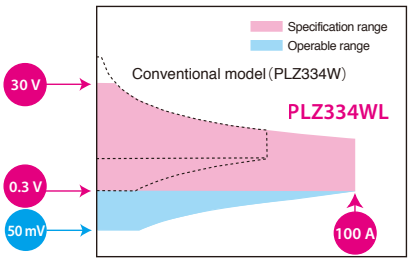


▲ Current rise time conversion: Approx. 2 μs (PLZ334WL)

▲ Current fall time conversion: Approx. 2 μs (PLZ334WL)

■ Realizing the low voltage operation

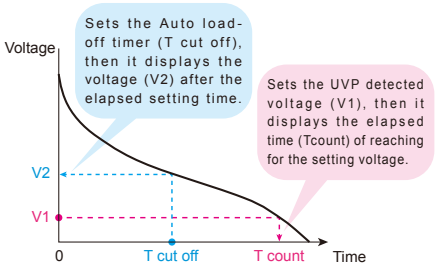
Possible to operate as low as 50 mV by the input voltage. Even below the input voltage of 0.3 V, this product can be used by reducing the current.



▲ Conceptual drawingof the operating range

■ Convenient feature for the discharge testing

The Auto load-off timer and the Cut-off features can be applied to the discharge capacity measurement of the rechargeable battery



PLZ334WL Specifications

model			PLZ334WL
Rating	Operating voltage (DC)		0.3 V to 30 V
			Minimum operating voltage for the Switching mode(includes the value of voltage drop generated by the inductance component of wirings)increases approximately 40 mV per 1 A/µs of the slew rate setting.
	Current		100 A
	Power		330 W
	Minimum start voltage *1		50 mV (typ)
Constant Current (CC) mode	Operating range	H	0 A to 100 A
		M	0 A to 10 A
		L	0 A to 1 A
	Setting range	H	0 A to 105 A
		M	0 A to 10.5 A
		L	0 A to 1.05 A
	Resolution	H	5 mA
		M	0.5 mA
		L	0.05 mA
	Accuracy of setting	H, M, L	±(0.2 % of set + 0.1 % of f.s.*2) + Vin/150 k *3
	Input voltage variation *4	H, M, L	±(0.1 % of set + 0.02 % of f.s.*2)
	Ripple	rms *5	8 mA
		p-p *6	80 mA
Constant Resistance (CR) mode	Operating range	H	330 S to 6 mS
			(3.03 mΩ to 166.7 Ω)
		M	33.3 S to 600 µS
			(30.3 mΩ to 1.667 kΩ)
		L	3.3 S to 60 µS
			(303 mΩ to 16.67 kΩ)
	Setting range	H	346.5 S to 0 S
			(2.886 mΩ to OPEN)
		M	34.65 S to 0 S
			(28.86 mΩ to OPEN)
		L	3.465 S to 0 S
			(288.6 mΩ to OPEN)
	Resolution	H	6 mS
		M	600 µS
		L	60 µS
	Accuracy of setting *7	H, M, L	±(0.5 % of set *8 + 0.5 % of f.s.*2) + Vin/150 k
Constant Voltage (CV) mode	Operating range	H	0.3 V to 30 V
		L	0.3 V to 4 V
	Setting range	H	0 V to 31.5 V
		L	0 V to 4.2 V
	Resolution	H	2 mS
		L	200 µS
	Accuracy of setting		±(0.1 % of set + 0.1 % of f.s.)
	Input current variation *9		12 mV
Constant Power (CP) mode	Operating range	H	33 W to 330 W
		M	3.3 W to 33 W
		L	0.33 W to 3.3 W
	Setting range	H	0 W to 346.5 W
		M	0 W to 34.65 W
		L	0 W to 3.465 W
	Resolution	H	20 mW
		M	2 mW
		L	0.2 mW
	Accuracy of setting	H, M, L	±(2.5 % of f.s. *2)
Voltmeter	Display	H	0.000 V to 30.000 V
		L	0.0000 V to 4.0000 V
	Accuracy		±(0.1 % of rdg + 0.1 % of f.s.)
Ammeter	Display	H, M	0.00 A to 100.00 A
		L	0.0000 A to 1.0000 A
	Accuracy		±(0.2 % of rdg + 0.3 % of f.s.)
Watt-meter	Display	H, M	0.00 W to 330.00 W
		L *15	0.000 W to 30.000 W
		L *16	0.0000 W to 3.3000 W
Switching mode	Operation mode		CC/CR mode
	Selectable frequency range		1 Hz to 50 kHz
	Duty cycle setting		5 % to 95 % 1 % step *10
	Accuracy of frequency setting		±(0.5 % of set)
Slew rate	Selectable range (CC)	H	5 mA/µs to 50 A/µs
		M	500 µA/µs to 5 A/µs
		L	50 µA/µs to 500 mA/µs
	Accuracy of setting *11		±(10 % of set + 0.8 µs)
Soft start	Operation mode		CC mode
	Selectable time range *12		Off, 100 µs, 200 µs, 500 µs, 1000 µs, 2 ms, 5 ms,10 ms,20 ms
	Accuracy of setting		±(30 % of set + 10 µs)
Response	Response speed		NORMAL, FAST
Remote sensing	Sensing voltage that can be compensated		3 V for a single line
Protection function	Overvoltage protection (OVP)		Turns off the load at 115 % of the rated voltage
	Overcurrent protection (OCP)		Setting range 10 % to 110 % of the rated current Load off or limit selectable
	Overpower protection (OPP)		Setting range 10 % to 110 % of the rated power Load off or limit selectable
	Overheat protection (OHP)		Turns off the load when the heat sink temperature reaches 90 °C
	Undervoltage protection (UVP)		Turns off the load when detected. Can be set in the range of 0.3 V to 30 V
	Reverse connection protection (REV)		By diode and fuse. Turns off the load when an alarm occurs

model				PLZ334WL
Sequence function	Normal sequence			
	Operation mode			CC, CR, CV, CP
	Maximum number of steps			256
	Step execution time			1 ms to 999 h 59 min
	Resolution			1 ms, 100 ms, 1 s, 10 s, 1 min
	Fast sequence			
	Operation mode			CC, CR
	Maximum number of steps			1024
	Step execution time			25 µs to 100 ms
	Resolution			25 µs (25 µs to 100 µs)
				100 µs(100 µs to 100 ms)
Other functions	Elapsed time display			Measures the time from load on to load off. On/Off selectable. Measures from 1 s up to 999 h 59 min 59 s.
	Auto load off timer			Measures the time from load on to load off. Can be set in the range of 1 s to 999 h 59 min 59 s or off.
Input / Output signal	J1 connector			26-pin MIL connector
		EXT cont MODE		CC/CR/CP External Voltage Control, 0 to 100 % of the rating of Range by 0 to 10V
		EXT cont ADD		CC mode External Voltage Control, 0 to 100 % of the Local setting value of the rating Range by 0 to ±10 V, Adding up the value to the setting value of ExtCont.
		EXT cont CV		CV mode External Voltage Control, 0 to 100 % of the rating of Range by 0 to 10V
		IMON		Current monitor output, 10 Vf.s. (H/L range), 1 Vf.s. (M range)
		LOAD CONT INPUT		CMOS signal L level (or H level) Load On, Switchable to the logic level
		RANGE CONT		External range switch input, 2 bit
		ALARM INPUT		The alarm activates when the L level of CMO signal is applied for more than 10 µs. The internal circuit pulls up to 5 V by 10 kΩ
		TRIG INPUT		When it is in the pause condition, the pause can be cancelled when the L level of CMOS signal is applied for more than 10 µs. The internal circuit pulls up to 5 V by 10 kΩ
		ALARM CLEAR INPUT		The alarm can be cleared when the L level of CMOS signal is applied for more than 100 ms. The internal circuit pulls up to 5 V by 10 kΩ
		LOAD ON STATUS		On when the load is on. Open collector by the photo coupler
		RANGE STATUS		Range status output. 2 bit
		ALARM STATUS		On when the alarm is on(OVP, OCP, OPP, OHP, REV, UVP) or Turns on when the external alarm is applied
		SHORT SIGNAL OUT		Relay contact output (DC30 V/1 A)
	Front panel BNC connector			
		TRIG OUT		Outputs a pulse during sequence operation and switching operation.
		IMON OUT		1 V f.s(H/L range), 0.1 V f.s(M range)Isolated to the internal common(connected to the chassis potential)
Communication function	GPIB, RS232C, and USB interfaces are equipped as standard.			
General Specifications	Input voltage range			100 V AC to 240 V AC (90 V AC to 250 V AC), Single phase
	Input frequency range			47 Hz to 63 Hz
	Power consumption			95 VAmax
	Inrush current *13			65 Amax
	Operating temperature range			0 °C to 40 °C
	Operating humidity range			20 % to 85 % RH (without condensation)
	Storage temperature range			-20 °C to 70 °C
	Storage humidity range			90 % RH or less (without condensation)
	Isolation voltage			±500 V
	Insulation resistance	Primary - input terminal		500 VDC, 30 M or more (ambient humidity of 70 % RH or less)
		Primary - chassis		500 VDC, 30 M or more (ambient humidity of 70 % RH or less)
		Input terminal - chassis		500 VDC, 30 M or more(ambient humidity of 70 % RH or less)
	Withstand voltage	Primary - input terminal		No abnormalities at 1500 VAC for 1 minute.
		Primary - chassis		No abnormalities at 1500 VAC for 1 minute.
	Accessories			Setup Guide, Quick Reference (1 each for English and Japanese), CD-R (Contains the User's Manual and the Communication Interface Manual), Power cord, Set of screws for the load input terminal (2 sets.), Load input terminal cover, Screws for the Input terminal cover (2 pcs.), Protection dummy plug for J1 terminal, Connecting cable to the chassis
	Safety *14			Conforms to the requirements of the following directive and standard. Low Voltage Directive 2014/35/EU, EN61010-1 Class I, Pollution degree 2
	Electromagnetic compatibility (EMC)			Conforms to the requirements of the following directive and standard. EMC Directive 2014/30/EU, EN 61326-1, EN 55011 Emissions: Class A, Group 1 Immunity: Minimum immunity test requirements EN61000-3-2, EN61000-3-3
	Weight			Approx. 8.0 kg(17.64 lbs)
	Dimensions (mm(inch)(maximum)			214.5(8.44")W×124(4.88")(155(6.1"))H×400(15.75")(455(17.91"))D

*1 Minimum voltage at which the current starts flowing to the electronic load. At the load input terminal.
*2 In the M range, it applies for the full scale of the H range
*3 Vin: Input terminal voltage or the sensing voltage of the electronic load.
*4 When the input voltage is varied from 0.3 V to 30V at a current of the rated power/30 V
*5 Measurement frequency bandwidth : 10 Hz to 1 MHz
*6 Measurement frequency bandwidth : 10 Hz to 20 MHz
*7 Conversion rate of the input current. At the sensing terminal.
*8 set=Vin/Rset
*9 With respect to a change in the current of 10 % to 100 % of the rating at an input voltage of 0.3 V (during remote sensing)
*10 The minimum time width is 10 µs. Between 5 kHz to 50 kHz, the maximum duty cycle is limited by the minimum time width.
*11 Time to reach from 10 % to 90 % when the current is varied from 2 % to 100 % (20 % to 100 % in M range)
*12 Time to reach from 10 % to 90 % of the input current
*13 Approximately 35 A for the input voltage of AC100 V
*14 This product is categorized in the "Class I". The protective conductor terminal of this product must be connected to the ground. The safety can not be guaranteed when it is not connected to the ground properly.
*15 In a mode other than CR mode

Multifunctional Electronic Load (CC/CV/CR/CC+CV/CR+CV)

PLZ-U Series

GPIB RS232C DRIVERS CE

This photo shows a 5-channel frame housing 5 units.
The rack mount bracket is optional.

*Multi-channel load systems can be built easily! Operating multiple units in parallel offers large capacity!**

The PLZ-U Series provides a set of compact, high-performance multi-channel electronic load systems capable of operating in five modes - constant current, constant resistance, constant voltage, constant current+constant voltage and constant resistance+constant voltage. Adopting the modular (plug-in) design, the Series consists of four models - two frame models and two load unit models. The PLZ-30F frame can configure the load units up to three channels, and the PLZ-50F frame can configure up to five channels. Two load unit models are available, the PLZ-70UA (75-watt load that operates even at 0 V) and PLZ-150U (150-watt load that operates from 1.5 V up). Load units can be operated in parallel to increase the current capacity or power capacity. By combining different models of load units and frame, the power capacity can be changed from 75 W to 750 W (when five PLZ150U units are mounted in a PLZ-50F frame). Supporting the GPIB and RS232C interfaces as standard, the electronic load can be built into various types of test systems, making it useful in testing fuel cells, secondary cells, DC/DC converters, switching power supplies, multiple-output power supplies, and more.

*Only load units of the same model can be operated in parallel.

Dimensions

PLZ-30F: 292(11.5″)W × 128(5.04″)H × 400(15.75″)Dmm
PLZ-50F: 435(17.13″)W × 128(5.04″)H × 400(15.75″)Dmm

Accessories

Load unit: Operation manual, Rear load input terminal cover, Load input connector screw set (2 sets/M6 bolt, M6 nut, M6 spring washer and M4 screw), Load unit attachment screw (2 pcs./M3-10 screw), Sensing terminal screw (2 pcs./M3-6 screw, attached to the unit)
Frame: Operation manual, Power cord (with SVT3 18AWG 3-prong plug, cable length of 2.4 m), Front/Rear blank panel (2 pcs./PLZ-30F or 4 pcs./PLZ-50F), Protection dummy plug (2 pcs./for the FRAME CONT connector, attached to the unit)

Features

- Slew rate of 2.4 A/µs in the rising and falling edges in CC mode (PLZ150U)
- Built-in three ranges; voltmeter, ammeter, and wattmeter functions that provide readings of up to five digits
- The current slew rate can be changed continuously in constant current and constant resistance modes.
- Supports 0-V input - an indispensable feature for testing single-cell fuel cells.
- Individual units (channels) can operate either independently or in synchronization.
- Up to five load units of the same model can be operated in parallel.
- Up to three values can be stored in memory for each most frequently used operation mode and range.
- Equipped with various types of protection circuits (over voltage protection, over current protection, over power protection, over heat protection, under voltage protection, and reverse connection protection).
- Supports the GPIB and RS232C interfaces as standard.
- External control is available to turn on or off the output.

Application Software (downloadable free of charge)

Application software for controlling this system from a PC is available from our website.

[NOTICE]PLZ-70UA

The operating voltage is guaranteed by the input terminal of the load unit. Be sure to select a load cable that never inputs a voltage of 0 V or less to the load unit input terminal. This system detects the no-signal condition. The no-signal condition is detected when the voltage at the load unit input terminal is 0.3 V or less and when the input current is equal to or less than about 1 % of the rating, in which case the current will stop flowing.

Options

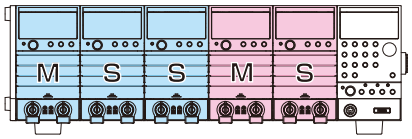
- Control flat cable
  PC01-PLZ-4W (300 mm)
  PC02-PLZ-4W (550 mm)
  (for connection between frames)

- Sequence creation software
  Wavy for PLZ-U

ES France - Département Puissance Energie - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 45 - Fax. 01 47 01 16 22 - e-mail: tem@es-france.com - Site Web: www.es-france.com

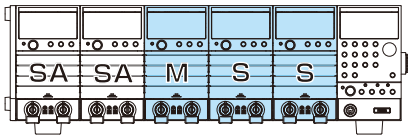
Parallel Operation for Larger Capacity

Up to five adjacent load units of the same models can be operated in parallel. For example, you can build a 375-watt load system by operating five PLZ70UA load units in parallel in the PLZ-50F frame or a 750-watt load system by operating five PLZ150U load units in parallel.



M: Master
S: Slave

When three load units of one model and two load units of another model are operated in parallel in the PLZ-50F frame



M: Master
S: Slave
SA: Standalone load unit

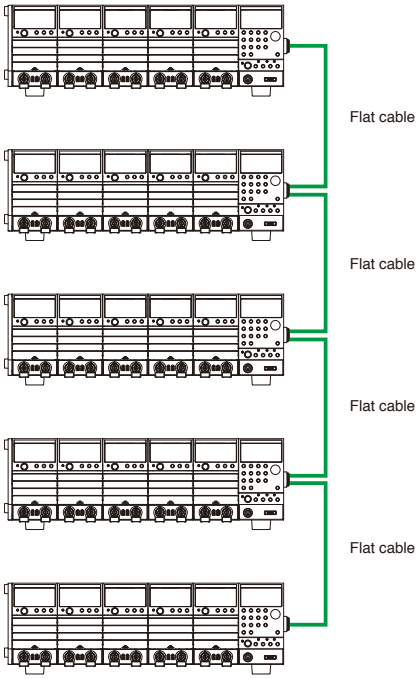
When three load units of the same model are operated in parallel and two standalone load units are operated independently in the PLZ-50F frame

Number of Modules and Capacities

Number of parallel operated load modules	PLZ70UA	PLZ150U
2	30 A/150 W	60 A/300 W
3	45 A/225 W	90 A/450 W
4	60 A/300 W	120 A/600 W
5	75 A/375 W	150 A/750 W

Frame Control

By connecting two or more frames, you can use one frame to control the other frames (up to five frames can be connected at a time). Operations such as load on/off and preset memory call can be performed.



Ordering Code * Please inquire by following code

Model name	Frame model	PLZ70UA	PLZ150U	Total number of unit
PLZ30F-70UA0-150U1	PLZ-30F	0	1	1
PLZ30F-70UA0-150U2		0	2	2
PLZ30F-70UA0-150U3		0	3	3
PLZ30F-70UA1-150U0		1	0	1
PLZ30F-70UA1-150U1		1	1	2
PLZ30F-70UA1-150U2		1	2	3
PLZ30F-70UA2-150U0		2	0	2
PLZ30F-70UA2-150U1		2	1	3
PLZ30F-70UA3-150U0		3	0	3

Model name	Frame model	PLZ70UA	PLZ150U	Total number of unit
PLZ50F-70UA0-150U1	PLZ-50F	0	1	1
PLZ50F-70UA0-150U2		0	2	2
PLZ50F-70UA0-150U3		0	3	3
PLZ50F-70UA0-150U4		0	4	4
PLZ50F-70UA0-150U5		0	5	5
PLZ50F-70UA1-150U0		1	0	1
PLZ50F-70UA1-150U1		1	1	2
PLZ50F-70UA1-150U2		1	2	3
PLZ50F-70UA1-150U3		1	3	4
PLZ50F-70UA1-150U4		1	4	5
PLZ50F-70UA2-150U0		2	0	2
PLZ50F-70UA2-150U1		2	1	3
PLZ50F-70UA2-150U2		2	2	4
PLZ50F-70UA2-150U3		2	3	5
PLZ50F-70UA3-150U0		3	0	3
PLZ50F-70UA3-150U1		3	1	4
PLZ50F-70UA3-150U2		3	2	5
PLZ50F-70UA4-150U0		4	0	4
PLZ50F-70UA4-150U1		4	1	5
PLZ50F-70UA5-150U0		5	0	5

PLZ-U Series Specifications

Model			PLZ150U	PLZ70UA
Rating				
Operating voltage (DC)			1.5 V to 150 V	0 V to 150 V
Current/power	Range	H	30 A/150 W	15 A/75 W
		M	3 A/150 W	1.5 A/75 W
		L	300 mA/45 W	150 mA/22.5 W
Isolation voltage of the load input terminal			500 VDC	
Withstand voltage between load input terminal channels			500 VDC	
Minimum start voltage*1			0.3 V or greater	
CC mode				
Operating range	Range	H	0 A to 30 A	0 A to 15 A
		M	0 A to 3 A	0 A to 1.5 A
		L	0 A to 300 mA	0 A to 150 mA
Selectable range			0 % to 105 % of f.s	
Resolution	Range	H	2 mA	1 mA
		M	0.2 mA	0.1 mA
		L	0.02 mA	0.01 mA
Accuracy of setting	Range	H, M, and L	±(0.2 % of set + 0.2 % of f.s) + Vin*2/500 kΩ	
Input voltage variation*3	Range	H	2 mA	
		M	1 mA	
		L	0.1 mA	
Ripple		rms*4	3 mA	7.5 mA
		p-p*5	30 mA	50 mA
CR mode				
Operating range The value inside parentheses is the conductance. *6	Range	H	PLZ150U OPEN to 50 mΩ (0 S to 20 S)	OPEN to 100 mΩ (0 S to 10 S)
		M	OPEN to 500 mΩ (0 S to 2 S)	OPEN to 1 Ω (0 S to 1 S)
		L	OPEN to 5 Ω (0 S to 200 mS)	OPEN to 10 Ω (0 S to 100 mS)
Selectable range			0 % to 105 % of f.s *7	
Resolution The value inside parentheses is the operating range.	Range	H	0.2 mS (0 S to 2 S)	0.1 mS (0 S to 1 S)
			2 mS (2 S to 20 S)	1 mS (1 S to 10 S)
		M	20 µS (0 S to 200 mS)	10 µS (0 S to 100 mS)
			0.2 mS (200 mS to 2 S)	0.1 mS (100 mS to 1 S)
		L	2 µS (0 S to 20 mS)	1 µS (0 S to 10 mS)
			20 µS (20 mS to 200 mS)	10 µS (10 mS to 100 mS)
Accuracy of setting*8	Range	H, M, and L	±(0.5 % of set*9 + 0.5 % of f.s*10) + Vin/500 kΩ	
CV mode				
Operating range	Range	H	1.5 V to 150 V	0 V to 150 V
		L	1.5 V to 15 V	0 V to 15 V
Selectable range			0 % to 105 % of f.s	
Resolution	Range	H	10 mV	
		L	1 mV	
Accuracy of setting	Range	H and L	±(0.1 % of set + 0.1 % of f.s)	
Input current variation *11			12 mV	

*1 Minimum voltage at which the current starts flowing to the PLZ-U.
(The PLZ-U detects no signal at an input voltage less than or equal to approximately 0.3 V and an input current less than or equal to approximately 1 % of the range rating. Therefore, if the input voltage is gradually increased from 0 V, no current will flow until 0.3 V is exceeded. If a current greater than or equal to 1% of the range rating starts flowing, the current can flow at voltages less than equal to 0.3 V.)
*2 Vin: Load input terminal voltage
*3 At a current greater than or equal to (Vin/500 kΩ)
*4 Measurement frequency bandwidth: 10 Hz to 1 MHz
*5 Measurement frequency bandwidth: 10 Hz to 20 MHz
*6 Conductance [S] = (Input current [A]/input voltage [V]) = (1/resistance [Ω])
*7 Conductance f.s
*8 Converted value in terms of the input current, during remote sensing
*9 set = input voltage × specified conductance = (input voltage/specified resistance)
*10 f.s = Rated current of the specified range
*11 During remote sensing

Model			PLZ150U	PLZ70UA
Voltmeter				
Measurement range			0 V to 150.0 V	
Resolution	15.75 V to 150 V		0.01 V	
	0 V to 15.75 V		0.001 V	
Measurement accuracy			±(0.1 % of rdg + 15 digits)	
Ammeter				
Measurement range	Range	H	0 A to 30 A	0 A to 15 A
		M	0 A to 3 A	0 A to 1.5 A
		L	0 mA to 300 mA	0 mA to 150 mA
Resolution	Range	H	0.001 A	
		M	0.0001 A	
		L	0.01 mA	
Measurement accuracy			±(0.2 % of rdg + 0.3 % of f.s)	
Wattmeter *1				
Measurement range			0 W to 150 W	0 W to 150 W
Resolution	100 W minimum		0.01 W	
	100 W or greater		0.1 W	
Switching mode				
Operation mode			CC and CR	
Selectable frequency range			1 Hz to 20 kHz	
Duty cycle setting			2 % to 98 %, 0.1 % steps	
Frequency resolution	1 Hz to less than 1 kHz		1 Hz	
	1 kHz to less than 10 kHz		10 Hz	
	10 kHz to 20 kHz		100 Hz	
Accuracy of frequency setting			±(0.5 % of set)	
Slew rate				
Operation mode			CC and CR	
Selectable range (CC)	Range	H	0.10 A/µs to 2.40 A/µs	0.05 A/µ to 1.20 A/µs
		M	0.10 A/µs to 0.24 A/µs	0.05 A/µ to 0.12 A/µs
		L	24 mA/µs*2	12 mA/µs*2
Selectable range (CR)	Range	H	0.10 A/µs to 0.24 A/µs	0.05 A/µ to 0.12 A/µs
		M	24 mA/µs*2	12 mA/µs*2
		L	2.4 mA/µs*2	1.2 mA/µs*2
Resolution			0.01 A/µs	
Accuracy of setting*3			±(10 % of set + 5 µs)	
Soft start				
Operation mode			CC	
Selectable time range			0.1, 1, 3, 10, 30, 100, or 300 ms	
Time accuracy			±(30 % of set +100 µs)	
Sequence function				
Sequence	Operation mode		CC and CR	
	Maximum number of steps		255	
	Step execution time		1 ms to 9 999 s	
	Number of loops		1 to 9999 (9999 is infinite loop)	

*1 Product of the measured voltage and measured current
*2 Fixed value
*3 Time to reach from 10 % to 90 % when the current is changed from 2 % to 100 % of the rated current of H range.

Model	PLZ150U	PLZ70UA
Protection function		
Overvoltage protection (OVP)	Turns off the load at 110 % of the rated voltage	
Overcurrent protection (OCP)	Set the value in the range of 0 % to 110 % of the rated current of H range. Trips at the value or 110 % of the rated current of the range, whichever is less. The action taken when the OCP trips can be set to load off or limit.	
Overpower protection (OPP)	Set the value in the range of 0 % to 110 % of the rated power of H range. Trips at the value or 110 % of the rated power of the range, whichever is less. The action taken when the OPP trips can be set to load off or limit.	
Overheat protection (OHP)	Trips when the heat sink temperature reaches 95 °C. The action taken when the OHP trips is to turn the load off.	
Reverse connection protection (RVP)	Short-term protection provided by a short-circuit system using a protection diode. The action taken when the OHP trips is to turn the load off.	
Undervoltage protection (UVP)	Set the value to off or in the range of 0 % to 100 % of the rated voltage. The action taken when the OHP trips is to turn the load off.	
Communication function		
GPIB	IEEE std. 488.2-1994 SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, and E1	
	Supports the SCPI command set Sets panel functions except the POWER switch and key lock and reads measured values	
RS232C	D-SUB 9-pin connector (conforms to EIA-232-D)	
	Sets panel functions except the POWER switch and key lock and reads measured values Baud rate: 2400, 4800, 9600, or 19200 bps; stop bit: 1; data length: 8 bits; parity: NONE; and flow control: XON/OFF	

PLZ-U Series Specifications

Model		PLZ150U	PLZ70UA
Inter-frame control and external control			
Inter-frame control		Controls up to four slave frames from the master frame.	
		Enables you to turn on/off the load, recall presets ABC on all channels simultaneously, and recall setup memories 0 to 3.	
External control	Recall input of preset mem-ories A, B, and C	Recalls preset memories A, B, and C on all channels simultaneously	
	Setup memory recall input	Recalls the setup memory 0 to 3	
	Enable input	Enables the turning on/off of the load, recalling of presets ABC on all channels simultaneously, and recalling of setup memories 0 to 3.	
	Load-on input	Turns on the load on all channels simultaneously.	
	Load on status output	On when the load is on (open collector output)	
	Alarm status output	On when the alarm is on (open collector output)	
	Internal power output	5 V and maximum output current of 100 mA	
Input signal		Low active, pull up to 5 V using 10 kΩ. Low level input voltage: 0 V to 1 V, high level input voltage: 4 V to 5 V	
Output signal		Open collector, output withstand voltage of 30 VDC, output saturation voltage of approximately 1.1 V, and maximum output current of 100 mA.	
Remote sensing			
Sensing voltage that can be compensated		2 V for a single line	
Miscellaneous			
ABC preset memories		Saves settings (A, B, and C) for each operation mode of each range	
Setup memories		Saves four sets of setup parameters	
Elapsed time display		Measures the time from when the load is turned on to when the load is turned off (0.1 s to 99999 s)	
Auto load off timer		Turns off the load after the specified time elapses (off or 1 s to 99999 s)	
Delayed load-on		Turns on the load after the specified time elapses (0 ms to 1 s, 10 ms steps)	
Parallel operation		Possible between adjacent load units (same model) in the frame.	
External analog control			
Power output		12 V and maximum output current of 50 mA.	
External voltage control input *1		Operates in CC, CR, and CV modes. 0 % to 100 % of f.s in the range of 0 V to 10 V.	
Load-on input		Low active (or high active), pull up to 5 V using 10 kΩ. Low level input voltage: 0 V to 1 V, high level input voltage: 4 V to 5 V	
Current monitor output		0 % to 100 % of the rated current in the range of 0 V to 10 V	
Common		Negative pin electric potential of the load input terminal	
General Specifications			
Weight		Approx. 2 kg (4.41 lbs)	
Accessories	Rear load input terminal cover	1 pc.	
	Set of screws for the load input connector	2 sets (M6 bolt, M6 nut, M6 spring washer, M4 screw)	
	Load unit attachment screws	2 pcs. (M3-10 screws, attached to the unit)	
	Sensing terminal screw on the rear panel	2 pcs. (M3-6 screws, attached to the unit)	

*1 The time for updating the setting in CR or CV mode is approximately 100 ms.

Model		PLZ30F	PLZ50F
Rated supply voltage		100 VAC to 240 VAC (90 VAC to 250 V) single phase	
Rated frequency		50 Hz or 60 Hz (47 Hz to 63 Hz)	
Power consumption	Frame alone	33 VA or less	40 VA or less
	When load units are installed in all channels	300 VAmax	500 VAmax
Cooling system		Forced air cooling using a heat sensing variable speed fan.	
Operating temperature range		0 °C to 40 °C	
Operating humidity range		20 % to 85 % RH (without condensation)	
Storage temperature range		–20 °C to 70 °C	
Storage humidity range		90 % RH or less (without condensation)	
Insulation resistance	Primary - chassis	500 VDC, 30 MΩ or more (ambient humidity of 70 % RH or less)	
Withstand voltage	Primary - chassis	No abnormalities at 1500 VAC for 1 minute.	
Ground continuity		25 Aac, 0.1 Ω or less	
Battery backup		Backs up the setup data immediately before the power is turned off Battery life: 3 years or longer (at 25 °C)	
Number of installable load modules		3	5
Dimensions (mm)		See outline drawing.	
Weight	Frame alone	Approx. 5 kg (11.02 lbs)	Approx. 7 kg (15.43 lbs)
Accessories	Power cord	1 pc. (with SVT3, 18AWG, 3-prong plug, cable length of 2.4 m)	
	Blank panel (front panel)	2 pcs. maximum *1	4 pcs. maximum *1
	Protection dummy plug	2 pcs. (for the FRAME CONT connector, attached to the unit)	
	Operation manual	1 pc.	
Electromagnetic compatibility *1, *2		Conforms to the requirements of the following directives and standards EMC Directive 2014/30/EU EN 61326-1 EN 55011 Emission: Class A, Group 1 Immunity: Minimum immunity test requirement EN61000-3-2, EN61000-3-3	
Safety *3, *4		Conforms to the requirements of the following directives and standards Low Voltage Directive 2014/35/EU EN61010-1 Class I Pollution degree 2	

*1 In products that have load units installed, blank panels are installed in the empty slots. In products that contain the frame alone, the maximum number of blank panels are installed.
*2 Only on models that have CE marking on the panel.
*3 Not applicable to custom order models.

Charge/Discharage System

PFX2500 Series

LAN PFX2512 PFX2532 USB PFX2511 CE

PFX2532

PFX2512

Dimensions / Weight

PFX2511: 214.5(8.45″)W×124(4.88″)H×400(15.75″)Dmm(inch)/7kg(15.43 lbs)
PFX2512: 214.5(8.45″)W×124(4.88″)H×400(15.75″)Dmm(inch)/7kg(15.43 lbs)
PFX2532: 429.5(16.91″)W×128(5.04″)H×550(21.65″)Dmm(inch)/17 kg (37.48 lbs)

Accessories

Power cord, 26-core/20-core flat cable, Sensing connector, Thermistor, Lock lever, Operation manual,
PFX2511/PFX2512: Cable with crimp terminal, PFX2512: LAN cable(2m), PFX2511: Twisted-pair wire with TP-BUS connectors, TP-BUS core, BPChecker2000 setup guide, BPChecker2000 BASIC edition CD-ROM, PFX2532: I/O terminal cover set, I/O terminal M8 screw set, Load input terminal cover set, Ferrite core for 26-core/20-core flat cables, 26-core cable (with ferrite core) for PAT-T, Sensing connector cover set, LAN cable

Options

■ Load cable
TL08-PFX
Max.50 A, length:5 m Load cable with voltage current, and temperature sensing cable.

TL08-PFX

■ Sensing cable set
TL09-PFX (for OP01/02-PFX) approx. 5 m
TL11-PFX (for OP03-PFX) approx. 5 m
TL12-PFX* (for OP03-PFX) approx. 3 m

■ Cable set
TL10-PFX* (for PFX2532)

■ Voltage/thermometer unit
OP01-PFX* (for PFX2511)
Up to 3 boards can be mounted
OP02-PFX* (for PFX2512/2532)
Up to 3 boards can be mounted

TL09-PFX

■ Voltage unit
OP03-PFX* (for SL01-PFX)
Up to 8 boards can be mounted

OP03-PFX

■ 8 slot unit
SL01-PFX* (for PFX2512/2532)

SL01-PFX

■ I/F cable
SC05-PFX (for PLZ-5W)
SC07-PFX (for PWR-01)

■ Application software
SD002 (for PFX2511)
BPChecker2000 FULL Edition
(The 2-channel version is supplied with PFX2511)
SD007-PFX (for PFX2512/2532)
BPChecker3000

SC05-PFX

SC07-PFX

■ Rack mount frame
KRB3-TOS(EIA) (for PFX2532)
KRB150-TOS(JIS) (for PFX2532)

Fully support charge and discharge measurement from basic test to simulation test

PFX2500 Series is a high performance Charge/Discharge system controller that takes measurements in combination with our DC power supply and electronic load in order to evaluate test sample (electric storage elements such as secondary batteries) characteristics. It is also capable to perform evaluation test with high-performance, large capacity and wide range of rating with the combination of DC power supply and electronic load. Execution of the test is conducted by the exclusive application software. The test corresponds to long time continuous test and synchronization test with temperature chambers with the multiplexed protection performance. In addition, easy data editing is also capable with fulfilling graphic performance.

Features

- Capable of high-precision measurement of cumulative capacities and amount of power as well as voltage and current
- Pattern charging/discharging capabilities by 1000 steps are installed (for PFX2512, 2532)
- Supporting temperature measurement and capable of monitoring temperatures during charging/discharging
- Fully equipped with safety features of the overcharge protection using voltage, electric charge and temperature
- Battery deterioration is prevented by turning off the output after detecting wobbling and shock with vibration sensor
- Capable of seamless charging/discharging (high speed charging/discharging transfer control) (for PFX2512, 2532)
- High speed sampling with maximum 1 ms can be realized (for PFX2512, 2532)
- A 6 V range is newly installed and is capable of high-precision measurement (for PFX2512, 2532)
- LAN as standard interface (for PFX2512, 2532)

The comparison of PFX2500 Series

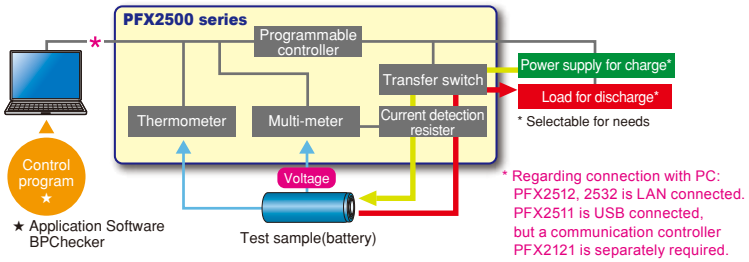
Item	PFX2511	PFX2512	PFX2532
Rating	60 V / 50 A	60 V / 50 A	60 V / 200 A
Communication interface	TP-BUS (PFX2121 is required for PC connection)	LAN	
Monitoring data minimum time interval	1 s (up to 30 channels), 2 s (more than 30 channels)	0.1 s	
High speed data sampling	–	✓ (Selected form 1 ms/10 ms/ 100 ms maximum 6000 points for every profile)	
Charge/ discharge mode	6 modes Charging: CC, CC-CV Discharging: CC, CP, CC-Pulse, CP-Pulse	9 modes Charging: CC, CC-CV(Cell CV Voltage)*1 Discharging: CC, CP,CC-CV(Cell CV Voltage)*1, CP-CV(Cell CV Voltage)*1 Others: Pattern(CC, CP, Cell CV voltage*2), I-V, Pause	
Test condition configuration	Maximum 20 patterns are divided into individual loop setting and total repeat setting with charging and discharging as a pair.	Individual Profile Setting (unlimited) for Charging/Discharging, etc Conditional branching function from charge/discharge results is available.	
Seamless charge/ discharge	– (Approx. 2 seconds for charge/discharge transfer time: Depending on the number of channels)	✓ (Response within 50 ms (TYP)*3)	
Rest time control	Fixed time	The time variable by cell temperature	

*1 Can be set only when the optional OP02-PFX Volt/Thermometer Unit or OP03-PFX Voltmeter Unit is installed.
*2 Can be set only when the optional OP02-PFX Volt/Thermometer Unit or OP03-PFX Voltmeter Unit is installed. Step time can be used in more than 500 ms.
*3 It is defined as the time for the charge/discharge current to change from 10 % to 90 % of the preset

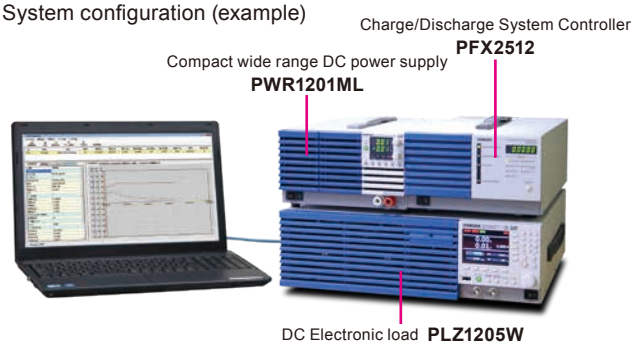
Complicated Systems Integrated into One

PFX2500 Series has integrated systems into one unit where battery evaluation is required. In addition, the series has high degrees of flexibility corresponding to wide range of rating since it is possible to combine our conventional DC power supply (for charging) and our electronic load (for discharging) tailored to needs. Introduction cost is able to be reduced by selecting equipment which meets charge/discharge test condition required.

● System conceptual diagram



● System configuration (example)



[Applied configuration (model ID)]

Model ID is used for combination of the selected power supply and electronic load if you wish to have a combination that is not on the available model ID list, please consult with us. More model IDs will be added in future. The latest information for the system configuration is available on our website.

Model ID		Power supply for charge	Electronic load for discharge
PFX2511	PFX2512		
5103	**7103**	PWR1600L	PLZ1004W(2 units in parallel)*2
5105 *4	**7105** *4	PAT60-67T	PLZ1004W+2000WB *1
5106	**7106**	PWR1600L	PLZ1004W *2
5107	**7107**	PAS10-70	PLZ1004W *2
5110	**7110**	PAS40-27	PLZ1004W *2
5112	**7112**	PAS10-35	PLZ334W *2
5119	**7119**	PWR1600L	PLZ1004W+2004WB *1
5122		PAS60-12	PLZ1004W *2
5125		PWR1600L	PLZ664WA *2
	7122	PAS60-12	PLZ664WA *2
	7124	PAS40-9	PLZ1004W *2
	7125	PWR1600L	PLZ664WA *2
	7126	PWR801L	PLZ1004W *2
	7127	PWR801ML	PLZ1004W *2
	7128	PWR1201ML	PLZ1004W *2
	7151	PWR401L	PLZ205W *2
	7152	PWR401ML	PLZ205W *2
	7153	PWR401L	PLZ405W *2
	7154	PWR401ML	PLZ405W *2
	7155	PWR801L	PLZ1205W *2
	7156	PWR801ML	PLZ1205W *2
	7157	PWR1201L	PLZ1205W *2
	7158	PWR1201ML	PLZ1205W *2
	7159	PWR1201ML	PLZ1205W(2 units in parallel)*2
	7160	PWR1201ML	PLZ1205W+2405WB *1

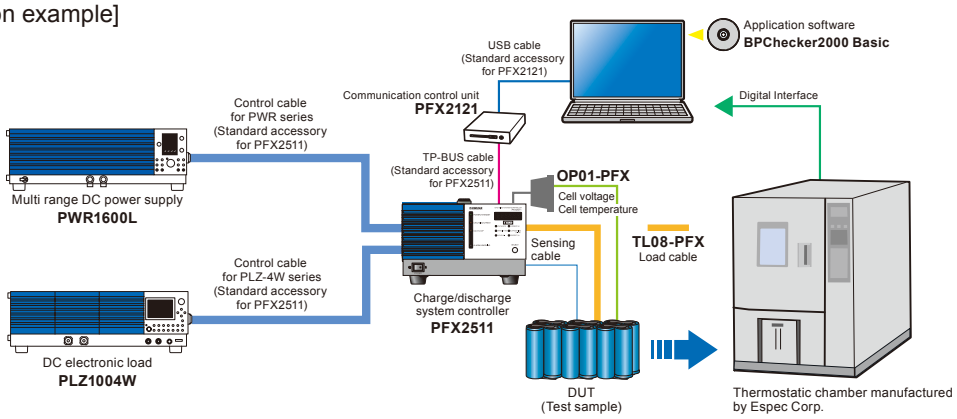
Model ID	Power supply for charge	Electronic load for discharge
PFX2532		
7301	PWR1600L (2 units in parallel)	PLZ1004W*2 + 2004WB
7302	PAT60-133T	PLZ1004W*2 + 2004WB x 2 (2 units in parallel)*3
7303	PAT40-200T	PLZ1004W*2 + 2004WB x 2 (2 units in parallel)*3
7304	PAT40-200T	PLZ1004W*2 + 2004WB
7305	PWR1600L	PLZ1004W*2
7306	PAT40-200T	PLZ1004W*2
7307	PWR1601L	PLZ1004W*2 x2 (2 units in parallel)
7351	PWR1201L	PLZ1205W *2
7352	PWR1201L	PLZ1205W*2 x 2
7353	PAT60-133T	PLZ1205W*2 + 2405WB x 2
7354	PAT40-200T	PLZ1205W *2
7355	PAT40-200T	PLZ1205W*2 + 2405WB
7356	PAT40-200T	PLZ1205W*2 + 2405WB x 2
7357	PAT40-200T	PLZ1205W*2 + 2405WB x 3
7358	PAT40-200T	PLZ1205W*1 + 2405WB x 4
7359	PAT80-100T	PLZ1205W*1 + 2405WB x 4

*1. M range
*2. H range
*3. Can be replaced with the Kikusui SR Large Capacity Electronic Load Smart Rack System PLZ5004W.
*4. A separate cable is required. For details, contact your Kikusui agent or distributor.

*A SC07-PFX (optional) is necessary to connect the PWR-01 series with the PFX2500 series.

*A SC05-PFX (optional) is necessary to connect the PLZ-5W series with the PFX2500 series.

[2511 System Configuration example]
(model ID : 5106)

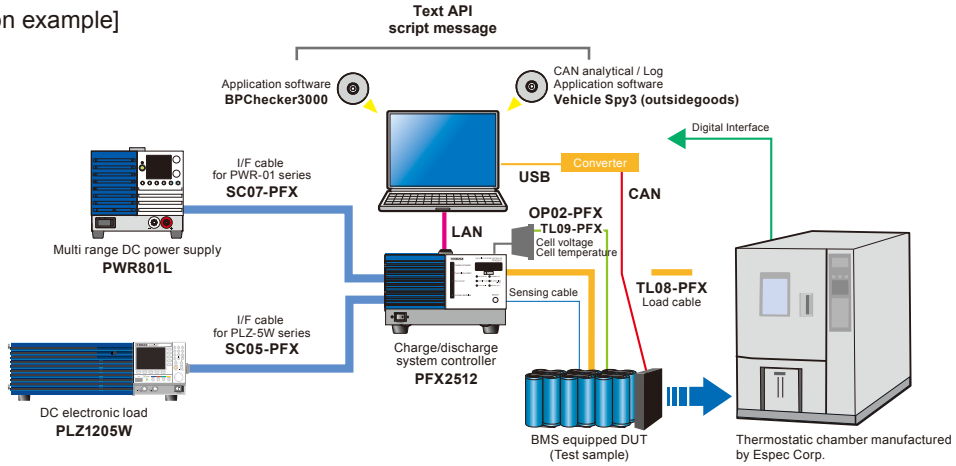


Comprehensive management from test condition setting to execution and data analysis on test results by PFX2511 exclusive application software, BPChecker2000 BASIC

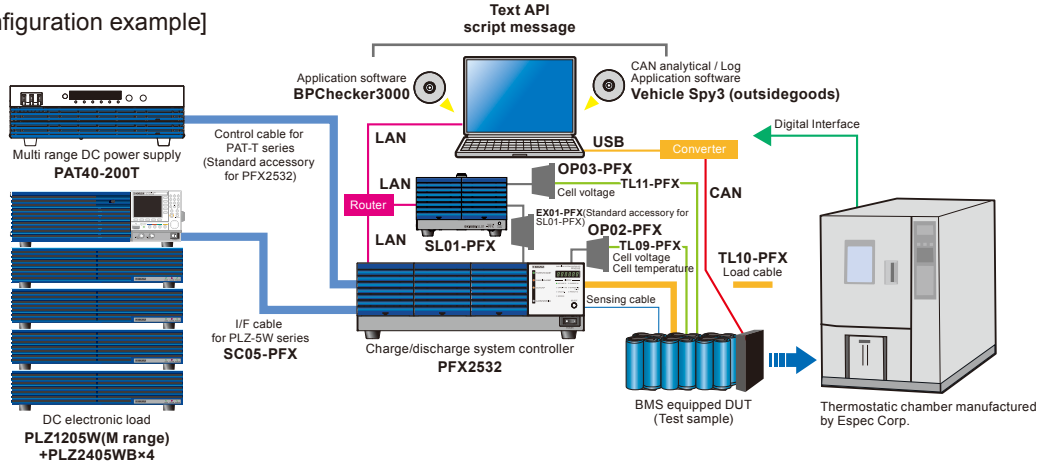
The application software, BPChecker2000, can manage all processes from creating the test condition file to output of the test result file. Setting and execution of conditions for battery charge and discharge characteristics test and an analysis of test results can be performed on the PC. In addition, in an environment where an RS485-USB (or RS232C) converter can be controlled, it can externally control the temperature chambers manufactured by ESPEC, and it allows to synchronize with the temperatures in the chamber.

* The control of BPChecker2000 Basic supplied with PFX2511 is limited to 2 channels. BPChecker2000 FULL Edition with no function limit is sold separately.

[2512 System Configuration example]
(model ID : 7155)



[2532 System Configuration example]
(model ID : 7358)



Comprehensive management from test condition setting to execution and data analysis on test results by PFX2512, 2532 exclusive application software, BPChecker3000

The application software, BPChecker3000 (SD007-PFX), is the new capability of PFX2512, 2532 where test condition and graphical drawing function are emphasized on existing BPChecker2000. This is the PFX2512, 2532 exclusive application software which realized [Seamless Charge/Discharge] and [High Speed Data Sampling]. At the test condition setting, the test condition (project) is created from database compiled charge/discharge condition (profile). The test execution shows that graphical display function is emphasized in its extraction and overwriting functions for larger data integration. In addition, synchronization operation with temperature chambers is capable and the charge/discharge test is comprehensively controlled including temperature control under test environment. Further, correspondence will also be capable working together with [CAN Bus] for which demand will be increased accompanied by the technical development of battery management in future.

PFX2500 Series Specifications

Unless otherwise specified, specifications should pursuant to the following settings and conditions.
* Worm-up time should be 30 minutes.
* TYP Value indicates typical values. Not assuring performance.

* "reading" shows readout value.
* "set" indicates setting value.
* "rating" indicates rating.

Rated Output		PFX2511	PFX2512	PFX2532
Number of output		1 ch	1 ch	1 ch
Charging current range *1		0.000 A to 50.000 A	0.000 A to 50.000 A	0.000 A to 200.000 A
Charging voltage range *1	60 V range	0.000 V to 60.000 V	0.000 V to 60.000 V	0.000 V to 60.000 V
	6 V range	–	0.000 V to 6.000 V	0.000 V to 6.000 V
Discharge current range *1		0.000 A to 50.000 A	0.000 A to 50.000 A	0.000 A to 200.000 A
Discharge voltage range *1 *2	60 V range	0.000 V to 60.000 V	0.000 V to 60.000 V	0.000 V to 60.000 V
	6 V range	–	0.000 V to 6.000 V	0.000 V to 6.000 V

*1 The range varies depending on factors such as the connected DC power supplies and electronic loads, the wiring configuration of the system, and the charge/discharge operation.
*2 The minimum voltage that can be discharged varies depending on factors such as the connected electronic load models and the wiring configuration.

Setting Accuracy			PFX2511	PFX2512	PFX2532
Static					
Constant current charge/ discharge	Range *3		0.000 A to 50.000 A	0.000 A to 50.000 A	0.000 A to 200.000 A
	Accuracy *4		*5	*5	*5
	Resolution		1 mA	1 mA	1 mA
Constant voltage charging	Range *3	60 V range	0.000 V to 60.000 V	0.000 V to 60.000 V	0.000 V to 60.000 V
		6 V range	–	0.000 V to 6.000 V	0.000 V to 6.000 V
	Accuracy *4		*5	*5	*5
	Resolution		1 mV	1 mV	1 mV
Constant power discharg- ing	Range *3		0.10 W to 3000.00 W	0.10 W to 3000.00 W	1 W to 12000 W
	Accuracy *4 *6		*5	± (0.5% of set + 1 W) *9	± (0.5% of set + 10 W) *9
	Resolution *7		100 mW	10 mW	1 W
Pulse					
Constant current discharg- ing	Range *3		0.000 A to 50.000 A	–	–
	Accuracy *4		*5	–	–
	Resolution		1 mA	–	–
	Number of settings		20 values	–	–
	Time width	Range	5.0 ms to 65000.0 ms	–	–
		Accuracy *4 *8	± (0.05% of set + 0.05 ms)	–	–
		Resolution	100 µs	–	–
Constant power discharg- ing	Range *3	60 V range	0.1 W to 3000.0 W	–	–
		6 V range	–	–	–
	Accuracy *4 *6		*5	–	–
	Resolution	60 V range	100 mW	–	–
		6 V range	–	–	–
	Number of settings		20 values	–	–
	Time width	Range	5.0 ms to 65000.0 ms	–	–
		Accuracy *4 *8	± (0.05% of set + 0.05 ms)	–	–
		Resolution	100 µs	–	–
Pattern *10					
Pattern constant current	Range *3		–	-50.000 A to 50.000 A	-200.000 A to 200.000 A
	Accuracy *4		–	*5	*5
	Resolution		–	1 mA	1 mA
	Number of settings		–	10000 values (Maximum number of steps)	10000 values (Maximum number of steps)
	Time width	Range	–	0.1s to 9999.9s (Time width for 1 step)	0.1s to 9999.9s (Time width for 1 step)
		Accuracy *4	–	± (0.05% of set + 10 ms)	± (0.05% of set + 10 ms)
		Resolution	–	100 ms	100 ms
Pattern constant power	Range *3		–	-3000.00 W to 3000.00 W	-12000 W to 12000 W
	Accuracy *4		–	± (0.5% of set + 1 W) *9	± (0.5% of set + 10 W) *9
	Resolution		–	10 mW	1 W
	Number of settings		–	10000 values (Maximum number of steps)	10000 values (Maximum number of steps)
	Time width	Range	–	0.1s to 9999.9s	0.1s to 9999.9s
		Accuracy *4	–	± (0.05% of set + 10 ms)	±(0.05% of set + 10 ms)
		Resolution	–	100 ms	100 ms

*3 Range might be different depending on DC power supply to be connected, model of electronic load, wiring situation, etc.
*4 Ambient temperature at 18 °C to 28 °C
*5 External equipment is controlled so as to Measurement Value being equal to Set Value by the software control.
*6 60 V range = At battery voltage above 5 V, 6 V range = at above 0.5 V
*7 Voltage activation rage for constant power discharge: 5 V to 60 V (assured value)
*8 Measure time after setting trigger at the half position (1/2) of pulse width (current amplitude)
*9 With battery voltage of 2 V or more. The battery voltage is measured, and the control current (constant current control) is calculated from the set power value through software calculation. The time required to process one calculation (from the voltage measurement to the output setting) is approximately 1 ms.
*10 The operating voltage range is 1 V or more (when the TL08-PFX is being used; regardless of whether a bias power supply is being used).

Measurement Accuracy			PFX2511	PFX2512	PFX2532
Static					
Charge / discharge current measure- ment	Range *11		0.0000 A to 50.0000 A	0.0000 A to 50.0000 A	0.000 A to 200.000 A
	Accuracy *12 *13		± (0.15% of reading + 0.02% of rating)	± (0.15% of reading + 0.02% of rating)	±(0.2 % of reading + 0.1 % of rating)
	Resolution		0.1 mA	0.1 mA	1 mA
Voltage measure- ment	Range	60 V range	-6.0000 V to 60.0000 V	-6.0000 V to 60.0000 V *14	-6.0000 V to 60.0000 V *14
		6 V range	–	-1.0000 V to 6.0000 V *15	-1.0000 V to 6.0000 V *15
	Accuracy *12 *13 *16	60 V range	± (0.05% of reading + 0.02% of rating)	± (0.05% of reading + 0.02% of rating)	± (0.05% of reading + 0.02% of rating)
		6 V range	–	± (0.05% of reading + 0.04% of rating)	± (0.05% of reading + 0.04% of rating)

Measurement Accuracy			PFX2511	PFX2512	PFX2532
Static					
Power measure- ment	Range		–	0.000 W to 3000.000 W	0.0 W to 12000.0 W
	Accuracy		–	Software calculation (Voltage measurement × current measurement)	
	Resolution		–	1 mW	100 mW
Capacity calculation	Range		0.000 Ah to 2000.000 Ah	0.000 Ah to 2000.000 Ah	0.000 Ah to 2000.000 Ah
	Accuracy *12 *13		Rely on the current measuring accuracy and the time accuracy		
	Resolution		0.1 mAh	1 mAh	1 mAh
Time *17	Accuracy *12 *18		±10 ppm (TYP)	±10 ppm (TYP)	±10 ppm (TYP)
Pulse					
Charge / discharge current	Range		0.0000 A to 50.0000 A	–	–
	Accuracy *12 *13		± (0.2% of reading + 0.03% of rating)	–	–
	Resolution		0.1 mA	–	–
	Measured value		Average current, Update a data per period of 500 ms	–	–
Battery voltage	Range		0.0000 V to 60.0000 V	–	–
	Accuracy *12 *13		± (0.05% of reading + 0.02% of rating)	–	–
	Resolution		0.1 mV	–	–
	Measure- ment	High voltage	Indicates the maximum battery voltage in one cycle of the pulse setting.	–	–
		Low voltage	Indicates the minimum battery voltage in one cycle of the pulse setting.	–	–
		Arbitrary	At the specified pulse point	–	–
Capacity calculation	Range		0.0000 Ah to 2000.0000 Ah	–	–
	Accuracy *12 *13		Rely on the current measuring accuracy and the time accuracy	–	–
	Resolution		0.1 mAh	–	–
Time *17	Accuracy *12 *18		±10 ppm (TYP values)	–	–
Pattern					
Charge / discharge current	Range *11		–	-50.0000 A to 50.0000 A	-200.000 A to 200.000 A
	Accuracy *12		–	± (0.2% of reading + 0.03% of rating)	±(0.2% of reading + 0.1% of rating)
	Resolution		–	0.1 mA	1 mA
	Measured value		–	Average current, Update a data per period of 1s	
Voltage measure- ment	Range	60 V range	–	-6.0000 V to 60.0000 V *14	-6.0000 V to 60.0000 V *14
		6 V range	–	-1.0000 V to 6.0000 V *15	-1.0000 V to 6.0000 V *15
	Accuracy *12	60 V range	–	± (0.05% of reading + 0.02% of rating)	± (0.05% of reading + 0.02% of rating)
		6 V range	–	± (0.05% of reading + 0.04% of rating)	± (0.05% of reading + 0.04% of rating)
	Resolution *16		–	0.1 mV	0.1 mV
Power measure- ment	Range		–	-3000.000 W to 3000.000 W	-12000.00 W to 12000.00 W
	Accuracy *12		–	Software calculation (Voltage measurement × current measurement)	
	Resolution		–	1 mW	10 mW
Capacity calculation	Range		–	-2000.000 Ah to 2000.000 Ah	-2000.000 Ah to 2000.000 A
	Accuracy *12		–	Rely on the current measuring accuracy and the time accuracy	
	Resolution		–	1 mAh	1 mAh
Time *17	Accuracy *12 *18		–	±10 ppm (TYP)	±10 ppm (TYP)
High speed sampling					
Current measure- ment	Range *19		–	-50.0000 A to 50.0000 A	-200.000 A to 200.000 A
	Accuracy *12 *19 *20	1 ms sampling	–	± (0.2% of reading + 0.5% of rating)	± (0.4% of reading + 0.5% of rating)
		10 ms sampling		± (0.15% of reading + 0.05% of rating)	± (0.3% of reading + 0.1% of rating)
		100 ms sampling		± (0.15% of reading + 0.02% of rating)	± (0.2% of reading + 0.1% of rating)
	Resolution		–	0.1 mA	1 mA
Voltage measure- ment	Range	60 V range	–	-6.0000 V to 60.0000 V	-6.0000 V to 60.0000 V
		6 V range		-1.0000 V to 6.0000 V	-1.0000 V to 6.0000 V
	Accuracy *12 *19 *20	1 ms sampling *16	–	± (0.1% of reading + 0.1% of rating)	± (0.1% of reading + 0.1% of rating)
		10 ms sampling *16		± (0.1% of reading + 0.05% of rating)	± (0.1% of reading + 0.05% of rating)
		100 ms sampling		60 V range: ± (0.05% of reading + 0.02% of rating)	60 V range: ± (0.05% of reading + 0.02% of rating)
				6 V range: ± (0.05% of reading + 0.04% of rating)	6 V range: ± (0.05% of reading + 0.04% of rating)
	Resolution *16		–	0.1 mV	0.1 mV

*11 Measurable range: PFX2512/ -52.500 A to 52.500 A (TYP value) However, accuracy outside of the range is not assured. PFX2532/ -210.000 A to 210.000 A (TYP value) However, accuracy outside of the range is not assured.
*12 Ambient temperature at 18 °C to 28 °C
*13 Measurable range: Within the above listed range
*14 Measurable range: - 6.500 V to 65.000 V (TYP value) However, accuracy outside of the range is not assured.
*15 Measurable range: - 6.500 V to 6.500 V (TYP value) However, accuracy outside of the range is not assured.
*16 Common with 6 V/60 V ranges
*17 Accuracy of the elapsed time (Cutoff condition) when charging / discharging or resting.
*18 Monthly error: approximately 30 seconds.
*19 Accuracy outside of the rating output range is not assured.

PFX2500 Series Specifications

*Thermistor 103AT-2 (by SEMITEC Corporation) is used for the temperature detector.

Temperature measurement	PFX2511	PFX2512	PFX2532
Resistor (temperature) measuring section *1			
Measurement range	-40.0 °C to 100.0 °C		
Measurement resolution	0.1 °C		
Measurement accuracy *2 *3	± 0.5 °C (measurement temperature at 0 °C to 40.0 °C)		
	± 1 °C (measurement temperature at -20 °C to 80 °C)		
Reference (thermistor 103AT-2)			
Part name	Thermistor (103AT-2, SEMITEC Corporation)		
R25	10.0 kΩ, Nominal zero-power resistor value at 25 °C		
Operating temperature range	-50.0 °C to 110.0 °C		
Temperature accuracy *3	± 0.5 °C (measurement temperature at 0 °C to 40.0 °C)		
Tolerance	± 1 %		
Constant-B	3435 K ± 1 % (measurement temperature at 25 °C)		

*1 The temperature measurement does not mean tracing absolute temperature. Resistor to temperature conversion value
*2 Error of temperature detecting element is excluded.
*3 Ambient temperature at 18 °C to 28 °C

Protection Functions	PFX2511	PFX2512	PFX2532
Overvoltage (overcharge) protection	Software OVP, Hardware OVP		
Undervoltage (overdischarge) protection	Software UVP, Hardware UVP		
Overcurrent protection	Software OCP *1, Hardware OCP Load shorting protection		
Capacity (overcharge/ overdischarge) protection	Software OAH *2		
Overtemperature (DUT) protection	Software OTP		
Vibration alarm			

*1 For the software OCP, the application software automatically sets a value obtained by adding 5 A to the preset current.
*2 The application software calculates the value by multiplying the nominal capacity by the preset percentage and sets the capacity.

General Specifications		PFX2511	PFX2512	PFX2532
Nominal input rating		100 Vac to 240 Vac, 50 Hz/60 Hz		
Input voltage range		90 Vac to 250 Vac		
Power consumption		60 VAmax OP01-PFX 3 boards installed: 80 VAmax	60 VAmax OP02-PFX 3 boards installed: 80 VAmax	60 VAmax OP02-PFX 3 boards installed: 80 VAmax
Operating temperature/ humidity range		0 °C to 40 °C, 20 % rh to 85 % rh (No condensation)		
Storage temperature/humidity range		-10 °C to 60 °C, 0 % rh to 90 % rh (No condensation)		
Operating environment		Indoors, Overvoltage category II		
Altitude		Up to 2000 m		
Isolation voltage	Across the I/O terminals and chassis	± 70 Vmax		
Insulation resistance	Primary and chassis	500 Vdc, 30 MΩ or greater, 70 % rh or less		
	Primary and across the I/O terminals			
Withstand voltage	Primary and chassis	1500 Vac, No abnormalities over 1 minute		
	Primary and across the I/O terminals			
Safety *1		Compliant with the requirements in the following standard. Low voltage directive 2014/35/EU EN61010-1 (Class I *2 , Pollution degree 2)		
Electromagnetic compatibility(EMC) *1		Compliant with the requirements in the following standard. EMC Directive 2014/30/EU EN61326-1 (Class A *3), EN55011 (Class A *3, Group 1 *4), EN61000-3-2, EN61000-3-3		
Accessories	Power cord	1 pc		
	Cable with crimp terminal	4 pcs. (Red: 2 pcs, White: 2 pcs) 45 cm each (17.72 inch)		–
	I/O terminal cover set	–	–	Three terminal covers, six cable ties for locking
	I/O terminal M8 screw set	–	–	6 sets
	Load input terminal cover set	–	–	Cover, four auxiliary bands
	26-core flat cable	1 pc		
	20-core flat cable	1 pc		
	26-core cable (for PAT-T)	–	–	1 pc
	Twisted pair cable with TP-BUS connector	1 pc (1 m)	–	–
	Sensing connector	1 pc		
	Sensing connector cover set	–	–	One cover set, one cable tie for locking
	Thermistor	1 pc		
	Lock lever	2 pcs		
	LAN cable	–	1 pc (2 m)	1 pc (2 m)
	Operation manual	1 copy		
	BPChecker2000 Setup guide	1 copy	–	–
	BPChecker2000 Basic Edition CD-ROM	1 pc	–	–

*1 Limited to the product with CE marking on panel. Not applied to specially ordered or modified articles.
*2 This product is the Class I equipment. Please be sure to connect the protection conductor terminal of product to ground. If not correctly connected to ground, safeness is not guaranteed.
*3 This product is the Class A equipment. It is aimed to use the product under the industrial environment. If this product is used in housing area, it might be the cause of interference. If it is the case, special action to reduce electromagnetic radiation might be required for users in order to prevent receiving interference.
*4 This product is the Group 1 equipment. The product does not generate/use radio frequency energy in the form of electromagnetic radiation, induction and/or static coupling intentionally for material processing or inspection/analysis.

Voltage/thermometer unit OP01-PFX / OP02-PFX

Cell Voltage measurement		OP01	OP02
Static			
Number of measurement terminals		4	
Measurable range *1		-2.0000 V to 20.0000 V	
Accuracy		±(0.05% of rdng + 0.02% of f.s)	
Measurement resolution *2		0.1 mV	
Measurement value		Average voltage of the every 500 ms	Average voltage of the every 100 ms
Measurement interval		500 ms	100 ms
Pulse			
Number of measurement terminals		4	–
Measurable range *1		-2.0000 V to 20.0000 V	–
Accuracy		±(0.05% of rdng + 0.02% of f.s)	–
Measurement resolution *2		0.1 mV	–
Measurement value *3	High voltage	Maximum voltage in one cycle	–
	Low voltage	Minimum voltage in one cycle	–
	user-specified	–	–
Measurement interval *4		1 ms	–
Cell Temperature measurement *5			
Number of measurement terminals		4	
Thermocouple type		K type	
Measurable range *6		-100.0 °C to 400.0 °C	
Measurement resolution *7 *8		±1.5 °C (TYP values)	
Reference junction compensation *7 *9		±0.5 °C(TYP values)	
Accuracy		0.1 °C	

*1 You can apply a voltage from -20 V to 22 V.
*2 Ambient temperature at 18 °C to 28 °C
*3 Automatically synchronized with the BPChecker2000 pulse setting (specify two points from high voltage, low voltage, and user-specified).
*4 The application software records data every second.
*5 The temperature scale conforms to JIS C 1602-1995 (ITS-90). (ITS-90 is an international temperature scale.)
*6 Depending on your thermocouple's specifications (thermocouple class, wire diameter and insulation), the usable temperature range will vary.
*7 Ambient temperature at 18 °C to 28°C.
*8 When the voltage that the thermocouple calibrator produces is measured.
*9 This shows the internal sensor performance. This indicates the temperature measurement accuracy of the thermocouple connector. Thermometer accuracy = Measurement accuracy + reference junction compensation + thermocouple tolerance

Voltmeter unit OP03-PFX

Cell voltage measurement	
Number of measured terminals	8
Measurement range *1	-2.0000 V to 20.0000 V
Measurement accuracy *2	±(0.05 % of reading + 0.02 % of rating)
Resolution	0.1 mV
Measured value	Average voltage every 100 ms
Measurement interval	100 ms

*1 You can apply a voltage from -20 V to 22 V.
*2 Ambient temperature at 18°C to 28°C.

8Slot unit SL01-PFX

Number of slots	8	
Compatible boards *1	Voltmeter Unit OP03-PFX	
Interface	LAN(Ethernet) PC connection	Sync connector EX01-PFX connection
Input voltage range	90 Vac to 250 Vac, 50 Hz/60 Hz	
Power consumption	when 8 OP03-PFXs are installed: 80 VAmax	
Operating temperature and humidity range	0°C to 40°C, 20 %rh to 85 %rh (no condensation)	
Dimensions (mm (inch))	214.5(8.44) W × 155(6.10) H × 410(16.14) Dmm	
weight	Approx. 5 kg (11.02 lb)	
Accessories	Power cord/100 V System (1 pc.)	
	Power cord/200 V System (1 pc.)	
	EX01-PFX (1 pc.) extension board (for installing in a PFX2512/2532 slot)	
	LAN cable (1 pc.) 2m Straight type	
	14-core flat cable (1 pc.)	
	Ferrite core for 14-core flat cable (1 pc.)	
	Lock lever (2 pcs.)	
	Handling of the product (1 copy)	

*1 OP02-PFX cannot be installed.

TOS SERIES SELECTION GUIDE

High-End Multi-type

Hipot, Insulation Resistance, Ground Bond, Leakage or Partial discharge,

TOS9303LC P.80

AC/DC Hipot Tester with Insulation Resistance, Ground Bond, and Leakage Current Test

- ACW 5 kV/100 mA(500 VA)
- DCW 5 kV/20 mA,7.2 kV/13.9 mA(100 W)
- IR 0.001 MΩ to 100.0 GΩ (DC-25 V to -1000 V/DC+50 V to +7200 V)
- EC 0.001 Ω to 0.600 Ω (3.0 A to 42.0 A)
- LC 1 µA to 100 mA(rms)

Rise Time Fall Time LAN USB RS232C Timer

D 430(16.93")(440(17.32"))W×132(5.2")(155(6.10"))H ×500(19.69")(550(21.65"))Dmm
W 22 kg(48.5 lbs)

TOS9303 P.79

AC/DC Hipot Tester with Insulation Resistance and Ground Bond Test

- ACW 5 kV/100 mA(500 VA)
- DCW 5 kV/20 mA,7.2 kV/13.9 mA(100 W)
- IR 0.001 MΩ to 100.0 GΩ (DC-25 V to -1000 V/DC+50 V to +7200 V)
- EC 0.001 Ω to 0.600 Ω (3.0 A to 42.0 A)

Rise Time Fall Time LAN USB RS232C Timer

D 430(16.93")(440(17.32"))W×132(5.2")(155(6.10"))H ×500(19.69")(540(21.26"))Dmm
W 21 kg(46.3 lbs)

TOS9302 P.79

AC Hipot Tester with Ground Bond Test

- ACW 5 kV/100 mA(500 VA)
- EC 0.001 Ω to 0.600Ω (3.0 A to 42.0 A)

Rise Time Fall Time LAN USB RS232C Timer

D 430(16.93")(440(17.32"))W×132(5.2")(155(6.10"))H ×500(19.69")(540(21.26"))Dmm
W 20 kg(44.1 lbs)

Hipot Tester with Insulation Resistance Test

Hipot Tester

Standard

Standard type suitable for production and inspection lines

TOS5302 P.90

- ACW 5 kV/100 mA(500 VA)
- IR 0.03 MΩ to 5 GΩ (DC-25 V to -1000 V)

Rise Time Fall Time USB Timer

D 320(12.60˝)W×132(5.2˝)H×350(13.78˝)Dmm
W 14 kg(30.9 lbs)

TOS5301 P.90

- ACW 5 kV/100 mA(500 VA)
- DCW 6 kV/10 mA(50 W)

Rise Time Fall Time USB Timer

D 320(12.60˝)W×132(5.2˝)H×350(13.78˝)Dmm
W 15 kg(33.1 lbs)

TOS5300 P.90

- ACW 5 kV/100 mA(500 VA)

Rise Time Fall Time USB Timer

*"Fall Time" can be set at 0.1 s or OFF

D 320(12.60˝)W×132(5.2˝)H×350(13.78˝)Dmm
W 14 kg(30.9 lbs)

Low-cost type

TOS5200 P.95

- ACW 5 kV/100 mA(500 VA)

Rise Time Fall Time USB RS232C Timer

*"Fall Time" can be set at 0.1 s or OFF

D 320(12.60˝)W×132(5.2˝)H×350(13.78˝)Dmm
W 14 kg(30.9 lbs)

- ACW Max. output-voltage of AC hipot testing
- DCW Max. output-voltage of DC hipot testing
- IR Measurement range of insulation resistance testing
- EC Measurement range of ground bond testing
- LC Measurement range of leakage current testing
- PD Measurement range of partial discharge testing
- D Dimensions
- W Weight

- Rise Time Equipped with rise time control function
- Fall Time Equipped with fall time control function
- LAN Equipped with LAN interface as standard
- GPIB Equipped with GPIB interface as standard
- RS232C Equipped with RS232C interface as standard
- USB Equipped with USB interface as standard
- Timer Equipped with timer function

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this analyzer covers it all!

NEW

TOS9301PD P.78

AC/DC Hipot Tester with Insulation Resistance and Partial Discharge Test

ACW 5 kV/100 mA(500 VA)
DCW 5 kV/20 mA,7.2 kV/13.9 mA(100 W)
IR 0.001 MΩ to 100.0 GΩ (DC-25 V to -1000 V/ DC+50 V to +7200 V)
PD 5 kV/50 mA(250 VA)

Rise Time Fall Time LAN USB RS232C Timer

D 430(16.93")(440(17.32"))W×132(5.2")(155(6.10"))H ×525(20.67")(565(22.24"))Dmm
W 22 kg(48.5 lbs)

TOS9301 P.78

AC/DC Hipot Tester with Insulation Resistance Test

ACW 5 kV/100 mA(500 VA)
DCW 5 kV/20 mA,7.2 kV/13.9 mA(100 W)
IR 0.001 MΩ to 100.0 GΩ (DC-25 V to -1000 V/ DC+50 V to +7200 V)

Rise Time Fall Time LAN USB RS232C Timer

D 430(16.93")(440(17.32"))W×132(5.2")(155(6.10"))H ×370(14.57")(410(16.14"))Dmm
W 18 kg(39.7 lbs)

TOS9300 P.78

AC Hipot Tester with Insulation Resistance Test

ACW 5 kV/100 mA(500 VA)
IR 0.001 MΩ to 100.0 GΩ (DC-25 V to -1000 V)

Rise Time Fall Time LAN USB RS232C Timer

D 430(16.93")(440(17.32"))W×132(5.2")(155(6.10"))H ×370(14.57")(410(16.14"))Dmm
W 17 kg(37.5 lbs)

TOS9320 P.80

High-voltage Scanner

High voltage scanner for TOS9300 series multi-channel testing systems

D 430(16.93")(440(17.32"))W×88(3.46")(105(4.13"))H ×370(14.57")(390(15.35"))Dmm
W 8 kg(17.6 lbs)

Ground Bond Tester

High-End

TOS6210 P.99

0.001 Ω to 0.600 Ω (6 A to 62 A)

GPIB RS232C Timer

D 430(16.93˝)W×88(3.47˝)H×270(10.63˝)Dmm
W 11kg(24.25 lbs)

TOS6200A P.99

0.001 Ω to 1.200 Ω (3 A to 31 A)

GPIB RS232C Timer

D 430(16.93˝)W×88(3.47˝)H×270(10.63˝)Dmm
W 9kg(19.84 lbs)

Options

- Remote Control Box
- Test Probe
- Test Lead
- Warning Light Unit
- Buzzer Unit
- Load resistor for calibration of a Hipot Tester

P.102

The Electrical Appliance & Material Safety Low (Japan), UL (U.S.A.), CSA (Canada), VDE (Germany) and BS (U.K) are some major examples of safety standards in use throughout the world that require the performing of hipot testing. For this reason, it is necessary to confirm for what portion of what standard testing is to be performed when purchasing a hipot tester. Although the 500 VA capacity hipot testers available from KIKUSUI can basically be applied to tests specified in all safety standards, we recommend that you consult with us prior to purchase in order to select the model that best matches

For the withstanding test and the insulation resistance test of the EUT (Equipment Under Test) with turned on electricity.

Our Hipot Testers and Insulation Resistance Testers are designed to test the EUT (Equipment Under Test) with turned off electricity. In case the test requires the EUT (Equipment Under Test) with turned on electricity, please contact with our distributor or agent.

Hipot Tester with Insulation Resistance Test

TOS9300/9301

LAN USB RS232C LXI CE UK CA

TOS9300(AC)

TOS9301(AC/DC)

High-performance hipot tester with insulation resistance capabilities

The TOS9300/9301 is a high performance electrical safety analyzer with hipot tester and insulation resistance capabilities for international safety standards. Wide-ranging hipot capabilities and insulation resistance capabilities make the TOS9300/9301 the perfect safety analyzer for R&D equipment, quality assurance testing, standard compliance tests and product line equipment. Combined with the high-voltage scanner TOS9320, the TOS9300 series can be automated into a safe, reliable test system with up to 16 channels.

Dimensions / Weight

TOS9300: 430(16.93″)W X 132(5.2″)H X 370(14.57″)Dmm(inch) / 17 kg(37.5 lbs)
TOS9301: 430(16.93″)W X 132(5.2″)H X 370(14.57″)Dmm(inch) / 18 kg(39.7 lbs)

Accessories

Power cord, High-voltage test lead [TL31-TOS], High-voltage warning sticker, Cable tie, SIGNAL I/O plug(Assembly type D-sub plug unit), Setup guide, CD-ROM, Safety Information
TOS9301 only: Heavy object warning label(Affix this to the product as necessary.)

Features

- AC5 kV/100 mA, DC7.2 kV/100 W hipot test
- Electrical breakdown inspection setting available
- LAN/USB/RS232C standard digital interface
- Easy to read LCD display for real time monitoring during tests, All measurement values and standard outlines displayed in each test

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Hipot Tester with Insulation Resistance and Partial Discharge Test

TOS9301PD

LAN USB RS232C LXI CE UK CA

NEW

AC/DC hipot tester with insulation resistance and partial discharge test capabilities

The TOS9301PD is an electrical safety analyzer capable of AC and DC hipot, insulation resistance, and partial discharge testing. Wide-ranging hipot capabilities, insulation resistance and partial discharge testing features make the TOS9301PD the perfect safety analyzer for R&D equipment, quality assurance testing, standard compliance tests and product line equipment tests. Combined with the high-voltage scanner TOS9320, the TOS9301PD can be automated into a safe, reliable test system with up to 16 channels.

Dimensions / Weight

430(16.93″)W X 132(5.2″)H X 525(20.67″)Dmm(inch) / 22 kg(48.5 lbs)

Accessories

Power cord, High-voltage test lead [TL31-TOS], High-voltage warning sticker, Cable tie, SIGNAL I/O plug(Assembly type D-sub plug unit), Setup guide, CD-ROM, Safety information, Heavy object warning label(Affix this to the product as necessary.)

Features

- AC5 kV/100 mA, DC7.2 kV/100 W hipot test
- Insulation diagnosis available with partial discharge model
- Electrical breakdown inspection setting available
- LAN/USB/RS232C standard digital interface
- Easy to read LCD display for real-time monitoring during testing. All measurement values and standard outlines displayed in each test.

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Tél. 01 47 95 99 45 - Fax. 01 47 01 16 22 - e-mail: tem@es-france.com - Site Web: www.es-france.com

Hipot Tester with Ground Bond Test

TOS9302

LAN USB RS232C LXI CE UK CA

AC hipot tester with ground bond test capabilities

The TOS9302 is an electrical safety analyzer capable of AC hipot tester and ground bond test capabilities. Accurate AC hipot and ground bond testing features make the TOS9302 the perfect safety analyzer for R&D equipment, quality assurance testing, standard compliance tests and product line equipment. Combined with the high-voltage scanner TOS9320, the TOS9302 can be automated into a safe, reliable test system with up to 16 channels.

Dimensions / Weight

430(16.93″)W × 132(5.2″)H × 500(19.69″)Dmm(inch) / 20 kg(44.1 lbs)

Accessories

Power cord, High-voltage test lead [TL31-TOS], High-voltage warning sticker, Cable tie, SIGNAL I/O plug(Assembly type D-sub plug unit), Setup guide, CD-ROM, Safety Information, Heavy object warning label(Affix this to the product as necessary.), Test leads for earth continuity test [TL13-TOS]

Features

- AC5 kV/100 mA hipot test
- New amplifier type allows for 40 A AC/DC ground bond testing
- LAN/USB/RS232C standard digital interface
- Easy to read LCD display for real time monitoring during tests, All measurement values and standard outlines displayed in each test

Hipot Tester with Insulation Resistance and Ground Bond Test

TOS9303

LAN USB RS232C LXI CE UK CA

AC/DC hipot tester with insulation resistance and ground bond test capabilities

The TOS9303 is a highly versatile electrical safety analyzer capable of AC/DC hipot, insulation resistance, and ground bond testing. Combined with the high-voltage scanner TOS9320, the TOS9303 can be automated into a safe, reliable test system with up to 16 channels.

Dimensions / Weight

430(16.93″)W × 132(5.2″)H × 500(19.69″)Dmm(inch) / 21 kg(46.3 lbs)

Accessories

Power cord, High-voltage test lead [TL31-TOS], High-voltage warning sticker, Cable tie, SIGNAL I/O plug(Assembly type D-sub plug unit), Setup guide, CD-ROM, Safety Information, Heavy object warning label(Affix this to the product as necessary.), Test leads for earth continuity test [TL13-TOS]

Features

- AC5 kV/100 mA, DC7.2 kV/100 W hipot test
- New amplifier type allows for 40 A AC/DC ground bond testing
- Electrical breakdown inspection setting available
- LAN/USB/RS232C standard digital interface
- Easy to read LCD display for real time monitoring during tests, All measurement values and standard outlines displayed in each test

Hipot Tester with Insulation Resistance, Ground Bond, and Leakage Current Test

TOS9303LC

LAN USB RS232C LXI CE UK CA

The all-in-one multi analyzer capable of AC/DC hipot tester, insulation resistance, ground bond, and leakage current testing

The TOS9303LC is the "all-rounder" electrical safety analyzer capable of conducting AC/DC hipot, insulation resistance, ground bond and leakage current testing in a single model. Combined with the high-voltage scanner TOS9320, the TOS9303LC can be automated into a safe, reliable test system with up to 16 channels.

Dimensions / Weight

430(16.93″)W × 132(5.2″)H × 500(19.69″)Dmm(inch) / 22 kg(48.5 lbs)

Accessories

Power cord(2 pcs), High-voltage test lead [TL31-TOS], High-voltage warning sticker, Cable tie, SIGNAL I/O plug(Assembly type D-sub plug unit), Setup guide, CD-ROM, Safety Information, Heavy object warning label(Affix this to the product as necessary.), Test leads for earth continuity test [TL13-TOS], Spare fuse(15 A, 250 V *Stored in the fuse holder), Test leads for leakage current test [TL22-TOS], Flat probe [FP01-TOS]

Features

- AC5 kV/100 mA, DC7.2 kV/100 W hipot test
- New amplifier type allows for 40 A AC/DC ground bond testing
- Touch current/protective conductor current/leakage current testing
- Electrical breakdown inspection setting available
- LAN/USB/RS232C standard digital interface
- Easy to read LCD display for real time monitoring during tests, All measurement values and standard outlines displayed in each test

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High-voltage scanner

TOS9320

CE UK CA

High voltage scanner for TOS9300 series multi-channel testing systems

The TOS9320 high-voltage scanner allows for rapid distribution of testing voltage from the main unit to multiple testing points for withstanding voltange and insulation resistance testing. Channels can be controlled via an external device through the rear panel CONTROLLER INTERFACE connector. The scanner can also be used standalone or with an external control device for other Kikusui withstanding voltage and insulation resistance testing instruments. Hipot tests for electronic devices with multiple testing points have never been easier.

Dimensions / Weight

430(16.93″)W × 132(5.2″)H × 500(19.69″)Dmm(inch) / 8 kg(17.6 lbs)

Accessories

Power cord, High-voltage test lead [TL31-TOS], Lead for high voltage parallelconnection [TL33-TOS], Interface cable, CONTROLLER INTERFACE plug (Assembly type)[D-sub plug unit], High-voltage warningsticker(2 pc.), Channel labels(For the panel , For the test leads), User's manual, Safety Information

Features

- Output can be expanded to four channels with one high-voltage scanner. The electric potential of each channel can be arbitrarily set to high, low, or open, and can be tested at any of these four points.
- Up to four high voltage scanners (total 16 channels) can be connected to each unit.
- Output of each channel and contact with testing points can be easily monitored.
- High voltage scanner capable of output distribution both standalone and when connected with existing withstanding voltage/insulation resistance testing equipment models

TOS9300 Series Specifications

Wishtanding Voltage Test

Output function			TOS9300	TOS9301	TOS9301PD	TOS9302	TOS9303	TOS9303LC
AC output section	Output range		0.050 kV to 5.000 kV					
		Resolution	1 V					
		Setting accuracy	±(1.2 % of setting + 0.02 kV) (at no load)					
	Max. rated load *1		500 VA(5 kV / 100 mA)					
	Max. rated current		100 mA (when the output voltage is 0.2 kV or higher)					
	Transformer rating		500 VA					
	Output voltage waveform *2		Sine					
		Distortion	2 % or less. (when the output voltage is 0.5 kV or higher and no load or a pure resistive load is connected)					
	Crest factor		√2 ± 3 % (0.8 kV or more)					
	Frequency		50 Hz / 60 Hz					
		Accuracy	±0.1 %					
	Voltage regulation		±3 % or less (when changing from maximum rated load to no load)					
	Short-circuit current		200 mA or more (output voltage 0.5 kV or higher)					
	Output method		PWM switching					
Start voltage			The voltage at the start of the test can be set.					
		Setting range	1 % to 99 % of the test voltage					
		Resolution	1 %					
Output voltage monitor function			If the output voltage exceeds ±(10 % of setting + 0.05 kV), the output is turned off, and the protection function is activated.					

DC Output function			TOS9301	TOS9301PD	TOS9303	TOS9303LC
DC output section	Output voltage range		0.050 kV to 7.200 kV			
		Resolution	1 V			
		Setting accuracy	±(1.2 % of setting + 0.02 kV)			
	Max. rated load *1		100 W (5 kV/20 mA, 7.2 kV/13.9 mA)			
	Max. rated current		20 mA			
	Ripple	7.2 kV no load	20 Vp-p (TYP)			
		Max. rated load	50 Vp-p (TYP)			
	Voltage regulation		1 % or less (when changing from maximum rated load to no load)			
	Short-circuit current		100 mA (TYP) (200 mA peak)			
	Discharge function		Forced discharge after test completion (discharge resistance: 125 kΩ)			
Start voltage			The voltage at the start of the test can be set.			
		Setting range	1 % to 99 % of the test voltage			
		Resolution	1 %			
Output voltage monitor function			If the output voltage exceeds ±(10 % of setting + 0.05 kV), the output is turned off, and the protection function is activated.			

*1 When tests are performed consecutively, output time limit and rest time may become necessary depending on the upper limit setting

*2 If an AC voltage is applied to a capacitive load, the output voltage may rise higher than at no load depending on the load capacitance. Further, waveform distortions may occur if an EUT whose capacitance is dependent on voltage (for example, an EUT that consists of ceramic capacitors) is connected as the load. However, if the test voltage is 1.5 kV, the effect of a capacitance of 1000 pF or less can be ignored. Because the product's high-voltage power supply uses the PWM switching method, if the test voltage is 500 V or less, the switching and spike noise proportions are large. The lower the test voltage, the greater the waveform is distorted.

Measurement function		TOS9300	TOS9301	TOS9301PD	TOS9302	TOS9303	TOS9303LC
Voltmeter	Measurement range	0.00 kV to 7.50 kV AC/DC					
	Resolution	0.1 V					
	Accuracy	±(1.2 % of reading + 0.005 kV)					
	Response	Can be switched between true rms and mean-value response rms conversion.					
		Peak-value response in a separate system (the peak-value response is for measuring the dielectric breakdown voltage while rising)					
	Hold function	The voltage measurement after a test is finished is held while the pass/fail judgment is displayed.					
Ammeter *3 *4	Measurement range	AC: 0.00 mA to 110 mA, DC: 0.00 mA to 22 mA (Current including the active component and reactive component)					
	Accuracy	±(1 % of reading + 2 µA) (active component)					
	Response	Can be switched between true rms and mean-value response rms conversion.					
	Hold function	The current measurement after a test is finished is held while the pass judgment is displayed.					
	Offset cancel function	Cancels up to 10 mA of the current flowing through the insulation resistance and stray capacitance components across output cables and the like (resistance component only for DC tests). OFF function available.					
	Calibration	Active component: Calibrated with the rms of a sine wave using a pure resistive load. Reactive component: Not calibrated.					

*3 During AC voltage tests, current also flows in the stray capacitance of items such as the test leads and tools.
For details on stray capacitance, see "Stray Capacitance of AC Withstanding Voltage Tests"

*4 When the temperature and humidity are high, erroneous current from the product's internal and external high-voltage wiring sections to ground increases. When the humidity exceeds 70 %, an erroneous current of about 50 µA may be generated.

Judgment function			TOS9300	TOS9301	TOS9301PD	TOS9302	TOS9303	TOS9303LC
Current judgment operation			The output is shut off when a judgment is made. Buzzer volume level can be set in the range of 0 (OFF) to 10 for pass and fail separately. In an auto test, the buzzer is valid only for the judgment that takes place at the end of the program.					
	UPPER FAIL	Judgment method	UPPER FAIL results when a current greater than or equal to the Upper limit is detected. For DCW, judgment is not made during the judgment delay (Judge Delay).					
		Display	"Upper-FAIL" is displayed.					
		Buzzer	On					
		SIGNAL I/O	The Upper-FAIL signal is generated continuously until a STOP signal is received.					
	LOWER FAIL	Judgment method	LOWER FAIL results when a current less than or equal to the Lower limit is detected. Judgment is not made during Voltage rise time or Voltage fall time of an ACW test.					
		Display	"Lower-FAIL" is displayed.					
		Buzzer	On					
		SIGNAL I/O	The Lower-FAIL signal is generated continuously until a STOP signal is received.					
	PASS	Judgment method	PASS judgment is made if Upper-FAIL or Lower-FAIL has not occurred when the test time elapses.					
		Display	"PASS" is displayed.					
		Buzzer	On (fixed to 50 ms)					
		SIGNAL I/O	The PASS signal is generated for the length of time specified by the Pass Hold setting. If Pass Hold is set to Infinity, the PASS signal is generated continuously until a STOP signal is received.					
Voltage rise rate judgment operation			Monitors the voltage rise rate during Voltage rise time. This is valid when Auto set-ting of the judgment delay (Delay Auto) is set to on and the output voltage is 0.2 kV or more. The output is shut off when a judgment is made. Buzzer volume level can be set in the range of 0 (OFF) to 10 for pass and fail separately.					
	dV/dt FAIL	Judgment method	When the voltage rise rate (dV/dt) is less than approx. 1 V/s.					
		Display	"Upper-FAIL (dV/dt)" is displayed.					
		Buzzer	ON					
		SIGNAL I/O	The U FAIL signal is generated continuously until a STOP signal is received.					
Upper limit setting range			AC: 0.01 mA to 110.00 mA, DC: 0.01 mA to 21.00 mA					
Lower limit setting range			AC: 0.00 mA to 109.99 mA, DC: 0.00 mA to 20.99 mA, OFF. Setting 0.00 is equivalent to OFF.					
Judgment accuracy *5 *6			±(1 % of setting + 5 µA)					
Current detection method			Compares to the reference value using the following method. Calculate true rms values, convert mean-value responses to rms values					
Response speed (filter) switching			Switches the current detection response speed (sensitivity) used in UPPER FAIL judgment between five levels in ACW and DCW tests.					

*5 During AC voltage tests, current also flows in the stray capacitance of items such as the test leads and tools. For details on stray capacitance, see "Stray Capacitance of AC Withstanding Voltage Tests"

*6 When the temperature and humidity are high, erroneous current from the product's internal and external high-voltage wiring sections to ground increases. When the humidity exceeds 70 %, an erroneous current of about 50 µA may be generated.

Timer function	TOS9300	TOS9301	TOS9301PD	TOS9302	TOS9303	TOS9303LC
Voltage rise time settings range	0.1 s to 200.0 s					
Voltage fall time setting time *7	0.1 s to 200.0 s, OFF					
Test time setting range	0.1 s to 1000.0 s, OFF					
Judgment delay (Judge Delay) setting range *8	0.1 s to 100.0 s, AUTO *9 (DCW only)					
Accuracy	±(100 ppm of setting + 20 ms) (excluding the fall time)					

*7 This setting is used only when a PASS judgment occurs in ACW and DCW tests. During a DCW test, the voltage may not drop all the way within the set time because of the electrostatic capacity inside the product and the EUT.

*8 Less than the sum of the rise time and fall time.

*9 If Delay Auto is set to on, LOWER judgment is not made until the charge time ends.

Other specifications		TOS9300	TOS9301	TOS9301PD	TOS9302	TOS9303	TOS9303LC
Analog monitor *10		Outputs a voltage signal according to the current waveform or voltage waveform					
	I	Current waveform: Scale 50 mA/1 V					
	V	Voltage waveform: Scale 1 kV/1 V					
Grounding mode (GND)		Can be switched between Low and Guard.					
	Low	GND is connected to the low terminal. Measures the current flowing across the low terminal and chassis (normal applications).					
	Guard *11	GND is connected to Guard. Measures only the current flowing through the low terminal (current flowing through the chassis is not measured) (high sensitivity, high accuracy measurement applications).					

*10 Monitor signal output is isolated from the chassis (earth). If you connect an oscilloscope or an external device whose BNC shield is grounded, be sure to set the grounding mode (GND) to Guard. The value is not calibrated.

*11 If there is a possibility that the EUT or tools and the like will be grounded or if you are uncertain, do not set GND to Guard. Doing so is extremely dangerous because the ammeter will be shorted and will not be able to measure current. For normal applications, set GND to Low.

TOS9300 Series Specifications

Insulation Resistance Test

Output function			TOS9300	TOS9301	TOS9301PD	TOS9303	TOS9303LC
Negative polarity	Output voltage range		-0.025 kV to -1 kV				
		Resolution	1 V				
		Setting accuracy	±(1.2 % of setting + 0.002 kV)				
	Max. rated load		1 W (-1 kV/1 mA)				
	Ripple	1 kV no load	2 Vp-p or less				
		Max. rated load	10 Vp-p or less				
	Short-circuit current		12 mA or less				
Positive polarity *1	Output voltage range		–	+0.05 kV to +7.2 kV			
		Resolution		1 V			
		Setting accuracy		±(1.2 % of setting + 0.02 kV)			
	Max. rated load			7.2 W(7.2 kV/1 mA)			
	Ripple	1 kV no load		20 Vp-p or less			
		Max. rated load		50 Vp-p or less			
	Short-circuit current			100 mA (TYP) (200 mA peak)			
Max. rated current			1 mA				
Voltage regulation			1 % or less (when changing from maximum rated load to no load)				
Discharge function			Forced discharge after test completion (discharge resistance: 20 kΩ)				
Output voltage monitor function			If the output voltage exceeds ±(10 % of setting + 0.05 kV), the output is turned off, and the protection function is activated.				

*1 TOS9300 are not supported.

Measurement function				TOS9300	TOS9301	TOS9301PD	TOS9303	TOS9303LC
Voltmeter	Measurement range			Negative polarity: 0 Vdc to -1.2 kVdc, positive polarity: 0 Vdc to 7.5 kVdc				
	Resolution			0.1 V				
	Accuracy			Negative polarity: ±(1 % of reading + 0.001 kV), positive polarity: ±(1.2 % of reading + 0.001 kV)				
Resistance meter	Measurement range			0.001 MΩ to 100.0 GΩ (in the range of maximum rated current of 1 mA to 5 nA)				
	Accuracy *2 *3 (when GND is set to Guard) (i: measured current) (R: measurement resistance)	5 nA ≤ i ≤ 50 nA *4	500.000 MΩ ≤ R < 1.000 GΩ:	±(15 % of reading + 0.5 MΩ)				
			1.000 GΩ ≤ R < 10.000 GΩ:	±(15 % of reading + 5 MΩ)				
			10.000 GΩ ≤ R ≤ 100.000 GΩ:	±(20 % of reading + 200 MΩ)				
		50 nA < i ≤ 100 nA *4	200.000 MΩ ≤ R < 1.000 GΩ:	±(10 % of reading + 0.5 MΩ)				
			1.000 GΩ ≤ R < 10.000 GΩ:	±(10 % of reading + 5 MΩ)				
			10.000 GΩ ≤ R < 50.000 GΩ:	±(10 % of reading + 50 MΩ)				
			50.000 GΩ ≤ R ≤ 100.000 GΩ:	±(20 % of reading + 200 MΩ)				
		100 nA < i ≤ 200 nA *5	100.000 MΩ ≤ R < 1.000 GΩ:	±(7 % of reading + 0.5 MΩ)				
			1.000 GΩ ≤ R < 2.000 GΩ:	±(7 % of reading + 5 MΩ)				
			2.000 GΩ ≤ R < 10.000 GΩ:	±(7 % of reading + 10 MΩ)				
			10.000 GΩ ≤ R < 50.000 GΩ:	±(7 % of reading + 100 MΩ)				
		200 nA < i ≤ 1 μA *5	10.000 MΩ ≤ R < 100.000 MΩ:	±(5 % of reading + 0.05 MΩ)				
			100.000 MΩ ≤ R < 1.000 GΩ:	±(5 % of reading + 0.5 MΩ)				
			1.000 GΩ ≤ R < 10.000 GΩ:	±(5 % of reading + 5 MΩ)				
			10.000 GΩ ≤ R < 25.000 GΩ:	±(5 % of reading + 50 MΩ)				
		1 μA < i ≤ 1 mA *5	0.001 MΩ ≤ R < 10.000 MΩ:	±(2 % of reading + 0.003 MΩ)				
			10.000 MΩ ≤ R < 100.000 MΩ:	±(2 % of reading + 0.03 MΩ)				
			100.000 MΩ ≤ R < 1.000 GΩ:	±(2 % of reading + 0.3 MΩ)				
			1.000 GΩ ≤ R < 5.000 GΩ:	±(2 % of reading + 3 MΩ)				
	Accuracy *6 (when GND is set to Low) (i: measured current) (R: measurement resistance)	5 nA ≤ i ≤ 50 nA *4	500.000 MΩ ≤ R < 1.000 GΩ:	±(25 % of reading + 0.5 MΩ)				
			1.000 GΩ ≤ R < 10.000 GΩ:	±(25 % of reading + 5 MΩ)				
			10.000 GΩ ≤ R ≤ 100.000 GΩ:	±(30 % of reading + 200 MΩ)				
		50 nA < i ≤ 100 nA *4	200.000 MΩ ≤ R < 1.000 GΩ:	±(20 % of reading + 0.5 MΩ)				
			1.000 GΩ ≤ R < 10.000 GΩ:	±(20 % of reading + 5 MΩ)				
			10.000 GΩ ≤ R < 50.000 GΩ:	±(20 % of reading + 50 MΩ)				
			50.000 GΩ ≤ R ≤ 100.000 GΩ:	±(30 % of reading + 200 MΩ)				
		100 nA < i ≤ 200 nA *5	100.000 MΩ ≤ R < 1.000 GΩ:	±(10 % of reading + 0.5 MΩ)				
			1.000 GΩ ≤ R < 2.000 GΩ:	±(10 % of reading + 5 MΩ)				
			2.000 GΩ ≤ R < 10.000 GΩ:	±(10 % of reading + 10 MΩ)				
			10.000 GΩ ≤ R < 50.000 GΩ:	±(10 % of reading + 100 MΩ)				
		200 nA < i ≤ 1 μA *5	10.000 MΩ ≤ R < 100.000 MΩ:	±(5 % of reading + 0.05 MΩ)				
			100.000 MΩ ≤ R < 1.000 GΩ:	±(5 % of reading + 0.5 MΩ)				
			1.000 GΩ ≤ R < 10.000 GΩ:	±(5 % of reading + 5 MΩ)				
			10.000 GΩ ≤ R < 25.000 GΩ:	±(5 % of reading + 50 MΩ)				
		1 μA < i ≤ 1 mA *5	0.001 MΩ ≤ R < 10.000 MΩ:	±(2 % of reading + 0.003 MΩ)				
			10.000 MΩ ≤ R < 100.000 MΩ:	±(2 % of reading + 0.03 MΩ)				
			100.000 MΩ ≤ R < 1.000 GΩ:	±(2 % of reading + 0.3 MΩ)				
			1.000 GΩ ≤ R < 5.000 GΩ:	±(2 % of reading + 3 MΩ)				
	Hold function			The resistance measurement after a test is finished is held while the pass judgment is displayed.				
	Offset cancel function			Cancels up to 2000 GΩ of the unnecessary insulation resistance across output cables and the like. OFF function available.				

*2 Humidity: 70 %rh or less (no condensation), when there is no interference caused by wobbly test leads or other problems.

*3 If the grounding mode (GND) is set to low in a highly humid environment, leakage current to ground will be generated from the high-voltage wiring sections inside the product and the high-voltage wiring sections between the product and the EUT. This leakage current ranges from several nA to several tens of μA depending on the usage and wiring conditions of the optional TOS9320 high voltage scanner and greatly affects measurement accuracy. The effects of leakage current can be reduced by making measurements with the offset enabled.

*4 Add 10 % to the accuracy when measuring 100 V or less.

*5 Add 5 % to the accuracy when measuring 100 V or less.

*6 When the measured current is limited to 100 nA or more (no condensation) when the humidity is 50 %rh

Judgment function			TOS9300	TOS9301	TOS9301PD	TOS9303	TOS9303LC
Behavior based on judgment			The output is shut off when a judgment is made. Buzzer volume level can be set in the range of 0 (OFF) to 10 for pass and fail separately. In an auto test, the buzzer is valid only for the judgment that takes place at the end of the program.				
	UPPER FAIL	Judgment method	UPPER FAIL results when a resistance greater than or equal to the Upper limit is detected. Judgment is not made during or Voltage rise time.				
		Display	"Upper-FAIL" is displayed.				
		Buzzer	On				
		SIGNAL I/O	The Upper-FAIL signal is generated continuously until a STOP signal is received.				
	LOWER FAIL	Judgment method	LOWER FAIL results when a resistance less than or equal to the Lower limit is detected. Judgment is not made during the judgment delay (Judge Delay).				
		Display	"Lower-FAIL" is displayed.				
		Buzzer	On				
		SIGNAL I/O	The Lower-FAIL signal is generated continuously until a STOP signal is received.				
	PASS	Judgment method	PASS judgment is made if Upper-FAIL or Lower-FAIL has not occurred when the test time elapses.				
		Display	"PASS" is displayed.				
		Buzzer	On (fixed to 50 ms)				
		SIGNAL I/O	The PASS signal is generated for the length of time specified by the Pass Hold setting. If Pass Hold is set to Infinity, the PASS signal is generated continuously until a STOP signal is received.				
Voltage rise rate judgment operation			Monitors the voltage rise rate during Voltage rise time. This is valid when Auto setting of the judgment delay (Delay Auto) is set to on and the output voltage is 0.2 kV or more. The output is shut off when a judgment is made. Buzzer volume level can be set in the range of 0 (OFF) to 10 for pass and fail separately.				
	dV/dt FAIL	Judgment method	When the voltage rise rate (dV/dt) is less than approx. 1 V/s.				
		Display	"Lower-FAIL (dV/dt)" is displayed.				
		Buzzer	On				
		SIGNAL I/O	The L FAIL signals are generated continuously until a STOP signal is received.				
Upper limit setting range			0.001 MΩ to 100.000 GΩ (in the range up to the maximum rated current), OFF				
Lower limit setting range			0.000 MΩ to 99.999 GΩ (in the range up to the maximum rated current), OFF. Setting 0.000 is equivalent to OFF.				
Accuracy *7 *8 *9 (i: measured current) (R: measure-ment resistance)	5 nA ≤ i ≤ 50 nA *10	500.000 MΩ ≤ R < 1.000 GΩ:	±(15 % of setting + 0.51 MΩ)				
		1.000 GΩ ≤ R < 10.000 GΩ:	±(15 % of setting + 15 MΩ)				
		10.000 GΩ ≤ R ≤ 100.000 GΩ:	±(20 % of setting + 210 MΩ)				
	50 nA < i ≤ 100 nA *10	200.000 MΩ ≤ R < 1.000 GΩ:	±(10 % of setting + 0.51 MΩ)				
		1.000 GΩ ≤ R < 10.000 GΩ:	±(10 % of setting + 15 MΩ)				
		10.000 GΩ ≤ R < 50.000 GΩ:	±(10 % of setting + 60 MΩ)				
		50.000 GΩ ≤ R ≤ 100.000 GΩ:	±(20 % of setting + 210 MΩ)				
	100 nA < i ≤ 200 nA *11	100.000 MΩ ≤ R < 1.000 GΩ:	±(7 % of setting + 0.51 MΩ)				
		1.000 GΩ ≤ R < 2.000 GΩ:	±(7 % of setting + 15 MΩ)				
		2.000 GΩ ≤ R < 10.000 GΩ:	±(7 % of setting + 20 MΩ)				
		10.000 GΩ ≤ R < 50.000 GΩ:	±(7 % of setting + 110 MΩ)				
	200 nA < i ≤ 1 μA *11	10.000 MΩ ≤ R < 100.000 MΩ:	±(5 % of setting + 0.06 MΩ)				
		100.000 MΩ ≤ R < 1.000 GΩ:	±(5 % of setting + 0.51 MΩ)				
		1.000 GΩ ≤ R < 10.000 GΩ:	±(5 % of setting + 15 MΩ)				
		10.000 GΩ ≤ R < 25.000 GΩ:	±(5 % of setting + 60 MΩ)				
	1 μA < i ≤ 1 mA *11	0.001 MΩ ≤ R < 10.000 MΩ:	±(2 % of setting + 0.013 MΩ)				
		10.000 MΩ ≤ R < 100.000 MΩ:	±(2 % of setting + 0.04 MΩ)				
		100.000 MΩ ≤ R < 1.000 GΩ:	±(2 % of setting + 0.31 MΩ)				
		1.000 GΩ ≤ R < 5.000 GΩ:	±(2 % of setting + 13 MΩ)				
Accuracy *12 (when GND is set to Low) (i: measured current) (R: measurement resistance)	5 nA ≤ i ≤ 50 nA *10	500.000 MΩ ≤ R < 1.000 GΩ:	±(25 % of setting + 0.51 MΩ)				
		1.000 GΩ ≤ R < 10.000 GΩ:	±(25 % of setting + 15 MΩ)				
		10.000 GΩ ≤ R ≤ 100.000 GΩ:	±(30 % of setting + 210 MΩ)				
	50 nA < i ≤ 100 nA *10	200.000 MΩ ≤ R < 1.000 GΩ:	±(20 % of setting + 0.51 MΩ)				
		1.000 GΩ ≤ R < 10.000 GΩ:	±(20 % of setting + 15 MΩ)				
		10.000 GΩ ≤ R < 50.000 GΩ:	±(20 % of setting + 60 MΩ)				
		50.000 GΩ ≤ R ≤ 100.000 GΩ:	±(30 % of setting + 210 MΩ)				
	100 nA < i ≤ 200 nA *11	100.000 MΩ ≤ R < 1.000 GΩ:	±(10 % of setting + 0.51 MΩ)				
		1.000 GΩ ≤ R < 2.000 GΩ:	±(10 % of setting + 15 MΩ)				
		2.000 GΩ ≤ R < 10.000 GΩ:	±(10 % of setting + 20 MΩ)				
		10.000 GΩ ≤ R < 50.000 GΩ:	±(10 % of setting + 110 MΩ)				
	200 nA < i ≤ 1 μA *11	10.000 MΩ ≤ R < 100.000 MΩ:	±(5 % of setting + 0.06 MΩ)				
		100.000 MΩ ≤ R < 1.000 GΩ:	±(5 % of setting + 0.51 MΩ)				
		1.000 GΩ ≤ R < 10.000 GΩ:	±(5 % of setting + 15 MΩ)				
		10.000 GΩ ≤ R < 25.000 GΩ:	±(5 % of setting + 60 MΩ)				
	1 μA < i ≤ 1 mA *11	0.001 MΩ ≤ R < 10.000 MΩ:	±(2 % of setting + 0.013 MΩ)				
		10.000 MΩ ≤ R < 100.000 MΩ:	±(2 % of setting + 0.04 MΩ)				
		100.000 MΩ ≤ R < 1.000 GΩ:	±(2 % of setting + 0.31 MΩ)				
		1.000 GΩ ≤ R < 5.000 GΩ:	±(2 % of setting + 13 MΩ)				

*7 Making judgments on 200 μA or less requires at least 3 seconds after the rise time ends. Making judgments when the low pass filter is set to on requires at least 10 seconds after the rise time ends.

*8 Humidity: 70 %rh or less (no condensation), when there is no interference caused by wobbly test leads or other problems.

*9 If the grounding mode (GND) is set to low in a highly humid environment, leakage current to ground will be generated from the high-voltage wiring sections inside the product and the high-voltage wiring sections between the product and the EUT. This leakage current ranges from several nA to several tens of μA depending on the usage and wiring conditions of the optional TOS9320 high voltage scanner and greatly affects measurement accuracy. The effects of leakage current can be reduced by making measurements with the offset enabled.

*10 Add 10 % to the accuracy when measuring 100 V or less.

*11 Add 5 % to the accuracy when measuring 100 V or less.

*12 When the measured current is limited to 100 nA or more (no condensation) when the humidity is 50 %rh

TOS9300 Series Specifications

Timer function	TOS9300	TOS9301	TOS9301PD	TOS9303	TOS9303LC
Voltage rise time settings range	0.1 s to 200.0 s				
Test time setting range	0.1 s to 1000.0 s, OFF				
Judgment delay (Judge Delay) setting range *13	0.1 s to 100.0 s, AUTO *14				
Accuracy *15	±(100 ppm of setting + 20 ms)				

*13 Less than the sum of the rise time and fall time.
*14 If Delay Auto is set to on, UPPER judgment is not made until the charge time ends.
*15 This excludes fall time.

Other specifications		TOS9300	TOS9301	TOS9301PD	TOS9303	TOS9303LC
Grounding mode (GND)		Can be switched between Low and Guard.				
	Low	GND is connected to the low terminal. Measures the current flowing across the low terminal and chassis (normal applications).				
	Guard *16	GND is connected to Guard. Measures only the current flowing through the low terminal (current flowing through the chassis is not measured) (high sensitivity, high accuracy measurement applications).				
Filter function		A low-pass filter can be inserted into the ammeter measurement circuit. *17				

*16 If there is a possibility that the EUT or tools and the like will be grounded or if you are uncertain, do not set GND to Guard. Doing so is extremely dangerous because the ammeter will be shorted and will not be able to measure current. For normal applications, set GND to Low.
*17 When the low pass filter is on, a judgment delay of at least 5 seconds and a test time are required.

Earth Continuity Test

Output function			TOS9302	TOS9303	TOS9303LC
Current setting range *1		Resolution	3.0 A to 42.0 A AC/DC		
		Accuracy	0.1 A		
AC	Maximum rated output *2		±(1 % of setting + 0.4 A)		
	Distortion		220 VA (at the output terminal)		
	Frequency		2 % or less (20 A or more, using a 0.1 Ω pure resistive load)		
		Accuracy	Select 50 Hz or 60 Hz. Sine		
	Open terminal voltage		±200 ppm		
	Output method		6 Vrms or less		
DC	Maximum rated output		PWM switching		
	Ripple		220 W (at the output terminal)		
	Open terminal voltage		±0.4 Ap-p or less (TYP)		
			6.0 V or less		

*1 No greater than the maximum rated output and resistance no greater than the output terminal voltage 5.4 V.
*2 When tests are performed consecutively, output time limit and rest time may become necessary depending on the upper limit setting

Measurement function		TOS9302	TOS9303	TOS9303LC
Output ammeter	Measurement range	0.0 A to 45.0 A AC/DC		
	Resolution	0.1 A		
	Accuracy	±(1 % of reading + 0.2 A)		
	Response	AC: true rms value: DC: mean value		
	Hold function	The current measurement after a test is finished is held while the pass or fail judgment is displayed.		
Output voltmeter	Measurement range	AC: 0.00 V to 6.00 V, DC: 0.00 V to 8.50 V		
	Resolution	0.001 V		
	Offset cancel function	Cancels up to 5 V (AC/DC) of the unnecessary voltage from measurements. OFF function available.		
	Accuracy	±(1 % of setting + 0.02 V)		
	Response	AC: true rms value: DC: mean value		
	Hold function	The voltage measurement after a test is finished is held while the pass or fail judgment is displayed.		
Resistance meter	Measurement range *3	1 mΩ to 600 mΩ		
	Resolution	1 mΩ		
	Offset cancel function	Cancels up to 10 Ω of the unnecessary resistance from measurements. OFF function available.		
	Accuracy	±(2 % of reading + 3 mΩ)		
	Hold function	The resistance measurement after a test is finished is held while the pass judg-ment is displayed.		

*3 Calculated from the measured output voltage and measured output current.

Judgment function			TOS9302	TOS9303	TOS9303LC
Behavior based on judgment			Judgment based on resistance or sensing voltage can be selected. The output is shut off when a judgment is made. Buzzer volume level can be set in the range of 0 (OFF) to 10 for pass and fail separately. In an auto test, the buzzer is valid only for the judgment that takes place at the end of the program.		
	UPPER FAIL	Judgment method	UPPER FAIL results when a resistance greater than or equal to the Upper limit is detected or when a sensing voltage is detected. Judg-ment is not made during a contact check.		
		Display	“Upper-FAIL” is displayed.		
		Buzzer	On		
		SIGNAL I/O	The Upper-FAIL signal is generated continuously until a STOP signal is received.		
	LOWER FAIL	Judgment method	LOWER FAIL results when a resistance less than or equal to the lower limit (Lower) is detected or when a sensing voltage is detected.		
		Display	“Lower-FAIL” is displayed.		
		Buzzer	On		
		SIGNAL I/O	The Lower-FAIL signal is generated continuously until a STOP signal is received.		
	PASS	Judgment method	PASS judgment is made if Upper-FAIL or Lower-FAIL has not oc-curred when the test time elapses.		
		Display	“PASS” is displayed.		
		Buzzer	On (fixed to 50 ms)		
		SIGNAL I/O	The PASS signal is generated for the length of time specified by the Pass Hold setting. If Pass Hold is set to Infinity, the PASS signal is generated continuously until a STOP signal is received.		
Resistance judgment	Upper limit setting range		0.0001 Ω to 10.0000 Ω		
	Lower limit setting range		0.0000 Ω to 9.9999 Ω		
	Judgment accuracy		±(2 % of UPPER + 3 mΩ)		
Voltage judgment	Upper limit setting range		0.001 V to 5.000 V AC/DC		
	Lower limit setting range		0.000 V to 4.999 V AC/DC		
	Judgment accuracy		±(2 % of UPPER + 0.05 V)		
Calibration			Calibrated using a pure resistive load (with the rms of a sine wave for AC)		
Contact check function			Checks that current flows through the test leads and then starts the test. (OFF setting available)		

Timer function	TOS9302	TOS9303	TOS9303LC
Current rise time settings range	0.1 s to 200.0 s		
Current fall time setting time *4	0.1 s to 200.0 s, OFF		
Test time	0.1 s to 1000.0 s, OFF		
Accuracy	±(100 ppm of setting + 20 ms) (excluding the fall time)		

*4 This setting is used only when a PASS judgment occurs. During a DC test, the voltage may not drop

TOS9300 Series Specifications

Partial Discharge Test

Output function			TOS9301PD
AC output section	Output range		0.050 kV to 5.000 kV
		Resolution	1 V
		Setting accuracy	±(1.2 % of setting + 0.02 kV) (at no load)
	Max. rated load		250 VA (5 kV/50 mA)
	Max. rated current		50 mA (when the output voltage is 0.2 kV or higher)
	Output voltage waveform *1		Sine
		Distortion	2 % or less. (when the output voltage is 0.5 kV or higher and no load or a pure resistive load is connected)
	Crest factor		√2 ± 3 % (800 V or higher)
	Frequency		50 Hz / 60 Hz
		Accuracy	±0.1 %
	Voltage regulation		±3 % or less (when changing from maximum rated load to no load)
	Output method		PWM switching
Output voltage monitor function			If the output voltage exceeds ±(10 % of setting + 0.05 kV), the output is turned off, and the protection function is activated.

*1 If an AC voltage is applied to a capacitive load, the output voltage may rise higher than at no load depending on the load capacitance. Further, waveform distortions may occur if an EUT whose capacitance is dependent on voltage (for example, an EUT that consists of ceramic capacitors) is connected as the load. However, if the test voltage is 1.5 kV, the effect of a capacitance of 1000 pF or less can be ignored. Because the product's high-voltage power supply uses the PWM switching method, if the test voltage is 500 V or less, the switching and spike noise proportions are large. The lower the test voltage, the greater the waveform is distorted.

Measurement function			TOS9301PD
Voltmeter	Measurement range		0.00 kV to 7.50 kV AC/DC
	Resolution		0.1 V
	Accuracy		±(1.2 % of reading + 0.05 kV)
	Response		Can be switched between true rms and peak-value response.
	Hold function		The voltage measurement after a test is finished is held while the pass/fail judgment is displayed.
Electric charge measurement	Electric charge measurement method		IEC60664-1 Edition 3.0 compliant
	Measurement range		0 pC to 10000 pC
	Measurement resolution	100 pC range	0.1 pC
		1000 pC range	0.1 pC
		10000 pC range	1 pC
	Accuracy *2	100 pC range	±(5% of full scale + 7 pC)
		1000 pC range	±(5% of full scale)
		10000 pC range	±(5% of full scale)
	Measurement interval		Determination based on the measured values in each cycle of an applied voltage.
	Hold function		Determination based on the measured values in each cycle of an applied voltage.
	Maximum electrostatic capacity of the EUT		10 nF
	Peak hold function		Holds the maximum value during a measurement.
	Filter function		A low-pass filter can be inserted into the electric charge measurement circuit.
	Discharge inception voltage, discharge inception voltage measurement		Measures the voltage at which discharge exceeding a preset electric charge starts and the voltage at which discharge ceases (complies with IEC60664-1 third edition).
	Calibration (Precalibration)		Calibrate using the built-in calibration capacitor (1000 pF).
	Pulse counting function		Counts the number of pulses that have passed through the high-pass filter and makes a FAIL judgment if the count exceeds the upper limit.
		Upper limit setting range	1 to 100000
	BPF characteristics switching function		Can switch the characteristics of the band-pass filter in the electric charge measuring circuit
		Center frequency	100 kHz / 160 kHz / 300 kHz
	Coupling capacitor		0.01 µF

*2 When Band Pass Filter is set to 160 kHz.

Judgment function			TOS9301PD
Electric discharge judgment			The output is shut off when a judgment is made.
	Upper FAIL (Current)	Judgment method	A current higher than or equal to the upper limit is measured.
		Display	"Upper-FAIL (Current)" is displayed.
		Buzzer	On
		SIGNAL I/O	The U FAIL signal is generated continuously until a STOP signal is received.
	Upper FAIL (Coulomb)	Judgment method	An electric charge greater than or equal to the upper limit is measured.
		Display	"Upper-FAIL (Coulomb)" is displayed.
		Buzzer	On
		SIGNAL I/O	The U FAIL signal is generated continuously until a STOP signal is received.
	Upper FAIL (Pulse)	Judgment method	A discharge pulse count greater than or equal to the upper limit is measured.
		Display	"Upper-FAIL (Pulse)" is displayed.
		Buzzer	On
		SIGNAL I/O	The U FAIL signal is generated continuously until a STOP signal is received.
	PASS	Judgment method	Upper-FAIL does not happen after the test time has elapsed.
		Display	"PASS" is displayed.
		Buzzer	On
		SIGNAL I/O	The PASS signal is generated for the length of time specified by the Pass Hold setting. If Pass Hold is set to Infinity, the PASS signal is generated continuously until a STOP signal is received.
Upper current limit			50 mA (with no calibration)
Upper limit of electric charge (Upper Coulomb)		Setting range	1 pC to 10000 pC
		Accuracy	As per the accuracy of electric charge measurement
Pulse count judgment criteria (Upper Pulse Count) setting range			1 to 100000 (with no calibration)

Timer function	TOS9301PD
Voltage rise time (Rise Time) setting range	0.1 s to 200.0 s
Voltage fall time (Fall Time) setting range *3	0.1 s to 200.0 s, OFF
Test time setting range	0.1 s to 1000.0 s, OFF
Accuracy	±(100 ppm of setting + 20 ms) (excluding Fall Time)

*3 This setting is used only when PASS judgment occurs.

Other specifications		TOS9301PD
Analog monitor *4		Outputs a voltage signal according to the current waveform, voltage waveform, or electric discharge waveforms.
	V	Voltage waveform: Scale 1 kV/1 V
	Qpd	Electric discharge: Full scale of the scale measurement range/10 V
	Ipd *5	Partial discharge current waveform

*4 Monitor signal output is isolated from the chassis (earth).
*5 The Ipd waveforms are the ones that can be obtained after the actual discharge waveforms have passed the TOS9301PD measurement filter. Therefore, the scale varies according to the frequency response of the discharge waveform.

TOS9300 Series Specifications

Leakage Current Test

Measurement function				TOS9303LC
Measurement Item	TC			Touch current measurement
		Measurement mode		Uses a measurement circuit network representing the impedance of a human body and measures the voltage drop across a reference resistance to calculate the touch current.
		Probe settings	Enc - Pe	A terminal: measurement terminal (for connecting to the enclosure of the EUT) B terminal: open
			Enc - Enc	A and B terminals: measurement terminal (for connecting to the enclosure of the EUT)
			Enc - Liv Enc - Neu	A terminal: measurement terminal (for connecting to the enclosure of the EUT) B terminal: open
	PCC			Protective conductor current measurement
		Measurement method		Measures the voltage drop across a reference resistance inserted in the middle of the protective ground line to calculate the protective conductor current. The measurement impedance is 150 Ω.
	Patient			Patient leakage current measurement
		Measurement method		Uses a network conforming to IEC 60601 and measures the voltage drop across a reference resistance to calculate the patient leakage current.
	Meter			Measures the current flowing or voltage applied across the A and B terminals (simultaneous measurement not possible).
		Measurement method	Current measurement	Uses a measurement circuit network representing the impedance of a human body and measures the voltage drop across a reference resistance to calculate the current flowing across the A and B terminals.
			Voltage measurement	Measures the voltage applied across the A and B terminals.
Current measurement mode			DC	Eliminates AC components and measures only the DC component.
			RMS	Measures the true rms value (switch AC and AC+DC)
			Peak *1	Measures waveform peak values

*1 Current measurements may not be stable due to the effects of the power supply line waveform or the wiring environment between the product and the EUT.

Measurement circuit network		TOS9303LC
Network	A (IEC 60990 compliant) *2	(1.5 kΩ // 0.22 μF) + 500 Ω, reference measurement element: 500 Ω
	B (IEC 60990 compliant)	(1.5 kΩ // 0.22 μF) + 500 Ω // (10 kΩ + 22 nF), reference measurement element: 500 Ω, voltage measurement U1 and U3 switchable
	C (IEC 60990 compliant)	(1.5 kΩ // 0.22 μF) + 500 Ω // (10 kΩ + (20 kΩ + 6.2 nF) // 9.1 nF), reference measurement element: 500 Ω, voltage measurement U1 and U3 switchable
	D (Electrical Appliances and Materials Safety Act, etc.)	1 kΩ, reference measurement element: 1 kΩ
	E (Electrical Appliances and Materials Safety Act)	1 kΩ // (10 kΩ + 11.225 nF + 579 Ω), reference measurement element:1 kΩ
	F (UL and the like)	1.5 kΩ // 0.15 μF, reference measurement element: 1.5 kΩ
	G	2 kΩ, reference measurement element: 2 kΩ
	H (IEC 61010-1, 60601-1wet)	375 Ω // 0.22 μF + 500 Ω, reference measurement element: 500 Ω
	I (Patient)	1 kΩ // 10 kΩ + 0.015 μF, reference measurement element: 1 kΩ
	J (through)	For voltmeter calibration
	PCC-1	150 Ω, reference measurement element: 150 Ω
	PCC-2 (IEC 60598-1)	150 Ω // 1.5 μF, reference measurement element: 150 Ω
Network constant tolerance		Resistance: ±0.1 %, capacitor 0.15 μF: ±2 %, others: ±1 %
Network accuracy	A, B, C, H	Input voltage vs. output voltage ratio: logical value ± 5 % (according to IEC 60990 Annex L and F)
	E	Input voltage vs. output voltage ratio: logical value ± 5 %
	D, G	Reference measurement element (resistance) ± 1 %
	I	Input voltage vs. output voltage ratio: logical value ± 5 %

*2 Current measurements may not be stable due to the effects of the power supply line waveform or the wiring environment between the product and the EUT.

Measurement section				TOS9303LC
Measurement range *3	Range 1			DC, RMS: 1.00 μA(min.) to 200.00 μA(max), Peak: 1.00 μA(min.) to 282.00 μA(max)
	Range 2			DC, RMS: 12.50 μA(min.) to 2000.0 μA(max), Peak: 17.50 μA(min.) to 2830.0 μA(max)
	Range 3			DC, RMS: 125.0 μA(min.) to 20.000 mA(max), Peak: 175.0 μA(min.) to 28.300 mA(max)
	Range 4			DC, RMS: 1.250 mA(min.) to 100.00 mA(max), Peak: 1.750 mA(min.) to 100.00 mA(max)
	Range switching			Auto or Fix selectable. If a measurement falls outside the measurement range of each range, the measured value blinks as a warning.
		Auto		The range is set automatically according to the measurements.
		Fix		For TC and PCC measurements, the measurement range is selected automatically according to the UPPER value. For meter measurements, the range is fixed to the specified range.
	Bandwidth switching			Can be expanded to a bandwidth that allows measurements from 0.1 Hz, which is required in the measurement of medical instruments and the like.
		Normal		Normal measurement bandwidth: 15 Hz to 1 MHz
		Expand		Expands the measurement range to 0.1 Hz to 1 MHz
Total accuracy *4 (when network A, B, or C is used) *5	Range 1	DC		±(5.0 % of reading + 2 μA)
		RMS	0.1 Hz ≤ f < 15 Hz	±(10.0 % of reading + 2 μA)
			15 Hz ≤ f ≤ 100 kHz	±(7.0 % of reading + 2 μA)
			100 kHz < f ≤ 1 MHz	±(10.0 % of reading + 2 μA)
		Peak	0.1 Hz ≤ f < 15 Hz	±(10.0 % of reading + 10 μA)
			15 Hz ≤ f ≤ 1 kHz	±(10.0 % of reading + 10 μA)
			1 kHz < f ≤ 100 kHz	±(10.0 % of reading + 10 μA)
			100 kHz < f ≤ 1 MHz	±(20.0 % of reading + 10 μA)
	Range 2	DC		±(5.0 % of reading + 20 μA)
		RMS	0.1 Hz ≤ f < 15 Hz	±(10.0 % of reading + 10 μA)
			15 Hz ≤ f ≤ 100 kHz	±(7.0 % of reading + 8 μA)
			100 kHz < f ≤ 1 MHz	±(10.0 % of reading + 10 μA)
		Peak	0.1 Hz ≤ f < 15 Hz	±(10.0 % of reading + 10 μA)
			15 Hz ≤ f ≤ 1 kHz	±(10.0 % of reading + 10 μA)
			1 kHz < f ≤ 100 kHz	±(10.0 % of reading + 10 μA)
			100 kHz < f ≤ 1 MHz	±(20.0 % of reading + 10 μA)
	Range 3	DC		±(5.0 % of reading + 50 μA)
		RMS	0.1 Hz ≤ f < 15 Hz	±(10.0 % of reading + 20 μA)
			15 Hz ≤ f ≤ 100 kHz	±(7.0 % of reading + 20 μA)
			100 kHz < f ≤ 1 MHz	±(10.0 % of reading + 20 μA)
		Peak	0.1 Hz ≤ f < 15 Hz	±(10.0 % of reading + 50 μA)
			15 Hz ≤ f ≤ 1 kHz	±(7.0 % of reading + 50 μA)
			1 kHz < f ≤ 100 kHz	±(10.0 % of reading + 50 μA)
			100 kHz < f ≤ 1 MHz	±(20.0 % of reading + 50 μA)
	Range 4	DC		±(5.0 % of reading + 0.5 mA)
		RMS	0.1 Hz ≤ f < 15 Hz	±(10.0 % of reading + 0.2 mA)
			15 Hz ≤ f ≤ 100 kHz	±(7.0 % of reading + 0.2 mA)
			100 kHz < f ≤ 1 MHz	±(10.0 % of reading + 0.2 mA)
		Peak	0.1 Hz ≤ f < 15 Hz	±(10.0 % of reading + 0.5 mA)
			15 Hz ≤ f ≤ 1 kHz	±(7.0 % of reading + 0.5 mA)
			1 kHz < f ≤ 100 kHz	±(10.0 % of reading + 0.5 mA)
			100 kHz < f ≤ 1 MHz	±(20.0 % of reading + 0.5 mA)
Input resistance				1 MΩ ± 1 %
Input capacitance				200 pF or less (internal voltmeter input capacitance: 100 pF or less)
Common mode rejection ratio				10 kHz or less: 60 dB or more, 10 kHz to 1 MHz: 40 dB or more
Offset cancel function				Cancels up to 10 mA of the unnecessary current from measurements. OFF function available.

*3 Voltmeter band expansion is possible when network I is selected.
*4 0.1 Hz ≤ f < 15 Hz is for when voltmeter band expansion (VoltMeter BandWidth) is set to Expand. Requires at least 120 second of test time.
*5 A value converted to current for measurements using Network A, B, C or H with voltmeter accuracy of this product as the reference.
If a network other than A, B, C or H is used, calculate as follows:
For Network D, E, or I, the ■ part of ±(□% of reading + ■A) is half the value.
For F, the ■ part is one-third the value.
For G, the ■ part is one-fourth the value.
For PCC-1 or PCC-2, the ■ part is 3.3 times the value.

Timer function		TOS9303LC
Judgment delay (Judge Delay)	Setting range	1 s to 1000 s, OFF
	Accuracy	±(100 ppm of setting + 20 ms)
Test time	Setting range	1 s to 1000 s, OFF
	Accuracy	±(100 ppm of setting + 20 ms)

TOS9300 Series Specifications

Judgment function			TOS9303LC
Behavior based on judgment			Judgment starts after the judgment delay (Judge Delay). Buzzer volume level can be set in the range of 0 (OFF) to 10 for pass and fail separately. In an auto test, the buzzer is valid only for the judgment that takes place at the end of the program.
	UPPER FAIL	Judgment method	UPPER FAIL results when a current greater than or equal to the upper limit (Upper) is detected.
		Display	"Upper-FAIL" is displayed.
		Buzzer	On
		SIGNAL I/O	The Upper-FAIL signal is generated continuously until a STOP signal is received.
	LOWER FAIL	Judgment method	LOWER FAIL results when a current less than or equal to the lower limit (Lower) is detected.
		Display	"Lower-FAIL" is displayed.
		Buzzer	On
		SIGNAL I/O	The Lower-FAIL signal is generated continuously until a STOP signal is received.
	PASS	Judgment method	PASS judgment is made if Upper-FAIL or Lower-FAIL has not occurred when the test time elapses.
		Display	"PASS" is displayed.
		Buzzer	On (fixed to 50 ms)
		SIGNAL I/O	The PASS signal is generated for the length of time specified by the Pass Hold setting. If Pass Hold is set to Infinity, the PASS signal is generated continuously until a STOP signal is received.
Upper Setting range	RANGE 1		DC, RMS: 0.1 µA(min.) to 200 µA(max), Peak: 0.1 µA(min.) to 282 µA(max)
	RANGE 2		DC, RMS: 15.1 µA(min.) to 2.00 mA(max), Peak: 21.3 µA(min.) to 2.83 mA(max)
	RANGE 3		DC, RMS: 151 µA(min.) to 20.00 mA(max), Peak: 213 µA(min.) to 28.3 mA(max)
	RANGE 4		DC, RMS: 1.51 mA(min.) to 100 mA(max), Peak: 2.13 mA(min.) to 100 mA(max)
Judgment accuracy			Conforms to total accuracy(Read "reading" as "upper setting" of total accuracy.)

Other specifications			TOS9303LC
Voltage conversion			Displays the estimated current converted with the preset supply voltage (Conv Voltage), based on the voltage supplied to the EUT and the measured current. (This is invalid in meter mode.)
	Setting range		80.0 V to 300.0 V, OFF
	Resolution		0.1 V
Power supply line polarity selection			Set the polarity of the power supply line to supply to the EUT to positive or negative.
Single fault mode (Condition) selection			Set the EUT single fault mode to normal, neutral line disconnection (Fault Neu), or protective ground wire disconnection (Fault PE).
Ground check			In the touch current test between the enclosure and power supply line, if the EUT enclosure is grounded, CONTACT FAIL occurs.
Measurement check			Checks the measurement function by shorting across the A and B terminals. If an error is found, the protection function is activated.
Supply voltage measurementAC LINE (EUT)		Measurement range	80.0 V to 250.0 V
		Resolution	0.01 V
		Accuracy	±(3 % of reading + 1 V)
Supply current measurementAC LINE (EUT)		Measurement range	0.1 A to 15.00 A
		Resolution	0.001 A
		Accuracy	±(5 % of reading + 30 mA)
Power measurement (active power)		Measurement range	10 W to 1500 W
		Accuracy	±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1)
Voltage measurement across the A and B terminals	Measurement range	DC	10.00 V to 300.0 V
		RMS	10.00 V to 300.0 V
		Peak	15.00 V to 430.0 V
	Input impedance		Approx. 40 MΩ
	Accuracy *6		±(3 % of reading + 2 V) (measurement range fixed to AUTO)
	SELV detection		Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights.
		Setting range	10.0 V to 99.9 V, OFF
		Resolution	0.1 V
Measurement terminal	Rated voltage	Between the A and B terminals	250 V
		Between the terminals and chassis	250 V
	Rated current		100 mA
	Measurement category		CAT-II
	Valid terminal display		Terminals valid for measurement are indicated on the display.
	110% terminal		Terminal for supplying 110% voltage of the AC line.
Power supply for the EUT	Nominal voltage range		100 V to 240 V, 50 Hz/60 Hz
	Input voltage range (allowable voltage range)		85 Vac to 250 Vac
	Rated output capacity		1500 VA
	Maximum operating current		15 A (Overcurrent protection is activated at approximately 15.7 A.)
	Inrush current		70 Apeak max. (within 20 ms)

*6 If voltage is measured with the A and B terminals open, measurements will be easily affected by induced voltage.

Interface (Common)

			TOS9300	TOS9301	TOS9301PD	TOS9302	TOS9303	TOS9303LC
REMOTE			5-pin DIN connector. Connect the following option to remotely control the starting and stopping of tests. • Remote control box RC01-TOS, RC02-TOS • High voltage test probe HP01A-TOS, HP02A-TOS (when the test voltage is 4 kVac 5 kVdc or less)					
SIGNAL I/O			D-sub 37-pin connector. For the pin arrangement					
	Function		Enable/disable interlock, recall setup memories, recall auto test programs, start/stop testing, monitor the test and voltage generation status, monitor the test status, monitor judgment results, monitor the step execution status of auto tests, monitor the activation status of protection functions					
	Input specifications		The input signals are all low-active control. The input terminal is pulled up to +12 V by a resistor. Leaving the input terminal open is equivalent to applying a high level signal.					
		High-level input voltage	11 V to 15 V					
		Low-level input voltage	0 V to 4 V					
		Low-level input current	-5 mA max.					
		Input time width	5 ms min.					
	Output specifications	Output method	Open collector output (4.5 Vdc to 30 Vdc)					
		Output withstanding voltage	30 Vdc					
		Output saturation voltage	Approx. 1.1 V (25 °C)					
		Maximum output current	400 mA(TOTAL)					
STATUS OUT			Output terminal of an option product.					
	Positive terminal (red)		Outputs +24 V. Use Status Out of CONFIG settings to set the output conditions.					
	Negative terminal (black)		+24 V circuit common.					
SCANNER			MINI DIN 8-pin connector. Terminal for the optional TOS9320 high voltage scanner. The maximum number of connections is 4 devices(16 channels).					
USB (host)			Standard type A socket, FAT32, 32 GB or less Complies with the USB 2.0 specifications; data rate: 12 Mbps (full speed)					
Remote control			All functions except turning on and off the power, key lock, and auto test can be remotely controlled.					
	RS232C	Hardware	D-sub 9-pin connector (EIA-232D compliant) Baudrate: 9600, 19200, 38400, 57600, 115200 bps Data length: 8 bits; stop bits: 1 bit; parity bit: none, flow control: none/CTS-RTS					
		Message terminator	LF during reception, LF during transmission.					
	USB (device)	Hardware	Standard Type B connector. Complies with the USB 2.0 specifications; data rate: 480 Mbps (high speed)					
		Message terminator	LF or EOM during reception, LF + EOM during transmission.					
		Device class	Complies with the USBTMC-USB488 device class specifications.					
	LAN	Hardware	IEEE 802,3 100Base-TX/10Base-T Ethernet. Auto-MDIX compliant.IPv4, RJ-45 connector.					
		Compliant standards	LXI 1.4 Core Specification 2011					
		Communication protocol	VXI-11, HiSLIP, SCPI-RAW, SCPI-Telnet					
		Message terminator	VXI-11, HiSLIP: LF or END during reception, LF + END during transmission. SCPI-RAW: LF during reception, LF during transmission.					
Display			7-inch LCD					

TOS9300 Series Specifications

Other Functions (Common)

		TOS9300	TOS9301	TOS9301PD	TOS9302	TOS9303	TOS9303LC
Auto test		Auto execution by combining ACW, DCW, IR, and EC. For LC, a combination is possible only using TC, PCC, and Patient.					
Test condition memory	Setup memory	Up to 51 test conditions (ACW, DCW, IR, EC, PD, LC) can be saved.					
	Program memory	Up to 100 program (ACW, DCW, IR, EC, PD) combinations, each containing 100 steps, can be saved.					
	Program memory (LC)	Up to 100 program (TC, PCC, Patient) combinations, each containing 100 steps, can be saved.					
Test result memory		Records up to 1000 latest test result of independent tests and auto tests. These are cleared when the power is turned off. Test results can be saved in CSV format to a USB memory device.					
System clock		For recording the calibration time and test times					
	Recordable time	Up to year 2038					
	Calibration period setting	Displays a warning at power-on when the specified period passes. Select whether to activate a protection function or only display a warning in the display area when a warning occurs.					
Measurement display		Maximum and minimum measurements can be displayed.					
	Normal	Displays measurements during a test. Maximum and minimum values are not held.					
	Maximum and minimum value display	Displays the maximum current measurement for withstanding voltage (ACW/DCW) tests, the minimum resistance measurement for insulation resistance (IR) tests, the resistance measurement or voltage measurement for earth continuity (EC) tests.					
Test start method	Double Action	When you press STOP, “READY” is shown for 0.5 seconds. A test starts only when you press START within this period.					
	Momentary	Tests are only executed while the START switch is held down.					
	Start Long	A test starts only when the START switch is held down for at least 1 second.					
PASS judgment display time (Pass Hold)		Set the time to hold the pass judgment result display (0.05 s to 10.00 s) or hold it until STOP is pressed (Infinity).					
STOP signal disable (Fail Mode)		It is possible to set the instrument so that fail judgment results and PROTECTION mode cannot be released from a device connected to the SIGNAL I/O connector or REMOTE connector.					
Key lock		Lock the operation of the keys to prevent changing the settings or overwriting memory or programs by mistake.					
Protection functions		If a protection function is activated during a test, the output is shut off and the test is stopped immediately.In an LC test, the power supply to the EUT is stopped, and the A and B terminals are opened.Conditions that cause a protection function to be activated are as follows.					
	Interlock	Interlock is activated.					
	Power Supply	There is an error in the power supply section.					
	Output Error	An output voltage outside of the following range is detected. ACW, DCW, IR test, PD test: ±(10 % of setting + 50 V), EC test: ±(10 % of setting + 2 A)					
	Over Load	An output power or output current outside of the following range is detected. ACW: 550 VA, DCW: 110 W or 50 mA, IR (7200 V test): 110 W or 25 mA, IR (-1000 V test): 2 mA, EC: 240 VA, LC: AC LINE OUT current at approx. 15.7 A or power at 1600 VA					
	Over Heat	The internal temperature of the product is abnormally high.					
	Over Rating	During a withstanding voltage test, an output current is generated for a length of time that exceeds the output time limit					
	Cal	The preset calibration period is exceeded.					
	Remote	The REMOTE connector is connected or disconnected.					
	Signal I/O	There is a change in the SIGNAL I/O connector’s ENABLE signal.					
	Communication	An internal communication error is occurring.					
	Over Range	A value exceeding the maximum value of the measurement range is detected.					
	Measure	An error is detected in the LC test measurement check.					
	Short	A relay operation error is detected in an LC test.					
	Earth Fault	When the grounding mode (GND) is set to Guard, abnormal current flows from the high voltage output of this product to ground.					
	Scan I/F	While scanning, the interface cable is disconnected. Or, the channel-assigned scanner is not detected.					

General Specifications (Common)

			TOS9300	TOS9301	TOS9301PD	TOS9302	TOS9303	TOS9303LC
Backup battery life			3 years (at 25 °C)					
Environment	Installation location		Indoors, 2000 m or less					
	Spec guaranteed range	Temperature	5 °C to 35 °C (41 °F to 95 °F) (18°C to 28°C for partial discharge tests)					
		Humidity	20 %rh to 80 %rh (20%rh to 70%rh for partial discharge tests) (no condensation)					
	Operating rang	Temperature	0 °C to 40 °C (32 °F to 104 °F)					
		Humidity	20 %rh to 80 %rh (no condensation)					
	Storage range	Temperature	-20 °C to 70 °C (-4 °F to 158 °F)					
		Humidity	90 %rh or less (no condensation)					
Power supply	Nominal voltage range (allowable voltage range)		100 Vac to 120 V, 200 V to 240 V (90 Vac to 132 V, 170 V to 250 V)					
	Power consumption	No load(READY state)	100 VA or less					
		Rated load	800 VA max.					
	Allowable frequency range		47 Hz to 63 Hz					
Insulation resistance (between AC LINE and chassis)			30 MΩ or more (500 Vdc)					
Withstanding voltage (between AC LINE and chassis)			1500 Vac, 1 minute, 20 mA or less					
Earth continuity			25 Aac, 0.1 Ω or less					
Weight			TOS9300: Approx. 17 kg (37.5 lb.), TOS9301: Approx. 18 kg (39.7 lb.), TOS9301PD: 22 kg (48.5 lb.), TOS9302: Approx. 20 kg (44.1 lb.), TOS9303: Approx. 21 kg (46.3 lb.), TOS9303LC: Approx. 22 kg (48.5 lb.)					
Accessories			Power cord (1 pc., *length: 2.5 m : The attached power cord varies depending on the shipment destination.) High-voltage test lead [TL31-TOS] (1 pair), SIGNAL I/O plug (1 set), High-voltage warning sticker (1 pc.), Setup Guide (1 copy), CD-ROM (1 disc), Safety Information (1 copy), Heavy object warning label (1 pc., *Not included with the TOS9300) Test leads for earth continuity test [TL13-TOS] (1 pair., *TOS9302, TOS9303,TOS9303LC only) [TOS9303LC only: Spare fuse (1 pc.), Test leads for leakage current test (2 red, 1 black), Flat probe (1 sheet)]					
Electromagnetic compatibility *1 *2			Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU EN 61326-1 (Class A *3), EN 55011 (Class A *3, Group 1 *4), EN 61000-3-2, EN 61000-3-3 Applicable under the following conditions The maximum length of all cabling and wiring connected to the prod-uct must be less than 2.5 m.Shielded cables are being used when using the SIGNAL I/O.The high-voltage test lead TL31-TOS is in use.Electrical discharges are applied only to the EUT.					
Safety *1			Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU *2, EN 61010-1 (Class I *5 , Pollution Degree 2 *6)					

*1 Does not apply to specially ordered or modified products.
*2 Only on models that have CE/UKCA marking on the panel.
*3 This is a Class A instrument. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.
*4 This is a Group 1 instrument. This product does not generate and/or use intentionally radio-frequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/anal-ysis purpose.
*5 This is a Class I instrument. Be sure to ground this product's protective conductor terminal. The safety of this product is guaranteed only when the product is properly grounded.
*6 Pollution is addition of foreign matter (solid, liquid or gaseous) that may produce a reduction of dielectric strength or surface resistivity. Pollution Degree 2 assumes that only non-conductive pollution will occur

TOS9300 Series Specifications

High Voltage Scanner

Basic specifications			TOS9320
Maximum operating voltage	AC		5 kV
	DC		7.2 kV
Number of channels			4 (Each channel can be set to high, low, or open.)
Maximum connections			4 units Channel numbers are assigned according to the order in which connections are made to the TOS9300 series tester. 1st scanner: CH1 to CH4 2nd scanner: CH5 to CH8 3rd scanner: CH9 to CH12 4th scanner: CH13 to CH16
Contact check function			Available
Indicators	DANGER		Lights in sync with the TOS9300 series tester
	CHANNEL		Indicates the setting of each channel with color Red: High Green: Low Orange: Contact being checked Off: Open
	EXTERNAL		Lights when external control is on
	POWER		Lights when the power is on

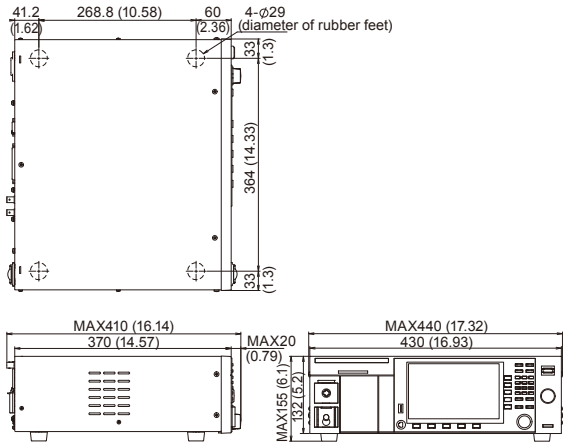
Interface and other functions			TOS9320
Control switch			EXTERNAL I/O switch for switching the following controls. ON: External control through the CONTROLLER INTERFACE OFF: Control from the TOS9300 series tester
CONTROLLER INTERFACE (external control)			D-sub 25-pin connector.
	Function		Sets each channel to high or low or all channels to open. Outputs the setting of each channel.
	Input		The input signals are all low-active control. The input terminal is pulled up to +12 V by a resistor. Leaving the input terminal open is equivalent to applying a high level signal.
		High-level input voltage	11 V to 15 V
		Low-level input voltage	0 V to 4 V
		Low-level input current	-5 mA max.
		Input time width	5 ms min.
	Output	Output method	Open collector output (4.5 Vdc to 30 Vdc)
		Output withstanding voltage	30 Vdc
		Output saturation voltage	Approx. 1.1 V (25°C, 77°F)
		Maximum output current	400 mA (TOTAL)
TOS9300 series tester interface			MINI DIN 8-pin connector. Accuracy guaranteed up to 4 units (16 channels)

General specifications			TOS9320
Environment	Installation location		Indoors, 2000 m or less
	Spec guaranteed range	Temperature	5°C to 35°C (41°F to 95°F)
		Humidity	20%rh to 70%rh (no condensation)
	Operating range	Temperature	0°C to 40°C (32°F to 104°F)
		Humidity	20%rh to 80%rh (no condensation)
	Storage range	Temperature	-20°C to 70°C (-4°F to 158°F)
		Humidity	90%rh or less (no condensation)
Power supply	Nominal voltage range (allowable voltage range)		100 Vac to 240 Vac (90 Vac to 250 Vac)
	Power consumption		50 VA max.
	Allowable frequency range		47 Hz to 63 Hz
Insulation resistance (between AC LINE and chassis)			30 MΩ or more (500 Vdc)
Withstanding voltage (between AC LINE and chassis)			1500 Vac for 1 minute, 20 mA or less
Earth continuity			25 Aac/0.1 Ω or less
Weight			Approx. 8 kg (17.6 lb)
Accessories			Power cord (1 pc., length: 2.5 m: The attached power cord varies depending on the shipment destination.) High-voltage test lead [TL31-TOS] (8 red), Lead for high voltage parallelconnection [TL33-TOS] (1 pair), Interface cable (1 pc.), CONTROLLER INTERFACE plug (1 set), High-voltage warningsticker (2 pc.), Channel labels (For the panel (1 sheet), For the test leads (1 sheet)), User's manual (1 copy), Safety Information (1 copy)
Electromagnetic compatibility *1 *2			Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU, EN 61326-1 (Class A *3), EN 55011 (Class A *3, Group 1 *4), EN 61000-3-2, EN 61000-3-3 Applicable under the following conditions The maximum length of all cabling and wiring connected to this product is less than 2.5 m. A shielded cable is used for the connection to the CONTROLLER INTERFACE. The high-voltage test lead TL31-TOS is in use.Electrical discharges are applied only to the EUT.
Safety *1			Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU *2, EN 61010-1 (Class I *5, Pollution Degree 2 *6)

*1 Does not apply to specially ordered or modified products.
*2 Only on models that have CE/UKCA marking on the panel.
*3 This is a Class A instrument. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.
*4 This is a Group 1 instrument. This product does not generate and/or use intentionally radio frequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/analysis purpose.
*5 This is a Class I instrument. Be sure to ground this product's protective conductor terminal. The safety of this product is guaranteed only when the product is properly grounded.
*6 Pollution is addition of foreign matter (solid, liquid or gaseous) that may produce a reduction of dielectric strength or surface resistivity. Pollution Degree 2 assumes that only non-conductive pollution will occur except for an occasional temporary conductivity caused by condensation.

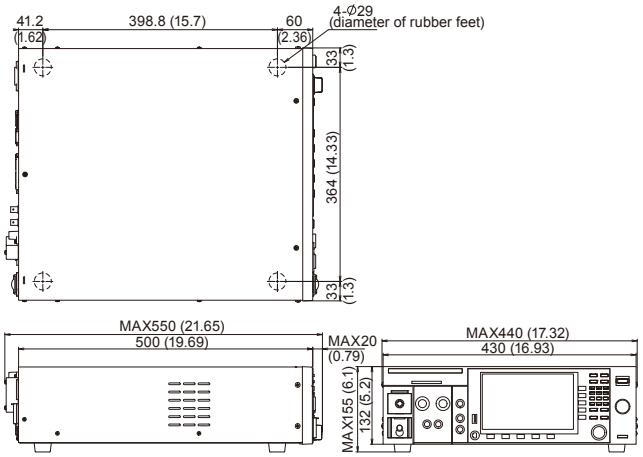
External Dimensional Diagrams

TOS9300, TOS9301



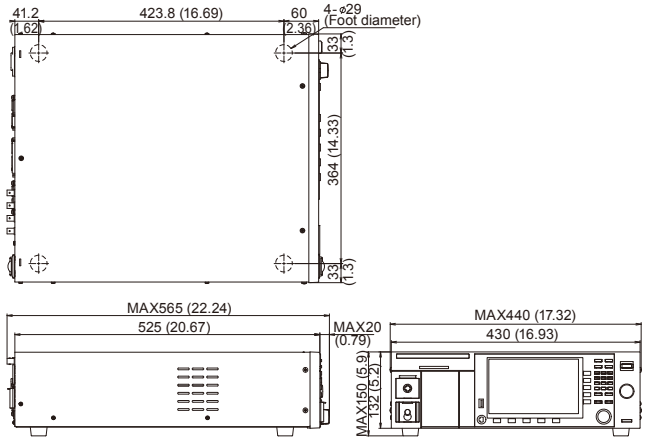
Unit: mm (inch)

TOS9303LC



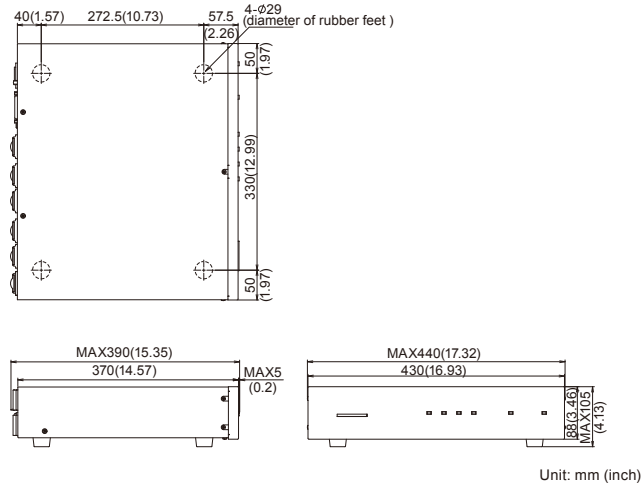
Unit: mm (inch)

TOS9301PD



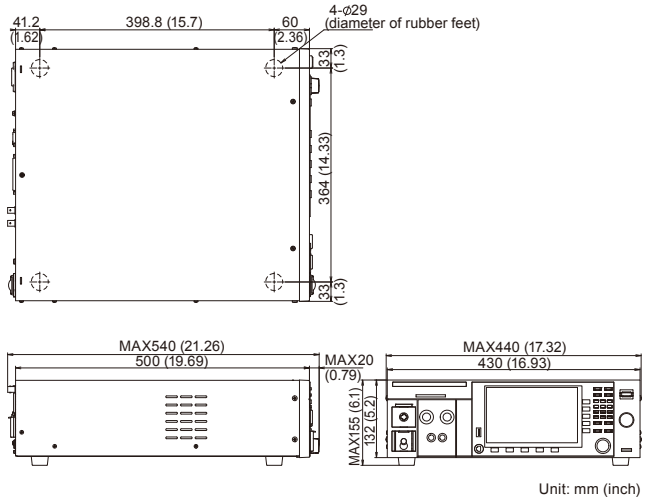
Unit: mm (inch)

TOS9320



Unit: mm (inch)

TOS9302, TOS9303



Unit: mm (inch)

Hipot Tester / Hipot Tester with Insulation Resistance Test

TOS5300 Series

USB DRIVERS CE

TOS5301

TOS5300

TOS5302

A new standard for hipot & insulation resistance testing applied to world-wide input voltage

The TOS5300 Series are test instruments used in Hipot tests and insulation resistance tests, two of the four tests regarded as necessary for ensuring the safety of electrical products. With an output of 5 kV/100 mA (AC) and 6 kV/50 W (DC), the series can be used in Hipot & insulation resistance testing of electronic equipment and electronic parts, based on the requirements of IEC, EN, UL, VDE, JIS, and other international safety standards and the Electrical Appliance and Material Safety Law. Also, the test voltage stability is improved with the adoption of a newly developed switching amplifier. Since the output voltage can be kept constant even when the AC line voltage or frequency changes, consistent testing can be performed, even when the power supply environment is in an unstable region. The TOS5300 is also equipped with a number of features that are capable of meeting a variety of test needs. It is a new low-cost standard model that provides thorough operability, reliability and safety.

Dimensions / Weight

TOS5302: 320(12.60″)W × 132(5.20″)H × 350(13.78″)Dmm / 14kg(30.9 lbs)
TOS5301: 320(12.60″)W × 132(5.20″)H × 350(13.78″)Dmm / 15kg(33.1 lbs)
TOS5300: 320(12.60″)W × 132(5.20″)H × 350(13.78″)Dmm / 14kg(30.9 lbs)

Accessories

Power cord, High-voltage test lead wire: TL31-TOS, High-voltage warning sticker, D-sub 25-pin plug, User's Manual, CD-R(Contains the Communication Interface Manual, the KI-VISA library, and the Safety evalution test.)

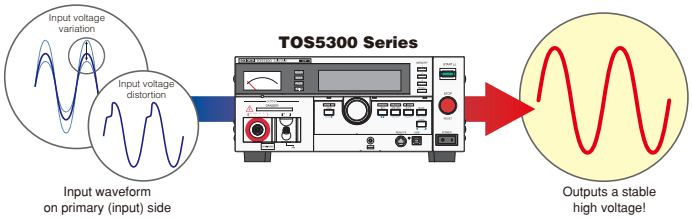
Features

TOS5302: ■ Hipot (Withstanding voltage): AC 5 kV/100 mA
Insulation Resistance: 25 V -1000 V
TOS5301: ■ Hipot (Withstanding voltage): AC 5 kV/100 mA, DC 6 kV/50 W
TOS5300: ■ Hipot (Withstanding voltage): AC 5 kV/100 mA
Common: ■ The PWM amp system provides highly-stable output
■ High-precision measurement ± 1.5 % of reading
■ Rise/Fall time control function
■ Key lock function and Protection cover on the panel operation
■ Limit voltage function
■ Monitoring output voltage function
■ Calibration due notice and warning function
■ Equipped with USB interface

Features and Functions

■ The PWM amplifier provides highly stable output!
[Input voltage variation: ± 0.3 %]

The TOS5300 Series equips with a high-efficient PWM amplifier that can output a stable high-voltage without being affected by the variation of AC power line, users can perform "safe", "stable", and highly "reliable" tests with confidence, even in regions with large voltage variations.



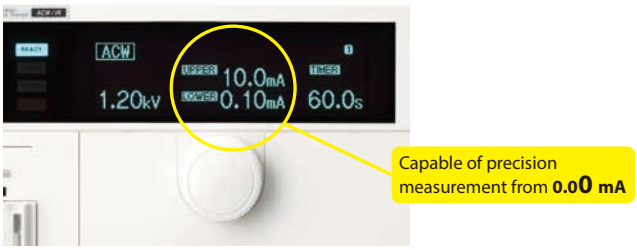
■ 6 kV/50 W DC Hipot (Withstanding voltage) test [Model TOS5301]

Capable to perform DC Hipot (Withstanding voltage) test up to 6 kV. (Model TOS5301) Equipped with a stable DC/DC converter with a low-ripple and the load variation of 3 % or less.

■ Realizing high-precision measurement with high-resolution and high-speed judgement

Equipped with a high-accuracy, high-resolution of True RMS measurement circuit, including a Voltmeter with ± 1.5 % of reading (500 V or greater)/ minimum resolution of 1V, and an Ammeter with ± 1.5 % of reading (1 mA or more)/minimum resolution of 1 µA.

In addition, it is also equipped with an Auto range function, with achieving a judgment accuracy of ± 1.5 % of reading. The Lower limit judgment accuracy achieves a level of performance equivalent to the Upper limit judgment accuracy that enables to detect for such a poor contact or disconnections of test leads. Moreover, it realizes the fast judgment by the test time of 0.1 second, while reliable testing can be performed, thanks to high-precision, high-resolution, high-speed measurement and the judgment functions.



▲ AC Hipot (Withstanding voltage) test settings display (example)

ES France - Département Puissance Energie - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 45 - Fax. 01 47 01 16 22 - e-mail: tem@es-france.com - Site Web: www.es-france.com

Features and Functions

■ Insulation resistance test for 25 V to 1000 V* [Model TOS5302]

The TOS5302 is equipped with an insulation resistance tester. The test voltages can be set from 25 V, 50 V, 100 V, 125 V, 250 V, 500 V and 1000 V. And for setting at 500 V and above, it can perform the insulation resistance test up to 5.00 GΩ.

*At 500 V and above, measurements up to 5.00 GΩ are possible.

■ Protection cover prevents physical operation error in the production site

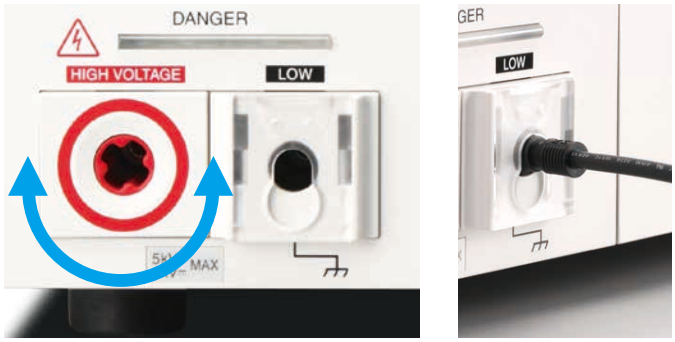
In many cases, workers on electronic equipment production lines and inspection lines are not technical experts. Therefore, it is possible that the operators may change setting conditions and make operation errors. In order to prevent from such cases, the TOS5300 is equipped with a key lock function and a protection cover to disable a physical key operation from the front panel.

▲ View with the protection cover removed

▲ Storing the protection cover for the key operation to the base of unit.

■ New design of output terminal improves safety and functionality

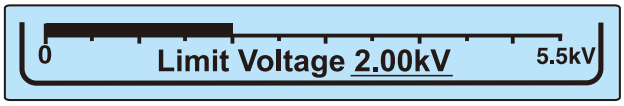
The free rotation mechanism protects from twisting (or breaking) of the cable. Also, with having the lock function for the LOW terminal on the main unit, the metal plate is no longer attached to the test lead of LOW-side, and it makes to resist damage to the test lead. Because of elimination of these projected components, the TOS5300 can avoid from unexpected accidents such as when the unit travels to other location. And also when the test lead is snagged on something, or unexpected stress is applied on the test lead, the High (High-voltage) test lead is designed to disconnect easily, but the Low (ground) test lead is designed to resist disconnection.



▲ Flat surface design of the HIGH terminal with free rotation mechanism, and the LOW terminal with lock function

■ Limit voltage function

Prevents the user from setting a test voltage that exceeds the preset voltage.



▲ LIMIT VOLTAGE setting (example)

■ Monitoring output voltage function

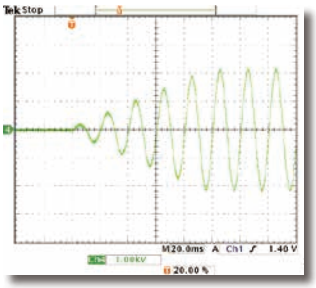
If the output voltage exceeds the setting voltage of (± 350 V), it turns off the output and the system switches to PROTECTION mode.

In order to handle kilo's of high voltage when the Hipot (Withstand voltage) and insulation tests are conducted, there are number of safety measures are required to take place. Having with these functions improve, the operational safety and the protection for the EUT.

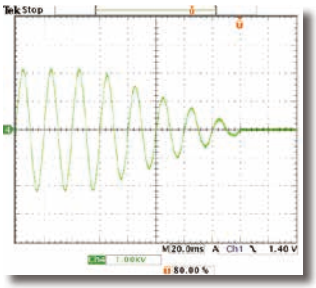
■ Rise/Fall time control function

The Rise time control function enables you to increases the test voltage gradually to reach the setting voltage while the AC Hipot (Withstanding voltage) test is conducted. The voltage rise time can be set from 0.1 s to 10.0 s at a resolution of 0.1 s.

The Fall time control function enables you to decrease the test voltage gradually when the PASS judgment is made at the AC Hipot (Withstanding voltage) test. The voltage fall time is fixed at 0.1 s. (OFF is also selectable).



▲ Rise time control waveform (example)



▲ Fall time control waveform (example)

■ Interlock feature

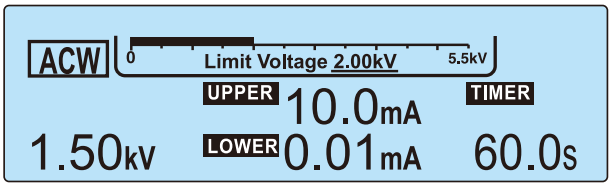
The product is equipped with an interlock function that operates together with external devices to interrupt output. To ensure the safe operation of tester, the interlock function activates when the SIGNAL I/O connector pins number 1 and 13 are opened, and when they are short-circuited, the interlock function is released.

■ Discharge feature [Model TOS5301/TOS5302]

Equipped with a forced discharge function that forcibly discharge the electricity which has been charged in the EUT after the completion of DC Hipot (Withstanding voltage) test or insulation resistance test.

■ Upper limits/Lower limits setting function

It automatically detects connector lead breaks and disconnections of wiring by measuring extremely small amounts of current that flows when voltage is applied to the EUT.



▲ Example setting display of Upper limit, Lower limit, and Test time

■ Calibration due notice and Warning function

To assure the traceability of periodic calibration of the product, this function gives a notice of calibration due managed by the builtin real-time clock. Even if the due data has elapsed, it is possible to avoid the oversight of operator with limiting the operation with a display of warning message.

■ AUTO TEST feature for consecutive testing [Model TOS5302]

The TOS5302 can perform an AC Hipot (Withstanding voltage) test and an insulation resistance test consecutively.

Either of the following can be conducted :

Insulation resistance test → AC Hipot (Withstanding voltage) test, or

AC Hipot (Withstanding voltage) test → Insulation resistance test.

TOS5300 Series Specifications

Unless specified otherwise, the specifications are for the following settings and conditions.
• The warm-up time is 30 minutes. • TYP:These are typical values.These values do not guarantee the performance of the product.
• rdng: Indicates the readout value. • set: Indicates a setting. • f.s: Indicates full scale.

Withstanding Voltage Test Mode

			TOS5300	TOS5301	TOS5302
AC output section	Output range		0.05 kV to 5.00 kV		
		Accuracy	±(2 % of set + 20 V) when no load is connected		
		Setting range	0.00 kV to 5.50 kV		
		Resolution	10 V steps		
	Max. rated output *1		500 VA (5 kV/100 mA)		
	Max. rated voltage		5 kV		
	Max. rated current		100 mA (when the output voltage is 0.5 kV or greater)		
	Transformer rating		500 VA		
	Output voltage waveform *2		Sine		
		Distortion	If the output voltage is 0.5 kV or more: 3 % or less (when no load or a pure resistive load is connected).		
	Frequency		50 Hz or 60 Hz		
		Accuracy	±0.5 % (excluding during voltage rise time)		
	Voltage regulation		10 % or less (when changing from maximum rated load to no load)		
	Input voltage variation		±0.3 % (5 kV when no load is connected; power supply voltage: 90 V to 250 V)		
	Short-circuit current		200 mA or more (when the output voltage is 1.0 kV or greater)		
	Output method		PWM switching		
DC output section	Output range		-	0.05 kV to 6.00 kV	-
		Accuracy		± (2 % of set + 20 V) When no load is connected	
		Setting range		0.00 kV to 6.20 kV	
		Resolution		10 V STEP	
	Max. rated output *1			50 W (5 kV/10 mA)	
	Max. rated voltage			6 kV	
	Max. rated current			10 mA	
	Ripple (TYP)	5 kV when no load is connected		50 Vp-p	
		Max. rated load		100 Vp-p	
	Voltage regulation			3% or less (When changing from maximum rated load to no load)	
	Short-circuit current (TYP)			40 mA (when generation 6 kV output)	
	Discharge feature			Forced discharge after test completion (discharge resistance: 125 kΩ)	
Start Voltage			The voltage at the start of withstanding voltage tests can be set to 50% of the test voltage.		
Limit Voltage			The test voltage upper limit can be set. AC: 0.00 kV to 5.50 kV, DC: 0.00 kV to 6.20 kV		
Output voltage monitor feature			If output voltage exceeds the specified value +350 V or is lower than the specified value - 350 V, output is turned off, and protective features are activated.		
Voltmeter	Analog	Scale	6 kV AC/DC f.s		
		Accuracy	± 5 % f.s		
		Indication	Average value response/rms scale		
	Digital	Measurement range	0.000 kV to 6.500 kV AC/DC		
		Display	□ . □□□ kV		
		Accuracy	V < 500 V: ±(1.5 % of rdng + 20 V); V ≥ 500 V: ±1.5 % of rdng		
		Response	True rms (response time: 50 ms)		
		Hold feature	After a test is finished, the measured voltage is retained until the PASS or FAIL judgment is cleared.		
Ammeter	Digital	Measurement range	AC: 0.00 mA to 110 mA	AC: 0.00 mA to 110 mA DC: 0.00 mA to 11 mA	AC: 0.00 mA to 110 mA
		Display	i = measured current: i < 1 mA: □□□ μA; 1 mA ≤ i < 10 mA: □ . □□□ mA; 10 mA ≤ i < 100 mA: □□ . □□ mA; 100 mA ≤ i: □□□ . □ mA		
		Accuracy *3	1.00 mA ≤ i: ±(1.5 % of rdng); i < 1.00 mA: ±(1.5 % of rdng + 30 μA)		
		Response	True rms (response time: 50 ms)		
		Hold feature	After a test is finished, the measured voltage is retained until the PASS judgment is cleared.		

Withstanding Voltage Test Mode

			TOS5300	TOS5301	TOS5302
Judgment feature	Judgment method and judgment operation				

Judgment	Judgment method	Display	Buzzer	SIGNAL I/O
UPPER FAIL	If a current that is greater than or equal to the upper limit is detected, the output is turned off, and an UPPER the output is turned off, and an UPPER FAIL judgment occurs. During the voltage rise time (Rise Time) of DC withstanding voltage tests, an UPPER FAIL judgment also occurs if there is a problem with the voltage rise ratio.	FAIL LED lights OVER is displayed on the screen	ON	Generates a U-FAIL signal
LOWER FAIL	If a current that is less than or equal to the lower limit is detected, the output is turned off, and a LOWER FAIL judgment occurs. This judgment is not performed during voltage rise time (Rise Time) of all tests and during the voltage fall time (Fall Time) of AC withstanding voltage tests.	FAIL LED lights UNDER is displayed on the screen	ON	Generates a L-FAIL signal
PASS	If the specified time elapses without any problems, the output is turned off, and a PASS judgment occurs.	PASS LED lights	ON	Generates a PASS signal

• If PASS HOLD is enabled, the PASS signal is generated continuously until the TOS5300 Series receives a STOP signal.
• The UPPER FAIL and LOWER FAIL signals are generated continuously until the TOS5300 Series receives a STOP signal.
• The FAIL and PASS buzzer volume levels can be changed.
• For PASS judgments, the length of time that the buzzer sounds for is fixed to 0.2 seconds. Even if PASS HOLD is enabled, the buzzer turns off after 0.2 seconds.

		TOS5300	TOS5301	TOS5302
	Upper limit setting	AC: 0.01 mA to 110 mA	AC: 0.01 mA to 110 mA DC: 0.01 mA to 11 mA	AC: 0.01 mA to 110 mA
	Lower limit setting	AC: 0.01 mA to 110 mA / OFF	AC: 0.01 mA to 110 mA / OFF DC: 0.01 mA to 11 mA / OFF	AC: 0.01 mA to 110 mA / OFF
	Judgment accuracy *3	1.00 mA ≤ i: ±(1.5 % of set), i < 1.00 mA: ±(1.5 % of set + 30 μA)		
	Current detection method	Calculates the current's true rms value and compares this value with the reference value		
	Calibration	Calibrated with the rms of a sine wave using a pure resistive load		
Time	Voltage rise time	0.1 s to 10.0 s		
	Resolution	0.1 s		
	Voltage fall time	0.1 s / OFF (only enabled when a PASS judgment occurs)		
	Test time	0.1 s to 999 s, can be turned off (TIMER OFF)		
	Resolution	0.1 s to 99.9 s: 0.1 s. 100 s to 999 s: 1 s.		
	Accuracy	±(100 ppm + 20 ms) excluding Fall Time		

*1. Regarding the output time limits:
Taking size, weight, and cost into consideration, the heat dissipation capability of the voltage generator that is used for withstanding voltage tests has been designed to be one half that of the rated output. Use the TOS5300 Series within the following limits. If you use the product in a manner that exceeds these limits, the output section may overheat, and the internal protection circuits may be activated. If this happens, stop testing, and wait until the TOS5300 Series returns to its normal temperature.

Ambient temperature		Upper limit	Pause time	Output time
t ≤ 40 °C	AC	50 mA < i ≤ 110 mA	Greater than or equal to the output time	30 min. max.
		i ≤ 50 mA	Not necessary	Continuous output possible
	DC	5 mA < i ≤ 11 mA	Greater than or equal to the output time	1 min. max.
		i ≤ 5 mA	Greater than or equal to the wait time (WAIT TIME)	Continuous output possible

(Output time = voltage rise time + test time + voltage fall time)

*2. Regarding the test voltage waveform:
Waveform distortions may occur if an DUT whose capacitance is dependent on voltage (for example, an DUT that consists of ceramic capacitors) is connected as the load. However, if the test voltage is 1.5 kV, the effect of a capacitance of 1000 pF or less can be ignored.Because the product's high-voltage power supply uses the PWM switching method, if the test voltage is 500 V or less, the switching and spike noise proportions are large. The lower the test voltage, the greater the waveform is distorted.

*3. Regarding ammeter and judgment accuracy:
During AC withstanding voltage tests, current also flows in the stray capacitance of items such as the measurement leads and jigs. This current that flows in the stray capacitances is added to the current that flows in the DUT, and the sum of these currents is measured.Especially if you want to perform judgments with high sensitivity and accuracy, it is necessary to consider methods to limit the current that flows in these stray capacitances, such as by adding upper and lower limits.

Output voltage	1 kV	2 kV	3 kV	4 kV	5 kV
When using 350 mm long test leads that are suspended in air (TYP)	2 μA	4 μA	6 μA	8 μA	10 μA
When using the accessory,	16 μA	32 μA	48 μA	64 μA	80 μA

TOS5300 Series Specifications

Insulation resistance test section

			TOS5302
Output section	Output voltage		25 V, 50 V, 100 V, 125 V, 250 V, 500 V, 1000 VDC (negative)
		Accuracy	-0 %, +5 V
	Max. rated load		1 W (-1000 V DC / 1 mA)
	Max. rated current		1 mA
	Ripple	1000 V when no load is connected	2 Vp-p or less
		Max. rated load	10 Vp-p or less
	Voltage regulation		1 % or less (when changing from maximum rated load to no load)
	Short-circuit current		12 mA or less
	Discharge feature		Forced discharge after test completion (discharge resistance: approx. 25 kΩ
	Limit voltage		The test voltage upper limit can be set : 25 V, 50 V, 100 V, 125 V, 250 V, 500 V, 1000 V
	Output voltage monitor feature		If output voltage exceeds “10 % of set + 10 V” or is lower than “-(10 % of set + 10 V),” output is turned off, and protective features are activated.
Voltmeter	Analog	Scale	6 kV AC/DC f.s
		Accuracy	± 5 % f.s
		Indication	Average value response/rms scale
	Digital	Measurement range	0 V to -1200 V
		Display	Measured voltage: V < 100 V / 100 V ≤ V < 1000 V / 1000 V ≤ V Display: □□ V / □□□ V / □□□□ V
		Accuracy	± (1 % of rdng + 1 V)
Resistance meter	Measurement range / measurement accuracy *4 *5	25 V	0.03 MΩ ≤ R ≤ 25 MΩ / ±(2 % of rdng + 2 digits) 25 MΩ < R ≤ 125 MΩ / ±5 % of rdng 125 MΩ < R ≤ 250 MΩ / ±10 % of rdng
		50 V	0.05 MΩ ≤ R ≤ 50 MΩ / ±(2 % of rdng + 2 digits) 50 MΩ < R ≤ 250 MΩ / ±5 % of rdng 250 MΩ < R ≤ 500 MΩ / ±10 % of rdng
		100 V	0.100 MΩ ≤ R ≤ 100 MΩ / ±2 % of rdng 100 MΩ < R ≤ 500 MΩ / ±5 % of rdng 500 MΩ < R ≤ 1 GΩ / ±10 % of rdng
		125 V	0.125 MΩ ≤ R ≤ 125 MΩ / ±2 % of rdng 125 MΩ < R ≤ 625 MΩ / ±5 % of rdng 625 MΩ < R ≤ 1.25 GΩ / ±10 % of rdng
		250 V	0.250 MΩ ≤ R ≤ 250 MΩ / ±2 % of rdng 250 MΩ < R ≤ 1.25 GΩ / ±5 % of rdng 1.25 GΩ < R ≤ 2.5 GΩ / ±10 % of rdng
		500 V	0.50 MΩ ≤ R ≤ 500 MΩ / ±2 % of rdng 500 MΩ < R ≤ 2.5 GΩ / ±5 % of rdng 2.5 GΩ < R ≤ 5 GΩ / ±10 % of rdng
		1000 V	1 MΩ ≤ R < 1 GΩ / ±2 % of rdng 1 GΩ ≤ R ≤ 5 GΩ / ±5 % of rdng
	Display *5		25 kΩ ≤ R < 1.00 MΩ: □□□ kΩ 1.00 MΩ ≤ R < 10.0 MΩ: □ . □□ MΩ 10.0 MΩ ≤ R < 100 MΩ: □□ . □ MΩ 100.0 MΩ ≤ R < 1.00 GΩ: □□□ MΩ 1.00 GΩ ≤ R ≤ 9.99 GΩ: □ . □□ GΩ
Hold feature			After a test is finished, the measured resistance is retained until the PASS judgment is cleared.
Current detection response speed			Can be switched between three levels: Fast, Mid, Slow
Judgment feature	Judgment method and judgment operation		See table below
	Upper limit setting range		0.03 MΩ to 5.00 GΩ
	Lower limit setting range		0.03 MΩ to 5.00 GΩ
	Judgment accuracy (the same for UPPER and LOWER)		Measurement accuracy + 2 digits Humidity: 20 %rh to 70 %rh (no condensation). No interference caused by wobbly test leads or other problems. For judgments of 200 nA or less, a test time of at least 1.0 seconds is necessary. If the current detection response speed is set to Mid, a test time of at least 0.3 seconds is necessary. If the current detection response speed is set to Slow, a test time of at least 0.5 seconds is necessary.
Time	Voltage rise time		10 ms (TYP)
	Test Time		0.1 s to 999 s, can be turned off (TIMER OFF)
		Resolution	0.1 s to 99.9 s: 0.1 s. 100 s to 999 s:1 s.
	Accuracy		± (100 ppm + 20 ms)

Judgment	Judgment method	Display	Buzzer	SIGNAL I/O
UPPER FAIL	If a resistance that is greater than or equal to the upper limit is detected, the output is turned off, and an UPPER FAIL judgment occurs. This judgment is not performed during voltage rise time (Rise Time).	FAIL LED lights; OVER is displayed on the screen	ON	Generates a U-FAIL signal
LOWER FAIL	If a resistance that is less than or equal to the lower limit is detected or if a problem occurs during the voltage rise time (Rise Time), the output is turned off, and a LOWER FAIL judgment occurs.	FAIL LED lights; UNDER is displayed on the screen	ON	Generates a L-FAIL signal
PASS	If the specified time elapses without any problems, the output is turned off, and a PASS judgment occurs.	PASS LED lights	ON	Generates a PASS signal

• If PASS HOLD is enabled, the PASS signal is generated continuously until the TOS5300 Series receives a STOP signal.
• The UPPER FAIL and LOWER FAIL signals are generated continuously until the TOS5300 Series receives a STOP signal.
• The FAIL and PASS buzzer volume levels can be changed.
• For PASS judgments, the length of time that the buzzer sounds for is fixed to 0.2 seconds.
Even if PASS HOLD is enabled, the buzzer turns off after 0.2 seconds.

*4 Humidity: 20 %rh to 70 %rh (no condensation). No bends in the test leads.
*5 R = measured insulation resistance

TOS5300 Series Specifications

Other features/Interfaces

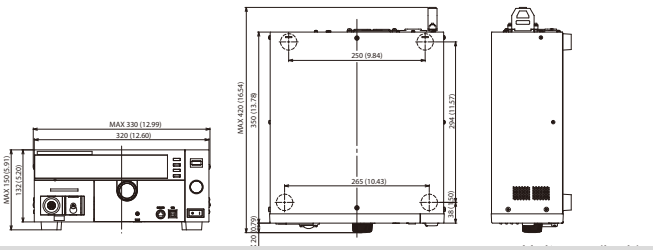
		TOS5300	TOS5301	TOS5302
Double action feature		Tests can only be started by pressing and releasing STOP and then pressing START within 0.5 seconds of releasing the STOP switch.		
Length of time to maintain a PASS judgment result		You can set the length of time to maintain a PASS judgment: 50 ms, 100 ms, 200 ms, 1 s, 2 s,5 s, or HOLD.		
Momentary feature		Tests are only executed while the START switch is held down.		
Fail mode feature		This feature enables you to prevent remotely transmitted stop signals from clearing FAIL judgments and PROTECTION modes.		
Timer feature		This feature finishes tests when the specified time elapses.		
Output voltage monitor feature		If output voltage exceeds “setting + 350 V” or is lower than “setting - 350 V,” the TOS5300 Series switches to PROTECTION mode, output is turned off, and testing finishes.		
Memory		Up to three sets of test conditions can be saved to memory.		
Key lock		Locks panel key operations (settings and changes).		
Protective features		Under any of the following conditions, the TOS5300 Series switches to the PROTECTION state, immediately turns output off, and stops testing. A message is displayed on the screen.		
	Interlock Protection	An interlock signal has been detected.		
	Power Supply Protection	An error was detected in the power supply.		
	Volt Error Protection	While monitoring the output voltage, a voltage outside of the rated limits was detected. AC or DC withstanding voltage tests: ±350 V Insulation resistance test: ±(10 % of set + 10 V)		
	Over Load Protection	During a withstanding voltage test, a value that is greater than or equal to the output limit power was specified. AC withstanding voltage test: 550 VA. DC withstanding voltage test: 55 VA.		
	Over Heat Protection	The internal temperature of the TOS5300 Series became too high.		
	Over Rating Protection	During a withstanding voltage test, the output current was generated for a length of time that exceeds the regulated time.		
	Calibration Protection	The specified calibration period has elapsed.		
	Remote Protection	A connection to or disconnection from the front-panel REMOTE connector was detected.		
	SIGNAL I/O Protection	The rear-panel SIGNAL I/O connector’s ENABLE signal has changed.		
	USB Protection	The USB connector has been disconnected while the TOS5300 Series was being controlled through the USB interface.		
System clock		Set in the following format: year/month/day hour/minutes/seconds.		
	Calibration date	Set when the TOS5300 Series is calibrated.		
	Calibration period setting	Sets the period before the next calibration is necessary.		
	Notification of when the calibration period elapses	Sets the operation that is performed when the specified calibration period elapses. When the TOS5300 Series turns on, it can display a notification or switch to the protection mode and disable testing.		
Interfaces	USB	USB Specification 2.0		
	REMOTE	Front-panel 9-pin MINI DIN connector. By connecting an optional device to this connector, you can control the starting and stopping of tests remotely.		
	SIGNAL I/O	Rear-panel D-sub 25-pin connector		

General

			TOS5300	TOS5301	TOS5302
Display			VFD: 256 × 64 dots + 4 status indicators		
Backup battery life			3 years (at 25 °C or 77 °F)		
Environment	Installation location		Indoors, at a height of up to 2000 m		
	Spec guaranteed range	Temperature	5 °C to 35 °C (41 °F to 95 °F)		
		Humidity	20 %rh to 80 %rh (no condensation)		
	Operating range	Temperature	0 °C to 40 °C (32 °F to 104 °F)		
		Humidity	20 %rh to 80 %rh (no condensation)		
	Storage range	Temperature	-20 °C to 70 °C (-4 °F to 158 °F)		
		Humidity	90 %rh or less (no condensation)		
Power supply	Nominal voltage range (allowable voltage range)		100 VAC to 240 VAC (90 VAC to 250 VAC)		
	Power consumptio	When no load is connected (READY)	100 VA or less		
		When rated load isconnected	800 VA max.		
	Allowable frequency range		47 Hz to 63 Hz		
Insulation resistance (between AC LINE and the chassis)			30 MΩ or more (500 VDC)		
Withstanding voltage (between AC LINE and the chassis)			1390 VAC, 2 seconds, 20 mA or less		
Earth continuity			25 AAC, 0.1 Ω or less		
Safety *6			Complies with the requirements of the following directive and standard. Low Voltage Directive 2014/35/EU, EN 61010-1 Class I Pollution degree 2		
Electromagnetic compatibility (EMC) *6 *7			Complies with the requirements of the following directive and standard. EMC Directive 2014/30/EU EN 61326-1 (Class A), EN 55011 (Class A, Group 1), EN 61000-3-2, EN 61000-3-3 Applicable under the following conditions The maximum length of all cabling and wiring connected to the TOS5300 Series must be less than 3 m. The high test lead TL31-TOS is being used. Electrical discharges are not occurring outside the DUT.		
Dimensions			See “Outline drawing.”		
Weight			Approx. 14 kg (30.9 lbs)	Approx. 15 kg (33.1 lbs)	Approx. 14 kg (30.9 lbs)
Accessories			Power cord: 1pc./High test lead (TL31-TOS): 1set (1 red wire and 1 black wire, each with alligator clips); 1.5 m/ D-sub 25-pin plug: 1set ; assembly type/High-voltage warning sticker: 1pc./User’s manual: 1pc. / CD-R: 1pc. *8		

*6 Does not apply to specially ordered or modified TOS5300 Series testers.
*7 Limited to products that have the CE mark on their panels.
*8 Contains the User’s Manual, the Communication Interface Manual, the KI-VISA library, and the Safety evalution test.

External Dimensional Diagrams



Hipot Tester

TOS5200

USB RS232C CE

A perfect AC hipot test solution, with 500 VA capacity and equipped PWM amplifier at very affordable investment

TOS5200 is designated model for AC Hipot Test with 500 VA capacity and 200 mA short circuit current output capability. With equipped PWM amplifier, this model can provide a stable & reliable output without being affected by AC power line. Therefore, it is a perfect AC Hipot Test solution for electronic equipment or devices based upon IEC, EN, UL, VDE and JIS etc. requirement. As TOS5200 maintains most of all features of our upper class model for AC Hipot Test, it achieves the superb cost / performance ratio for those who needs 200 VA or 500 VA capacity, or both. Also, as it equips Interlock function together with other safety features, operator can carry out the Test with higher current value in safety.

Dimensions / Weight

320(12.60″)W × 132(5.20″)H × 350(13.78″)Dmm / 14kg(30.9 lbs)

Accessories

Power cord, High-voltage test lead wire: TL31-TOS, High-voltage warning sticker, D-sub 25-pin plug, Setup Guide, Quick Reference, Safety information, CD-R(Contains the Communication Interface Manual, the KI-VISA library, and the Safety evalution test.)

Features

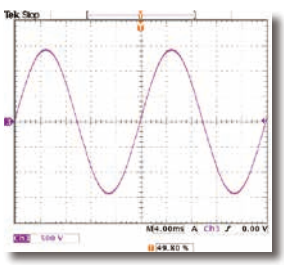
- Hipot (Withstanding voltage): AC 5 kV/100 mA
- High-precision measurement ± 1.5 % of reading
- Rise/Fall time control function
- Key lock function and Protection cover on the panel operation
- Limit voltage function
- Monitoring output voltage function
- Equipped with USB and RS232C interface as standard

Features and Functions

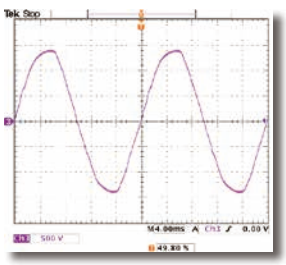
■ Highly stable output is realized with PWM Switching Amplifier!

Equipped with the PWM switching amplifier system, the TOS5200 realizes highly stable output not affected by input form AC line.A conventional Hipot Tester boosts and outputs the AC line's input voltage using a slide transformer system and which, the input voltage fluctuations will affect the output, preventing test from being performed properly. Since the TOS5200 equips with a high-efficient PWM amplifier that can output a stable high-voltage without being affected by the variation of AC power line, users can perform "safe", "stable", and highly "reliable" tests with confidence, even in regions with large voltage variations.

The output waveform is essential factor in Hipot (Withstanding oltage) testing!



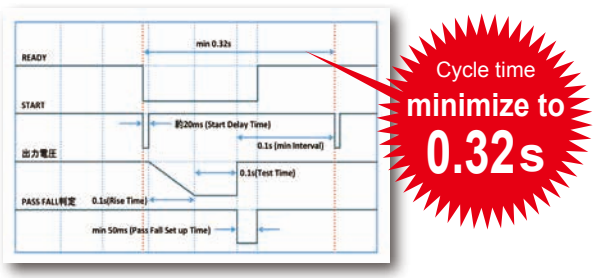
▲ AC output waveform of TOS5200



▲ AC output waveform of the slide transformer system

■ Capable of Test Time setting from 0.1s, which enables to reduce the tact time !

The TOS5200 can set the test time from 0.1 sec without sacrificing measurement accuracy.This makes test time 5 times faster compared to the TOS5050A (max test time:0.5sec) and it leads to reduce the tact time. Reduction of the tact time leads to improve the productivity, so it has been an issue that reducing the tact time may cause to worsen the measurement accuracy when the test time is faster than measurement respond speed.



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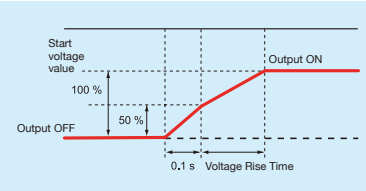
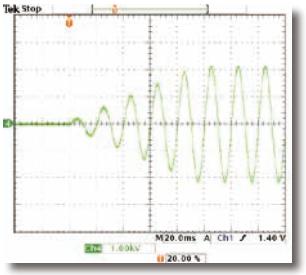
Features and Functions

■ Rise time / Fall time control function

The rise time control function is to prevent the excessive stress that is being applied to the EUT (equipment under test). The Hipot (Withstanding voltage) test is conducted to verify the safety performance of the EUT and which test voltage for Hipot (Withstanding voltage) test is applied approximately five to ten times greater than the voltage that handles by the EUT. If a high voltage is applied rapidly with no rise time, the transitional large voltage (current) will be occurred, and it may cause a damage to the EUT. For this reason, safety standards stipulate the procedure of Hipot (Withstanding voltage) test, and the test voltage must be gradually increased to the specified voltage when the test is performed. The rise time control function adopted in the TOS5200 can set the voltage rise time from 0.1s to 10.0s (at a resolution of 0.1s) and also it is capable to set the 50% (fixed) of the applied test voltage. In addition, the fall time control function enables to decrease the test voltage gradually after the completion of a PASS judgement. The voltage fall time is fixed at 0.1s (OFF is also selectable).

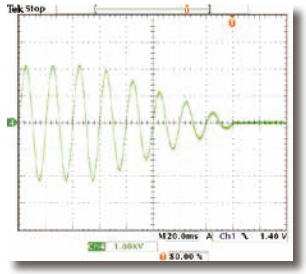


▲ Start voltage can be set at 50 % of the test voltage



The Rise time control function enables you to increases the test voltage gradually to reach the setting voltage while the AC Hipot (Withstanding voltage) test is conducted. The voltage rise time can be set from 0.1s to 10.0s at a resolution of 0.1s.

▲ Rise time control waveform (example)



The Fall time control function enables you to decrease the test voltage gradually when the PASS judgment is made at the AC Hipot (Withstanding voltage) test. The voltage fall time is fixed at 0.1s. (OFF is also selectable).

▲ Fall time control waveform (example)

■ High Precision, High Resolution, Realizing high-speed judgment

High-precision measurement ±1.5% of reading (with voltmeter 500 V or higher, Ammeter 1 mA or higher) The auto-range function achieves the equivalent specifications of the judgment accuracy for the upper and lower fail, and it makes effective to detect the contact failure or the disconnected status of the test lead. Moreover, the test time as fast as 0.1s realize the high-speed judgment. It assures to perform testing with the high-precision, high-resolution, high-speed-measurement, and the judgment function.

■ Improved the setting resolution of the leak current by 0.01 mA !

TOS5200 can set the current limit from0.01 mA to 110 mA.
(TOS5050A: 0.1 mA to 110 mA)
lEnables to clarify the actual value of device under test (DUT)
lThe setting resolution of the lower limit setting has been improved from the previous model, it enables to defect the failure more accurately.

TOS5200 Specifications

Unless specified otherwise, the specifications are for the following settings and conditions.
• The warm-up time is 30 minutes. • TYP:These are typical values. These values do not guarantee the performance of the product.
• rdng: Indicates the readout value. • set: Indicates a setting. • f.s: Indicates full scale.

Withstanding voltage tester

AC Output section	Output range		0.05 kV to 5.00 kV
		Accuracy	± (2 % of set + 20 V) when no load is connected
		Operating range	0.00 kV to 5.50 kV
		Resolution	10 V steps
	Max. rated output *1		500 VA (5 kV/100 mA)
	Max. rated voltage		5 kV
	Max. rated current		100 mA (when the output voltage is 0.5 kV or greater)
	Transformer rating		500 VA
	Output voltage waveform *2		Sine
		Distortion	If the output voltage is 0.5 kV or more: 3 % or less (when no load or a pure resistive load is connected)
	Crest factor		√ 2 ± 3 % less than (when the output voltage is 800 V or greater, no load)
	Frequency		50 Hz or 60 Hz
		Accuracy	± 0.5 % (excluding during voltage rise time)
	Voltage regulation		10 % or less (when changing from maximum rated load to no load)
	Input voltage variation		±0.3 % (5 kV when no load is connected; power supply voltage: 90 V to 250 V)
	Short-circuit current		200 mA or more (when the output voltage is 1.0 kV or greater)
	Output method		PWM switching
Start voltage			The voltage at the start of withstanding voltage tests can be set to 50 % of the test voltage.
Limit voltage			The test voltage upper limit can be set . AC: 0.00 kV to 5.50 kV
Output voltage monitor feature			If output voltage exceeds the specified value + 350 V or is lower than the specified value - 350 V, output is turned off, and protective features are activated.
Voltmeter	Digital	Measurement range	0.000 kV to 6.500 kV AC
		Display	□ . □□□ kV
		Accuracy	V < 500 V: ± (1.5 % of reading + 20 V), V ≥ 500 V: ±1.5 % of reading
		Response *3	True rms, Average value response/rms display switchable
		Hold feature	After a test is finished, the measured voltage is retained until the PASS or FAIL judgment is cleared.
Ammeter	Digital	Measurement range	0.00 mA to 110 mA
		Display	i = measured current i < 1 mA: □ . □□□ mA 1 mA ≤ i < 10 mA: □ . □□□ mA 10 mA ≤ i < 100 mA: □□ . □□ mA 100 mA ≤ i: □□□ .□ mA
		Accuracy *4	1.00 mA ≤ i: ± (1.5 % of reading), i < 1.00 mA: ± (1.5 % of reading + 30 µA)
		Response *3	True rms, Average value response/rms display switchable
		Hold feature	After a test is finished, the measured current value is retained until the PASS judgment is cleared.

Judgment feature	Judgment method and judgment operation		
	Upper limit setting		0.01 mA to 110 mA
	Lower limit setting		0.01 mA to 110 mA / OFF
	Judgment accuracy *4		1.00 mA ≤ i: ± (1.5 % of set), i < 1.00 mA: ± (1.5 % of set + 30 µA)
	Current detection method		Calculates the current's true rms value and compares this value with the reference value
	Calibration		Calibrated with the rms of a sine wave using a pure resistive load
Time	Voltage rise time		0.1 s to 10.0 s
		Resolution	0.1 s
	Voltage fall time		0.1 s / OFF (only enabled when a PASS judgment occurs)
	Test Time		0.1 s to 999 s, can be turned off (TIMER OFF)
		Resolution	0.1 s to 99.9 s: 0.1 s/100 s to 999 s: 1 s
	Accuracy		± (100 ppm + 20 ms) excluding Fall Time

Judgment	Judgment method	Display	Buzzer	SIGNAL I/O
UPPER FAIL	If a current that is greater than or equal to the upper limit is detected, the output is turned off, and an UPPER FAIL judgment occurs.	FAIL LED lights; UPPER is displayed on the screen	ON	Generates a U-FAIL signal
LOWER FAIL	If a current that is less than or equal to the lower limit is detected, the output is turned off, and a LOWER FAIL judgment occurs. This judgment is not performed during voltage rise time (Rise Time) of all tests and during the voltage fall time (Fall Time) of AC withstanding voltage tests.	FAIL LED lights; LOWER is displayed on the screen	ON	Generates a U-FAIL signal
PASS	If the specified time elapses without any problems, the output is turned off, and a PASS judgment occurs.	PASS LED lights; displayed on the screen	ON	Generates a PASS signal

• If PASS HOLD is enabled, the PASS signal is generated continuously until the TOS5300 Series receives a STOP signal.
• The UPPER FAIL and LOWER FAIL signals are generated continuously until the TOS5300 Series receives a STOP signal.
• The FAIL and PASS buzzer volume levels can be changed.
• For PASS judgments, the length of time that the buzzer sounds for is fixed to 0.2 seconds.
Even if PASS HOLD is enabled, the buzzer turns off after 0.2 seconds.

*1. Regarding the output time limits:
Taking size, weight, and cost into consideration, the heat dissipation capability of the voltage generator that is used for withstanding voltage tests has been designed to be one half that of the rated output. Use the TOS5300 Series within the following limits. If you use the product in a manner that exceeds these limits, the output section may overheat, and the internal protection circuits may be activated. If this happens, stop testing, and wait until the TOS5300 Series returns to its normal temperature.

Ambient temperature		Pause time	Output time
t ≤ 40 °C	50 mA < i ≤ 110 mA	Greater than or equal to the output time	30 min. max.
	i ≤ 50 mA	Not necessary	Continuous output possible

(Output time = voltage rise time + test time + voltage fall time)

*2. Regarding the test voltage waveform:
Waveform distortions may occur if an DUT whose capacitance is dependent on voltage (for example, an DUT that consists of ceramic capacitors) is connected as the load. However, if the test voltage is 1.5 kV, the effect of a capacitance of 1000 pF or less can be ignored.Because the product's high-voltage power supply uses the PWM switching method, if the test voltage is 500 V or less, the switching and spike noise proportions are large. The lower the test voltage, the greater the waveform is distorted.
*3. For both True rms and Mean-value response, 50 ms or above response time is required to satisfy the measurement accuracy.
*4. Regarding ammeter and judgment accuracy:
During AC withstanding voltage tests, current also flows in the stray capacitance of items such as the measurement leads and jigs. This current that flows in the stray capacitances is added to the current that flows in the DUT, and the sum of these currents is measured.Especially if you want to perform judgments with high sensitivity and accuracy, it is necessary to consider methods to limit the current that flows in these stray capacitances, such as by adding upper and lower limits.

Output voltage	1 kV	2 kV	5 kV
When using 350 mm long test leads that are suspended in air (TYP)	2 µA	4 µA	10 µA
When using the accessory, high test lead TL31-TOS (TYP)	16 µA	32 µA	80 µA

In case of 70 % humidity or higher, it is considerable to add 50 µA on the Limit value.

TOS5200 Specifications

Other features / Interfaces

Test mode		
	Double action feature	Tests can only be started by pressing and releasing STOP and then pressing START within 0.5 seconds of releasing the STOP switch.
	Length of time to maintain a PASS judgment result	You can set the length of time to maintain a PASS judgment: 50 ms, 100 ms, 200 ms, 1 s, 2 s,5 s, or HOLD.
	Momentary feature	Tests are only executed while the START switch is held down.
	Fail mode feature	This feature enables you to prevent remotely transmitted stop signals from clearing FAIL judgments and PROTECTION modes.
	Timer feature	This feature finishes tests when the specified time elapses.
	Output voltage monitor feature	If output voltage exceeds “setting + 350 V” or is lower than “setting - 350 V,” the TOS5200 switches to PROTECTION mode, output is turned off, and testing finishes.
	Memory	Up to three sets of test conditions can be saved to memory.
	Key lock	Locks panel key operations (settings and changes).
Protective features		Under any of the following conditions, the TOS5200 switches to the PROTECTION state, immediately turns output off, and stops testing. A message is displayed on the screen.
	Interlock Protection	An interlock signal has been detected.
	Power Supply Protection	An error was detected in the power supply.
	Volt Error Protection	While monitoring the output voltage, a voltage outside of the rated limits was detected. AC or DC withstanding voltage tests: ±350 V
	Over Load Protection	During a withstanding voltage test, a value that is greater than or equal to the output limit power was specified. AC withstanding voltage test: 550 VA.
	Over Heat Protection	The internal temperature of the TOS5200 became too high.
	Over Rating Protection	During a withstanding voltage test, the output current was generated for a length of time that exceeds the regulated time.
	Remote Protection	A connection to or disconnection from the front-panel REMOTE connector was detected.
	SIGNAL I/O Protection	The rear-panel SIGNAL I/O connector’s ENABLE signal has changed.
	USB Protection	The USB connector has been disconnected while the TOS5200 was being controlled through the USB interface.
Interfaces	USB	USB Specification 2.0
	RS232C *1	D-SUB 9-pin connector on the rear panel (compliant with EIA-232-D) All functions other than the POWER switch and KEY-LOCK
	REMOTE	Front-panel 9-pin MINI DIN connector. By connecting an optional device to this connector, you can control the starting and stopping of tests remotely.
	SIGNAL I/O	Rear-panel D-sub 25-pin connector

*1. "Talk mode" can be set, when RS232C is used as comunication interface.

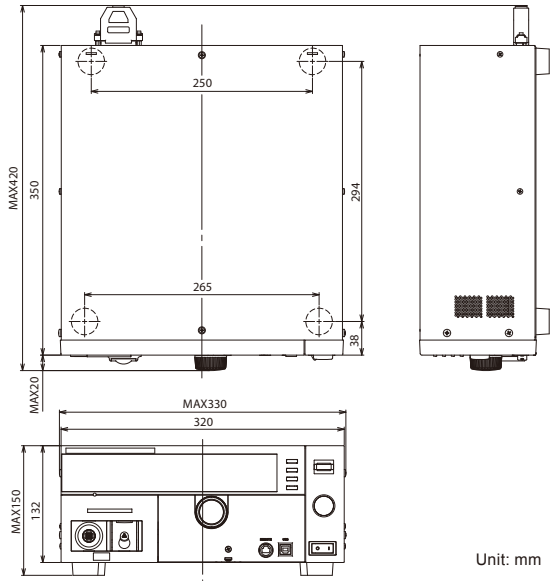
Talk mode	Description		
0	It responds only for commands from PC. (Default setting)		
1	It responds automatically for start and end test, and returns the status, setting value, measured value.		
	Response at start		<START>
	Response at end of test	Status	<PASS>, <U_FAIL>, <L_FAIL>, <PROT>, <ABOUT>
		Setting value, Measured value	Test No., Programme No., Test mode, Measured voltage, Measured current, Test time

General

Display			LCD: LED backlight
Environment	Installation location		Indoors, at a height of up to 2000 m
	Spec guaranteed range temperature/humidity		5 °C to 35 °C (41 °F to 95 °F)/ 20 %rh to 80 %rh (no condensation)
	Operating range temperature/ humidity		0 °C to 40 °C (32 °F to 104 °F)/ 20 %rh to 80 %rh (no condensation)
	Storage range temperature/ humidity		-20 °C to 70 °C (-4 °F to 158 °F)/ 90 %rh or less (no condensation)
Power supply	Nominal voltage range (allowable voltage range)		100 Vac to 240 Vac (90 Vac to 250 Vac)
	Power consumption	When no load is connected (READY)	100 VA or less
		When rated load isconnected	800 VA max.
	Allowable frequency range		47 Hz to 63 Hz
Insulation resistance (between AC LINE and the chassis)			30 MΩ or more (500 Vdc)
Withstanding voltage (between AC LINE and the chassis)			1500 Vac, one minute
Earth continuity			25 Aac, 0.1 Ω or less
Electromagnetic compatibility (EMC) *1			Complies with the requirements of the following directive and standard. EMC Directive 2014/30/EU, EN 61326-1(ClassA *2), EN 55011(ClassA *2, Group1 *3), EN 61000-3-2, EN 61000-3-3 Applicable under the following conditions The maximum length of all cabling and wiring connected to the TOS5200 must be less than 2.5 m. The shielded cable is being used when using the SIGNAL I/O. The high test lead TL31-TOS
Safety *1			Complies with the requirements of the following directive and standard. Low Voltage Directive 2014/35/EU, EN 61010-1 (Class I *4, Pollution degree 2)
Dimensions (mm(inches))(maximum)			320 (12.6") (330(12.99")) W × 132(5.2") (150(5.91")) H × 350(13.78") (420(16.54")) D
Weight			Approx. 14 kg (30.9 lbs)
Accessories			Power cord : 1pc. / High test lead (TL31-TOS) : 1set (1 red wire and 1 black wire, each with alligator clips); 1.5 m / D-sub 25-pin plug : 1set ; assembly type / High-voltage warning sticker : 1pc. / Setup Guide / Quick Reference (1 each for English and Japanese) / Safety informaion / CD-R *5

*1 Only on models that have the CE marking on the panel. Although signals are insulated with output terminals, each signal is common. Logic setting is also possible.
*2 This is a Class A equipment. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.
*3 This is a Group 1 equipment. This product does not generate and/or use intentionally radio-frequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/analysis purpose.
*4 This is a Class I equipment. Be sure to ground this product’s protective conductor terminal. The safety of this product is only guaranteed when the product is properly grounded.
*5 Contains the User's Manual, the Cimmunication Interface Manual, VISA library (KI-VISA), IVI-COM driver, and Safety evaluation test.

External Dimensional Diagrams



Unit: mm

TU01-TOS

Option(s) for Electrical Safety Testers

The TU01-TOS is a terminal unit that converts the 25 pin SIGNAL I/O connector of the Kikusui TOS5200/5300/5301/5302 Withstanding Voltage Tester to the 14 pin SIGNAL I/O connector of the TOS5050A/ 5051A. You can insert this unit between a controller and a TOS5200/5300/5301/5302 to perform the same external control that you can perform on the TOS5050A/ 5051A.

Ground Bond Tester

TOS6210

GPIB RS232C DRIVERS CE

Dimensions / Weight

430(16.93″)W × 88(3.47″)H × 270(10.63″)Dmm / 11kg(24.25 lbs)

Accessories

AC power cord, Test leadwire TL12-TOS, Short bar(2pcs., these are inserted between the OUTPUT and SAMPLING terminals.), AC power fuse(2pcs., including one spare in the fuse holder), Operation manual

Supports UL60950-1 - new standard for information technology equipment (ITE)

While inheriting the basic performance and functions of its predecessor (TOS6200), such as a constant current driving system that provides current waveforms with little skew and high measurement accuracy, the TOS6210 tester extends the maximum test current from 30 A to 60 A, which is demanded by the new standard. In addition, the tester also lets you judge the acceptability of the device under test based on the drop in voltage, as required in the standard. What's more, you can preset test conditions of up to 20 different types of safety standards, such as those for information technology equipment, home appliances, medical devices, and measuring instruments, in the memory on the main unit's panel. A simple memory call operation allows you to set up a protective earthling or protective bonding continuity test as stipulated in UL60950-1 and other relevant specifications including IEC and JIS standards. The tester also features a set of functions that meet the specific needs of testing personnel, such as an offset cancellation function and a memo function that allows you to input calibration dates, production numbers, and other test-related information and read the input information later via the GPIB or RS-232C interface.

Features

- Test current value: 6 A to 62 A AC / Resistance value: 0.001 Ω to 0.600 Ω
- Voltage judgement function
- Offset cancelling function
- Stores 100 test conditions in memory
- Incorporates test conditions into program
- Contact Check function
- Equipped with standard GPIB and RS232C interfaces
- Equipped with standard test lead (TL12-TOS)

Ground Bond Tester

TOS6200A

GPIB RS232C DRIVERS CE

Dimensions / Weight

430(16.93″)W × 88(3.47″)H × 270(10.63″)Dmm / 9kg(19.84 lbs)

Accessories

AC power cord, Test leadwire TL11-TOS, Short bar(2pcs., these are inserted between the OUTPUT and SAMPLING terminals.), AC power fuse(2pcs., including one spare in the fuse holder), Operation manual

Suitable design for the automated ground bond testing adopted with the constant current method.

The TOS6200A tester is designed to perform the ground bond tests required for class-I devices by safety standards such as IEC, EN, VDE, BS, UL, JIS, and the Electrical Appliance and Material Safety Low (Japan). Equipped with a new high-efficiency power supply, it is compact and lightweight, about half the size and weight of our conventional products, while achieving a large output of 150 VA. Use of the constant current method eliminates the need to reset test currents even in the face of fluctuating resistance values for the device being tested. The test duration can also be set from 0.3 s, making the tester suitable for production line testing, which requires reduced cycle time. This tester is also designed for ease of use, featuring a large, easy-to-read display, memory capacity for storage of 100 types of test conditions, and incorporation of test conditions into programs to enable automatic testing. Standard GPIB and RS-232C interfaces allow the user to use PCs or other devices to control test conditions such as test current, resistance value for judgement, and test duration, and enables read-back of measured values and test results.

Features

- Test current value: 3 A to 30 A AC / Resistance value: 0.001 Ω to 1.200 Ω
- Offset cancelling function
- Stores 100 test conditions in memory
- Incorporates test conditions into program
- Contact Check function
- Equipped with standard GPIB and RS232C interfaces
- Equipped with standard test lead (TL11-TOS)

TOS6210 Specifications

Output block		
Current setting range *1		6.0 Aac to 62.0 Aac (With respect to resistance resulting in output power of the maximum rated Output or less and an output terminal voltage of 5.4 V or less)
	Resolution	0.1 A
	Accuracy	± (1 % of setting + 0.4 A)
Maximum rated output		220 VA (at the output terminals)
Distortion factor		2 % or less (with respect to 0.1 Ω pure resistance load of 20 A or greater)
Frequency		50/60 Hz, sine wave (selectable)
	Accuracy	±200 ppm
Open terminal voltage		6 Vrms or less
Output method		PWM switching method
Output ammeter		
Measurement range		0.0 Aac to 66.0 Aac
Resolution		0.1 A
Accuracy		± (1 % of reading + 0.4 A)
Response		Mean value response/rms value display (response time: 200 ms)
Holding function		The current measured at the end of test is held during the PASS or FAIL inteval
Output voltmeter		
Measurement range		0.00 Vac to 6.00 Vac
Resolution		0.01 V
Offset cancel function		0.00 to 5.40 V (Offset ON/OFF function provided)
Accuracy		± (1 % of reading + 0.02 V)
Response		Mean value response/rms value display (response time: 200 ms)
Holding function		The voltage measured at the end of test is held during the PASS or FAIL inteval
Ohmmeter *2		
Measurement range		0.001 to 0.600 Ω
Resolution		0.001 Ω
Offset cancel function		0.000 to 0.600 Ω (Offset ON/OFF function provided)
Accuracy		± (2 % of reading + 0.003 Ω)
Holding function		The resistance measured at the end of test is held during the PASS or FAIL interval
Pass/fail judgement function *3		
Resistance value-based judgement		Window comparator system • If a resistance value equal to or greater than the upper reference value is detected, a FAIL determination is returned. • If a resistance value equal to or less than the lower reference value is detected, a FAIL determination is returned. • If a resistance value has been judged as FAIL, the tester shuts off the output and generates a FAIL signal. • If the set time elapses without abnormalities, the tester shuts off the output and generates a PASS signal.
	Setting range for the upper reference value (UPPER)	0.001 to 0.600 Ω
	Setting range for the lower reference value (LOWER)	0.001 to 0.600 Ω
	Resolution	0.001 Ω
	Judgement accuracy	± (2 % of UPPER + 0.003 Ω)
Sampled voltage value-based judgement		Window comparator system • If a voltage value equal to or greater than the upper reference value is detected, a FAIL determination is returned. • If a voltage value equal to or less than the lower reference value is detected, a FAIL determination is returned. • If a voltage value has been judged as FAIL, the tester shuts off the output and generates a FAIL signal. • If the set time elapses without abnormalities, the tester shuts off the output and generates a PASS signal.
	Setting range for the upper reference value (UPPER) *4	0.01 to 5.40 V
	Setting range for the lower reference value (LOWER)	0.01 to 5.40 V
	Resolution	0.01 V
	Judgement accuracy	± (2 % of UPPER + 0.05 V)
Calibration		Calibration is performed with the rms value of the sine wave, using a pure resistance load.
LED	PASS	Lights for approximately 0.2 sec when the measured value has been judged as PASS. It is lit continuously when the PASS holding time is set to HOLD.
	UPPER FAIL	Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL.
	LOWER FAIL	Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL.
Buzzer		• The buzzer sounds for the pass holding time has been set if the measured value has been judged as PASS. • The buzzer sounds continuously under the following condition: The measured value has been judged as PASS when the PASS holding time is set to HOLD. The measured value has been judged as UPPER FAIL. The measured value has been judged as LOWER FAIL. • The buzzer volume for FAIL or PASS judgment are adjustable. Note that it cannot be adjusted individually since setting is shared with the setting for PASS.
Time		
Test time	Setting range	Setting range 0.3 to 999 s Timer ON/OFF function is available.
	Accuracy	± (100 ppm of setting + 20 ms)
Environment		
Operating environment		Indoor use, Overvoltage Category II
Warranty range	Temperature	5 °C to 35 °C
	Humidity	20 %rh to 80 %rh (non condensing)
Operating range	Temperature	0 °C to 40 °C
	Humidity	20 %rh to 80 %rh (non condensing)
Storage range	Temperature	-20 °C to 70 °C
	Humidity	90 %rh or less (non condensing)

Power requirement		
Allowable voltage range		85 Vac to 250 Vac
Power consumption	At no load (READY)	60 VA or less
	At rated load	420 VA max.
Allowable frequency range		47 Hz to 63 Hz
Insulation resistance		30 MΩ min. (500 Vdc), between AC line and chassis
Hipot		1390 Vac (2 seconds), between AC line and chassis
Ground bond		25 Aac/0.1 Ω max.
Electromagnetic compatibility (EMC) *5 *6		
Conforms to the requirements of the following directive and standard. EMC Directive 2014/30/EU EN 61326-1 (Class A), EN 55011 (Class A, Group 1), EN 61000-3-2, EN 61000-3-3 Under following conditions 1. Used test leadwire (TL12-TOS) which is supplied. 2. Used the shielded cable which length is less than three meters when the SIGNAL I/O is used.		
Safety *5		
Conforms to the requirements of the following directive and standard. Low Voltage Directive 2014/35/EU EN61010-1 (Class I, Pollution degree 2)		
Physical dimensions (mm(inch)(maximum)/ Weight		
430(16.93")(455(17.91"))W×88(3.46")(140(5.51"))H×270(10.63")(350(13.78))D/ Approx.11 kg(24.25 lbs)		
Accessories		
AC power cord		1 piece
Test leadwire TL12-TOS		1 set
Short bar		2 pieces (These are inserted between the OUTPUT and SAMPLING terminals.)
AC power fuse		2 pieces (2, including one spare in the fuse holder)
Operation manual		1 copy

*1 Time limitation with respect to output
The heat radiation capacity at the output block of the tester is designed to be onethird of the rated output, accounting for size, weight, cost, and other factors. Always use the tester within the limitation values given below. Use of the tester beyond these limits will cause the temperature of the output block to rise excessively, potentially tripping the internal protection circuit. In this case, suspend testing for approximately 30 minutes, then press the STOP switch. When temperatures fall to normal levels, the tester will revert to ready status.

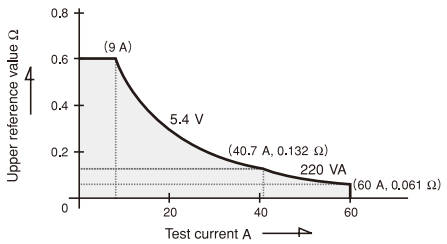
Output time limitation			
Ambient temperature t (°C)	Test current I (A)	Pause time	Maximum allowable continuous test time
t ≤ 40°C	40 < I ≤ 60	Equal to or greater than the test time	≤ 10 minutes
	20 < I ≤ 40	Equal to or greater than the test time	≤ 30 minutes
	I ≤ 20	Not required	Continuous output possible

*2 About ohmmeter's response time
A resistance value is instantaneously obtained, calculated using the measured voltage and current values. The response time of the ohmmeter complies with the response times of the voltmeter and ammeter.

*3 Resistance value-based and sampled voltage value-based judgments cannot be simultaneously conducted.

*4 Limited by the maximum rated output and the output terminal voltage. The tester can be used within the range shown below.

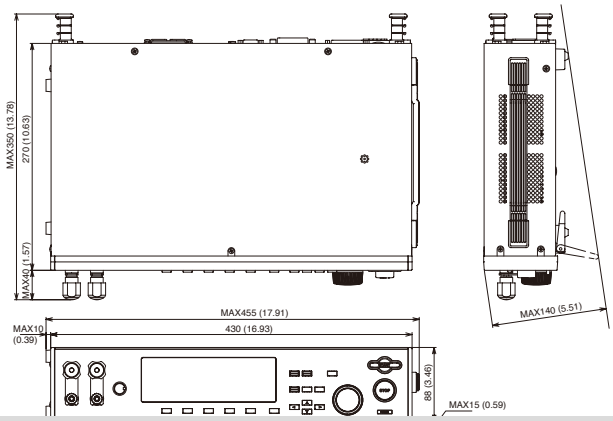
Allowable range in which to determine the test current value and upper reference value



*5 Not applicable to custom order models.

*6 Only on models that have CE marking on the panel.

External Dimensional Diagrams



TOS6200A Specifications

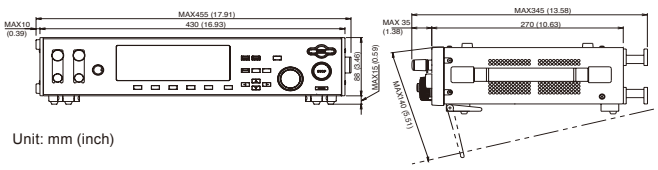
Output block		
Current setting range *1		3.0 Aac to 30.0 Aac (With respect to resistance resulting in output power of the maximum rated Output or less and an output terminal voltage of 5.4 V or less)
	Resolution	0.1 A
	Accuracy	± (1 % of setting + 0.2 A)
Maximum rated output		150 VA (at the output terminals)
Distortion factor		2 % or less(with respect to 0.1 Ω pure resistance load of 10 A or greater)
Frequency		50/60 Hz, sine wave (selectable)
	Accuracy	± 200 ppm
Open terminal voltage		6 Vrms or less
Output method		PWM switching method
Output ammeter		
Measurement range		0.0 Aac to 33.0 Aac
Resolution		0.1 A
Accuracy		± (1 % of reading + 0.2 A)
Response		Mean value response/rms value display (response time: 200 ms)
Holding function		The current measured at the end of test is held during the PASS or FAIL inteval
Output voltmeter		
Measurement range		0.00 Vac to 6.00 Vac
Resolution		0.01 V
Accuracy		± (1 % of reading + 0.02 V)
Response		Mean value response/rms value display (response time: 200 ms)
Holding function		The voltage measured at the end of test is held during the PASS or FAIL inteval
Ohmmeter *2		
Measurement range		0.001 Ω to 1.200 Ω
Resolution		0.001 Ω
Offset cancel function		0.000 Ω to 1.200 Ω (Offset ON/OFF function provided)
Accuracy		± (2 % of reading + 0.003 Ω)
Holding function		The resistance measured at the end of test is held during the PASS interval
Pass/fail judgement function		
Resistance value-based judgement		Window comparator system • If a resistance value equal to or greater than the upper reference value is detected,a FAIL determination is returned. • If a resistance value equal to or less than the lower reference value is detected, a FAIL determination is returned. • If a resistance value has been judged as FAIL, the tester shuts off the output and generates a FAIL signal. • If the set time elapses without abnormalities, the tester shuts off the output and generates a PASS signal.
Setting range for the upper reference value (UPPER)		0.001 Ω to 1.200 Ω
Setting range for the lower reference value (LOWER)		0.001 Ω to 1.200 Ω
Resolution		0.001 Ω
Judgement accuracy		± (2 % of UPPER + 0.003 Ω)
Sampled voltage value-based judg- ment		Window comparator system • If a voltage value equal to or greater than the upper reference value is detected, a FAIL determination is returned. • If a voltage value equal to or less than the lower reference value is detected, a FAIL determination is returned. • If a voltage value has been judged as FAIL, the tester shuts off the output and gen- erates a FAIL signal. • If the set time elapses without abnormalities, the tester shuts off the output and generates a PASS signal.
Setting range for the upper reference value (UPPER)		0.01 V to 5.40 V
Setting range for the lower reference value (LOWER)		0.01 V to 5.40 V
Resolution		0.01 V
Judgment accuracy		± (2 % of setting + 0.05 V)
Calibration		Calibration is performed with the rms value of the sine wave, using a pure resistance load.
LED	PASS	Lights for approximately 0.2 sec when the measured value has been judged as PASS.It is lit continuously when the PASS holding time is set to HOLD.
	UPPER FAIL	Lights if a resistance value equal to or greater than the upper reference value is detected and judged FAIL.
	LOWER FAIL	Lights if a resistance value equal to or greater than the upper reference value is detected and judged FAIL.
Buzzer		• The buzzer sounds for the pass holding time has been set if the measured value has been judged as PASS. • The buzzer sounds continuously under the following condition: The measured value has been judged as PASS when the PASS holding time is set to HOLD. The measured value has been judged as UPPER FAIL. The measured value has been judged as LOWER FAIL. • The buzzer volume for FAIL or PASS judgment are adjustable. Note that it cannot be adjusted individually since setting is shared with the setting for PASS.
Time		
Test Time	Setting range	0.3 to 999 s Timer ON/OFF function is available.
	Accuracy	± (100 ppm of setting + 20 ms)
Environment		
Operating environment		Indoor use, Overvoltage Category II
Warranty range		Temperature: 5 °C to 35 °C Humidity: 20 %rh to 80 %rh (non condensing)
Operating range		Temperature: 0 °C to 40 °C Humidity: 20 %rh to 80 %rh (non condensing)
Storage range		Temperature: -20 °C to 70 °C Humidity: 90 %rh or less (non condensing)
Altitude		Up to 2000 m
Power requirement		
Allowable voltage range		85 Vac to 250 Vac
Power consum- ption	At no load (READY)	60 VA or less
	At rated load	280 VA max.
Allowable frequency range		47 Hz to 63 Hz
Insulation resistance		30 MΩ min. (500 Vdc), between AC line and chassis
Hipot		1390 Vac (2 seconds), between AC line and chassis
Ground bond		25 Aac/0.1 Ω max.
Safety *3 Conforms to the requirements of the following directive and standard.		
Low Voltage Directive 2014/35/EU, EN61010-1, Class I, Pollution degree 2		
Electromagnetic compatibility (EMC) *3 *4		
Conforms to the requirements of the following directive and standard. EMC Directive 2014/30/EU, EN61326-1 (Class A), EN55011 (Class A, Group 1), EN61000-3-2, EN61000-3-3 Under following conditions 1. Used test leadwire (TL11-TOS) which is supplied. 2. Used the shielded cable which length is less than three meters when the SIGNAL I/O is used.		
Physical dimensions (mm(inch)(maximum)		430(16.93")(455(17.91"))W × 88(3.46")(140(5.51"))H × 270(10.63")(345(13.58"))D
Weight		Approx. 9 kg (19.84 lbs)
Accessories		
AC power cord		1 piece
Test leadwire TL11-TOS		1 set
Short bar		2 pieces (These are inserted between the OUTPUT and SAMPLING terminals.)
AC power fuse		2 pieces (2, including one spare in the fuse holder)
Operation manual		1 copy

*1 Time limitation with respect to output
The heat radiation capacity at the output block of the tester is designed to be one-third of the rated output, accounting for size, weight, cost, and other factors. Always use the tester within the limitation values given below. Use of the tester beyond these limits will cause the temperature of the output block to rise excessively, potentially tripping the internal protection circuit. In this case, suspend testing for approximately 30 minutes, then press the STOP switch. When temperatures fall to normal levels, the tester will revert to ready status.

Output time limitation			
Ambient temperature t (°C)	Test current I (A)	Pause time	Maximum allowable continuous test time
t ≤ 40°	15 < I ≤ 30	Equal to or greater than the test time	≤ 30 minutes
	I ≤ 15	Not required	Continuous output possible

*2 About ohmmeter's response time
A resistance value is instantaneously obtained, calculated using the measured voltage and current values. The response time of the ohmmeter complies with the response times of the voltmeter and ammeter.
*3 Not applicable to custom order models.
*4 Only on models that have CE marking on the panel.

External Dimensional Diagrams



Unit: mm (inch)

Options for Electrical Safety Testers

■ Test Lead

TL01-TOS
[cable length: 1.5 m/max. operating voltage: 5 kV]

TL02-TOS
[cable length: 3 m/max. operating voltage: 5 kV]

TL03-TOS
[cable length: 1.5 m/max. operating voltage: 10 kV]

TL11-TOS
[cable length: 1.5 m/max. operating current: 30 A]

TL12-TOS
[cable length: 1.5 m/max. operating current: 60 A (for TOS6210)]

TL13-TOS
[cable length: 1.6 m/max. operating current: 40 A]

TL22-TOS
[cable length: 1.7 m/max. rating: 1000 V, 10 A]

TL31-TOS
[cable length: 1.5 m/max. operating voltage: 5 kV]

TL32-TOS
[cable length: 3 m/max. operating voltage: 5 kV]

TL33-TOS
[cable length: 0.5 m/max. operating voltage: 5 kV]

■ Buzzer Unit

BZ01-TOS (for 100 V AC)
*This can not be used with TOS5300 Series.

■ Test Probe

HP01A-TOS *
[cable length: 1.8 m/max. operating voltage: 4 kV AC(RMS), 5kV DC]

HP02A-TOS *
[cable length: 3.5 m/max. operating voltage: 4 kV AC(RMS), 5kV DC]

* The optional adaptor DD-5P/9P is required for the connection with TOS5300, TOS5200 series and TOS9300 series.

LP02-TOS
[cable length: 2 m/max. operating current: 60 A (for TOS6210)]

■ DIN Cable

DD-3 5P
[Cable length: 3 m/ DIN plug to DIN plug]

DD-5P/6P
[Adaptor/DIN to Mini DIN]

■ Remote Control Box

RC01-TOS *
[one-hand operation/ dimensions: 200(7.87″)W × 70(2.76″)H × 39(1.54″)D mm/cable length: 1.5 m]

RC02-TOS *
[both-hands operation/ dimensions: 330(12.99″)W × 70(2.76″)H × 39(1.54″)D mm/cable length: 1.5 m]

* The optional adaptor DD-5P/6P is required for the connection with TOS5300, TOS5200 series and TOS9300 series..

■ Warning Light Unit

PL01-TOS (for 100 V AC)
*This can not be used with TOS5300 Series.

PL02A-TOS (for 24 V DC)

■ Terminal Unit

TU01-TOS
TOS5300/TOS5200 series signal I/O converter unit (25 pin to 14 pin)

EIA Standard Rack (Inch Size) Mounting Options

Product name	Bracket	
	Model name	Panel width (*1)
TOS9300/9301	KRB3-TOS	3
TOS9301PD	KRB3-TOS	3
TOS9302	KRB3-TOS	3
TOS9303	KRB3-TOS	3
TOS9303LC	KRB3-TOS	3
TOS9320	KRB2-TOS	2
TOS5300	KRA4-TOS	4
TOS5301	KRA4-TOS	4
TOS5302	KRA4-TOS	4
TOS5200	KRA4-TOS	4
TOS6210	KRB2-TOS	2
TOS6200A	KRB2-TOS	2

*1 : EIA panel width is 44.45 mm (1 3/4 inch). The panel width does not include the rubber feet.

JIS Standard Rack (Millimeter Size) Mounting Options

Product name	Bracket	
	Model name	Panel width (*2)
TOS9300/9301	KRB150-TOS	3
TOS9301PD	KRB150-TOS	3
TOS9302	KRB150-TOS	3
TOS9303	KRB150-TOS	3
TOS9303LC	KRB150-TOS	3
TOS9320	KRB100-TOS	2
TOS5300	KRA200-TOS	4
TOS5301	KRA200-TOS	4
TOS5302	KRA200-TOS	4
TOS5200	KRA200-TOS	4
TOS6210	KRB100-TOS	2
TOS6200A	KRB100-TOS	2

*2 : JIS panel width is 50 mm. The panel width does not include the rubber feet, casters, and

Battery Impedance Meter

BIM1000 Series

USB RS232C CE

Easy & reliable Battery measurements

Ever-changing battery technology requires batteries powering electric vehicles to have high voltage, high power and low impedance. The Battery Impedance Meter, or BIM1000 Series, is capable of measuring up to 1000 V of test voltage for simultaneous measurements of both battery voltage and resistance at high speeds. The BIM is the ideal equipment for power battery development research and production tests.

Lineup

BIM1030 (300 V max.)
BIM1100 (1000 V max.)

Dimensions / Weight

214(8.43″)W × 80(3.15″)H × 300(11.81″)D mm(inch) /
3 kg(6.61 lbs)

Accessories

Power cable, For Safety documents, Packing list, CD-ROM

Options

- Clip-type four-wire test lead TL01-BIM
- Pin-type four-wire test lead TL02-BIM
- Zero adjustment tool OP01-BIM

Features

- Maximum voltage measurement: 1000 V max. (BIM1100), 300 V max. (BIM1030)
- Voltage measurement accuracy: ±(0.01 % of reading +3 digit)
- Resistance measurement accuracy: ±(0.5 % of reading +5 digit)
- Resistance measurement ranges: 3 mΩ/30 mΩ/300 mΩ/3 Ω
- High resolution: Voltage 10 μV(6 V range), Resistance 0.1 μΩ(3 mΩ range)
- Measurement frequency: 1 kHz ±0.2 Hz
- Sampling speed(Resistance & voltage simultaneous measurements): 20 ms(FAST)
- Zero adjustment function: Effective for decreasing measurement error.
- Measurement logging(500 pairs) and collective transfer function
- SIGNAL I/O, RS232C and USB as standard interface
- New high visibility color display.

Specifications

Voltmeter

Item		BIM1030	BIM1100
Rated input		±300 V	±1000 V
Range		6 V, 60 V, 300 V, AUTO	6 V, 60 V, 600 V, 1000 V, AUTO
Maximum display value *1	6 V range	±6.30000 V	±6.30000 V
	60 V range	±63.0000 V	±63.0000 V
	300 V range	±315.000 V	–
	600 V range	–	±630.000 V
	1000 V range	–	±1050.00 V
Resolution	6 V range	10 μV	10 μV
	60 V range	100 μV	100 μV
	300 V range	1 mV	–
	600 V range	–	1 mV
	1000 V range	–	10 mV
Accuracy *2		±(0.01 % of reading + 3 digit)	
Temperature coefficient		±(0.001 % of reading + 0.3 digit) /°C	

Resistance Meter

Item		BIM1030	BIM1100
Measurement method		Four-terminal measurement method	
Range		3 mΩ, 30 mΩ, 300 mΩ, 3 Ω, AUTO	
Maximum display value *1	3 mΩ range	3.1000 mΩ	
	30 mΩ range	31.000 mΩ	
	300 mΩ range	310.00 mΩ	
	3 Ω range	3.1000 Ω	
Resolution	3 mΩ range	0.1 μΩ	
	30 mΩ range	1 μΩ	
	300 mΩ range	10 μΩ	
	3 Ω range	100 μΩ	
Measured current *3	3 mΩ range	100 mA	
	30 mΩ range	100 mA	
	300 mΩ range	10 mA	
	3 Ω range	1 mA	
Measurement frequency		1 kHz ±0.2 Hz	
Accuracy *4		±(0.5 % of reading + 5 digit)	
Temperature coefficient	3 mΩ range	±(0.05 % of reading + 1 digit) /°C	
	30 mΩ range	±(0.05 % of reading + 0.5 digit) /°C	
	300 mΩ range	±(0.05 % of reading + 0.5 digit) /°C	

Sampling Time

Item		BIM1030	BIM1100
Sampling speed	Power supply frequency 50 Hz	FAST: 20 ms, MID: 50 ms, SLOW: 160 ms	
	Power supply frequency 60 Hz	FAST: 20 ms, MID: 42 ms, SLOW: 150 ms	

Judgment Function

Item		BIM1030	BIM1100
Judgment method		Window comparator method. Judgment made with software.	
Resistance	Setting range	0.0000 Ω to 3.1000 Ω	
	Resolution	100 μΩ	
Voltage	Setting range	0.000 V to 315.000 V	0.00 V to 1050.00 V
	Resolution	1 mV	10 mV

Other Functions

Item		BIM1030	BIM1100
Trigger Function		Select external trigger (EXTERNAL) or internal trigger (INTERNAL).	
	INTERNAL	Measures at the sampling speed (FAST, MID, SLOW) interval.	
	EXTERNAL	Starts measurement with a SIGNAL I/O connector signal, *TRG, or the SNGL TRG key on the front panel	
	Trigger delay	0 to 9.999 s, OFF	
	Accuracy	±0.2 ms	
Average function		The average count can be set between 2 and 99. OFF setting available.	
Memory function		Saves up to 100 sets of measurement conditions.	
key lock		Locks the key operation.	
Zero adjustment		Zero adjustment of the voltmeter and resistance meter. OFF setting available. Zero point clear function available.	
	Adjustment rang	1000 digit	

Interface

Item	BIM1030	BIM1100
RS232C	D-SUB 9-pin connector, EIA-232-D compliant	
USB	Complies with USB Specification 2.0. 12 Mbps max. (Full Speed)	

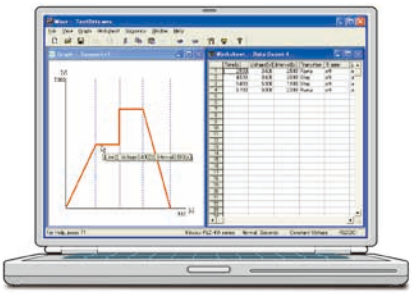
General Specifications

Item		BIM1030	BIM1100
Environment	Installation location	Indoors, 2000 m or less	
	Spec guaranteed range	Temperature: 18 °C to 28 °C (-4 °F to 158 °F) Humidity: 20 %rh to 80 %rh (no condensation)	
	Operating range	Temperature: 0 °C to 40 °C (32 °F to +122 °F) Humidity: 20 %rh to 80 %rh (no condensation)	
	Storage range	Temperature: -10 °C to 60 °C (-4 °F to 158 °F) Humidity: 90 %rh or less (no condensation)	
Power supply	Input voltage range	85 Vac to 264 Vac (100 Vac to 240 Vac)	
	Input frequency range	47 Hz to 63 Hz	
	Rated power	30 VA	
Isolation voltage		±300 V max	±1000 V max
Insulation resistance (between AC LINE and chassis)		30 MΩ or more (500 Vdc)	
Withstanding voltage	Between the AC LINE and the chassis	1500 Vac for 1 minute, 10 mA or less	
	Between all the measurement terminals and the chassis	2000 Vdc for 1 minute, 1 mA or less	
	Between all the measurement terminals and SIGNAL I/O	2000 Vdc for 1 minute, 1 mA or less	
Electromagnetic compatibility (EMC)		Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU EN 61326-1 (Class A), EN 55011 (Class A, Group 1), EN 61000-3-2, EN 61000-3-3	
Safety		Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU EN 61010-1 (Class I, Pollution Degree 2), EN 61010-2-030, EN 61010-031	

*1. Displays OVER when the measurement range is exceeded.
*2. Add ±2 digit when the sampling speed is set to FAST or MID.
*3. Within error ± 10 %.
*4. Add ±3 digit when the sampling speed is set to FAST and ±2 digit when

Application Software for Power Supplies and Electronic Loads

WAVY Series



Features

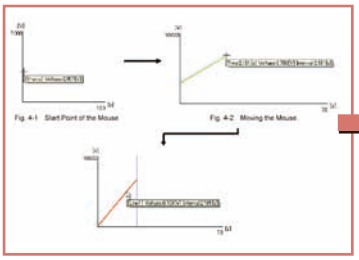
- Easy operation for waveform images by using a mouse
- Sequence data can be edited easily.
- Sequence data can be stored easily.
- Four types of interfaces are available.
  (USB, LAN, RS232C, GPIBs from NI, INTERFACE, and CONTEC)
- Text files can be read freely.

Operating Environment

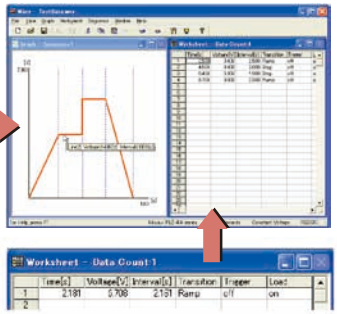
- CPU: Pentium IV or later (Core 2 or later)
- OS/Memory: Refer to the website for the latest information available.
- Interface: RS232C. An RS232C cross-over cable is required.

Easy-to-operate software expanding functions of power supplies and electronic loading units

WAVY is sequence creation software that supports the power supplies and electronic loads from KIKUSUI Electronics Corp.
You can use WAVY to create and edit sequences easily with a mouse. During sequence execution, you can also display execution points for visualization to monitor voltage, current, and other parameters and save them as a file.



Data now created with a mouse is displayed as shown on the right.



* When adding data, you can also enter the data directly in data cells.

Lineup

Model	Version	Hardware Sequence *1	Software Sequence *2	Operation Mode
Wavy for PCR-WE (SD032-PCR-WE)	6.0	✔ (600 steps)	-	CV (AC, DC, AC+DC)
Wavy for PWR-01 (SD027-PWR-01)	6.0	✔ (64 steps)	✔ (1024 steps)	CV, CC
Wavy for PWX (SD013-PWX)	6.0	-	✔ (1024 steps)	CV, CC
Wavy for PAV (SD024-PAV)	6.0	✔ (12 steps)	✔ (1024 steps)	CV, CC
Wavy for PMX (SD025-PMX)	6.0	-	✔ (1024 steps)	CV, CC
Wavy for PBZ	6.3	✔ (1024 steps)	-	CC, CV/DC, AC+DC
Wavy for PAS & PWR	5.0	-	✔ (1024 steps)	CV, CC
Wavy for PCR-M	5.1	-	✔ (2048 steps)	CV (AC, DC, AC+DC)
Wavy for PCR-LE (SD011-PCR-LE)	5.5	✔ (600 steps)	-	CV (AC, DC, AC+DC)
Wavy for PLZ-4W	5.3	✔ (Normal mode: 256 steps, Fast mode:1024 steps)	-	CV, CC, CR, CP
Wavy for PLZ-5W (SD023-PLZ-5W)	5.0	✔ (10000 steps)	-	CV, CC, CR, CP
Wavy for PLZ-5WH2 (SD033-PLZ-5WH2)	5.0	✔ (10000 steps)	-	CV, CC, CR, CP
Wavy for PLZ-U	3.2	✔ (256 steps)	✔ (1024 steps)	CC, CV, CR, CC + CV, CR + CV

*1 "Hardware Sequence" is to control the equipment using built-in sequence function of the unit. *2 "Software Sequence" is to control the sequence using "Wavy"

DRIVERS

The instrument drivers uploaded on our website are free to download for your convenience.

	IVI-COM	IVI-C	VisualBasic 6.0	LabVIEW	Lab Windows/CVI
Test and Measurement Instruments					
TOS5300 Series	✔ (IviDCPwr)	✔ (IviDCPwr)	✔ (IVI-COM)	✔ (IVI-C)	✔ (IVI-C)
TOS6210/6200A			✔		
AC Power Supplies					
PCR-MA Series	✔ (IviDCPwr)	✔ (IviDCPwr)	✔ (IVI-COM)	✔ (IVI-C)	✔ (IVI-C)
PCR-LE Series	✔ (IviACPwr)	✔ (IviACPwr)	✔ (IVI-COM)	✔ (IVI-C)	✔ (IVI-C)
DC Power Supplies					
PWR-01 Series	✔ (IviDCPwr)	✔ (IviDCPwr)	✔ (IVI-COM)	✔ (IVI-C)	✔ (IVI-C)
PMX-A Series	✔ (IviDCPwr)	✔ (IviDCPwr)	✔ (IVI-COM)	✔ (IVI-C)	✔ (IVI-C)
PBZ Series	✔ (IviDCPwr)	✔ (IviDCPwr)	✔ (IVI-COM)	✔ (IVI-C)	✔ (IVI-C)
PWX Series	✔ (IviDCPwr)	✔ (IviDCPwr)	✔ (IVI-COM)	✔ (IVI-C)	✔ (IVI-C)
Electronic Loads					
PLZ Series (5W/5WH2/4WL/U)	✔	✔	✔ (IVI-COM)	✔ (IVI-C)	✔ (IVI-C)
Common Libraries					
VISA	KI-VISA				
IVI	IVI Shared Components				

Note: For details of the operation condition, please refer to our web site.

Rack Mount

Various Kikusui products can be easily mounted in a rack by using a bracket and rack mount frame, rack adaptor, etc.
JIS standards (millimeter size) and EIA standards (inch size) racks are available. Brackets and rack mount frames, rack adaptors, etc. applicable to each type are also available.
Since the width of one panel is 50 mm for JIS Standards and 44.45 mm for EIA Standards, the bracket and rack mount frame, etc. of the panel width matched to the product body are selected based on one panel width.

Racks

The KRO Series are designed in accordance with both JIS Standards and EIA Standards. Since these racks are equipped with support angle as standard, even heavy products can be mounted. (With products weighing more than 70 kg, use a rack with brackets.)
The KRO Series conforms both JIS and EIA standards simply replacing the front panel with the rear panel.
The KRC series is a multifunctional decorative rack that is based on a steel cabinet rack and designed to allow the attachment of various rack options.
In addition to having models that meet two different standards (JIS and EIA) and being available in two overall heights (1,835 mm and 1,435 mm), this series comes in depths of 800 mm and 950 mm (two types), giving it eight models in all. Also, additional support angles (two types), base fittings and suspension eyebolts are available as separately sold options.

The Enclosed Type Rack (Custom product on request)

The rack system that will be used for concerning the heat generated from the Power Supplies, considerable amount of the dust as an environmental condition, metal corrosion occurred such as at plating factory, an electrolytic chemical synthesis factory.
(*The water cooled unit will be built in the system which require for the water pipe and drain)

Model		Pay load weight	Number of panels		Overall height	Weight	The length for maximum surface	Support angle	Support leveler	Options		
		kg	JIS	EIA	mm	kg				Support angle	Base hold angle	Eyebolt
Open rack (KRO series)	KRO1600	Approx. 300	32	36	1825	55	700	12 (6 pairs)	4			
	KRO1250		25	28	1475	50		10 (5 pairs)				
	KRO900		18	20	1125	45		8 (4 pairs)				
Decorative rack (KRC series)	KRC363L	Approx. 300		36	1835	95	950	12 (6 pairs)	4			
	KRC273L			27	1435	85		10 (5 pairs)				
Decorative rack (KRC series) Production item upon order	KRC363	Approx. 300		36	1835	90	800	12 (6 pairs)	4	OP01-KRC OP02-KRC *1	OP03-KRC *2	OP04-KRC *3
	KRC273			27	1435	75		10 (5 pairs)				
	KRC1603		32		1835	90	800	12 (6 pairs)				
	KRC1603L					95	950					
	KRC1203		24		1435	75	800	10 (5 pairs)				
	KRC1203L					85	950					

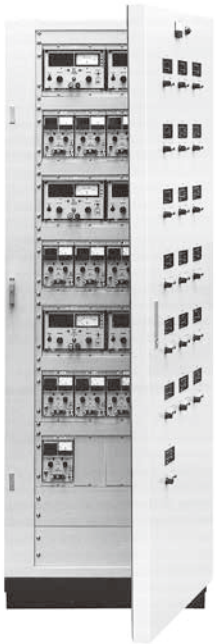
• The KRO Series payload weight can be increased to approximately 400kg by changing the casters.
• The KRO Series are sold in kit form.
• The support angle is designed for Kikusui racks and products. It is not interchangeable with products of the other manufacturer.

*1 These support angles (OP01-KRC) are equivalent to the support angles incorporated into the main rack unit.
They come in a two-item (1-pair) set. When the product weight exceeds 70 kg, use a weight support angle (OP02-KRC).
*2 These L-shaped fittings (OP03-KRC) secure the base of the rack to the floor. The set includes four main fitting components and the bolts and nuts that secure the fittings to the bases.
*3 These eyebolts (OP04-KRC) are specially made for the KRC series. The set includes four M12 eyebolts.

KRO Series

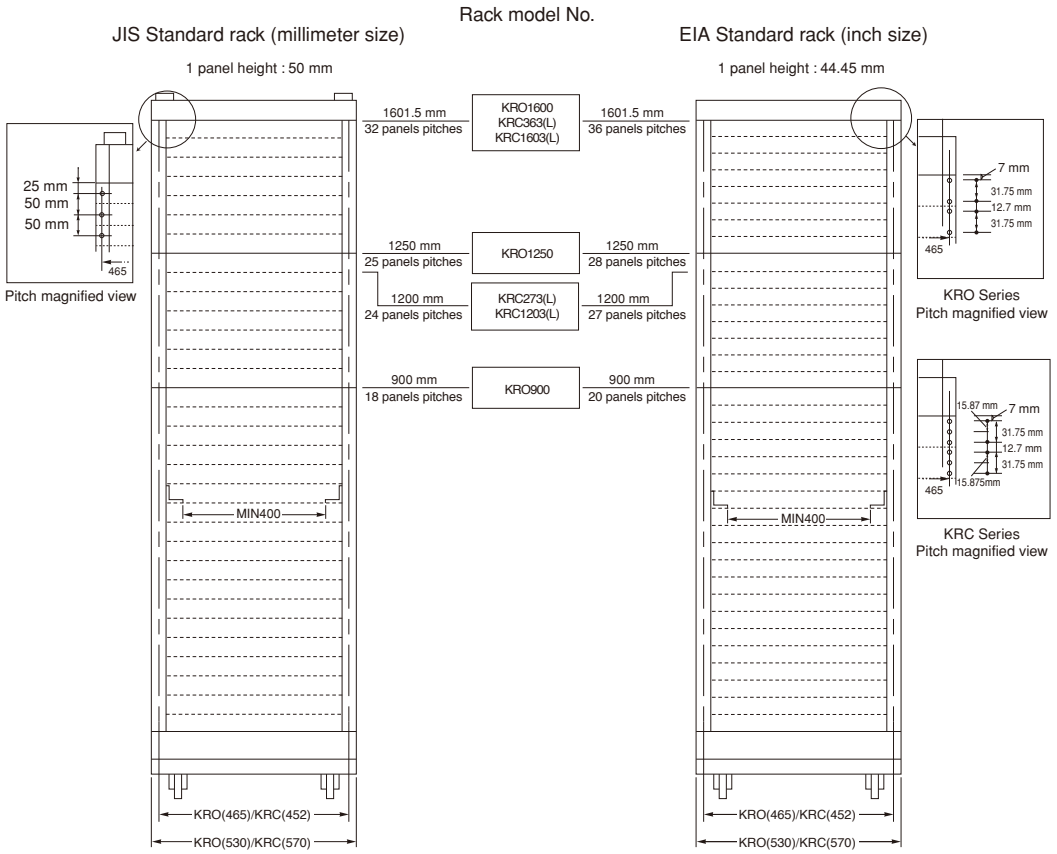
KRC Series

The Enclosed type rack



[NOTICE]
Please use supporting angles (reinforcing cramps).
When mounting product by using rack mount frame, rack adapter, and bracket, please make sure to support the mounted product by using the supporting angle (reinforcing cramps) capable of bearing the product load.

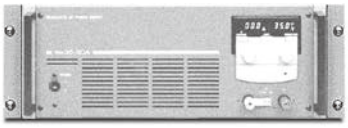
Racks Mount



Racks & Accessories

■ Bracket

The bracket can be used to install models of 1 (1/1) rack in width directly in the rack.



Sample for the bracket (Pair of right and left portion)

■ Blank panel

When using brackets to install models liable to give off heat, it is necessary to provide at least the minimum number of blank panels required for each model. Plate-type panels and mesh-type blank panels are also available.

Sample for the blank panel

■ For use with rack adapter

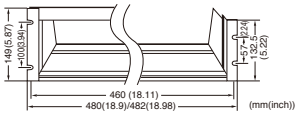
KRA3 and KRA150 are rack adapters conforming to EIA/JIS standards to be used with standard racks. Power supplies can be stored without using brackets.

Complied products

- PWR-01 Series
- PWR Series (400/800 W)
- PWX750ML
- PMX-A Series
- PMX-Multi Series
- PCR500MA
- PLZ-5W Series (200/400 W)
- PLZ334WL
- PFX2500 Series

KRA150

KRA3



EIA Standard Rack (Inch Size) Mounting Options

	Product name			Bracket		Blank panel	Rack mount frame			Rack adapter	
	Series	Type	Width	Bracket model No.	Panel width(*1)	"M" is added for mesh type	Rack mount frame model No.	Panel width(*1)	Bracket necessary when fastening mainframe to rack mount frame	Rack adaptor model No.	Panel width(*1)
DC power supply	PWR-01	400	1/6							KRA3	3
		800	1/3							KRA3	3
		1200	1/2							KRA3	3
		2000	1	KRB3-TOS	3						
	PWR	400	1/4							KRA3	3
		800	1/2							KRA3	3
		1600	1	KRB3-TOS	3						
	PAV		1/6							KRA2-PAV	2
	PWX	750/1500	1							KRB1-PWX SUPPORT ANGLE (*2)	
	PMX-A		1/4			BP191(-M)				KRA3	3
	PMX-Multi		1/2			BP191(-M)				KRA3	3
	PBZ		1	KRB3-TOS	3						
AC power supply	PCR-WEA/WEA2	1000/2000/3000	1	KRB3-TOS	3						
		6000	1	KRB6	6						
		12000	1	KRB9	9						
	PCR-MA	500	1/2							KRA3	3
		1000/2000	1	KRB3-TOS	3						
		4000	1	KRB6	6						
	PCR-LE	500	1	KRB4	4						
		1000	1	KRB6	6						
		2000	1	KRB9	9						
Electronic Load	PLZ-5W	200/400	1/2							KRA3	
		1200	1	KRB3-TOS	3						
	PLZ2405WB		1	KRB2-TOS	2						
	PLZ-5WH2	1000/2000/4000	1	KRB3-TOS	3						
		12000	1	KRB9	9						
		20000	1	KRB13	13						
	PLZ334WL		1/2							KRA3	3
	PLZ-U	PLZ-30F	2/3	KRB3-PLZ-30F	3						
		PLZ-50F	1	KRB3-PLZ-50F	3						
*3	PFX2511/PFX2512/SD01-PFX		1/2							KRA3	3
*3	PFX2532		1	KRB3-TOS	3						

*1 EIA panel width is 44.45 mm (1 3/4 inch). The panel width does not include the rubber feet, casters, and levelers.
*2 The instrument may fall. Install the suitable support angles applying to the used rack system to support the instrument.
*3 Battery Tester

JIS Standard Rack (Millimeter Size) Mounting Options

	Product name			Bracket		Blank panel	Rack mount frame			Rack adapter	
	Series	Type	Width	Bracket model No.	Panel width(*1)	"M" is added for mesh type	Rack mount frame model No.	Panel width(*1)	Bracket necessary when fastening mainframe to rack mount frame	Rack adaptor model No.	Panel width(*1)
DC power supply	PWR-01	400	1/6							KRA150	3
		800	1/3							KRA150	3
		1200	1/2							KRA150	3
		2000	1	KRB150-TOS	3						
	PWR	400	1/4							KRA150	3
		800	1/2							KRA150	3
		1600	1	KRB150-TOS	3						
	PAV		1/6							KRA2-PAV	2
	PWX	750/1500	1							KRB1-PWX SUPPORT ANGLE (*2)	
	PMX-A		1/4			BP1H(-M)				KRA150	3
	PMX-Multi		1/2			BP1H(-M)				KRA150	3
	PBZ		1	KRB150-TOS	3						
AC power supply	PCR-WEA/WEA2	1000/2000/3000	1	KRB150-TOS	3						
		6000	1	KRB300	6						
		12000	1	KRB400-PCR-LE	8						
	PCR-MA	500	1/2							KRA150	3
		1000/2000	1	KRB150-TOS	3						
		4000	1	KRB300	6						
	PCR-LE	500	1	KRB200	4						
		1000	1	KRB300	6						
		2000	1	KRB400-PCR-LE	8						
Electronic Load	PLZ-5W	200/400	1/2							KRA150	3
		1200	1	KRB150-TOS	3						
	PLZ2405WB			KRB100-TOS	2						
	PLZ-5WH2	1000/2000/4000	1	KRB150-TOS	3						
		12000	1	KRB400-PCR-LE	8						
		20000	1	KRB600	13						
	PLZ334WL		1/2							KRA150	3
	PLZ-U	PLZ-30F	2/3	KRB150-PLZ-30F	3						
		PLZ-50F	1	KRB150-PLZ-50F	3						
*3	PFX2511/PFX2512/SL01-PFX		1/2							KRA150	3
*3	PFX2532		1	KRB150-TOS	3						

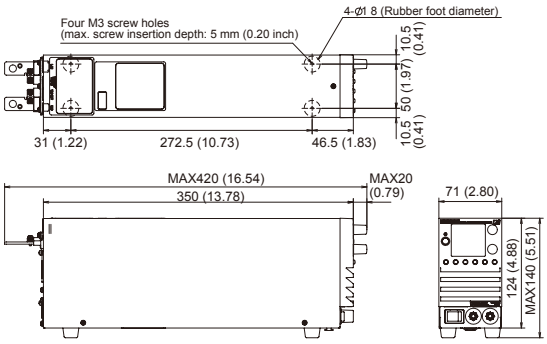
*1 JIS panel width is 50 mm. The panel width does not include the rubber feet, casters, and levelers.
*2 The instrument may fall. Install the suitable support angles applying to the used rack system to support the instrument.
*3 Battery Tester

PWR-01 Series External Dimensional Diagrams / Rack Mount Option

Unit: mm (inch)

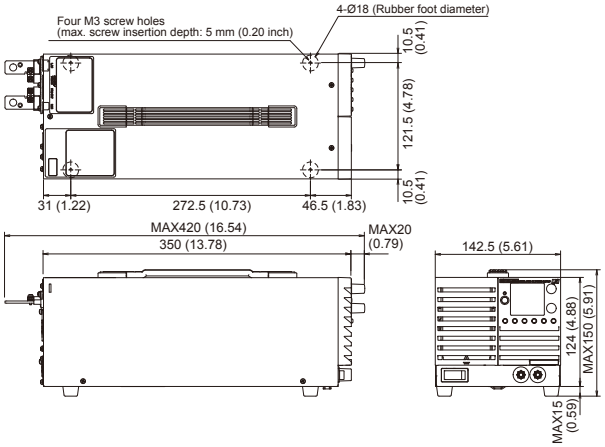
■ 400 W Model (6 units can be rack mounted)

PWR401L/PWR401ML/PWR401MH/PWR401H



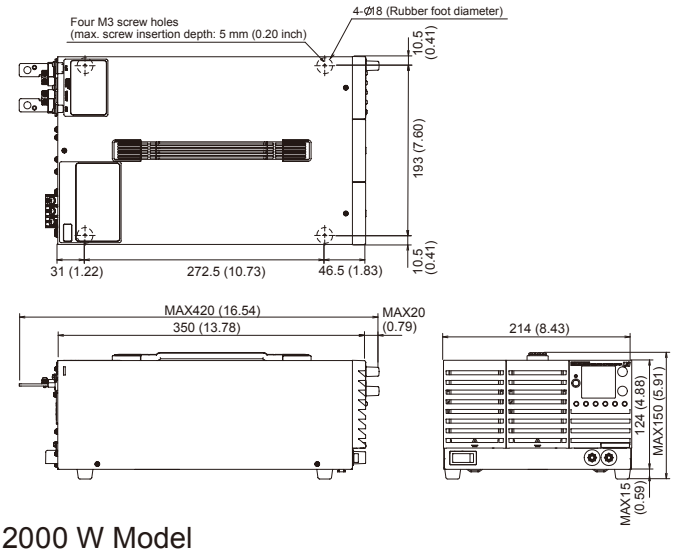
■ 800 W Model (3 units can be rack mounted)

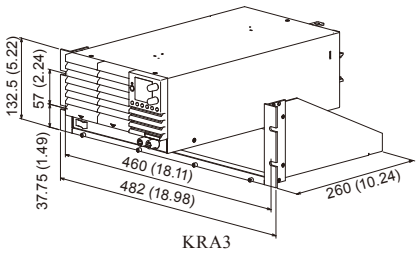
PWR801L/PWR801ML/PWR801MH/PWR801H



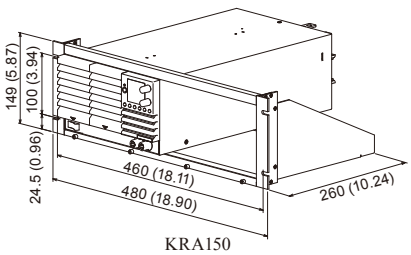
■ 1200 W Model (2 units can be rack mounted)

PWR1201L/PWR1201ML/PWR1201MH/PWR1201H





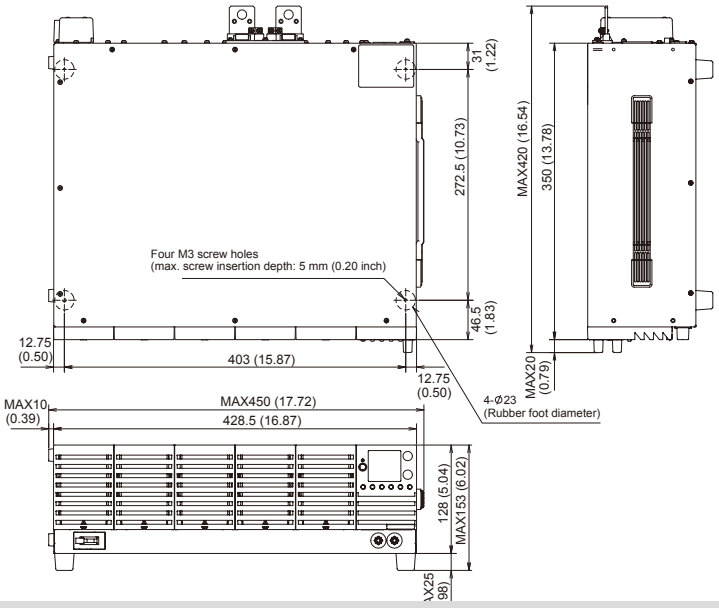
KRA3

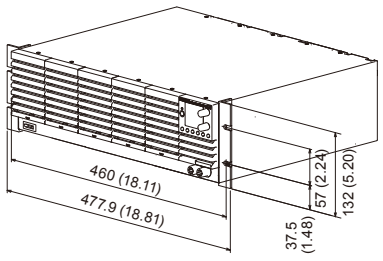


KRA150

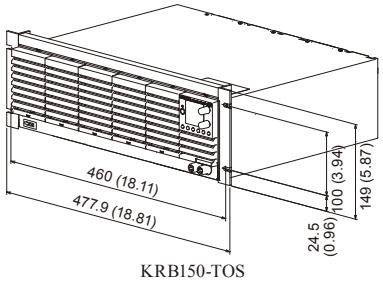
■ 2000 W Model

PWR2001L/PWR2001ML/PWR2001MH/PWR2001H





KRB3-TOS



KRB150-TOS

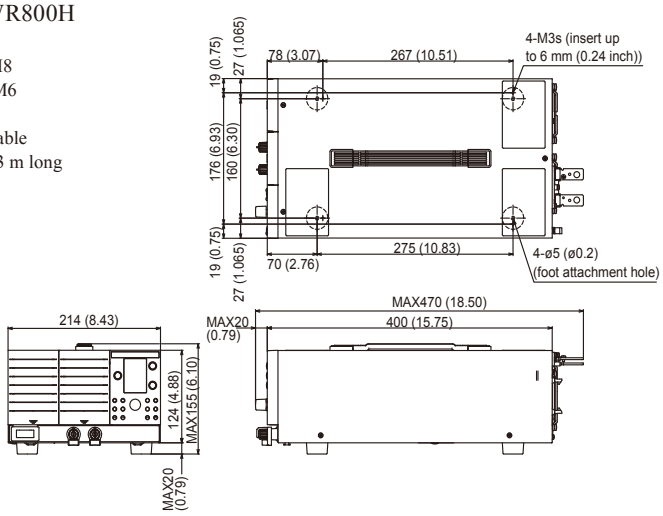
PWR Series External Dimensional Diagrams / Rack Mount Option

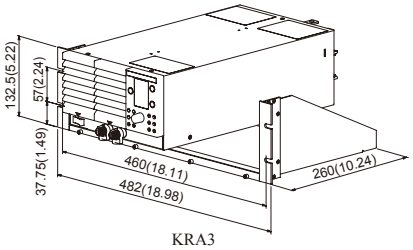
Unit: mm (inch)

■ 800 W TYPE (2 units can be rack mounted)

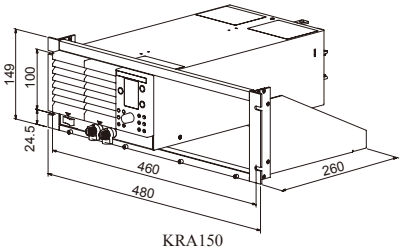
PWR800M/PWR800H

Output (Rear) M8
(Front) M6
Input AC inlet
Accessory power cable
approx. 3 m long





KRA3

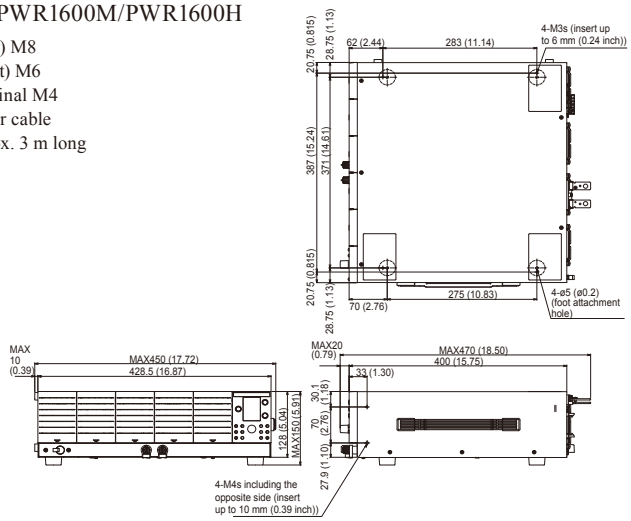


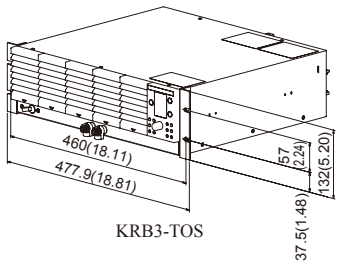
KRA150

■ 1600 W TYPE

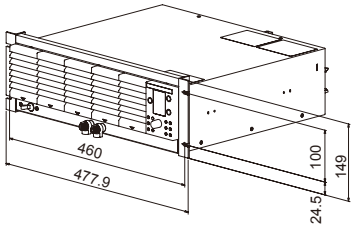
PWR1600L/PWR1600M/PWR1600H

Output (Rear) M8
(Front) M6
Input Terminal M4
Accessory power cable
approx. 3 m long





KRB3-TOS

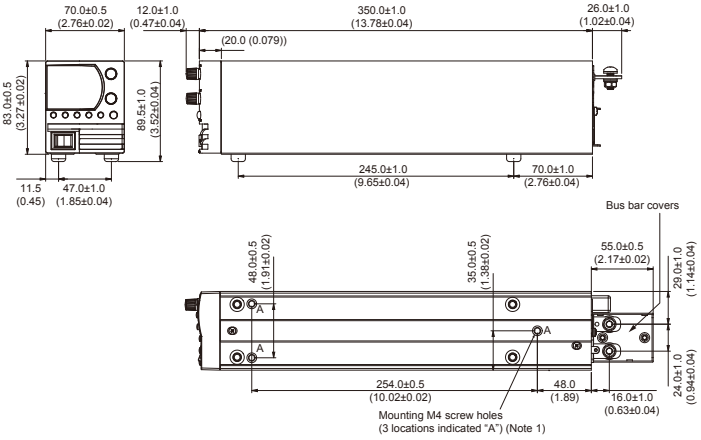


KRB150-TOS

PAV Series External Dimensional Diagrams

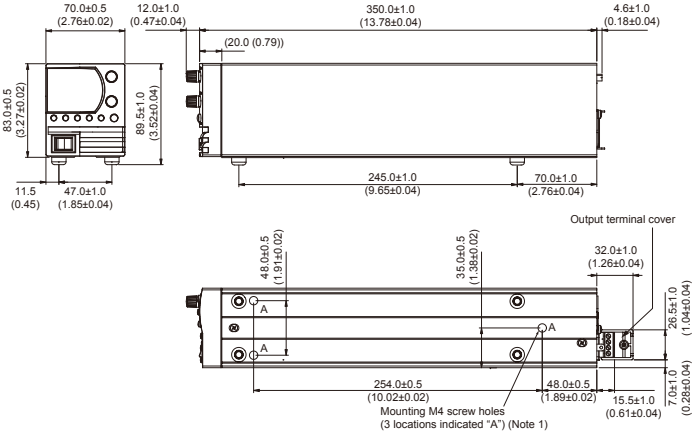
Unit: mm (inch)

■ Models whose rated output voltage is 10 V to 100 V



(Note 1) Keep screw insertion depth to 6 mm or less.

■ Models whose rated output voltage is 160 V to 650 V

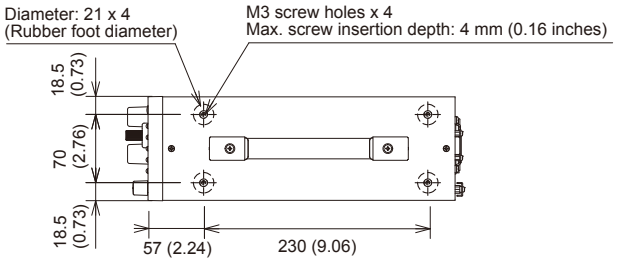


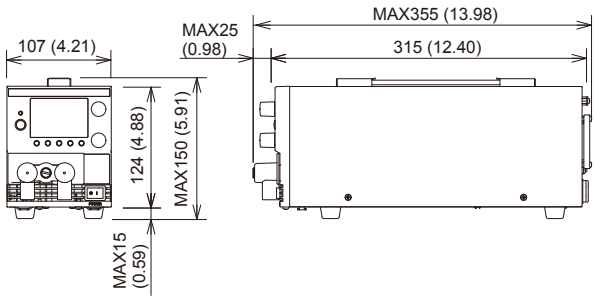
(Note 1) Keep screw insertion depth to 6 mm or less.

PMX-A Series External Dimensional Diagrams / Rack Mount Option

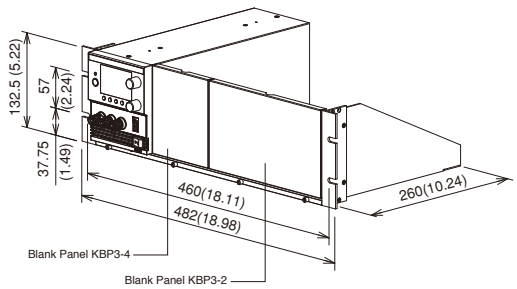
Unit: mm (inch)

PMX18-2A/PMX18-5A
PMX35-1A/PMX35-3A
PMX70-1A/PMX110-0.6A
PMX250-0.25A/PMX350-0.2A
PMX500-0.1A

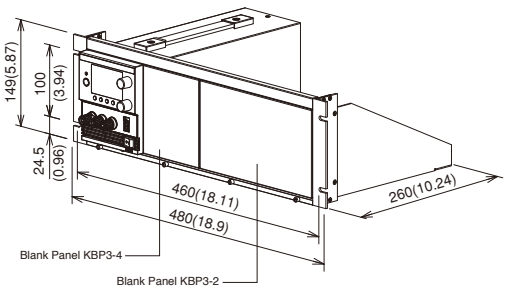




KRA3



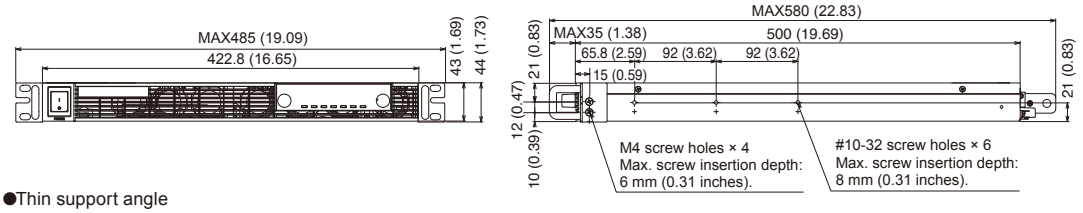
KRA150



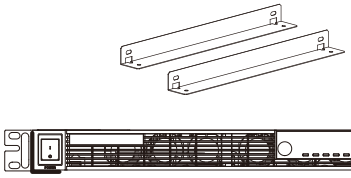
PWX Series External Dimensional Diagrams / Rack Mount Option

PWX750LF/PWX750MLF/PWX750MHF/PWX750HF
PWX1500L/PWX1500ML/PWX1500MH/PWX1500H

Unit: mm (inch)



●Thin support angle
KRB1-PWX SUPPORT ANGLE

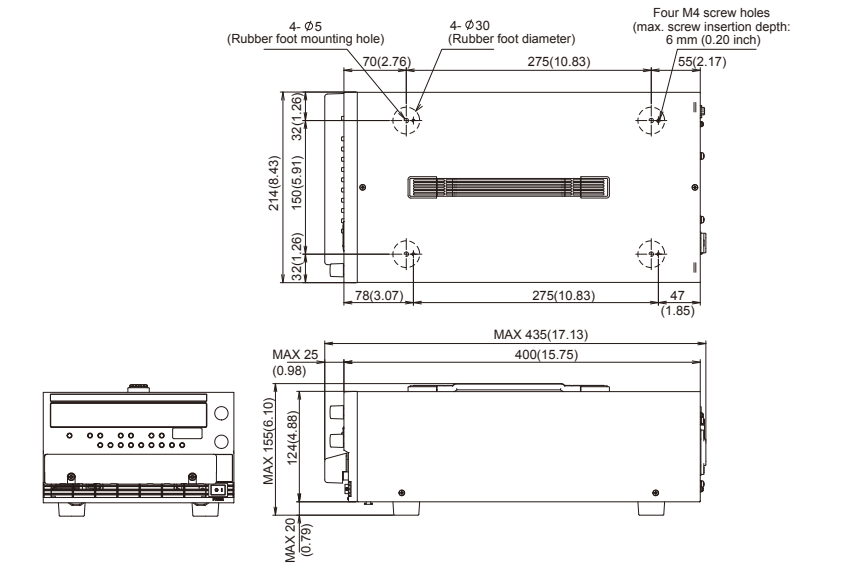


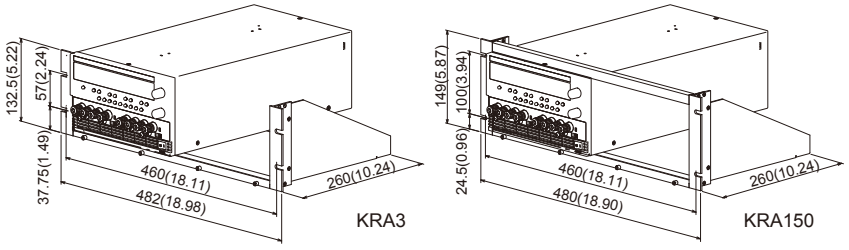
*Under the parallel operation, the optional parallel operation cable can not be used when the unit is installed side by side in the rack mount system.

PMX-Multi Series External Dimensional Diagrams / Rack Mount Option

PMX32-3DU
PMX32-3TR
PMX32-2QU

Unit: mm (inch)



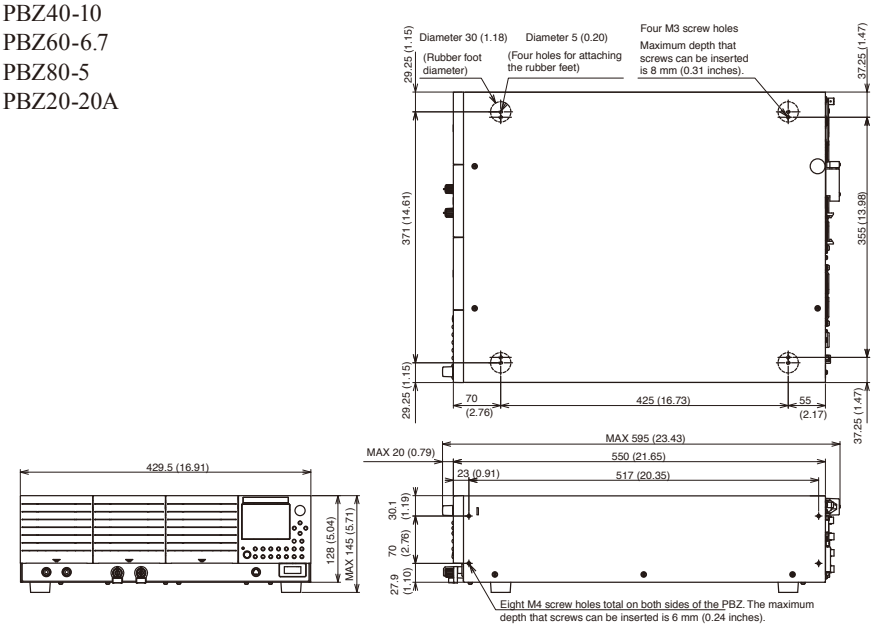


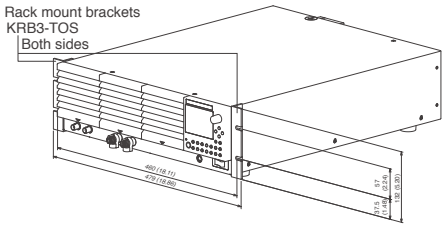
PMX32-2QU model example

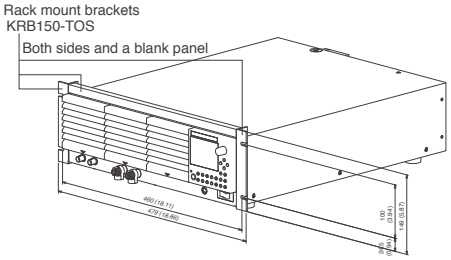
PBZ Series External Dimensional Diagrams / Rack Mount Option

PBZ20-20
PBZ40-10
PBZ60-6.7
PBZ80-5
PBZ20-20A

Unit: mm (inch)







PBZ SR Series External Dimensionals

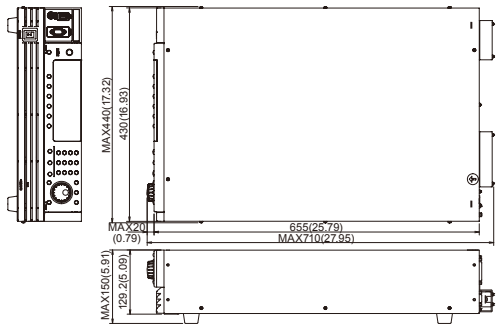
■ Dimensions (mm (inch) (Maximum dimensions))

PBZ20-60 SR	PBZ40-30 SR	432.6 (17.03") (545 (21.46")) W × 579.4 (22.81") (685 (26.97")) H × 700 (27.56") (735 (28.94")) D
PBZ60-20.1 SR	PBZ80-15 SR	
PBZ20-80 SR	PBZ40-40 SR	432.6 (17.03") (545 (21.46")) W × 712.1 (28.04") (815 (32.09")) H × 700 (27.56") (735 (28.94")) D
PBZ60-26.8 SR	PBZ80-20 SR	
PBZ20-100 SR	PBZ40-50 SR	432.6 (17.03") (545 (21.46")) W × 844.8 (33.26") (950 (37.40")) H × 700 (27.56") (735 (28.94")) D
PBZ60-33.5 SR	PBZ80-25 SR	

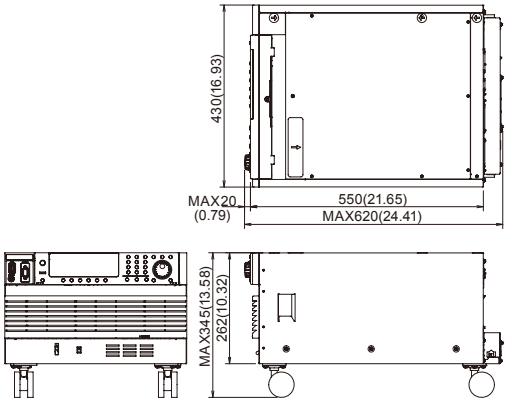
PCR-WEA/WEA2 Series External Dimensional Diagrams / Rack Mount Option

Unit: mm (inch)

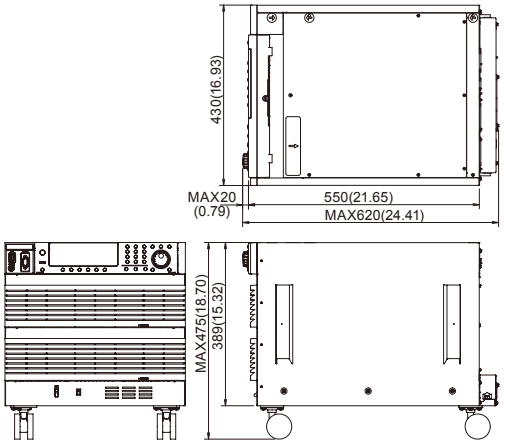
■ PCR1000WEA/PCR2000WEA/PCR3000WEA2



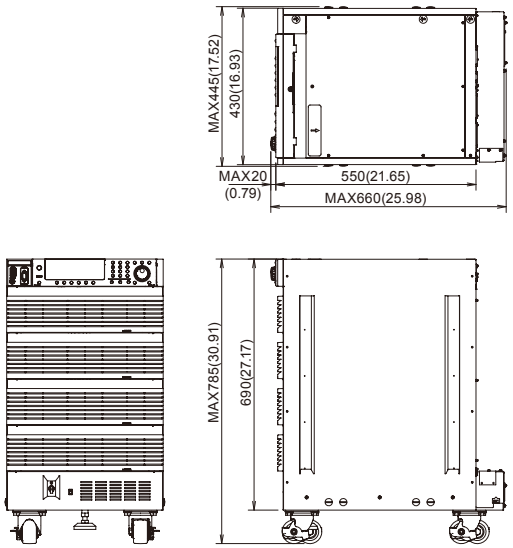
■ PCR6000WEA2



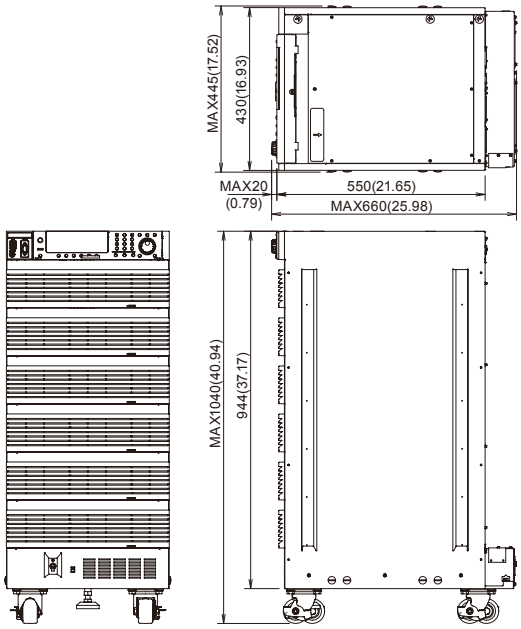
■ PCR12000WEA2



■ PCR18000WEA2/PCR24000WEA2

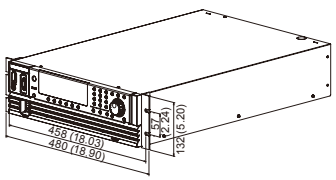


■ PCR30000WEA2/PCR36000WEA2

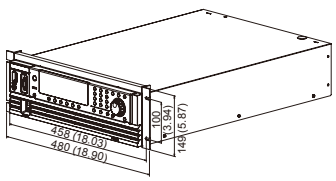


●PCR1000WEA/ PCR2000WEA/ PCR3000WEA2

When mounting on an inch rack
(bracket model KRB3-TOS)

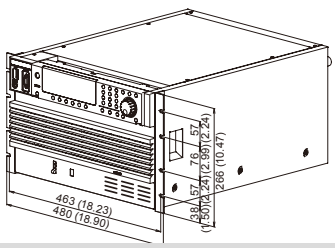


When mounting on a millimeter rack
(bracket model KRB150-TOS)

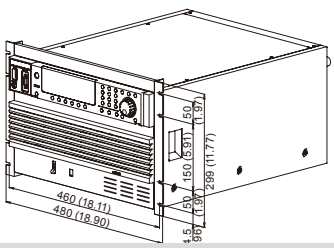


●PCR6000WEA2

When mounting on an inch rack
(bracket model KRB6)



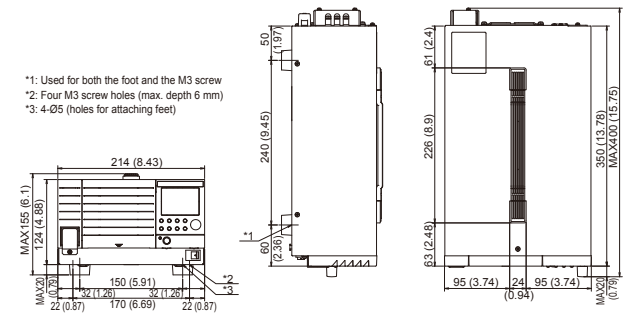
When mounting on a millimeter rack
(bracket model KRB300)



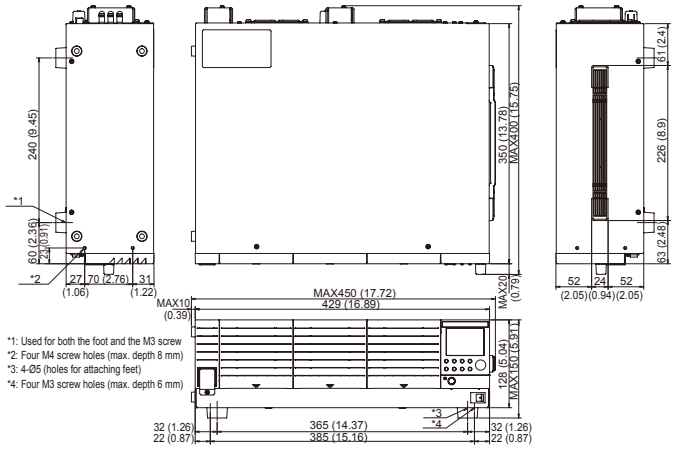
PCR-MA Series External Dimensional Diagrams / Rack Mount Option

Unit: mm (inch)

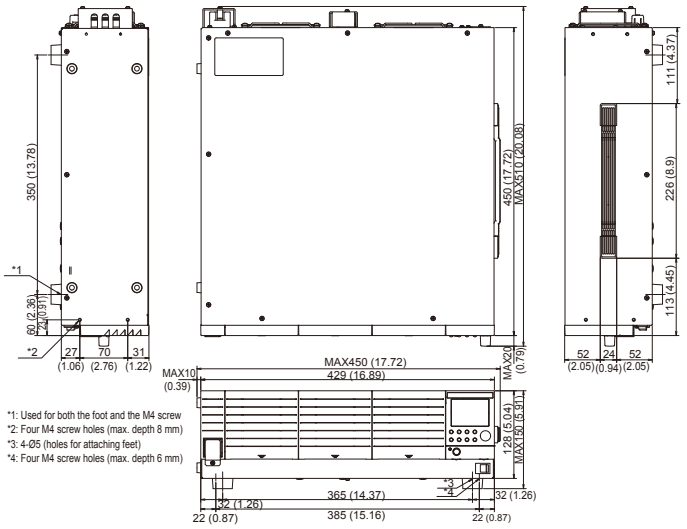
■ PCR500MA



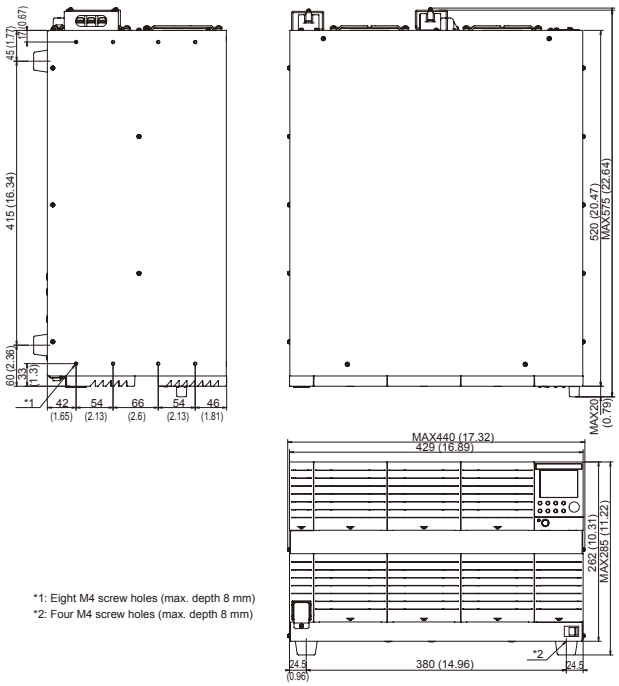
■ PCR1000MA



■ PCR2000MA

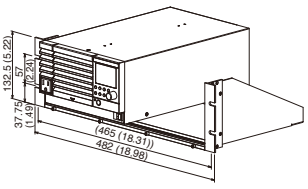


■ PCR4000MA

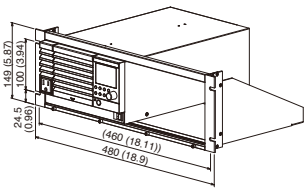


●PCR500MA

When mounting on an inch rack
(Bracket model: KRA3)

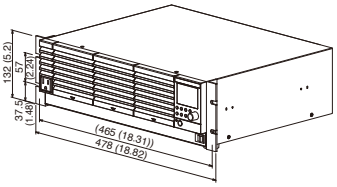


When mounting on a millimeter rack
(Bracket model: KRA150)

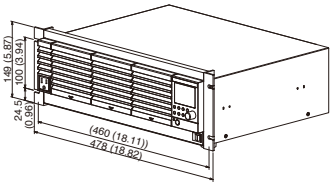


●PCR1000MA/PCR2000MA

When mounting on an inch rack
(Bracket model: KRB3-TOS)

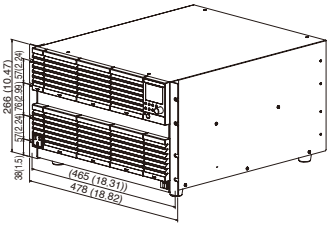


When mounting on a millimeter rack
(Bracket model: KRB150-TOS)

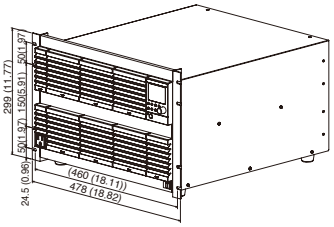


●PCR4000MA

When mounting on an inch rack
(Bracket model: KRB6)



When mounting on a millimeter rack
(Bracket model: KRB300)



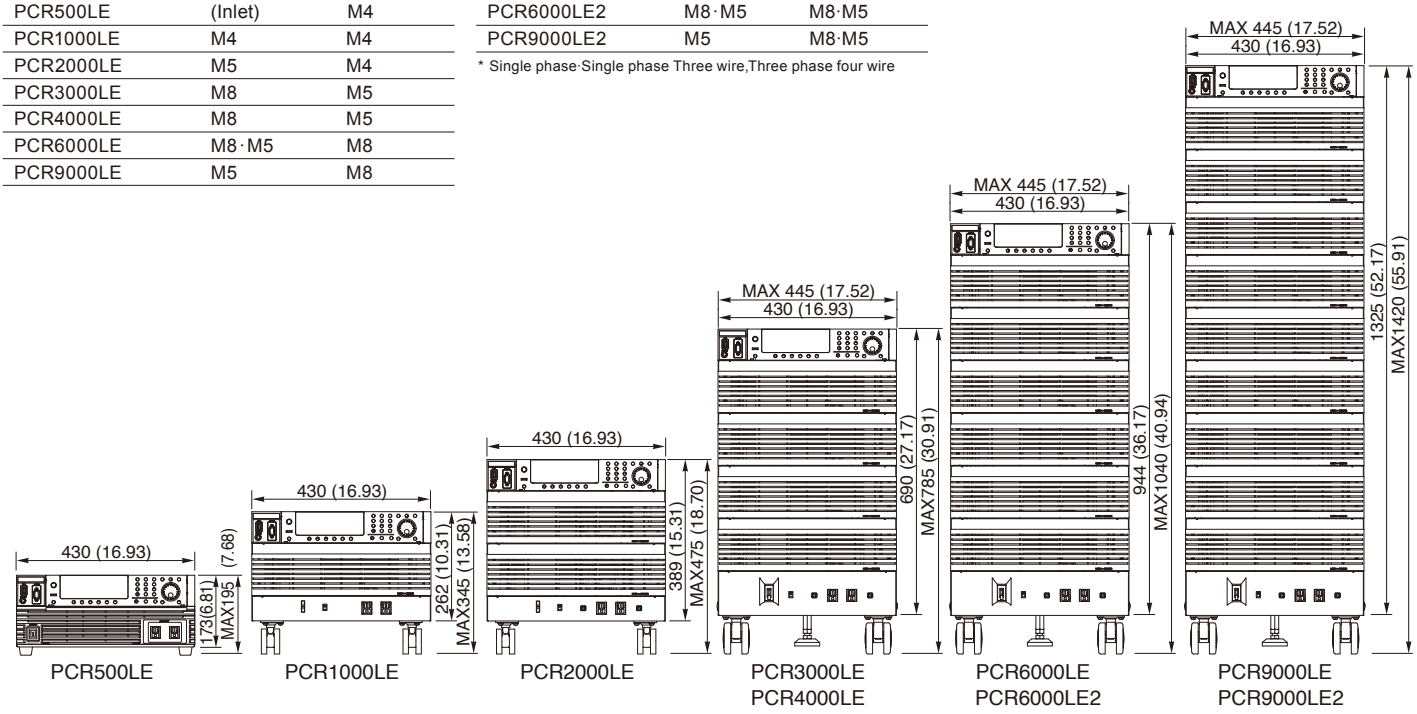
PCR-LE/LE2 Series External Dimensional Diagrams / Rack Mount Option

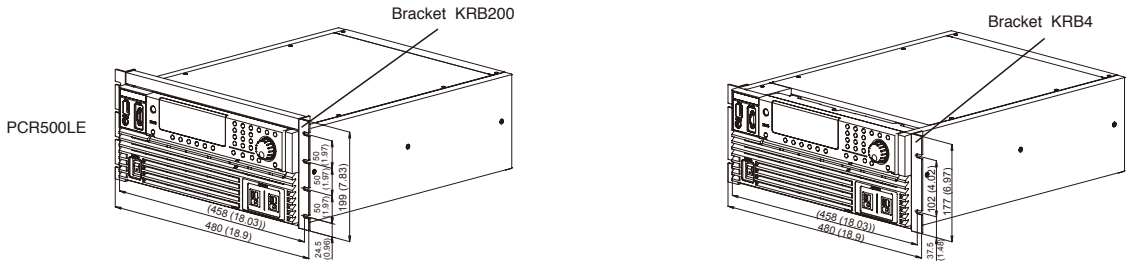
Unit: mm (inch)

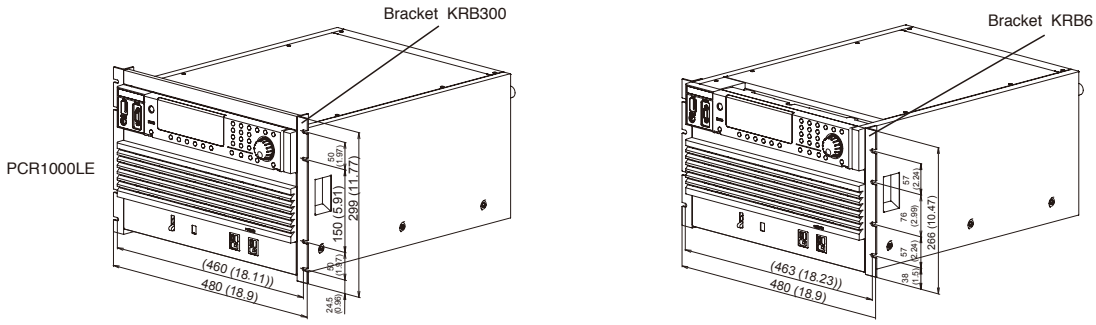
Model	Input terminal	Output terminal
PCR500LE	(Inlet)	M4
PCR1000LE	M4	M4
PCR2000LE	M5	M4
PCR3000LE	M8	M5
PCR4000LE	M8	M5
PCR6000LE	M8·M5	M8
PCR9000LE	M5	M8

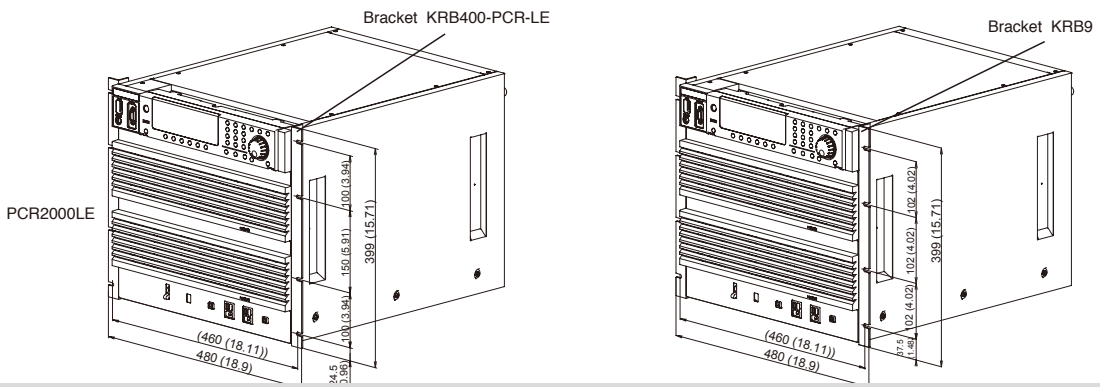
Model	Input terminal	Output terminal *
PCR6000LE2	M8·M5	M8·M5
PCR9000LE2	M5	M8·M5

* Single phase·Single phase Three wire,Three phase four wire







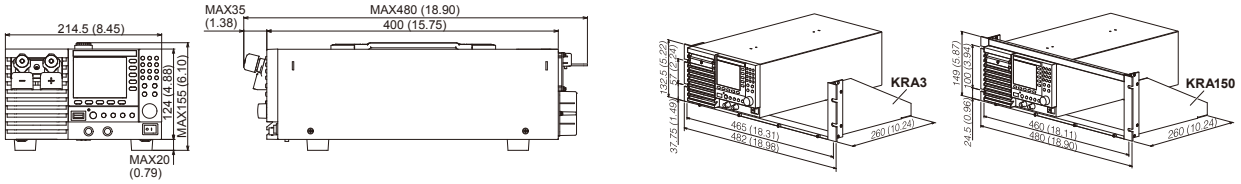


PLZ-5W Series External Dimensional Diagrams / Rack Mount Option

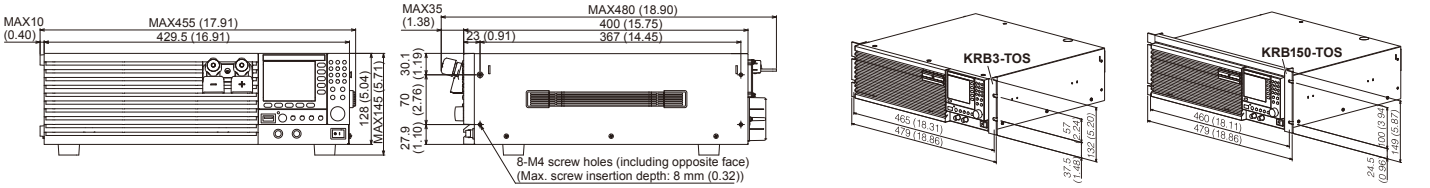
Unit:mm (inch)

PLZ205W/PLZ405W
PLZ1205W
PLZ2405WB

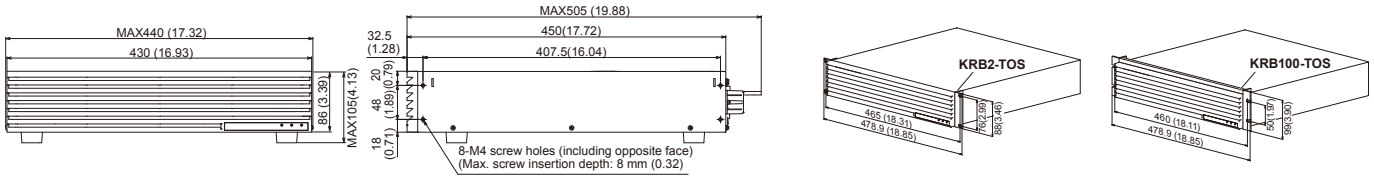
■ PLZ205W, PLZ405W



■ PLZ1205W



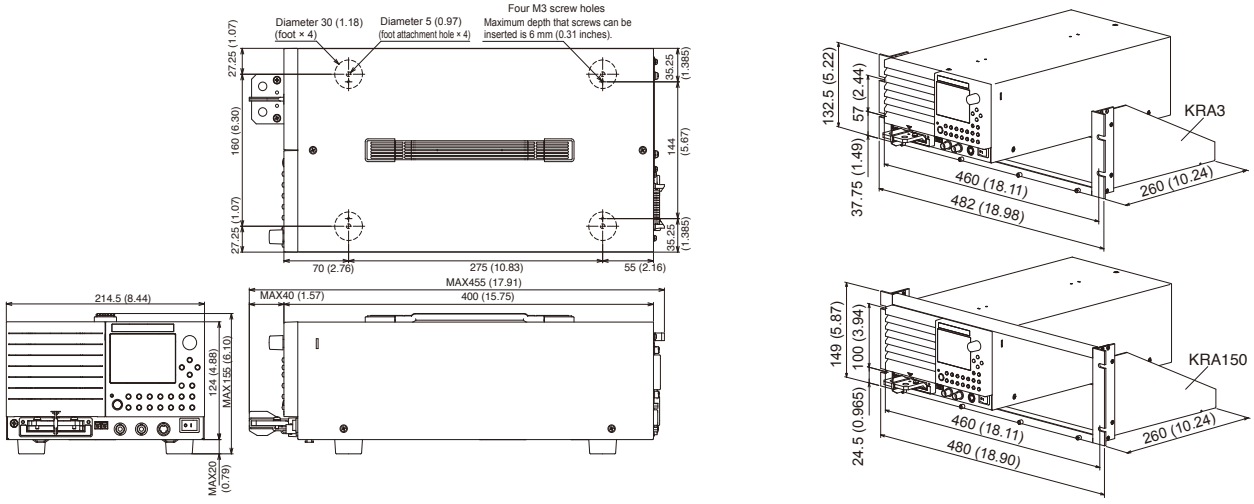
■ PLZ2405WB



PLZ-4WL Series External Dimensional Diagrams / Rack Mount Option

Unit:mm (inch)

PLZ334WL

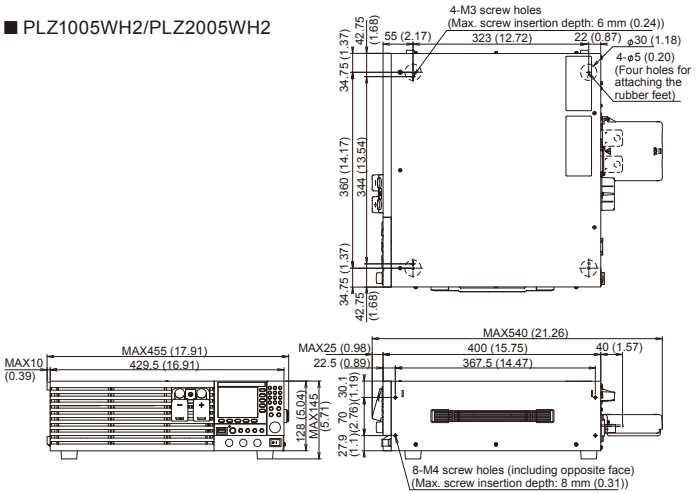


PLZ-5WH2 Series External Dimensional Diagrams / Rack Mount Option

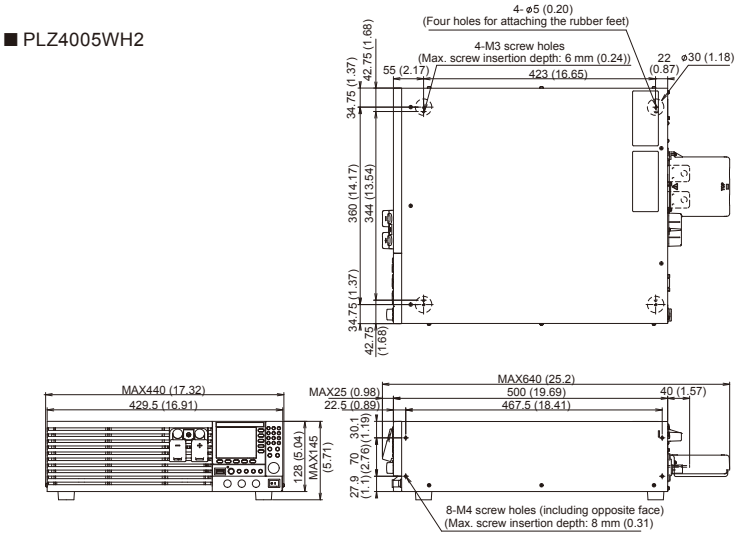
PLZ1005WH2/PLZ2005WH2/PLZ4005WH2
PLZ12005WH2/PLZ20005WH2

Unit:mm (inch)

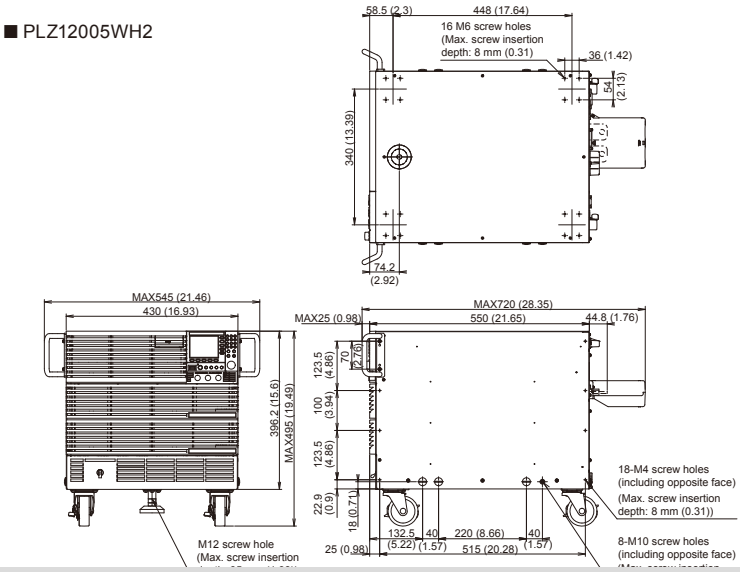
■ PLZ1005WH2/PLZ2005WH2



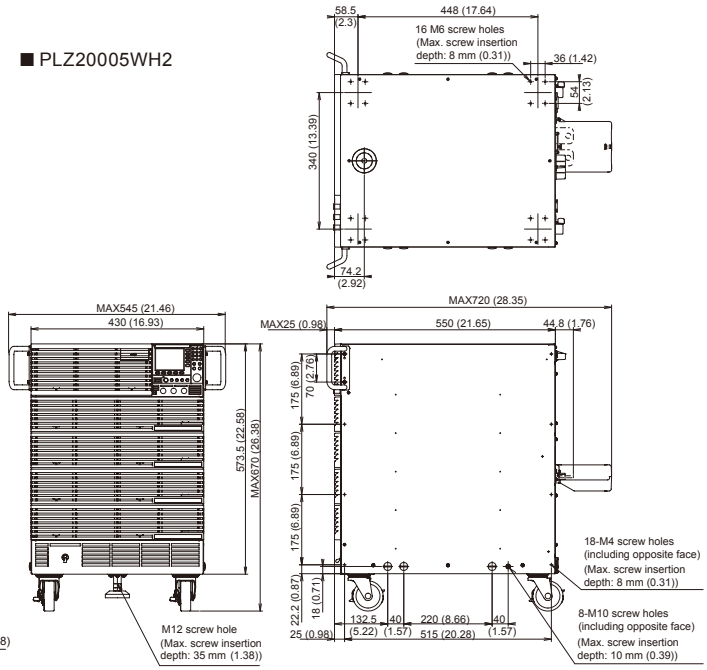
■ PLZ4005WH2



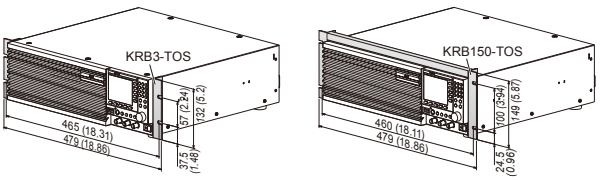
■ PLZ12005WH2



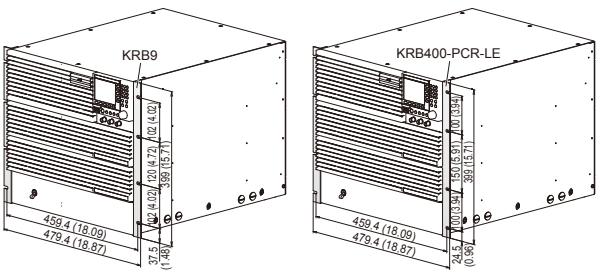
■ PLZ20005WH2



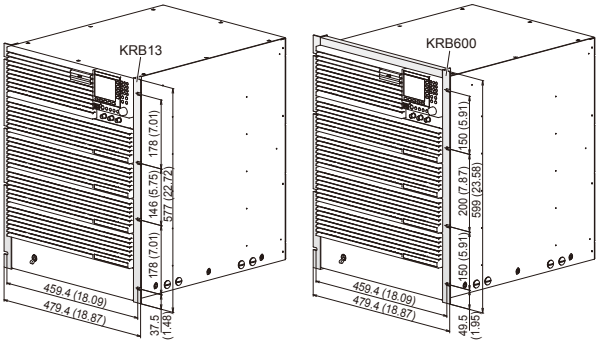
● PLZ1005WH2/PLZ2005WH2/PLZ4005WH2



● PLZ12005WH2



● PLZ20005WH2

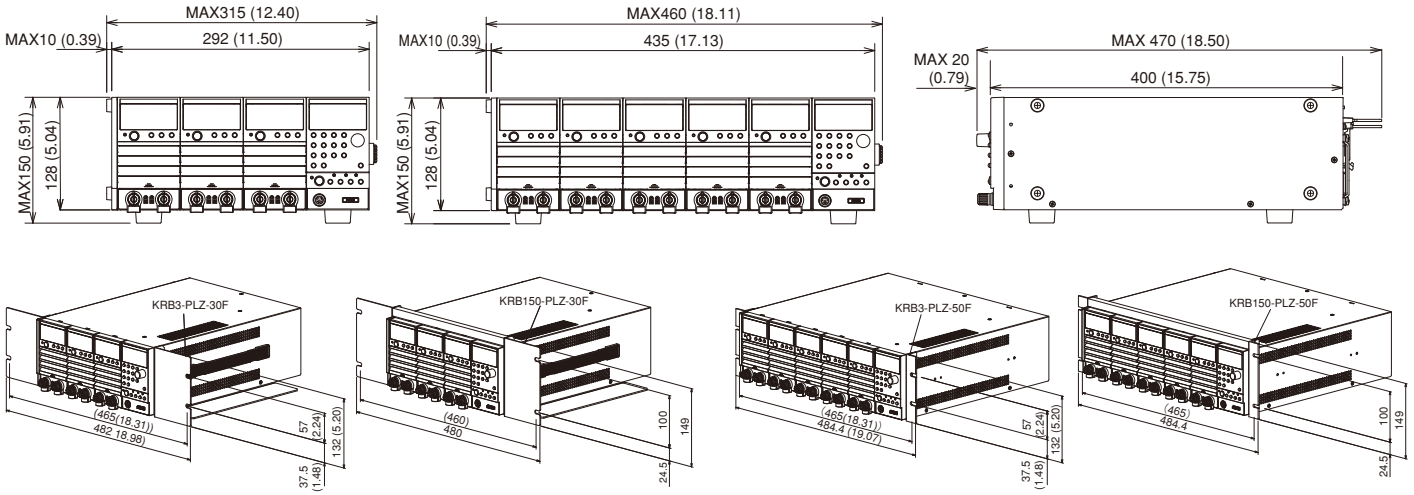


PLZ-U Series External Dimensional Diagrams / Rack Mount Option

PLZ70UA/ PLZ150U
PLZ-30F/PLZ-50F

Unit: mm (inch)

DC input terminals: (Rear) M6, (Front) M6
Input: AC inlet
Attached power cable: SVT3 18AWG 3P plug, Cable length 2.4 m



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●Distributor/Representative